

1934

Causes of slow acid production in butter cultures

Louis Albert Harriman
Iowa State College

Follow this and additional works at: <https://lib.dr.iastate.edu/rtd>

 Part of the [Agriculture Commons](#), and the [Food Science Commons](#)

Recommended Citation

Harriman, Louis Albert, "Causes of slow acid production in butter cultures " (1934). *Retrospective Theses and Dissertations*. 13705.
<https://lib.dr.iastate.edu/rtd/13705>

This Dissertation is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Retrospective Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI[®]

NOTE TO USERS

This reproduction is the best copy available.

UMI[®]

CAUSES OF SLOW ACID PRODUCTION
IN BUTTER CULTURES

BY

L. A. HARRIMAN

12/14/34

A Thesis submitted to the Graduate Faculty
for the Degree

of

DOCTOR OF PHILOSOPHY

Major Subject Dairy Bacteriology

Approved:

Signature was redacted for privacy.

In charge of Major work

Signature was redacted for privacy.

Head of Major Department

Signature was redacted for privacy.

Dean of Graduate College



Iowa State College
1934

UMI Number: DP12739

UMI[®]

UMI Microform DP12739

Copyright 2005 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

OR
H266

TABLE OF CONTENTS

	Page
I. INTRODUCTION	4
II. STATEMENT OF PROBLEM	6
III. HISTORICAL	7
A. Examples of slow acid production	7
B. Influence of the milk used	9
C. Germicidal property of the milk used	9
D. Effect of heat on the germicidal property	11
E. Effect of abnormal milk	12
F. Contamination	12
G. Bacteriophage and primitive forms	14
H. Bacterial variation	14
I. Bacterial inhibition	16
IV. GENERAL METHODS	18
V. EXPERIMENTAL	19
Part I. Effect of milk used in mak- ing butter cultures on the rate of acid production	19
Section A. The effect of milk from vari- ous herds and individual cows	20
Section B. The effect of organisms present in the milk	25

T4795

	Page
Section C. The effect of con- tamination from plant equipment . . .	28
Part II. Effect of the butter cultures used as inoculating material on the rate of acid production.	37
Section A. Examination of but- ter cultures	38
Section B. Examination of bac- teria free filtrates from butter cultures.	50
Section C. Attempts to produce slow cultures ex- perimentally	77
VI. DISCUSSION OF RESULTS	86
VII. CONCLUSIONS	89
VIII. BIBLIOGRAPHY	92
IX. ACKNOWLEDGMENTS	96

INTRODUCTION

Butter cultures* sometimes fail to produce acid at a normal rate when inoculated into milk, and such abnormally slow acid production probably occurs wherever butter cultures are used in the manufacture of dairy products.

Butter cultures which fail to develop acid at the usual or expected rate are a source of serious trouble in creameries and cheese factories in causing delays in routine schedules of operation. Furthermore, if slow growing cultures are incubated for extended periods, so that a normal amount of acid is finally produced, the cultures often show an undesirable flavor and body, which may be so objectionable that the culture is rejected.

When a slow growing culture is used in the manufacture of various products, difficulties often result because the normal changes do not occur. The general plan of plant operation may make it very inconvenient to allow sufficient time for the expected changes to take place. Moreover, if unusually long periods are allowed, which may be necessary where procedures depend on the changes normally brought about by the culture, defects may develop which would normally be restricted or prevented by a properly growing

*The term butter culture will be used to refer to the common type of culture so widely employed in the manufacture of butter, cheese, artificial butter milk, etc.

culture. These defects may involve the flavor and aroma or the body and texture of the finished product. They may be so pronounced as to cause rejection and loss of the material being manufactured, or of the finished product.

One characteristic of certain slow growing butter cultures is the rather sudden or explosive manner in which they occur. A culture may be entirely normal in appearance, yet a transfer of this culture may be slow in developing acid. So far as known there is no method of bacteriological, chemical or organoleptic examination by which the occurrence of the difficulty can be predicted, and an actual trial with the culture seems necessary.

There are undoubtedly various causes of slow acid production by butter cultures. Some of these are fairly easily determined, either by careful inspection of the methods used in handling the cultures or by bacteriological examination of the defective cultures. In other cases, however, such methods fail to disclose the cause of the slow acid production, and the rather unusual aspects of such cases have motivated the work herein reported.

STATEMENT OF PROBLEM

The investigation was undertaken to determine the cause, or causes, of the abnormally slow acid production in certain butter cultures. The results are presented in two parts, as follows:

Part I. Effect of the milk used in making the butter culture on the rate of acid production.

Part II. Effect of the butter cultures used as inoculating material on the rate of acid production.

HISTORICAL

The literature contains many statements which are of significance in a consideration of slow acid production in butter cultures. Because these are not all closely related, they are discussed in a number of sections.

A. Examples of slow acid production.

Several instances of the slow development of butter cultures have been reported.

Knudsen and Sørensen (25) noted that some of the bacteria ordinarily found in butter cultures grow very poorly in sterilized aseptic milk, with accompanying feeble development of lactic acid.

Whitehead and Cox (40) used the term "non-acid" milk to describe the milk in which butter cultures grew slowly. They gave a method for determining whether or not a butter culture will develop at a normal rate in manufacturing processes; it consists essentially of determining the rate at which pasteurized milk inoculated with the culture will develop acid when incubated at 37° C. These workers made the following statement: "The fact has to be accepted that different starter cultures vary in their power to produce acid not only as between cultures but also in any one culture at different periods. Unfortunately, examination of a ripe cul-

ture by taste, aroma or chemical methods gives no indication of how the starter will perform in the cheese vat. Cultures which show exactly the same acidity when ready for use and are indistinguishable in taste and aroma may yet be entirely different in action in the vat."

Some of the factors suggested as causes of inhibition of lactic fermentation in the manufacture of cheese were studied by Leitch (26), who concluded that slow acid development was not due to contamination with any one species of bacteria, or to any property of fresh, raw, normal milk.

Moir (29) stated that not much is known about the loss of vitality in cultures and listed some of the possible causes, as follows: "(1) Constantly over ripening the cultures, (2) Organisms from the same pure culture may vary considerably in their ability to produce acid, (3) A streptococcus indistinguishable in appearance from a lactic streptococcus has been found actually to restrain acid development, (4) Obscure abnormalities in the milk, and (5) Milks of low acidity."

Whitehead and Riddet (41) reported a case of slow development in making cheese in which two or three hours over the normal time was required for the whey to reach an acidity of approximately 0.9 per cent.

B. Influence of the milk used.

Baker and Hamner (2) found that milk from different animals made butter cultures of varying acidities, while lots of milk from the same animal made cultures of approximately the same acidity. They also found that, in general, milk having high total solids tended to rank high in the acidity produced in it by cultures.

Knudsen and Sørensen (25) also reported that milk containing a high percentage of total solids permitted the development of a high titrable acidity and suggested that this was due to the greater concentration of buffer substances in the milk high in solids.

C. Germicidal property of the milk used.

Stocking (38) studied the numbers of acid producing bacteria in fresh, raw milk and reported that Streptococcus lactis multiplied rapidly in it.

Heineman and Glenn (18), who studied agglutination as a possible explanation of the germicidal property of milk, found no marked decrease in numbers of S. lactis (as determined by the plate method) when cultures were subjected to the influence of the serum of milk.

According to Rosenau and McCoy (33), the action of fresh, raw milk on bacteria appears to resemble that of a weak

antiseptic rather than a true germicide. They noted that the decrease in the numbers of bacteria is largely apparent, being due at least in part to agglutination.

Chambers (7) reported that there is no common relationship between agglutination and bacterial inhibition in milk, except that both are destroyed by heat.

Sherman and Curran (35) noted that fresh milk was responsible for a slight but definite inhibitory effect on S. lactis cultures inoculated into it.

Farmer and Hammer (12) found that butter cultures varied in their resistance to the germicidal action of raw milk and that different lots of milk varied in their action on the same culture.

Christiansen (8) stated that although dairy skim milk did not cause any discernible inhibition of pathogenic streptococci, milk fat did and sometimes even excluded growth. However, there was no inhibition on the two strains of S. lactis tested.

Jones (20, 21), and Jones and Sims (23) reported the preparation from milk serum of a substance 200 times more active than the original milk in the inhibition of mastitis streptococci.

D. Effect of heat on the germicidal property.

Hunziker (19) found that the germicidal property of milk was destroyed when the milk was heated to 149° F. for 40 minutes. Rosenau and McCoy (33) reported that boiling or heating above 80° C. destroys the germicidal action. According to Chambers (7) the germicidal property of milk is destroyed by heating to 80° to 90° C. for 2 minutes. He stated that S. lactis shows no difference in growth in heated and in raw milk.

Hammer and Baker (16) reported that milk heated to 145° F. for 30 minutes developed acid and coagulated more slowly when inoculated with a butter culture, than milk heated to higher temperatures. They suggested that the explanation undoubtedly lies in the effect of heat on the germicidal property.

Knudsen and Sørensen (25) stated that lactic acid bacteria grow better in milk the more it has been heated, and that with lower heating temperatures this may be due to destruction of bactericidal substances but with higher heating temperatures the effect must be ascribed to the formation of products of decomposition which are more easily utilized by the bacteria than the constituents appearing naturally in the milk.

E. Effect of abnormal milk

Leitch (26) reported instances in which abnormal milk present to the extent of only 0.1 per cent interfered with acid development in cheese manufacture.

Moir (29) listed abnormal milk, present at the rate of as little as one pint in the herd milk from 40 cows, as one of the causes of loss of vitality of butter cultures. He also stated that milk of low acidity, sometimes due to mammitis, should not be used for making butter cultures.

Whitehead and Cox (42) reported that leucocytes present in milk in excess of five millions per cubic centimeter, prevented the development of normal quantities of acid, this effect being eliminated by heat treatment to 49° to 50° C. for 30 seconds.

F. Contamination

Marshall (38) gave data indicating that Bacillus subtilis increased the rate of multiplication of S. lactis in milk and also the rate of acid development.

Morgan (30) showed that the contamination of active butter cultures with very small numbers of B. subtilis had little effect on their action; however, if B. subtilis once obtained a good start it would increase rapidly, though its full effect might not be felt for 4 or 5 days when the butter

culture appeared to go quite dead. The organism then decreased in numbers and S. lactis revived. Morgan reported that in one case of "slow cheese" a very large number of B. subtilis organisms was found in the butter culture used and that when a vat of cheese was made with normal culture the cheese was salted in 6.5 hours, while the cheese from a vat made with the culture contaminated with B. subtilis was salted after 10.5 hours, the same pasteurized milk being used in both vats.

The action of B. subtilis in inhibiting lactic fermentation in milk could not be confirmed by Leitch (26).

Cox and Whitehead (11) studied the effect, on acid production, of four organisms commonly found in contaminated milk. B. subtilis appeared to stimulate acid production; Bacterium coli varied in its effect; two strains of Staphylococcus had a slight stimulating effect; while Bacterium faecalis alkaligenes had only a slight effect which was barely beyond experimental error.

Whitehead and Cox (39) showed that colon bacilli, when present to the extent of hundreds of millions per ml. of milk, produced substances which inhibited the production of acid by lactic streptococci. They stated that such a condition would probably not be encountered in a cheese vat but that the cumulative effect of such inhibitory substances may be one of the causes of the loss in vitality which all

butter cultures suffer.

Whitehead and Riddet (41) reported the presence in a vat of "slow milk" of an organism, indistinguishable in appearance from S. lactis, which restrained S. lactis to a marked extent. This organism was rather small in size, clotted milk only after 4 or 5 days at 30° C. and was quite active in reduction of methylene blue.

G. Bacteriophage and primitive forms.

Bacteriophage and primitive forms should be considered as possible contaminants of butter cultures.

Sherman and Safford (36) reported the presence of filtrable microorganisms in soils, manures, hay infusions, fresh human feces and milk. Brueckner and Sherman (6) demonstrated that primitive forms of bacteria were present in the aseptically drawn milk of a majority of the healthy cows studied.

Lipska (37) found coliphage in fresh milk and in commercial milk and reported that this coliphage survived the bactericidal phase of milk.

H. Bacterial Variation.

Some of the characteristics of slow growing butter cultures indicate that bacterial variation, or dissociation,

may be responsible for changes in the rate of acid development of the cultures.

According to Hadley (14), pure line cultures of many species are composed of cells, all of which are by no means identical. He stated that from the same strain may arise, depending on cultural or other conditions, substrains possessing little resemblance to each other or to the parent strain.

Zinsser and Wilson (43) made the following statement. "There is actually at the present time no evidence that bacteria can change in virulence by gradual adaptation, but alterations, more or less sudden (analogous to mutations) may take place in the course of bacterial growth in which cultural, and sometimes morphological, changes may be accompanied by modifications of chemical structure and of virulence."

Work supporting different phases of bacterial variation has been reported by many investigators, among whom may be mentioned Cowan (10) working on "R" and "S" types of streptococci; Smith and Jordan (37), who produced filtrable forms of Corynebacterium diphtheriae; Hadley, Delves and Klimek (15), who worked on the "G" form of the Shiga bacillus; Kendall (23), who produced a filtrable form of Eberthella typhosa by the use of his "K" medium; and Knaysi (24), who secured varying strains of Bacillus megatherium from the same stock culture. Seastone and Lawrence (34)

could not confirm the above mentioned work of Kendall.

Grinnel (13), in his study of filtrable forms, pointed out the effect of the filter, the nature of the suspension fluid, and the age of the cells in obtaining such forms.

Buchanan and Truax (5), working with S. lactis, reported that they were unable to secure high and low acid strains of this organism by constant selection and transfer. They made the observation that continued growth of S. lactis under favorable conditions seemed to render the organism less variable and that the best method of securing high and low acid strains would be to select, from a number of sources, strains already established.

Harriman and Hammer (17) found that certain pure cultures of S. lactis which coagulated milk rapidly could be split into rapidly and slowly coagulating strains.

Hammer and Baker (16), working with butter cultures, reported that heavy inoculations did not tend to increase the acid tolerance of the organisms.

I. Bacterial inhibition by culture filtrates.

Some investigators contend that bacterial filtrates contain growth products, other than the usually recognized by-products, which cause inhibition of the cultures producing them.

Besredka (4) reported the presence of a substance in Staphylococcus broth culture filtrates which inhibited the growth of the homologous organisms, but which exerted little or no influence on the development of heterologous bacteria. He claimed that this substance originates as a result of the disintegration of the cells. Barnes (3) could not duplicate this work and stated that it appeared the effect of culture filtrates on the growth of bacteria is due to an alteration of necessary nutrient materials rather than to the presence of a truly inhibitory agent.

Cornwell and Beer (9) noted that the filtrate of a 72 day old broth culture of a Staphylococcus did not act as a disinfectant on a fresh inoculum, but it did prevent an increase in the numbers of the organisms.

Rogers and Whittier (32), after eliminating volatile products of metabolism, easily oxidizable products of metabolism, total lactate concentration, and self-induced changes in reduction potential as factors in limiting the growth of S. lactis, showed that such limitation is due to a substance diffusible through a collodion membrane.

Rogers (31) reported the presence of a specific diffusible substance in S. lactis cultures which markedly restrained the growth of Lactobacillus bulgaricus.

GENERAL METHODS

Cultures used. The butter cultures and S. lactis cultures used were obtained from the Dairy Industry Section of the Iowa Agricultural Experiment Station.

Milk used. The herd milk was obtained from the deliveries to the Iowa State College milk plant and the milk from individual cows was obtained at the College dairy farm.

Media used. The beef infusion agar was made according to the method of the American Public Health Association (1).

The tomato juice agar was made as follows: For each liter, 400 ml. of tomato juice (secured by filtering canned tomatoes) were neutralized to a pH of 7.0. Ten gm. of Bacto peptone, 10 gm. of Bacto peptonized milk and 15 gm. of agar were dissolved in 600 ml. of water by boiling, after which the preparation was made up to the original weight and added to the tomato juice. The medium was autoclaved at 15 pounds pressure for 30 minutes, distributed in tubes or bottles and again autoclaved.

Determination of acidity. Titration for the determination of acidity was carried out on 10 ml. samples with 0.1 N sodium hydroxide, using phenolphthalein as an indicator.

EXPERIMENTAL

PART I

Effect of the Milk Used in Making
Butter Cultures on the Rate of Acid Production.

The work reported in Part I deals with the effect of the milk, or factors closely associated with it, on the rate of acid production in butter cultures. The investigations carried out are considered in three sections, as follows:

Section A. The effect of milk from various herds and individual cows.

Section B. The effect of organisms present in the milk.

Section C. The effect of contamination from plant equipment.

Section A. The effect of milk from various herds and individual cows.

The effect of milk from various herds and individual cows on the rates of acid development by butter cultures and S. lactis cultures was studied in three series of experiments, which also included comparisons of raw and pasteurized milk.

In general, the method employed consisted of placing 10 ml. portions of the milk to be tested into as many sterile test tubes as were required by the number of heat treatments and the number of cultures to be used. After pasteurizing and cooling, each tube was inoculated with 0.005 ml. of a butter culture or 0.02 ml. of a S. lactis culture (the amounts being obtained by dilution in a sterile water blank) and incubated at room temperature. Observations for coagulation were made every two hours during the period beginning 16 hours and ending 24 hours after inoculation.

Series 1. Series 1 consisted of 14 trials with herd milk. Most of the trials included a sample of milk from each of seven herds. Ten ml. of milk from each sample were placed in each of six test tubes, three of which were held raw, while three were pasteurized at 65° C. for 30 minutes and then cooled. Three S. lactis cultures were used to inoculate the six tubes, each culture being added to one tube of raw milk and to one tube of pasteurized milk. The tubes were incubated at room temperature and observations for coagu-

lation made as already indicated.

The samples of milk from the different herds showed some variations in the time required for coagulation by any one culture, whether the milk was raw or pasteurized. The variations in coagulation time among the samples in one trial was usually less than four hours. In most of the trials coagulation occurred in less than 24 hours. However, the variations in coagulation rates were not consistent in the different trials and milk from a herd which coagulated comparatively rapidly in one trial, frequently coagulated slow in another. Pasteurizing the milk did not cause any appreciable change in the time required for coagulation and the principal effect of the pasteurization was to decrease the variations occurring among the different lots of milk used in a trial. One of the S. lactis cultures usually coagulated pasteurized milk in from 18 to 20 hours, while the other two usually required about 24 hours. There was little difference in the coagulation rates of the various S. lactis cultures in the raw milk.

Series.3. Four trials were included in Series 3, each trial involving a sample of milk from each of seven animals. Ten ml. of each sample were placed in each of nine test tubes. Three of these were held raw, three pasteurized at 63° C. for 30 minutes and three pasteurized at 82° C. for 30 minutes.

After cooling the tubes of milk, three S. lactis cultures were used to inoculate the nine tubes, each culture being added to one tube of raw milk, to one tube pasteurized at 63° C. and to one tube pasteurized at 82° C. The tubes were incubated at room temperature and observations made on the time of coagulation.

The samples of milk from different cows showed no significant variations in the time required for coagulation by any one of the cultures, whether the milk was raw or pasteurized. The variations among the samples in a trial were usually less than two hours. Coagulation generally required less than 16 hours or about 24 hours, depending on the culture used and the pasteurization temperature. Pasteurizing the milk at 63° C. for 30 minutes had practically no effect on the time required for coagulation while pasteurizing at 82° C. for 30 minutes decreased the time required for coagulation. One of the S. lactis cultures coagulated raw milk and milk pasteurized at 63° C. about six hours before the other cultures.

Series 3. Five trials were run in Series 3, each trial involving a sample of milk from each of seven animals. Ten ml. of each sample were placed in each of nine test tubes, three of which were held raw, while three were pasteurized at 63° C. for 30 minutes and three pasteurized at 82° C. for 30 minutes and then cooled. Three butter cultures were used to inoculate the nine tubes, each culture being added to

one tube of raw milk, to one tube pasteurized at 63° C. and to one tube pasteurized at 82° C. The tubes were incubated at room temperature and observations made on the time of coagulation.

The samples of milk from different cows showed little variation in the time required for coagulation by any of the butter cultures, whether the milk was raw or pasteurized, and the variations were usually less than two hours. Coagulation commonly required less than 16 hours or about 22 hours, depending on the culture used and the pasteurization temperature. Pasteurizing the milk at 63° C. for 30 minutes had little effect on the time required for coagulation, while pasteurizing at 82° C. for 30 minutes decreased the time required for coagulation. Two of the butter cultures coagulated milk about six hours before the other one.

The results reported in Section A show that, with the samples studied, the source of the milk had little effect on the time required for coagulation by S. lactis cultures or butter cultures. This was found to be the case with both herd milk and milk from individual cows. The variations were so small that the source of the milk was considered to be unimportant as a cause of slow acid production in butter cultures. The greatest variations observed in coagulation rates were those occurring among different cultures; the time required for coagulation varied as much as six hours with cul-

tures coagulating milk in 24 hours or less. Another variation in the time required for coagulation was noted in the comparison of raw and pasteurized milk; pasteurization at 82° C. for 30 minutes decreased the coagulation time about six hours.

Section B. The effect of organisms present
in the milk.

The effect of organisms commonly present in raw milk on the acid production by butter cultures was studied (a) by making comparisons of the rates of acid development in samples of raw milk from different herds, and (b) by determining the influence of bacteria isolated from butter cultures grown in raw milk on the rate of acid development.

Five trials were run on samples of milk from each of seven herds in order to determine whether or not the raw milk contained organisms which would restrain the development of acid by butter cultures. Each sample was divided into two 200 ml. portions and one portion held in ice water for approximately four hours while the other was held at room temperature for the same period. After the holding, each portion was inoculated with a butter culture at the rate of 2.5 per cent and incubated at 30° C., titrations being made after inoculation and every two hours for eight hours and again after 24 hours.

In all the trials there was considerable variation in the rates of acid development among the samples of raw milk from the different herds, whether the samples had been held in ice water or at room temperature before inoculation; after eight hours the acidity in the portion held in ice water ranged between 0.34 and 0.66 per cent, while in the portions held at room temperature it ranged between 0.40 and 0.68 per

cent. The portions held at room temperature usually developed acid at slightly faster rate than the corresponding portions held in ice water; after eight hours the acidities were from 0.01 per cent to 0.18 per cent higher in the former than in the latter. In a few of the pairs, however, acid developed at about the same rate in the portions which had been held at room temperatures as in those which had been held iced. Six such pairs were selected for further study; in these pairs, the differences in the acidities of the two portions constituting a pair were 0.05 per cent or less.

The 12 cultures constituting the 6 pairs selected were plated on beef infusion agar and the plates incubated at 30° C. for three days, after which 300 colonies (about 25 from each set of plates) were picked into tubes of litmus milk. Six of the litmus milk cultures, showing reactions distinctly different than would be expected from normal butter culture organisms, were studied in order to determine whether or not they would restrain the growth of a butter culture. Without any attempt to purify them, each of the six cultures was inoculated into two 200 ml. portions of sterile skim milk at the rate of approximately 2.5 per cent. Both portions were incubated for two hours, one at 21° C. and the other at 30° C. They were then inoculated with a butter culture at the rate of 2.5 per cent, and two additional portions of sterile skim milk were also inoculated to use as controls. Incubation was

continued at 21° C. and 30° C. and a check was held at each temperature; titrations were made after inoculation and every two hours for 12 hours and again after 24 hours.

None of the cultures tested showed any significant tendency to restrain acid production by the butter culture, as compared with the checks. After 12 hours at 21° C. the check had an acidity of 0.79 per cent, while the minimum acidity among the portions containing the cultures to be tested was 0.73 per cent and the maximum was 0.84 per cent. All the portions incubated at 21° C., including the check, were coagulated at the end of the 12 hour period. After six hours at 30° C. the check had an acidity of 0.71 per cent, while the minimum acidity among the portions containing the cultures to be tested was 0.64 per cent and the maximum was 0.75 per cent. All the portions incubated at 30° C., including the check, were coagulated at the end of the six hour period.

The results of the work reported in Section B indicate that the organisms occurring naturally in the samples of raw milk tested/did not restrain the development of acid by a butter culture to any marked extent. Furthermore, six cultures isolated from the samples of raw milk used did not appear to have any significant restraining action on the development of the butter culture. It should be noted that while the trials were carried out on raw milk, the numbers of organisms present in milk intended for making butter cultures would be greatly decreased by pasteurization.

Section C. The effect of contamination
from plant equipment.

The effect of the contamination of milk from plant equipment on the rate of acid development by butter cultures inoculated into the milk was studied in three experiments which also included comparisons of different heat treatments of the milk.

In general, the procedure consisted of dividing samples of milk from various sources in the milk plant into as many 300 ml. portions as were required by the number of pasteurization treatments and the number of butter cultures to be used. After pasteurizing and cooling, the portions were inoculated with a butter culture at the rate of 2.5 per cent and incubated at 30° C. for 22 hours, titrations being made every two hours for ten hours and again after 22 hours.

Experiment 1. In Experiment 1, pasteurized skim milk from a lot which had failed to make cottage cheese, on account of slow acid development, was used along with whole raw milk from the receiving vat. Milk from each of these sources was divided into twelve 300 ml. portions, three of which were held without any treatment, three pasteurized at 63° C. for 30 minutes, three pasteurized at 82° C. for 30 minutes, and three sterilized in the autoclave at 15 lb. pressure for 25 minutes. After cooling the portions of milk, three butter cultures, designated No. 122, No. 144, and No. 7

were used to inoculate the 13 portions, each culture being added to one portion of raw milk, to one portion pasteurized at 63° C., to one portion pasteurized at 82° C. and to one of the sterilized portions. The portions were incubated and titrated as already outlined. The results secured are given in Table 1.

The samples of milk from the two sources showed some variations in the rates of acid development by any one of the cultures, whether in the raw, pasteurized or sterilized conditions. However, the greatest variations appeared to result from differences in the butter cultures. The percentages of acid developed after ten hours by the different cultures varied as much as 0.26 per cent in the portions of pasteurized skim milk which had received the same treatment and as much as 0.13 per cent in the portions of whole raw milk.

In both samples pasteurization or sterilization tended to increase the rate of acid development by each of the cultures and, generally speaking, the higher the temperature of heating the faster the rate of acid production.

Experiment 2. In Experiment 2 the following samples were taken from the milk processed in a single run; No. 1, raw whole milk from the receiving vat; No. 2, skim milk before pasteurization; No. 3, pasteurized skim milk from the pasteurizing vat; and No. 4, pasteurized skim milk after it had been transferred to the cheese vat. Samples No. 1 and No. 2 were

Table 1. Percentages of acid formed by three butter cultures in pasteurized skim and whole raw milk. Temperature 30° C.

Milk		Butter		Per cent acid at the end of					
Kind	Treatment	No.	culture:	2 hr.	4 hr.	6 hr.	8 hr.	10 hr.	22 hr.
Pasteurized skim	None	7	:	0.18	0.41	0.53	0.57	0.52	0.60
		122	:	.19	.30	.60	.75	.78	.74
		144	:	.17	.25	.42	.60	.69	.73
		7	:	.20	.39	.51	.56	.63	.70
	63° C. 30 min.	122	:	.20	.36	.72	.79	.84	.73
		144	:	.17	.29	.50	.71	.77	.75
	82° C. 30 min.	7	:	.21	.35	.68	.62	.73	.81
		122	:	.20	.36	.73	.79	.84	.89
		144	:	.18	.32	.67	.77	.80	.95
		7	:	.26	.42	.64	.70	.75	.92
	Sterilized	122	:	.26	.41	.71	.77	.82	.96
		144	:	.23	.35	.60	.74	.85	.99
Whole raw	None	7	:	.18	.26	.47	.59	.67	.62
		122	:	.16	.24	.45	.77	.74	.77
		144	:	.18	.23	.36	.49	.64	.76
		7	:	.21	.33	.53	.56	.64	.65
	63° C. 30 min.	122	:	.20	.35	.69	.75	.77	.77
		144	:	.18	.34	.63	.73	.76	.75
	82° C. 30 min.	7	:	.21	.40	.69	.72	.78	.80
		122	:	.20	.39	.69	.77	.81	.90
		144	:	.19	.34	.50	.77	.81	.99
		7	:	.27	.41	.67	.70	.73	.94
	Sterilized	122	:	.24	.38	.63	.72	.83	.93
		144	:	.25	.38	.64	.74	.77	.94

each divided into six 200 ml. portions. Two portions of each were held without further treatment, two pasteurized at 63° C. for 30 minutes and two pasteurized at 82° C. for 30 minutes. Sample No. 3 was divided into two portions which received no further treatment. Sample No. 4 was divided into four portions, two of which were held without further treatment, while the other two were pasteurized at 82° C. for 30 minutes. After cooling the portions of milk, two butter cultures, designated No. 15 and No. C15, were used to inoculate them at the rate of 2.5 per cent, each culture being added to one portion of raw milk, to one portion pasteurized at 63° C. for 30 minutes. Culture No. 15 was a regular mother culture while culture No. C15 was a large lot culture of the same strain. Both were normal in appearance and acidity. After inoculation the portions were incubated and titrated at the intervals already indicated. The results secured are given in Table 2.

The samples of milk from the four sources showed some variations in the rates of acid development by each of the cultures; this was the case with both the untreated and pasteurized portions. Acid development usually took place at a more rapid rate in the pasteurized portions than in the raw portions, and, in most cases, pasteurization at 82° C. increased the rate over that at 63° C. The butter cultures showed marked and consistent differences in the rates of acid development during each two hour period for ten hours. The mother culture (No. 15)

Table 2. Percentages of acid formed by two butter cultures in four samples of milk. Temperature 30° C.

Sample No.	Milk		Butter		Per cent acid at the end of					
	Source	Treatment	No.	culture	2 hr.	4 hr.	6 hr.	8 hr.	10 hr.	22 hr.
1	:	:	:	:	:	:	:	:	:	:
	:	:	:	15	0.18	0.23	0.39	0.67	0.67	0.77
	:Raw whole,	:None	:	C15	.16	.19	.22	.20	.48	.78
	:from receiving:	:	:	15	.18	.24	.63	.74	.79	.73
	:vat	:63°C. 30 min.:	:	C15	.16	.19	.21	.20	.24	.78
2	:	:	:	15	.23	.42	.64	.77	.85	.89
	:	:82°C. 30 min.:	:	C15	.18	.21	.23	.20	.49	.81
	:	:	:	15	.20	.28	.60	.73	.69	.77
	:Raw skim, from:	:None	:	C15	.17	.22	.26	.52	.54	.77
	:pasteurizing	:	:	15	.20	.37	.71	.78	.84	.76
3	:vat	:63°C. 30 min.:	:	C15	.18	.20	.20	.23	.34	.77
	:	:	:	15	.21	.42	.74	.77	.79	.87
	:	:82°C. 30 min.:	:	C15	.17	.20	.22	.27	.40	.80
	:Skim, after	:	:	15	.19	.34	.65	.75	.76	.72
	:pasteurization:	:None	:	C15	.17	.19	.20	.20	.22	.77
4	:	:	:	15	.20	.33	.63	.76	.80	.75
	:Skim, from	:None	:	C15	.17	.19	.20	.22	.26	.80
	:cheese vat	:	:	15	.21	.40	.69	.77	.82	.89
	:	:82°C. 30 min.:	:	C15	.18	.19	.22	.24	.31	.80
	:	:	:							

increased in acidity at an apparently normal rate in all the samples during each two hour period while the large lot culture (No. C15) had not increased in acidity to any marked extent in any of the samples at the end of a six hour period, and in three of the samples a marked increase did not take place during the entire ten hour period. At the end of ten hours the differences between the acidities developed by the butter cultures in milk from any one source were as much as 0.55 per cent and never less than 0.15 per cent. However, during the period between 10 and 22 hours the acidity in culture No. 15 did not increase to any marked extent, having previously reached values near the maximum, while the acidity of No. C15 increased to values which were comparable to those of No. 15.

It should be emphasized that both of the cultures used were normal in appearance and acidity. However, after securing the above results, the slow culture, No. C15, was examined microscopically and by plating on beef infusion agar and picking colonies into litmus milk for the detection of organisms not normal to butter cultures. Neither method revealed any contamination of the culture.

Experiment 3. Samples of milk for Experiment 3 were taken from milk processed in one run, and at the same places as in Experiment 2.

After dividing each sample into four 200 ml. portions,

two portions of each were pasteurized at 63° C. for 30 minutes and two at 82° C. for 30 minutes. The portions were then cooled and two butter cultures were used to inoculate the four portions at the rate of 2.5 per cent, each culture being added to one portion pasteurized at 63° C. and to one portion pasteurized at 82° C. Both cultures came from the same strain as the cultures used in Experiment 2, No. 20 being a regular mother culture while No. C20 was a large lot culture. Both were normal in appearance and acidity. After inoculation the portions were incubated and titrated at the intervals already stated. The results secured are given in Table 3.

In general, the results are the same as those secured in Experiment 2. The samples of milk from the four different sources showed some variations in the rates of acid development by each of the cultures whether the milk was pasteurized at 63° C. or 82° C. The difference in the pasteurization temperatures had no significant effect on the rate of acid development, except with the whole milk, in which the portions pasteurized at 82° C. developed acid more rapidly in most cases than those pasteurized at 63° C.

The butter cultures showed marked differences in the rates of acid development during each two hour period for ten hours, the large lot culture (No. C20) being much slower than the mother culture (No. 20) in all the samples. After ten hours this difference varied from 0.25 to 0.51 per cent.

Table 3. Percentages of acid formed by two butter cultures in four samples of milk, each given two heat treatments. Temperature 30° C.

Milk		Butter	Per cent acid at the end of					
Source	Treatment	culture: No.	2 hr.	4 hr.	6 hr.	8 hr.	10 hr.	22 hr.
Raw whole, from receiving vat	63°C. 30 min.	20	0.19	0.28	0.59	0.77	0.78	0.80
	82°C. 30 min.	20	.19	.22	.26	.33	.44	.79
Raw skim, from pasteurizing vat	63°C. 30 min.	20	.21	.31	.62	.78	.80	.83
	82°C. 30 min.	20	.18	.24	.31	.40	.52	.81
Skim, after pasteurization	63°C. 30 min.	20	.21	.34	.69	.73	.86	.83
	82°C. 30 min.	20	.18	.22	.26	.30	.35	.83
Skim, from cheese vat	63°C. 30 min.	20	.21	.32	.70	.81	.80	.88
	82°C. 30 min.	20	.18	.23	.28	.32	.41	.83
Raw whole, from receiving vat	63°C. 30 min.	20	.19	.29	.64	.73	.78	.75
	82°C. 30 min.	20	.18	.21	.23	.26	.32	.73
Raw skim, from pasteurizing vat	63°C. 30 min.	20	.21	.32	.76	.78	.77	.87
	82°C. 30 min.	20	.18	.23	.28	.37	.52	.75
Skim, after pasteurization	63°C. 30 min.	20	.19	.30	.51	.67	.77	.74
	82°C. 30 min.	20	.18	.21	.23	.25	.27	.70
Skim, from cheese vat	63°C. 30 min.	20	.21	.33	.71	.81	.82	.88
	82°C. 30 min.	20	.18	.23	.26	.33	.42	.82

After 22 hours the differences had nearly disappeared due to the continued growth by No. C20 while No. 20 had previously reached values near the maximum.

The results reported in Section C indicate that, in the samples studied, contamination from plant equipment was not important as a cause of variations in acid production by butter cultures. The variations in the samples were too small and too inconsistent to be of any significance. However, the variations in acid production by different butter cultures were striking. In two trials there were large differences in the rates of acid development when two apparently normal butter cultures were inoculated into lots of milk receiving identical treatments. Furthermore, these differences were caused by exceptionally slow rates of acid production by the large lot cultures as compared with the mother cultures.

PART II

Effect of the Butter Cultures Used
as Inoculating Material on the Rate of Acid Production.

The results obtained in Part I showed that in the trials carried out the milk used in making butter cultures, and certain factors closely associated with the milk, had no pronounced effect on the rate of acid production. Milk from different sources, organisms naturally occurring in the milk, contamination from plant equipment, and different heat treatments of the milk caused only relatively slight differences in the rates of growth of a butter culture. The differences were small as compared with the variations caused by abnormally slow butter cultures encountered in actual practice. However, when different butter cultures were used as inoculating material, marked variations were encountered in acid production. The rates of acid development by some apparently normal cultures were so slow that they suggested the abnormally slow cultures which occur in routine practice. The investigation was accordingly directed to a study of the cultures used as inoculating material. The results secured are given in three sections as follows:

Section A. Examination of butter cultures.

Section B. Examination of bacteria free filtrates from butter cultures.

Section C. Attempts to produce slow cultures experimentally.

Section A. Examination of butter cultures.

The examination of various butter cultures was carried out in three series of experiments.

Series 1. In order to determine whether or not the butter cultures used as inoculating material were responsible for slow acid development in certain instances, the following procedure was used. A normal mother culture, which served as the check culture, was inoculated into each of two 200 ml. portions of sterile skim milk, and the butter culture to be tested was inoculated into one of the portions at the same rate. The culture tested was either a mother culture or a large lot culture and was described as either normal or slow, according to the presence or absence of coagulation after 16 hours under the conditions obtaining in the routine propagation of mother cultures or large lot cultures. With this inoculation procedure, one portion of the skim milk contained a 2.5 per cent inoculation from the check culture, while the other contained a 2.5 per cent inoculation from the check culture plus a 2.5 per cent inoculation from the culture to be tested. The latter portion undoubtedly contained a much larger number of living bacteria than the former, because even though the culture tested may have been described as slow, it was old enough to have very large numbers of cells in an active condition. After inoculation, both portions were incubated at room temperature for approximately 16 hours and then titrated.

The number of check cultures used with each culture tested varied from one to five. The results are given in Table 4.

Four of the five mother cultures tested were slow cultures and one of them was normal. One of the slow cultures caused a decrease of 0.20 per cent in the amount of acid formed by the check culture (on which it was tested). The other three slow cultures and the normal culture had little effect on the check culture, the greatest difference between the acidities produced by the check culture and by the check culture plus the culture to be tested being 0.04 per cent.

Nine of the 15 large lot cultures were slow cultures while the other six were normal. The nine slow cultures caused decreases in the amounts of acid formed by the check cultures ranging from 0.14 to 0.52 per cent, with the exception of one of the cultures in combination with one out of five check cultures, where a slight increase resulted. Three of the six normal large lot cultures caused decreases in the amounts of acid formed by the check cultures ranging from 0.25 to 0.36 per cent, while the other three normal cultures caused increases ranging from 0.06 to 0.13 per cent.

It should be pointed out that only one of the five mother cultures, this being one which was originally classified as slow, restrained the growth of the check culture on which it was tested, while 12 of the 15 large lot cultures, including all of the slow ones and three of the six normal ones, retarded the growth of the check cultures. It appears

Table 4. Effect of various butter cultures on the acid produced by a check culture. Room temperature.

Butter culture tested		Strain		No.		Per cent acid formed after 16 hr. Check culture plus Check culture by check culture		Effect of culture tested on acid produced by check culture	
No.	No.	No.	No.	Check culture	plus Check culture	by check culture	tested	acid produced	by check culture
<u>Slow mother cultures</u>									
11:	103	122	122	0.65	0.69		+ 0.04		
12:	27	122	122	.81	.79		- .02		
13:	29	122	122	.81	.77		- .04		
143:	15	15	15	.67	.47		- .20		
<u>Normal mother culture</u>									
14:	146	122	122	.74	.76		+ .02		
<u>Slow large lot cultures</u>									
2:	122	122	122	.75	.34		- .49		
124:15 and 17*		15	15	.65	.25		- .40		
:		17	17	.63	.25		- .38		
125:15 and 17*		15	15	.66	.23		- .43		
:		17	17	.59	.24		- .35		
126:15 and 17*		15	15	.73	.27		- .46		
:		17	17	.68	.27		- .41		
131:15 and 17*		15	15	.63	.23		- .40		
:		17	17	.62	.24		- .38		
138:15 and 17*		15	15	.62	.23		- .40		
:		17	17	.60	.25		- .35		
139:	15	15	15	.73	.21		- .52		
:		17	17	.69	.20		- .49		
142:15 and 103*		15	15	.55	.27		- .28		
:		17	17	.40	.26		- .14		
:		103	103	.56	.41		- .15		
70:	15	19-1	19-1	.69	.72		+ .03		
:		19-01	19-01	.72	.57		- .15		
:		15	15	.64	.34		- .40		
:		20	20	.49	.24		- .25		
:		-146	-146	.72	.49		- .23		
<u>Normal large lot cultures</u>									
16:	G3	122	122	.81	.87		+ .06		
17:	122	122	122	.68	.74		+ .06		
18:	G3	122	122	.68	.81		+ .13		
20:	122	122	122	.81	.45		- .36		
140:15 and 103*		15	15	.71	.35		- .36		
:		17	17	.71	.37		- .34		
:		103	103	.71	.46		- .25		

Table 4. (Cont'd)

Butter culture tested		Strain No.	Per cent acid formed after 16 hr. Check culture	plus Check culture tested	Effect of culture tested on acid produced by check culture
141	15 and 103*	15	.63	.38	- .35
		17	.60	.29	- .31
		103	.59	.30	- .29

*Two cultures used in inoculating large lot of milk.

from these data that there was some relationship between the conditions under which cultures were prepared and their ability to restrain acid development of other cultures on which they were tested.

The fact that 10 of the 13 slow cultures and only three of the seven normal ones restrained the growth of the check cultures indicates some correlation between the rates of coagulation of the cultures tested and their restraining ability. There may have been a closer correlation if some basis other than the presence or absence of coagulation after 16 hours had been used to divide the cultures into the slow and the normal groups.

It should also be noted that all of the 11 cultures containing strain No. 15 retarded the growth of the check cultures, and that two of the three cultures containing strain No. 122 had the same effect.

Series 2. In Series 2, various mother cultures, large lot cultures and experimental cultures, each group including some that were slow and some that were normal, were examined according to the following procedure. Each culture was plated on tomato juice agar and the plates incubated for three days at 21° C. After counting, 25 colonies were picked into tubes of litmus milk from a plate representing each culture. The tubes were incubated eight days at room temperature, observations being made daily on the changes in the tubes.

On the basis of the changes occurring in them, the tubes were placed in three groups, as follows: (a) fairly rapid reduction and coagulation, suggesting typical S. lactis; (b) reduction and acid development but no coagulation after eight days, presumably indicating S. lactis var. tardus; and (c) no reduction and very little acid after eight days, suggesting citric acid fermenting streptococci. Considerable numbers of the cultures in group (c) were examined microscopically, and in practically all cases organisms of the expected morphology were present. Some of them were also inoculated into 200 ml. portions of sterile skim milk and volatile acid determinations made on these cultures after five days at room temperature. The volatile acidities were large enough in all cases to indicate that the cultures were citric acid fermenters. The results obtained in the studies of the butter cultures are given in Table 5.

Nine mother cultures were examined, eight of which were slow while the other was a normal culture. The acidities of the slow cultures at the time of examination varied from 0.84 to 0.80 per cent, while the plate counts ranged from 20.5 million to 815 million bacteria per ml. The plate count of the normal mother culture was 95.5 million bacteria per ml. Eleven large lot cultures were examined, eight of which were slow while the other three were normal. The acidities of the eight slow cultures at the time of plating ranged from

Table 5. Number and general types of organisms in slow and normal butter cultures.

		Action of 25 colonies picked into litmus milk							
Butter culture studied:	Age: Per : in : cent: No.:hr.:acid:	Bacteria : per ml.	No. coagulating after				Classification		
			1 : day	2 : days	3 : days	4 : days	S.lactis : tardus	acid : ferm.	Citric : type
<u>Slow mother cultures</u>									
143:	16:	0.55:	88,000,000:	4 :	20 :	:	:	24 :	1
149:	40:	.80:	815,000,000:	1 :	24 :	:	:	25 :	
150:	16:	.55:	42,000,000:	21 :	2 :	:	:	23 :	2
151:	16:	.57:	26,500,000:	25 :	:	:	:	25 :	
152:	16:	.71:	37,800,000:	24 :	:	:	:	24 :	
222:	24:	.71:	443,000,000:	13 :	:	:	:	13 :	12
223:	24:	.62:	460,500,000:	13 :	:	:	:	13 :	12
234:	20:	.34:	222,000,000:	9 :	:	:	:	9 :	16
<u>Normal mother culture</u>									
235:	16:	:	95,500,000:	14 :	:	:	:	14 :	11
<u>Slow large lot culture</u>									
138:	22:	.25:	44,300,000:	25 :	:	:	:	25 :	
139:	16:	.54:	37,000,000:	25 :	:	:	:	25 :	
183:	16:	.65:	585,000,000:	19 :	6 :	:	:	25 :	
186:	20:	.54:	103,000,000:	:	:	:	:	:	24
190:	16:	.44:	:	2 :	:	:	:	2 :	25
197:	16:	.58:	190,000,000:	25 :	:	:	:	25 :	
201:	16:	.50:	57,500,000:	25 :	:	:	:	25 :	
226:	16:	.37:	:	:	:	:	:	:	12 : 2
<u>Normal large lot cultures</u>									
140:	16:	.76:	304,500,000:	12 :	5 :	:	:	17 :	8
141:	16:	.75:	470,000,000:	10 :	6 :	2 :	:	18 :	5 : 2
202:	16:	.84:	575,000,000:	20 :	4 :	:	:	24 :	1

Table 5 (Cont'd)

Action of 25 colonies picked into litmus milk										
Butter culture studied:	Age: Per cent in acid:	Bacteria per ml.	No. coagulating after:				Classification			
			1 day	2 days	3 days	4 days	S. lactis var.	acid ferm.	tardus type	
Slow experimental cultures										
200:	16:	0.56:	146,000,000:	24	:	:	:	24	:	1
204:	16:	.41:	26,100,000:	25	:	:	:	25	:	
205:	16:	.56:	200,000,000:	25	:	:	:	25	:	
206:	16:	.33:	35,850,000:	:	:	:	:	:	:	25
209:	16:	.49:	14,900,000:	12	:	5	:	17	:	7
211:	16:	.48:	60,000,000:	11	:	14	:	25	:	
219:	16:	.30:	55,000,000:	:	:	2	:	2	:	21
221:	16:	.30:	13,500,000:	:	:	:	:	:	:	25
228:	16:	.32:	28,000,000:	:	:	:	:	:	:	25
229:	16:	.56:	55,000,000:	:	:	:	:	:	:	25
Normal experimental cultures										
194:	16:	.85:	178,500,000:	:	:	20	:	20	:	
195:	16:	.83:	765,000,000:	:	:	21	:	21	:	4
196:	16:	.89:	590,000,000:	21	:	:	:	21	:	4
199:	16:	.86:	805,000,000:	25	:	:	:	25	:	
203:	16:	.77:	135,000,000:	18	:	6	:	24	:	1
207:	16:	.73:	101,000,000:	23	:	:	:	23	:	2
208:	16:	.81:	280,500,000:	10	:	13	:	24	:	1
210:	16:	.78:	213,000,000:	18	:	2	:	20	:	5
216:	16:	.70:	501,500,000:	18	:	1	:	19	:	4
217:	16:	.67:	31,500,000:	6	:	2	:	8	:	17
218:	16:	.71:	77,500,000:	4	:	21	:	25	:	
220:	16:	.72:	348,500,000:	7	:	6	:	13	:	12
227:	16:	.70:	305,500,000:	8	:	13	:	24	:	1

0.25 to 0.65 per cent and the plate counts varied from 37 million to 585 million bacteria per ml. The acidities of the three normal large lot cultures varied from 0.75 to 0.84 per cent while the plate counts ranged from 304.5 million to 575 million bacteria per ml. Twenty-three experimental cultures were examined, 10 of which were slow, while the other 13 were normal. The acidities of the 10 slow cultures ranged from 0.33 to 0.56 per cent when plated and the plate counts varied from 13.5 million to 200 million bacteria per ml. The acidities of the 13 normal experimental cultures varied from 0.67 to 0.89 per cent and the plate counts ranged from 31.5 million to 805 million bacteria per ml. No definite correlation seemed to exist between acidities and plate counts of the cultures examined. However, in general, the cultures with low acidities in each group were generally accompanied by low counts while, to a lesser extent, the cultures with high acidities had high counts, indicating that slow growing cultures are caused by comparatively low numbers of organisms, rather than by a diminished acid production per cell.

In most cases, there appeared to be a normal distribution of the organism present among the butter culture types. From plates representing five of the slow cultures, however, only colonies of the citric acid fermenting type were obtained. These five cultures also had comparatively low plate counts. There was some variation in the time required for coagulation by the cultures of the S. lactis type but this

is not significant considering the variations in the numbers of cells in the inoculating material obtained in picking colonies from a plate.

It should be emphasized that no contaminating colonies (with the exception of an occasional mold colony) ever appeared on the plates, and that the colonies picked into tubes of litmus milk always brought about fermentations typical of normal butter culture organisms. Furthermore, microscopic examination of slow cultures revealed no contamination of the culture, or abnormality in the morphology of the cells.

Series 3. In Series 3 a slow mother culture of strain No. 15 was titrated and plated in duplicate on tomato juice agar at the end of 20 hours, 22 hours, 24 hours, 26 hours, 30 hours, and 42 hours. After incubating the plates three days at room temperature and counting the colonies, 25 colonies were picked into tubes of litmus milk from plates representing each period. The tubes of litmus milk were incubated eight days at room temperature, observations being made daily on the changes in the tubes; eventually the cultures were classified into S. lactis and citric acid fermenting streptococci. The results obtained are given in Table 6.

The results show a fairly constant increase in acidity beginning with 0.35 per cent after 20 hours and ending with 0.70 per cent after 42 hours. The plate counts were all comparatively large, ranging from 222 million bacteria per ml.

Table 6. Numbers and general types of organisms in a slow butter culture at various intervals. Room temperature.

Age in hr.	Per cent acid	Bacteria per ml.	Classification of 25 colonies picked into litmus milk	
			S. lactis	Citric acid fermenting type
20	0.35	222,000,000	10	15
22	.41	238,500,000	7	18
24	.45	256,500,000	14	11
26	.49	230,500,000	5	20
30	.56	240,500,000	14	11
42	.70	351,500,000	17	8

to 351.5 million. There was some correlation between the percentages of acidity and the plate counts; the lowest count was obtained after 30 hours and the highest count after 48 hours, the others showing some fluctuation.

The colonies picked into litmus milk from platings representing the various periods contained a rather high proportion of citric acid fermenting streptococci. No contaminating colonies appeared on the plates, and the fermentations in the litmus milk tubes were typical of normal butter culture organisms.

The results reported in Section A show that some freshly inoculated butter cultures could be definitely restrained by the addition of certain mother cultures or large lot cultures, either slow or normal. This indicates that the cause of slow acid development is in the cultures used as inoculating material. No contamination was found in slow acid producing butter cultures by any of the methods used, and the morphology of the cells always appeared to be normal. Litmus milk tubes inoculated with colonies picked from a plate poured with a slow acid producing culture showed a normal distribution of the colonies among the butter culture types of organisms, although a few of the slow cultures yielded only citric acid fermenting streptococci. The rate of coagulation of the S. lactis cultures picked did not appear to vary with the classification (slow or normal) into which the cultures had been placed.

Section B. Examination of bacteria
free filtrates from butter cultures

Since it was found (a) that certain butter cultures, most of which were slow in acid production, retarded the growth of a freshly inoculated normal butter culture when added at the time of inoculation, and (b) that routine examinations of the slow cultures revealed no ordinary forms of contamination, studies on bacteria free filtrates* from butter cultures were carried out. The filtrates were obtained in the following manner.

After the butter culture had coagulated it was filtered through coarse filter paper which removed most of the casein, leaving a fairly clear filtrate. This filtrate was then passed through a grade N Berkfeld filter and stored in a screw cap bottle at 5° C. All the apparatus with which the filtrate came in contact during the procedure was sterilized in the autoclave at 15 pounds pressure for 30 minutes.

Tests for sterility of a considerable number of the filtrates were made by inoculating 1 ml. into each of two tubes of sterile litmus milk and incubating one of the tubes at room temperature and one at 37° C., and also by making smears of the filtrates on two plates of beef infusion agar and two plates of tomato juice agar and incubating one of each of these at room temperature and one at 37° C. The litmus milk

*The term "bacteria free filtrate" is used to refer to a filtrate free from bacteria in the usual form.

tubes did not show changes except in one case in which a slow acid development appeared. The contents of many of the tubes showing no changes were examined microscopically and no indications of growth were ever found. The agar plates did not show growth of any nature after four days incubation, except that on an occasional plate a mold colony developed.

The effect of the filtrates on acid production by butter cultures and S. lactis cultures was studied in the following manner. The culture which was to be used as the test culture was inoculated into two 200 ml. portions of sterile skim milk at the rate of 2.5 per cent, and the filtrate to be tested was added to one of the portions at the same rate. Both portions were incubated at room temperature for 16 hours and then titrated.

The bacteria free filtrates were investigated in eight series of experiments, each of which is discussed separately.

Series 1. Series 1 included studies on the effect of various bacteria free filtrates on acid production by apparently normal butter cultures. The filtrates were obtained from mother cultures, large lot cultures and experimental cultures, each group including both slow and normal cultures. The data showing the effect of the filtrates on the acid production of the test cultures are given in Table 7.

Nineteen filtrates from mother cultures were tested,

Table 7. Effect of bacteria free filtrates from slow and normal butter cultures, on the amount of acid developed by test butter cultures. Room temperature.

Filtrate	Butter culture yielding No.	Test culture No.	Per cent acid formed in 16 hr. Test culture	Per cent acid formed in 16 hr. plus filtrate culture	Effect of filtrate on acid produced by test culture
<u>Slow mother cultures</u>					
129:	18	15	0.63	0.56	-0.07
130:	37	37	.39	.41	+ .02
143:	15	17	.68	.25	- .43
144:	3	S. 1 1*	.78	.23	- .55
145:	229	S. 1 1	.78	.21	- .57
146:	24	S. 1 1	.78	.27	- .51
149:	15	15	.79	.77	- .02
150:	17	17	.80	.74	- .06
151:	229	S. 1 1	.77	.23	- .55
152:	223	S. 1 1	.77	.23	- .54
222:	17	15	.89	.77	- .12
223:	203	15	.89	.64	- .25
234:	15	15	.93	.56	- .37
<u>Normal mother cultures</u>					
35:19-01		19-01	.53	.53	- .01
56:19-1		19-1	.60	.61	+ .01
127:	15	15	.63	.67	+ .04
128:	17	17	.62	.67	+ .05
192:	15	15	.73	.43	- .30
235:	15	15	.93	.59	- .34
<u>Slow large lot cultures</u>					
2:	122	122	.68	.29	- .39
70:	15	15	.74	.23	- .51
124:15 and		15	.68	.23	- .45
:	17	17	.59	.23	- .36
125:15 and		15	.73	.23	- .50
:	17	17	.70	.22	- .48
126:15 and		15	.65	.50	- .15
:	17	17	.62	.51	- .11
131:15 and		15	.73	.34	- .39
:	17	17	.74	.29	- .45
138:15 and		15	.77	.19	- .58
:	17	17	.68	.20	- .48

*S. 1 = S. lactis

Table 7 (Cont'd)

Filtrate	Test	Per cent acid	Effect of
:Butter	:culture:	formed in 16 hr.:	filtrate
:culture	:No.:	Test	on acid
:yielding	:	:culture	produced
No.:	filtrate	Test	plus
:	:	:culture:	filtrate:
:	:	:	culture
<u>Slow large lot cultures</u>			
139:	15 :	15 :	0.77: 0.31: -0.56
:	:	17 :	.78: .20: - .58
142:15 and 103:	:	17 :	.68: .36: - .42
:	:	103 :	.67: .33: - .34
183:	15 :	15 :	.80: .25: - .55
:	:	17 :	.78: .31: - .47
185:	15 :	15 :	.73: .33: - .50
186:	15 :	15 :	.73: .30: - .53
190:	15 :	15 :	.81: .22: - .59
197:	15 :	15 :	.73: .35: - .48
201:	15 :	15 :	.81: .25: - .56
226:	15 :	15 :	.84: .35: - .49
<u>Normal large lot cultures</u>			
20:	122 :	122 :	.73: .34: - .38
37:	122 :	122 :	.53: .58: + .05
44: 19-01	:	19-01 :	.61: .33: - .28
132:15 and 17 :	:	15 :	.67: .41: - .26
:	:	17 :	.71: .37: - .34
140:15 and 103:	:	15 :	.77: .23: - .54
:	:	103 :	.77: .50: - .27
141: 15 and 103:	:	15 :	.77: .28: - .49
:	:	103 :	.77: .47: - .30
202:	146 :	15 :	.81: .36: - .45
<u>Slow experimental cultures</u>			
200:	15 :	15 :	.78: .26: - .52
204:	15 :	15 :	.78: .29: - .49
205:	15 :	15 :	.78: .35: - .43
206:	15 :	15 :	.78: .23: - .55
209:	15 :	15 :	.81: .49: - .32
211:	15 :	15 :	.81: .48: - .33
219:	232 :	15 :	.89: .51: - .38
221:	15 :	15 :	.89: .42: - .47
228:	15 :	15 :	.68: .34: - .34
229:	15 :	15 :	.68: .38: - .30
230:	15 :	15 :	.88: .95: + .07
232:	146 :	15 :	.86: .88: + .02
<u>Normal experimental cultures</u>			
193:	15 :	15 :	.73: .30: - .43
194:	15 :	15 :	.73: .30: - .43
195:	146 :	146 :	.77: .77: + .00

Table 7 (Cont'd)

Filtrate	:Test	:Per cent acid	:Effect of
:Butter	:culture:	:formed in 16 hr.:	:filtrate
:culture	:No.	:Test	:on acid
:yielding	:	:culture	:produced
No.:	:filtrate	:Test	:plus
	:	:culture:	:filtrate:
	:		:culture
	:		
Normal experimental cultures			
196:	146 :	146:	0.77: 0.78: + 0.01
199:	15 :	15:	.78: .59: - .19
200:	15 :	15:	.78: .26: - .52
203:	15 :	15:	.78: .50: - .28
208:	15 :	15:	.81: .45: - .36
210:	15 :	15:	.81: .43: - .38
216:	15 :	15:	.89: .89: + .00
217:	15 :	15:	.89: .56: - .33
218:	232 :	15:	.89: .93: + .04
220:	15 :	15:	.89: .68: - .21
227:	15 :	15:	.68: .53: - .15
231:	15 :	15:	.88: .94: + .06
233:	146 :	15:	.88: .89: + .01

13 of which were obtained from slow cultures while six came from normal cultures. Of the 13 filtrates from slow mother cultures, nine caused decreases, ranging from 0.12 to 0.57, in the percentages of acid formed by the test cultures, while four caused comparatively small changes, ranging from a decrease of 0.07 to an increase of 0.02. Two of the six filtrates from normal mother cultures caused decreases, ranging from 0.30 to 0.34, in the percentages of acid formed by the test cultures, while four caused comparatively insignificant changes, which varied from a decrease of 0.01 to an increase of 0.05. Greater decreases occurred in the five trials with the S. lactis culture than with any of the butter cultures used as test cultures.

Sixteen filtrates from slow large lot cultures and seven filtrates from normal large lot cultures were tested. All of the 16 filtrates from slow large lot cultures caused decreases, ranging from 0.34 to 0.59, in the percentages of acid formed by the test cultures. Six of the seven filtrates from normal large lot cultures caused decreases in the percentages of acid which ranged from 0.27 to 0.54, while the remaining filtrate caused an insignificant increase of 0.05.

Twelve filtrates from slow experimental cultures and 16 from normal experimental cultures were tested. Ten of the 12 filtrates from slow experimental cultures caused decreases in the percentages of acid, the decreases ranging from 0.30

to 0.55. The remaining two filtrates caused increases of 0.02 and 0.07 respectively in the percentages of acid produced. Of the 16 filtrates from normal experimental cultures, 10 caused decreases ranging from 0.15 to 0.52 in the percentages of acid formed, four caused increases ranging from 0.01 to 0.06, and two caused no change.

It should be emphasized that the filtrates tested brought about comparatively marked decreases in the percentages of acid formed by the test culture or had no significant effect. They never caused marked increases. The fact that 37 of the 43 slow cultures tested (88 per cent) and 16 of the 27 normal cultures (59 per cent) yielded filtrates which caused rather marked decreases in the percentages of acid formed by the test cultures indicates some correlation between the rate of coagulation of the cultures filtered and the restraining power of the filtrates obtained from them.

Since 11 of the 19 filtrates from the mother cultures (58 per cent) and 22 of the 23 filtrates from large lot cultures (96 per cent) caused rather marked decreases in the percentages of acid produced by the ten cultures, it appears that large lot cultures are more likely to yield restraining filtrates than mother cultures. The experimental filtrates cannot be included in this comparison since many of them were made by a combination of the methods used in making mother cultures and the methods used for large lot cultures.

Series 2. In Series 2 the effects of four filtrates on the acid production by butter cultures and of eight other filtrates on the acid production of S. lactis cultures were tested. Three of the filtrates tested on butter cultures came from normal large lot cultures, while the other came from a slow large lot culture. Four of the filtrates tested on S. lactis cultures came from slow large lot cultures, three came from slow experimental cultures, while the remaining one came from a normal large lot culture. Four of the S. lactis test cultures were isolated from butter cultures and six from six samples of raw milk. Table 8 gives the results obtained in the trials with the butter cultures, while Table 9 gives the results obtained with the S. lactis cultures.

The data show that one filtrate definitely restrained 11 of the 13 butter cultures on which it was tested; one restrained one out of six cultures; one restrained two out of six cultures; while one restrained two out of three cultures. Of the filtrates tested on S. lactis cultures, one restrained three out of ten cultures; two restrained three out of six; one restrained two out of four; two restrained one out of four cultures; while two restrained two out of three cultures. It appears that the different filtrates tested restrained certain cultures and had no effect on others. These data suggest that different filtrates have different degrees of restraining ability and that different butter cultures and S. lactis

Table 8. Effect of bacteria free filtrates on the amounts of acid formed by butter cultures. Room temperature.

Test culture No.	Per cent acid formed in 16 hr.							
	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 20:	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 6 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 7 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 70 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 70 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 70 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 70 :	:Test : :cul- : :Test:t :cul-:p :ture:fil- :trate : :No. 70 :
122-19-01	:0.72:	0.41	:0.73:	0.75	:0.73:	0.77	:0.67:	0.62
122-B-2	:.76:	.32	:.67:	.74	:.67:	.70	:.74:	.23
122-19	:.75:	.41	:.67:	.72	:.67:	.69	:.60:	.27
122-19-1	:.79:	.31	:.70:	.36	:.70:	.41	:	
122-10	:.75:	.38	:.58:	.56	:.64:	.43	:	
146	:.76:	.52	:.74:	.75	:.75:	.75	:	
122-19-10	:.68:	.51	:		:		:	
122-B	:.79:	.32	:		:		:	
103	:.61:	.63	:		:		:	
3	:.76:	.27	:		:		:	
4	:.72:	.23	:		:		:	
5	:.74:	.23	:		:		:	
6	:.34:	.33	:		:		:	

cultures have varying abilities to resist the action of filtrates.

Series 3. The studies in Series 3 were carried out by adding a filtrate to a freshly inoculated butter culture or S. lactis culture and making plate counts and observing the coagulation time of tubes of litmus milk inoculated with colonies picked from the plates; in the case of the butter cultures, the distribution of the colonies picked among the normal butter culture organisms was also noted. The filtrates all came from slow large lot cultures. The following procedure was used.

A butter culture or S. lactis culture was inoculated into the required number of 200 ml. portions of sterile skim milk at the rate of 2.5 per cent, and then one of the filtrates to be used was added to each freshly inoculated portion at the same rate, one portion being held without the addition of filtrate to serve as a check. After incubation at room temperature for 16 hours, the portions were titrated and then plated on tomato juice agar. After incubating the plates for three days at 21° C. the colonies were counted and 25 were picked from each set of plates into tubes of litmus milk. The litmus milk tubes were incubated eight days at room temperature and observations made daily on the changes occurring in them. The results are given in Table 10.

In all except 2 of the 19 portions containing fil-

Table 10. Effect of bacteria free filtrates on the amount of acid and types of organisms in butter cultures and S. lactis temperature.

Test culture and filtrate	Filtrate	Source of filtrate	Per cent acid formed	Bacteria per ml.	No. coagulated	1 day	2 days	3 days
Butter culture 15	None	Slow experimental culture	0.79	425,000,000		22		
Butter culture 15	54	Slow experimental culture	.29	27,200,000				
Butter culture 15	92	Slow experimental culture	.28	39,280,000				
Butter culture 15	124	Slow large lot culture	.77	430,000,000		19		
Butter culture 15	None	Slow large lot culture	.78	480,000,000		18		
Butter culture 15	124	Slow large lot culture	.23	6,320,000		24		
Butter culture 15	125	Slow large lot culture	.37	13,240,000		8		
Butter culture 15	131	Slow large lot culture	.52	6,930,000		21		
Butter culture 19-01	None	Slow large lot culture	.67	530,000,000		15		
Butter culture 19-01	133	Slow large lot culture	.23	253,000		9		
Butter culture 19-01	134	Slow large lot culture	.33	252,500		14		
Butter culture 19-01	None	Slow experimental culture	.78	560,000,000		16		
Butter culture 19-01	54	Slow experimental culture	.30	26,100,000				
Butter culture 19-01	58	Slow experimental culture	.73	149,000,000		24		
Butter culture 19-01	91	Slow experimental culture	.41	30,300,000		25		
Butter culture 19-01	92	Slow experimental culture	.28	41,800,000		25		
S. lactis 15	None	Slow large lot culture	.37	219,000,000		20		
S. lactis 15	125	Slow large lot culture	.22	50,500		19		
S. lactis G	None	Slow large lot culture	.74	370,000,000	17	7		
S. lactis G	125	Slow large lot culture	.52	61,500,000	14	10		
S. lactis P1	None	Slow large lot culture	.58	1,775,000,000		4		
S. lactis P1	125	Slow large lot culture	.41	1,376,000,000				
S. lactis P2	None	Slow large lot culture	.71	670,000,000		25		
S. lactis P2	136	Slow large lot culture	.27	455,000		25		
S. lactis 15	None	Slow large lot culture	.37	229,500,000		17		
S. lactis 15	135	Slow large lot culture	.21	237,500		18		
S. lactis 15	136	Slow large lot culture	.24	120,500		15		
S. lactis 15	137	Slow large lot culture	.25	83,000		21		

free filtrates on the amount of acid formed and the numbers
 in butter cultures and S. lactis cultures. Room

rate	:Per :cent :acid :formed:	:Bacteria :per ml.	:Action of 25 colonies :picked into litmus milk									
			:No. coagulating in:				:Classification					
			:1 :day:	:2 :days:	:3 :days:	:4 :days:	:S.lactis :var. :tardus	:S.lactis :acid :ferm. :type	:Citric :acid			
ulture	: 0.79	: 425,000,000:	: 22	:	:	:	:	: 22	:	: 3	:	
ulture	: .29	: 27,200,000:	:	:	:	:	:	:	:	:	:	: 25
ulture	: .28	: 39,280,000:	:	:	:	:	:	:	:	:	:	: 25
ure	: .77	: 430,000,000:	: 19	: 2	:	:	:	: 21	:	: 4	:	
ure	: .78	: 480,000,000:	: 18	: 7	:	:	:	: 25	:	:	:	
ure	: .23	: 6,320,000:	: 24	: 1	:	:	:	: 25	:	:	:	
ure	: .37	: 13,240,000:	: 8	:	:	:	:	: 8	:	:	:	: 17
ure	: .52	: 6,930,000:	: 21	: 2	:	:	:	: 23	:	:	:	: 2
ure	: .67	: 530,000,000:	: 15	: 7	: 2	:	:	: 24	:	:	:	: 1
ure	: .23	: 253,000:	: 9	: 3	: 5	:	:	: 17	:	:	:	: 8
ure	: .33	: 252,500:	: 14	: 7	: 3	:	:	: 24	:	:	:	: 1
ure	: .76	: 560,000,000:	: 16	: 6	: 3	:	:	: 25	:	:	:	
ulture	: .30	: 26,100,000:	:	:	:	:	:	:	:	:	:	: 25
ulture	: .73	: 149,000,000:	: 24	: 1	:	:	:	: 25	:	:	:	
ulture	: .41	: 30,300,000:	: 25	:	:	:	:	: 25	:	:	:	
ulture	: .28	: 41,800,000:	: 25	:	:	:	:	: 23	:	:	:	: 2
ure	: .37	: 219,000,000:	: 20	: 3	:	:	:	: 25	:	:	:	: 2
ure	: .22	: 50,500:	: 19	: 6	:	:	:	: 25	:	:	:	
ure	: .74	: 370,000,000:	: 17	: 7	:	:	:	: 24	:	:	:	
ure	: .58	: 61,500,000:	: 14	: 10	: 1	:	:	: 25	:	:	:	
ure	: .58	: 1,775,000,000:	: 4	: 21	:	:	:	: 25	:	:	:	
ure	: .41	: 1,376,000,000:	:	: 25	:	:	:	: 25	:	:	:	
ure	: .71	: 670,000,000:	: 25	:	:	:	:	: 25	:	:	:	
ure	: .27	: 455,000:	: 25	:	:	:	:	: 25	:	:	:	
ure	: .37	: 229,500,000:	: 17	: 8	:	:	:	: 25	:	:	:	
ure	: .21	: 237,500:	: 18	: 7	:	:	:	: 25	:	:	:	
ure	: .24	: 120,500:	: 15	: 10	:	:	:	: 25	:	:	:	
ure	: .25	: 83,000:	: 21	: 4	:	:	:	: 25	:	:	:	

trates there were marked decreases in the percentages of acid as compared with the checks. In all except one of the trials showing a decrease in the acidity produced, there was also a much lower plate count than in the check. With the above exceptions the acidities of the butter cultures ranged from 0.67 to 0.79 per cent in the checks while in the portions containing filtrates they ranged from 0.23 to 0.52 per cent. The plate counts ranged from 425 million to 560 million in the check portions while in the portions containing filtrates the counts ranged from approximately 250,000 to over 41 million. With the S. lactis cultures the acidities ranged from 0.37 to 0.74 per cent in the checks while in the portions containing filtrates they varied from 0.21 to 0.52 per cent. The counts ranged from 219 million to 1,775 million in the checks while in the portions containing filtrates they varied from 50,500 to over 61 million.

With the butter cultures there appeared to be a normal distribution of the organisms among the butter culture types except that from plates representing three of the 12 portions containing filtrates all of the cultures picked appeared to be citric acid fermenting streptococci organisms, as indicated by the reaction in litmus milk and the morphology. There was some variation in the coagulation rates of the S. lactis cultures picked but these did not appear to be significant.

The results of Series 3 indicate quite clearly that

the effect of the filtrates tested was to decrease the numbers of organisms, thereby causing comparatively slow acid production due to a lack of organisms, rather than to influence the ability of the cells present to produce acid.

Series 4. Series 4 consisted of observations on the effects of two filtrates from slow large lot cultures and two from normal large lot cultures on one butter culture.

The butter culture was added to five 200 ml. portions of sterile skim milk at the rate of 2.5 per cent and one of the filtrates was added to each of four portions at the same rate, one portion being held as check. Observations were made on the acidities, the plate count on tomato juice agar, the distribution of colonies picked among the types of butter culture organisms, and the coagulation rates of the S. lactis types; observations were made after 6, 10, 14, 24, 28, and 32 hours. The results obtained are given in Table 11.

The acidity of the check increases from 0.34 per cent after 6 hours to 0.88 per cent after 28 hours while the acidities of the portions containing the filtrates varied from 0.30 to 0.23 per cent after 6 hours and from 0.35 to 0.79 per cent after 28 hours. The acidity of the check after 24 hours was not equalled by the acidities of any of the portions containing filtrate after 32 hours. The plate count of the check was 175.5 million after 6 hours and it reached a maximum of 540 million after 14 hours. The plate counts of the portions con-

Table 11. Effect of bacteria free filtrates on the bacteria per ml. and type of organisms in a butter culture at various intervals. Room temperature.

Age in hr.	Filtrate No.	Per cent acid	Bacteria per ml.	Action of 25 colonies picked into litmus milk					Classification	Citric acid ferm. type
				No. coagulating in						
				1 day	2 days	3 days	4 days	5 days		
6	:None	:0.35	:175,500,000	:25	:	:	:	:25	:	
	:138	:.23	24,900	:24	:	:	:	:24	:	
	:139	:.21	21,500	:24	:1	:	:	:25	:	
	:140	:.20	30,300	:10	:9	:6	:	:	:	
	:141	:.23	735,000	8	:9	:	:	:17	:8	
10	:None	:.70	:345,000,000	:23	:2	:	:	:25	:	
	:138	:.20	113,500	:14	:10	:	:	:24	:1	
	:139	:.21	143,000	:24	:1	:	:	:25	:	
	:140	:.23	160,000	:13	:12	:	:	:25	:	
	:141	:.24	4,140,000	:25	:	:	:	:25	:	
14	:None	:.77	:540,000,000	:25	:	:	:	:25	:	
	:138	:.19	764,000	:17	:8	:	:	:25	:	
	:139	:.21	1,868,000	:5	:20	:	:	:25	:	
	:140	:.23	3,940,000	:12	:13	:	:	:25	:	
	:141	:.28	775,000	:2	:22	:	:	:24	:1	
24	:None	:.87	:181,500,000	1	:23	:	:	:24	:1	
	:138	:.27	2,770,000	1	:23	:	:	:24	:1	
	:139	:.30	2,110,000	:	:18	:5	:	:23	:2	
	:140	:.41	12,100,000	:	:15	:4	:	:19	:6	
	:141	:.73	265,000,000	:	:24	:	:	:24	:1	
28	:None	:.88	:232,500,000	:	:25	:	:	:25	:	
	:138	:.35	32,650,000	1	:24	:	:	:25	:	
	:139	:.51	88,500,000	:	:18	:7	:	:25	:	
	:140	:.60	285,000,000	:	:11	:14	:	:25	:	
	:141	:.79	685,000,000	1	:23	:	:	:24	:1	
32	:None	:.86	:150,500,000	:	:24	:1	:	:25	:	
	:138	:.56	10,500,000	:	:24	:1	:	:25	:	
	:139	:.65	283,500,000	:	:18	:6	:	:24	:1	
	:140	:.71	259,500,000	:	:12	:13	:	:25	:	
	:141	:.81	62,000,000	:	:24	:	:	:24	:1	

taining filtrate varied from 21,500 to 24,900 after 6 hours and from 775,000 to approximately 3 million after 24 hours. After 28 hours one of the portions containing filtrate exceeded the maximum count of the check, while after 32 hours the remaining three portions did not equal the count of the check after 10 hours. There appears to be nothing unusual in the distribution of the colonies picked among the butter culture types or in the coagulation rates of the S. lactis cultures.

Series 5. The effect, on the acidities produced, of making a series of transfers of mixtures of butter culture and bacteria free filtrates was studied in Series 5. The following procedure was used. A butter culture was inoculated into seven 200 ml. portions of sterile skim milk at the rate of 2.5 per cent and six filtrates (four from slow experimental and two from normal experimental cultures) were added at the same rate, one filtrate being added to each portion. After incubation for 16 hours at room temperature the portions were titrated and placed at 5° C. if they had coagulated; if not, they were allowed to coagulate before being placed at the lower temperature. Within two or three days the portions were removed to room temperature and a transfer made from each to a 200 ml. portion of skim milk at the rate of 2.5 per cent. The portions were incubated and titrated as previously. This procedure was followed until a total of seven sets of titrations

had been made. The percentages of acid found are given in Table 12.

In each of the first three transfers all of the portions containing a filtrate in addition to the butter culture formed less acid than the check portion. On the fourth transfer one portion containing a filtrate formed acid comparable to the check; on the fifth transfer this was true of two additional portions; on the sixth transfer with one additional portion; and on the seventh transfer with one more portion, so that on the last transfer all portions containing filtrates, except one, formed percentages of acid comparable to that of the check. The remaining portion containing filtrate showed variations in the percentages of acid formed, as compared with the check, but on the seventh transfer there was still a marked difference between it and the check in the amount of acid produced.

The data secured indicate that certain portions appeared to recover from the effect of the filtrate, either by a diluting out of the filtrate, or by a failure of the restraining principle of the filtrate to reproduce or to be reproduced. The fact that one portion failed to recover from the restraining effect of the filtrate indicates that the active principle continued to be formed throughout the series of transfers in some unknown manner, or was gaining entrance at some point during the procedure of transferring.

Table 12. Acidities formed in a series of transfers of mixtures of a butter culture and various bacteria free filtrates. Room temperature.

Inoculation	Per cent acid formed in 16 hr. in						
	1st	2nd	3rd	4th	5th	6th	7th
	trans-fer	trans-fer	trans-fer	trans-fer	trans-fer	trans-fer	trans-fer
Butter culture alone:	0.89	0.82	0.52	0.66	0.84	0.87	0.75
B. C. + filt. No.216:	.46	.41	.34	.64	.87	.92	.84
B. C. + filt. No.217:	.56	.44	.35	.67	.89	.91	.83
B. C. + filt. No.218:	.56	.40	.33	.45	.50	.68	.75
B. C. + filt. No.219:	.50	.44	.36	.54	.73	.89	.82
B. C. + filt. No.220:	.68	.47	.40	.47	.84	.91	.82
B. C. + filt. No.221:	.29	.24	.30	.43	.47	.52	.32

Series 6. In Series 6 an attempt was made to increase the activity of filtrates. The following procedure was used. A butter culture was inoculated into seven 300 ml. portions of sterile skim milk at the rate of 2.5 per cent. Six filtrates, coming from four slow experimental cultures and two normal experimental cultures, were then added at the rate of 2.5 per cent, one filtrate being added to each of six of the portions, and the remaining portion being held as a check. After incubation for 16 hours at room temperature, the portions were titrated and the coagulated portions placed at 5° C.; incubation of the uncoagulated portions was continued, each portion being removed to the lower temperature following coagulation. When the last portion had coagulated (usually after two or three days) the portions were filtered and each of the filtrates added to another group of transfers from the strain of mother culture used originally. This procedure was carried out until eight mixtures had been made. The percentages of acid found are shown in Table 13.

In all cases the percentage of acid formed by the culture plus a filtrate was less than that formed by the culture alone. The differences were marked with all the filtrates used in the first six mixtures. The differences with the filtrates used in the seventh and eighth mixtures were less than the differences in the preceding mixtures with the exception of one filtrate which appeared to have a marked

Table 13. Acidities formed in a series of mixtures of butter culture and bacteria free filtrates, each filtrate used being recovered from the previous mixture. Room temperature.

Inoculation	Per cent acid formed in 16 hr. by butter culture plus filtrates from the preceding mixture							
	Mixture							
	2	3	4	5	6	7	8	
Butter culture alone	0.89	0.92	0.82	0.73	0.93	0.88	0.91	0.94
B. C. + filt. No. 216	.46	.49	.41	.38	.52	.44	.77	.77
B. C. + filt. No. 217	.56	.48	.43	.41	.59	.44	.71	.77
B. C. + filt. No. 218	.56	.52	.39	.44	.63	.42	.67	.78
B. C. + filt. No. 219	.50	.57	.37	.40	.59	.44	.64	.76
B. C. + filt. No. 220	.68	.48	.37	.40	.61	.41	.70	.76
B. C. + filt. No. 221	.29	.34	.35	.38	.47	.37	.43	.39

restraining action throughout the entire eight mixtures. These results indicate that the restraining principle of the six filtrates tested was definitely retained during the series of eight mixtures or regularly gained entrance at some point. The possibility of the diluting out of the filtrate was greater in this series of eight mixtures than in the seven transfers involved in Series 5, and the fact that the restraining ability was not lost indicates that the inhibitory principle was being formed in some manner in the cultures or that it regularly gained entrance at some point in the procedure.

Series 7. Series 7 consisted of two trials in which observations were made on the rate of acid production by a butter culture after the addition of different amounts of filtrate. The following procedure was used. A butter culture was inoculated (2.5 per cent) into as many 200 ml. portions of sterile skim milk as were required by the number of filtrates and dilutions to be used, plus two portions to be used as checks in each trial. Filtrates were then added as follows. In Trial 1 three filtrates (No. 185, No. 226 and No. 248) from slow large lot cultures were used in amounts giving dilutions of 1 part of filtrate in 20 parts of milk, 1 in 40, 1 in 100, 1 in 400, 1 in 2000 and 1 in 20,000. In Trial 2, filtrates No. 185 and No. 226 were used together with two filtrates, No. 228 and No. 229, from slow experimental cultures; the dilutions employed were 1 part of filtrate in 2,000 parts

of milk, 1 in 20,000, 1 in 200,000, 1 in 2,000,000 and 1 in 20,000,000. The various portions in each trial were incubated for 16 hours at room temperature and then titrated. The results are shown in Table 14.

In Trial 1, the two check portions formed 0.79 and 0.86 per cent acid, while the acidities in the portions containing filtrate No. 185 ranged from 0.25 to 0.39 per cent; those in the portions containing filtrate No. 226 ranged from 0.30 to 0.53 per cent; and those in the portions containing filtrate No. 248 ranged from 0.41 to 0.48 per cent. In Trial 2, the two check portions formed 0.86 and 0.89 per cent acid. The acidities in the portions containing filtrate No. 185 varied from 0.36 to 0.65 per cent; those in the portions containing filtrate No. 226 varied from 0.49 to 0.76 per cent; those in the portions containing filtrate No. 228 varied from 0.69 to 0.86 per cent; while those in the portions containing filtrate No. 229 varied from 0.67 per cent to 0.69 per cent.

Although there were no regular fluctuations in the percentages of acid in the succeeding portions of a series containing any one of the filtrates, there was a tendency for the percentages of acid to increase as the dilutions increased. The figures given indicate that with some of the filtrates there was a marked inhibition in dilutions as high as 1 in 20,000, and that two filtrates exerted a slight restraining influence in a dilution of 1 in 20,000,000.

Table 14. Effect of different amounts of filtrate on acid production by a butter culture. Room temperature.

Trial No.	Per cent acid formed by test culture	Filtrate No.	Per cent acid formed in 16 hr. by test culture with one part of filtrate in the following parts of milk					
			20	40	100	400	2,000	20,000
1		185	0.25	0.26	0.27	0.32	0.35	0.39
	0.79 and 0.86	226	.30	.33	.33	.38	.53	.32
		248	.44	.46	.43	.44	.48	.41

Trial No.	Per cent acid formed by test culture	Filtrate No.	Per cent acid formed in 16 hr. by test culture with one part of filtrate in the following parts of milk					
			2,000	20,000	200,000	2,000,000	20,000,000	
2		185	0.36	0.59	0.61	0.59	0.65	
	0.79 and 0.86	226	.49	.54	.76	.64	.65	
		228	.69	.69	.71	.86	.86	
		229	.67	.69	.68	.68		

Series 8. In Series 8, five trials were carried out on the heat resistance of the restraining principle of inhibitory filtrates. The following method was adopted. Test tubes were prepared by heating and blowing bulbs about 4 cm. in diameter on the bottom, giving a comparatively thin wall to this part of the tube. After sterilizing the cotton stoppered tubes, one ml. portions of the filtrate to be tested were carefully placed into as many tubes as were required by the number of exposures to be used. The filtrate was heated by immersing the bulbs and about one half of the necks of the tubes in water of the desired temperature.

In Trial 1, the filtrates were heated to 50° and 60° C. and in Trial 2 to 60° and 80° C., an exposure of 30 minutes being used in each trial. In Trials 3, 4 and 5 the filtrates were heated to 60° C. for 5, 10 and 15 minutes.

After heating, the filtrates were added to 100 ml. portions of sterile skim milk which had just been inoculated with the test butter culture at the rate of 2.5 per cent. The portions were incubated for 16 hours at room temperature and then titrated. The results obtained are given in Table 15.

The data show that in Trial 1 the unheated portions of filtrate restrained the test culture to a marked extent, that the portions heated to 50° C. for 30 minutes restrained the test culture to a smaller extent, and that the portions heated to 60° C. appeared to have no influence on the test

Table 15. Effect of heat on the inhibiting principle of bacteria free filtrates. Room temperature.

		Per cent acid formed in 16 hr.							
		By test:		By test culture plus filtrate					
		By culture:		heated to					
		plus		50°C.	60°C.	80°C.	60°C.	60°C.	60°C.
Trial No.	Filtrate No.	culture	unheated	30 min.	50 min.	30 min.	5 min.	10 min.	15 min.
	20:	0.79	0.31	0.68	0.81				
1	22:		.45	.63	.83				
	20:	.75	.26		.77	0.74			
2	22:		.25		.76	0.77			
	185:	.86	.27			0.85	0.83	0.87	
3	186:		.31			0.92	0.90	.86	
	195:	.82	.26			.22	.80	.78	
4	186:		.31			.79	.87	.86	
	228:	.82	.52			.77	.83	.83	
5	229:		.50			.84	.79	.83	

culture. In Trial 2 the unheated portions of filtrate restrained the test culture very markedly, while the portions heated to 60° and 80° C, had no apparent effect on the test culture. In Trials 3, 4, and 5 the unheated portions of filtrate markedly restrained the test culture, while the portions heated to 60° C. for 5, 10, and 15 minutes, except the 5 minute period for filtrate No. 185 in Trial 4, had no discernible restraining action on the test culture.

The results secured show that the inhibitory action of the filtrates tested was affected at comparatively low temperatures for comparatively short holding periods. An exposure of 30 minutes at 50° C. seemed to have some destructive effect on the restraining ability of the filtrates, while the higher temperatures for this period appeared to completely destroy the inhibitory principle. At a temperature of 60° C., a period of 5 minutes seemed to destroy the filtrate action.

The data reported in Section E show that when bacteria free filtrates obtained from certain slow and normal butter cultures were added to freshly inoculated portions of a butter culture or S. lactis culture, there was a definite restraining action on the development of acid and on the increase in the numbers of bacteria.

When plates were poured with cultures containing filtrate and colonies picked into tubes of litmus milk, the coagulation rates of the S. lactis cultures appeared to be normal, and in the case of the butter cultures, there seemed

to be a normal distribution of the organisms among the butter culture types.

The restraining action of five out of six filtrates tested appeared to be lost in a series of seven transfers of mixtures of a butter culture and the filtrates. The inhibitory action of five out of six filtrates seemed to be greatly diminished in a series of mixtures of butter cultures and bacteria free filtrates, each filtrate coming from the previous mixture. The presence of very small amounts of filtrates (dilutions of one part of filtrate in 20 million parts of milk, in some cases) appeared to retard acid development of the test culture used. Heating to comparatively low temperatures for short periods seemed to destroy the restraining action of the filtrates.

Section C. Attempts to produce slow
butter cultures experimentally

Since it was found that large lot cultures, which are exposed to the air more than mother cultures in the process of making, yielded bacteria free filtrates with a restraining action on butter cultures more often than mother cultures, attempts were made to produce slow butter cultures experimentally by exposure to the air. In general, the methods employed consisted of exposing to the air the milk from which butter cultures were to be made, or of bubbling air through the milk, and then inoculating the milk with normal butter cultures. The experiments were conducted in two series.

Series 1. Series 1 consisted of six trials in which pasteurized whole milk was exposed to the air before inoculation with butter cultures. In each trial, approximately two liters of whole milk were pasteurized in a cotton stoppered six liter flask and cooled. After pipetting 140 ml. portions of the milk into each of four glass stoppered bottles to serve as checks, equal portions of the remainder of the milk were placed in two large evaporating dishes, so that comparatively large surfaces were exposed. The portions were exposed to the air for approximately two hours, one in the laboratory where mother cultures were transferred (location A), the other in the room where the large lot cultures were made (location B). After exposure four 140 ml. portions from each dish were

placed in glass stoppered bottles. Two bottles from each portion, along with two of the check bottles, were inoculated with mother culture No. 15, and a similar set of bottles was inoculated with mother culture No. 146. In Trial 5 an additional butter culture was studied, so larger quantities of milk were prepared.

The freshly inoculated cultures were incubated for 16 hours at 21° C. and then titrated. The results are given in Table 16.

The results show that in three of the six trials butter culture No. 15 produced smaller amounts of acid in the bottle containing milk exposed to the air than in the checks. In Trial 2 the bottles containing milk exposed in location A produced 0.44 and 0.38 per cent of acid, while the checks produced 0.75 and 0.72 per cent. In Trial 3, the bottles containing milk exposed in location A produced 0.59 and 0.42 per cent of acid, those containing milk exposed in location B produced 0.42 and 0.37 per cent, while the checks produced 0.67 and 0.69 per cent. In Trial 6, the bottles containing milk exposed in location B produced 0.62 and 0.60 per cent acid, while the checks produced 0.84 and 0.83 per cent. In all of the trials, culture No. 146 produced percentages of acid in the exposed portions which did not vary significantly from the checks. In the only trial with butter culture No. 233 the bottles containing milk exposed in location A pro-

Table 16. Percentages of acid formed by butter cultures in pasteurized whole milk exposed to the air. Temperature 21° C.

		Per cent acid formed in 16 hr. by					
		butter culture		butter culture		butter culture	
Trial:	Exposure	No. 15		No. 146		No. 233	
No. :	of milk	Portion:	Portion:	Portion:	Portion:	Portion:	Portion:
		A	B	A	B	A	B
	:None	: 0.76	: 0.74	: 0.79	: 0.78	:	:
1	:Location A:	: .74	: .85	: .79	: .78	:	:
	:Location B:	: .76	: .79	: .82	: .89	:	:
	:None	: .75	: .72	: .77	: .77	:	:
2	:Location A:	: .44	: .38	: .80	: .80	:	:
	:Location B:	: .65	: .70	: .78	: .77	:	:
	:None	: .67	: .69	: .78	: .77	:	:
3	:Location A:	: .59	: .42	: .78	: .71	:	:
	:Location B:	: .42	: .37	: .70	: .73	:	:
	:None	: .59	: .59	: .69	: .71	:	:
4	:Location A:	: .57	: .54	: .67	: .68	:	:
	:Location B:	: .62	: .59	: .75	: .71	:	:
	:None	: .70	: .69	: .72	: .75	: 0.71	: 0.70
5	:Location A:	: .67	: .68	: .70	: .70	: .32	: .38
	:Location B:	: .74	: .71	: .77	: .78	: .38	: .32
	:None	: .84	: .83	: .81	: .83	:	:
6	:Location A:	: .72	: .70	: .84	: .81	:	:
	:Location B:	: .62	: .60	: .81	: .79	:	:

duced 0.32 and 0.38 per cent acid, the portions exposed in location B produced 0.38 and 0.32 per cent, while the checks produced 0.71 and 0.70 per cent.

The results obtained show that in some trials milk which had been exposed to the air produced less acid when inoculated with certain butter cultures than the same milk inoculated without being exposed. This suggests that exposure to the air contaminated the milk or changed it in some manner which retarded acid development by the butter cultures used.

Four filtrates were secured from the milk used in Trial 5; one was obtained from the checks inoculated with culture No. 15, one from the checks inoculated with culture No. 233, one from the milk exposed in location A and inoculated with culture No. 15, and one from the corresponding portions inoculated with culture No. 233. Of these filtrates only that from the milk exposed to the air and inoculated with culture No. 233 was strikingly inhibitory when tested on butter culture No. 15.

Series 2. Series 2 consisted of four trials in which either pasteurized whole milk or sterilized skim milk were aerated and then inoculated, using two cultures for inoculation. In each of two trials approximately 2 liters of whole milk were pasteurized and cooled in a 6 liter flask, after which four 140 ml. portions were pipetted to glass stoppered bottles to serve as checks. The remainder of the milk was

divided equally between two sterile, quart milk bottles and then aerated. In each of the other two trials, three 600 ml. portions of skim milk were sterilized in cotton stoppered, quart milk bottles at 15 lb. pressure for 25 minutes. Four 140 ml. portions of the milk from one bottle were pipetted into four glass stoppered bottles to serve as checks, while the remaining two 600 ml. portions were aerated.

The pasteurized whole milk and the sterilized skim milk were aerated in the same manner. The procedure of aerating consisted of fitting the milk bottles containing the milk with 2-hole rubber stoppers to which glass tubes and rubber tubing were attached and then bubbling air through the milk by means of a suction pump. The air bubbled through one of the bottles in each pair was passed through cotton packed in a 10 cm. section of a glass tube 3 cm. in diameter, while that bubbled through the other bottle was unfiltered. All of the apparatus for aerating the milk was sterilized before starting the operation.

After aeration, 140 ml. portions from each lot of milk were placed in four glass stoppered bottles and these portions, together with the unaerated portions, were then inoculated with 0.1 ml. of the butter cultures to be used. After incubating 16 hours at 21° C., the various lots of milk were titrated. The results obtained are shown in Table 17.

In all of the trials, butter culture No. 15 formed

Table 17. Effect on acid production of aerating milk into which butter cultures were to be inoculated. Temperature 21° C.

Trial: No.	Milk		Per cent acid formed in 16 hr. by			
	Kind	Treatment	Butter culture No. 15		Butter culture No. 146	
			Portion: A	Portion: B	Portion: A	Portion: B
1		:None	: 0.76	: 0.74	: 0.79	: 0.78
	: Pasteurized	: Aerated without filter	: .42	: .48	: .76	: .77
	: whole	: Aerated with filter	: .72	: .78	: .76	: .76
2		:None	: .75	: .72	: .77	: .77
	: Pasteurized	: Aerated without filter	: .48	: .45	: .90	: .77
	: whole	: Aerated with filter	: .68	: .63	: .78	: .81
3		:None	: .69	: .68	: .78	: .77
	: Sterilized	: Aerated without filter	: .42	: .42	: .75	: .70
	: skim	: Aerated with filter	: .56	: .51	: .68	: .72
4		:None	: .71	: .72	: .77	: .77
	: Sterilized	: Aerated without filter	: .51	: .57	: .68	: .79
	: skim	: Aerated with filter	: .50	: .57	: .81	: .79

considerably less acid in the milk which had been aerated without an air filter than in the checks, and in two of the trials considerably less acid in the milk aerated with an air filter than in the checks. In Trial 1 the acidity in the bottles containing milk aerated without a filter was 0.42 and 0.48 per cent, while the acidity in the checks was 0.76 and 0.74 per cent. In Trial 2 the acidity in bottles containing milk aerated without a filter was 0.48 and 0.45 per cent, while acidity in the checks was 0.75 and 0.72 per cent. In Trial 3 the acidity in the bottles containing milk aerated without a filter was 0.42 per cent in both cases, the acidity in the bottles containing milk aerated with a filter was 0.36 and 0.51 per cent and the acidity in the checks was 0.69 and 0.68 per cent. In Trial 4 the acidity in the milk aerated without a filter was 0.51 and 0.57 per cent, the acidity in the milk with a filter was 0.50 and 0.57 per cent, while the acidity in the checks was 0.71 and 0.72 per cent.

In all of the trials the percentages of acid formed by butter culture No. 146 in the aerated milk did not vary significantly from the percentages in the checks.

In Trial 4 tests were run on the aerated portions of milk which indicated that it was free from any gross contamination. Samples of the aerated portions were removed from the milk before inoculation with the butter culture and plated on beef infusion agar and tomato juice agar and also placed

in tubes of litmus milk in quantities of 1.0, 0.1, 0.01, and 0.001 ml. The plates were incubated at room temperature and examined after three days and five days. There were never more than three colonies on any of the plates, while many of them showed no growth. The litmus milk tubes were incubated at room temperature and examined daily for 18 days. Changes did not occur in the appearance of the litmus milk.

The results obtained in Series 2 show that in all of the trials, butter culture No. 15 formed less acid in both bottles containing milk aerated without a filter than in the checks. In two of the four trials butter culture No. 15 formed considerably less acid in the milk aerated with a filter than in the checks. It should be pointed out that there were never marked increases in the acidity produced in the litmus milk. These facts indicate that bubbling air through the milk caused some change in the milk or some contamination which restrained the growth of butter culture No. 15. Butter culture No. 146 was never restrained.

Three filtrates were secured from the milk used in Trial 4; one was obtained from the checks, one from the milk aerated without a filter, and one from the milk aerated with a filter, all being inoculated with culture No. 15. The filtrates from the aerated milk markedly restrained butter culture No. 15, while the filtrate from the checks did not.

The results reported in Section C show that the

growth of certain butter cultures inoculated into milk which had been exposed to the air, or through which air had been bubbled, was sometimes restrained. The data also show that the latter method of air treatment, by which more air had been in contact with the milk, was more effective in retarding butter culture growth than the former method. This indicates a relationship between the air which was in contact with the milk before inoculation, and the abnormally slow growth of the butter cultures inoculated into the milk.

DISCUSSION OF RESULTS

From the data presented it appears that the strikingly slow coagulation of certain butter cultures under practical conditions is not due to (a) the source of the milk, whether from herds or individual animals, (b) the organisms occurring naturally in milk, or (c) the contamination from plant equipment. These results are in agreement with the work of certain investigators, especially Moir (29) and Leitch (26).

It should be recognized, of course, that abnormalities and contaminating organisms which retard the rate of acid production of a butter culture may be present in milk. It seems probable that a combination of these conditions may occur in a lot of milk and their combined effect be sufficient to produce an abnormally slow butter culture. This would be more likely to be the case if the pasteurization exposure used in the preparation of the milk was relatively low.

Large differences in the coagulation rates of butter cultures were first noted experimentally when transfers of mother cultures and large lot cultures were compared. In two of the early comparisons these differences were very conspicuous with all of the lots of milk used and transfers from the large lot cultures were always much slower in their rate of acid production than transfers from the mother cultures. It should be pointed out that the large lot cultures were ap-

parently normal when used. It was then found that most of the slow large lot cultures tested markedly restrained the growth of a normal butter culture when added to it in small amounts at the time of inoculation. This rather definitely suggests that slow acid production in butter cultures is probably due to some factor concerned with the inoculating material.

Microscopic examination and plating on tomato juice agar and beef infusion agar showed that the slow butter cultures were not contaminated with any of the ordinary forms of bacteria. However, most of the bacteria free filtrates obtained from slow butter cultures by means of a Berkfeld filter exerted a definite restraining action on the production of acid when added to new transfers of certain butter cultures. The fact that restraining filtrates were obtained from a larger proportion of the slow cultures filtered than of the normal cultures, indicates a relationship between slow acid production in cultures and the restraining action of the bacteria free filtrates from cultures.

Some of the filtrates restrained butter cultures when present in amounts as small as one part of filtrate in 20 million parts of milk, thus indicating that the inhibitory principle is very active. This activity, together with the destruction of the restraining effect of the filtrates by comparatively low exposures to heat, suggests a resemblance to

some kind of living matter, rather than to a chemical product. However, the addition of restraining filtrates to butter cultures failed to alter the characteristic rates of acid production by butter cultures through a series of transfers and attempts to increase the activity of the inhibitory principle resulted in a decrease rather than an increase. Such a situation is not necessarily inconsistent with the idea that the inhibitory principle is a form of life because there may be a delicate balance between the bacteria and the inhibitory factor so that changes in the rate of acid production are greatly delayed at one time and only slightly delayed at another.

The data on the attempts to give milk an inhibitory property by exposing it to the air were successful in some cases but not in others. It would not necessarily be expected that the trials along this line would give results that were entirely uniform. Variations in the periods of exposure and in the condition of the air could easily account for the inhibitory principle being added to milk from the air in one case but not in another. The fact that the inhibitory principle may come from the air is quite in line with the suggestion that it is a form of living matter since various forms of life are present in the air.

CONCLUSIONS

1. The variations in the coagulation rates of S. lactis cultures and butter cultures in milk from different herds and individual cows were so small whether the milk was raw or pasteurized, that the source of the milk was considered unimportant as a cause of slow acid production by butter cultures.

2. Organisms occurring naturally in the samples of raw milk studied and six organisms isolated from butter cultures grown in raw milk did not restrain the production of acid by butter cultures to any marked extent.

3. Contamination from plant equipment did not significantly retard the production of acid by butter cultures.

4. The addition of a slow butter culture to a normal culture markedly restrained the growth of the normal culture in most cases.

5. The delayed acid production of slow butter cultures was usually accompanied by a comparatively slow growth of organisms as indicated by the numbers per milliliter according to the plate count.

6. Bacteriological examination of a considerable number of slow butter cultures revealed no contamination and when colonies were picked into litmus milk from plates poured with the cultures there was nothing unusual in the rates of

coagulation of the S. lactis cultures or in the distribution of the organisms among the butter culture types.

7. When butter cultures were filtered through a filter paper to remove the casein and then passed through grade N Berkfeld filters, bacteria free filtrates were obtained. When added to a freshly inoculated butter culture or S. lactis culture, a majority of the filtrates from slow butter cultures and a smaller proportion of those from normal butter cultures markedly restrained acid production and increase in numbers of organisms as indicated by the plate count.

8. When butter cultures containing bacteria free filtrates were plated and colonies picked into litmus milk, the rates of coagulation of the S. lactis cultures and the distribution of organisms among the butter culture types appeared to be normal.

9. Some of the bacteria free filtrates exerted a restraining action on the growth of butter cultures when present in very small quantities.

10. When mixtures of a butter culture and restraining filtrates were carried through a series of seven transfers, the culture was commonly restored to a normal rate of acid production.

11. Attempts to increase the activity of filtrates by adding them to a butter culture and then recovering them when coagulation had occurred were unsuccessful although each fil-

trate was carried through a series of seven trials.

12. The restraining action of the bacteria free filtrates was destroyed at comparatively low temperatures for comparatively short exposures.

13. Exposing the milk from which butter cultures were to be made to the air, or bubbling air through the milk, often definitely retarded the growth of the cultures in a manner suggestive of air contamination or of some change in the milk. The retarding action resulting from the exposure of the milk to the air was comparable to the retarding action of bacteria free filtrates recovered from most slow butter cultures and some normal cultures.

BIBLIOGRAPHY

1. American Public Health Association, Laboratory Section.
Report of the committee on standard methods of bacterial milk analysis. Amer. Pub. Health Assoc. Public Health Papers and Reports. 35:285. 1910.
2. Baker, M. P. and Hamner, B. W.
Influence of the milk on the starters made from it. Iowa Agr. Exp. Sta. Res. Bul. 93. 1926.
3. Barnes, L. A.
Do broth culture filtrates contain a bacterial growth inhibiting substance? Jr. Bact. 21:395-406. 1931.
4. Besredka, A.
Étude sur l'immunité locale. Le pansement antistaphylococcique. Compt. Rend. Soc. Biol. 89:7-8. 1923.
5. Buchanan, Robert Earle and Truax, Roy.
Non-inheritance of impressed variations in Streptococcus lacticus. Jr. Inf. Dis. 7:68-697. 1910.
6. Brueckner, H. J. and Sherman, J. M.
Primitive or filtrable forms of bacteria and their occurrence in aseptic milk. Jr. Inf. Dis. 51:1-16. 1932.
7. Chambers, W. H.
The germicidal action of milk. Jr. Bact. 5:527-541. 1920.
8. Christiansen, M.
Investigations of a factor in the milk fat with inhibiting action on the growth of pathogenic streptococci. Summary. Int. Dy. Congress Conference Papers. 1931, Sect. 2:119-120. 1931.
9. Cornwell, J. W. and Beer, W. A.
On the cessation of growth of Bacterium typhosus. Indian Jr. Med. Res. 13:789-801. 1925.
10. Cowan, M. J.
Variation in streptococci with special reference to colony form, hemolysin production and virulence. Brit. Jr. Exp. Path. 3:187-195. 1922.

11. Cox, G. A. and Whitehead, H. R.
The influence of other bacteria on the production of acid by lactic streptococci in milk. N. Z. Jr. of Ag. Res. 2:164-175. 1916.
12. Farmer, R. S. and Hammer, B. W.
Studied on the development of butter cultures from mixtures of organisms. Iowa Agr. Exp. Sta. Res. Bul. 146. 1931.
13. Grinnell, F. B.
Aspect of different types of broth on filtrability of Bacillus prodigiosus. Jr. Bact. 18:175-180. 1921.
14. Hadley, J. M.
Dissociative aspects of bacterial behaviour. Jr. Inf. Dis. 49:284.
15. Hadley, P., Delves, E., and Klimek, J.
Filtrable bacteria. Jr. Inf. Dis. 48:151-153. 1931.
16. Hammer, B. W. and Baker, M. P.
Studies on starters. Iowa Agr. Exp. Sta. Bul. 106. 1928.
17. Harriman, L. A. and Hammer, B. W.
Variations in the coagulation and proteolysis of milk by Streptococcus lactis. Jr. Dy. Sci. 14:40-49. 1931.
18. Heineman, P. G. and Glenn, T. H.
The agglutinating power of milk serum. Jr. Inf. Dis. 5:534-541. 1908.
19. Hunziker, O. F.
Investigations concerning the germicidal action in cow's milk. N. Y. (Cornell) Agr. Exp. Sta. Bul. 197. 1901.
20. Jones, F. S.
The influence of milk on the growth of scarlet fever streptococci. Jr. Exp. Med. 47:965-975. 1928.
21. _____
Preparation of lactenin. Jr. Exp. Med. 51:327-339. 1930.
22. _____ and Sims, H. S.
Adaptation of mastitis streptococci to milk. Jr. Exp. Med. 50:279-291. 1929.

23. Kendall, A. I.
The filtration of bacteria. *Sci.* 75:298-301. 1932.
24. Knaysi, Georges.
Morphological and cultural studies of Bacillus megatherium. *Jr. Bact.* 26:623-644. 1933.
25. Knudsen, S. and Sørensen, A.
Bidrag til syrevækkernes bakteriologi. *K. Vet.-og Landbohøjskole, Copenhagen. Aarskrift* 1929:64-138.
English summary p. 131-137. 1929.
26. Leitch, Renwick H.
L'arrêt de la fermentation lactique dans la preparation du fromage. *Le Lait.* 13:529-541. 1933.
27. Lipska, Irene.
Le phénomène d'Herelle dans le lait. *Le Lait.* 12:89-95. 1932.
28. Marshall, Max S.
An associative study of Streptococcus lacticus and Bacillus subtilis. *Jr. Dy. Sci.* 3:406-413. 1920.
29. Moir, G. M.
Starters for cheese making. *N. Z. Jr. Agr. Res.* 47:1933.
30. Morgan, G. F. V.
Slow development of acidity in cheese making. *N. Z. Jr. Agr. Res.* 37:305-322. 1928.
31. Rogers, L. A.
The inhibiting effect of Streptococcus lactis on Lactobacillus bulgaricus. *Jr. Bact.* 16:321-325. 1928.
32. Rogers, L. A. and Whittier, E. O.
Limiting factors in the lactic fermentation. *Jr. Bact.* 16:211-229. 1928.
33. Rosenau, Milton J. and McCoy, George W.
Germicidal property of milk. *Jr. Med. Res.* 18:165-202. 1908.
34. Seastone, C. V. and Lawrence, M. B.
Attempt to confirm existence of a filtrable cycle of bacteria by use of "K" medium. *Jr. Inf. Dis.* 52: 20-26. 1933.

35. Sherman, J. M. and Curran, H. R.
The germicidal action of milk. Proc. Soc. Exp. Biol.
and Med. 23:15-17. 1924.
36. _____ and Safford, C. E.
Occurrence of filtrable forms of bacteria in nature.
Sci. 73:448-449. 1931.
37. Smith, G. H. and Jordan, E. F.
Protobacterial forms of Bacterium diphtheriae.
Jr. Bact. 20:25-40. 1930.
38. Stocking, W. A.
The so-called "germicidal property" of milk. Conn.
(Storrs) Agr. Exp. Sta. Ann. Rpt. 16:89-106. 1904.
39. Whitehead, H. R. and Cox, G. A.
Influence of bacilli of the colon group on the pro-
duction of acid by lactic streptococci in milk. Jr.
Dy. Res. 4:74-85. 1932.
40. _____ and _____
A method for the determination of vitality in
starters. N. Z. Jr. Sci. and Tech. 13:304-310.
1932.
41. _____ and Riddet, W.
Slow development of acidity in cheese manufacture.
N. Z. Jr. Ag. 46:225-229. 1933.
42. _____ Robinson, Hugh and Cox, Geoffrey Alan.
Observations of some factors in the milk of individ-
ual cows which modify the growth of lactic strepto-
cocci. Biochem. Jr. 27:951-962. 1933.
43. Zinsser, Hans and Wilson, E. B.
Bacterial dissociation and a theory of the rise and
decline of epidemic waves. Jr. Prev. Med. 6:497-
514. 1932.

ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to Dr. B. W. Harmer for his aid and counsel throughout this work.

DP

1

2

7

4

8

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI[®]

NOTE TO USERS

This reproduction is the best copy available.

UMI[®]



UNCLASSIFIED

Title: The Absolute Infrared Absorption Band Intensities of the
Methylene Group Vibrations of some Methylene Halides

Author: Richard M. Hedges

(Official certification of the classification shown is filed in the
Ames Laboratory Document Library)

W. E. Dreeszen / G. Schwartz

W. E. Dreeszen

Secretary to Declassification
Committee

UNCLASSIFIED



THE ABSOLUTE INFRARED ABSORPTION BAND INTENSITIES
OF THE METHYLENE GROUP VIBRATIONS
OF SOME METHYLENE HALIDES

by

Richard M. Hedges

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major Subject: Physical Chemistry

Approved:

George S. Hammond
In Charge of Major Work

Charles G. Coats
Head of Major Department

R M Stixon
Dean of Graduate College

Iowa State College

1955

T11672 ✓

UMI Number: DP12748

UMI[®]

UMI Microform DP12748

Copyright 2005 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

TABLE OF CONTENTS

	Page
INTRODUCTION	1
HISTORICAL BACKGROUND	2
THEORY	7
Infrared Band Intensities	7
Normal Coordinate Analysis	11
EXPERIMENTAL METHOD	17
Materials	17
Solution Measurements	17
Vapor Phase Measurements	18
RESULTS	21
INTERPRETATION OF DATA	34
CONCLUSIONS	42
LITERATURE CITED	43
ACKNOWLEDGEMENTS	45
APPENDIX	46

INTRODUCTION

Of the activity in infrared spectroscopy in recent years a relatively small (although increasing) fraction has been devoted to the investigation of the intensities of absorption bands. The reasons for this neglect are manifold, and include the involved nature of the experimental procedures required to obtain absolute infrared absorption intensities, the difficulty of performing normal coordinate analyses of polyatomic molecules, and even the occasional breakdown of the assumptions used in the theory whereby one derives the polar properties of chemical bonds from the absolute intensities. These various points will be discussed in detail in later sections.

In spite of these difficulties, there seems to be a great deal of information to be learned about the nature of chemical bonds from studies of absolute intensities of infrared absorption bands.

The research to be described in this thesis is an investigation of the absolute infrared absorption intensities of the vibrational bands principally ascribable to the stretching of the carbon-hydrogen bonds and the deformation (bending) of the hydrogen-carbon-hydrogen angle of some methyl halides. The particular series of compounds was chosen because a reasonably good potential function was available for them. This makes it possible to study the polar properties of the carbon-hydrogen bonds of these molecules and establish trends with variation of the halogens. The errors arising from the approximate nature of the theory appear in only a systematic way.

HISTORICAL BACKGROUND

Since work on intensities of infrared bands has been reviewed^{1,2,3} several times in recent years, a complete review of the subject will not be attempted here. Rather, the recent work pertaining to carbon-hydrogen intensities and the polar properties of the carbon-hydrogen bond will be reviewed together with the work on the infrared spectra of the methylene halides.

The polar properties of carbon-hydrogen bonds have attracted a great deal of attention in the way of infrared intensity investigation. Probably much of this attention arises from interest in the sign of the C-H bond moment. The results of Coulson's⁴ quantum mechanical calculations indicate that in methane the C-H polarity is $C^+ - H^-$ with the bond moment equal to 0.4×10^{-10} e.s.u. Gent⁵ in a review of the C-H polarity concluded that in acetylene the C-H polarity is $C^- - H^+$. This conclusion is compatible with chemical evidence for it is well known that acetylene is acidic and its hydrogens are quite labile.

The polarity of C-H bonds as a function of the state of hybridization of the carbon atom has been discussed by Walsh⁶, who has shown that as the amount of p character decreases the carbon becomes more negative relative to the hydrogen. Thus, in methane, the state of hybridization is sp^3 and the polarity is $C^+ - H^-$ and in acetylene with sp hybridization the polarity has reversed to $C^- - H^+$. Walsh also brought forth a corollary which stated that if a substituent on a carbon atom were replaced by a more electronegative substituent (X), more p character would be evoked in the carbon orbital participating in the C-X

bond. These arguments were used in discussing bond strengths and polarities and molecular shapes.

The method of Wilson and Wells⁷ for obtaining the intensities of infrared bands provided the impetus for the many intensity studies in recent years. This method, which is almost universally employed now, requires that sufficient non-absorbing foreign gas be added to the sample to broaden the rotational lines so as to eliminate violent fluctuations in intensity with frequency. The procedure requires the extrapolation of the apparent integrated absorption coefficient divided by the partial pressure to zero partial pressure of the absorbing gas. These two steps allow vibrational band intensities to be measured to a reasonable accuracy even with spectrographs of low resolving power. Ethylene⁸, methane and ethane⁹ were among the first compounds to be studied by the method of Wilson and Wells. For methane⁹ $(\mu)_{\text{CH}}$ was found to be 0.31×10^{-18} e.s.u. and $(\frac{\partial \mu}{\partial r})_{\text{CH}}$ was $\pm 0.55 \times 10^{-18}$ e.s.u. This value of $(\mu)_{\text{CH}}$ agrees reasonably well with the value calculated by Coulson⁴ although it sheds no light on the sign of the dipole. In ethane $(\mu)_{\text{CH}}$ was estimated to be 0.3×10^{-18} e.s.u. from the parallel bending mode while both stretching modes yielded a value of $\pm 0.75 \times 10^{-10}$ e.s.u. for $(\frac{\partial \mu}{\partial r})_{\text{CH}}$. In the case of ethylene it was also found that the value obtained for $(\mu)_{\text{CH}}$ was not a constant but was dependent on the mode of vibration, being 0.37×10^{-18} e.s.u. and 0.52×10^{-18} e.s.u. respectively, for the ν_5 and ν_7 inplane bending modes, and 0.77×10^{-18} e.s.u. for the ν_{11} out-of-plane bending mode, while $(\frac{\partial \mu}{\partial r})_{\text{CH}}$ is 0.60×10^{-10} e.s.u. As a result of these measurements, the approximation of bond

moment additivity, as it had been introduced by Rollefson and Havens¹⁰, was seen to have some failings. Bell, Thompson and Vago¹¹ and later Cole and Thompson¹² studied the intensities of some bending modes of a number of substituted benzenes in solution. Their results suggested a mean value of 0.57×10^{-18} e.s.u. for $(\mu)_{\text{CH}}$ with the hydrogen atom being at the positive end of the C-H dipole. Francis¹³ studied the intensities of several bands in twelve aliphatic hydrocarbons and found that $(\mu)_{\text{CH}}$ ranged from 0.2×10^{-18} e.s.u. to 0.4×10^{-18} e.s.u. and $(\frac{\partial \mu}{\partial r})_{\text{CH}}$ to be about -0.75×10^{-10} e.s.u. (the hydrogen was assumed to be at the positive end of the C-H dipole).

There have been several studies made of the band intensities of different bands of acetylene. Calloman, McKean and Thompson¹⁴ studied C-H stretching band intensity and deduced that $(\frac{\partial \mu}{\partial r})_{\text{CH}}$ was 0.8×10^{-10} e.s.u.

Van Alten¹⁵ studied the intensities of several bands in C_2H_2 , C_2D_2 and C_2HD using a higher pressure of foreign gas than did Calloman, McKean and Thompson¹⁴. Wingfield and Straley¹⁶ have studied the intensity of ν_5 bending vibration in C_2H_2 and C_2D_2 (also studied by Van Alten). The results of Van Alten and of Wingfield and Straley agree quite well, both yielding a value of $(\mu)_{\text{CH}}$ about 0.99×10^{-10} e.s.u. For $(\frac{\partial \mu}{\partial r})_{\text{CH}}$, Van Alten obtained a value of 0.869×10^{-10} e.s.u.

The bond moments of HCN and DCN were obtained from intensities by Hyde and Hornig¹⁷ who found a value of 1.13×10^{-18} e.s.u. for $(\mu)_{\text{CH}}$ and $\pm 1.05 \times 10^{-10}$ e.s.u. for $(\frac{\partial \mu}{\partial r})_{\text{CH}}$. They also were able to show that if C is positive in the $\text{C}\equiv\text{N}$ dipole, then H is positive in the C-H dipole.

Barrow and McKean¹⁸ studied infrared intensities in the methyl halides and found from the E modes that $\left(\frac{\partial\mu}{\partial r}\right)_{\text{CH}}$ ranges from $\pm 0.70 \times 10^{-18}$ e.s.u. for methyl fluoride to ± 0.23 for methyl iodide.

The values of $\left(\frac{\partial\mu}{\partial r}\right)_{\text{CH}}$ in the A_1 class, however, varied from 1.7×10^{-10} e.s.u. for methyl fluoride to about 0.9×10^{-10} e.s.u. for methyl iodide. The values of $(\mu)_{\text{CH}}$ were, in general, around 0.4×10^{-18} e.s.u.

The intensities of all but one of the bands of dimethyl acetylene have been examined by Mills and Thompson¹⁹ who found the probable value of the C-H dipole in this compound to be about 0.4×10^{-18} e.s.u. and that of the C-C dipole to be about 1×10^{-18} e.s.u. They find that if the acetylenic carbon atoms have a residual negative charge (which is considered most probable), then the hydrogen atoms in the C-H bonds must carry a residual positive charge.

Recently, the work of Hisatsune and Eggers²⁰ on the intensities and bond moments of formaldehyde was published. The results chosen for the C-H properties were $(\mu)_{\text{CH}}$ equal to 0.50×10^{-18} e.s.u. ($\text{C}^- - \text{H}^+$) and $\left(\frac{\partial\mu}{\partial r}\right)_{\text{CH}}$ equal to 1.3×10^{-10} e.s.u., although, they did comment that the B_1 symmetry block gave an abnormally large $(\mu)_{\text{CH}}$ of about 1×10^{-18} e.s.u.

Flett²¹ measured the intensities of the C-H stretching vibration bands of a number of toluene derivatives, which had substituents para to the methyl group, on the methyl group, or both. He was able to correlate the variation of the intensities of the aliphatic and aromatic C-H bands with the electron donor or acceptor character of the substituent. However, he did not attempt to obtain bond moments or bond moment deriva-

tives.

There are still, perhaps, insufficient infrared intensity data available to properly evaluate its real position in molecular spectroscopy. However, it is apparent that, although bond moments and bond moment derivatives derived from intensity studies of different bands of a given molecule are not always consistent, the further study of vibrational band intensities will lead to a better insight of the electronic structure of molecules.

THEORY

Since the theory of infrared intensities and molecular normal coordinate analyses are well discussed elsewhere it would serve little purpose to repeat the development of the theory here. In particular, the excellent book by Wilson, Decius and Cross²² provides quite complete derivations and discussions of these theories together with the references to the original literature of the developments. What will be attempted here is to provide a brief survey of the theory basic to the work to be described later.

Infrared Band Intensities

If one assumes the validity of the well known law for the absorption of monochromatic radiation, $I = I_0 e^{-\alpha pl}$, where I_0 is the intensity of the radiation incident upon a cell of length l containing an absorbing gas at partial pressure p , I is the intensity of the transmitted radiation and α is the molar absorption coefficient, then the absorption of a given absorption band may be described by the integrated absorption coefficient at unit pressure.

$$A = \int \alpha(\nu) d\nu = \frac{1}{pl} \int \ln \frac{I_0}{I} d\nu. \quad (1)$$

The integration is carried out over the frequency range of the absorption band. With a spectrometer of infinite resolving power I_0/I would be measured directly, however, actual spectrometers do not measure I_0/I but rather measure the integral of intensities of fre-

quencies over a range of frequencies.

$$T = \int I(\nu) g(\nu, \nu') d\nu. \quad (2)$$

T is the apparent intensity detected at an instrument setting ν' (the central frequency admitted by the finite slit) and $g(\nu, \nu')$ is the slit function, i.e. the fraction of the radiation of actual frequency ν admitted at the instrument setting ν' . The integration is carried out over the range of the finite slit width (all ν for which $g(\nu, \nu') \neq 0$) but since g soon vanishes outside a narrow range centered at ν' , the integration can be carried to $\pm \infty$. Thus one may measure the apparent integrated absorption coefficient.

$$B = \int \alpha_{\text{apparent}} d\nu = \frac{1}{pl} \int \ln \frac{I_0}{T} d\nu'. \quad (3)$$

Wilson and Wells⁷ have shown that if I_0 does not vary rapidly over a slit width, and if either the resolving power is high compared to the variation in α or the resolving power does not change much over the band that

$$\lim_{pl \rightarrow 0} B = A. \quad (4)$$

By measuring B at different values of pl (by varying either p or l) and extrapolating B to zero pl, one can find A, the true integrated absorption intensity.

One can expand $\ln T_0/T$ for small absorption and keeping the first term of the expansion get

$$C = \frac{1}{pl} \int \frac{T_0 - T}{T} d\nu \quad (5)$$

This method was used by Bourgin²³. This method is quite simple to use in that the "absorption areas" $\int \frac{T_0 - T}{T} d\nu$ can frequently be measured directly on the recorder chart without replotting.

The true integrated absorption A may be obtained by extrapolation of C similar to the extrapolation of B. Although $\lim_{pl \rightarrow 0} C$ is equal to A and thus $\lim_{pl \rightarrow 0} B$, at all finite values of pl, C is less than B and the extrapolation curve of C has greater curvature than that of B, in practice, therefore, one may expect the extrapolation of B to yield a more accurate value for A than the extrapolation of C.

Because of the rotational fine structure of the vibrational band, $\exp(-\alpha pl)$ will ordinarily vary with extreme fluctuations on passing through the individual lines of the vibrational-rotational band. The addition of a sufficient pressure of non-absorbing foreign gas can broaden the lines of the rotational fine structure and eliminate the fluctuation in $\exp(-\alpha pl)$. Unless the spectrometer has high resolving power, it is still necessary to obtain A by extrapolating B. Although extreme fluctuation in $\exp(-\alpha pl)$ may be eliminated by pressure broadening of the rotational structure, there remains the variation of the absorption coefficient over slit width because of the band envelope.

In summary, the true integrated coefficient of a vibrational band by the Wilson and Wells method may be obtained if (1) the rotational fine structure is eliminated by pressure broadening, (2) the curves are extrapolated to zero pl product so that variations in absorption due to

the envelope are eliminated, and (3) the apparent integrated absorption coefficient rather than the absorption is measured in order to make the extrapolation procedure valid at relatively high absorptions.

It is well known that an absorption intensity is related to the spectral transition probability²¹ and thus to the matrix element of the dipole moment for the transition. In the case of the absorption band of the i'th fundamental vibration this relation²² is

$$A_i = \int \alpha(\nu) d\nu = \frac{8\pi^2 N \nu_i}{3hc} \left\{ \left| \mu_{ix}^{''0} \right|^2 + \left| \mu_{iy}^{''0} \right|^2 + \left| \mu_{iz}^{''0} \right|^2 \right\} \quad (6)$$

where A_i is the integrated intensity of the i'th band whose central frequency is ν_i , N is the number of molecules per unit concentration, h is Planck's constant, c is the velocity of light and $(\mu_{ix}^{''0})$ is the x component of the dipole moment (or transition moment) for the transition between the ground and first excited states, similarly for $(\mu_{iy}^{''0})$ and $(\mu_{iz}^{''0})$.

If the dipole moment is now expanded in a power series in the normal coordinates, Q , the intensity can be related to the dipole moment change with vibration.⁸

$$A_i = \frac{N\pi}{3c} \left\{ \left| \frac{\partial \mu_x}{\partial Q_i} \right|^2 + \left| \frac{\partial \mu_y}{\partial Q_i} \right|^2 + \left| \frac{\partial \mu_z}{\partial Q_i} \right|^2 \right\} \quad (7)$$

Since the normal coordinates are related to the internal coordinates (usually combinations of bond coordinates, i.e. bond stretching and bond angle deformation) by linear transformation,

$$Q_i = \sum_j L_{ij} R_j, \quad (8)$$

the $\frac{\partial \mu}{\partial Q}$ are similarly related to $\frac{\partial \mu}{\partial R}$ ---

$$\frac{\partial \mu_x}{\partial Q_i} = \sum_j L_{ij}^{-1} \frac{\partial \mu_x}{\partial R_j} . \quad (9)$$

It is now possible to use the above results, together with the assumption of bond moment additivity, to calculate "effective charges" for bond stretchings $\frac{\partial \mu}{\partial r}$ and bond dipole moments. The $\frac{\partial \mu}{\partial R_k}$, where R_k is a bond angle deformation coordinate yield the dipole moments.

Normal Coordinate Analysis

A brief discussion of Wilson's F G Matrix method^{22,25} for the mathematical analysis of molecular vibrations will be given here.

If for a molecule whose vibrations are simple harmonic motion, the coordinates of the atoms are expressed as generalized displacement coordinates, then the kinetic energy of the molecule (for nuclear displacements only) is

$$T = 1/2 \sum_i \sum_j a_{ij} \dot{q}_i \dot{q}_j ; \quad (10)$$

where, within the framework of small vibration theory, the a_{ij} 's are constants. Similarly, the potential energy is

$$V = 1/2 \sum_i \sum_j b_{ij} q_i q_j ; \quad (11)$$

where, b_{ij} is equal to $\left(\frac{\partial^2 V}{\partial q_i \partial q_j}\right)_0$ or the force constants for displacement.

The Lagrangian equations of motion for the molecular vibrations are then

$$\sum_j a_{ij} \frac{d}{dt} \dot{q}_j + \sum_j b_{ij} q_j = 0 . \quad (12)$$

For $3N$ degrees of freedom, there will be $3N$ such equations corresponding to i equal to 1, 2, 3, ... $3N$. By means of an orthogonal transformation

$$q_i = \sum_k c_{ik} Q_k, \quad (13)$$

one can obtain the normal coordinates Q_k , that allow one to express the kinetic and potential energy in pure quadratic form (i.e., free from cross products)

$$T = 1/2 \sum_k \dot{Q}_k^2; \quad (14)$$

$$V = 1/2 \sum_k \lambda_k Q_k^2. \quad (15)$$

The λ_k are the $3N$ eigenvalues of the characteristic (or secular) equation

$$\left| \lambda a_{ij} - b_{ij} \right| = 0; \quad (16)$$

and the c_{ik} is the matrix formed from the eigenvectors.

It can be seen from this characteristic equation that, in general, λ may occur with any element of the determinant. This can make the solution of such equations for some polyatomic molecules quite difficult, where the order of the characteristic equation is large. It is also frequently difficult to set up the a_{ij} in terms of internal coordinates so as not to include translations and rotations.

As a means of circumventing some of the difficulties of older methods of treating molecular vibrations, Wilson²⁵ devised the F G Matrix method. (An equivalent method was devised independently and almost simultaneously by Eliashevich²⁶.)

In this method the elements of the G matrix are defined by the equation

$$G_{kl} = \sum_{i=1}^{3N} \frac{1}{m_i} B_{ki} B_{li} \quad (k, l = 1, 2, \dots, (3N-6)) ; \quad (17)$$

where N is the number of atoms and m_i is the mass of the i th atom.

B_{ki} is an element of the transformation relating the Cartesian displacement coordinates x_i to the internal coordinates R_k .

$$R_k = \sum_i B_{ki} x_i . \quad (18)$$

(In matrix notation this is $R = B_x$) The kinetic energy in terms of R_k is

$$2T = \sum_{k=1}^{3N-6} \sum_{l=1}^{3N-6} (G^{-1})_{kl} \dot{R}_k \dot{R}_l = \dot{R}' G^{-1} \dot{R} ; \quad (19)$$

where G^{-1} is the inverse matrix of G, \dot{R} is the column matrix whose elements are the \dot{R}_k and \dot{R}' is the transpose of \dot{R} . The potential energy is then expressed by

$$2V = \sum_{k=1}^{3N-6} \sum_{l=1}^{3N-6} F_{kl} R_k R_l = R' F R ; \quad (20)$$

in which F_{kl} is one of the force constants.

The secular equation is then

$$\left| F - G^{-1} \lambda \right| = 0 , \quad (21)$$

which is comparable in form to that obtained earlier. However, if one multiplies through this secular equation by G, one obtains

$$\left| G F - G G^{-1} \lambda \right| = 0 , \quad (22)$$

which is equivalent to

$$\left| G F - E \lambda \right| = 0 . \quad (23)$$

Here E is the identity or unit matrix.

In this secular equation the λ occur only on the principal diagonal and with unit coefficients. This form is convenient for expansion as an algebraic equation in λ as well as for many numerical methods of solution of determinants. Perhaps one of the most objectionable qualities of this form is that it is not symmetrical about its principal diagonal.

In the case of a symmetrical molecule, one can construct internal symmetry coordinates, chosen so as to agree with the transformation properties of one of the symmetry species appropriate to the point group symmetry of the molecule. Since the symmetry species appropriate to the point group are orthogonal to one another, the use of symmetry coordinates factors the secular equation into block diagonal form, so that instead of having to solve a $(3N-6) \times (3N-6)$ determinant one may solve several of lesser order. The extent of reduction possible, of course, is dependent on the number of symmetry elements that the molecule possesses.

The a priori knowledge of how the symmetry of a molecule may affect the description of its spectra and eigenfunctions may be gained through the application of the techniques of group theory.^{22,27,28}

The normal coordinates Q are related to R by the transformation

$$R = L Q ; \quad (24)$$

in which L is chosen so that the energies in terms of Q are of the form

$$2V = Q' L' F L Q = Q' \Lambda Q, \quad (25)$$

$$2T = \dot{Q}' L' G^{-1} L \dot{Q} = \dot{Q}' E \dot{Q}, \quad (26)$$

in which Λ is a diagonal matrix of the λ 's.

Thus

$$L' F L = \Lambda, \quad (27)$$

$$L' G^{-1} L = E \quad (28)$$

$$\text{or} \quad L L' = G, \quad (29)$$

$$\text{and} \quad G F L = L \Lambda \quad (30)$$

$$\text{or} \quad L^{-1} G F = \Lambda L^{-1}. \quad (31)$$

Thus the elements in the rows of the secular equation supply the coefficients of the forward transformation (L) while the columns serve for the reverse transformation (L^{-1}). The solution of the secular equation yields eigenfunctions \bar{L} which are related to the normal eigenfunctions L by a trivial constant. The expression

$$L' F L = \Lambda, \quad (32)$$

provides a convenient normalizing condition.²⁹ The relationship between \bar{L} and L is

$$\bar{L} = L D; \quad (33)$$

where D is a diagonal matrix of trivial constants. D may be found from the relation

$$\bar{L} F \bar{L} = D L' F L D = D \wedge D \sim D r^2 \lambda r \delta r s . \quad (34)$$

The relation

$$L L' = G \quad (35)$$

serves as a convenient check.

EXPERIMENTAL METHOD

Materials

The compounds investigated were of the highest purity available. Since these compounds have simple infrared spectra which have been well analyzed and assigned,^{30,31} it was possible to use the spectra as a check for impurities. Most of the compounds were used as received. CH_2Cl_2 was purchased from the Matheson Company. CH_2Br_2 and CH_2I_2 were purchased from Eastman Kodak Company. CH_2BrCl was given by Dow Chemical Company. CH_2F_2 and CH_2ClF were given by the Jackson Laboratory of the E. I du Pont de Nemours and Company.

It was necessary to purify the CH_2Br_2 by fractional distillation through a center rod column using about 40 theoretical plates in order to remove a trace (ca. 0.05%) of CH_2BrCl . Another sample of CH_2Br_2 , which had been furnished by the Dow Chemical Company, contained in addition to the CH_2BrCl some CHCl_2Br which apparently formed an azeotrope with the CH_2Br_2 . Since the CHCl_2Br could not be separated from the CH_2Br_2 by fractional distillation using 80 theoretical plates, the sample was not used.

Solution Measurements

The intensities of the two fundamental vibrations ν_1 and ν_6 (CH stretching vibrations) were measured in CCl_4 solution for CH_2Cl_2 , CH_2BrCl , CH_2Br_2 and CH_2I_2 . These intensities were measured on a Perkin-Elmer Model 13 infrared spectrophotometer equipped with a lithium fluoride prism and a slit servo mechanism that regulated the slit to

provide constant I_0 . Sodium chloride cells of 0.8 mm path length were used.

The intensities were determined using Ramsay's³² extension of the method of absorption areas. Since the change in dispersion across the bands was small, it was possible to measure the absorption areas directly from the recorder chart. The area of each band was measured at least twice with a planimeter.

Several solutions of different concentration were measured for each molecule. The solutions were used immediately after preparation.

Vapor Phase Measurements

The intensities of the ν_1 , ν_6 and ν_3 bands of CH_2F_2 , CH_2ClF , CH_2Cl_2 , CH_2BrCl and CH_2Br_2 were measured in the vapor phase.

A Perkin-Elmer Model 112 infrared spectrophotometer (a single-beam instrument with a double-pass monochromator) was used for the vapor phase studies. A lithium fluoride prism was used to study the 3000 cm^{-1} region (ν_1 and ν_6) with a resolution of about 8 cm^{-1} . For the study of the 1400 to 1500 cm^{-1} region (ν_3) a CaF_2 prism was used with a resolution of 2 to 2.5 cm^{-1} .

The cell used for this work was a multiple reflection cell of the White type^{33,34} designed by the author to match the aperture of the Perkin-Elmer Model 112 spectrometer. The $3\frac{1}{2}$ inch diameter mirrors in the brass cell have a 40 cm radius of curvature. The path lengths in the cell are multiples of 4 times the distance between the mirrors (4×40) or 160 cm . The path length of the cell is changed by rotation of one of the half mirrors about a vertical axis; the motion which

rotates the mirror is transmitted into the cell by the action of a differential screw compressing a sylphon bellows to which a connecting rod is mounted. The external focussing optics used with the cell were essentially the same as those used by Pilston and White³⁵ for the Perkin-Elmer 10 meter cell.

A small glass vacuum manifold connected to the cell by heavy walled teflon tubing provided a filling system for the cell. Vapor pressure measurements were made with a large bore (9 mm I. D.) open end monometer and barometric readings by expansion from the manifold to the cell using the known ratio of these volumes to calculate the final pressure.

Samples of CH_2F_2 and CH_2ClF (both gases) were measured into the manifold directly from the cylinders containing them. Liquid samples were first allowed to degas by pumping on them, then the manifold was evacuated and the vapor pressure measured into the manifold.

After a sample had been measured into the cell, about one atmosphere of pressurizing gas was added. Nitrogen was used as the pressurizing gas for work in the 3000 cm^{-1} region and helium for work in the 1400 to 1500 cm^{-1} region. Helium was used here because interfering water vapor was detected in the cylinder of nitrogen at the time of these measurements.

For the measurements in the 1400 to 1500 cm^{-1} region, the optical path connecting the source housing, cell and monochromator was enclosed in a large plastic bag and the whole optical path (except that within the cell) was flushed dry with helium in order to lower the water vapor background as much as possible. It was not possible to eliminate the water vapor spectrum completely, but in most cases the interference was

negligible.

The absorption bands of a sample were measured at several path lengths (usually four or five); the different path lengths were obtained by changing the path length within the multiple reflection cell. Background measurements were made with the cell evacuated and at the corresponding cell path lengths.

The bands were replotted on semi-logarithmic paper ($\ln \frac{I_0}{I}$ VS γ) and then the areas were measured at least twice with a planimeter. These areas ($\int \ln \frac{I_0}{I} d\gamma$) were then plotted against the pl product and the true integrated absorption coefficients were obtained from the slope of these plots.

RESULTS

The measured integrated apparent band areas $\int \ln \frac{I_0}{I} d\nu$ for a given gas were plotted against the pl product. The true intensity A of a band was obtained from the limiting slope of this plot. In several cases where other bands slightly overlapped the band of interest, it was possible to separate them graphically. In the vapor phase, the ν_1 and ν_6 bands of all the compounds studied overlap one another to such an extent that graphical separation was not possible. However, since the peak intensities of these two bands were nearly equal in all cases, the individual band intensities of ν_1 and ν_6 have been taken as being equal to one half the true intensity sum obtained from the limiting slope of the intensity sum plots for ν_1 and ν_6 (figures 1 through 5).

With the exception of CH_2F_2 all the compounds studied exhibited quite simple structure for the ν_1 and ν_6 bands. Since CH_2F_2 is a much lighter molecule than the other molecules of the series, the P and R branches of the ν_6 perpendicular band are more pronounced. This fact is the main explanation of the different appearance of the 3000 cm^{-1} region of CH_2F_2 . However, Stewart and Nielsen³⁶ have found from the high resolution spectra that a third band overlaps this region also. This third band is most likely the binary combination band of ν_3 and ν_8 . It was not possible to make allowance for the intensity contribution of this third band, but since the $(\nu_3 + \nu_8)$ band is very weak it is not believed to cause appreciable error.

The ν_3 bands of these compounds lie in the region 1370 to

to 1520 cm^{-1} ; this region is usually obscured by the absorption of atmospheric water vapor. Although the spectrometer was flushed with dry gas, this procedure did not completely eliminate the presence of water vapor lines from the background. Since the water vapor lines are quite sharp, it is conceivable that they might not be canceled out in the replotting of the absorption band of the sample gas and thus contribute to the experimental error. In particular, the ν_3 band region of CH_2BrCl and had rather strong water vapor lines present that probably caused considerable error in the measured band intensity. It may be seen in Table 1, where the band intensities are summarized that the CH_2BrCl ν_3 band intensity is somewhat out of line. Only in the re-

Table 1. Absorption Band Intensities
in Vapor Phase ($\text{cm}^{-1} / \text{atm.-cm}$)

	CH_2F_2	CH_2ClF	CH_2Cl_2	CH_2BrCl	CH_2Br_2
ν_1	104	39.6	20	5	2.17
ν_6	104	39.6	20	5	2.17
ν_3	2.11	5.95	5.52	0.391	0.839

gion of the ν_3 band of CH_2Br_2 were the water vapor lines eliminated from the background.

The ν_3 band of CH_2F_2 has not been reported before as having been observed in the infrared. The Raman-effect data on CH_2F_2 show ν_3 to be at 1508 cm^{-1} . The ν_3 band of CH_2F_2 was observed in the infrared

in this research at $1508 \pm 5 \text{ cm}^{-1}$. Probably the interference of the water vapor spectrum has prevented the earlier detection of ν_3 . The

ν_3 band was slightly overlapped by the tail of the quite strong 1435 cm^{-1} ν_8 band of CH_2F_2 . The band area of the CH_2F_2 ν_3 was separated graphically from the ν_8 tail. However, this procedure is subject to appreciable error.

In liquid phase the ν_1 and ν_6 bands of the methylene halides are separated considerably and were almost completely resolved. The intensities of the ν_1 and ν_6 bands of several methylene halides were measured in CCl_4 solution using Ramsay's method III.³² It is to

Table 2. Absorption Band Intensities
in CCl_4 Solution ($\text{cm}^{-1} / \text{atm.-cm}$)

	CH_2Cl_2	CH_2BrCl	CH_2Br_2	CH_2I_2
ν_1	21.9	8.70	7.40	6.69
ν_6	10.1	19.4	28.5	40.1

be noticed that the solution intensities are greatly different from the vapor phase intensities even if one considers only the intensity sums.

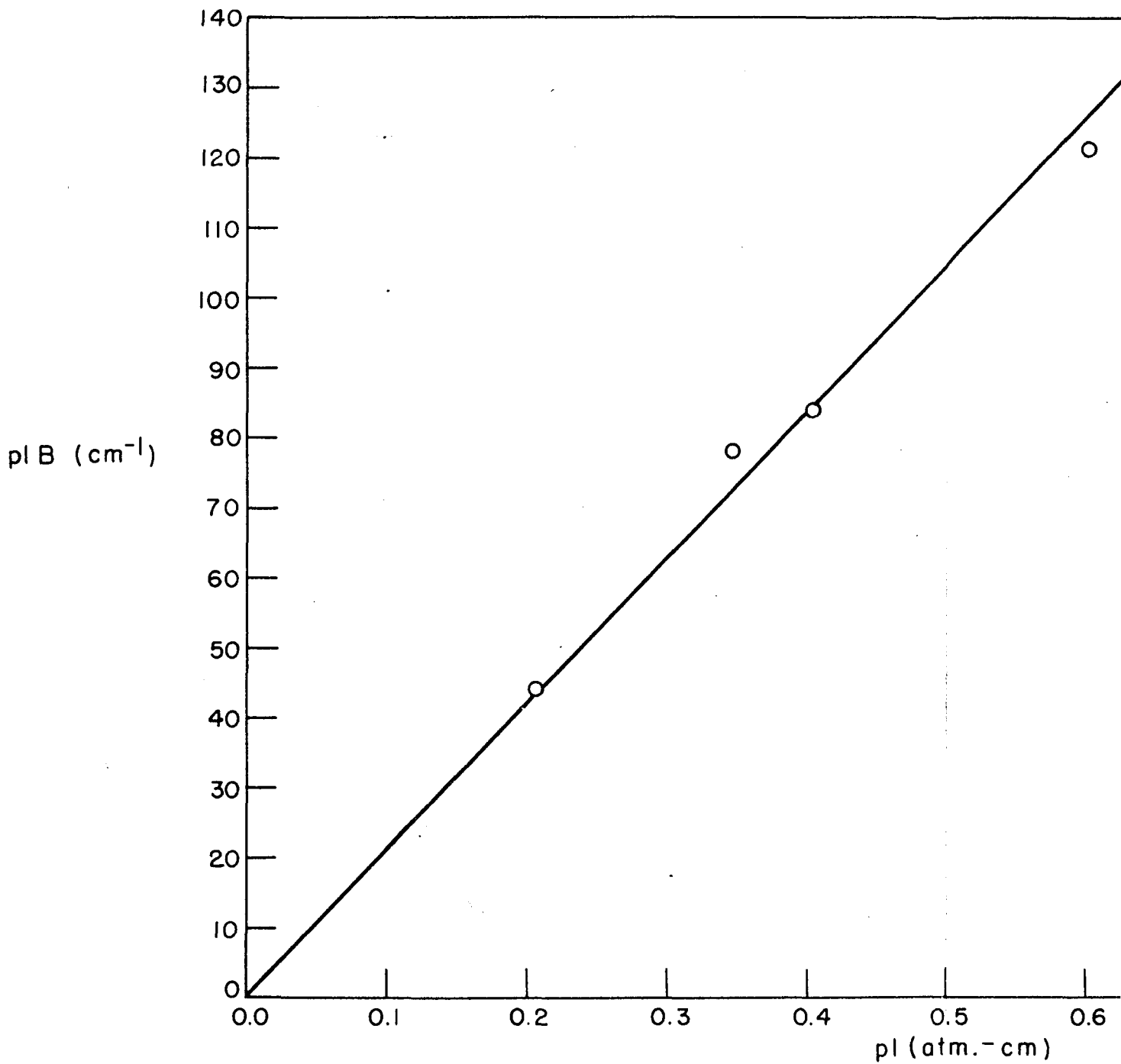
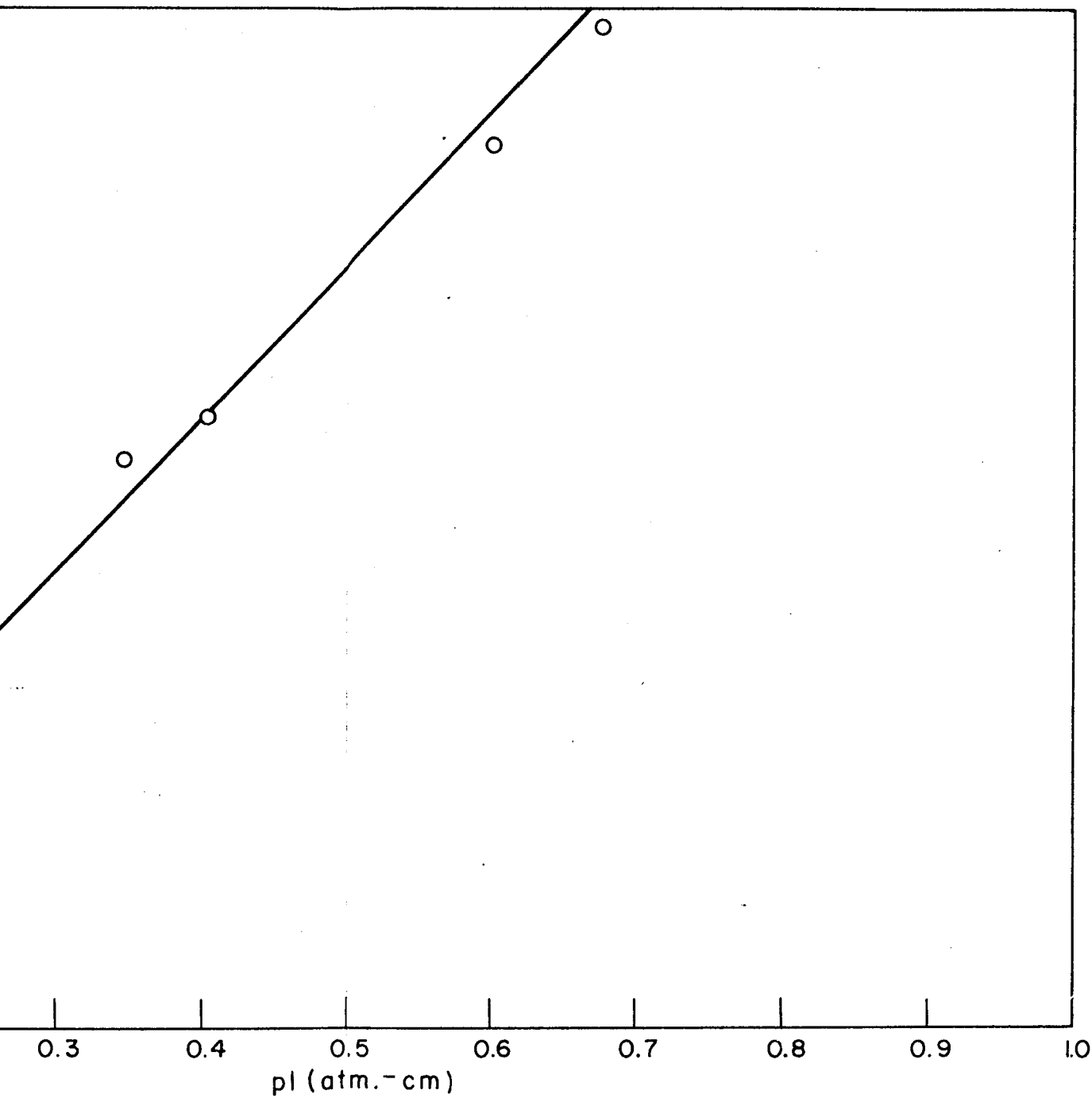


FIGURE 1 INTENSITY PLOT OF THE 3000 cm^{-1} BAND



INTENSITY PLOT OF THE 3000 cm⁻¹ BANDS OF CH₂F₂ (ν₁ AND ν₆)

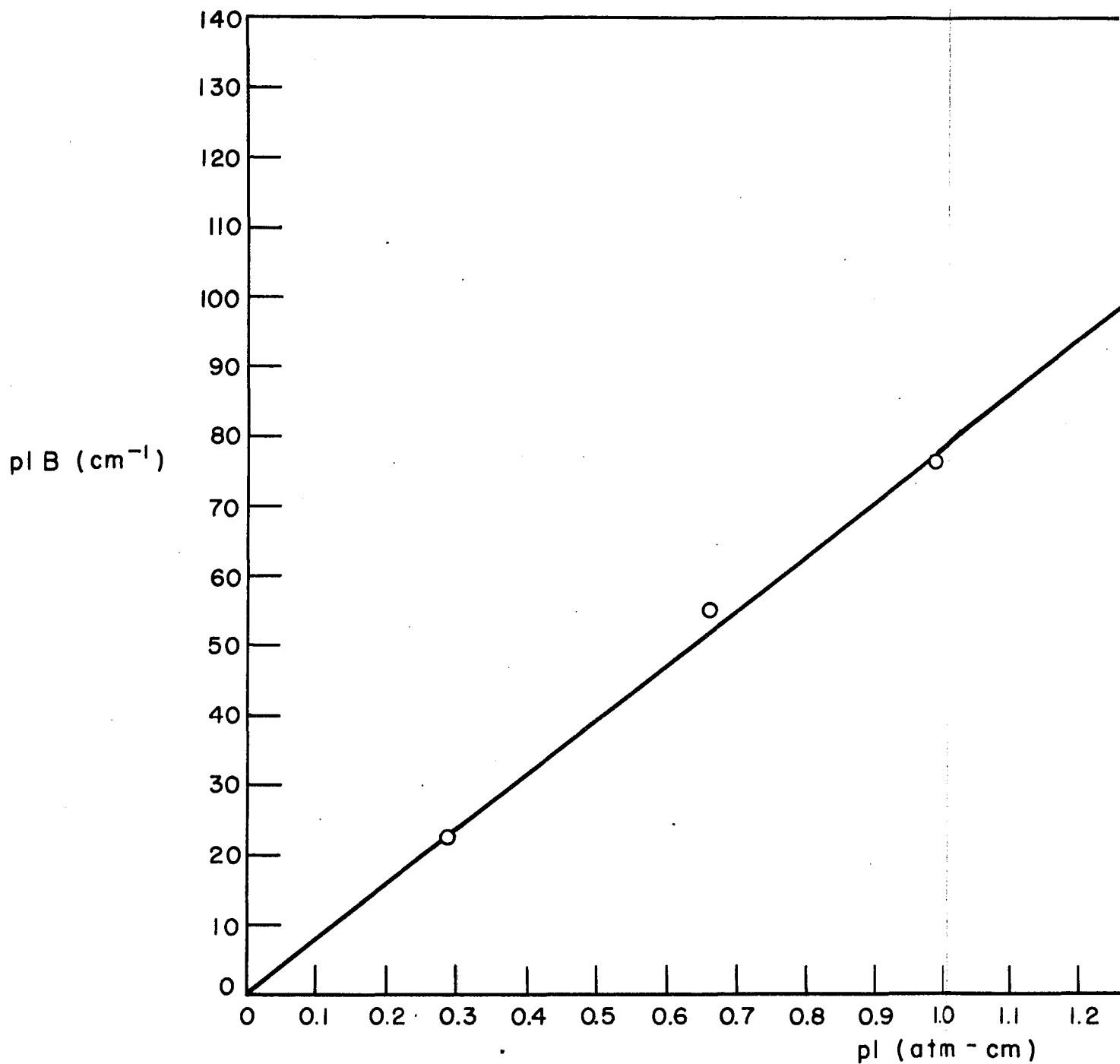
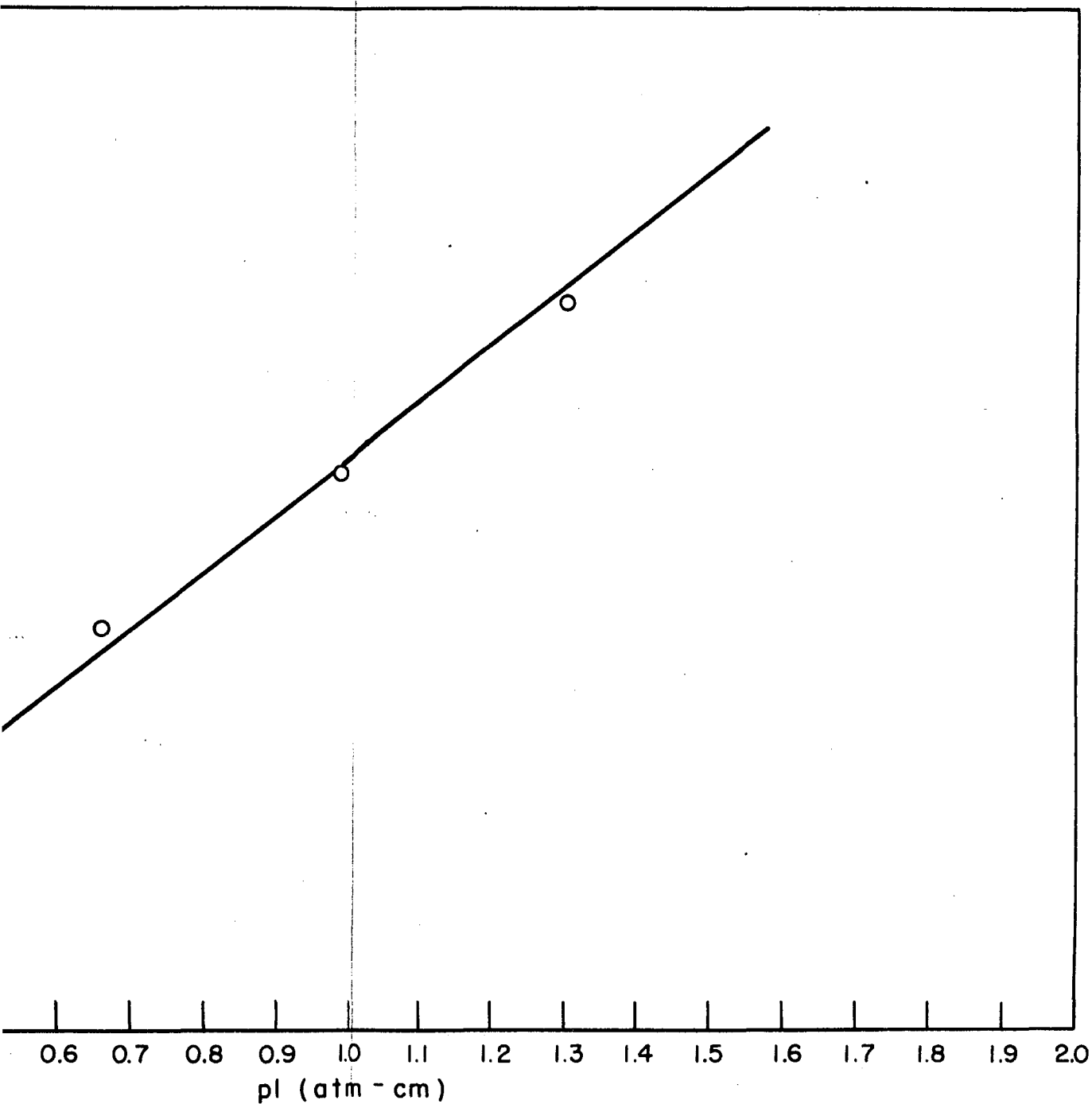


FIGURE 2 INTENSITY PLOT OF THE TWO 3000 cm⁻¹



DENSITY PLOT OF THE TWO 3000 cm^{-1} BANDS OF CH_2ClF (ν_1 AND ν_6)

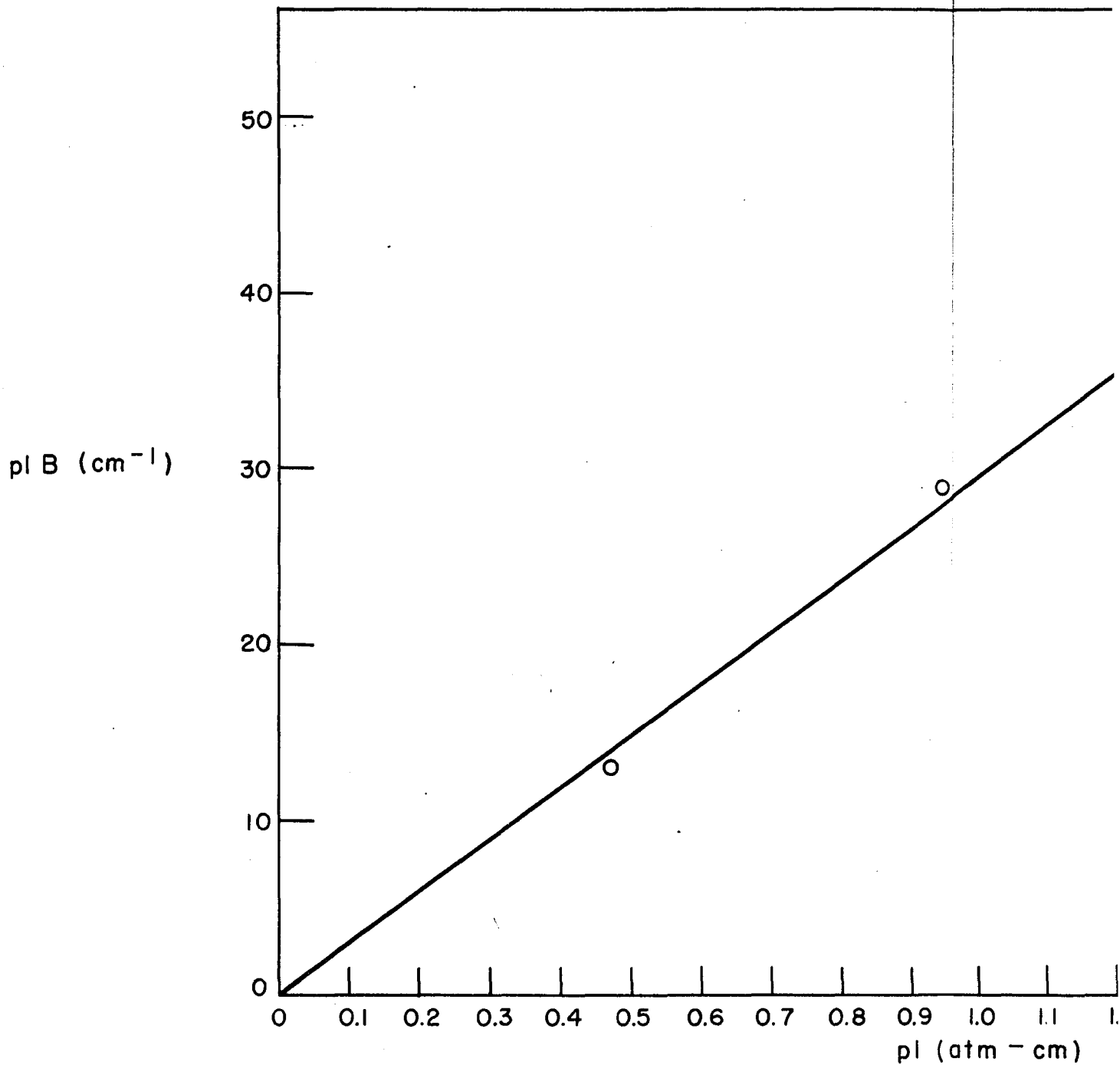
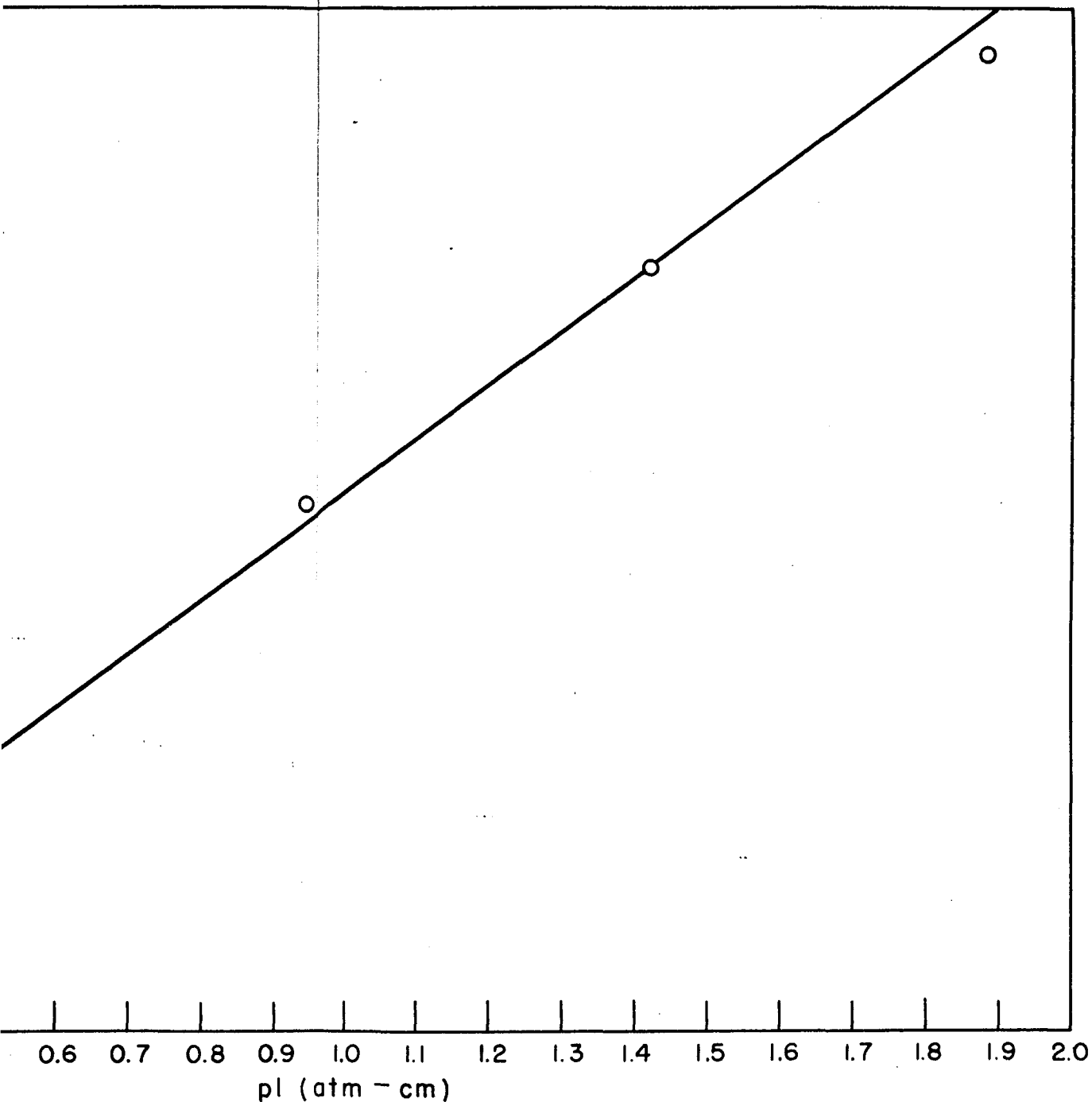


FIGURE 3 INTENSITY PLOT OF THE TWO 3000 cm



DENSITY PLOT OF THE TWO 3000 cm^{-1} BANDS OF CH_2Cl_2 (ν_1 AND ν_6)

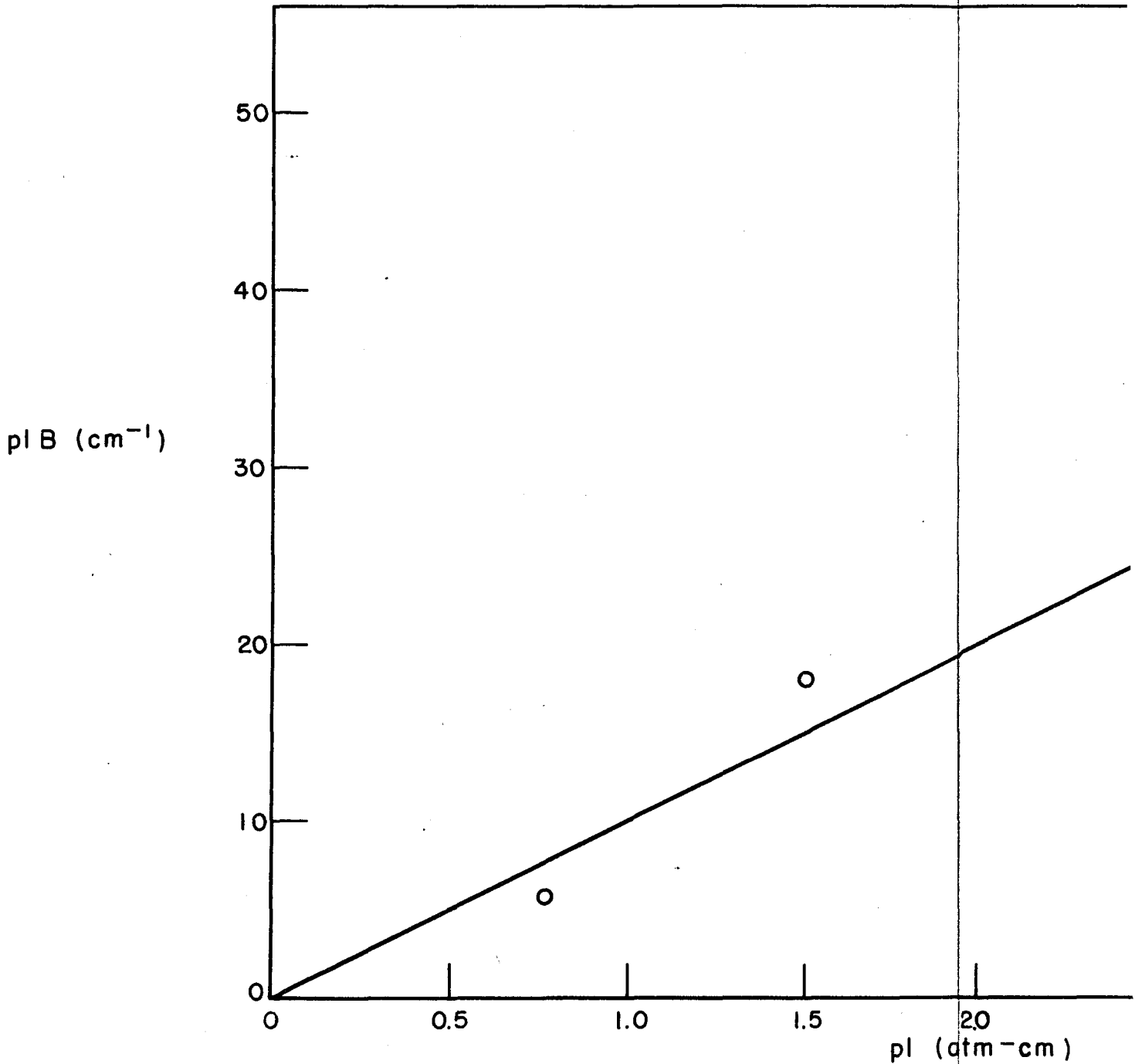
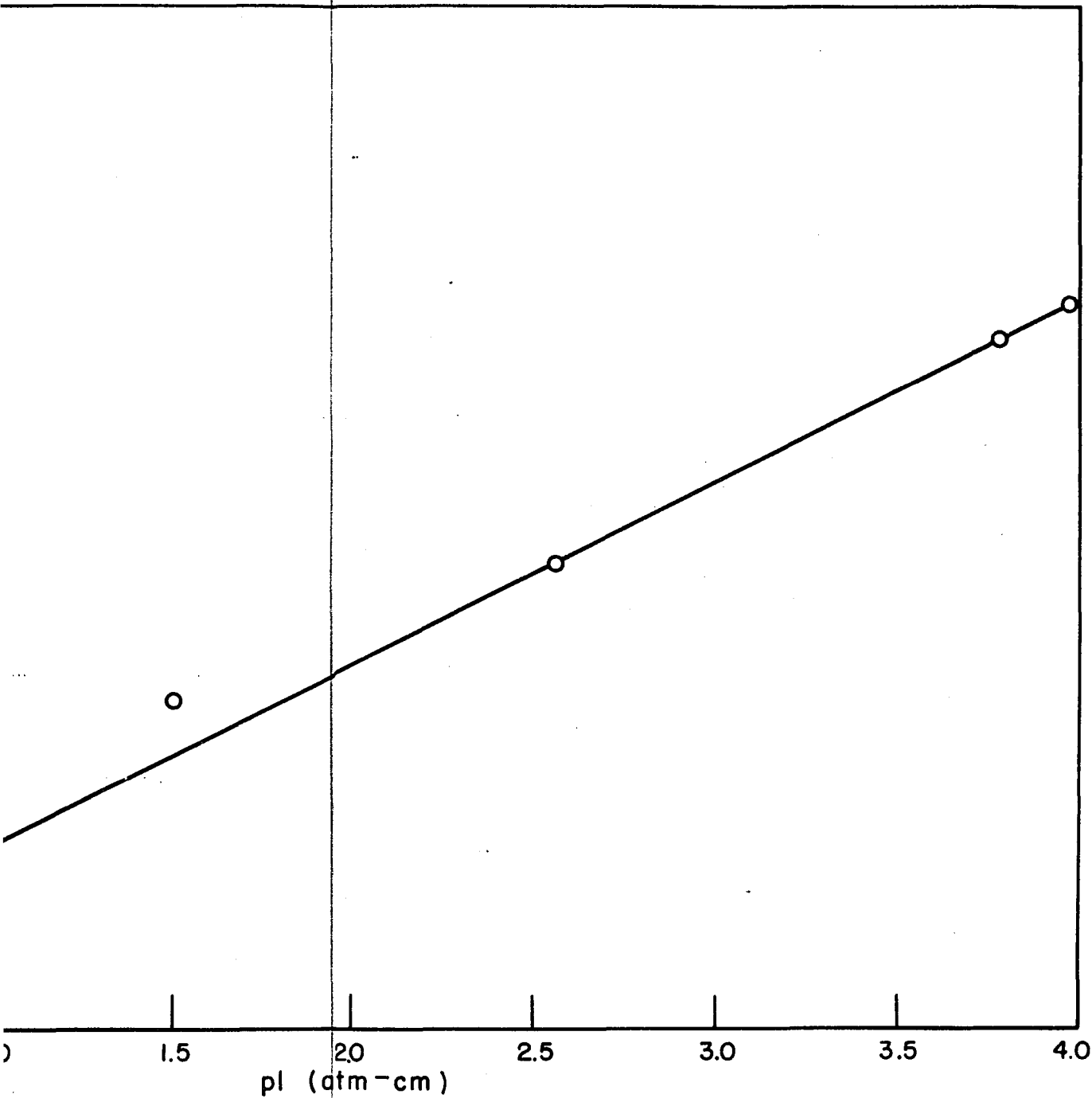


FIGURE 4 INTENSITY PLOT OF THE TWO 3000 cm^{-1}



DENSITY PLOT OF THE TWO 3000 cm⁻¹ BANDS OF CH₂BrCl (ν₁ AND ν₆)

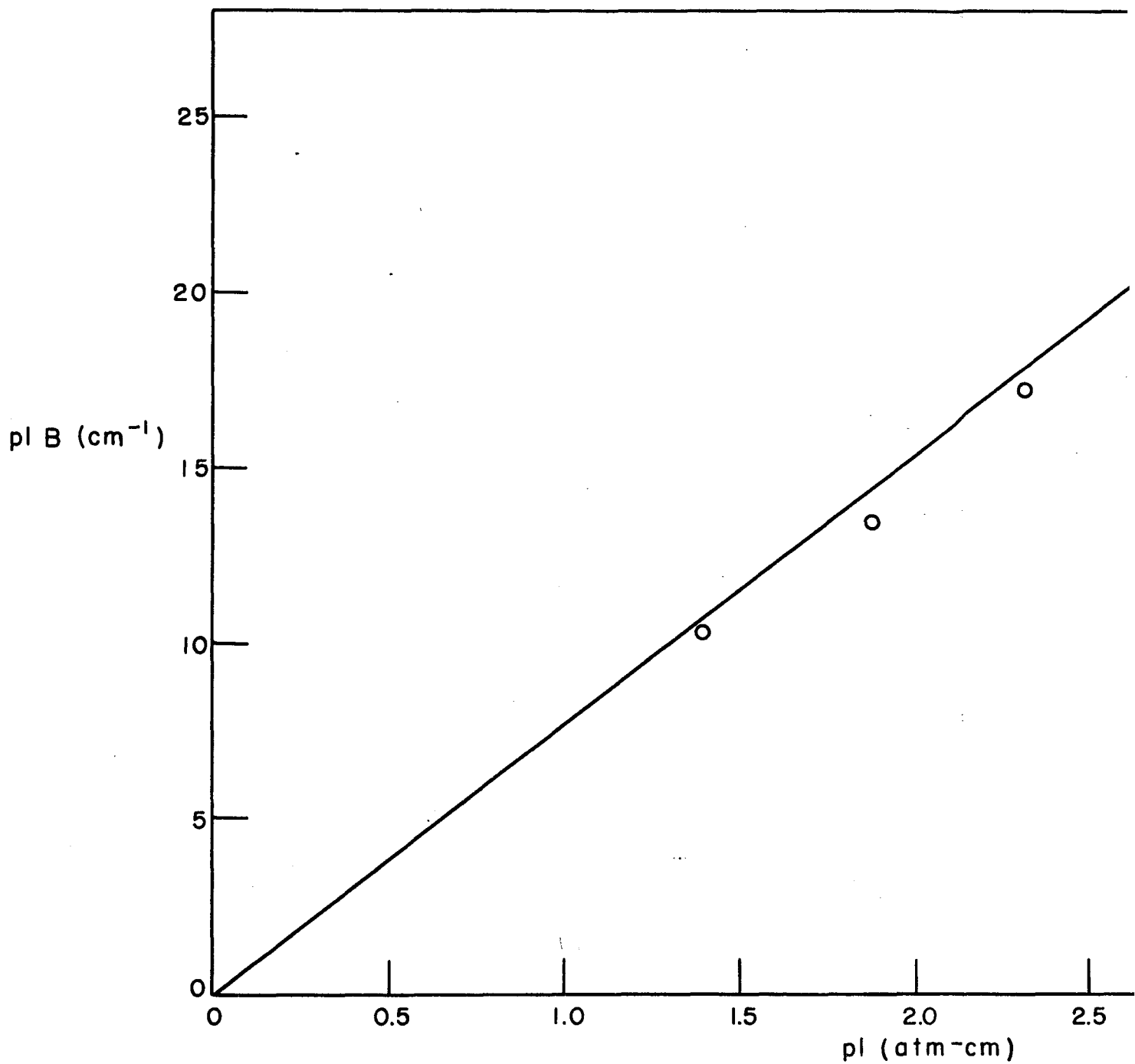
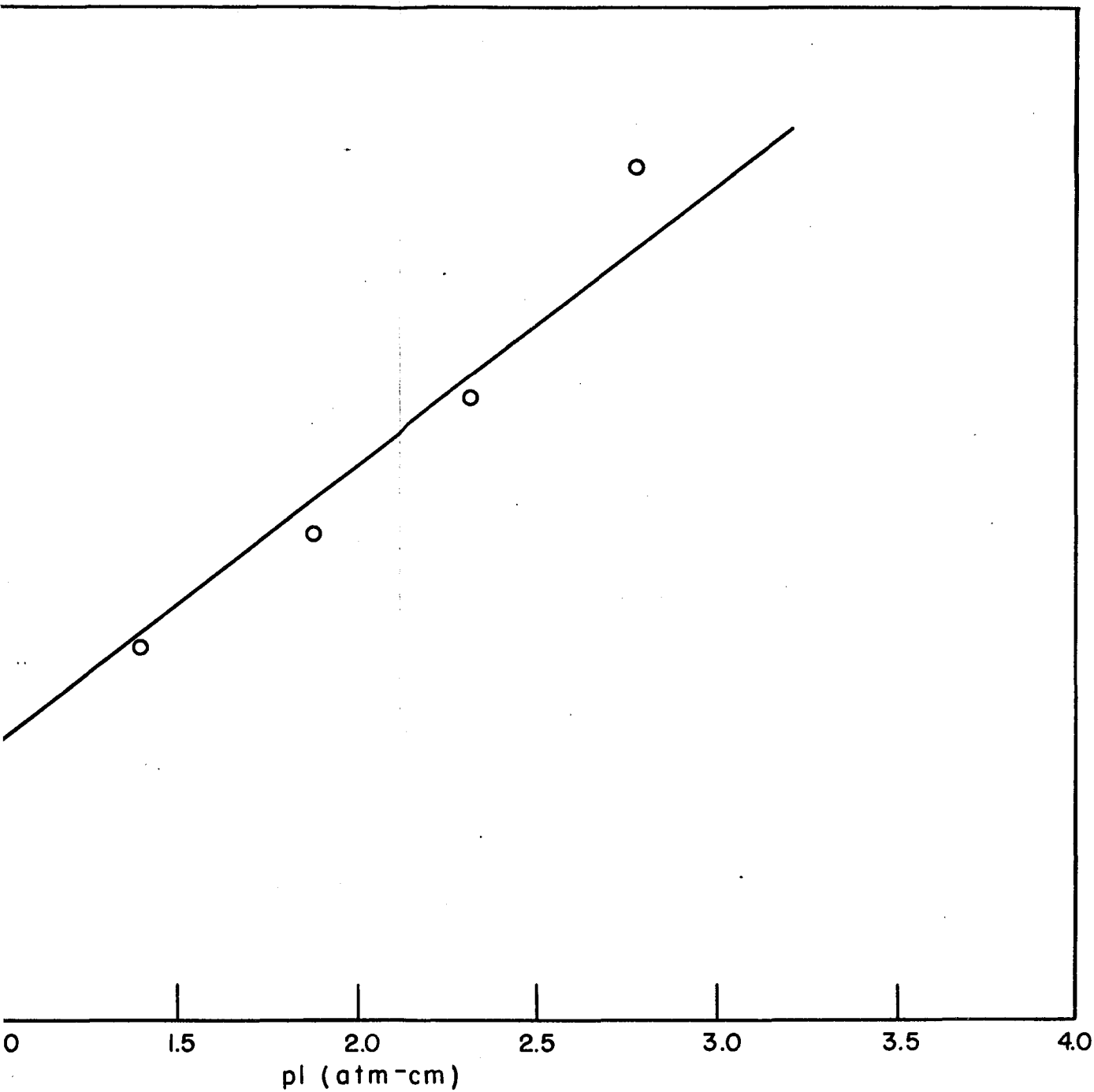


FIGURE 5 INTENSITY PLOT OF THE TWO 3000 cm⁻¹ BANDS



INTENSITY PLOT OF THE TWO 3000 cm^{-1} BANDS OF CH_2Br_2 (ν_1 AND ν_6)

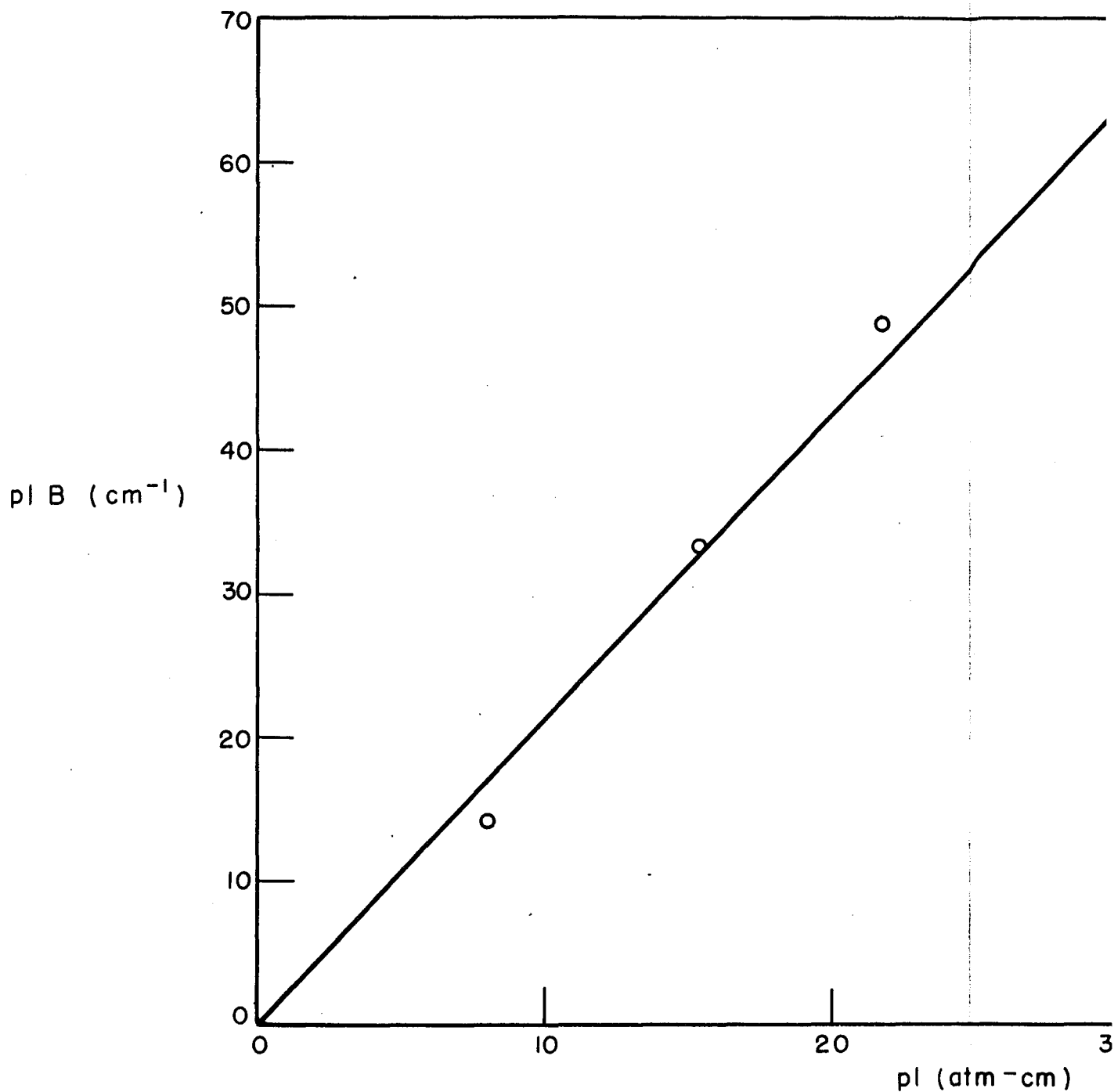


FIGURE 6 INTENSITY PLOT OF THE ν_3

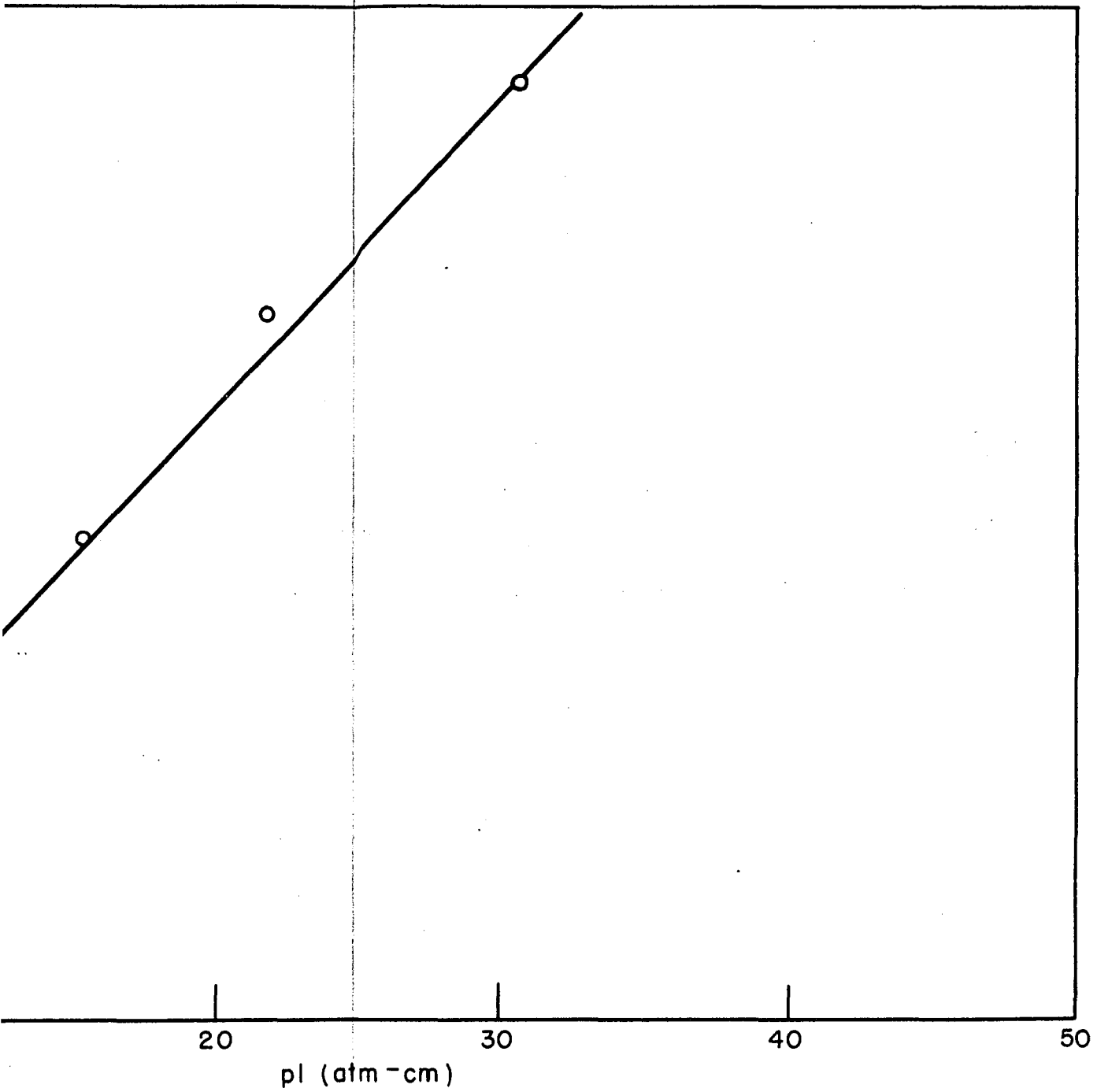


FIGURE 6 INTENSITY PLOT OF THE ν_3 BAND OF CH_2F_2

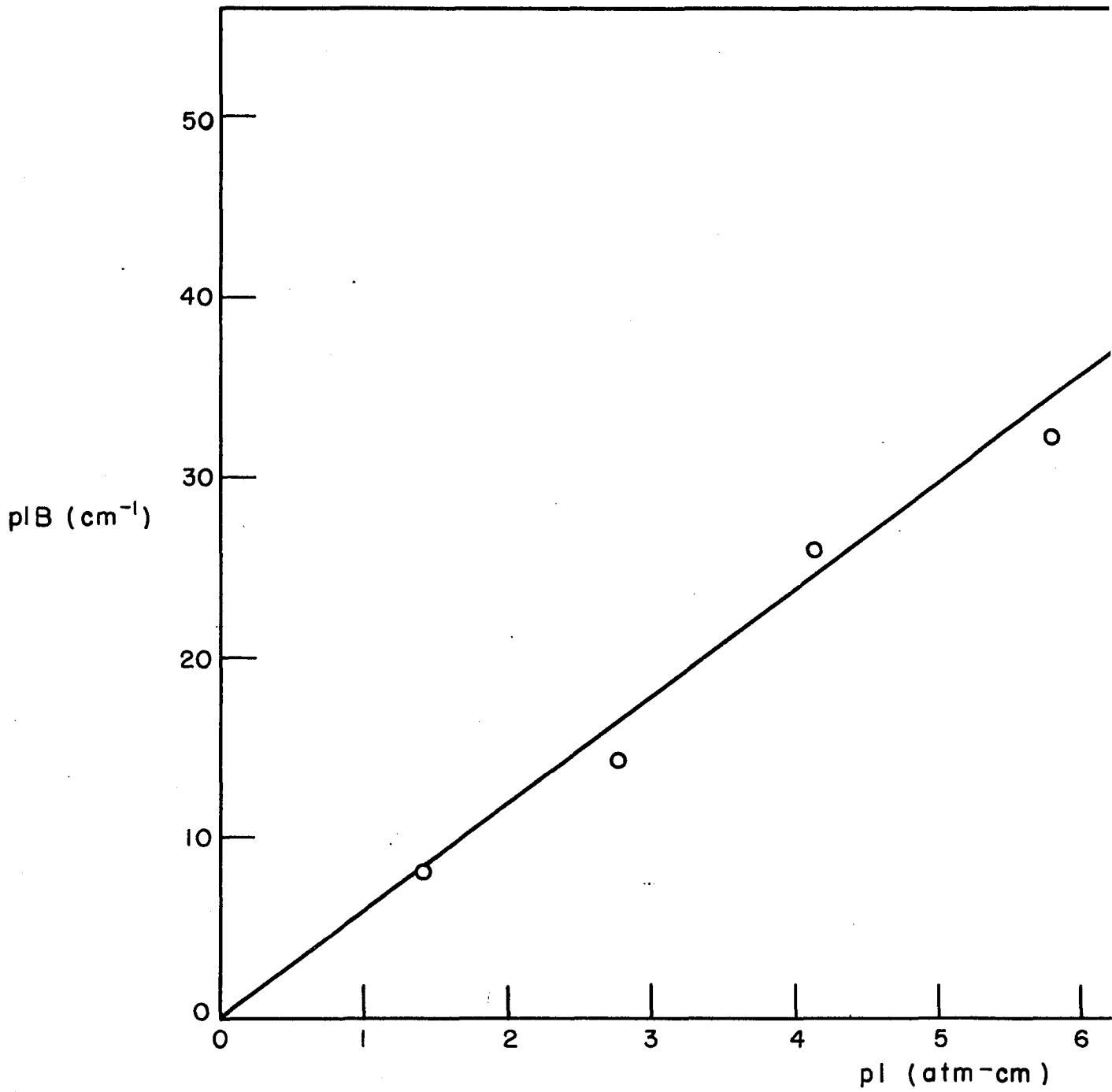
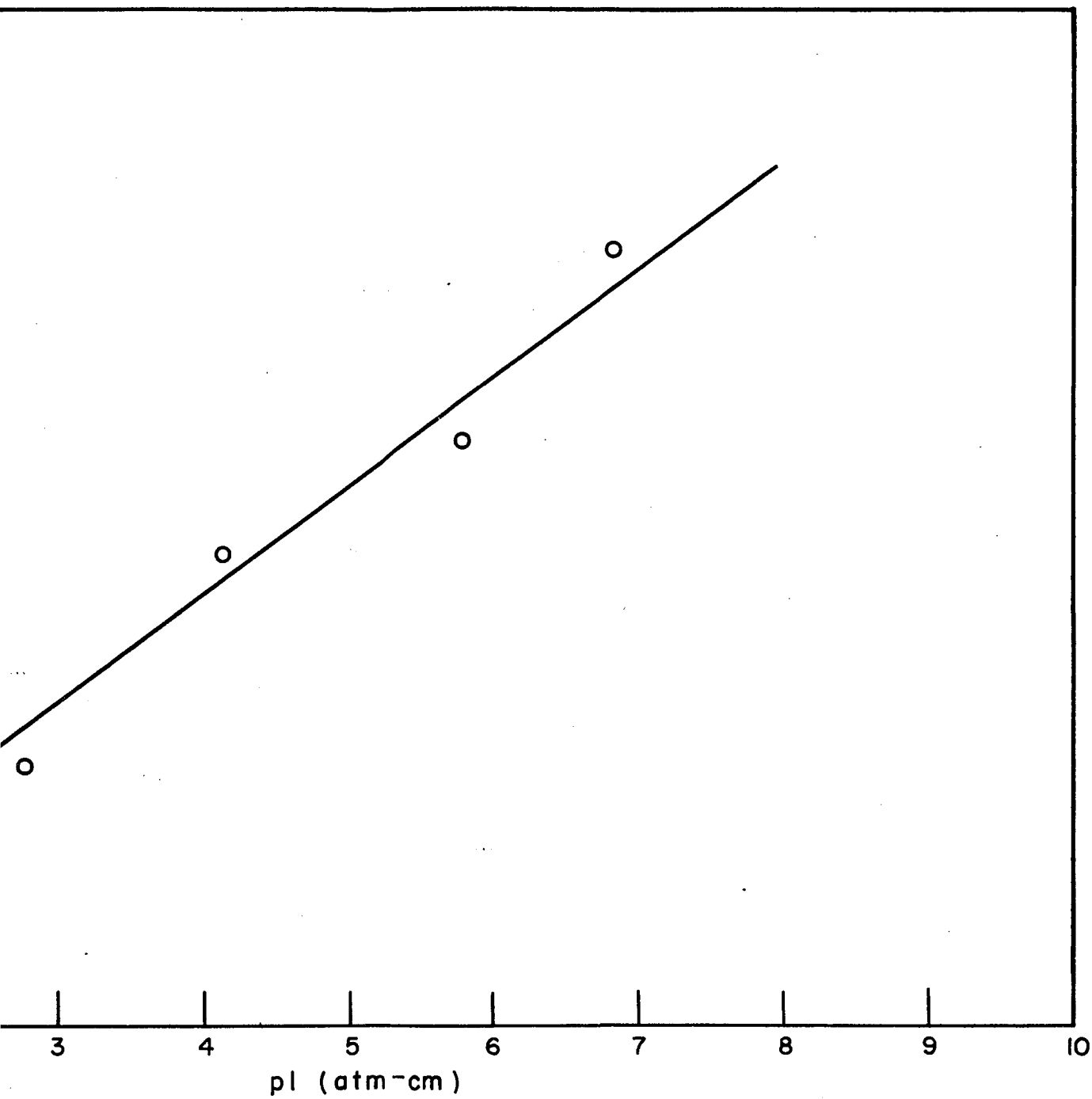


FIGURE 7 INTENSITY PLOT OF THE ν_3 B



E 7 INTENSITY PLOT OF THE ν_3 BAND OF CH₂ClF

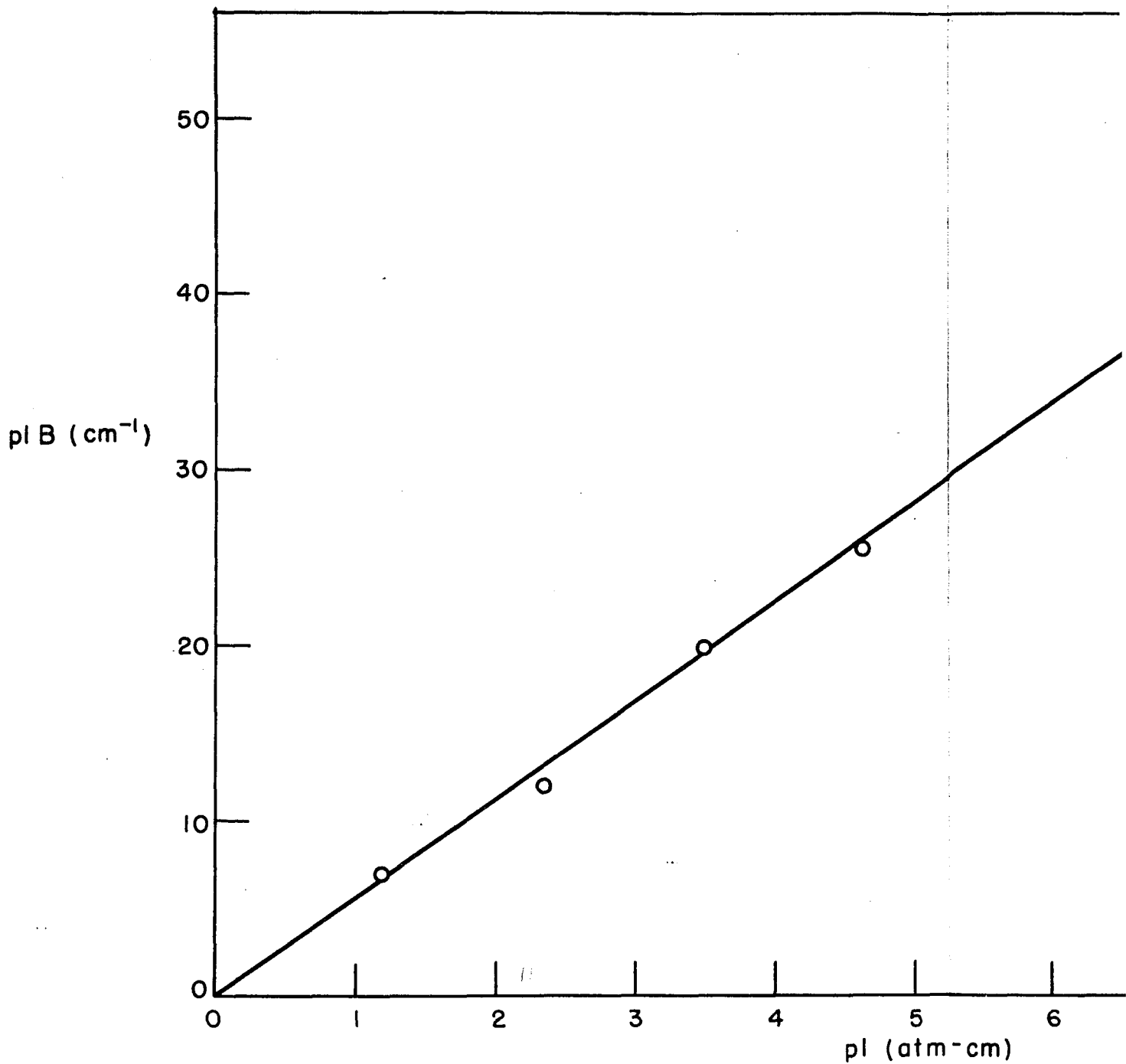


FIGURE 8 INTENSITY PLOT OF THE ν_3 BAND

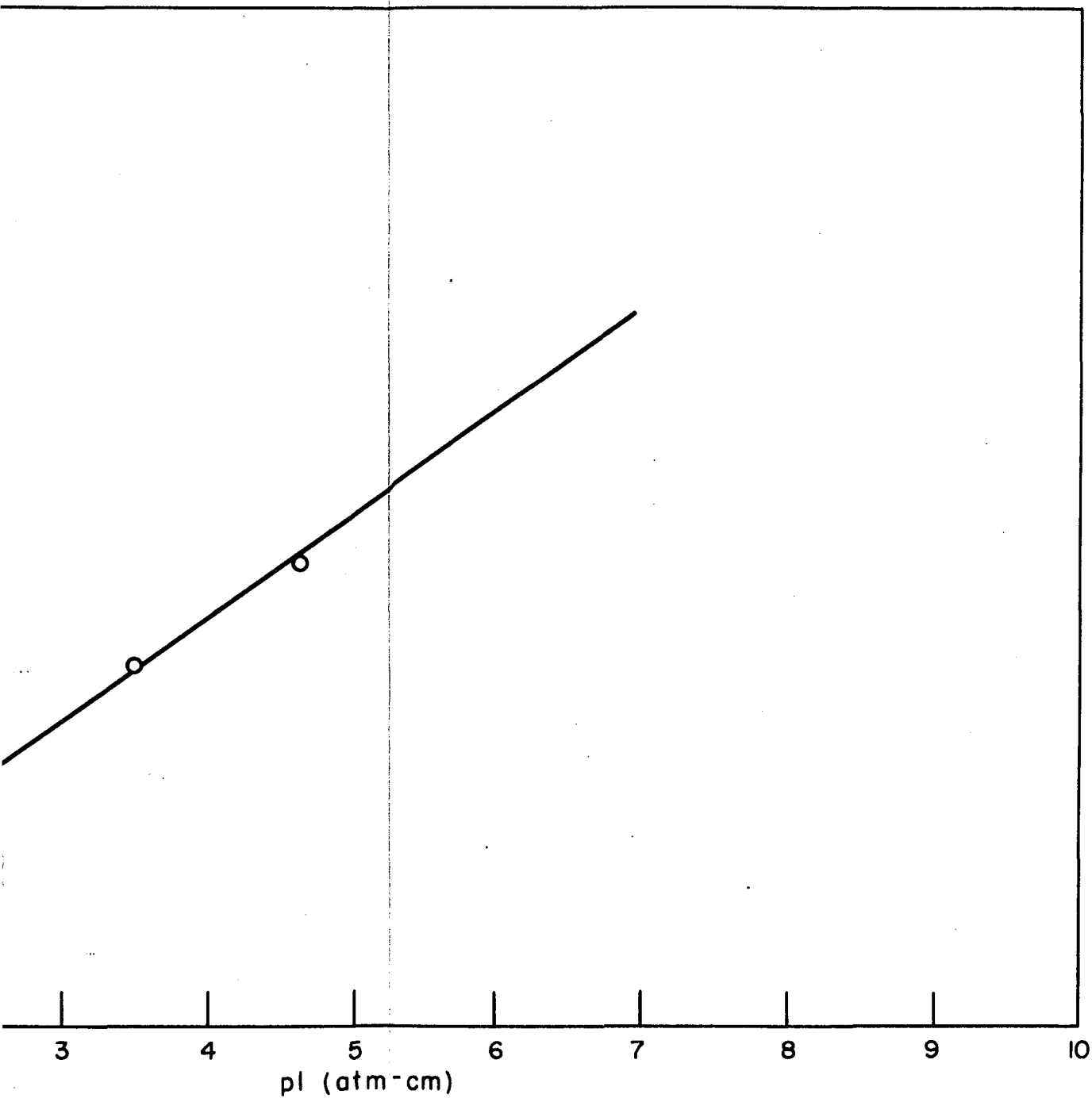


FIGURE 8 INTENSITY PLOT OF THE ν_3 BAND OF CH_2Cl_2

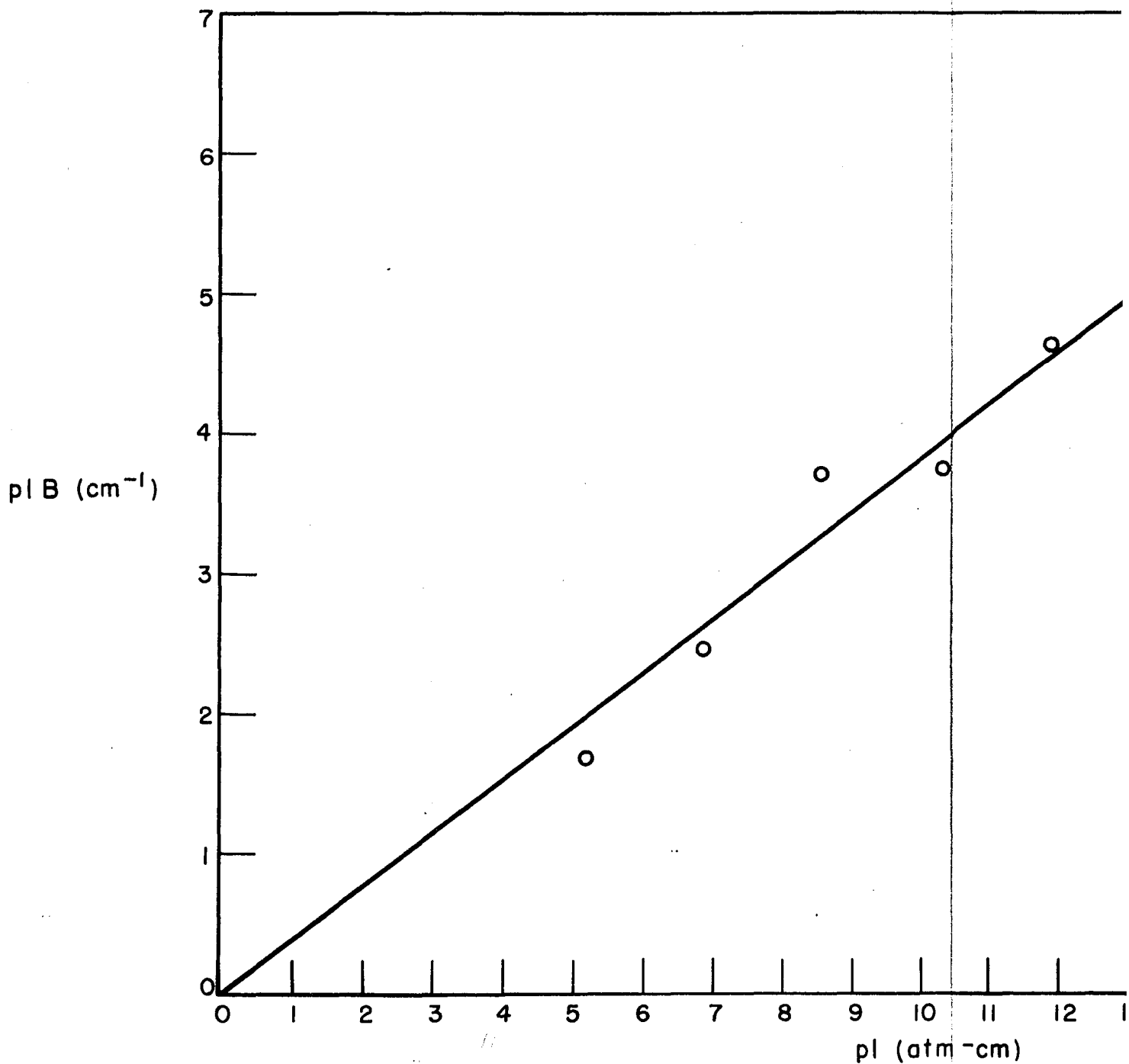


FIGURE 9 INTENSITY PLOT OF THE ν_3 BAND

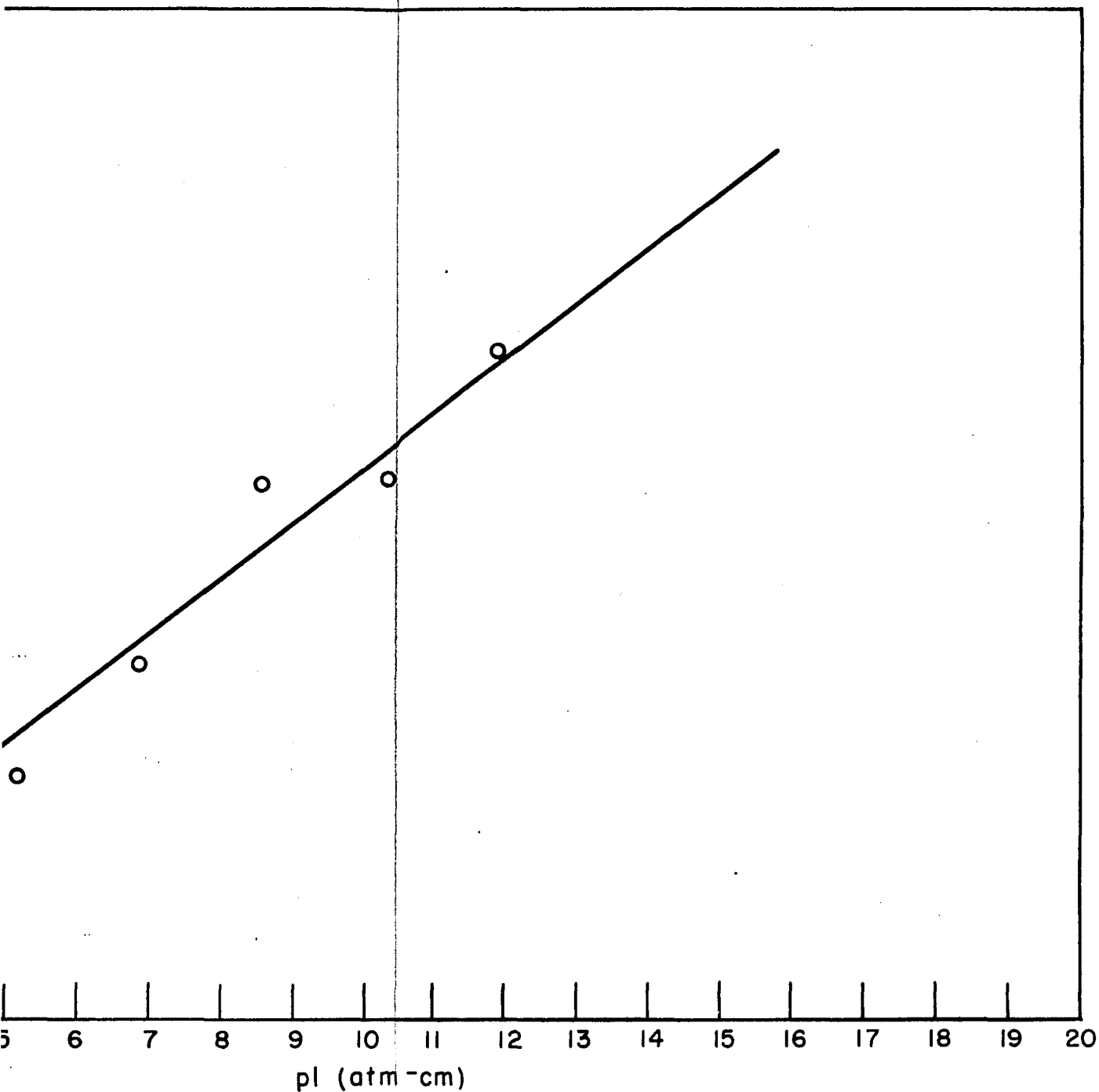


FIGURE 9 INTENSITY PLOT OF THE ν_3 BAND OF CH_2BrCl

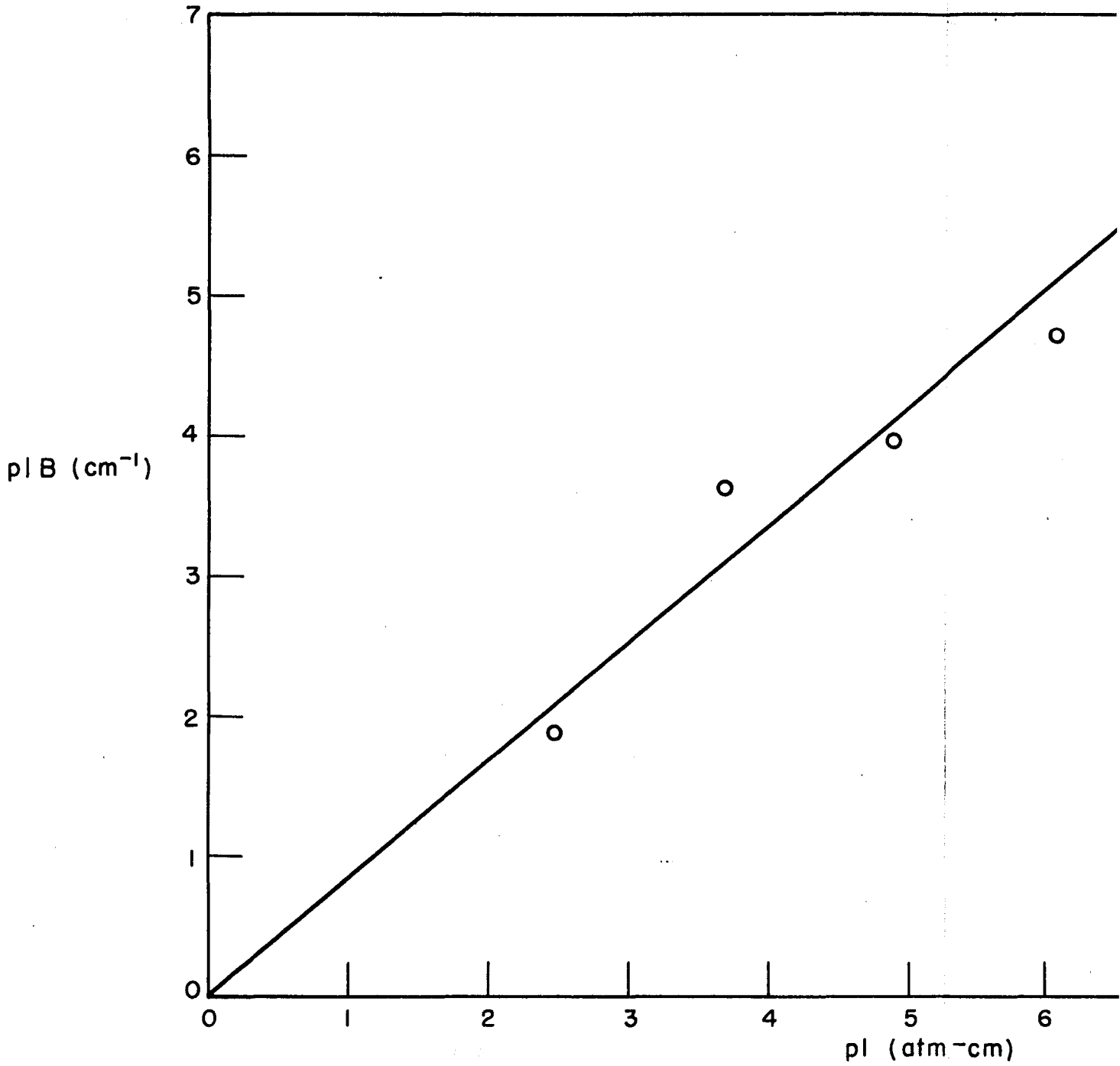
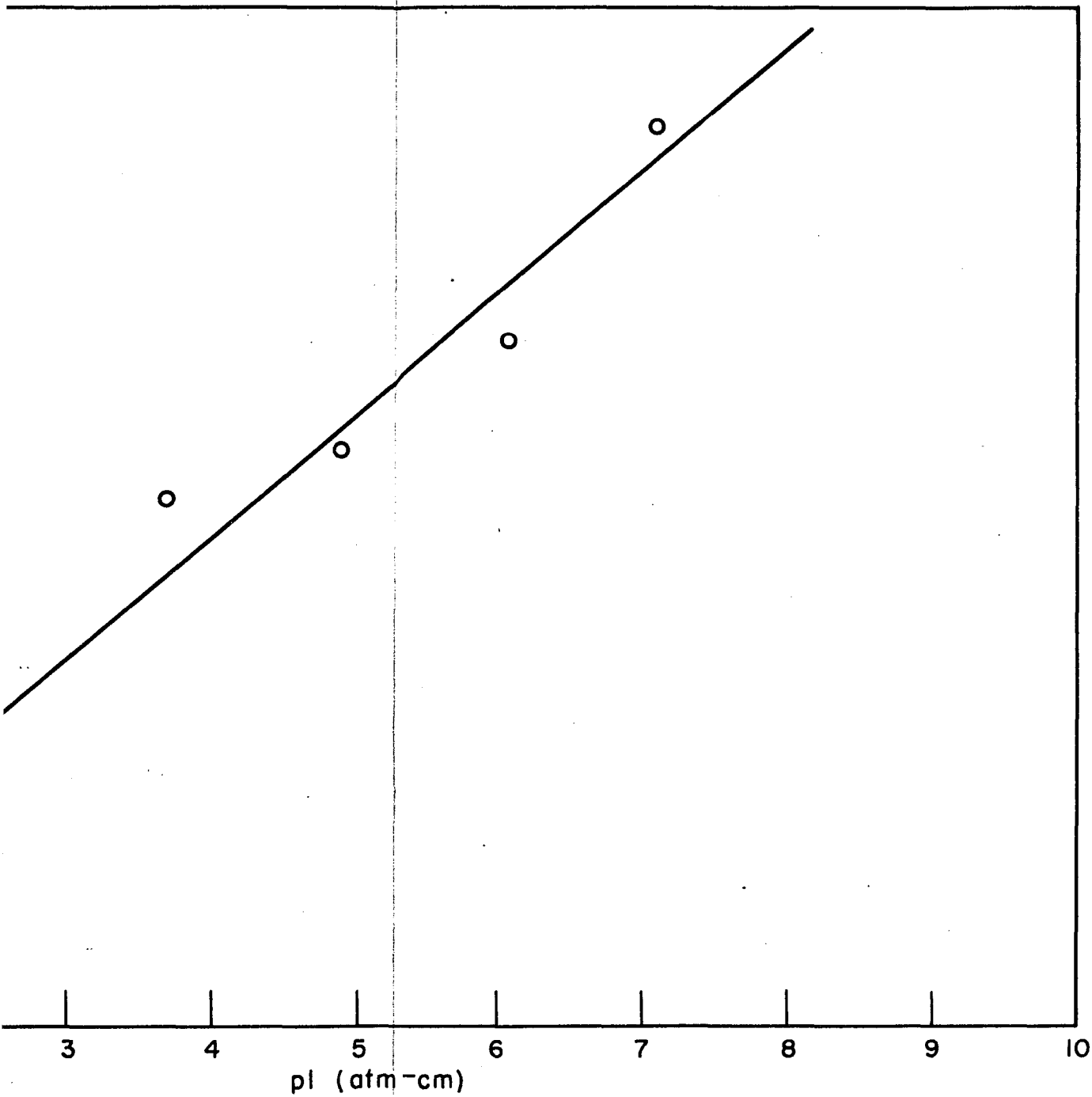


FIGURE 10 INTENSITY PLOT OF THE ν_3 BAND



E IO INTENSITY PLOT OF THE ν_3 BAND OF CH_2Br

INTERPRETATION OF DATA

The intensity of a vibration band is related to the dipole moment change with vibration (7). If the intensity is measured in $\text{cm}^{-1} / \text{atm.-cm}$ and $\frac{\partial \mu}{\partial Q}$ in e.s.u. then the relationship is

$$\frac{\partial \mu}{\partial Q_1} = \pm 5.653 (A_1)^{\frac{1}{2}}. \quad (36)$$

Table 3 contains the values of $\frac{\partial \mu}{\partial Q}$ that were determined for the methylene halides studied based from the vapor phase intensities.

Table 3. $(\frac{\partial \mu}{\partial Q})$'s Derived from Vapor Phase Intensities (e.s.u.)

	CH_2F_2	CH_2ClF	CH_2Cl_2	CH_2BrCl	CH_2Br_2
$(\frac{\partial \mu}{\partial Q_1})$	58.8	35.6	25.3	12.7	8.32
$(\frac{\partial \mu}{\partial Q_2})$	58.8	35.6	25.3	12.7	8.32
$(\frac{\partial \mu}{\partial Q_3})$	8.20	13.8	13.3	3.54	5.18

In order to interpret the $\frac{\partial \mu}{\partial Q}$ in terms of bond moment parameters, the normal coordinate transformation matrices were needed. Normal coordinate calculations were made for CH_2F_2 , CH_2Cl_2 , CH_2Br_2 , CH_2ClF and CH_2BrCl . The force constants necessary for these calculations were obtained from several sources. The force constants for CH_2Cl_2 and CH_2Br_2 were those determined by Decius³⁷ and the force constants for CH_2F_2 were those determined by Pace³⁸. Pace's work was an extension of Decius'

type of analysis to fluoromethanes but he found it was necessary to employ more interaction terms in his potential function. Plyler and Benedict³⁰ also extended Decius' type of analysis to fluoromethanes, and without introducing any more interaction terms. However, their calculated frequencies are in much poorer agreement with experiment than Pace's. The force constants used for CH_2BrCl and CH_2ClF were those of Decius³⁷ and Plyler and Benedict³⁰. The additional constants required for the CH_2XY molecules were taken as the geometric mean of the corresponding constants involving a single constant after the method of Plyler and Benedict³⁰. The normal coordinate calculations were carried out by the methods of Wilson²⁴.

The solution of the secular determinants arising in these calculations was accomplished by an iterative process^{28,39} which yields the largest root (or eigenvalue) λ_r and at the same time the corresponding eigenvector \bar{L}_r . The eigenvector \bar{L}_r is related to the normal coordinate L_r by a trivial constant.

To obtain the sub-dominant roots and their vectors, a matrix was reduced by the method described in Duncan, Frazer and Collar³⁹. This requires the inverse function L_r^{-1} which may be obtained by use of the relation,

$$L_r' F = \lambda_r L_r^{-1} \quad (37)$$

Most of the calculations were carried out using a desk calculator, however, the A' vibrations of the CH_2XY molecules yield secular determinants of order 6 and their solution was too slow and tedious for that. These two sixth order secular determinants were solved using an

I. B. M. 602-A. The same type of iterative procedure was used but Aitken's⁴⁰ "deflation" procedure was used to reduce the matrices, since the other procedure tends to cause loss of significant figures if repeated many times.

The symmetry coordinates, G and F matrix elements, and force constants used in these calculations are presented in the appendix together with the L and L^{-1} transformation matrices.

The calculated frequencies are summarized in Table 4. The agreement of the calculated with observed frequencies is quite satisfactory for the most part. However, the agreement in the case of CH_2ClF is poorer than one would like and the calculated ν_4 of CH_2BrCl is distressingly high.

It is very likely that approximating the additional force constants required for the CH_2XY molecules as the geometric mean of the force corresponding to that of the molecules containing a single halogen, is a poor one. Since calculated frequencies are less sensitive to inexact eigenfunctions than are other parameters, it was not believed that the normal coordinates calculated for CH_2ClF and CH_2BrCl are sufficiently reliable for calculating bond moment parameters. Also the CH_2BrCl ν_3 intensity was obtained under working conditions which were very likely to cause error.

Table 4. Calculated and Observed Frequencies in cm^{-1}

Molecule	ν_i	Calc.	Obs.	$\Delta\%$
CH_2F_2	$\nu_1(\text{A}_1)$	3005	2949	1.9
	$\nu_3(\text{A}_1)$	1503	1508	-0.3
	$\nu_2(\text{A}_1)$	1127	1116	1.0
	$\nu_4(\text{A}_1)$	553	529	4.5
	$\nu_6(\text{B}_1)$	3084	3012	2.4
	$\nu_7(\text{B}_1)$	1218	1176	3.6
CH_2Cl_2	$\nu_1(\text{A}_1)$	2999	2985	0.5
	$\nu_3(\text{A}_1)$	1435	1424	0.8
	$\nu_2(\text{A}_1)$	715	706	1.3
	$\nu_4(\text{A}_1)$	297	286	3.8
	$\nu_6(\text{B}_1)$	3077	3048	1.0
	$\nu_7(\text{B}_1)$	899	898	0.1
CH_2Br_2	$\nu_1(\text{A}_1)$	2999	2988	0.4
	$\nu_3(\text{A}_1)$	1409	1385	1.7
	$\nu_2(\text{A}_1)$	576	579	-0.5
	$\nu_4(\text{A}_1)$	173	174	-0.6
	$\nu_6(\text{B}_1)$	3076	3065	0.3
	$\nu_7(\text{B}_1)$	810	813	-0.4

Table 4. (contd.)

Molecule	γ_i	Calc.	Obs.	$\Delta\%$
CH ₂ BrCl	$\gamma_1(A')$	2999	2987	0.4
	$\gamma_3(A')$	1421	1402	1.3
	$\gamma_8(A')$	1245	1225	1.6
	$\gamma_9(A')$	723	728	-0.7
	$\gamma_2(A')$	599	606	-1.11
	$\gamma_4(A')$	303	226	34.1
	$\gamma_6(A'')$	3077	3060	0.6
	$\gamma_5(A'')$	1140	1130	0.9
	$\gamma_7(A'')$	847	852	0.6
CH ₂ ClF	$\gamma_1(A')$	3005	2993	0.4
	$\gamma_3(A')$	1543	1470	5.0
	$\gamma_8(A')$	1425	1351	5.5
	$\gamma_9(A')$	954	1068	-10.7
	$\gamma_2(A')$	749	760	-1.4
	$\gamma_4(A')$	388	385	0.8
	$\gamma_6(A'')$	3080	3048	1.1
	$\gamma_5(A'')$	1281	1234	3.6
	$\gamma_7(A'')$	989	1004	-1.5

The relationships between the $\frac{\partial \mu}{\partial s}$ and bond moment parameters were obtained by considering the geometry of the molecule.

Table 5. Dipole Moment Change Transformation
Coefficients for CH_2X_2 A_1 Vibrations

	$\left(\frac{\partial \mu}{\partial r}\right)_{\text{CH}}$	$\left(\frac{\partial \mu}{\partial r}\right)_{\text{CX}}$	μ_{CH}	μ_{CX}
$\frac{\partial \mu}{\partial s_1}$	$\sqrt{2/3}$			
$\frac{\partial \mu}{\partial s_2}$		$\sqrt{2/3}$		
$\frac{\partial \mu}{\partial s_3}$			$\sqrt{1/3}$	$\sqrt{1/3}$
$\frac{\partial \mu}{\partial s_4}$			$\sqrt{1/3}$	$\sqrt{1/3}$

When a symmetry species such as the B_1 of CH_2X_2 contains a rotation, one must be careful that the condition of no resultant angular momentum be imposed upon the vibration, when obtaining the transformations from $\frac{\partial \mu}{\partial s_k}$ to bond moment parameters. The transformations then will be several simultaneous equations.

Table 6. Coefficients of the Equations for CH_2X_2 B_1 Vibrations

$$\left(\frac{\partial \mu}{\partial s_k}\right) = a \left(\frac{\partial \mu}{\partial r}\right)_{\text{CH}} + b \mu_{\text{CH}} + c \mu_{\text{CX}}$$

Molecule	$\left(\frac{\partial \mu}{\partial s_k}\right)$	$\left(\frac{\partial \mu}{\partial r}\right)_{\text{CH}}$	μ_{CH}	μ_{CX}
CH_2F_2	S_6	1.15	-0.0738×10^8	-0.0738×10^8
	S_7		-0.607	0.210
CH_2Cl_2	S_6	1.15	-0.0675×10^8	-0.0675×10^8
	S_7		-0.669	0.148
CH_2Br_2	S_6	1.15	-0.0662×10^8	-0.0662×10^8
	S_7		-0.686	0.131

The coefficients from Table 5 and Table 6 together with appropriate L matrix transformations were used in deriving equations relating the $\frac{\partial \mu}{\partial \varphi_i}$ to the bond moments and bond moment derivatives. The coefficients of these equations are presented in Table 7.

Table 7. Coefficients of the Equations

$$\frac{d\mu}{d\varphi_i} = a \left(\frac{d\mu}{dr} \right)_{cH} + b \left(\frac{d\mu}{dr} \right)_{cX} + c \mu_{cH} + d \mu_{cX}$$

		a	b	c	d
CH ₂ F ₂	1 (Q ₁)	0.84 x10 ¹²	-0.05 x10 ¹²	0.11 x10 ²⁰	-0.07 x10 ²⁰
	3 (Q ₄)	0.02 x10 ²⁰	0.02 x10 ²⁰	-1.21 x10 ¹²	0.04 x10 ¹²
	6 (Q ₆)	1.20 x10 ¹²	0	0.04 x10 ²⁰	-0.12 x10 ²⁰
CH ₂ Cl ₂	1 (Q ₁)	0.84 x10 ¹²	-0.05 x10 ¹²	0.11 x10 ²⁰	-0.05 x10 ²⁰
	3 (Q ₄)	0.02 x10 ²⁰	0.06 x10 ²⁰	-1.22 x10 ¹²	0.04 x10 ¹²
	6 (Q ₆)	1.21 x10 ¹²	0	0.03 x10 ²⁰	-0.09 x10 ²⁰
CH ₂ Br ₂	1 (Q ₁)	0.84 x10 ¹²	-0.05 x10 ¹²	0.11 x10 ²⁰	-0.04 x10 ²⁰
	3 (Q ₄)	0.02 x10 ²⁰	0.05 x10 ²⁰	-1.22 x10 ¹²	0.06 x10 ¹²
	6 (Q ₆)	1.21 x10 ¹²	0	0.03 x10 ²⁰	-0.09 x10 ²⁰

If the assumption is made that the bond dipole moment does not change when the bond angles are deformed and also that the molecular dipole moment is the vector sum of the bond dipole moments, then it is possible to solve the equations of Table 7 and

$$\mu_T = \mu_{CH} + \mu_{CX} \quad (38)$$

simultaneously for the bond moment parameters. The motion of halogen atoms is too slight in these vibrations to obtain $\left(\frac{d\mu}{dr}\right)_{CX}$ with significance. The results are summarized in Table 8 together with the values of the molecular dipole moments⁴¹. The values of $\left(\frac{d\mu}{dr}\right)_{CX}$ were

Table 8. Bond Polar Properties (in e.s.u.)

	CH ₂ F ₂	CH ₂ Cl ₂	CH ₂ Br ₂
$\mu_{CX} \times 10^{-10}$	± 1.66 to 1.55	± 1.39 to 1.25	± 1.26 to 1.23
$\mu_{CH} \times 10^{-10}$	± 0.01 to 0.12	± 0.06 to 0.15	± 0.04 to 0.13
$\left(\frac{d\mu}{dr}\right)_{CH} \times 10^{-10}$	0.84 to 0.34	0.40 to 0.11	0.16 to 0.02
$\mu_T \times 10^{-10}$	1.93	1.62	1.5
$\mu_{CX} \times 10^{-10}$ (assumed)	1.5	1.3	1.2
$\mu_{CH} \times 10^{-10}$ (assumed)	-0.1	-0.1	-0.1

calculated using the assumed values of μ_{CX} and μ_{CH} .

CONCLUSIONS

The infrared intensities and bond polar properties of the methylene halides show the pronounced effect of the different halogens on the effective charge ($\frac{\partial \mu}{\partial r}$) of the C-H bonds. The effect on the μ_{CH} is apparently rather uniform. The μ_{CH} of the methylene halide molecules, however, is smaller than in most other carbon-hydrogen compounds.

The observation and intensity study of the CH_2F_2 ν_3 band confirms the assignment of this band, previously detected only in the Raman effect.

The great difference in the intensities of the ν_1 and ν_6 bands in solution compared to their intensities in vapor phase indicates strong solvent perturbations and suggest that one should be extremely cautious when attempting to interpret solution intensity data in terms of polar parameters of the isolated molecule.

LITERATURE CITED

1. J. Vincent, *J. phys. radium* 11, 1 (1950).
2. D. Z. Robinson, Ohio State Symposium on Molecular Structure and Spectroscopy, June 1951.
3. D. M. Dennison, Ohio State Symposium on Molecular Structure and Spectroscopy, June 1954.
4. C. A. Coulson, *Trans. Faraday Soc.* 38, 433 (1942).
5. W. L. G. Gent, *Quart. Rev.* 2, 383 (1948).
6. A. D. Walsh, *Disc. Faraday Soc.* 2, 18 (1947).
7. E. B. Wilson, Jr. and A. J. Wells, *J. Chem. Phys.* 14, 578 (1946).
8. A. M. Thorndike, A. J. Wells and E. B. Wilson, Jr., *J. Chem. Phys.* 15, 157 (1947).
9. A. M. Thorndike, *J. Chem. Phys.* 15, 868 (1947).
10. R. Rollefson and R. Havens, *Phys. Rev.* 48, 779 (1935).
11. R. P. Bell, H. W. Thompson and E. E. Vago, *Proc. Roy. Soc. (London)* A 192, 498 (1948).
12. A. R. H. Cole and H. W. Thompson, *Trans. Faraday Soc.* 46, 103 (1950).
13. S. A. Francis, *J. Chem. Phys.* 18, 861 (1950).
14. H. J. Calloman, D. C. McKean and H. W. Thompson, *Proc. Roy. Soc. (London)* A 208, 341 (1951).
15. Lloyd Van Alten, Ph. D. Thesis, Univ. of Wash. 1954 (Original not consulted; abstracted in *Dissertation Abstracts* 14, 770 (1954)).
16. E. C. Wingfield and J. W. Straley, *J. Chem. Phys.* 23, 731 (1955).
17. G. E. Hyde and D. F. Hornig, *J. Chem. Phys.* 20, 647 (1952).
18. G. M. Barrow and D. C. McKean, *Proc. Roy. Soc. (London)* A 213, 27 (1952).
19. I. M. Mills and H. W. Thompson, *Proc. Roy. Soc. (London)* A 228, 287 (1955).
20. I. C. Hisatsune and D. F. Eggers, *J. Chem. Phys.* 23, 487 (1955).
21. M. St. Flett, *J. phys. radium* 15, 388 (1954).

22. E. B. Wilson, J. C. Decius and P. C. Cross, Molecular Vibrations, McGraw-Hill Book Co., Inc., New York, 1955.
23. D. C. Bourgin, Phys. Rev. 29, 794 (1927).
24. L. Pauling and E. B. Wilson, Introduction to Quantum Mechanics, McGraw-Hill Book Co., Inc., New York, 1935. Section 40.
25. E. B. Wilson, Jr., J. Chem. Phys. 1, 1047 (1939).
26. M. Eliashevich, Compt. rend. acad. sci. U. R. S. S. 28, 605 (1940).
27. H. Eyring, J. Walter and G. E. Kimball, Quantum Chemistry, John Wiley and Sons, Inc., New York, 1949.
28. G. Herzberg, Infrared and Raman Spectra of Polyatomic Molecules, D. Van Nostrand Co., New York, 1945.
29. B. L. Crawford and W. Fletcher, J. Chem. Phys. 19, 141 (1951).
30. E. K. Plyler, W. H. Smith and N. Aquista, J. Research Nat. Bur. Standards 44, 503 (1950).
31. E. K. Plyler and W. S. Benedict, J. Research Nat. Bur. Standards 47, 202 (1951).
32. D. A. Ramsay, J. Am. Chem. Soc. 74, 72 (1952).
33. J. U. White, J. Opt. Soc. Am. 32, 285 (1942).
34. H. J. Bernstein and G. Herzberg, J. Chem. Phys. 16, 30 (1948).
35. R. G. Pilston and J. U. White, J. Opt. Soc. Am. 44, 572 (1954).
36. H. B. Stewart and H. H. Nielsen, Phys. Rev. 75, 640 (1949).
37. J. C. Decius, J. Chem. Phys. 16, 214 (1948).
38. E. L. Pace, J. Chem. Phys. 18, 881 (1950).
39. R. A. Frazer, W. J. Duncan and A. R. Collar, Elementary Matrices, Cambridge University Press, Cambridge, 1952. Page 142.
40. A. C. Aitken, Proc. Roy. Soc. Edinburgh 57, 269 (1937).
41. P. Kisliuk and C. H. Townes, Molecular Microwave Spectra Tables, National Bureau of Standards Circular 518 (1952).

ACKNOWLEDGEMENTS

The author is deeply grateful to Dr. Harrison Shull for the patient guidance and encouragement during the author's course of graduate study. The association has been a great source of intellectual stimulation to the author.

Thanks are due to Dr. George S. Hammond for his encouragement and advice given during the preparation of this thesis.

APPENDIX

The several matrices used in the normal coordinate calculations and the calculated normal coordinate transformation matrices are tabulated in this appendix. Included here are the general symmetry coordinates, G (kinetic energy) matrix and F (force constant) matrix elements for CH_2X_2 (A_1 and B_1 symmetries) and CH_2XY molecules.

Table 23 contains the values of the force constants that were used in the calculations.

The calculated normal coordinate transformation matrices for CH_2F_2 , CH_2Cl_2 and CH_2Br_2 are contained in Table 24, and those for CH_2ClF and CH_2BrCl are contained in Table 25.

Table 9. CH_2X_2 Internal Coordinates

R_1	=	$\Delta(\text{C-X}_1)$	a_1	=	$\Delta(\text{X}_1\text{-C-H}_1)$
r_1	=	$\Delta(\text{C-r}_1)$	a_2	=	$\Delta(\text{X}_1\text{-C-H}_2)$
β	=	$\Delta(\text{X-C-X})$	a_3	=	$\Delta(\text{X}_2\text{-C-H}_2)$
γ	=	$\Delta(\text{H-C-H})$	a_4	=	$\Delta(\text{X}_2\text{-C-H}_1)$

Table 10. CH_2X_2 Symmetry Coordinates

A_1 Species

U	R_1	R_2	r_1	r_2	a_1	a_2	a_3	a_4	β_1	γ
S_1	0	0	$1/\sqrt{2}$	$1/\sqrt{2}$	0	0	0	0	0	0
S_2	$1/\sqrt{2}$	$1/\sqrt{2}$	0	0	0	0	0	0	0	0
S_3	0	0	0	0	0	0	0	0	$1/\sqrt{2}$	$-1/\sqrt{2}$
S_4	0	0	0	0	$-1/\sqrt{12}$	$-1/\sqrt{12}$	$-1/\sqrt{12}$	$-1/\sqrt{12}$	$2/\sqrt{12}$	$2/\sqrt{12}$
S_5	0	0	0	0	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$

Table 11. CH_2X_2 Symmetry Coordinates

B_1 Species

U	R_1	R_2	r_1	r_2	a_1	a_2	a_3	a_4	β_1	γ
S_6	0	0	$1/\sqrt{2}$	$-1/\sqrt{2}$	0	0	0	0	0	0
S_7	0	0	0	0	$1/2$	$-1/2$	$-1/2$	$1/2$	0	0

Table 12. CH₂XY Internal Coordinates

R_x	=	$\Delta(C-X)$	α_{x1}	=	$\Delta(X-C-H_1)$
R_y	=	$\Delta(C-Y)$	α_{r1}	=	$\Delta(Y-C-H_1)$
r_1	=	$\Delta(C-H_1)$	β	=	$\Delta(X-C-Y)$
		γ	=	$\Delta(H-C-H)$	

Table 13. CH₂XY Symmetry Coordinates
A' Species

U	R_x	R_y	r_1	r_2	α_{x1}	α_{x2}	α_{r1}	α_{r2}	β	γ
S_1	1	*								
S_2		1								
S_3			$1/\sqrt{2}$	$1/\sqrt{2}$						
S_4					$-1/\sqrt{6}$	$-1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$-1/\sqrt{6}$	$1/\sqrt{6}$
S_5							$1/\sqrt{6}$	$1/\sqrt{6}$		$-2/\sqrt{6}$
S_6					$1/\sqrt{6}$	$1/\sqrt{6}$			$-2/\sqrt{6}$	
S'	^a				$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$	$1/\sqrt{6}$

* Blank spaces in U matrices are 0.

^a $S' \equiv 0$. (redundant coordinate)

Table 14. CH₂XY Symmetry Coordinates
A'' Species

U	R_x	R_y	r_1	r_2	α_{x1}	α_{x2}	α_{r1}	α_{r2}	β	γ
S_7	*						$1/\sqrt{2}$	$-1/\sqrt{2}$		
S_8			$1/\sqrt{2}$	$-1/\sqrt{2}$						
S_9					$1/\sqrt{2}$	$-1/\sqrt{2}$				

* Blank spaces in U matrices are 0.

Table 15. G Matrix Elements of CH_2X_2

A_1 Species

$$G_{11} = \frac{1}{m_H} + \frac{2}{3m_C}$$

$$G_{12} = \frac{-2}{3m_C}$$

$$G_{13} = \frac{-2\sqrt{2}}{3m_C} \left(\frac{1}{d} + \frac{1}{D} \right)$$

$$G_{14} = \frac{-2\sqrt{2}}{3m_C} \left(\frac{1}{d} - \frac{1}{D} \right)$$

$$G_{22} = \frac{1}{m_X} + \frac{2}{3m_C}$$

$$G_{23} = \frac{2\sqrt{2}}{3m_C} \left(\frac{1}{d} + \frac{1}{D} \right)$$

$$G_{24} = \frac{2\sqrt{2}}{3m_C} \left(\frac{1}{d} - \frac{1}{D} \right)$$

$$G_{33} = \frac{1}{d^2 m_H} + \frac{1}{D^2 m_X} + \frac{4}{3m_C} \left(\frac{1}{d} - \frac{1}{D} \right)^2$$

$$G_{34} = \frac{\sqrt{6}}{2} \left(\frac{1}{d^2 m_H} - \frac{1}{D^2 m_X} \right) - \frac{2\sqrt{6}}{3m_C} \left(\frac{1}{d^2} - \frac{1}{D^2} \right)$$

$$G_{35} = \frac{3}{2} \left(\frac{1}{d^2 m_H} + \frac{1}{D^2 m_X} \right) + \frac{2}{m_C} \left(\frac{1}{d} - \frac{1}{D} \right)^2$$

Table 16. G Matrix Elements of CH_2X_2

B_1 Species

$$G_{66} = \frac{1}{m_H} + \frac{4}{3m_C}$$

$$G_{67} = \frac{-2}{3m_C} \left(\frac{3}{D_x} + \frac{1}{d} \right)$$

$$G_{77} = \frac{1}{2m_H d^2} + \frac{3}{2m_C D_x^2} + \frac{1}{3m_C} \left(\frac{3}{D_x} + \frac{1}{d} \right)^2$$

Table 17. G Matrix Elements of CH₂XY (m_x > m_y)

A' Species

$$G_{11} = \frac{1}{m_x} + \frac{1}{m_c}$$

$$G_{12} = \frac{-1}{3m_c}$$

$$G_{13} = G_{23} = -\frac{2}{3m_c}$$

$$G_{14} = \frac{4\sqrt{3}}{9m_c} \left(\frac{1}{D_y} + \frac{2}{d} \right)$$

$$G_{15} = \frac{2\sqrt{3}}{9m_c} \left(\frac{1}{D_y} - \frac{1}{d} \right)$$

$$G_{16} = \frac{4\sqrt{3}}{9m_c} \left(\frac{1}{D_y} - \frac{1}{d} \right)$$

$$G_{22} = \frac{1}{m_y} + \frac{1}{m_c}$$

$$G_{24} = \frac{-4\sqrt{3}}{9} \frac{1}{dm_c}$$

$$G_{25} = \frac{-8\sqrt{3}}{9} \frac{1}{dm_c}$$

$$G_{26} = \frac{2\sqrt{3}}{9} \frac{1}{m_c} \left(\frac{1}{d} + \frac{3}{D_x} \right)$$

$$G_{33} = \frac{1}{m_H} + \frac{2}{3m_c}$$

$$G_{34} = -\frac{2\sqrt{6}}{9} \frac{1}{m_c} \left(\frac{1}{d} + \frac{1}{D_y} \right)$$

$$G_{35} = \frac{-\sqrt{6}}{9} \frac{1}{m_c} \left(\frac{1}{D_y} - \frac{5}{d} \right)$$

$$G_{36} = \frac{-\sqrt{6}}{9} \frac{1}{m_c} \left(\frac{2}{D_y} + \frac{3}{D_x} - \frac{1}{d} \right)$$

$$G_{44} = \frac{4}{3d^2 m_H} + \frac{2}{3 D_y m_y} + \frac{2}{9m_c} \left(\frac{11}{d^2} + \frac{3}{D_y} - \frac{10}{d D_y} \right)$$

Table 17. (contd.)

$$G_{45} = -\frac{1}{3d^2 m_H} + \frac{1}{3D_y^2 m_y} - \frac{1}{9m_c} \left(\frac{1}{d} - \frac{3}{D_y} + \frac{2}{dD_y} \right)$$

$$G_{46} = -\frac{2}{3d^2 m_H} + \frac{2}{3D_y^2 m_y} - \frac{1}{9m_c} \left(\frac{11}{d^2} - \frac{6}{D_y^2} - \frac{5}{dD_y} \right) - \frac{1}{9m_c} \left(\frac{3}{dD_x} - \frac{3}{D_y D_x} \right)$$

$$G_{55} = \frac{7}{3d^2 m_H} + \frac{1}{6D_y^2 m_y} + \frac{1}{18m_c} \left(\frac{59}{d^2} + \frac{3}{D_y^2} - \frac{14}{dD_y} \right)$$

$$G_{56} = \frac{1}{6d^2 m_H} + \frac{1}{3D_y^2 m_y} + \frac{1}{18m_c} \left(\frac{1}{d^2} + \frac{6}{D_y^2} - \frac{19}{dD_y} \right) + \frac{1}{18m_c} \left(\frac{3}{D_x D_y} - \frac{39}{dD_x} \right)$$

$$G_{66} = \frac{1}{3d^2 m_H} + \frac{2}{3D_y^2 m_y} + \frac{3}{2D_x^2 m_x} + \frac{1}{18m_c} \left(\frac{11}{d^2} + \frac{27}{D_x^2} \right) + \frac{1}{18m_c} \left(\frac{12}{D_y^2} + \frac{6}{dD_x} + \frac{12}{D_x D_y} - \frac{20}{dD_y} \right)$$

Table 18. G Matrix Elements of CH₂XY

Aⁿ Species

$$G_{77} = \frac{1}{d^2 m_H} + \frac{3}{2D_c^2 m_x} + \frac{1}{6m_c} \left(\frac{1}{d} + \frac{3}{D_c} \right)^2$$

$$G_{78} = -\frac{\sqrt{2}}{3m_c} \left(\frac{1}{d} + \frac{3}{D_c} \right)$$

$$G_{79} = -\frac{1}{2d^2 m} + \left(\frac{1}{d} + \frac{3}{D_y} \right) \left(\frac{1}{d} + \frac{3}{D_c} \right) \frac{1}{6m_c}$$

$$G_{88} = \frac{1}{m_H} + \frac{4}{3m_c}$$

$$G_{89} = -\frac{\sqrt{2}}{3m_c} \left(\frac{1}{d} + \frac{3}{D_y} \right)$$

$$G_{99} = \frac{1}{d^2 m} + \frac{3}{2D_y^2 m_y} + \frac{1}{6m_c} \left(\frac{1}{d} + \frac{3}{D_y} \right)^2$$

Table 19. F Matrix Elements of CH₂X₂

A₁ Species

$$F_{11} = f_r^1$$

$$F_{12} = F_{13} = F_{14} = 0$$

$$F_{22} = f_R^1 + f_R^2$$

$$F_{23} = f_{R\beta}^1 - f_{R\gamma}^1$$

$$F_{24} = \frac{-2}{\sqrt{6}} (f_{Ra}^1 + f_{Ra}^2) + \frac{2}{\sqrt{6}} (f_{R\beta}^1 + f_{R\gamma}^1)$$

$$F_{33} = f_\beta^1 + f_\gamma^1$$

$$F_{34} = \frac{-2}{\sqrt{6}} (f_{\beta\alpha}^1 - f_{\alpha\gamma}^1) + \frac{1}{\sqrt{6}} (f_\beta^1 - f_\gamma^1)$$

$$F_{44} = \frac{1}{3} (f_a^1 + f_a^2 + f_a^3 + f_a^4) - \frac{4}{3} (f_{\beta\alpha}^1 + f_{\gamma\alpha}^1) + \frac{1}{3} (f_\beta^1 + f_\gamma^1)$$

Table 20. F Matrix Elements of CH₂X₂

B₁ Species

$$F_{66} = f_r^1$$

$$F_{67} = 0$$

$$F_{77} = (f_a^1 + f_a^2) - (f_a^3 + f_a^4)$$

Table 21. F Matrix Elements of CH₂XY

A⁺ Species
m_X > m_Y

$$F_{11} = f_{R_x}^1$$

$$F_{12} = f_{R_{xy}}^2$$

$$F_{13} = F_{23} = F_{24} = F_{35} = F_{36} = 0$$

$$F_{15} = \frac{\sqrt{6}}{3} f_{R_x\alpha_y}^2$$

$$F_{16} = \frac{\sqrt{6}}{3} f_{R_x\alpha_x}^1$$

$$F_{22} = f_{R_y}^1$$

$$F_{24} = \frac{1}{\sqrt{6}} (2f_{R_y\alpha_y}^1 - f_{R_y\beta}^1 - 2f_{R_y\alpha_x}^2)$$

$$F_{25} = \frac{\sqrt{6}}{3} f_{R_y\alpha_y}^1$$

$$F_{26} = \frac{\sqrt{6}}{3} (f_{R_y\alpha_x}^2 - f_{R_y\beta}^1)$$

$$F_{33} = f_r^1$$

$$F_{44} = \frac{1}{6} (2f_{\alpha_y}^1 + 2f_{\alpha_x}^3 + f_{\gamma}^1 - 4f_{\alpha_x}^2 - 4f_{\alpha}^4 + 2f_{\alpha_x}^1 + 2f_{\alpha_x}^3 + f_{\beta}^1)$$

$$F_{45} = \frac{1}{3} (f_{\alpha_y}^2 - f_{\alpha}^2 - f_{\gamma}^1 + f_{\alpha_y}^3 - f_{\alpha_y}^1 - f_{\alpha}^4 + 2f_{\alpha_x\gamma}^1)$$

$$F_{46} = \frac{1}{3} (f_{\alpha}^2 + f_{\alpha}^4 - f_{\alpha_y}^1 - f_{\alpha_x}^3 + f_{\beta}^1)$$

Table 21. (contd.)

$$F_{55} = \frac{1}{3} (f_{\alpha}^1 + 2f_{\gamma}^1 + f_{\alpha}^3)$$

$$F_{56} = \frac{1}{3} (f_{\alpha}^2 + f_{\alpha}^4)$$

$$F_{66} = \frac{1}{3} (f_{\alpha}^1 + f_{\alpha}^3 + 2f_{\beta}^1)$$

Table 22. F Matrix Elements of CH₂XY

Aⁿ Species
m_X > m_Y

$$F_{77} = f_{\alpha}^1 - f_{\alpha}^4$$

$$F_{78} = F_{89} = 0$$

$$F_{79} = f_{\alpha}^2 - f_{\alpha}^4$$

$$F_{88} = f_r^1$$

$$F_{99} = f_{\alpha}^1 - f_{\alpha}^3$$

Table 23. Force Constants

The following constants are assumed to be zero: $f_{Rr}^1, f_{R\gamma}^1, f_r^2,$
 $f_{ra}^1, f_{ra}^2, f_{r\beta}^1, f_{r\gamma}^1, f_{r\gamma}^2, f_{\alpha\beta}^1, f_{\alpha\beta}^2, f_{\beta\gamma}^2, f_{\gamma}^2,$ and $f_{\gamma}^3.$

The numerical units are 10^5 dyne cm^{-1} for two stretching coordinates, 10^3 dyne for bending and stretching, and 10^{-11} dyne cm for two bending coordinates.

$r_0\text{C-F} = 1.35 \text{ \AA}, r_0\text{C-Cl} = 1.75 \text{ \AA}, r_0\text{C-Br} = 1.88 \text{ \AA},$ all $\alpha_0 = \beta_0 = \gamma_0 = 109^\circ 28'.$

Constant	Terms involved	X=F	X=Cl	X=Br	X=F (Pace)
f_R^1	C-X _j : C-X _j	6.26	3.383	2.840	6.246
f_R^2	C-X _j : C-X _k	0.96	0.332	0.186	0.967
f_r^1	C-H ₁ : C-H ₁	5.04	5.04	5.04	5.04
f_{Ra}^1	C-X _j : H-C-X _j	0.40	0.340	0.305	0.659
f_{Ra}^2	C-X _j : H-C-X _k	-.21	-.164	-.152	0.000
$f_{R\beta}^1$	C-X _j : X _j -C-X _k	0.34	0.338	0.342	0.644
$f_{R\beta}^2$	C-X _j : X _k -C-X _l	-.34	-.249	-.190	0.00
f_{α}^1	H _j -C-X _j : H _j -C-X _j	0.875	0.687	0.589	0.952
f_{α}^2	H _j -C-X _j : H _j -C-X _k	0.050	0.009	-.005	0.179

Table 23. (contd.)

Constant	Terms involved	X=F	X=Cl	X=Br	X=F (Pace)
f_{α}^3	$H_j-C-X_j : H_k-C-X_j$	-0.048	-0.034	-0.026	-0.004
f_{α}^4	$H_j-C-X_j : H_k-C-X_k$	-0.145	-0.065	-0.060	-0.114
f_{β}^1	$X_j-C-X_k : X_j-C-X_l$	1.75	1.236	1.061	2.143
f_{β}^2	$X_j-C-X_k : X_j-C-X_l$	0.17	0.092	0.134	0.478
f_{β}^3	$X_j-C-X_k : X_l-C-X_m$	-0.10	-0.037	0.039	0.111
f_{γ}^1	$H_j-C-H_k : H_j-C-H_l$	0.530	0.530	0.530	0.530
$f_{R\gamma}^2$	C-X : H-C-H				-0.145
$f_{\alpha\gamma}^1$	H-C-X : H-C-H				0.017
$f_{\beta\alpha}^1$	$X_j-C-X_k : H-C-X_k$				0.304
		X=Cl ; Y=F		X=Br ; Y=Cl	
f_R^2	C-X : C-Y	0.565		0.2485	
f_{β}^1	X-C-Y : X-C-Y	1.471		1.145	
f_{α}^2	$H_j-C-X : H_j-C-Y$	0.21		0.002	
$f_R^2 \alpha$	C-X : H-C-Y	-0.186		-0.157	(= $f_R^2 \alpha$)
$f_R^1 \beta$	C-X : X-C-Y	0.339		0.340	(= $f_R^1 \beta$)
f_{α}^4	$H_j-C-X : H_l-C-Y$	-0.0861		-0.062	

Table 24. Normal Coordinate Transformations

L and L⁻¹ (in units of g^{-1/2})



L (A ₁)	Q ₁	Q ₂	Q ₃	Q ₄
S ₁	1.023 x10 ¹²	0.03035 x10 ¹²	-0.002927 x10 ²⁰	0.01986 x10 ²⁰
S ₂	-0.06399 x10 ¹²	0.3165 x10 ¹²	0.05702 x10 ²⁰	0.02489 x10 ²⁰
S ₃	0.1566 x10 ²⁰	-0.3213 x10 ²⁰	0.1213 x10 ¹²	-1.010 x10 ¹²
S ₄	-0.03337 x10 ²⁰	-0.1009 x10 ²⁰	0.3459 x10 ¹²	1.079 x10 ¹²

L ⁻¹ (A ₁)	S ₁	S ₂	S ₃	S ₄
Q ₁	0.9697 x10 ⁻¹²	-0.06272 x10 ⁻¹²	0.02720 x10 ⁻²⁰	0.009039 x10 ⁻²⁰
Q ₂	0.20440 x10 ⁻¹²	2.729 x10 ⁻¹²	-0.2970 x10 ⁻²⁰	-0.3451 x10 ⁻²⁰
Q ₃	-0.08186 x10 ⁻²⁰	2.561 x10 ⁻²⁰	1.962 x10 ⁻¹²	1.780 x10 ⁻¹²
Q ₄	0.07521 x10 ⁻²⁰	-0.5699 x10 ⁻²⁰	-0.6560 x10 ⁻¹²	0.3243 x10 ⁻¹²

L (B ₁)	Q ₆	Q ₇
S ₆	1.046 x10 ¹²	0.03841 x10 ¹²
S ₇	-0.1959 x10 ²⁰	0.8325 x10 ²⁰

L ⁻¹ (B ₁)	S ₆	S ₇
Q ₆	0.9480 x10 ⁻¹²	-0.04400 x10 ⁻²⁰
Q ₇	-0.2217 x10 ⁻¹²	1.191 x10 ⁻²⁰

Table 24. (contd.)

CH₂Cl₂

L (A ₁)	Q ₁	Q ₂	Q ₃	Q ₄
S ₁	1.023 x10 ¹²	-0.01182 x10 ¹²	-0.0002753 x10 ²⁰	0.02131 x10 ²⁰
S ₂	-0.05879 x10 ¹²	0.2724 x10 ¹²	0.03898 x10 ²⁰	0.06778 x10 ²⁰
S ₃	0.1371 x10 ²⁰	-0.1680 x10 ²⁰	0.1418 x10 ¹²	-1.009 x10 ¹²
S ₄	-0.05314 x10 ²⁰	-0.1839 x10 ²⁰	0.1285 x10 ¹²	1.107 x10 ¹²

L ⁻¹ (A ₁)	S ₁	S ₂	S ₃	S ₄
Q ₁	0.9730 x10 ⁻¹²	-0.03325 x10 ⁻¹²	0.01620 x10 ⁻²⁰	-0.00191 x10 ⁻²⁰
Q ₂	0.1976 x10 ⁻¹²	3.088 x10 ⁻¹²	-0.3625 x10 ⁻²⁰	-0.5214 x10 ⁻²⁰
Q ₃	-0.02670 x10 ⁻²⁰	4.034 x10 ⁻²⁰	3.374 x10 ⁻¹²	2.832 x10 ⁻¹²
Q ₄	0.08854 x10 ⁻²⁰	0.04714 x10 ⁻²⁰	-0.4526 x10 ⁻¹²	0.4868 x10 ⁻¹²

L (B ₁)	Q ₆	Q ₇
S ₆	1.050 x10 ¹²	0.01770 x10 ¹²
S ₇	-0.1513 x10 ²⁰	0.7748 x10 ²⁰

L ⁻¹ (B ₁)	S ₆	S ₇
Q ₆	0.9491 x10 ⁻¹²	0.02958 x10 ⁻²⁰
Q ₇	-0.1368 x10 ⁻¹²	1.295 x10 ⁻²⁰

Table 24. (contd.)

CH₂Br₂

L (A ₁)	Q ₁	Q ₂	Q ₃	Q ₄
S ₁	1.023 x10 ¹²	0.008207 x10 ¹²	-0.0002823 x10 ²⁰	0.02030 x10 ²⁰
S ₂	-0.05752 x10 ¹²	0.2444 x10 ¹²	0.02420 x10 ²⁰	0.06673 x10 ²⁰
S ₃	0.1323 x10 ²⁰	-0.1656 x10 ²⁰	0.08712 x10 ¹²	-1.005 x10 ¹²
S ₄	-0.05656 x10 ²⁰	-0.1721 x10 ²⁰	0.08192 x10 ¹²	1.107 x10 ¹²

L ⁻¹ (A ₁)	S ₁	S ₂	S ₃	S ₄
Q ₁	0.9736 x10 ⁻¹²	-0.02596 x10 ⁻¹²	0.01384 x10 ⁻²⁰	-0.003697 x10 ⁻²⁰
Q ₂	0.2119 x10 ⁻¹²	3.363 x10 ⁻¹²	-0.4378 x10 ⁻²⁰	-0.6045 x10 ⁻²⁰
Q ₃	-0.08071 x10 ⁻²⁰	6.563 x10 ⁻²⁰	5.408 x10 ⁻¹²	4.518 x10 ⁻¹²
Q ₄	0.08766 x10 ⁻²⁰	0.02489 x10 ⁻²⁰	-0.4599 x10 ⁻¹²	0.4827 x10 ⁻¹²

L (B ₁)	Q ₆	Q ₇
S ₆	1.050 x10 ¹²	0.01369 x10 ¹²
S ₇	-0.1426 x10 ²⁰	0.7584 x10 ²⁰

L ⁻¹ (B ₁)	S ₆	S ₇
Q ₆	0.9499 x10 ⁻¹²	-0.01715 x10 ⁻²⁰
Q ₇	0.1787 x10 ⁻¹²	1.315 x10 ⁻²⁰

Table 25. Normal Coordinate Transformations

L and L⁻¹ (in units of g^{-1/2})

CH₂XY

CH₂ClF

L (A')	Q ₁	Q ₂	Q ₃
S ₁	0.3197 x10 ¹²	-0.02031 x10 ¹²	-0.04296 x10 ¹²
S ₂	-0.1128 x10 ¹²	0.3027 x10 ¹²	-0.04820 x10 ¹²
S ₃	0.008181 x10 ¹²	0.01338 x10 ¹²	1.022 x10 ¹²
S ₄	0.2972 x10 ²⁰	-0.6000 x10 ²⁰	-0.1030 x10 ²⁰
S ₅	0.09565 x10 ²⁰	0.08037 x10 ²⁰	0.1223 x10 ²⁰
S ₆	0.08235 x10 ²⁰	0.4801 x10 ²⁰	-0.04762 x10 ²⁰

L (A')	Q ₄	Q ₅	Q ₆
S ₁	0.02178 x10 ²⁰	-0.05824 x10 ²⁰	-0.05704 x10 ²⁰
S ₂	0.04142 x10 ²⁰	-0.1599 x10 ²⁰	-0.03518 x10 ²⁰
S ₃	0.003739 x10 ²⁰	-0.04157 x10 ²⁰	0.001219 x10 ²⁰
S ₄	0.5822 x10 ¹²	-0.7682 x10 ¹²	0.1135 x10 ¹²
S ₅	1.008 x10 ¹²	1.099 x10 ¹²	-0.001602 x10 ¹²
S ₆	-0.2588 x10 ¹²	0.2045 x10 ¹²	0.1933 x10 ¹²

Table 25. (contd.)

CH₂ClF

L ⁻¹ (A')	S ₁	S ₂	S ₃
Q ₁	2.654 x10 ⁻¹²	-0.5287 x10 ⁻¹²	0.1247 x10 ⁻¹²
Q ₂	0.6459 x10 ⁻¹²	2.051 x10 ⁻¹²	0.1259 x10 ⁻¹²
Q ₃	-0.02808 x10 ⁻¹²	-0.07332 x10 ⁻¹²	0.9690 x10 ⁻¹²
Q ₄	-0.2489 x10 ⁻²⁰	1.112 x10 ⁻²⁰	0.01575 x10 ⁻²⁰
Q ₅	-0.09831 x10 ⁻²⁰	-1.147 x10 ⁻²⁰	-0.1494 x10 ⁻²⁰
Q ₆	-2.941 x10 ⁻²⁰	-2.029 x10 ⁻²⁰	0.06939 x10 ⁻²⁰

L ⁻¹ (A')	S ₄	S ₅	S ₆
Q ₁	0.1282 x10 ⁻²⁰	0.02865 x10 ⁻²⁰	0.6084 x10 ⁻²⁰
Q ₂	-0.1254 x10 ⁻²⁰	0.1233 x10 ⁻²⁰	0.6364 x10 ⁻²⁰
Q ₃	-0.02385 x10 ⁻²⁰	0.01055 x10 ⁻²⁰	-0.01359 x10 ⁻²⁰
Q ₄	0.5253 x10 ⁻¹²	0.6044 x10 ⁻¹²	-0.1698 x10 ⁻¹²
Q ₅	-0.4768 x10 ⁻¹²	0.3903 x10 ⁻¹²	0.05112 x10 ⁻¹²
Q ₆	1.523 x10 ⁻¹²	0.06030 x10 ⁻¹²	3.043 x10 ⁻¹²

Table 25. (contd.)

CH₂ClF

L (A ^u)	Q ₇	Q ₈	Q ₉
S ₇	0.7875 x10 ²⁰	-0.1058 x10 ¹²	-0.5556 x10 ²⁰
S ₈	0.02096 x10 ²⁰	1.050 x10 ¹²	0.01541 x10 ²⁰
S ₉	0.2749 x10 ²⁰	-0.1368 x10 ¹²	0.9571 x10 ²⁰

L ⁻¹ (A ^u)	S ₇	S ₈	S ₉
Q ₇	1.053 x10 ⁻²⁰	0.1853 x10 ⁻²⁰	0.6079 x10 ⁻²⁰
Q ₈	-0.01655 x10 ⁻¹²	0.9475 x10 ⁻¹²	-0.02485 x10 ⁻¹²
Q ₉	-0.3048 x10 ⁻²⁰	0.08229 x10 ⁻²⁰	0.8666 x10 ⁻²⁰

Table 25. (contd.)

CH₂BrCl

L (A')	Q ₁	Q ₂	Q ₃
S ₁	0.2366 x10 ¹²	-0.1637 x10 ¹²	-0.04047 x10 ¹²
S ₂	0.09534 x10 ¹²	0.2836 x10 ¹²	-0.04146 x10 ¹²
S ₃	0.01324 x10 ¹²	0.003963x10 ¹²	1.023 x10 ¹²
S ₄	0.2028 x10 ²⁰	-0.03931 x10 ²⁰	-0.07500 x10 ²⁰
S ₅	0.06406 x10 ²⁰	-0.01627 x10 ²⁰	0.1174 x10 ²⁰
S ₆	0.1749 x10 ²⁰	0.04836 x10 ²⁰	-0.03991 x10 ²⁰

L (A')	Q ₄	Q ₅	Q ₆
S ₁	0.07475 x10 ²⁰	-0.03857 x10 ²⁰	-0.05003 x10 ²⁰
S ₂	-0.1055 x10 ²⁰	-0.06263 x10 ²⁰	-0.01354 x10 ²⁰
S ₃	-0.001587 x10 ²⁰	-0.02115 x10 ²⁰	0.002937 x10 ²⁰
S ₄	1.064 x10 ¹²	-0.4387 x10 ¹²	0.05273 x10 ¹²
S ₅	0.3491 x10 ¹²	1.421 x10 ¹²	-0.01237 x10 ¹²
S ₆	-0.5380 x10 ¹²	0.1404 x10 ¹²	0.1649 x10 ¹²

Table 25. (contd.)

CH₂BrCl

L ⁻¹ (A')	S ₁	S ₂	S ₃
Q ₁	2.737 x10 ⁻¹²	1.565 x10 ⁻¹²	0.3161 x10 ⁻¹²
Q ₂	-1.215 x10 ⁻¹²	2.908 x10 ⁻¹²	0.06495 x10 ⁻¹²
Q ₃	0.01897 x10 ⁻¹²	-0.01932 x10 ⁻¹²	0.9738 x10 ⁻¹²
Q ₄	-0.4297 x10 ⁻²⁰	-0.01298 x10 ⁻²⁰	-0.008758 x10 ⁻²⁰
Q ₅	-0.07133 x10 ⁻²⁰	0.09364 x10 ⁻²⁰	-0.08957 x10 ⁻²⁰
Q ₆	-3.263 x10 ⁻²⁰	-2.520 x10 ⁻²⁰	0.2739 x10 ⁻²⁰

L ⁻¹ (A')	S ₄	S ₅	S ₆
Q ₁	0.2852 x10 ⁻²⁰	0.1970 x10 ⁻²⁰	0.7338 x10 ⁻²⁰
Q ₂	0.2160 x10 ⁻²⁰	0.2832 x10 ⁻²⁰	-0.2307 x10 ⁻²⁰
Q ₃	-0.006361 x10 ⁻²⁰	0.01075 x10 ⁻²⁰	-0.006677 x10 ⁻²⁰
Q ₄	0.7216 x10 ⁻¹²	0.2586 x10 ⁻¹²	-0.3207 x10 ⁻¹²
Q ₅	-0.1575 x10 ⁻¹²	0.6466 x10 ⁻¹²	0.09420 x10 ⁻¹²
Q ₆	1.764 x10 ⁻¹²	-0.09052 x10 ⁻¹²	3.826 x10 ⁻¹²

Table 25. (contd.)

CH₂BrCl

L (A ^{''})	Q ₇	Q ₈	Q ₉
S ₇	0.6502 x10 ²⁰	0.01516 x10 ¹²	0.4195 x10 ²⁰
S ₈	-0.09999 x10 ²⁰	1.050 x10 ¹²	-0.1083 x10 ²⁰
S ₉	-0.7002 x10 ²⁰	0.004791 x10 ¹²	0.8674 x10 ²⁰

L ⁻¹ (A ^{''})	S ₇	S ₈	S ₉
Q ₇	1.009 x10 ⁻²⁰	0.1806 x10 ⁻²⁰	0.8135 x10 ⁻²⁰
Q ₈	-0.01227 x10 ⁻¹²	0.9492 x10 ⁻¹²	-0.01515 x10 ⁻¹²
Q ₉	0.4895 x10 ⁻²⁰	0.03152 x10 ⁻²⁰	0.7577 x10 ⁻²⁰

DP

1 2 7 5 3

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600

UMI[®]

NOTE TO USERS

This reproduction is the best copy available.

UMI[®]

BELIEFS OF FACULTY CONCERNING FUNCTIONS AND QUALIFICATIONS
OF THE HOME ECONOMICS ADMINISTRATOR IN
LAND-GRANT INSTITUTIONS

by

Frances M. Hettler

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major Subject: Vocational Education

Approved:

Hester Chadderdan
In Charge of Major Work

Ray Bryan *By B. Morgan*
Head of Major Department

R M Hixon
Dean of Graduate College

Iowa State College

1953

UMI Number: DP12753

UMI[®]

UMI Microform DP12753

Copyright 2005 by ProQuest Information and Learning Company.

All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

LB2341
H47GD

TABLE OF CONTENTS

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	8
Functions and Principles of Administration.....	8
Administrative Problems Relating to Faculty.....	13
Personnel policies.....	13
Faculty development.....	20
Student Participation in Administration.....	27
Administration of Home Economics.....	33
Criteria for administrative organization and procedures.....	33
Responsibility for home and family life education.....	43
Organization of home economics admin- istrative units.....	47
Concerns of home economics administrators..	50
Qualifications of Administrators.....	52
METHOD OF PROCEDURE.....	55
Formulation of Statements of Functions and Qualifications.....	55
Development of the Questionnaire.....	58
Selection of Recipients for Questionnaire.....	61
Procurement of Responses.....	63
Collection and Treatment of Data.....	64
FINDINGS.....	68
Functions of the Home Economics Administrator... 68	68
Leadership functions.....	69
Functions concerning staff selection and orientation.....	86
Functions concerning staff responsibilities	95
Functions concerning staff growth and welfare.....	110
Functions concerning students and alumnae..	125
Functions concerning institutional activities.....	136
Functions concerning intra-institutional activities.....	149
Suggested additional functions.....	162

TABLE OF CONTENTS (CONTINUED)

	Page
Selection of Candidates for Administrative Units.....	163
Qualifications of Candidates.....	170
Personal.....	171
Social.....	176
Professional.....	180
Administrative.....	186
SUMMARY AND RECOMMENDATIONS.....	196
BIBLIOGRAPHY.....	216
ACKNOWLEDGMENTS.....	223
APPENDIX.....	224

LIST OF TABLES

	Page
1. Return of Questionnaires Concerning Proposed Functions and Qualifications of the Home Economics Administrator in Land-Grant Institutions by Administrators, Home Economics and Extension Staff Members.....	65
2. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Leadership.....	71
3. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Leadership.....	80
4. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Leadership.....	83
5. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Staff Selection and Orientation....	87
6. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Staff Selection and Orientation....	91
7. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Staff Selection and Orientation....	93
8. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Staff Responsibilities.....	96
9. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Staff Responsibilities.....	101
10. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Staff Responsibilities.....	106

LIST OF TABLES (CONTINUED)

	Page
11. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Staff Growth and Welfare.....	111
12. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Staff Growth and Welfare.....	118
13. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Staff Growth and Welfare.....	120
14. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Students and Alumnae.....	126
15. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Students and Alumnae.....	131
16. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Students and Alumnae.....	133
17. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning the Proposed Administrative Functions: Institutional Activities.....	137
18. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Institutional Activities.....	142
19. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Institutional Activities.....	144
20. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning Proposed Administrative Functions: Intra-institutional Activities....	150

LIST OF TABLES (CONTINUED)

	Page
21. Beliefs of Resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Intra-institutional Activities.....	155
22. Beliefs of Selected Groups of Administrators Concerning the Proposed Administrative Functions: Intra-institutional Activities.....	158
23. Selection of Candidates by Administrators, Resident and Extension Staff Members and Panel Members for Administrative Positions in Three Home Economics Units.....	167
24. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning Qualifications: Personal.....	172
25. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning Qualifications: Social.....	177
26. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning Qualifications: Professional.....	181
27. Beliefs of Administrators, Resident and Extension Staff Members and Panel Members Concerning Qualifications: Administrative.....	188

INTRODUCTION

Administration in institutions of higher learning is considered a process by which the objectives of the institution may be accomplished. Philosophies concerning administration vary considerably as a comparison of administrative procedures among institutions or departments within institutions will substantiate. An assumption fundamental to this study is that an institution which encourages the active participation of administrators, faculty and students in processes of policy formation and decision-making will accomplish its purposes more effectively than an institution where the autocratic or laissez-faire type of administration is practiced.

As a basis for this study the following definition, by Klein and his co-workers at Ohio State University, was chosen since it gives credence to the democratic association of individuals within a group enterprise:

. . . democratic administration may be defined as a way of accomplishing purposes which have been formulated through free discussion on the part of everyone concerned, by means of plans likewise determined as a result of free discussion.¹

¹Arthur J. Klein and others. Adventures in reconstruction of education. Columbus, Ohio, Col. of Ed., Ohio State University. 1940. p. 241.

If educators believe that the democratic way of life is the most effective means of attaining goals, then they should also accept those principles by which it is accomplished. Fundamental principles of democratic association have been set forth by many educators, but those selected to serve as bases for the development of administrative functions and qualifications were summarized from the writings of Alberty,¹ Gilmore² and Hopkins.³

Each person is accepted for his own dignity and worth as an individual.

Each person, as an individual or a group member, has the capacity to base his actions on the use of intelligence.

Every individual is sensitive to the effect of his actions upon other persons.

Individuals who are affected by decisions have the right and responsibility to share in the making of such decisions.

All persons involved in a cooperative enterprise value the freedom of sharing in the development of its objectives and procedures.

¹Harold B. Alberty. Some principles of democratic association. In Harold Benjamin, ed. Democracy in the administration of higher education. pp. 63-74. Tenth Yearbook of the John Dewey Society. New York, Harper & Bros. 1950. pp. 63-64.

²Doris E. Gilmore. The application of criteria appropriate to democratic values of selected administrative patterns in home economics in higher education for the purpose of refining the criteria and reconstructing practice. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1948. p. 35.

³L. Thomas Hopkins. Interaction, the democratic process. Boston, D. C. Heath & Co. 1941. pp. 102-103.

Each individual's growth is encouraged through group participation.

The assumption is made that functions can be performed effectively and with worth-while results only through the application of the general principles of democratic association. Tead, who has written extensively in the field of administration, defined a function thusly:

A function is a body of duties closely related in homogeneous character and in operational similarity, which for purposes of execution are naturally and conveniently grouped together as the unified responsibility of a person or department.¹

He also made a specific analysis of functions related to the process of administration and listed these ten functions as important elements in the administrative process:

1. To define and set forth the purposes, aims, objectives or ends of the organization.
2. To lay down the broad plan for the structuring of the organization.
3. To recruit and organize the executive staff as defined in the plan.
4. To provide a clear delegation and allocation of authority and responsibility.
5. To direct and oversee the general carrying forward of the activities as delegated.
6. To assure that a sufficient definition and standardization of all positions have taken place so that quantity and quality of performance are specifically established and are assuredly being maintained.

¹Ordway Tead. The art of administration. New York, McGraw-Hill Book Co., Inc. 1951. p. 102.

7. To make provisions for the necessary committees and conferences and for their conduct in order to achieve good coordination among major and lesser functional workers.
8. To assure stimulation and the necessary energizing of the entire personnel.
9. To provide an accurate evaluation of the total outcome in relation to established purposes.
10. To look ahead and forecast as to the organization's aims as well as the ways and means toward realizing them, in order to keep both ends and means adjusted to all kinds of inside and outside influences and requirements.¹

Since few investigations have been made in the area of home economics administration, this study was undertaken to determine what functions of the home economics administrator in land-grant institutions are believed to be sound by certain administrators and home economics staff members of such institutions. To be effective an administrator should possess a combination of abilities and personal qualities which are consistent with the functions to be achieved. Consequently, a second part of the study was to secure the beliefs of administrators and home economics staff members regarding qualifications considered important for the head of a home economics department² in land-grant institutions.

¹Tead, *ibid.*, p. 105.

²Department in this study refers to the organization within which all home economics subject matter areas operate; includes schools, colleges and divisions of home economics as well as departments.

Results of such a study should prove useful in several respects. It is hoped that more home economists, after having an opportunity to study the functions of the position derived from this investigation, will be challenged to serve the profession in an administrative capacity. Knowing what the position entails and looking upon administration as an area of specialization may challenge some individuals to prepare for administrative work. Administrators and those who direct graduate work might use the findings in guiding qualified students into administrative work.

Home economics administrators may be stimulated by the list of functions believed sound by administrators and staff members to evaluate their performance and see wherein they may become more effective. The qualifications thought to be important may also indicate points at which some home economics administrators may need to make improvement. The presidents of land-grant institutions might possibly use the findings in assisting the home economics administrator to become more effective. The beliefs of faculty regarding functions perhaps will suggest areas where administrators and staff members need to discuss cooperatively principles and policies involved.

Another possible use of the description of functions, assuming that a group of staff members desire democratic administration, is to challenge them to clarify their role

in administration. If more staff members would indicate a greater willingness to share in administrative functions, perhaps additional home economists would be disposed to accept administrative responsibility.

When personnel are being selected for home economics administrative positions, the results of the investigation may be of use. In selecting personnel each institution must consider its balance in staff members as to training, ability and personality, but the findings could serve as general guides for personnel selection.

This study was limited to land-grant institutions since the functions of the chief administrative officer of the home economics department in this type of institution differ somewhat from those in liberal arts and teacher-training institutions. Extension work as well as resident teaching and research is the concern of the home economics administrator in most land-grant institutions. Although the administrative leader usually is not responsible entirely for each of these three aspects of the program, she needs to contribute to a cooperative relationship and recognize the importance of each aspect. In land-grant institutions a member of the extension staff usually administers that portion of the off-campus teaching done by extension staff members and in a few institutions one staff member carries administrative responsibility for home economics research. The head of the home economics department needs to assume some leadership in help-

ing these three areas to cooperate in instructing students and in contributing to the welfare of the people of the state.

To have as homogeneous a group of institutions as possible, the study was limited to those land-grant institutions granting degrees in home economics and also carrying on research and extension work in home economics. In some states other types of institutions are responsible for resident teaching in home economics. Those land-grant institutions maintained for Negroes were not included in the study because it was assumed that beliefs of Negroes concerning functions and qualifications of home economics administrators based on democratic concepts would be affected to some extent by the experiences of their race. The homogeneity of the group might be influenced by these experiences, thus the Negro institutions were excluded. Only institutions of the continental United States were used in the study, since mailing of materials to the territories would be very time consuming and expensive. After these eliminations 42 land-grant institutions remained for use in the study.

REVIEW OF LITERATURE

The literature concerning administration in institutions of higher learning which was selected for review in this study pertains to functions and principles, faculty, students, home economics and qualifications of administrators.

Functions and Principles of Administration

A theoretical study by Faulkner¹ was particularly helpful in developing this investigation, since it provided a list of functions and principles of administration for institutions of higher learning which had implications for administrators of units within such institutions.

Faulkner studied the statements of functions and principles in the literature which pertained to the internal administration of institutions of higher learning for the purpose of discovering if there was any consistent viewpoint among writers. He defined internal administration as those administrative activities pertaining to instruction and personnel. The method followed by Faulkner consisted of listing statements of functions or principles from the liter-

¹Donald Faulkner. An inquiry into the principles of higher educational administration. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1939.

ature, translating them into terms of standard definitions by using the dictionary to define each word that indicated a function or principle and finally condensing them into general statements. His source of data was the literature concerning higher education which included educational surveys, journals, bulletins and periodicals of educational associations and books on general educational administration and specific functions of administrative officers. Faulkner did not claim that the statements of functions and principles which he found in the literature were sound or were being followed in practice.

Statements of 25 functions concerning internal administration resulted from Faulkner's study of the literature:

1. To formulate the statement of aims and objectives of the institution.
2. To formulate all policies concerning the educational work of the institution.
3. To exercise judicial powers over members of the student body and of the faculty.
4. To execute the legislative enactments of the institution.
5. To advise the legislative bodies of the institution.
6. To present the needs and opportunities of the institution to the various groups which are interested in the success of the institution.
7. To maintain amity and unity of purpose in the institutional personnel and the constituency.
8. To build the institutional budget.

9. To execute the institutional budget.
10. To record academic facts.
11. To supervise all schedules of classes and room usage.
12. To supervise educational and administrative research.
13. To administer the library organization.
14. To administer curriculum construction and coordination.
15. To supervise extra-curricular activities.
16. To select all officers of administration.
17. To select all instructors.
18. To improve instruction.
19. To study and adjust staff compensation.
20. To supervise admissions.
21. To supervise the guidance program.
22. To administer graduation regulations.
23. To supervise financial aid for students.
24. To supervise the living arrangements of students.
25. To supervise the placement of students and former students.¹

Faulkner also compiled a list of principles of internal administration for institutions of higher learning which consisted of the following:

¹Ibid., pp. 136-138.

1. The administration of the internal affairs of the institution of higher learning should contribute to the satisfaction of the social and economic needs of the constituency and clientele.
2. The administration of the internal affairs of the institution of higher learning should contribute to the stated aims of the institution.
3. The administration of the internal affairs of the institution of higher learning should take into consideration the individual differences of the student body.
4. The administration of the internal affairs of the institution of higher learning should promote self-direction on the part of students through participation in certain phases of administration.
5. The administration of the internal affairs of the institution of higher learning should foster the experimental attitude in all phases of the work of the institution.
6. The administration of the internal affairs of the institution of higher learning should promote the continuing interest of the institution in its students.
7. The administration of the internal affairs of the institution of higher learning should be characterized by a high ethical and moral tone.
8. The administration of the internal affairs of the institution of higher learning should promote the coordination of the institutional services.
9. In the administration of the internal affairs of the institution of higher learning all pertinent factors involved in each decision should be taken into consideration.

10. The executive phase of the administration of the internal affairs of the institution of higher learning should be centralized under the control of the president or of the academic subdivision immediately concerned.
11. The board and the faculty should participate in the legislative phase of the administration of internal affairs of the institution of higher learning.
12. Each group of the institutional personnel should participate in the judicial phase of the administration of the internal affairs of the institution of higher learning, insofar as it is concerned with members of the group.
13. Each legislative body should participate in the selection of its executive officer.
14. Each candidate for a faculty post should be approved by the president and the faculty of the department concerned.
15. Administrative functions which are concerned, primarily, with the control and direction of the work of instruction and research should be vested in the faculty.
16. The duties of each officer and instructor should be clearly defined; and the conditions of tenure made a matter of contractual relationship.
17. The administration of the internal affairs of the institution of higher learning should promote the welfare and morale of the personnel.
18. Authority sufficient to gain a desired end should accompany the responsibility for gaining this end.
19. The qualifications of members of the personnel of an institution of higher learning should include academic and professional training sufficient to gain the educational objectives implied by their functions.¹

¹Ibid., pp. 497-499.

Administrative Problems Relating to Faculty

Personnel policies

Administrators in institutions of higher learning are constantly confronted with the problem of selecting and maintaining a staff which will help attain the educational objectives of the institution. One study¹ was found in which the primary concern was the institutional policies and practices that affect the teaching and research staffs. During 1947-1948 Woodburne visited 46 institutions which consisted of an approximately equal number of liberal arts colleges, endowed universities and state universities which were selected on the basis of academic standing, geographical location and interest in the study. Conferences were held with four to seven persons in positions of responsibility for staff activities in each institution.

Woodburne presented his report in the form of an analytical discussion of the practices and policies affecting the faculties of these colleges and universities; he found it was impossible to summarize the practices in tabular form.

In the selection of staff personnel, the principal

¹Lloyd S. Woodburne. Faculty personnel policies in higher education. New York, Harper & Bros. 1950.

deficiencies among the institutions, according to his judgment, were failure to devise a systematic means for surveying the field of possible candidates and to formulate criteria for desirable qualities in candidates. Decisions concerning staff appointments were based largely on training, experience, publications and recommendations of candidates, although the latter was considered unsatisfactory by most of the administrators interviewed.

Bases for promotion in rank most commonly found were teaching and scholarly work, research, public service and administrative service. According to Woodburne a few institutions were using evaluation of classroom performance by students, in others interclass visitation was practiced among staff members and some were seeking alumni evaluation of teaching. Critical reading of research publications by a faculty committee with representatives from science, social science and the humanities was practiced in a few institutions. In general, evaluation of staff members' contributions was not found to be a regular periodic procedure. Most of the institutions had a policy of requiring a probationary period of five to seven years, within which time the staff member must qualify for a promotion or leave the institution. In the majority of the colleges, however, this policy was not applied in practice.

Woodburne found few institutions that had a definite

salary policy. Informing staff members of the establishment of minimum salaries for the various academic ranks, however, was a general tendency. Some institutions had raised their salary scale for minimum salaries but not for the maximum level which had resulted in fewer advances within each rank.

Among the institutions the terms of appointment for instructors and for professors were more similar than for other ranks. Very commonly appointment of instructors was considered temporary and probational and those not qualifying for promotion in approximately six years were to be separated from the institution, whereas professorial rank usually carried indeterminate tenure. In some institutions assistant and associate professors had appointments restricted to three to six years and retention was based on contributions of real merit. He found, however, that increased demand for staff members and concern for the feelings of individuals resulted in retention of most staff members regardless of merit.

Woodburne discovered few institutions in which new staff members were given what he considered an adequate orientation to their duties. He maintained that the institution should be as responsible as the individual for his becoming an effective faculty member.

Those institutions visited showed a tendency to lower the retirement age to 65 thus allowing more opportunity for promotions to top ranks. Most retirement funds consisted of

joint contributions from the individual and the institution but the proportionate amounts varied considerably.

Various means were being used to promote scholarly work of the staff. In those institutions providing leaves of absence, the value of the proposed project was usually the basis for granting the leave to the staff members. Some institutions gave grants of money to be used for study during the summer with no teaching responsibilities assigned and a few paid salaries on a twelve-month basis with one quarter of the year to be devoted to scholarly work. In some institutions there were policies relating to provision for the staff to pursue scholarly work through various means, but often practices did not follow these policies because of insufficient funds. Consequently, leaves of absence were granted in these colleges to individuals on the basis of one half of their annual salary and the resulting scholarly effort came at considerable personal cost to the individual.

Woodburne investigated three areas that affect conditions of work: teaching loads, committee work and semi-administrative tasks. Teaching loads, defined as time spent in the classroom, ranged from 5 to 20 hours per week and averaged 11 hours. The high enrollments in graduate work resulted in overworked teachers at that level also.

Many faculty members, according to Woodburne, wanted to participate in committee work because they believed such

work indicated confidence in their ability. There was a tendency, however, to appoint small groups of persons to a number of committees. Many faculty members and administrators indicated the belief that the faculty should be consulted when determining major questions of educational and instructional policy and qualifications for appointment and promotion.

Most institutions had a serious lack in adequate clerical help which resulted in valuable faculty time being spent on such tasks. One university was faced with a choice of raising salaries or hiring more typists and chose the former.

The need for long-range planning was recognized in most of the institutions. Lack of sufficient time was reported as the reason for many inadequacies in integration of policies and procedures.

The organization of the institutions was believed by those interviewed to be an important influence in the effective functioning of staff policies and procedures. The liberal arts colleges usually had a dean of the college or faculty responsible for matters relating to the curriculum and students, and an advisory or administrative committee chosen from the faculty which served as a general policy committee that passed on promotions, appointments and leave requests. The smaller universities frequently were organized into departments with the chairmen, dean of the

faculty and a small staff committee acting in an advisory capacity to the president.

After study of the data collected by visiting the 46 institutions, Woodburne found that similarities were greater than differences in the decisions made in staff matters; consequently he suggested that some conditions would apply to all institutions. He presented the following essential conditions for developing and maintaining an able faculty:

1. An appointment procedure which will furnish officials with evidence of ability and promise not dependent on the warmth of a recommendation.
2. Some means of including in the survey of candidates most of the qualified persons in the country, irrespective of present position or geographic location.
3. An interview technique which will gather some clues on the qualities of mind and character which are desired.
4. Some unequivocal evidence of a candidate's teaching effectiveness.
5. A promotional procedure which will gain clear evidence of scholarly and teaching ability as well as a suggestion, at least, of the staff member's probable long-time contribution to the institution.
6. Announced minimal salaries for the various ranks with some indication of the range of expectancy.
7. The elimination of all known inequities in the salary scale.
8. A policy of increases which reviews faculty contributions frequently and makes salary adjustments on this basis.

9. Merit increases, when made, of from 5 per cent to 8 per cent of the salary received.
10. A salary scale substantially above the income of service personnel in the same cost-of-living area.
11. The opportunities in teaching and research which are held out to new appointees supported by positive measures providing time for reading and time and funds for scholarly work.
12. Terms of appointment which have meaning in terms of their probationary character, and the prospect of elimination at the end of them.
13. A policy of separation from the staff which allows the institution to look for abler and abler people to fill its teaching ranks.
14. A procedure on eliminations which takes into account the future which can justifiably be held out to each staff member.
15. A tenure policy which is derived from the permanent obligations of the college or university, rather than from reasons of economic security.
16. Retirement plans which allow a dignified and satisfying emeritus period, and annuities which allow decent if modest living.
17. Leaves of absence with full salary, for some period of time, for scholarly work and research.
18. A reduction in faculty time assigned to committees and to clerical or semi-administrative duties.
19. Time for official and faculty committees to consider the long-range problems of staff as well as the integration of separate policies.
20. An organization which will permit the detailed and careful consideration of present and future staff problems at the levels both of the college and of the university.¹

¹Ibid., pp. 194-196.

Faculty development

Growth of staff members is a concern of administrators in institutions of higher learning since the attainment of educational objectives largely depends on the quality of teaching. An evaluation of administrative plans for one phase of staff growth, the improvement of college teaching, was made by Williams¹ among the liberal arts faculties of 109 institutions. Approximately one half of these institutions were supported by public funds. The use of the term "liberal arts" faculty is open to question when the list of 109 schools is inspected. Some of the institutions listed have no college of liberal arts but limit teaching and research mainly to technical and scientific areas. However, his investigation indicated aspects of administrative responsibility for the improvement of teaching which are pertinent to the present study.

The purposes of his study were to discover the administrative devices employed and to formulate principles concerning the use of administrative tools for improvement of faculty members in service. Williams used a questionnaire to secure his data although he did not indicate from whom the responses to the questionnaire were obtained. The responsi-

¹Chester S. Williams. Improvement of college teaching, an evaluation of administrative plans. Unpublished Doctoral Dissertation. New Haven, Conn., Yale University Library. 1949.

bilities of the respondent in the institution might have affected the data given on the questionnaire.

A majority of the institutions used these general administrative devices to promote development in the liberal arts faculty: adjustment of work load for participation in institutional activities other than teaching, provision of funds for attendance at professional meetings, provision of a library containing books and periodicals on college teaching and departmental conferences regarding the improvement of instruction.

General faculty conferences for the purpose of improving instruction, sabbatical leaves, a committee on the improvement of instruction and laboratory facilities for experimentation were employed to improve teaching techniques in many of the institutions. Specific means for the in-service training of staff members most frequently used in these schools included faculty conferences prior to the opening of school, administrative handbooks, study of course syllabi and examinations, appointment of an advisor to aid a new instructor, faculty rating by students and intervisitation of classes by staff members.

To evaluate principles concerning administrative means of improving teaching, Williams selected a panel composed of respondents from the 12 institutions that placed the most emphasis on faculty growth. Since these institutions

seemed to have given more thought to this subject than the other schools, Williams believed the respondents from such institutions would be qualified to judge the validity of both the general principles and specific devices for improving teaching. Eleven of these panel members replied and unanimously agreed on two principles relative to the program as a whole: the faculty and administrators of liberal arts colleges should devise administrative means to aid the in-service development of each faculty member through democratic means, and the administration should constantly engage in evaluation and experimentation relating to the program of in-service development for faculty with respect to meeting the various aims of the institution and needs of staff members.

Of the many devices employed at the various institutions to promote faculty growth, the panel considered as essential conferences by the adviser and department head with the individual instructor about results of his work, departmental meetings for the improvement of instruction and adjustment of the teaching load to encourage teachers to participate in other institutional activities than teaching.

In conclusion Williams, following the statements accepted by the panel, recommended these procedures for improving college teaching: holding a faculty pre-school

conference, preparing a handbook of needed information, appointing an advisor to new staff members, holding departmental meetings, studying curriculum and improvement of teaching through committees and providing opportunities for staff members to attend professional meetings. Individual activities believed desirable for professional improvement included reading of professional literature dealing with teaching, counseling with students, filing and studying course syllabi and examinations and individual research and experimentation in teaching.

Closely related to Williams' study was one done by Kelley¹ who was interested in the features of inservice educational programs employed in Catholic colleges for women. The particular portion of his report of interest here is the review he made of 20 studies representing investigations in all types of institutions on the improvement of college teaching through inservice training.

Kelley made a count of the procedures reported in the 20 studies and found 115 separate activities used to promote college instruction. From this list he compiled a shorter one of 31 that recurred most frequently and classified them into ten major categories:

¹William F. Kelley. The inservice growth of the college teacher. Omaha, Nebr., Creighton University. 1950.

1. Pre-contract demands and orientation to the campus.
2. Clarifying institutional objectives.
3. Administrative interest in good teaching and teaching morale.
4. Enlisting the democratic cooperation of the entire faculty.
5. Assisting in the professional development of the faculty.
6. Directing or supervising instruction.
7. Developing centralized services and providing mechanical facilities.
8. Securing ratings of the faculty by students and alumni.
9. Encouraging research in education and in subject-matter fields.
10. Insuring the flow of ideas between the campus and the world.¹

An important factor in faculty relations is morale upon which the studies of Williams and Kelley have a bearing, since competence in the performance of professional work tends to contribute to personal satisfaction. A further study in this area was made by Carl² who proposed to investigate the working conditions of teachers to determine

¹Ibid., p. 129.

²Mary Kathryn Carl. The influence of work and social environments upon the behavior of two high level groups. Unpublished Doctoral Dissertation. College Park, Md., University of Maryland Library. 1951.

the factors which influence their behavior in order to assist educational administrators to develop a more adequate understanding of group activity. The study by Carl helped this writer reaffirm belief in certain democratic principles; that if individuals are to feel themselves to be a part of an organization they should participate in setting group goals, understand their duties, participate in evaluation of their work and receive rewards commensurate with their contributions. To accomplish this, vigorous democratic leadership is required on the part of administrators.

Somewhat meager information was given concerning Carl's method of procedure, but she did collect data by use of questionnaires and interviews from two groups of college graduates who were teachers, presumably in two departments of some institution of higher learning. The groups consisted of 15 to 45 members. Information relating to the work load and to the interpretation of responsibilities of each group member was obtained from the individual concerned and the administrator responsible for the group.

After analyzing the responses of one group Carl found these conditions existing: new members seemed to lack orientation to the group, older members felt they had lost status in the group, individuals showed a tendency to make hostile attacks on other members, spontaneous groups for discussion of problems were not formed, communication between

small groups and the group as a whole was lacking and a resistance to change was prevalent.

The analysis of responses from the other group showed, according to Carl, enthusiastic and spontaneous formation of small groups for formulating ideas and accomplishing work; a prevalence of group and individual optimism; duties of positions well understood; a tendency for older members to feel a threat to their status and for individuals to feel they were blocked in opportunities for advancement.

Needs of the group members Carl concluded from these analyses were:

1. Need to be recognized for a job well done.
2. Need to feel belongingness in a status group.
3. Need to be well informed of the group operations.
4. Need for status.
5. Need to feel strong leadership.¹

Carl suggested that a departmental structure in an educational institution gave an excellent opportunity for the individual to identify himself with a group and the goals established by the group. She further recommended that administrators review with each individual, periodically, the responsibilities of his position and discuss with him any changes which might occur as well as the reasons for such changes. These procedures would help individuals maintain

¹Ibid., pp. 50-52.

a feeling of security in their positions, Carl believed.

Analysis of responses she obtained indicated the members of both groups desired that a leader have the following qualities:

1. Makes decisions that appear meaningful.
2. Adheres to decisions.
3. Follows through with decisions.
4. Acts quickly in emergency situations.
5. Impresses others that actions are goal-oriented.
6. Is consistent in decisions, rewards and punishment.
7. Defines and sets meaningful goals.¹

Student Participation in Administration

Principles relating to democratic administration imply that continuous growth of individuals is facilitated by providing each with opportunities to participate actively in the formation of policies that concern them. Two studies have application to the author's investigation since they pertain to participation by students in areas where they are directly concerned with administrative decisions.

To study the status of student participation in admin-

¹Ibid., pp. 54-55.

istration Falvey¹ used sources of information consisting of student handbooks, catalogues and bulletins from colleges; correspondence with 18 colleges; conversations with administrators, faculty members, students and staff members of four-year liberal arts colleges and her own personal experience. Detailed descriptions of the methods used for gathering and analyzing data were not given in her report, since it was presented as a handbook for the use of students, faculty and administrators who are concerned with this aspect of administration. In her presentation she proposed six purposes of student participation in administration:

1. The governmental organization should provide the student body with the means of formulating its purposes and policies as a group. It must be remembered that these purposes and policies are dynamic, evolving concepts and that, once arrived at, they cannot be neatly tucked away and forgotten.
2. Student participation should promote an increasing sense of responsibility and concern on the part of each student in respect to the welfare of the total college community and of himself as these two interests react and impinge upon each other.
3. The development of effective leadership and intelligent obedience to authority are functions of student participation in college administration.
4. It is through student participation devices that the means are provided for the expression of student opinion and for the release of tension.

¹Frances E. Falvey. Student participation in college administration. New York, Bur. of Pub., Teachers College, Columbia University. 1952.

5. If student participation is making the most of its opportunities, it will serve to develop interest in the school, increase school spirit, and improve the morale of the college community.
6. Student participation must fulfill its aim to enlarge the consciousness of each member of the community of the fact that those who hold opposing views to his own might just possibly be right, that is, to cultivate tolerance toward the opposition, respect for the honest opinions of others, consideration for the rights of minorities.¹

Falvey found the most frequent participation of students to be in such matters as formulation and administration of social rules, management of extra-curricular activities and the social program, organization and execution of the student orientation program. In a few institutions students were participating with staff members in functions for which Falvey believed faculty members are usually entirely responsible: formation of academic rules, grading procedures, academic discipline and curriculum development. Students in these institutions had made valuable contributions, according to faculty members and administrators, and Falvey recommended extension of such participation.

Examples were also found where students were included in administrative affairs relating to fiscal policies and procedures, public relations, student admissions and placement, staff appointments and promotions, buildings and grounds, lecture and concert series, college calendar and official

¹Ibid., pp. 30-31.

college publications. She found enthusiasm in some institutions for the practice of students serving on joint committees with faculty because this contributed to students' understanding of problems, to their practice in making decisions and to their adherence to such decisions with good spirit.

In her analysis of practices in the various institutions studied, Falvey found the beginning of a movement toward what she called "community government." In community government the students participate in administrative functions in cooperation with the faculty and the administration.

Whereas the study of Falvey concerned the participation of students in many aspects of administration, an investigation by Roudebush¹ related to student participation in curriculum revision. She assumed that all experiences provided by the institution were potentially educative and thus a part of the curriculum. She further assumed that an educational program based on democratic principles implied a democratic approach to educational practices, consequently opinions of students should be sought.

The study by Roudebush dealt with the use of student

¹Alma R. Roudebush. A study of the utilization of student judgment of curriculum revision in the home economics division at the New York State College for Teachers at Buffalo. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1951.

Judgment in curriculum revision in the home economics division at one institution, New York State College for Teachers at Buffalo. She developed four questionnaires, bearing on the various phases of student life in college and the activities of graduates after leaving college, which were sent to the 734 students who were home economics majors in the institution from September, 1942, through September, 1949. A different form went to those who had dropped out of college, undergraduate freshmen, upper-classmen and graduates. Returns totaled 61 per cent.

Of those responding, 86 per cent indicated they would select home economics again as a major. The group which had been graduated concurred with this opinion 98 per cent, undergraduates 92 per cent and those who dropped out 59 per cent. Their concept of home economics varied from the belief that it is a broad area to one of its being highly specialized.

Over one half of the respondents listed the quality of teaching as the reason courses were or were not helpful. Severest criticism was given to courses in which students believed that the theory was not clearly related to the solution of every day problems. Respondents indicated that motivation for learning in some courses tended to offset poor teaching.

More opportunity for discussion was a desire expressed often by respondents; more discussions among students and

with faculty. They also wished greater student-faculty cooperation, although most of those replying believed the faculty was available when they needed help. Few indicated any inclination to take over the entire responsibility for decisions in any phase of the program but expressed a desire to know the bases of decisions affecting them.

In concluding her study Roudebush made 16 recommendations based on an analysis of the opinion of selected students and alumnae. Those pertinent to the present study are:

Opportunities should be provided by the college staff to secure student judgment, and student judgment should be sought specifically when curriculum changes are being considered.

Experimentation should be carried on to find ways of locating individual differences among students and of helping students get those experiences which seem particularly desirable in fostering their growth and development.

It should be a responsibility of faculty members to help students develop an understanding of the reasons for including all required courses and experiences in the program.

It should be a responsibility of faculty members continually to appraise educational experiences and to plan for the elimination of those no longer functional. Moreover, as this evaluation goes forward, the further responsibility to include new experiences designed to meet needs expressed by students arises.

The home economics staff should continue to explore curriculum problems with other departments and divisions, particularly with the staff members teaching the courses required for home economics majors.

The faculty should take leadership in providing opportunities for student discussion groups and for faculty-student discussion groups to discuss problems of mutual interest.

The development of an evaluation device for out of class work experience would seem to be desirable in order to help students rate the experience as it contributes to growth and development.

Faculty members need to seek opinion of the graduates of the institution in regard to strengths and weaknesses of the program.

It seems desirable to investigate the kinds of help students wish in regard to placement and whether it is possible to provide the desired help.

The college should continue to explore ways of acquainting prospective students with the educational program.¹

Administration of Home Economics

Research concerning the administration of college departments of home economics is very limited. An inspection of the yearly lists of doctoral dissertations compiled by the Association of Research Libraries for the past ten years reveals three dissertations dealing with administration in home economics. At least two research projects in this area are in progress.

Criteria for administrative organization and procedures

The administrative organization and procedures in home

¹ Ibid., pp. 421-432.

economics units were explored by Gilmore.¹ Although she recognized that all phases of administration are inter-related, the study was limited to administrative practices within the home economics unit. She also restricted her study to those administrative practices and procedures which can reflect the influence of a democratic philosophy. Gilmore's study differed from the one undertaken by the writer in that she confined the administrative functions studied to those of planning, organization and operation; whereas the writer included the additional functions concerned with instruction, curriculum and personnel.

The study by Gilmore makes a significant contribution to the field of home economics administration by establishing criteria by which certain administrative practices and procedures may be evaluated in terms of promoting democratic values. Her study served as a stimulus and foundation for the present study of the functions and qualifications of home economics administrators.

Gilmore accepted the following elements as fundamental to democratic association and justified them through documented evidence from writings in philosophy and education:

¹Doris Eloise Gilmore. The application of criteria appropriate to democratic values of selected administrative patterns in home economics in higher education for the purpose of refining the criteria and reconstructing practice. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1948.

1. Respect for individual personality.
2. Concern for the common good of the group - social sensitivity.
3. Faith in man's ability to determine plans and to execute them - as individuals and as a member of groups.
4. Freedom for the use of intelligence - by individuals and by groups.
5. The right and responsibility of the individual to participate in decisions that involve the values to which he gives allegiance.¹

After a survey and interpretation of the writings in the field of educational administration, Gilmore formulated a set of 15 criteria to evaluate administrative practices that promote democratic values:

Criteria for Planning and Policy-making

1. Cooperative planning and policy-making are recognized and accepted responsibilities of the administrative officer. Provision is made for all persons affected by the administrative unit to participate actively in formulating and evaluating school policy on the level of their ability to participate.
2. Planning and policy-making are conceived as continuous, on going processes within which opportunity is provided for experimentation and evaluation.
3. Freedom is provided for the designated administrator to act in terms of established policy. Faculty members, likewise, have freedom to express their responsible judgment regarding the efficiency of administrative action and the adequacy of existing policy.

¹Ibid., pp. 34-35.

4. All policies concerning the organization and operation of the administrative unit in relationship to the central administration of the institution and the location of authority and responsibility as defined in institutional policies and rules are clearly defined and recorded.

Criteria for Appraising Organizational Procedures

1. The designated administrative officer is responsible for bringing the staff into a responsible relationship to decision-making. The administrative officer, free to act within established policy, usually takes counsel with the staff on matters where administrative authority is clearly defined, in order that the policy may remain under the widest possible scrutiny and consideration.
2. The staff is obligated to share responsibility with the administrative officer, both before and after decisions are taken, in order that the democratic pattern of shared authority and responsibility may not be defeated by the apathy of those who would most notice its loss.
3. The administrative officer is responsible for providing conditions which stimulate and encourage each individual to participate intelligently and effectively in the group enterprise in terms of his distinctive capacities.
4. Provision is made for the creation of conditions that facilitate the responsible participation of students in cooperative planning with the staff group.
5. Any administrative officer or staff member placed in a position of leadership, is responsible for creating and maintaining conditions that lift group discussions to the level where ideas may be fully and profitably exchanged. Discussion is not a matter of pitting personality against personality.

6. The administrative officer is responsible for keeping the problem of organization before the staff as a matter of intellectual interest in order that the relevancy of organization to agreed-upon purpose may be a matter of con-joint decision.

Criteria for Appraising Operational Procedures

1. The administrative officer is responsible for securing the resources needed by the staff to realize the aims and purposes which the group sets forth, and is responsible for having the matter of resources reconsidered where they seem not to be well used or to have been well planned.
2. The selection and appointment of members to any administrative or faculty position within the administrative unit is a cooperative project in which all responsible members participate equally.
3. Each member of the administrative unit shares the responsibility for creating and maintain-ing an atmosphere which invites each staff member to develop professionally and as a person.
4. The administrative officer exercises leadership in creating the machinery by which the contribu-tion of growth of each as a professional person, may be evaluated and rewarded.
5. The administrative officer exercises leadership in promoting insight into the interrelatedness of educative experience. Means are provided for the cross-fertilization of ideas and the development of increased understanding among the staff members in specialized areas within the unit, within the institution at large, and in agencies within the community.¹

To determine the effectiveness of the criteria in identifying administrative practices which further the re-alization of democratic values, a group of institutions was

¹Ibid., pp. 75-80.

selected for visitation. Gilmore specified six bases for selection of units to be visited: should represent units of different size, be within a reasonable traveling distance, the administrative head should have held that position for two or more years, the institution should have given some evidence of democratic practice, the administrator and sufficient staff members should indicate willingness to cooperate so that the visit would be profitable and the summer school faculty should be representative of that of the regular school year.

Twelve administrative heads of home economics units in various types of institutions agreed to cooperate in the study. One institution with a small department was dropped due to pressure of time which left three institutions with small departments, less than 10 staff members; four with medium departments, 10 to 20 staff members; and four large departments with a staff of over 20 individuals. Interviews were held at the eleven institutions during the summer and fall of 1948. Each administrative head was interviewed, also 25 other administrative officers and 75 staff members of differing rank, age, length of service and subject matter interest.

At the completion of the interviews at each institution a study was made of materials collected and the data were organized and formulated into a report of the administrative pattern of that home economics unit. Each report was sent

to the administrative head of the unit for verification, then analyzed by applying the criteria to the procedures used in the institution.

Gilmore drew two sets of conclusions in her study, one of which related to administrative practices found in the 11 institutions:

1. Concern for the realization of democratic values through the administration of a home economics unit was evident in units of all size.
2. Administrative practices varied as widely between units of the same size as between units of different size.
3. Organizational machinery for the promotion of democratic administrative procedures was more evident in large units than in either the medium or small.
4. Small problem-centered groups were recognized as means of facilitating cooperative group participation in units of all size.
5. Three factors contributed to the effectiveness of organization procedure in realizing democratic values in all units:
 - a. Extent of cooperation with groups and between groups
 - b. Acceptance of the importance of group action by administrators and faculty
 - c. The extent to which cooperative planning affected practice.
6. The number of units included in each group was too limited to warrant the formulation of conclusions relative to the relationship of democratic administrative practice to size.

7. Extent and quality of faculty participation in decision-making varied more widely than the range of administrative matters in which faculty members participate.
8. The value of cooperative group appraisal of administrative organization and practice by the individuals directly concerned within the unit was apparent in those units where such evaluation had taken place.¹

After applying the criteria to the procedures reported in the 11 institutions, Gilmore drew these conclusions relative to the utility of the criteria:

1. The formulated criteria proved equally useful in the appraisal of administrative procedure in units of all sizes.
2. The formulated criteria were more useful in identifying tangible organizational procedures than in analyzing the informal procedures.
3. The effectiveness of the criteria would be increased when used by the staff of an administrative unit in appraising its own organizational and administrative procedures.²

In 1944 the American Home Economics Association appointed a committee consisting largely of home economics administrators, to develop criteria for evaluating college home economics programs.³ The committee developed a device for surveying conditions existing in institutions where four-year curricula in home economics were offered and, after a

¹Ibid., pp. 467-469.

²Ibid., p. 469.

³Ivol Spafford. (ed) Home economics and higher education. Washington, D. C., American Home Economics Association. 1949.

pilot study in 16 colleges and universities, collected data from 60 institutions. These were selected, on the basis of size, geographical location and type, as a representative sample of college programs of home economics in the United States.

Analysis of the data resulted in the formulation of criteria relating to administration, staff, students, curricula, philosophy and purposes, teaching and physical facilities. The criteria presented as a basis for evaluating the administration of home economics units in institutions of higher learning were:

A. The General Administration of Home Economics

1. Home economics is given a vital place in the educational program of the institutions.
2. Conditions favor the development of a broad and rich program within the place assigned to home economics.
3. The organization of home economics is suited to the place assigned to or desired for home economics in the institution.
4. The organization within home economics promotes the best interests of the department as a whole in conjunction with that of specific areas.
5. If home economics is not an independent unit, the dean of the college in which it is located is vitally interested in the field.

B. Administration within Home Economics

1. Home economics functions as an integral part of the institution.

2. The essential administrative functions of home economics have been recognized and provision has been made for carrying them out.
3. The relation between the general administration and home economics administration is clear-cut and clearly understood.
4. The department's program is kept within its resources, human and material.
5. Leadership within the staff is utilized, and the personal and professional growth of staff members is promoted.
6. The home economics administrator is well qualified for her position.
7. The home economics administration promotes a broad and rich program of home economics.
8. It secures and keeps a staff whose members are qualified for their work and happy in doing it.
9. It helps staff members to progress professionally.

C. Democracy in Administration

1. The administrative staff believes that a department can achieve its best purposes only through democratic action.
2. Both administrative and nonadministrative staff members sincerely try to operate democratically.
3. Progress is being made toward removing obstacles to democratic action.¹

¹Ibid., pp. 172-177.

Responsibility for home and family life education

The principle assumption of a study by Henderson¹ was that

The major responsibility of home economics is the coordination of functional education for home and family life and that other purposes and content should be integrated with this one.²

Administrative organization and procedures in home economics must be adjusted, she maintained, if such an assumption is accepted. The portion of her study which is pertinent here related to proposals for the administration of home economics in institutions of higher learning made for the purpose of furthering the coordination of educational efforts in home and family living.

Henderson defined home and family life education as "any and all activity engaged in by a learner or his associates for the deliberate purpose of growth in ability in home and family life."³ Home economics was believed by Henderson to be only one area of educational activity contributing to home and family living. Jensen⁴ in her study of home and family

¹Grace M. Henderson. Proposals for the administration of home economics in higher institutions in the light of coordinated community education efforts in home and family life. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1944.

²Ibid., pp. 11-12.

³Ibid., p. 13.

⁴Frances Jensen. The role of home economics in education for home and family living as a part of the general education of students in six selected land-grant colleges. Unpublished Doctoral Dissertation. (Abstract) Ithaca, N. Y., Cornell University Library. 1952.

living in general education also assumed that home economics has a responsibility in cooperating with other institutional departments to provide home and family life education for all students. She interviewed the university education and home economics administrators and the head of the departments of home economics education, sociology and family relationships in six land-grant institutions. These interviewees also believed such cooperation should be encouraged.

Believing that home and family living is basic to the program of home economics, Henderson proposed that all its purposes, both vocational and personal, be concerned with home and family living. She maintained that home economics administrators have the responsibility for seeing that procedures within their departments facilitate the consideration of all problems of home and family living so that their close interrelationship is recognized. To accomplish this she made six suggestions:

- (1) plan programs after consideration of all the important and prevalent interrelated problems of families in the service area, (2) encourage specialists also to be integrators, (3) arrange for staff and students to do frequent co-operative work with families, (4) develop cooperative projects involving specialists in several kinds of problems of families, (5) build an internal administrative structure that facilitates co-operative interrelationships, (6) use committees and councils as further avenues of co-ordination.¹

¹Henderson, op. cit., p. 496.

In conclusion Henderson stated:

In the light of the contention that the primary responsibility of home economics in higher institutions today is to participate in improving current and future home and family life through community-wide educational programs in home and family life that are coordinated in terms of the democratic ideal, it is believed that --

- I. Residence, research and field work must be developed in interdependence.
- II. Research must be directed toward the study of the many-sided problems of families, the creation of the conduct of programs, and the process of coordination itself.
- III. Field service should be directed toward helping community leaders and families themselves coordinate activities and study, as these bear upon the improvement of home and family life.
- IV. Resident teaching should develop professional leaders for the many community agencies participating in coordinated programs of home and family education.
- V. Lay leadership in home and family education should be augmented by a university-wide effort to reach all students with this emphasis, in addition to making it the major emphasis for departments within home economics itself.
- VI. Administrative procedures should facilitate the cooperation of all subject divisions that contribute to the solution of problems in home and family life.
- VII. Administrative procedures within home economics departments should facilitate the consideration of all problems of home and family life, recognizing their close interrelationship.

- VIII. Administrative practices should facilitate the growth of staff members in the abilities their teaching emphasizes and in the assumption of responsibility for educational leadership in home and family life.
- IX. Administrative practices should provide an exemplification of the democratic values.
- X. Institutions of higher education should facilitate the coordination of all home and family education agencies within the service-area of which they are a part.¹

One of Henderson's beliefs concerned the contribution of home economics to education for home and family living of all students in institutions of higher learning and Jensen² in her study sought to determine the function of home economics in achieving this goal in selected land-grant institutions.

Six land-grant institutions were chosen by Jensen as sources of data to be secured by personal interviews with selected administrators during the winter and spring of 1951. Interview questions centered around the contribution of home economics to education for home and family living and the personal philosophy of the interviewee, the current program of family life education at the university, responsibility of land-grant home economics departments for such education, encouragement given students not majoring in home economics to enroll in home and family living courses and conditions that would maximize the contribution to general education.

¹Ibid., pp. 559-561.

²Jensen, op. cit., p. 1.

Jensen found considerable variability among the interviewees in respect to philosophy, background and opinions relating to the home and family living program. In general, her findings revealed the following beliefs among the majority of persons interviewed in the six land-grant institutions:

1. Education for home and family living is an important part of general education of college students in land-grant institutions; such courses should be offered on an elective basis.

2. Courses in home and family living should be taught by individuals who are interested in general education.

3. Land-grant institutions have assumed positions of leadership in home economics and should also assume leadership in the area of education for home and family living in general education by preparing elementary, secondary and college teachers in home economics who have a philosophy which embraces general education.

4. Students who do not major in home economics receive little help in family life education from the home economics department; however, there appears to be a growing awareness of the need for aiding the non-major students.

Organization of home economics administrative units

An important factor in the effectiveness of an administrative unit within an institution of higher learning is

the organization of the unit. O'Toole¹ undertook an investigation of the purposes and organization of large home economics units in land-grant institutions to determine the conditions of organizations that existed, secure an evaluation of organizations and develop proposals for organization which would promote the accepted functions of the home economics units and the institutions of which they were a part.

The study by O'Toole concerned certain aspects of institutional organization closely related to home economics and to those phases of organization which pertain to administration, resident instruction, research, extension and other field services.

She selected 12 of the largest units based on number of staff members and of majors and non-majors enrolled in home economics courses. The home economics administrator in two institutions failed to reply to her request to participate in the study. Since time was limited she selected only four of the institutions to study extensively: Cornell University, Ohio State University, Oklahoma Agricultural and Mechanical College and Pennsylvania State College. In each of these

¹Lela O'Toole. The purposes and organization relating to large home-economics units in ten land-grant colleges and universities with proposals for effective organization. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1949.

institutions O'Toole spent from two to four weeks interviewing 30 to 40 persons including certain institutional administrators, home economics administrators, persons in charge of resident teaching, research, extension and other field services, staff members and the head officer of the student home economics clubs. College publications and reports were also used as sources of information.

Descriptions and charts relating to the purposes and organization of each unit were prepared by O'Toole and submitted to the home economics administrator for approval. She then proceeded to locate evidence in the ten units of the extent to which the organization furthered the functions of the institution, promoted the purposes of home economics and developed democratic values among faculty and students.

On the basis of her findings, her philosophy of education, experience, knowledge of the general functions of land-grant institutions and home economics units in these institutions, O'Toole presented these proposals for effective organization of the large home economics unit in a land-grant institution:

1. The structural organization should be planned by the faculty to further the functions of the institution through coordination of each aspect - resident instruction, research, and field services - interrelatedness and interdependence of the different aspects, cooperation with staff in other fields and organizations, decentralization, and continuous evaluation.

2. The structural organization should be planned by the faculty to promote the purposes of home economics through including common requirements in general courses and home economics to contribute to living and homemaking, providing professional training related to home and family living, offering a program to enrich the general and professional education of non-majors, making guidance or counseling an integral part of teaching, preparing graduates for leadership in the field of home economics, conducting research to strengthen home and family living, providing extension services (or cooperating with others who provide such services) as well as a field service program to train professional home economists and lay leaders, providing for in-service training of faculty and for cooperation with faculties in other home-economics units in the state, and fostering international understanding of home and family.
3. The organization should be planned to promote development of democratic values, on the part of the staff and students, through their participation in determining the organization, purposes, policies and procedures, and for carrying out the latter. It should also provide for the development of the democratic outlook.¹

Concerns of home economics administrators

In 1887 the institutions founded through the provisions of the Morrill Act formed the Association of Land-Grant Colleges and Universities and in 1917 home economics became a division of the Association. Once a year administrators and staff members responsible for resident, research and extension work in these institutions meet to discuss problems concerning their work. The Proceedings of these meetings were

¹Ibid., pp. 468-469.

analyzed by Chapin¹ to discover the concerns of the home economics administrators from 1919 through 1944.

Over this period Chapin found that the major problems of the administrative leaders were: development of the curricula, improvement of instruction, social trends and their effect on the curriculum, the role of staff members in instruction as influenced by teaching load, promotions and salary and professional growth and details of administrative responsibilities.

These administrators, according to Chapin, failed to give much consideration to such problems as the determination of departmental objectives, the evaluation of the instructional program, the provision of facilities for instruction, the relation of administration to student welfare, the importance of finance and public relations, the position of home economics in the institution and the organization within the department.

Because her study included a survey of only those portions of the Proceedings of the Association of Land-Grant Colleges and Universities pertaining to the Home Economics Section, Chapin did not believe that definite conclusions

¹Mildred R. Chapin. A study of the concerns of home economics administrators in land-grant institutions as revealed in the Proceedings of the Association of Land-Grant Colleges and Universities from 1919 through 1944. Unpublished study on file in the Dept. of H. Ec. Ed., Ohio State University. 1946.

from her study were justified until more information could be obtained concerning the method of planning the programs and the reports of general committees.

Qualifications of Administrators

Research in the area of qualifications considered essential for administrators is very limited and most of the studies that have been made are applicable largely to administrators at the secondary school level. One¹ was carried on for the purpose of investigating the qualifications necessary for the chief administrative officer of the junior college and the findings with respect to personality traits and educational training have some bearing on the present study.

Data concerning qualifications and training of present administrators were collected by use of a check list sent by Andrews to each administrative head of the 287 public junior colleges in the United States. The response was approximately 53 per cent. To secure judgments concerning the qualifications and training needed by such administrators a second check list was mailed to a panel of 52 individuals "particularly well qualified" in junior college education.

¹Wade Andrews. The qualifications and training necessary for the chief administrative officer of the public junior college. Unpublished Doctoral Dissertation. Austin, Tex., University of Texas Library. 1952.

No criteria were given for the selection of the panel members. Sixty-five per cent of this group responded.

Andrews found the average age of the administrators to be 47 years and that they assumed their present positions at the age of 41. The panel believed it desirable to enter administrative work before reaching the age of 40. The administrators were members of various professional, civic, social and church organizations and the panel recommended membership in some organization within each of these areas. Each administrator expressed some avocational interests; the panel recommended reading as the most desirable interest.

Personality traits which the majority of the administrators believed contributed to their success as an administrative officer and those which the panel also considered desirable were cooperation, tact, honesty, sincerity, enthusiasm, friendliness, courtesy, common sense and a sense of humor. In addition, the panel considered as highly desirable creativeness, loyalty, articulateness, intelligence and a pleasant voice.

The administrators generally had obtained at least a master's degree in the field of education and the panel believed a doctoral degree desirable, expressing preference for the Ph.D.; training in educational administration was considered important by the panel.

An area which Andrews did not investigate was that of administrative ability. Studies in this area would be helpful to individuals in administration and those who are responsible for securing administrative leaders.

METHOD OF PROCEDURE

After defining administration and selecting basic principles of administration, it was necessary to formulate statements of functions and qualifications of administrators, develop an instrument by which opinions could be obtained and collect and summarize data concerning opinions.

Formulation of Statements of Functions and Qualifications

Using the definition and the general principles of democratic administration and knowledge of the organization of home economics departments in land-grant institutions as bases, a tentative list of statements was developed describing the functions of the home economics administrator. The investigator's experience as a member of both an extension and a resident staff in a land-grant institution proved helpful in developing these statements. In formulating this list of functions an attempt was made to include those which would promote the accomplishment of institutional and departmental goals, the welfare of staff members and students as well as the state as a whole. This necessitated the consideration of functions relating to the advancement of teaching, research and extension.

A tentative list of qualities of administrators also was formulated after obtaining suggestions from the literature, informally analyzing home economics administrators and considering the qualities implied in the statements of function. In addition informal discussions with home economics staff members yielded suggestions of qualities for administrators. The qualities listed relate to training and experience, personal and professional characteristics and administrative abilities.

These tentative statements of functions and qualifications were submitted to a panel¹ of nine staff members of the Iowa State College to secure the judgment of individuals who had had experience in college administration or in working under an administrator in a home economics department. Seven of the staff members represented four subject matter areas in the field of home economics: child development, foods and nutrition, home economics education and home management. Six had had experience as teachers, five as researchers, one as an extension worker and five as administrators. Two persons outside the field of home economics who had had administrative and research experience were also included in the group. This panel was asked to judge the statements as to clarity and completeness.

¹For names of first panel members see the Appendix, page 225.

Using the suggestions from this group, a refinement of the statements of functions and qualifications was made. These were submitted to a second panel,¹ which was instructed to accept or reject each statement on the basis of soundness, clarity and completeness. In addition each panel member was asked to suggest revisions of statements and additions which should be made.

The second panel consisted of seven men and eight women from eight institutions of higher learning and one governmental agency; two of the group were retired. They were all known to believe in democratic principles of administration. Each of the panel members had had experience as staff members in institutions of higher learning and the women, in addition, were home economists. Twelve of the group had had administrative experience and seven had been employed at some time in a land-grant institution. A further consideration in the selection of this group was avoidance of persons who might later be drawn in the sample to respond to the questionnaire as staff members of land-grant institutions. After receiving replies from the panel members further refinement of the statements of functions and qualifications was made.

¹For a list of second panel members see the Appendix, page 226.

Development of the Questionnaire¹

The two sets of statements formed the basis for a questionnaire to obtain the beliefs of home economics staff members and a selected group of administrators in land-grant institutions regarding the functions and qualifications of the home economics administrator in such an institution.

One section of the questionnaire was devised to secure beliefs regarding the soundness of each of the proposed functions with opportunity to indicate one of three degrees of soundness: sound, partly sound or unsound. Many of the statements had subdivisions in which case provision was made for judging each subdivision separately. The directions asked the respondent to indicate as "partly sound" any single statement or subdivision of a statement when only a portion of it was judged sound. If the entire statement or subdivision was considered unsound, it was to be checked "unsound"; likewise if the entire statement or subdivision was considered sound, it was to be checked "sound."

During the preparation of the questionnaire the need for clarification of terms became evident. Consequently definitions of "department," "staff," "students," "leadership" and "machinery" were included in this section to give some degree of uniformity to the concept of these terms.

¹For a copy of the questionnaire see the Appendix, pages 235-241.

For the section of the questionnaire pertaining to qualifications of the administrator, an attempt was made to obtain consideration of the entire character of the individual in addition to those specific characteristics that might tend to help or hinder an individual in administering a home economics department effectively. Since it is difficult to think of administrative characteristics in the abstract and since it was desirable to secure consideration of a group rather than single characteristics, departmental situations in three land-grant institutions were described using as a guide a publication of the United States Office of Education.¹ Some adjustments were made in figures and vocations, for which preparation was offered, to increase the distinctiveness of the three situations. Data were given concerning the size of the department, its program of work, including the extent of the graduate program, and its place in the administrative organization of the institution.

Data concerning the qualities of five candidates supposedly available for these three departmental situations were listed: training and experience, personal and professional qualities and administrative abilities. The statements of qualifications previously formulated were used as the basis for these descriptions. To force the respondents to be dis-

¹U. S. Office of Education. Division of Vocational Education. Home economics in degree-granting institutions. U. S. Office of Educ. Misc., 2557. Wash., D. C. Rev. 1952.

criminative, one of the five candidates was described as possessing a small degree of a quality, one or two of the candidates were made to possess the quality to a moderate degree and the remaining candidates to possess the quality to a high degree. Hence, among the five candidates there was a range from low to high in the degree to which each quality was possessed. Since most individuals do not possess all the qualities desirable in an administrator, an attempt was made to distribute the degree to which qualities were possessed among the five candidates so they would be characterized as nearly as possible like persons with whom the respondents might come in contact.

The respondents were asked to select a candidate to fill each of the three positions and also to indicate the five characteristics for each candidate which they believed would help and the five characteristics that would hinder the candidate in administering effectively the home economics department in a land-grant institution. The investigator was more interested in the characteristics checked for each candidate than which candidates were selected for the positions described. It was hoped that the use of such a device would result in a cluster of characteristics considered desirable for administrators.

Before having the questionnaire printed, it was pre-tested using five men and women on the staff at the Iowa

State College who were not included in the sample drawn. This group was asked to record the amount of time necessary to fill out the questionnaire, indicate if the directions for filling it out were clear and judge whether the cover letter would arouse their interest sufficiently to cause them to cooperate in responding to the questionnaire.

Selection of Recipients for Questionnaire

The beliefs concerning the functions and qualifications of home economics administrators in land-grant institutions were desired of certain administrators and of those individuals who work directly with home economics administrators: home economics staff members who were teachers, research or extension workers. Those administrators were selected who would probably have most reason to be familiar with the responsibilities of the home economics administrator: president, dean of agriculture, director or associate director of the experiment station, director or associate director of the agricultural extension service, dean of the graduate school, state leader of home demonstration work and head of the home economics unit in each of the 42 institutions. Two hundred and eighty-six individuals composed this administrative group.

The home economics staff members in the 42 institutions consisted of 156 professors, 235 associate professors, 313

assistant professors, 322 instructors and 443 extension workers. Since several of these groups were large a sample was drawn. To obtain accurate lists for drawing the sample and mailing the questionnaires, lists of administrative personnel and home economics staff members were compiled from a recent United States Department of Agriculture publication¹ and sent to the head of home economics in each of the 42 land-grant institutions asking that the list be corrected and returned.

Using a table of random numbers, 100 individuals were drawn from each of the four academic ranks after the names had been listed alphabetically by institutions and numbered consecutively. In addition 100 staff members participating in home economics extension work were drawn in a like manner, making a total of 500 staff members in the sample. Extension workers were sampled as a separate group because all institutions do not assign academic rank to this group. The number 100 was arbitrarily chosen since the smallest group was composed of 156 professors. Using the same number from each rank weights the percentage of respondents to those individuals having more experience and training. This resulted in the extension group being represented by the smallest

¹Lulu B. Thorne. Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations. U. S. Dept. Agr., Agr. Res. Adm., Off. of Exp. Sta. Agr. Handbook No. 35. 1951.

proportion in the sample drawn but this group also works less closely with the head of the home economics department than do resident staff members.

Procurement of Responses

A cover letter was prepared to accompany the questionnaire explaining the purpose of the study and asking participation in it. A second letter¹ written by an administrator at the Iowa State College was also included with each questionnaire explaining that the study was being undertaken in partial fulfillment of the requirements for the Ph.D. degree and pointing out the value of such a study to land-grant institutions as they search for qualified persons to take administrative positions. The President of Iowa State College wrote a letter which was enclosed with the questionnaires sent to the presidents of the other 41 institutions. The letter from the Dean of Home Economics was sent to other heads of home economics as well as all resident staff members. The deans of agriculture, directors of experiment stations, directors of extension and deans of graduate schools received a letter written by the Dean of Agriculture. The Assistant Director of Extension for Home Economics prepared the letter which went to the state leaders of home

¹For copies of the letters accompanying the questionnaire see the Appendix, pages 228-231.

demonstration work and other home economics extension staff members.

The 786 questionnaires were mailed March 1, 1953, with the request that they be returned, in the self-addressed stamped envelope which was enclosed, by March 10, if possible. The first follow-up postcard¹ was sent to non-respondents on March 15 and the second card on March 25 to the remaining non-respondents.

Collection and Treatment of Data

Before the first follow-up card presumably reached the respondents, 282 questionnaires or 36 per cent had been returned. Before the second card should have been received, an additional 138 individuals or 17 per cent had returned the questionnaires. The second follow-up card brought 94 responses of 12 per cent making the total number of questionnaires returned 514 or 65 per cent. In addition to these respondents 70 individuals returned the questionnaire unanswered or indicated by letter they could not complete it. The most frequent reasons given for refusal were pressure of work and a feeling of inadequacy in experience or training to react satisfactorily to statements in the questionnaire.

The data in Table 1 indicate the extent of the response

¹For copies of the follow-up cards see the Appendix, page 232.

of the various groups to whom the questionnaires were sent. It will be noted that in some of the administrative groups the number of questionnaires sent did not total 42. This variation occurred because in certain of the institutions vacancies in positions, leaves of absence or combinations of duties reduced the number of persons available.

Table 1. Return of Questionnaires Concerning Proposed Functions and Qualifications of the Home Economics Administrator in Land-Grant Institutions by Administrators, Home Economics and Extension Staff Members

Groups	Questionnaires		
	No. sent	No. returned	% returned
Administrators			
Presidents	42	19	45.2
Head of home economics	40	33	82.5
Home demonstration agent leader	40	29	72.5
Dean of agriculture	41	27	65.9
Director of experiment station	40	27	67.5
Director of extension	41	21	51.2
Dean of graduate school	42	18	42.9
Total	286	174	60.2
Resident staff members			
Professors	100	70	70.0
Associate professors	100	69	69.0
Assistant professors	100	68	68.0
Instructors	100	69	69.0
Total	400	276	69.0
Extension staff members	100	64	64.0
Grand total	786	514	65.4

Of the administrative groups the largest percentages of response were from the heads of the home economics departments and the home demonstration agent leaders. In only two groups, presidents and deans of the graduate schools, were the returns less than 50 per cent. One of the 15 panel mem-

bers to whom the final questionnaire was sent did not respond because he believed his knowledge of the field of home economics was inadequate.

Treatment of the data consisted chiefly of determining the percentages of persons indicating each degree of soundness of the proposed functions and selecting a particular candidate for each of the three situations described. Since the data were secured on two different bases, a population and a sample of a population, no further statistical treatment was feasible. The study was planned to survey beliefs of selected groups of individuals in a particular type of institution rather than to make predictions for a larger population. Responses of the resident staff group, by academic ranks, and extension staff might have been analyzed further to discover if they were statistically significant. However, these analyses were not made to prevent increasing the scope of the study unduly.

Data concerning the importance of qualifications of the five candidates were summarized by determining the number of responses which indicated the described quality of the particular candidate as a help in administration; likewise the qualities believed a hindrance were summarized for each candidate. Such a procedure made it possible to compare the number of responses of the administrators, resident and

extension staff members and panel members indicating the helpfulness or hindrance of the 28 qualities of all candidates.

Two individuals who responded to the section of the questionnaire concerning functions did not reply to the section on qualifications. In addition 86 did not follow the directions on this portion of the questionnaire and checked more than five qualities considered a help and a hindrance to candidates. The reactions of these individuals to the qualifications were summarized separately. However, 50 per cent or more of the respondents in the administrative, resident and extension staff groups and all but two of the panel members followed directions.

FINDINGS

The findings concerning beliefs of home economics staff members and a selected group of administrators in land-grant institutions in regard to the proposed functions and qualifications of the home economics administrator in such institutions will be presented in three sections: functions, selection of candidates for three institutional situations and qualifications of candidates.

Functions of the Home Economics Administrator

The beliefs of faculty regarding functions of the home economics administrator in land-grant institutions have been divided into seven groups: leadership, staff selection and orientation, staff responsibilities, staff growth and welfare, students and alumnae, institutional activities and intra-institutional activities. No classification of the functions was found that would result in mutually exclusive groups, since there is overlapping in these areas of administration.

In replying to the questionnaire several respondents made general comments concerning their beliefs. In some cases individuals checked the functions partly sound because

they believed the functions could be done by other persons, were not important or were not feasible. One respondent judged as unsound those functions she believed should be delegated to other individuals. Such statements helped the writer in placing the responses in the proper categories. "In the 'right hands' wouldn't they all be sound?" was a question written on one questionnaire. All comments aided the writer to some extent in interpreting replies and analyzing the data.

Leadership functions

The term leadership has been variously defined but in this study it is concerned primarily with the initiation and implementation of cooperative action and thought. Such a concept requires frequent interaction between the leader and other members of a group. The leadership passes from one group member to another and decisions concerning action are arrived at through group processes. Coercion and force have no place in this conception of leadership.

The home economics administrator in land-grant institutions has an ascribed leadership status due to title and position and to the assignment of duties to that position by institutional authorities. Some leadership functions delegated to the administrator may be performed directly, others may be performed indirectly through the group as a

whole, by committees or individuals to whom responsibility and authority have been delegated.

In making the judgments requested in the questionnaire the definition of leadership was important to the interpretation of the statements of functions. Failure of respondents to read the definition or to read it carefully probably caused some individuals to misinterpret the statements and resulted in responses which may not reflect the true beliefs of respondents.

In general, considerable agreement among extension staff, resident staff and administrators that all of the proposed leadership functions were sound will be noted from the data presented in Table 2. Agreement was even greater when those individuals judging the functions partly sound were added to those judging them to be sound. Less than 5 per cent of the entire group believed any one of these functions was entirely unsound. Relatively few persons failed to react to the soundness of these functions.

The leadership function considered sound most commonly, 97 per cent of the staff members and administrators and 100 per cent of the panel, was that the home economics administrator help the general administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution. When to this group is added the number

Table 2. Beliefs of Administrators, Resident and
Members Concerning the Proposed Administration

Function		Administrators	
		No.	%
Assumes leadership in:			
Formulating departmental goals (both general educational and professional) that are sound	Sound	158	91.3
	Partly sound	14	8.1
	Unsound	1	.6
	No response	1	
Seeing that these goals are consistent with the institutional goals	Sound	158	91.3
	Partly sound	15	8.7
	Unsound		
	No response	1	
Developing and evaluating the departmental curriculum (curricula)	Sound	137	79.2
	Partly sound	33	19.1
	Unsound	3	1.7
	No response	1	
Helping the staff improve the quality of teaching	Sound	148	85.5
	Partly sound	24	13.9
	Unsound	1	.6
	No response	1	
Helping the staff to build an educational philosophy and to scrutinize and revise it, as needed	Sound	140	81.9
	Partly sound	28	16.4
	Unsound	3	1.7
	No response	3	
Helping the staff develop an awareness that one of its major goals is the development and general welfare of the students	Sound	140	81.4
	Partly sound	31	18.0
	Unsound	1	.6
	No response	2	
Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living	Sound	124	72.1
	Partly sound	40	23.3
	Unsound	8	4.6
	No response	2	
Stimulating staff to participate effectively in general institutional activities	Sound	121	70.3
	Partly sound	46	26.7
	Unsound	5	3.0
	No response	2	

Administrators, Resident and Extension Staff Members and Panel
 during the Proposed Administrative Functions: Leadership

Administrators		Resident staff		Extension staff		Total		Panel	
No.	%	No.	%	No.	%	No.	%	No.	%
158	91.3	221	81.2	53	82.8	432	84.9	14	100.0
14	8.1	48	17.7	10	15.6	72	14.2		
1	.6	3	1.1	1	1.6	5	.9		
1		4				5			
158	91.3	216	79.7	53	84.1	427	84.2	10	71.4
15	8.7	54	19.9	10	15.9	79	15.6	4	28.6
		1	.4			1	.2		
1		5		1		7			
137	79.2	168	62.5	44	68.7	349	69.0	12	85.7
33	19.1	92	34.2	19	29.7	144	28.5	2	14.3
3	1.7	9	3.3	1	1.6	13	2.5		
1		7				8			
148	85.5	183	67.8	47	73.5	378	74.6	11	78.6
24	13.9	74	27.4	15	23.4	113	22.3	3	21.4
1	.6	13	4.8	2	3.1	16	3.1		
1		6				7			
140	81.9	208	77.0	50	78.1	398	78.8	13	92.9
28	16.4	57	21.1	12	18.8	97	19.2	1	7.1
3	1.7	5	1.9	2	3.1	10	2.0		
3		6				9			
140	81.4	233	86.3	54	84.4	427	84.5	14	100.0
31	18.0	35	13.0	7	10.9	73	14.4		
1	.6	2	.7	3	4.7	6	1.1		
2		6				8			
124	72.1	197	72.7	50	78.1	371	73.2	13	92.9
40	23.3	61	22.5	11	17.2	112	22.1	1	7.1
8	4.6	13	4.8	3	4.7	24	4.7		
2		5				7			
121	70.3	159	58.9	39	60.9	319	63.0	11	78.6
46	26.7	94	34.8	24	37.5	164	32.5	3	21.4
5	3.0	17	6.3	1	1.6	23	4.5		
2		6				8			

Table 2 (Continued)

Function		Administrators		Resid
		No.	%	No.
Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution	Sound	171	98.8	259
	Partly sound	2	1.2	14
	Unsound			
	No response	1		3
Exercises leadership in providing conditions by which students may be helped to evaluate:				
	Their own development			
	Sound	140	80.9	199
	Partly sound	33	19.1	66
	Unsound			5
	No response	1		6
The extent to which the curriculum meets their needs	Sound	125	72.2	196
	Partly sound	47	27.2	65
	Unsound	1	.6	9
	No response	1		6

Table 2 (Continued)

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
	171	98.8	259	94.9	63	98.4	493	97.4	14	100.0
nd	2	1.2	14	5.1	1	1.6	17	2.6		
a	1		3				4			
	140	80.9	199	73.7	54	84.4	393	77.5	14	100.0
nd	33	19.1	66	24.4	8	12.5	107	21.1		
a	1		5	1.9	2	3.1	7	1.4		
			6				7			
	125	72.2	196	72.6	49	76.6	370	73.0	13	92.9
nd	47	27.2	65	24.1	14	21.9	126	24.8	1	7.1
a	1	.6	9	3.3	1	1.5	11	2.2		
	1		6				7			

of persons who considered this function partly sound, there is complete agreement on the validity of the function.

The panel agreed unanimously that four of the 11 functions were sound. With the exception of three statements the panel judged the functions as sound more often than other respondents and no panel member believed a function entirely unsound. These findings might be expected as the panel members were selected because they subscribed to the democratic principles of administration upon which the functions were based. Also the panel had reacted previously to tentative statements of the functions. The leadership function which pertained to seeing that there was a consistency of departmental with institutional goals was judged sound by fewer of the panel than any other function. Two of the four panel members who believed this function partly sound were home economists and two were general administrators in a university system.

The function considered sound by the smallest number of respondents in each group, except the panel, pertained to the assumption of leadership by the administrator in stimulating the staff¹ to participate effectively in general institutional activities. Slightly less than two thirds of

¹Staff unless otherwise indicated refers to the professional personnel employed in the department part of full-time. (Non-professional staff includes secretaries, custodians and service employees.)

all respondents believed this function entirely sound, whereas almost one third of the respondents indicated the belief that the function was partly sound. Two individuals questioned the wording of the statement. One wrote: "Stimulation by administrators can be excessive therefore I tend to rate stimulate as partly sound." The other respondent commented:

Many of the circled 3's [unsound] are because I thoroughly believe that it is not the function of an administrator to "encourage," "stimulate," "help" or "recommend" to staff to fall in line with what the administrator has already thought through and thinks best. This implies that the administrator does not believe in the democratic process.

When the percentages of the groups which considered these functions sound were noted, it was found that they ranged from 70 to 99, 59 to 95 and 61 to 98 for the administrative, resident and extension staff groups respectively. Stimulating the staff to participate effectively in general institutional activities was least frequently approved and helping the general institutional administrator develop and maintain a sound understanding of home economics was most frequently approved. One administrator commented that the word "stimulating" sounded as though staff members were being coerced. Perhaps other individuals shared this viewpoint. Another respondent suggested that time and strength placed limitations on participation in general institutional ac-

tivities. One person added the remark that staff members considered themselves overworked and wished to add no more activities.

Only about 72 per cent of the administrators judged as sound the function of helping staff be constantly aware that a major goal is strengthening family living. Perhaps the statement of this function should be broadened to include administrators since some of the administrators who responded were unwilling to accept this function as sound.

Better family living has been basic to home economics since its inception as evidenced in the creed set forth in 1903 by the founder of the home economics movement, Mrs. Ellen H. Richards.

HOME ECONOMICS STANDS FOR

The ideal home life for today unhampered by the traditions of the past.

The utilization of all the resources of modern science to improve the home life.

The freedom of the home from the dominance of things and their due subordination to ideals.

The simplicity in material surroundings which will most free the spirit for the more important and permanent interest of the home and of society.¹

The Committee for Evaluating College Home Economics programs stated in the introduction to its report:

¹Keturah E. Baldwin. The home economics saga. Washington, D. C. American Home Economics Assoc. 1949. p. 17.

In fact, home economics has the unique distinction of using home and family life as its central theme.¹

Further emphasis was given to the importance of family life education for all students when the President's Commission on Higher Education recommended as one of the 11 goals of general education:

To acquire the knowledge and attitudes basic to a satisfying family life.²

A second function accepted as sound by approximately 72 per cent of the administrative group pertained to helping students evaluate the extent to which the curriculum meets their needs. One administrator indicated:

This matter of "meeting needs" is difficult to define. Do we have criteria for determining definite needs? Also ways of meeting them? Some may be easy to identify, others may not.

Perhaps others who did not believe this function sound shared the thinking expressed by this individual. However, the responsibility of helping students to evaluate the curriculum in relation to their needs is not lessened because desirable techniques may not be at hand for such appraisal and administrators should aid in providing conditions for effective evaluation.

¹Ivot Spafford, (ed.). Home economics and higher education. Washington, D. C. American Home Economics Assoc. 1949. p. xiv.

²Report of the President's Commission on Higher Education. Higher education for American democracy. Vol. I. Establishing the goals. New York, Harper & Bros. 1947. p. 56.

Only about two thirds of the resident staff members judged as sound the functions pertaining to the departmental curriculum and improvement of teaching. Comments by staff members indicated a feeling that democratic procedures were being overlooked in developing the curriculum and improving teaching. Several added comments that it was their belief the staff should develop the curriculum independently or should share in this function which suggests that some did not read the definition of leadership on the questionnaire or misinterpreted it. The Committee for Evaluating College Home Economics programs, composed of leaders in the home economics profession, made this statement in its report:

The major responsibility for curriculum building should rest with the staff, but the administrative head must pave the way for them to function in this area and to take leadership in developing a plan of action. She may need to help the staff approach curriculum planning from a broad viewpoint and to reconcile differences in points of view for the best interests of the entire department and the students. She has the further responsibility of setting up the machinery by which approved changes are incorporated into the program.

Responsibility for leadership in curriculum building involves stimulating staff members to be alert to the needs and interests of students; encouraging staff members to develop and put into operation such courses and curricula as are necessary to achieve the purposes of the department; developing an appropriate appraisal program; and cultivating an interest in thorough staff study of problems relating to curriculum and teaching.¹

¹Spafford, op. cit., p. 128.

About three fourths of the extension group approved as sound all of the leadership functions except two: developing and evaluating the departmental curriculum and stimulating the staff to participate in general institutional activities.

When the acceptances of functions by the four groups of respondents in Table 2 were compared, it was noted that in most cases at least 10 per cent more of the administrative than of the resident and extension groups judged five functions as sound. Since these functions deal with establishing goals, developing and evaluating the curricula of the department and institution and participating in general institutional activities, it might be expected that administrators would more commonly believe that these functions require leadership on the part of the administrator. In all except two functions the resident staff group was lowest in judging the functions sound although the differences in some instances were very slight.

The least variation among the administrative, extension and resident staff groups occurred in acceptance of these three functions:

Assumes leadership in helping the staff to build an educational philosophy and to scrutinize and revise it as needed.

Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution.

Exercises leadership in providing conditions by which students may be helped to evaluate the extent to which the curriculum meets their needs.

To secure a more detailed picture of the beliefs of groups of respondents regarding the soundness of the administrative leadership functions in home economics within land-grant institutions, Tables 3 and 4 were compiled. In Table 3 the judgments of resident staff members are presented according to academic rank.

Most frequently approval was given by the respondents within each academic group to the statement which concerns the head of home economics helping the general institutional administrator develop and maintain a sound understanding of the field of home economics; the percentages ranged from 93 to 99. The statement involving the administrator assuming leadership in the development and evaluation of the departmental curriculum was least acceptable of the 11 statements to the groups of professors and assistant professors. One respondent commented that the extent of leadership to be assumed in this function was not clear. Perhaps a closer scrutiny of the definition of leadership would have helped this respondent and others to understand the extent of leadership intended. The assistant professors and instructors least frequently approved the function relating to the assumption of leadership by the administrator in stimulating the

Table 3. Beliefs of Resident Staff Members, by the Proposed Administrative Function

Function		Professors		Associate profess	
		No.	%	No.	%
Assumes leadership in:					
Formulating departmental goals (both general educational and professional) that are sound	Sound	56	82.4	54	78.3
	Partly sound	12	17.6	13	18.8
	Unsound			2	2.9
	No response	2			
Seeing that these goals are consistent with the institutional goals	Sound	49	72.0	57	82.6
	Partly sound	18	26.5	12	17.4
	Unsound	1	1.5		
	No response	2			
Developing and evaluating the departmental curriculum (curricula)	Sound	42	61.8	38	55.9
	Partly sound	24	35.3	26	38.2
	Unsound	2	2.9	4	5.9
	No response	2		1	
Helping the staff improve the quality of teaching	Sound	51	72.9	47	71.2
	Partly sound	17	24.3	15	22.7
	Unsound	2	2.8	4	6.1
	No response			3	
Helping the staff to build an educational philosophy and to scrutinize and revise it, as needed	Sound	60	85.7	55	80.9
	Partly sound	8	11.4	13	19.1
	Unsound	2	2.9		
	No response			1	
Helping the staff develop an awareness that one of its major goals is the development and welfare of the students	Sound	60	85.7	58	86.6
	Partly sound	9	12.9	9	13.4
	Unsound	1	1.4		
	No response			2	
Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living	Sound	54	77.1	49	72.1
	Partly sound	13	18.6	14	20.6
	Unsound	3	4.3	5	7.3
	No response			1	
Stimulating staff to participate effectively in general institutional activities	Sound	49	70.0	41	61.2
	Partly sound	15	21.4	20	29.8
	Unsound	6	8.6	6	9.0
	No response			2	

s of Resident Staff Members, by Academic Rank, Concerning
Proposed Administrative Functions: Leadership

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
56	82.4	54	78.3	58	86.6	53	77.9	221	81.3
12	17.6	13	18.8	9	13.4	14	20.6	48	17.6
		2	2.9			1	1.5	3	1.1
2				1		1		4	
49	72.0	57	82.6	58	87.9	52	76.5	216	79.6
18	26.5	12	17.4	8	12.1	16	23.5	54	20.0
1	1.5							1	.4
2				2		1		5	
42	61.8	38	55.9	44	65.7	44	66.7	168	62.5
24	35.3	26	38.2	22	32.8	20	30.3	92	34.2
2	2.9	4	5.9	1	1.5	2	3.0	9	3.3
2		1		1		3		7	
51	72.9	47	71.2	47	70.1	38	56.7	183	67.8
17	24.3	15	22.7	18	26.9	24	35.8	74	27.4
2	2.8	4	6.1	2	3.0	5	7.5	13	4.8
		3		1		2		6	
60	85.7	55	80.9	55	83.3	38	57.6	208	77.0
8	11.4	13	19.1	9	13.7	27	40.9	57	21.1
2	2.9			2	3.0	1	1.5	5	1.9
		1		2		3		6	
60	85.7	58	86.6	60	90.9	55	82.1	233	86.3
9	12.9	9	13.4	6	9.1	11	16.4	35	13.0
1	1.4					1	1.5	2	.7
		2		2		2		6	
54	77.1	49	72.1	53	80.3	41	61.2	197	72.7
13	18.6	14	20.6	9	13.6	25	37.3	61	22.5
3	4.3	5	7.3	4	6.1	1	1.5	13	4.8
		1		2		2		5	
49	70.0	41	61.2	37	55.2	32	48.5	159	58.9
15	21.4	20	29.8	27	40.3	32	48.5	94	34.8
6	8.6	6	9.0	3	4.5	2	3.0	17	6.3
		2		1		3		6	

Table 3 (Continued)

Function		Professors		Associat
		No.	%	No.
Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution	Sound	69	98.6	63
	Partly sound	1	1.4	4
	Unsound			
	No response			2
Exercises leadership in providing conditions by which students may be helped to evaluate:				
	Their own development			
	Sound	51	73.9	51
	Partly sound	14	20.3	16
	Unsound	4	5.8	
	No response	1		2
The extent to which the curriculum meets their needs	Sound	48	69.6	45
	Partly sound	16	23.2	19
	Unsound	5	7.2	3
	No response	1		2

Table 3 (Continued)

	Professors		Associate professors		Assistant professors		Instructors		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
	69	98.6	63	94.0	64	94.1	63	92.6	259	94.9
und	1	1.4	4	6.0	4	5.9	5	7.4	14	5.1
se			2				1		3	
	51	73.9	51	76.1	55	80.9	42	63.6	199	73.7
und	14	20.3	16	23.9	12	17.6	24	36.4	66	24.4
se	4	5.8			1	1.5			5	1.9
	1		2				3		6	
	48	69.6	45	67.2	57	83.8	46	69.7	196	72.6
und	16	23.2	19	28.4	11	16.2	19	28.8	65	24.1
se	5	7.2	3	4.4			1	1.5	9	3.3
	1		2				3		6	

staff to participate effectively in general institutional activities. Data in Table 3 revealed that the instructors judged seven of the 11 functions completely sound less frequently than the other three groups by one to 13 per cent. Acceptance of leadership functions may require a maturity of viewpoint which these instructors had not yet acquired. They may have felt less secure in their positions and reflected these feelings in judging the functions.

In Table 4 are presented the judgments of the various administrative groups who reacted to the soundness of the leadership functions of the home economics administrator in land-grant institutions. All but two of the 173 administrators approved the leadership role of helping the general institutional administrator to develop and maintain a sound understanding of the field of home economics. The function least frequently approved varied somewhat from group to group but two functions tended to be accepted least frequently: that concerned with helping the staff keep constantly in mind that one of its major goals is the strengthening of family living and stimulating the staff to participate effectively in general institutional activities.

All of the leadership functions were accepted as sound by 76 per cent or more of the home economics administrative group. Responses of the home economics administrators and presidents agreed rather closely except on one function.

Table 4. Beliefs of Selected Groups of Administrative Functionaries

Function		President		Head of home economics		demo
		No.	%	No.	%	agen No.
Assumes leadership in:						
Formulating departmental goals (both general educational and professional) that are sound	Sound	17	94.4	29	87.9	25
	Partly sound	1	5.6	4	12.1	4
	Unsound					
	No response	1				
Seeing that these goals are consistent with the institutional goals	Sound	16	88.9	30	90.9	27
	Partly sound	2	11.1	3	9.1	2
	Unsound					
	No response	1				
Developing and evaluating the departmental curriculum (curricula)	Sound	14	77.8	25	75.8	24
	Partly sound	4	22.2	8	24.2	4
	Unsound					1
	No response	1				
Helping the staff improve the quality of teaching	Sound	16	88.9	27	81.8	26
	Partly sound	2	11.1	6	18.2	2
	Unsound					1
	No response	1				
Helping the staff to build an educational philosophy and to scrutinize and revise it, as needed	Sound	14	82.3	28	84.9	26
	Partly sound	2	11.8	5	15.1	2
	Unsound	1	5.9			
	No response	2				1
Helping the staff develop an awareness that one of its major goals is the development and general welfare of the students	Sound	15	83.3	29	87.9	25
	Partly sound	3	16.7	3	9.1	3
	Unsound			1	3.0	
	No response	1				1
Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living	Sound	12	66.7	30	90.9	24
	Partly sound	4	22.2	2	6.1	4
	Unsound	2	11.1	1	3.0	
	No response	1				1
Stimulating staff to participate effectively in general institutional activities	Sound	14	77.8	27	81.8	22
	Partly sound	4	22.2	6	18.2	7
	Unsound					
	No response	1				

Table 4 (Continued)

Function		President		Head of home economics		Head of demonstration agent
		No.	%	No.	%	No.
Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution	Sound	19	100.0	33	100.0	28
	Partly sound					1
	Unsound					
	No response					
Exercises leadership in providing conditions by which students may be helped to evaluate:						
	Their own development					
	Sound	17	89.5	28	87.5	26
	Partly sound	2	10.5	4	12.5	3
	Unsound					
	No response			1		
The extent to which the curriculum meets their needs	Sound	15	79.0	25	78.1	25
	Partly sound	4	21.0	7	21.9	3
	Unsound					1
	No response			1		

Twenty-four per cent more of the home economists than presidents believed it a sound function to help the staff keep constantly in mind that one of its major goals is the strengthening of family living. Such a response from the presidents might indicate to home economics administrators a rather urgent need for some of them to help the presidents develop a sound understanding of home economics and its purposes.

Variance in the acceptances of functions by the home economics administrators and home demonstration agent leaders was never greater than 8 per cent.

Eight of the 11 functions were approved least frequently by the deans of graduate schools. Most of these functions deal with philosophy of education, teaching and evaluation. Since this group of administrators is most concerned with graduate work and research, perhaps they have given less thought to these aspects of the educational program. Woodburne,¹ after studying the faculty personnel policies of 46 institutions of higher learning, indicated his belief that finding new knowledge was second in importance to the education of leaders.

Since the home economics administrator works closely with the resident staff a comparison of their beliefs regarding the leadership functions of the head of the department might be expected to have important implications. The acceptance of the various functions was similar in the two

¹Woodburne, op. cit., p. 11.

groups except that 18 and 23 per cent more of the administrators than resident staff members approved two functions. These related to the administrator helping the staff keep constantly in mind that one of its major goals is the strengthening of family living and stimulating the staff to participate effectively in general institutional activities. Perhaps this indicates where the administrator needs to work with staff members to help them broaden their vision of home economics and their relationships within the institution.

Functions concerning staff selection and orientation

A problem which faces most administrators annually is that of selecting staff members and subsequently orienting them to departmental and institutional practices, policies and purposes. Each of the six proposed functions of the home economics administrator in land-grant institutions regarding this problem were accepted wholly or in part by no less than 489 of the 514 administrators, extension and resident staff members and 14 of the panel members.

Approximately 90 per cent of all of the total respondents, administrators, resident and extension staff members, as shown in Table 5, accepted these three functions as sound:

Makes provision for

Applicants for staff positions being informed of the philosophy of the institution and department.

Table 5. Beliefs of Administrators, Resident and
Concerning the Proposed Administrative Functions

Function		Administrators		Res
		No.	%	
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning recommendation of individuals for appointment to the staff	Sound	116	67.0	
	Partly sound	50	29.0	
	Unsound	7	4.0	
	No response	1		
Promotes work of the department by recommending for selection, administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area	Sound	133	78.2	
	Partly sound	35	20.6	
	Unsound	2	1.2	
	No response	4		
Makes provision for:				
Applicants for staff positions being informed of the philosophy of the institution and department	Sound	158	91.3	
	Partly sound	15	8.7	
	Unsound			
	No response	1		
Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance, pensions, etc.	Sound	156	90.2	
	Partly sound	11	6.4	
	Unsound	6	3.4	
	No response	1		
Newly appointed staff members being helped to understand the operational details of the institution and department necessary for effective work	Sound	153	88.9	
	Partly sound	18	10.5	
	Unsound	1	.6	
	No response	2		
Staff having a clear knowledge of departmental and institutional policies	Sound	158	91.3	
	Partly sound	15	8.7	
	Unsound			
	No response	1		

Administrators, Resident and Extension Staff Members and Panel Members
 Proposed Administrative Functions: Staff Selection and Orientation

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
ound	116	67.0	176	64.2	45	70.3	337	66.0	14	100.0
	50	29.0	85	31.0	17	26.6	152	29.7		
	7	4.0	13	4.8	2	3.1	22	4.3		
	1		2				3			
ound	133	78.2	196	72.3	47	75.8	376	74.7	12	85.7
	35	20.6	65	24.0	14	22.6	114	22.7	2	14.3
	2	1.2	10	3.7	1	1.6	13	2.6		
	4		5		2		11			
ound	158	91.3	245	89.1	57	90.5	460	90.0	14	100.0
	15	8.7	29	10.5	5	7.9	49	9.6		
			1	.4	1	1.6	2	.4		
	1		1		1		3			
ound	156	90.2	237	86.2	60	95.2	453	88.6	12	85.7
	11	6.4	34	12.4	2	3.2	47	9.2	2	14.3
	6	3.4	4	1.4	1	1.6	11	2.2		
	1		1		1		3			
ound	153	88.9	225	81.8	53	84.1	431	84.5	14	100.0
	18	10.5	38	13.8	9	14.3	65	12.8		
	1	.6	12	4.4	1	1.6	14	2.7		
	2		1		1		4			
ound	158	91.3	245	89.1	57	90.5	460	90.0	14	100.0
	15	8.7	28	10.2	5	7.9	48	9.4		
			2	.7	1	1.6	3	.6		
	1		1		1		3			

Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance and pensions.

Staff having a clear knowledge of departmental and institutional policies.

Least frequently approved by all groups, except the panel, was the statement that the home economics administrator should take final responsibility for, but create machinery through which staff members may participate in, decisions concerning recommendations of individuals for appointment to the staff. Machinery was defined in a footnote on the questionnaire as some scheme of representation such as a committee or council to channel staff thinking. Of the total group two thirds judged this function wholly sound but fewer than 5 per cent rejected it entirely.

One respondent commented on the returned questionnaire: "Departments take major responsibility for choice of staff members. Administrative personnel selected by the dean." This is interpreted to mean that the faculty of the subject matter units in the department should assume the responsibility for selecting staff members within that area and heads of such units would be selected by the home economics administrator. According to the intent of the statement the latter procedure would be a violation of democratic principles. Another comment indicated the belief that temporary or part-time staff members might not have an adequate background to participate in selection of staff members.

An example of democratic participation of staff in this aspect of administration was reported by a group of faculty members of the College of Education at Ohio State University.

In no area of departmental concern do democratic procedures operate more effectively than in the selection of staff members. This is true of all appointments from graduate assistants to department chairmen.¹

Democratic procedures to these faculty members meant participation in decisions to determine policies, plans and procedures of those who would be affected by such decisions. Several techniques for staff participation were indicated in the practices at Ohio State University. In one department the chairman appointed a personnel committee which reviewed the credentials of applicants and rated them using a device developed by the department. The entire staff then reviewed and discussed the ratings before a formal vote was taken. In another department the entire staff developed criteria which should be met by the person to be selected. Names of individuals were then proposed by the staff members and through group discussions the list was reduced. A final sifting committee secured additional information concerning the candidates and presented the names of two candidates to the staff members for selection.

All the members of the panel accepted four of the six functions as sound, but only 12 of the 14 members judged

¹Klein and others. op. cit., p. 265.

those functions entirely sound which relate to selecting subject matter heads on the basis of overall interest in home economics in addition to leadership qualifications in the subject matter area, and applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance and pensions. The two members not accepting these gave no reasons for their judgments.

The beliefs of the resident staff, classified by professional rank, concerning functions related to staff selection and orientation, were compiled in Table 6. When the data within each group were compared it was noted that the professors, associate professors, assistant professors and instructors supported to the least extent the function which related to the administrator creating machinery through which staff members could participate in decisions concerning appointments to the staff. The function most frequently endorsed, ninety-three per cent, as entirely sound by the associate and assistant professors was the one stating that the staff should have a clear knowledge of departmental and institutional policies. Greatest acceptance by the professors was of the function regarding applicants for staff positions being informed of arrangements that affect their welfare. Instructors gave highest approval to still another function, informing staff applicants of the philosophy of the institution and department.

Table 6. Beliefs of Resident Staff Members, by Administrative Functions: Staff S

Function		Professors		Associa	
		No.	%	No.	
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning recommendation of individuals for appointment to the staff	Sound	53	75.7	43	
	Partly sound	15	21.4	22	
	Unsound	2	2.9	4	
	No response				
Promotes work of the department by recommending for selection, administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area	Sound	52	75.4	45	
	Partly sound	14	20.3	19	
	Unsound	3	4.3	2	
	No response	1		3	
Makes provision for:					
	Applicants for staff positions being informed of the philosophy of the institution and department	Sound	62	88.6	62
		Partly sound	8	11.4	7
		Unsound			
No response					
Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance, pensions, etc.	Sound	64	91.4	59	
	Partly sound	6	8.6	7	
	Unsound			3	
	No response				
Newly appointed staff members being helped to understand the operational details of the institution and department necessary for effective work	Sound	56	80.0	59	
	Partly sound	12	17.1	5	
	Unsound	2	2.9	5	
	No response				
Staff having a clear knowledge of departmental and institutional policies	Sound	61	87.1	64	
	Partly sound	9	12.9	4	
	Unsound			1	
	No response				

ident Staff Members, by Academic Rank, Concerning the Proposed
ive Functions: Staff Selection and Orientation

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
53	75.7	43	62.3	47	69.1	33	49.2	176	64.2
15	21.4	22	31.9	17	25.0	31	46.3	85	31.0
2	2.9	4	5.8	4	5.9	3	4.5	13	4.8
						2		2	
52	75.4	45	68.2	55	80.9	44	64.7	196	72.3
14	20.3	19	28.8	10	14.7	22	32.4	65	24.0
3	4.3	2	3.0	3	4.4	2	2.9	10	3.7
1		3				1		5	
62	88.6	62	89.9	61	89.7	60	88.2	245	89.1
8	11.4	7	10.1	7	10.3	7	10.3	29	10.5
						1	1.5	1	.4
						1		1	
64	91.4	59	85.6	61	89.7	53	78.0	237	86.2
6	8.6	7	10.1	6	8.8	15	22.0	34	12.4
		3	4.3	1	1.5			4	1.4
						1		1	
56	80.0	59	85.5	59	86.8	51	75.0	225	81.8
12	17.1	5	7.3	7	10.3	14	20.6	38	13.8
2	2.9	5	7.2	2	2.9	3	4.4	12	4.4
						1		1	
61	87.1	64	92.7	63	92.7	57	83.8	245	89.1
9	12.9	4	5.8	5	7.3	10	14.7	28	10.2
		1	1.5			1	1.5	2	.7
						1		1	

When the approvals of functions were compared among the academic ranks, the instructors were lower by 13 per cent than any other group in their approval of staff members participating in decisions concerning recommendation of individuals for appointment to the staff. They were also the lowest of the four groups in their acceptance of each of the six functions although the percentage of difference was slight in one instance.

The function upon which all of the academic groups tended to agree most closely in their judgments concerned applicants for staff positions being informed of the philosophy of the institution and department.

The responses regarding the soundness of functions which concerned selection and orientation of staff, by persons carrying different types of administrative responsibilities, are compiled in Table 7. The function least commonly accepted by six of the seven administrative groups related to faculty participation in decisions concerning recommendation of individuals for appointment to the staff. Functions most commonly approved varied considerably from group to group. The home demonstration agent leaders unanimously supported three functions as sound whereas the only other group to give unanimous acceptance to a function was the directors of extension.

Data in Table 7 also revealed that 12 per cent more of

Table 7. Beliefs of Selected Groups of administrative Functions: Staff Selection

Function		President		Head of home economics		H demon agent No.
		No.	%	No.	%	
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning recommendation of individuals for appointment to the staff	Sound	12	66.7	28	84.8	21
	Partly sound	5	27.7	5	15.2	7
	Unsound	1	5.6			1
	No response	1				
Promotes work of the department by recommending for selection, administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area	Sound	15	88.2	30	90.9	22
	Partly sound	2	11.8	3	9.1	7
	Unsound					
	No response	2				
Makes provision for:						
Applicants for staff positions being informed of the philosophy of the institution and department	Sound	16	88.9	32	97.0	29
	Partly sound	2	11.1	1	3.0	
	Unsound					
	No response	1				
Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance, pensions, etc.	Sound	15	83.3	31	94.0	29
	Partly sound	1	5.6	1	3.0	
	Unsound	2	11.1	1	3.0	
	No response	1				
Newly appointed staff members being helped to understand the operational details of the institution and department necessary for effective work	Sound	14	77.8	30	90.9	27
	Partly sound	4	22.2	3	9.1	2
	Unsound					
	No response	1				
Staff having a clear knowledge of departmental and institutional policies	Sound	15	83.3	30	90.9	29
	Partly sound	3	16.7	3	9.1	
	Unsound					
	No response	1				

the home economics administrators than any other administrative group judged as sound the function pertaining to faculty participation in selecting staff members. The home economics administrators and presidents disagreed to a greater extent, 16 per cent, in their acceptance of this function than any of the other five statements.

By referring to Tables 6 and 7 the responses of home economics administrators and resident staff members may be compared. These two groups show relatively close agreement in extent of acceptance of four of the six functions. Approximately 20 per cent more of the administrators than resident staff members believed it sound for the administrators to create machinery through which staff members may participate in decisions concerning recommendations of individuals for appointment to the staff and to recommend for selection administrative heads of subject matter units who have an overall interest in home economics.

Data from Tables 6 and 7 also reveal that for each of the functions from one to five members of the resident group did not indicate their beliefs whereas each of the home economics administrators expressed beliefs. Perhaps this indicates that some staff members had not given thought to these functions previously, hence were unwilling to express an opinion.

Functions concerning staff responsibilities

Achievement of educational goals is largely dependent upon staff members understanding and assuming their responsibilities in the educational program. In Table 8 are presented the functions of administrators in providing conditions which will contribute to the assumption of responsibilities by the staff and the beliefs of administrators, resident staff members, extension and panel members regarding the soundness of these functions. Examination of the total responses of the three groups and of the panel revealed that all of the functions were accepted by more than 95 per cent of the respondents when both the sound and partly sound judgments were considered together. Each function was judged unsound by some individuals but never by more than 5 per cent.

In studying the responses of the groups, it was noted that nine of the eleven functions were believed entirely sound by 70 per cent or more of the extension and resident staff members and administrators. The function receiving lowest acceptance, 56 per cent, was that which pertained to making provision for staff and students¹ to participate in the development and revision of policies regarding matters of general departmental concern. Forty per cent of the group judged this function partly sound, and comments which

¹Students refers to all graduate and undergraduate students majoring in home economics.

Table 8. Beliefs of Administrators, Resident and Exl
Concerning the Proposed Administrative Funcl

Function		Administrators		Resid No.
		No.	%	
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning the departmental budget	Sound	117	67.6	202
	Partly sound	45	26.0	65
	Unsound	11	6.4	6
	No response	1		3
Promotes work of the department by:				
Assisting staff members in defining their duties clearly	Sound	143	82.7	186
	Partly sound	28	16.2	73
	Unsound	2	1.1	13
	No response	1		4
Assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest	Sound	133	77.3	198
	Partly sound	32	18.6	66
	Unsound	7	4.1	8
	No response	2		4
Cooperating in the coordination of specialized interests and activities of staff members into an effective total organization	Sound	137	80.6	199
	Partly sound	31	18.2	64
	Unsound	2	1.2	4
	No response	4		9
Stimulating staff to participate effectively in departmental efforts	Sound	146	84.4	209
	Partly sound	27	15.6	57
	Unsound			5
	No response	1		5
Encouraging evaluation of the use of resources	Sound	142	83.0	210
	Partly sound	26	15.2	54
	Unsound	3	1.8	5
	No response	3		7

Administrators, Resident and Extension Staff Members and Panel Members
Proposed Administrative Functions: Staff Responsibilities

Administrators		Resident staff		Extension staff		Total		Panel	
No.	%	No.	%	No.	%	No.	%	No.	%
117	67.6	202	74.0	41	64.1	360	70.6	11	78.6
45	26.0	65	23.8	22	34.4	132	25.9	3	21.4
11	6.4	6	2.2	1	1.5	18	3.5		
1		3				4			
143	82.7	186	68.4	55	87.3	384	75.6	12	85.7
28	16.2	73	26.8	8	12.7	109	21.4	2	14.3
2	1.1	13	4.8			15	3.0		
1		4		1		6			
133	77.3	198	72.8	48	75.0	379	74.6	9	64.3
32	18.6	66	24.3	14	21.9	112	22.1	5	35.7
7	4.1	8	2.9	2	3.1	17	3.3		
2		4				6			
137	80.6	199	74.5	46	76.7	382	76.9	13	92.9
31	18.2	64	24.0	13	21.7	108	21.7	1	7.1
2	1.2	4	1.5	1	1.6	7	1.4		
4		9		4		17			
146	84.4	209	77.1	56	88.9	411	81.1	13	92.9
27	15.6	57	21.0	5	7.9	89	17.5	1	7.1
		5	1.9	2	3.2	7	1.4		
1		5		1		7			
142	83.0	210	78.1	52	82.5	404	80.3	14	100.0
26	15.2	54	20.1	11	17.5	91	18.1		
3	1.8	5	1.8			8	1.6		
3		7		1		11			

Table 8 (Cont)

Function	Administrators	
	No.	%
Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to:		
Keep the general public informed of the departmental program in cooperation with other institutional agencies	Sound	141 81.5
	Partly sound	32 18.5
	Unsound	
	No response	1
Help families of the state with their problems	Sound	105 59.0
	Partly sound	58 38.2
	Unsound	5 2.8
	No response	6
Cooperate with various agencies concerned with family life education	Sound	138 79.8
	Partly sound	34 19.6
	Unsound	1 .6
	No response	1
Makes provision for staff and students participating in development and revision of policies regarding matters of general departmental concern	Sound	83 48.0
	Partly sound	98 45.1
	Unsound	12 6.9
	No response	1
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for the professional growth of students	Sound	141 82.5
	Partly sound	26 15.2
	Unsound	4 2.3
	No response	3

Table 8 (Continued)

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
1	141	81.5	192	70.3	56	87.5	389	76.2	11	78.6
	32	18.5	76	27.9	6	9.4	114	22.4	3	21.4
			5	1.8	2	3.1	7	1.4		
	1		3				4			
1	105	59.0	171	62.9	41	65.1	317	63.0	10	71.4
	58	38.2	89	32.7	19	30.1	166	33.0	4	28.6
	5	2.8	12	4.4	3	4.8	20	4.0		
	6		4		1		11			
1	138	79.8	192	70.6	45	70.3	375	73.7	12	85.7
	34	19.6	75	27.6	19	29.7	128	25.1	2	14.3
	1	.6	5	1.8			6	1.2		
	1		4				5			
1	83	48.0	166	66.0	34	54.9	283	55.8	10	71.4
	98	45.1	97	35.7	26	41.9	201	39.7	4	28.6
	12	6.9	9	3.3	2	3.2	23	4.5		
	1		4		2		7			
1	141	82.5	197	73.5	49	77.8	387	77.1	11	78.6
	26	15.2	63	23.5	12	19.1	101	20.1	3	21.4
	4	2.3	8	3.0	2	3.1	14	2.8		
	3		8		1		12			

were added indicate that one of the main reasons was the assumption that students referred to all graduate and undergraduate students majoring in home economics. One home economics administrator commented, "A sample of students might be more practical than 'all' as referred to in the footnote." One of the panel members wrote:

There is a limit to the extent to which students can be given background in the time available to assist in making some policy decisions. I strongly feel that people should help to make such decisions only when they are properly prepared to do so (through experience, study, etc.) At times this system becomes so cumbersome unless used only for important long-time policy that it is not feasible.

Another respondent concurred in the view that if carried too far the participation of students in policy-making could be cumbersome. A further comment indicated students should not share in making all departmental policies only those which concern them directly and the advisability of any students participating in this activity was questioned by one person.

A viewpoint which may be interpreted to have a bearing on this function was expressed by the Commission on Teacher Education for the American Council of Education in this way:

We must find ways of giving young people status as responsible sharers in activities that make for the attainment of a better common life; we must give them a job they rightly feel to be worth while. We must provide them with opportunities to experience and grow in understanding of the physical and social world surrounding them. We must help them learn to think, feel, and act

under the authority of their independent rational powers: we must help them to achieve positive personal freedom. Finally, we must provide them with such experience in working cooperatively with others - with adults as well as with other young persons: we must aid them in becoming adepts at democratic planning and doing.¹

Antioch College² is an example of an institution where students share in making decisions on college policies. The administrative council, the policy forming body of the college, is composed of seven faculty members and two students, and the admissions committee also has two students who serve with six faculty members.

Greatest acceptance, about 80 per cent, of the three groups combined, administrators, resident and extension staff members, was received by two of the functions; stimulating staff to participate effectively in departmental affairs and encouraging evaluation of the use of resources.

The panel members differed from the total group of other respondents in the functions which received the lowest and the highest percentages of acceptance. They gave unanimous approval to the function of promoting departmental work by encouraging the evaluation of the use of resources. The

¹American Council on Education. Teachers for our times. Washington, D. C. 1944. p. 102. Commission on Teacher Education.

²Algo D. Henderson and Dorothy Hall. Antioch College: Its design for liberal education. New York. Harper & Bros. 1946. p. 206.

function least frequently endorsed by the panel concerned assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest. No comments by the panel revealed reasons why five of the group judged this function partly rather than entirely sound. Ten per cent more of the total group than the panel supported this function.

In comparing the beliefs of the administrative, resident and extension staff groups, it was noted that they all accepted least frequently the function in which the staff and students participate in developing and revising policies of general departmental concern. Between 80 and 84 per cent of the administrators believed seven functions completely sound, 83 to 89 per cent of the extension group judged four entirely sound whereas the highest acceptance of any function as wholly sound by the resident staff group was only 78 per cent.

To obtain a better indication of the beliefs of respondents concerning the functions relating to staff responsibilities within each group, Tables 9 and 10 were prepared. When the differences in percentages between the functions least frequently approved and those most frequently approved as entirely sound by each of the four academic groups were observed in Table 9, they were discovered to be approximately 20 per cent in each group. The function least com-

Table 9. Beliefs of Resident Staff Members, by Administrative Functions: St

Function		Professors		Associa
		No.	%	No.
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning the departmental budget	Sound	57	82.6	47
	Partly sound	10	14.4	20
	Unsound	2	3.0	2
	No response	1		
Promotes work of the department by:				
Assisting staff members in defining their duties clearly	Sound	46	67.7	48
	Partly sound	20	29.4	15
	Unsound	2	2.9	6
	No response	2		
Assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest	Sound	54	78.3	46
	Partly sound	14	20.3	19
	Unsound	1	1.4	4
	No response	1		
Cooperating in the coordination of specialized interests and activities of staff members into an effective total organization	Sound	50	74.6	51
	Partly sound	17	25.4	14
	Unsound			2
	No response	3		2
Stimulating staff to participate effectively in departmental efforts	Sound	52	75.4	54
	Partly sound	16	23.2	12
	Unsound	1	1.4	1
	No response	1		2
Encouraging evaluation of the use of resources	Sound	56	80.0	57
	Partly sound	14	20.0	8
	Unsound			2
	No response			2

Staff Members, by Academic Rank, Concerning the Proposed
 Alternative Functions: Staff Responsibilities

Professors	Associate professors		Assistant professors		Instructors		Total	
	No.	%	No.	%	No.	%	No.	%
7	47	82.6	51	75.0	47	70.1	202	74.0
0	20	14.4	16	23.5	19	28.4	65	23.8
2	2	3.0	1	1.5	1	1.5	6	2.2
1					2		3	
6	48	67.7	51	75.0	41	61.2	186	68.4
0	15	29.4	15	22.1	23	34.3	73	26.8
2	6	2.9	2	2.9	3	4.5	13	4.8
2					2		4	
4	46	78.3	54	79.4	44	66.7	198	72.8
4	19	20.3	12	17.7	21	31.8	66	24.3
1	4	1.4	2	2.9	1	1.5	8	2.9
1					3		4	
0	51	74.6	55	83.3	43	64.2	199	74.5
7	14	25.4	10	15.2	23	34.3	64	24.0
	2		1		1		4	
3	2	3.0	2	1.5	2	1.5	9	1.5
2	54	75.4	58	85.3	45	67.2	209	77.1
6	12	23.2	8	11.8	21	31.3	57	21.0
1	1	1.4	2	2.9	1	1.5	5	1.9
1	2				2		5	
6	57	80.0	53	81.5	44	65.7	210	78.1
4	8	20.0	10	15.4	22	32.8	54	20.1
	2		2		1		5	
	2	3.0	3	3.1	2	1.5	7	1.8

Table 9 (Continued)

Function		Professors		Assoc
		No.	%	No.
Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to:				
Keep the general public informed of the departmental program in cooperation with other institutional agencies	Sound	50	71.4	44
	Partly sound	19	27.2	17
	Unsound	1	1.4	1
	No response			
Help families of the state with their problems	Sound	44	63.8	44
	Partly sound	22	31.9	22
	Unsound	3	4.3	3
	No response	1		1
Cooperate with various agencies concerned with family life education	Sound	48	69.6	51
	Partly sound	20	29.0	19
	Unsound	1	1.4	1
	No response	1		1
Makes provision for staff and students participating in development and revision of policies regarding matters of general departmental concern	Sound	43	63.2	44
	Partly sound	24	35.3	24
	Unsound	1	1.5	1
	No response	2		2
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for the professional growth of students	Sound	51	76.1	44
	Partly sound	14	20.9	14
	Unsound	2	3.0	2
	No response	3		3

Table 9 (Continued)

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
50	71.4	48	70.6	50	73.5	44	65.7	192	70.3
19	27.2	17	25.0	18	26.5	22	32.8	76	27.9
1	1.4	3	4.4			1	1.5	5	1.8
		1				2		3	
44	63.8	44	64.7	43	63.2	40	59.7	171	62.9
22	31.9	21	30.9	23	33.9	23	34.3	89	32.9
3	4.3	3	4.4	2	2.9	4	6.0	12	4.2
1		1				2		4	
48	69.6	50	73.5	50	73.5	44	65.7	192	70.6
20	29.0	16	23.5	17	25.0	22	32.8	75	27.6
1	1.4	2	3.0	1	1.5	1	1.5	5	1.8
1		1				2		4	
43	63.2	46	66.7	44	64.7	33	49.2	166	61.0
24	35.3	19	27.5	23	33.8	31	46.3	97	35.7
1	1.5	4	5.8	1	1.5	3	4.5	9	3.3
2						2		4	
51	76.1	49	72.1	54	80.6	43	65.1	197	73.5
14	20.9	18	26.5	13	19.4	18	27.3	63	23.5
2	3.0	1	1.4			5	7.6	8	3.0
3		1		1		3		8	

monly accepted and the one most commonly accepted by professors and instructors were the same, but the percentages of acceptance varied considerably. Sixty-three and 49 per cent respectively accepted as sound the participation of staff and students in developing and revising general departmental policies. Eighty-three per cent of the professors and 70 per cent of the instructors indicated their belief in the soundness of the administrator taking final responsibility for, but creating machinery through which staff members may participate in, decisions concerning the departmental budget. Apparently relatively few of these groups shared the view of two respondents from the resident group who believed this was strictly a function of the administrator and that budgetary matters concerning salaries should not be determined by the staff.

The Report of the President's Commission on Higher Education recommended that faculty representatives participate in the determination of salary policies in each institution.

The Commission stated:

Problems regarding automatic or merit-based increases, differences in competitive situations between departments or colleges, equal salaries for men and women, compensation from outside sources, extra compensation for some additional collegiate duties, and other similar problems can be solved best at each institution through frank discussion and open facing of facts.¹

¹Report of the President's Commission on Higher Education. Higher education for American democracy. Vol. IV. Staffing higher education. New York. Harper & Bros. 1947. pp. 54-55.

The associate and assistant professors gave acceptance to the statement concerned with stimulating the staff and facilitating their use of every available means to help families of the state with their problems less often than to the other proposed functions relating to staff responsibilities. No more than two thirds of any group believed this function sound. Five respondents indicated the belief that this function should be the responsibility of the extension service. The vocational homemaking department should also share in this assignment according to another. Although there were no such comments some may have believed that radio programs, talks and demonstrations were simply additions to an already heavy work load. Some institutions have secured special personnel for radio, television and the information service. One of the important advantages of providing opportunities for contacts with families is to help the staff be aware of problems confronting families of the state to the end that their teaching is more realistic.

The function receiving highest approval by the associate professors was that concerned with encouraging evaluation of the use of resources. The assistant professors supported equally strongly the function of stimulating the staff to participate effectively in departmental efforts.

When the acceptances were compared among the groups according to academic rank, the instructors least commonly

judged every function sound except the one of staff participation in decisions concerning the departmental budget; in this case the associate professors were lowest. The assistant professors were highest in the percentage of approval of six of the 11 functions and were equally high with the associate professors on one function.

Beliefs of various administrative groups related to functions concerning staff responsibilities are presented in Table 10. The data reveal considerable variation among the groups in the functions least frequently and most frequently endorsed as entirely sound. The difference in the percentages between the lowest and highest acceptances of the various functions among the administrative groups ranged from 28 to 70. Fifty per cent or less of the respondents in five of the seven groups considered it a sound practice for the staff and students to participate in the development and revision of policies regarding matters of general departmental concern.

When the beliefs of the presidents and home economics administrators concerning the functions related to staff responsibilities were compared, it was noted that they differed in their acceptance of the functions by 15, 20 and 26 per cent. More of the home economics administrators than presidents considered these functions desirable:

Takes final responsibility for, but creates machinery through which staff members may participate in decisions concerning the departmental budget.

Table 10. Beliefs of Selected Groups of Administrative Functions: St

Function		President		Head of home economics		Home demonstrat agent lead	
		No.	%	No.	%	No.	%
Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning the departmental budget	Sound	9	50.0	25	75.7	24	82
	Partly sound	8	44.4	6	18.2	5	17
	Unsound	1	5.6	2	6.1		
	No response	1					
Promotes work of the department by:							
Assisting staff members in defining their duties clearly	Sound	17	94.4	26	78.8	23	79
	Partly sound	1	5.6	7	21.2	5	17
	Unsound					1	3
	No response	1					
Assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest	Sound	13	72.2	27	81.8	22	75
	Partly sound	5	27.8	6	18.2	4	13
	Unsound					3	10
	No response	1					
Cooperating in the coordination of specialized interests and activities of staff members into an effective total organization	Sound	15	83.3	26	78.8	23	82
	Partly sound	3	16.7	7	21.2	4	14
	Unsound					1	3
	No response	1				1	
Stimulating staff to participate effectively in departmental efforts	Sound	15	83.3	29	87.9	26	89
	Partly sound	3	16.7	4	12.1	3	10
	Unsound						
	No response	1					
Encouraging evaluation of the use of resources	Sound	15	83.3	29	87.9	25	86
	Partly sound	3	16.7	4	12.1	4	13
	Unsound						
	No response	1					

of Selected Groups of Administrators Concerning the Proposed
Administrative Functions: Staff Responsibilities

Group	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0.0	25	75.7	24	82.7	18	66.7	18	66.7	13	61.9	10	55.5	117	67.6
1.4	6	18.2	5	17.3	8	29.6	8	29.6	5	23.8	5	27.8	45	26.0
1.6	2	6.1			1	3.7	1	3.7	3	14.3	3	16.7	11	6.4
													1	
1.4	26	78.8	23	79.3	24	88.9	20	74.1	20	95.2	13	72.3	143	82.7
1.6	7	21.2	5	17.2	3	11.1	6	22.2	1	4.8	5	27.7	28	16.2
			1	3.5			1	3.7					2	1.1
													1	
1.2	27	81.8	22	75.9	20	76.9	21	77.8	17	80.9	13	72.3	133	77.3
1.8	6	18.2	4	13.8	5	19.2	5	18.5	4	19.1	3	16.6	32	18.6
			3	10.3	1	3.9	1	3.7			2	11.1	7	4.1
					1								2	
1.3	26	78.8	23	82.1	22	81.5	23	88.5	15	75.0	13	72.3	137	80.6
1.7	7	21.2	4	14.3	5	18.5	3	11.5	5	25.0	4	22.2	31	18.2
			1	3.6							1	5.5	2	1.2
			1				1		1				4	
1.3	29	87.9	26	89.7	22	81.5	23	85.2	20	95.2	11	61.1	146	84.4
1.7	4	12.1	3	10.3	5	18.5	4	14.8	1	4.8	7	38.9	27	15.6
													1	
1.3	29	87.9	25	86.2	23	85.2	21	77.8	17	85.0	12	70.6	142	83.0
1.7	4	12.1	4	13.8	3	11.1	5	18.5	3	15.0	4	23.5	26	15.2
					1	3.7	1	3.7			1	5.9	3	1.8
									1		1		3	

Table 10 (Continued)

Function		President		Head of home economics		Home demonstrator agent
		No.	%	No.	%	No.
Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to:						
Keep the general public informed of the departmental program in cooperation with other institutional agencies	Sound	14	73.7	27	81.8	27
	Partly sound	5	26.3	6	18.2	2
	Unsound					
	No response					
Help families of the state with their problems	Sound	13	68.4	20	62.5	15
	Partly sound	6	31.6	10	31.2	12
	Unsound			2	6.3	1
	No response			1		1
Cooperate with various agencies concerned with family life education	Sound	17	89.5	30	90.9	23
	Partly sound	2	10.5	3	9.1	5
	Unsound					1
	No response					
Makes provision for staff and students participating in development and revision of policies regarding matters of general departmental concern	Sound	9	50.0	23	69.7	19
	Partly sound	9	50.0	9	27.3	9
	Unsound			1	3.0	1
	No response	1				
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for the professional growth of students	Sound	16	88.9	29	87.9	23
	Partly sound	2	11.1	3	9.1	6
	Unsound			1	3.0	
	No response	1				

Table 10 (Continued)

mt	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1.7	27	81.8	27	93.1	20	76.9	20	74.1	21	100.0	12	66.7	141	81.5
1.3	6	18.2	2	6.9	6	23.1	7	25.9			6	33.3	32	18.5
					1								1	
1.4	20	62.5	15	53.6	17	68.0	17	65.4	14	70.0	9	50.0	105	59.0
1.6	10	31.2	12	42.9	8	32.0	8	30.8	5	25.0	9	50.0	58	38.2
	2	6.3	1	3.5			1	3.8	1	5.0			5	2.8
	1		1		2		1		1				6	
1.5	30	90.9	23	79.3	18	66.7	22	84.6	15	71.4	13	72.2	138	79.8
1.5	3	9.1	5	17.2	9	33.3	4	15.4	6	28.6	5	27.8	34	19.6
			1	3.5									1	.6
							1						1	
1.0	23	69.7	19	65.5	5	18.5	11	40.8	7	33.3	9	50.0	83	48.0
1.0	9	27.3	9	31.0	19	70.4	12	44.4	12	57.2	8	44.5	78	45.1
	1	3.0	1	3.5	3	11.1	4	14.8	2	9.5	1	5.5	12	6.9
													1	
1.9	29	87.9	23	79.3	21	80.8	22	84.6	15	71.4	15	83.3	141	82.5
1.1	3	9.1	6	20.7	3	11.5	4	15.4	5	23.8	3	16.7	26	15.2
	1	3.0			2	7.7			1	4.8			4	2.3
					1		1						3	

Makes provision for staff and students participating in development and revision of policies regarding matters of general departmental concern.

Comments from some of the administrators revealed beliefs that it might not be a sound practice for instructors to help determine the salary of the department head; that since fund limitations enter into this consideration, staff decisions might not result in good balance. The opportunities for closer proximity of home economics administrators than presidents to both staff and students may cause them to see more clearly the need for the participation of these groups in policy-making and to have more confidence in their judgment in processes of decision-making.

Because the resident and extension staffs are directly concerned with family life education, a comparison of the responses of the heads of home economics departments and home demonstration agent leaders concerning these functions is of particular interest:

Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks and demonstrations to

Keep the general public informed of the departmental program in cooperation with other institutional agencies

Help families of the state with their problems

Cooperate with various agencies concerned with family life education.

Eleven per cent more of the home demonstration agent leaders believed the first function entirely sound; however, more department heads accepted the last two functions. Two comments concerning the last statement indicated that some respondents believed this to be largely the function of the extension service or of the child development unit in the resident teaching organization although reasons for these beliefs were not given.

When the opinions of resident staff members and their administrative officers concerning the functions related to staff responsibilities were compared, the difference in their acceptance of various functions was greater than 14 per cent in only one instance. Twenty per cent more of the administrators than resident staff members believed this function entirely sound: stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks and demonstrations to cooperate with various agencies concerned with family life education. These two groups also showed interesting variation in that only one home economics administrator failed to indicate her belief concerning one function while three to nine staff members did not respond to each of the 11 functions. This lack of response is particularly important since the functions judged in this section concerned the staff especially.

Functions concerning staff growth and welfare

The effectiveness of staff members in contributing to the home economics program of a department is affected by their morale and professional competence. The beliefs of administrators, extension and resident staff members and panel members regarding the proposed administrative functions concerning staff growth and welfare are presented in Table 11. An inspection of these data showed that when both sound and partly sound judgments were considered together, each of the ten functions was endorsed by 90 per cent or more of the respondents of the total group, administrators, resident and extension staff members and the panel.

About 90 per cent of the total group of respondents, exclusive of the panel members, accepted as entirely sound five of the 10 functions relating to staff growth and welfare:

Promotes work of the department by

Allowing adequate flexibility for staff members to "grow" in ability to take responsibility

Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department.

Provides, as far as possible, conditions which stimulate staff members to

Table 11. Beliefs of Administrators, Resident and F
Concerning the Proposed Administrative Funct

Function	Administrators	
	No.	%
Promotes work of the department by:		
Allowing adequate flexibility for staff members to "grow" in ability to take responsibility	Sound	158 91.3
	Partly sound	15 8.7
	Unsound	
	No response	1
Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department	Sound	155 90.6
	Partly sound	16 9.4
	Unsound	
	No response	3
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for:		
The contributions of staff members	Sound	92 53.8
	Partly sound	64 37.4
	Unsound	15 8.8
	No response	3
The professional growth of staff members	Sound	113 66.1
	Partly sound	45 26.3
	Unsound	13 7.6
	No response	3
Provides, as far as possible, conditions which stimulate staff members to:		
Do professional creative work (research, writing, painting, designing, etc.)	Sound	162 93.6
	Partly sound	9 5.2
	Unsound	2 1.2
	No response	1
Continue professional development (teaching, counseling, research, etc.)	Sound	169 97.7
	Partly sound	3 1.7
	Unsound	1 .6
	No response	1
Contribute to professional organizations through membership, active participation and attendance at meetings	Sound	138 79.8
	Partly sound	35 20.2
	Unsound	
	No response	1

Administrators, Resident and Extension Staff Members and Panel Members
 and Administrative Functions: Staff Growth and Welfare

Administrators		Resident staff		Extension staff		Total		Panel	
No.	%	No.	%	No.	%	No.	%	No.	%
158	91.3	246	90.4	60	95.2	464	91.3	13	92.9
15	8.7	24	8.8	3	4.8	42	8.3	1	7.1
		2	.8			2	.4		
1		4		1		6			
155	90.6	250	91.6	56	88.9	461	90.9	14	100.0
16	9.4	22	8.1	7	11.1	45	8.9		
		1	.3			1	.2		
3		3		1		7			
92	53.8	137	50.7	39	60.9	268	53.0	7	50.0
64	37.4	102	37.8	21	32.8	187	37.0	7	50.0
15	8.8	31	11.5	4	6.3	50	10.0		
3		6				9			
113	66.1	164	61.2	45	70.3	322	64.0	7	50.0
45	26.3	78	29.1	16	25.0	139	27.6	7	50.0
13	7.6	26	9.7	3	4.7	42	8.4		
3		8				11			
162	93.6	242	88.3	51	79.7	455	89.0	12	85.7
9	5.2	30	11.0	12	18.7	51	10.0	2	14.3
2	1.2	2	.7	1	1.6	5	1.0		
1		2				3			
169	97.7	257	93.4	55	85.9	481	93.9	14	100.0
3	1.7	17	6.2	9	14.1	29	5.7		
1	.6	1	.4			2	.4		
1		1				2			
138	79.8	232	84.7	48	75.0	418	81.8	13	92.9
35	20.2	38	13.9	14	21.9	87	17.0	1	7.1
		4	1.4	2	3.1	6	1.2		
1		2				3			

Table 11 (Continued)

Function	Administrator	
	No.	%
Works with professional and non-professional staffs toward:		
Attainment of a reasonable balance among work, home and outside activities	Sound	88 51.5
	Partly sound	64 37.4
	Unsound	19 11.1
	No response	3
General betterment of staff living arrangements	Sound	68 40.2
	Partly sound	78 46.2
	Unsound	23 13.6
	No response	5
Maintenance of a friendly atmosphere	Sound	158 92.4
	Partly sound	13 7.6
	Unsound	
	No response	3

Table 11 (Continued)

Administrators		Resident staff		Extension staff		Total		Panel	
No.	%	No.	%	No.	%	No.	%	No.	%
88	51.5	133	48.2	36	56.3	257	50.3	10	71.4
64	37.4	96	34.8	21	32.8	181	35.4	2	14.3
19	11.1	47	17.0	7	10.9	73	14.3	2	14.3
3						3			
68	40.2	101	36.7	19	29.7	188	37.0	10	71.4
78	46.2	124	45.1	35	54.7	237	46.7	4	28.6
23	13.6	50	18.2	10	15.6	83	16.3		
5		1				6			
158	92.4	239	87.6	59	93.6	456	90.0	14	100.0
13	7.6	32	11.7	4	6.4	49	9.6		
		2	.7			2	.4		
3		3		1		7			

Do professional creative work

Continue professional development.

Works with professional and non-professional staffs toward maintenance of a friendly atmosphere.

When the judgments of the total group of respondents, not including the panel members, were considered, the function believed sound by the smallest number, 37 per cent, concerned the administrator working with professional and non-professional staffs toward general betterment of staff living arrangements. Forty-seven per cent of the total group believed this function partly sound and of all ten statements it was judged unsound by the most respondents, 16 per cent. Comments such as these by the individuals replying to the questionnaire give some indication of reasons for their beliefs:

There are some things staff members themselves would like to be responsible for.

Should be done only if there is serious need.

I interpret this to mean their home and believe it is unsound.

If possible, I believe it should be done.

Is this to be accomplished through adequate salaries?

In addition, two respondents indicated that administrators need to consider this function but might have so many responsibilities that little time would be available to fulfill the function.

About 50 per cent of the respondents in the total group judged two functions as sound, one of which was furnishing opportunity without developing tensions, for the staff to evaluate and recommend rewards, both material and non-material, for the contributions of staff members. Only one half of the panel members believed this function sound but made no comments which would give clues to the reasons for their judgments.

The thinking of some of the respondents regarding the faculty evaluating and rewarding staff contributions was revealed in these comments: the real issue in the statement was preventing the development of tensions among the staff members, the procedure could lead to competition among staff members or the slighting of class responsibilities to prepare publications, the function was institutional in nature and the type of reward to be given was important. One respondent wrote, "Besides growth, like virtue, is its own reward. Contribution of the staff must be rewarded in terms of pay, of course." Another believed the function was unsound if rewards meant only awards.

The second function accepted by only 50 per cent of the total group of respondents concerned working with professional and non-professional staffs toward attainment of a reasonable balance among work, home and outside activities. Twenty-nine per cent of the panel believed this function

partly sound but no members stated reasons for their judgments. Two respondents remarked that this function was not easy to attain as it is the individual staff member's responsibility and others believed such a function invaded the private lives of staff members, consequently was not the responsibility of the administrator. Two home economists expressed concern for the emphasis of this function by these comments:

It seems to be time in the growth of home economics for some effort toward community participation and time for same. Time for "good living" being practiced by staff - as participation in "women's place in religious, political and community circles." A restatement of and replanning for a part in such activities may need to be led by some administrator.

The home economics staff in most universities should be more acquainted with and better examples of "the best way to live" - with some time to practice the "gracious" - participating qualities which we advocate. We have taken on more and more until we cannot in many cases practice what we teach. Some administrative changes must be adjusted to this end to allow for leadership in living.

When the judgments of the panel given in Table 11 were studied further, it was found that the panel least commonly agreed on these two functions:

Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards, both material and non-material, for

The contributions of staff members.

The professional growth of staff members.

Perhaps the panel members believe that personal satisfaction is sufficient reward for contributions and professional growth of staff members. They may also have questioned whether the function could be performed without developing tensions. Since they made no comments regarding these functions reasons for their responses are merely speculations.

The panel gave unanimous acceptance to the following three functions as being sound:

Promotes work of the department by assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department.

Provides, as far as possible, conditions which stimulate staff members to continue professional development.

Works with professional and non-professional staffs toward maintenance of a friendly atmosphere.

In comparing the responses of the administrative, resident and extension groups in Table 11, it was discovered that the same function, working with professional and non-professional staffs toward general betterment of living arrangements, was least frequently believed entirely sound by all the groups. Fourteen to 18 per cent of the respondents in each group, excluding the panel, judged the function unsound. The differences in the percentages of acceptance of each function by the three groups, administrators, resident and extension staff, ranged from 3 to 15 per cent.

Data on the judgment of functions concerning staff growth and welfare of resident staff members by academic ranks are presented in Table 12. When comparisons among the groups were made of the judgments of each function, it was found that the assistant professors, except in one instance, most frequently approved each of the functions. Differences in the acceptance of each function among the four groups ranged from one to 13 per cent. Of the four groups, the instructors in all but two instances, least frequently indicated the belief that these functions are entirely sound.

Beliefs of the various groups of administrators concerning the functions relating to staff growth and welfare presented in Table 13 show that with one exception, the directors of extension, each group gave the lowest percentage of acceptance to the function concerned with working for general betterment of staff living arrangements. The functions receiving the highest percentage of support varied from group to group.

The presidents agreed unanimously on the soundness of the two functions which pertain to maintaining an environment conducive to working cooperatively and effectively toward the goals of the department; and stimulating staff members to continue professional development.

The home economics administrators also agreed unanimously that stimulating staff members to continue professional

Table 12. Beliefs of Resident Staff Members, by Administrative Functions: Sta

Function		Professors		Associate pr
		No.	%	No.
Promotes work of the department by:				
Allowing adequate flexibility for staff members to "grow" in ability to take responsibility	Sound	64	94.1	63
	Partly sound	4	5.9	5
	Unsound			
	No response	2		1
Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department	Sound	64	92.7	63
	Partly sound	5	7.3	5
	Unsound			
	No response	1		1
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for:				
The contributions of staff members	Sound	33	47.8	36
	Partly sound	31	44.9	20
	Unsound	5	7.3	11
	No response	1		2
The professional growth of staff members	Sound	38	55.9	41
	Partly sound	26	38.2	17
	Unsound	4	5.9	10
	No response	2		1
Provides, as far as possible, conditions which stimulate staff members to:				
Do professional creative work (research, writing, painting, designing, etc.)	Sound	65	92.9	61
	Partly sound	5	7.1	7
	Unsound			
	No response			1
Continue professional development (teaching, counseling, research, etc.)	Sound	66	94.3	65
	Partly sound	3	4.3	4
	Unsound	1	1.4	
	No response			
Contribute to professional organizations through membership, active participation and attendance at meetings	Sound	65	92.9	62
	Partly sound	4	5.7	5
	Unsound	1	1.4	1
	No response			1

Resident Staff Members, by Academic Rank, Concerning the Proposed
 Administrative Functions: Staff Growth and Welfare

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
64	94.1	63	92.6	64	94.1	55	80.9	246	90.4
4	5.9	5	7.4	3	4.4	12	17.6	24	8.8
				1	1.5	1	1.5	2	.8
2		1				1		4	
64	92.7	63	92.6	64	94.1	59	86.8	250	91.6
5	7.3	5	7.4	4	5.9	8	11.7	22	8.1
						1	1.5	1	.3
1		1				1		3	
33	47.8	36	53.7	42	62.7	26	38.8	137	50.7
31	44.9	20	29.9	20	29.9	31	46.3	102	37.8
5	7.3	11	16.4	5	7.4	10	14.9	31	11.5
1		2		1		2		6	
38	55.9	41	60.3	52	78.8	33	50.0	164	61.2
26	38.2	17	25.0	10	15.1	25	37.9	78	29.1
4	5.9	10	14.7	4	6.1	8	12.1	26	9.7
2		1		2		3		8	
65	92.9	61	89.7	63	92.6	53	78.0	242	88.3
5	7.1	7	10.3	5	7.4	13	19.1	30	11.0
						2	2.9	2	.7
		1				1		2	
66	94.3	65	94.2	66	97.1	60	88.2	257	93.4
3	4.3	4	5.8	2	2.9	8	11.8	17	6.2
1	1.4							1	.4
						1		1	
65	92.9	62	91.2	57	83.8	48	70.6	232	84.7
4	5.7	5	7.3	11	16.2	18	26.5	38	13.9
1	1.4	1	1.5			2	2.9	4	1.4
		1				1		2	

Table 12 (Continued)

Function		Professors		Associate
		No.	%	No.
Works with professional and non-professional staffs toward:				
Attainment of a reasonable balance among work, home and outside activities	Sound	28	40.0	34
	Partly sound	29	41.4	22
	Unsound	13	18.6	13
	No response			
General betterment of staff living arrangements	Sound	19	27.2	27
	Partly sound	39	55.7	28
	Unsound	12	17.1	13
	No response			1
Maintenance of a friendly atmosphere	Sound	60	85.7	60
	Partly sound	8	11.4	9
	Unsound	2	2.9	
	No response			

Table 13. Beliefs of Selected Groups of Administrative Functions: St

Function		President		Head of home economics		Head of
		No.	%	No.	%	agent
Promotes work of the department by:						
Allowing adequate flexibility for staff members to "grow" in ability to take responsibility	Sound	18	100.0	29	87.9	27
	Partly sound			4	12.1	2
	Unsound					
	No response	1				
Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department	Sound	15	83.3	30	93.7	25
	Partly sound	3	16.7	2	6.3	3
	Unsound					
	No response	1		1		1
Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for:						
The contributions of staff members	Sound	12	66.7	15	45.5	17
	Partly sound	6	33.3	16	48.5	9
	Unsound			2	6.0	3
	No response	1				
The professional growth of staff members	Sound	14	77.8	22	66.7	18
	Partly sound	4	22.2	9	27.3	8
	Unsound			2	6.0	3
	No response	1				
Provides, as far as possible, conditions which stimulate staff members to:						
Do professional creative work (research, writing, painting, designing, etc.)	Sound	17	94.4	32	97.0	25
	Partly sound			1	3.0	3
	Unsound	1	5.6			1
	No response	1				
Continue professional development (teaching, counseling, research, etc.)	Sound	18	100.0	33	100.0	27
	Partly sound					1
	Unsound					1
	No response	1				
Contribute to professional organizations through membership, active participation and attendance at meetings	Sound	14	77.8	30	90.9	25
	Partly sound	4	22.2	3	9.1	4
	Unsound					
	No response	1				

Table 13 (Conti

Function		President		Head of home economics		Ho
		No.	%	No.	%	agent
		No.	%	No.	%	No.
Works with professional and non-professional staffs toward:						
Attainment of a reasonable balance among work, home and outside activities	Sound	8	44.4	15	48.4	18
	Partly sound	7	38.9	15	48.4	8
	Unsound	3	16.7	1	3.2	3
	No response	1		2		
General betterment of staff living arrangements	Sound	6	33.3	11	35.5	15
	Partly sound	9	50.0	17	54.8	10
	Unsound	3	16.7	3	9.7	4
	No response	1		2		
Maintenance of a friendly atmosphere	Sound	16	94.1	29	90.6	29
	Partly sound	1	5.9	3	9.4	
	Unsound					
	No response	2		1		

development was a sound function. Only about one third of this group believed that working for general betterment of staff living arrangements was an entirely sound function of the home economics administrator.

That administrators of home economics departments in land-grant institutions have given consideration to this function is shown by a recommendation for staff development made at a Work Shop on Administrative Management attended by home economics administrators from such institutions in 1944.

More attention should be directed to provisions for creating a favorable environment for satisfying living.¹

Conditions existing during the wartime period probably caused these administrators to be especially concerned with living arrangements at this time. This same administrative group stated that satisfactory living space was an important environmental factor contributing to the best work of the staff and that administrators should help in locating such facilities. They believed comfortable and attractive living conditions contribute to personal satisfaction and professional effectiveness of staff members.

¹Report of the Work Shop in administrative management for Home Economists in the Assoc. of Land-Grant Colleges. Longs Peak Inn, Colo. July 24-29. 1944. (Mimeo. rept.) p. 24.

About 50 per cent of the home economics administrative group indicated that the following two functions were entirely sound:

Furnishes opportunity without developing tensions, for the staff to evaluate and recommend rewards, both material and non-material, for the contributions of staff members.

Works with professional and non-professional staffs toward attainment of a reasonable balance among work, home and outside activities.

Perhaps these administrators share the view that it is difficult for the staff to evaluate and recommend rewards without developing tensions and that the personal nature of the latter function makes it difficult to perform.

When the judgments of the presidents and home economics administrators concerning functions of staff growth and welfare were compared, it was found that the extent of their acceptances of five functions differed less than 5 per cent. Differences on the other functions varied from 10 to 21 per cent. The presidents believed these functions sound more frequently than the home economics administrators:

Promotes work of the department by allowing adequate flexibility for staff member to "grow" in ability to take responsibility.

Furnishes opportunity without developing tensions for the staff to evaluate and recommend rewards, both material and non-material, for

The contributions of staff members

The professional growth of staff members.

The home economics administrators gave higher percentages

of acceptance to the following functions than the presidents:

Promotes work of the department by assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department.

Provides, as far as possible, conditions which stimulate staff members to contribute to professional organizations through membership, active participation and attendance at meetings.

Reasons for these differences in beliefs concerning the functions are not known since the respondents made no comments regarding them.

When the variations in percentages of agreement on each function among the different administrative groups were examined in Table 13, they were noticed to range from 7 to 28. The function on which the groups showed least difference of opinion pertained to stimulating the staff to continue professional development; only 3 persons believed this function partly sound and one individual judged it unsound. The groups showed greatest difference in beliefs regarding the two functions concerned with furnishing opportunity for the staff to evaluate and recommend rewards for the contributions of staff members and working with staff members toward the maintenance of a friendly atmosphere.

The judgments of home economics staff members and their chief administrative officers of the functions relating to staff growth and welfare showed fairly high agreement. In no instance was the difference of their acceptance of a func-

tion greater than 9 per cent.

On this group of functions there were one or two administrators who did not indicate their beliefs concerning seven functions but there were one to eight individuals in the staff group who did not judge nine of the functions. Of the 30 staff members who failed to respond to the statements concerning staff growth and welfare, 12 of them were from the instructor group.

Functions concerning students and alumnae

Data in Table 14 concern the beliefs of administrators, resident and extension staff members and panel members in regard to the proposed functions of home economics administrators as they relate to students and alumnae.

In general, considerable agreement was found within the large groups, administrators, resident and extension staff members and the panel that all of the proposed functions were sound. Agreement was even greater when those individuals judging the functions partly sound were also included. No more than 5 per cent of the total group of respondents judged a function entirely unsound.

When the responses of the administrators, resident and extension staff members were totaled, it was noted that the difference in percentages between the function least commonly and that most commonly accepted was only 17 per cent. The

Table 14. Beliefs of Administrators, Resident and
Concerning the Proposed Administrative Fun

Function		Administrators	
		No.	%
Helps create a program that will foster the understanding among students that education is a life-long process	Sound	157	90.7
	Partly sound	15	8.7
	Unsound	1	.6
	No response	1	
Makes self available and urges staff to be available for contacts with students (individually and in groups) as one means of becoming familiar with their needs and interests	Sound	154	89.5
	Partly sound	18	10.5
	Unsound		
	No response	2	
Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus	Sound	136	79.5
	Partly sound	29	17.0
	Unsound	6	3.5
	No response	3	
Maintains contacts with alumnae to:			
Indicate personal interest and help them develop professionally	Sound	132	76.7
	Partly sound	38	22.1
	Unsound	2	1.2
	No response	2	
Seek their evaluation and suggestions for improvement of the departmental program	Sound	124	71.6
	Partly sound	47	27.2
	Unsound	2	1.2
	No response	1	
Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in:			
Placing of students and alumnae in positions	Sound	147	84.9
	Partly sound	24	13.9
	Unsound	2	1.2
	No response	1	
Keeping personnel records of students and alumnae in an up-to-date, permanent form for the use of professional staff and prospective employers	Sound	142	82.1
	Partly sound	29	16.9
	Unsound	2	1.2
	No response	1	
Counseling (educational, personal and vocational) of students	Sound	146	85.4
	Partly sound	22	12.9
	Unsound	3	1.7
	No response	3	

Administrators, Resident and Extension Staff Members and Panel Members
 Proposed Administrative Functions: Students and Alumnae

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
nd	157	90.7	227	83.8	57	90.5	441	87.0	14	100.0
ie	15	8.7	41	15.1	6	9.5	62	12.2		
	1	.6	3	1.1			4	.8		
	1		5		1		7			
nd	154	89.5	217	79.8	54	84.4	425	83.7	13	92.9
ie	18	10.5	55	20.2	10	15.6	83	16.3	1	7.1
	2		4				6			
nd	136	79.5	191	70.2	39	60.9	366	72.2	13	92.9
ie	29	17.0	69	25.4	22	34.4	120	23.7	1	7.1
	6	3.5	12	4.4	3	4.7	21	4.1		
	3		4				7			
nd	132	76.7	184	68.6	39	60.9	355	70.4	14	100.0
ie	38	22.1	79	29.5	23	35.9	140	27.8		
	2	1.2	5	1.9	2	3.2	9	1.8		
	2		8				10			
nd	124	71.6	205	75.9	52	81.3	381	75.0	12	85.7
ie	47	27.2	65	24.1	10	15.6	122	22.1	2	14.3
	2	1.2			2	3.1	4	2.9		
	1		6				7			
nd	147	84.9	228	83.5	50	79.4	425	83.5	14	100.0
ie	24	13.9	41	15.0	12	19.0	77	15.1		
	2	1.2	4	1.5	1	1.6	7	1.4		
	1		3		1		5			
nd	142	82.1	228	83.5	51	79.7	421	82.5	13	92.9
ie	29	16.9	38	13.9	12	18.8	79	15.5	1	7.1
	2	1.2	7	2.6	1	1.5	10	2.0		
	1		3				4			
nd	146	85.4	199	73.2	49	76.6	394	77.7	14	100.0
ie	22	12.9	63	23.1	13	20.3	98	19.3		
	3	1.7	10	3.7	2	3.1	15	3.0		
	3		4				7			

extent of approval ranged from 70 to 87 per cent.

The total group of respondents, excluding the panel, most frequently indorsed the function concerning the creation of a program that will foster the understanding among students that education is a life-long process. The group approved as sound by the lowest percentage the function relating to the maintenance of contacts with alumnae for the purpose of indicating personal interest and of helping them develop professionally. Some respondents wrote statements on the questionnaire which gave clues to reasons for their judgments on the latter function. Most of the comments indicated one of the following ideas: first, that the administrator would not have time to perform this function extensively and second, that responsibility for this function could be delegated to other individuals or groups. One respondent believed that this function would be difficult to perform if administrators did not know the alumnae personally and another that alumnae do not need encouragement to develop professionally, they will initiate and accomplish that for themselves. One individual interpreted the statement of the function to mean that contacts were to be maintained with all graduates regardless of the size of the alumnae group and questioned the feasibility of such a practice when the number of alumnae is large.

Home economics administrators in the Association of Land-Grant Colleges considered the problem of maintaining

contacts with alumnae at three of their workshops on administrative management. A recommendation made at the first workshop stated that:

College administrators should review regularly alumni lists with a definite policy of encouragement and direction of able people to proceed with graduate study.¹

At the third workshop on administrative management when the group was concerned with the dearth of trained home economists to fill the many available positions, the contacts with alumnae were again discussed.² Refresher courses were suggested as one means of professional improvement as well as graduate study through the offering of fellowships and scholarships.

The panel members unanimously accepted one half of the eight functions and in only one instance was a function approved as entirely sound by fewer than 13 of the 14 members. The function which pertained to maintaining contacts with alumnae to seek their evaluation and suggestions for improvement of the departmental program was believed partly sound by two. There were no comments from panel members so explanations for judgments were not available. As the result of a study³ at an institution for teacher education, the investi-

¹Report of the Workshop on Administrative Management. Op. cit., p. 21.

²Report of the workshop on administrative management for Home Economists in the Assoc. of Land-Grant Colleges. Tapoco, North Carolina. Oct. 16-20, 1949. pp. 15-21.

³Roudebush, op. cit., p. 431.

gator recommended that faculty members seek opinions of alumnae as well as students on course content and teaching methods when the curriculum is being evaluated.

Data in Table 14 concerning the various administrative groups reveal that the highest percentage of approval given any function was 91 and the lowest, 72. The percentages of respondents in the resident staff group judging the functions as entirely sound ranged from 69 to 84. The lowest and highest indorsement of functions by the extension staff were 61 and 91 per cent. This group least commonly accepted these two functions: (1) maintains contacts with alumnae to indicate personal interest and help them develop professionally and (2) shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus. Two respondents commented that the latter function was an institutional rather than a departmental function. Another judged the function partly sound because the word "all" was included. The three functions regarding which the administrative, resident and extension groups differed more than 15 per cent in their approval as wholly sound were:

Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus.

Maintains contacts with alumnae to indicate personal interest and help them develop professionally.

Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in counseling of students.

Several comments regarding the last function indicate some of the reasons for judgments. One individual did not understand the statement and three suggested that the responsibility for this function be delegated to other individuals or agencies. Tead expressed the need for student contacts with adults in this way:

. . . each student has to know that there are one or two adults on the campus who deeply care about him or her as a person. What is required is a direct relation which is warmly personalized without being excessively solicitous and intimate. . . . There is no escape from the psychic reality that if there is to be guided growth, some individual, warm of heart and wise of mind, should be the guide, counselor and friend of every student.¹

In Table 15 are presented data regarding the judgments by resident staff members, according to academic rank, of the proposed administrative functions concerning students and alumnae. When the extent of approval within each academic group was noted, the differences were discovered to range from 12 to 30 per cent; the instructors showed the greatest variation in acceptance. More than 75 per cent of the instructors, however, judged one half of the functions entirely sound.

¹Ordway Tead. College education and character. The Educational Forum. Jan. 1950. p. 139.

Table 15. Beliefs of Resident Staff Members, by Administrative Functions: S

Function		Professors		Assoc.	
		No.	%	No.	
Helps create a program that will foster the understanding among students that education is a life-long process	Sound	56	81.2	57	
	Partly sound	12	17.4	10	
	Unsound	1	1.4	1	
	No response	1		1	
Makes self available and urges staff to be available for contacts with students (individually and in groups) as one means of becoming familiar with their needs and interests	Sound	52	75.4	55	
	Partly sound	17	24.6	13	
	Unsound				
	No response	1		1	
Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus	Sound	50	72.5	46	
	Partly sound	17	24.6	18	
	Unsound	2	2.9	4	
	No response	1		1	
Maintains contacts with alumnae to:					
	Indicate personal interest and help them develop professionally	Sound	45	67.2	50
		Partly sound	21	31.3	13
		Unsound	1	1.5	2
No response		3		4	
Seek their evaluation and suggestions for improvement of the departmental program	Sound	49	72.1	60	
	Partly sound	19	27.9	7	
	Unsound				
	No response	2		2	
Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in:					
	Placing of students and alumnae in positions	Sound	54	77.1	60
		Partly sound	13	18.6	7
		Unsound	3	4.3	
No response				2	
Keeping personnel records of students and alumnae in an up-to-date, permanent form for the use of professional staff and prospective employers	Sound	56	80.0	55	
	Partly sound	11	15.7	11	
	Unsound	3	4.3	1	
	No response			2	
Counseling (educational, personal and vocational) of students	Sound	47	67.2	57	
	Partly sound	18	25.7	8	
	Unsound	5	7.1	2	
	No response			2	

resident Staff Members, by Academic Rank, Concerning the Proposed Administrative Functions: Students and Alumnae

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
56	81.2	57	83.8	59	86.7	55	83.3	227	83.8
12	17.4	10	14.7	8	11.8	11	16.7	41	15.1
1	1.4	1	1.5	1	1.5			3	1.1
1		1				3		5	
52	75.4	55	80.9	55	80.9	55	82.1	217	79.8
17	24.6	13	19.1	13	19.1	12	17.9	55	20.2
1		1				2		4	
50	72.5	46	67.6	54	79.4	41	61.2	191	70.2
17	24.6	18	26.5	12	17.7	22	32.8	69	25.4
2	2.9	4	5.9	2	2.9	4	6.0	12	4.4
1		1				2		4	
45	67.2	50	76.9	53	77.9	36	52.9	184	68.6
21	31.3	13	20.0	14	20.6	31	45.6	79	29.5
1	1.5	2	3.1	1	1.5	1	1.5	5	1.9
3		4				1		8	
49	72.1	60	89.5	54	80.6	42	61.8	205	75.9
19	27.9	7	10.5	13	19.4	26	38.2	65	24.1
2		2		1		1		6	
54	77.1	60	89.6	62	91.2	52	76.5	228	83.5
13	18.6	7	10.4	6	8.8	15	22.0	41	15.0
3	4.3					1	1.5	4	1.5
		2				1		3	
56	80.0	55	82.1	62	91.2	55	80.9	228	83.5
11	15.7	11	16.4	6	8.8	10	14.7	38	13.9
3	4.3	1	1.5			3	4.4	7	2.6
		2				1		3	
47	67.2	57	85.1	50	73.5	45	67.2	199	73.2
18	25.7	8	11.9	16	23.5	21	31.3	63	23.1
5	7.1	2	3.0	2	3.0	1	1.5	10	3.7
		2				2		4	

Among the four groups of resident staff members no function was believed sound by less than 53 per cent of any one group. The assistant professors most frequently believed that five functions were sound, although their percentage of approval for some functions was only slightly more than that of the other three groups. The two functions on which the four groups differed more than 25 per cent in acceptance were those which pertained to maintaining contacts with alumnae to indicate personal interest and help them develop professionally and to seek their evaluation and suggestions for improvement of the departmental program. More assistant professors than any of the other groups believed the first of these two functions was sound, whereas the lowest number of the instructors held this belief. In approval of the latter function the instructor group was also lowest and the associate professors highest.

Data regarding beliefs of the various groups of administrators concerning the proposed administrative functions which relate to students and alumnae are given in Table 16. The approval of these functions by the administrative groups ranged from 72 to 91 per cent.

The data show that the home economics administrators agreed closely in their beliefs as to the soundness of the eight functions. Their acceptance ranged from 85 to 91 per cent. Percentage of support of functions by the home demon-

Table 16. Beliefs of Selected Groups of Administrative Functions:

Function		President		Head of home economics	
		No.	%	No.	%
Helps create a program that will foster the understanding among students that education is a life-long process	Sound	18	94.7	29	87.9
	Partly sound	1	5.3	4	12.1
	Unsound				
	No response				
Makes self available and urges staff to be available for contacts with students (individually and in groups) as one means of becoming familiar with their needs and interests	Sound	17	89.5	29	90.6
	Partly sound	2	10.5	3	9.4
	Unsound				
	No response			1	
Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus	Sound	16	84.2	28	87.5
	Partly sound	2	10.5	4	12.5
	Unsound	1	5.3		
	No response			1	
Maintains contacts with alumnae to:					
Indicate personal interest and help them develop professionally	Sound	18	94.7	29	87.9
	Partly sound	1	5.3	3	9.1
	Unsound			1	3.0
	No response				
Seek their evaluation and suggestions for improvement of the departmental program	Sound	15	78.9	28	84.9
	Partly sound	4	21.1	5	15.1
	Unsound				
	No response				
Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in:					
Placing of students and alumnae in positions	Sound	17	89.5	28	84.9
	Partly sound	2	10.5	5	15.1
	Unsound				
	No response				
Keeping personnel records of students and alumnae in an up-to-date, permanent form for the use of professional staff and prospective employers	Sound	15	78.9	29	87.8
	Partly sound	4	21.1	2	6.1
	Unsound			2	6.1
	No response				
Counseling (educational, personal and vocational) of students	Sound	16	84.2	29	90.6
	Partly sound	3	15.8	2	6.3
	Unsound			1	3.1
	No response			1	

Selected Groups of Administrators Concerning the Proposed
 Relative Functions: Students and Alumnae

Percent	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
94.7	29	87.9	28	96.5	23	88.5	25	92.6	19	90.5	15	83.3	157	90.7
5.3	4	12.1	1	3.5	3	11.5	2	7.4	2	9.5	2	11.1	15	8.7
											1	5.6	1	.6
					1								1	
89.5	29	90.6	26	89.7	26	96.3	23	85.2	17	85.4	16	88.9	154	89.5
10.5	3	9.4	3	10.3	1	3.7	4	14.8	3	15.0	2	11.1	18	10.5
	1								1				2	
84.2	28	87.5	25	89.3	19	70.4	19	70.4	16	80.0	13	72.2	136	79.5
10.5	4	12.5	1	3.6	7	35.9	7	25.9	4	20.0	4	22.2	29	17.0
5.3			2	7.1	1	3.7	1	3.7			1	5.6	6	3.5
	1		1						1				3	
84.7	29	87.9	22	75.9	19	73.1	20	74.1	12	60.0	12	66.7	132	76.7
5.3	3	9.1	6	20.7	7	26.9	7	25.9	8	40.0	6	33.3	38	22.1
	1	3.0	1	3.4									2	1.2
					1				1				2	
78.9	28	84.9	25	86.2	18	66.7	15	55.6	13	65.0	10	55.6	124	71.6
21.1	5	15.1	3	10.3	8	29.6	12	44.4	7	35.0	8	44.4	47	27.2
			1	3.5	1	3.7							2	1.2
									1				1	
89.5	28	84.9	26	89.7	21	77.8	26	96.3	16	80.0	13	72.2	147	84.9
10.5	5	15.1	1	3.4	6	22.2	1	3.7	4	20.0	5	27.8	24	13.9
			2	6.9									2	1.2
									1				1	
78.9	29	87.8	27	93.1	20	74.1	24	88.9	16	80.0	11	61.1	142	82.1
21.1	2	6.1	2	6.9	7	25.9	3	11.1	4	20.0	7	38.9	29	16.8
	2	6.1											2	1.1
									1				1	
84.2	29	90.6	25	86.2	24	88.9	24	88.9	16	84.2	12	66.7	146	85.4
5.8	2	6.3	2	6.9	3	11.1	3	11.1	3	15.8	6	33.3	22	12.9
	1	3.1	2	6.9									3	1.7
	1								2				3	

stration agent leaders ranged from 76 to 97. Their approval of the function which pertained to maintaining contacts with alumnae to indicate personal interest and help them develop professionally was 10 per cent lower than the acceptance of any other function.

When the responses of the groups in Table 16 were compared, it was observed that no function was judged entirely sound by less than 56 per cent of any one group. There was a tendency for one of the following groups to give the lowest indorsement to each function: deans of the graduate schools, directors of experiment stations or directors of extension service.

When the beliefs of the presidents and home economics administrators regarding the functions were compared, the percentages of their judgments were found to vary less than 10 for any function. Perhaps this similarity in beliefs reflects their common concern for the welfare of both students and alumnae. They, more than many of the other administrative groups, may have more contacts with students or deal more directly with problems that concern students.

Since resident staff members and home economics administrators are both particularly concerned with students and alumnae, a comparison of the beliefs of these two groups regarding these functions proved interesting. The disagreements between the two groups were most pronounced in the

extent of their approval of these three functions:

Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus.

Maintains contacts with alumnae to indicate personal interest and help them develop professionally.

Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in counseling with students concerning educational, personal and vocational problems.

Approximately 18 per cent more of the administrators than the staff members accepted the three functions as entirely sound. These statements imply a responsibility for students and alumnae beyond that of classroom teaching and perhaps some members were unwilling to become involved in additional obligations.

From three to eight home economics staff members failed to indicate a judgment of these functions, but only one home economics administrator did not respond to three of the eight functions. Staff members might be expected to have opinions regarding the welfare of students with whom they work so closely.

A function pertaining to student participation in decisions concerning the policies of the department was discussed in the section on functions concerning staff responsibilities. Other functions discussed in that section also have implications for student welfare.

Functions concerning institutional activities

Since the home economics department operates within the framework of the institution, some of its functions are concerned with the broad aspects of the institutional program. The beliefs of administrators, resident and extension staff members and panel members regarding the proposed administrative functions related to institutional activities are presented in Table 17.

Inspection of the data revealed that the respondents approved the ten functions when both the sound and partly sound judgments were considered. However, only 43 per cent accepted as completely sound the proposal that the home economics administrator should participate vigorously in general institutional activities. When the judgments within each group were studied, it was noted that each of the four groups least frequently accepted this function. The acceptances ranged from 27 per cent for the extension group to 50 per cent for administrators and 69 per cent for the panel. Many comments indicated that the issue centered on the word "vigorously." A panel member who has had considerable experience in administration and evaluation of institutions of higher learning made this statement:

Table 17. Beliefs of Administrators, Resident and
Concerning the Proposed Administrative Func

Function		Administrators	
		No.	%
Helps to keep channels of communication functioning effectively among general administration, faculty and students	Sound	158	93.5
	Partly sound	11	6.5
	Unsound		
	No response	5	
Cooperates with administrative officers and faculty in:			
	Developing institutional goals		
	Sound	163	93.7
	Partly sound	11	6.3
Executing institutional policies	Unsound		
	No response		
	Sound	164	94.3
	Partly sound	10	5.7
Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies	Unsound		
	No response		
	Sound	127	73.0
	Partly sound	44	25.3
Promoting the establishment of policies of mutual benefit to the professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement	Unsound	3	1.7
	No response		
	Sound	134	77.0
	Partly sound	37	21.3
Conforming to institutional business procedures	Unsound	3	1.7
	No response		
	Sound	162	93.0
	Partly sound	12	7.0
Preparing statements, for use in informing state officials, of the accomplishment and needs of staff and students of the department	Unsound		
	No response		
	Sound	144	83.2
	Partly sound	25	14.5
	Unsound	4	2.3
	No response	1	

Administrators, Resident and Extension Staff Members and Panel Members
Proposed Administrative Functions: Institutional Activities

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
ound	158	93.5	243	91.0	53	93.0	454	92.1	13	100.0
	11	6.5	24	9.0	3	5.3	38	7.7		
					1	1.7	1	.2		
nse	5		9		7		21		1	
ound	163	93.7	256	93.4	59	92.2	478	93.4	14	100.0
	11	6.3	18	6.6	5	7.8	34	6.6		
			2				2			
nse										
ound	164	94.3	250	91.6	54	84.4	468	91.6	12	85.7
	10	5.7	23	8.4	10	15.6	43	8.4		
			3				3			
nse										
ound	127	73.0	215	79.1	49	77.8	391	76.8	14	100.0
	44	25.3	54	19.8	14	22.2	112	22.0		
	3	1.7	3	1.1			6	1.2		
nse			4		1		5			
ound	134	77.0	243	88.7	48	76.2	425	83.2	14	100.0
	37	21.3	28	10.2	13	20.6	78	15.3		
	3	1.7	3	1.1	2	3.2	8	1.5		
nse			2		1		3			
ound	162	93.0	234	87.0	51	80.9	447	88.3	14	100.0
	12	7.0	33	12.3	12	19.1	57	11.3		
			2	.7			2	.4		
nse			7		1		8			
ound	144	83.2	232	85.6	56	88.9	432	85.2	13	92.9
	25	14.5	36	13.3	4	6.3	65	12.8		
	4	2.3	3	1.1	3	4.8	10	2.0		
nse	1		5		1		7		1	7.1

Table 17 (Continued)

Function		Administrators		
		No.	%	
Participates vigorously in general institutional activities	Sound	84	49.7	
	Partly sound	76	45.0	
	Unsound	9	5.3	
	No response	5		
Stimulates general administration, faculty, students, extension personnel and alumnae to:				
	Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics	Sound	157	90.8
		Partly sound	16	9.2
		Unsound		
No response		1		
Encourage prospective students to avail themselves of these opportunities	Sound	151	87.8	
	Partly sound	20	11.6	
	Unsound	1	.6	
	No response	2		

Table 17 (Continued)

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
nd	84	49.7	113	41.8	17	27.0	214	42.6	9	69.2
e	76	45.0	142	52.6	39	61.9	257	51.2	4	30.8
	9	5.3	15	5.6	7	11.1	31	6.2		
	5		6		1		12		1	
nd	157	90.8	237	87.4	61	95.3	455	89.6	13	92.9
e	16	9.2	33	12.2	3	4.7	52	10.2	1	7.1
			1	.4			1	.2		
	1		5				6			
nd	151	87.8	221	82.2	60	93.8	432	85.5	12	85.7
e	20	11.6	46	17.1	4	6.2	70	13.9	2	14.3
	1	.6	2	.7			3	.6		
	2		7				9			

I think that too little emphasis has been given to the functions of the home economics administrator in participating actively and vigorously in general institutional activities not identified with home economics (administrative, faculty and social) since these contribute more than almost anything else to respect for and willingness to consider the needs and desires of home economics.

Respondents in the three groups, administrative, resident and extension staff members, gave substantial affirmation, 77 per cent, to the function which they placed second to the least frequently accepted one. This function pertained to cooperation with administrative officers and faculty in facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies. Reasons for failure to accept this function as sound were lacking since respondents made no comments. The panel members were in unanimous agreement as to the complete soundness of this function. Kefauver, a member of the Committee on Changing Conceptions in Educational Administration, stated the responsibilities of leadership in educational administration, thusly:

Educational administration is concerned not only with the plan of organization and the procedures being utilized. It is concerned, also, with the process by which these practices are adopted, support for them is maintained, and new practices are considered and instituted. The administrator is responsible for expediting a process which brings all the persons with legitimate interests in a program into effective collaboration in planning for it. By bringing persons of different

training and experience into active participation, the full experience of all groups can be drawn upon.¹

Panel members unanimously approved three additional functions as entirely sound and, with the exception of one function, no more than two members judged any of the remaining functions partly sound. However, a single function was believed unsound by one panel member.

More than 75 per cent of the respondents in the administrative, resident and extension staff groups approved the remaining eight functions as completely sound and in no instance did more than 5 per cent reject a function as unsound. Comparison of the differences in the extent of acceptance of the statements among the three groups disclosed that they ranged from 2 to 23 per cent. The function upon which the groups disagreed most concerned the vigorous participation of the administrator in general institutional activities.

Twenty-one individuals in the group of administrators, resident and extension staff members and one panel member failed to react to the function which relates to the administrator helping to keep channels of communication functioning effectively among general administration, faculty and students. There were some non-respondents in each group but the number of resident staff members was largest. No comments

¹Grayson N. Kefauver. Reorientation of educational administration. Nat. Soc. Stud. Educ. Yearbook 45, part 2. 1946. p. 3.

revealed reasons for the failure of these individuals to judge this particular function.

Table 18 contains the data concerning the beliefs of resident staff members, by academic rank, relating to the institutional functions of the home economics administrator. When the various academic groups were compared, the function which each group approved least frequently was found to concern the administrator participating vigorously in institutional activities. No more than 45 per cent of any professional group accepted this function as entirely sound.

Professors and assistant professors gave relatively high affirmation to the soundness of the function which pertained to keeping channels of communication functioning effectively. The function judged wholly sound most frequently by the associate professors and the instructors concerned cooperating with administrative officers and faculty in developing institutional goals.

Among the four groups the differences in extent of acceptance of the ten functions ranged from 5 to 13 per cent. The instructors approved six functions as entirely sound less frequently than the other three groups.

Data regarding beliefs of the seven groups of administrators pertaining to institutional functions of the head of a home economics department are presented in Table 19. With one exception, presidents, the respondents of the various

Table 18. Beliefs of Resident Staff Members, by Administrative Functions: Instit

Function		Professors		Associa te
		No.	%	No.
Helps to keep channels of communication functioning effectively among general administration, faculty and students	Sound	65	94.2	57
	Partly sound	4	5.8	9
	Unsound			
	No response	1		3
Cooperates with administrative officers and faculty in:				
	Developing institutional goals			
	Sound	63	90.0	67
	Partly sound	7	10.0	1
	Unsound			
	No response			1
Executing institutional policies	Sound	62	88.6	64
	Partly sound	8	11.4	4
	Unsound			
	No response			1
Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies	Sound	56	81.2	55
	Partly sound	12	17.4	9
	Unsound	1	1.4	2
	No response	1		3
Promoting the establishment of policies of mutual benefit to the professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement	Sound	63	90.0	61
	Partly sound	6	8.6	6
	Unsound	1	1.4	
	No response			2
Conforming to institutional business procedures	Sound	63	91.3	55
	Partly sound	6	8.7	10
	Unsound			
	No response	1		4
Preparing statements, for use in informing state officials, of the accomplishment and needs of staff and students of the department	Sound	59	88.1	59
	Partly sound	7	10.4	8
	Unsound	1	1.5	1
	No response	3		1

Resident Staff Members, by Academic Rank, Concerning the Proposed
Administrative Functions: Institutional Activities

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
65	94.2	57	86.4	63	95.5	58	87.9	243	91.0
4	5.8	9	13.6	3	4.5	8	12.1	24	9.0
1		3		2		3		9	
63	90.0	67	98.5	63	92.7	63	95.5	256	93.4
7	10.0	1	1.5	5	7.3	5	4.5	18	6.6
		1				1		2	
62	88.6	64	94.1	64	94.1	60	91.0	250	91.6
8	11.4	4	5.9	4	5.9	7	9.0	23	8.4
		1				2		3	
56	81.2	55	83.3	53	77.9	51	73.9	215	79.1
12	17.4	9	13.7	15	22.1	18	26.1	54	19.8
1	1.4	2	3.0					3	1.1
1		3						4	
63	90.0	61	91.0	62	91.2	57	82.6	243	88.7
6	8.6	6	9.0	5	7.3	11	15.9	28	10.2
1	1.4	2		1	1.5	1	1.5	3	1.1
								2	
63	91.3	55	84.6	62	92.5	54	79.4	234	87.0
6	8.7	10	15.4	5	7.5	12	17.7	33	12.3
						2	2.9	2	.7
1		4		1		1		7	
59	88.1	59	86.7	60	82.4	54	79.4	232	85.6
7	10.4	8	11.8	8	17.6	13	19.1	36	13.3
1	1.5	1	1.5			1	1.5	3	1.1
3		1				1		5	

Table 18 (Continued)

Function		Professors		Associa	
		No.	%	No.	
Participates vigorously in general institutional activities	Sound	30	43.5	24	
	Partly sound	36	52.2	39	
	Unsound	3	4.3	2	
	No response	1		4	
Stimulates general administration, faculty, students, extension personnel and alumnae to:					
	Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics	Sound	61	89.7	58
		Partly sound	7	10.3	8
		Unsound			1
		No response	2		2
Encourage prospective students to avail themselves of these opportunities	Sound	57	85.1	53	
	Partly sound	10	14.9	11	
	Unsound			2	
	No response	3		3	

Table 18 (Continued)

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
30	43.5	24	36.9	31	45.6	28	41.2	113	41.8
36	52.2	39	60.0	34	50.0	33	48.5	142	52.6
3	4.3	2	3.1	3	4.4	7	10.3	15	5.6
1		4				1		6	
61	89.7	58	86.6	63	92.6	55	80.9	237	87.4
7	10.3	8	11.9	5	7.4	13	19.1	33	12.2
		1	1.5					1	.4
2		2				1		5	
57	85.1	53	80.3	60	88.2	51	75.0	221	82.2
10	14.9	11	16.7	8	11.8	17	25.0	46	17.1
		2	3.0					2	.7
3		3				1		7	

Table 19. Beliefs of Selected Groups of Administrative Functions: Inst

Function		President		Head of home economics		Ho
		No.	%	No.	%	demonstr agent No.
Helps to keep channels of communication functioning effectively among general administration, faculty and students	Sound	17	94.4	30	93.7	25
	Partly sound	1	5.6	2	6.3	2
	Unsound					
	No response	1		1		2
Cooperates with administrative officers and faculty in:						
Developing institutional goals	Sound	18	94.7	33	100.0	28
	Partly sound	1	5.3			1
	Unsound					
	No response					
Executing institutional policies	Sound	17	89.5	30	90.9	27
	Partly sound	2	10.5	3	9.1	2
	Unsound					
	No response					
Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies	Sound	13	68.4	31	93.9	24
	Partly sound	6	31.6	2	6.1	3
	Unsound					2
	No response					
Promoting the establishment of policies of mutual benefit to the professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement	Sound	13	68.4	30	90.9	27
	Partly sound	6	31.6	3	9.1	2
	Unsound					
	No response					
Conforming to institutional business procedures	Sound	18	94.7	31	93.9	27
	Partly sound	1	5.3	2	6.1	2
	Unsound					
	No response					
Preparing statements, for use in informing state officials, of the accomplishment and needs of staff and students of the department	Sound	16	84.2	30	90.9	24
	Partly sound	3	15.8	2	6.1	4
	Unsound			1	3.0	1
	No response					

ted Groups of Administrators Concerning the Proposed
ive Functions: Institutional Activities

Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
30	93.7	25	92.6	24	88.9	27	100.0	21	100.0	14	82.4	158	93.5
2	6.3	2	7.4	3	11.1					3	17.6	11	6.5
1		2								1		5	
33	100.0	28	96.5	26	96.3	23	85.2	19	90.5	16	88.9	163	93.7
		1	3.5	1	3.7	4	14.8	2	9.5	2	11.1	11	6.3
30	90.9	27	93.1	27	100.0	27	100.0	20	95.2	16	88.9	164	94.3
3	9.1	2	6.9					1	4.8	2	11.1	10	5.7
31	93.9	24	82.8	15	55.5	20	74.1	13	61.9	11	61.1	127	73.0
2	6.1	3	10.3	11	40.8	7	25.9	8	38.1	7	38.9	44	25.3
		2	6.9	1	3.7							3	1.7
30	90.9	27	93.1	18	66.7	17	63.0	18	85.7	11	61.1	134	77.0
3	9.1	2	6.9	8	29.6	10	37.0	3	14.3	5	27.7	37	21.3
				1	3.7					2	11.2	3	1.7
31	93.9	27	93.1	27	100.0	26	96.3	20	95.2	13	72.3	162	93.0
2	6.1	2	6.9			1	3.7	1	4.8	5	27.7	12	7.0
30	90.9	24	82.7	21	77.8	24	92.3	16	76.2	13	72.3	144	83.2
2	6.1	4	13.8	6	22.2	2	7.7	4	19.0	4	22.2	25	14.5
1	3.0	1	3.5					1	4.8	1	5.5	4	2.3
						1						1	

Table 19 (Con

Function		President		Head of home economics		
		No.	%	No.	%	
Participates vigorously in general institutional activities	Sound	15	78.9	14	43.7	
	Partly sound	4	21.1	16	50.0	
	Unsound			2	6.3	
	No response			1		
Stimulates general administration, faculty, students, extension personnel and alumnae to:						
	Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics	Sound	18	94.7	30	90.9
		Partly sound	1	5.3	3	9.1
		Unsound				
		No response				
Encourage prospective students to avail themselves of these opportunities	Sound	17	94.4	29	87.9	
	Partly sound	1	5.6	4	12.1	
	Unsound					
	No response	1				

Table 19 (Continued)

Post	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
3.9	14	43.7	11	42.3	15	55.6	13	48.2	7	35.0	9	50.0	84	49.7
1.1	16	50.0	13	50.0	10	37.0	14	51.8	11	55.0	8	44.4	76	45.0
	2	6.3	2	7.7	2	7.4			2	10.0	1	5.6	9	5.3
	1		3						1				5	
4.7	30	90.9	28	96.5	26	96.3	25	92.6	16	80.0	14	77.8	157	90.8
5.3	3	9.1	1	3.5	1	3.7	2	7.4	4	20.0	4	22.2	16	9.2
									1				1	
4.4	29	87.9	28	96.5	24	88.9	21	77.8	17	85.0	15	83.3	151	87.8
5.6	4	12.1	1	3.5	3	11.1	5	18.5	3	15.0	3	16.7	20	11.6
							1	3.7					1	.6
									1				2	

groups approved to no greater extent than 56 per cent the function relating to the vigorous participation of the home economics administrator in general institutional activities. The deans of agriculture and of graduate schools and directors of experiment stations more frequently than the heads of home economics units believed this function sound.

The two functions least frequently accepted as sound by the presidents who responded to the questionnaire pertained to cooperating with administrative officers and faculty in facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies and to promoting the establishment of policies of mutual benefit to the professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement. Approximately 94 per cent of the presidents recognized one half of the functions as entirely sound. These functions were:

Helps to keep channels of communication functioning effectively among general administration, faculty and students.

Cooperates with administrative officers and faculty in

Developing institutional goals

Conforming to institutional business procedures.

Stimulates general administration, faculty, students, extension personnel and alumnae to

Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics

Encourage prospective students to avail themselves of these opportunities.

Comparison of some of the functions least frequently accepted by the presidents with those they most frequently accepted is interesting. Apparently most of the respondents in the presidential group believe that the home economics administrator should cooperate in executing institutional policies, yet some of them believed that staff members should have little responsibility in the formation of the policies. Speculation might lead to the conclusion that some respondents in this group did not believe in democratic association as the basis for educational administration.

Ninety per cent or more of the respondents in all of the administrative groups, except the graduate deans, judged as entirely sound at least four of the ten functions. The deans of the graduate schools gave no more than 89 per cent approval to any of these institutional functions.

When comparisons were made between the responses of the presidents and the home economics administrators, it was noted that their acceptances of three functions differed by 23 to 35 per cent. The home economics administrators supported more frequently than the presidents the following functions:

Cooperates with administrative officers and faculty
in

Facilitating the participation of home
economics staff members in the formulation
and evaluation of institutional policies

Promoting the establishment of policies of
mutual benefit to the professional and non-
professional staff and the institution, such
as salary, promotion, tenure and retirement.

Thirty-five per cent more of the presidents than the home
economics administrators considered it desirable for the ad-
ministrator to participate vigorously in general institutional
activities.

The administrators of home economics departments and
home demonstration agent leaders agreed to a large extent
to all but three of the institutional functions. Differences
of approximately 10 per cent existed on the following func-
tions:

Cooperates with administrative officers and faculty
in

Facilitating the participation of home
economics staff members in the formulation
and evaluation of institutional policies

Preparing statements, for use in informing
state officials, of the accomplishment and
needs of staff and students of the depart-
ment

Stimulates general administration, faculty,
students, extension personnel and alumnae
to encourage prospective students to avail
themselves of the opportunities for personal
growth and professional opportunities in
home economics.

Only the last function was sanctioned by more of the home demonstration agent leaders than the heads of home economics departments. Since the number of home economists available for openings is so limited, it is difficult to speculate why the home economics heads less frequently accepted this function.

Agreement of home economics administrators and staff members in the acceptance of functions concerning institutional activities, with one exception, was rather close. Fifteen per cent more of the administrators believed entirely sound the function which related to cooperating with administrative officers and faculty in facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies. This response might lead to the conjecture that some staff members reject democratic participation in policy formation.

Functions concerning intra-institutional activities

The work carried on within the units of colleges and universities must be coordinated with the general educational program of the institution. The administrator of each unit bears the responsibility for cooperating in the accomplishment of this coordination. In Table 20 are presented the data regarding the beliefs of administrators, resident and extension staff members and panel members concerning the

Table 20. Beliefs of Administrators, Resident and Extension Staff
Proposed Administrative Functions: Intra-institutional

Function	Administrators	
	No.	%
Encourages the increased understanding and exchange of ideas for the improvement of the educational program:		
Among staff members in specialized areas within the department	Sound	154 89.5
	Partly sound	15 8.7
	Unsound	3 1.8
	No response	2
Among staff members within the institution	Sound	126 73.3
	Partly sound	43 25.0
	Unsound	3 1.7
	No response	2
Between the community (local and state) and the department	Sound	118 68.6
	Partly sound	53 30.8
	Unsound	1 .6
	No response	2
With campus visitors	Sound	115 66.5
	Partly sound	51 29.5
	Unsound	7 4.0
	No response	1
Maintains working relationships with the agricultural extension service by:		
Cooperating in the selection of personnel, both at state and county levels	Sound	104 60.5
	Partly sound	55 32.0
	Unsound	13 7.5
	No response	2
Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research	Sound	158 90.8
	Partly sound	16 9.2
	Unsound	
	No response	
Assisting in the provision of needed resources	Sound	119 68.4
	Partly sound	48 27.6
	Unsound	7 4.0
	No response	

Resident and Extension Staff Members and Panel Members Concerning
 Administrative Functions: Intra-institutional Activities

Administrators		Resident staff		Extension staff		Total		Panel	
No.	%	No.	%	No.	%	No.	%	No.	%
154	89.5	227	83.5	57	89.1	438	86.2	14	100.0
15	8.7	37	13.6	6	9.4	58	11.4		
3	1.8	8	2.9	1	1.5	12	2.4		
2		4				6			
126	73.3	212	78.8	50	78.1	388	76.8	14	100.0
43	25.0	52	19.3	12	18.8	107	21.2		
3	1.7	5	1.9	2	3.1	10	2.0		
2		7				9			
118	68.6	195	72.2	43	67.2	356	70.4	13	90.9
53	30.8	73	27.0	20	31.2	146	28.8	1	7.1
1	.6	2	.8	1	1.6	4	.8		
2		6				8			
115	66.5	170	63.4	33	51.5	318	63.0	10	71.4
51	29.5	86	32.1	25	39.1	162	32.1	4	28.6
7	4.0	12	4.5	6	9.4	25	4.9		
1		8				9			
104	60.5	101	38.0	30	46.9	235	46.8	10	76.9
55	32.0	126	47.4	21	32.8	202	40.3	3	23.1
13	7.5	39	14.6	13	20.3	65	12.9		
2		10				12		1	
158	90.8	218	81.7	55	85.9	431	85.3	14	100.0
16	9.2	45	16.8	9	14.1	70	13.9		
		4	1.5			4	.8		
		9				9			
119	68.4	168	63.4	45	70.3	332	66.0	12	92.3
48	27.6	82	30.9	16	25.0	146	29.0	1	7.7
7	4.0	15	5.7	3	4.7	25	5.0		
		11				11		1	

Table 20 (C)

Function	Administrators	
	No.	%
Maintains working relationships with the agricultural experiment station in furthering research work by sharing in:		
Planning and evaluating the program	Sound	152 87.9
	Partly sound	21 12.1
	Unsound	
	No response	1
Securing a competent staff	Sound	160 92.5
	Partly sound	12 6.9
	Unsound	1 .6
	No response	1
Providing physical resources	Sound	136 79.1
	Partly sound	33 19.2
	Unsound	3 1.7
	No response	2
Planning and using the budget	Sound	136 78.6
	Partly sound	34 19.7
	Unsound	3 1.7
	No response	1
Maintains working relationships between home economics and other departments of the institution in:		
Developing programs to meet new needs which arise in the state and nation	Sound	153 87.9
	Partly sound	21 12.1
	Unsound	
	No response	
Providing courses in family life basic to general education for students enrolled in other departments	Sound	144 83.7
	Partly sound	25 14.5
	Unsound	3 1.8
	No response	2
Offering courses to non-home economics students for their professional education	Sound	146 83.9
	Partly sound	20 11.5
	Unsound	8 4.6
	No response	

Table 20 (Continued)

	Administrators		Resident staff		Extension staff		Total		Panel	
	No.	%	No.	%	No.	%	No.	%	No.	%
ound	152	87.9	204	75.8	51	79.7	407	80.4	14	100.0
	21	12.1	58	21.6	11	17.2	90	17.8		
			7	2.6	2	3.1	9	1.8		
nse	1		7				8			
ound	160	92.5	218	80.7	45	71.4	423	83.6	14	100.0
	12	6.9	49	18.2	14	22.2	75	14.8		
	1	.6	3	1.1	4	6.4	8	1.6		
nse	1		6		1		8			
ound	136	79.1	194	72.1	38	59.4	368	72.8	13	92.9
	33	19.2	72	26.8	19	29.7	124	24.6	1	7.1
	3	1.7	3	1.1	7	10.9	13	2.6		
nse	2		7				9			
ound	136	78.6	186	69.4	42	65.6	364	72.1	13	92.9
	34	19.7	70	26.1	16	25.0	120	23.8	1	7.1
	3	1.7	12	4.5	6	9.4	21	4.1		
nse	1		8				9			
ound	153	87.9	227	84.7	56	88.9	436	86.3	14	100.0
	21	12.1	40	14.9	6	9.5	67	13.3		
			1	.4	1	1.6	2	.4		
nse		8		1		9				
ound	144	83.7	229	85.1	57	90.5	430	85.3	14	100.0
	25	14.5	33	12.3	6	9.5	64	12.7		
	3	1.8	7	2.6			10	2.0		
nse	2		7		1		10			
ound	146	83.9	189	71.9	55	87.3	390	78.0	14	100.0
	20	11.5	60	22.8	7	11.1	87	17.4		
	8	4.6	14	5.3	1	1.6	23	4.6		
nse		13		1		14				

functions of the home economics administrator relating to intra-institutional activities.

Less than 50 per cent of the respondents in the total group, administrators, resident and extension staff members, recognized as entirely sound one function: the maintenance of working relationships with the agricultural extension service by cooperating in the selection of personnel, both at state and county levels. Thirteen per cent believed the function unsound. Each of the sub-groups, also, least frequently indorsed this one of the 14 functions.

Comments from respondents made it clear that the chief issue involved in the statement of this function was cooperating in the selection of extension personnel at the county level. One individual wrote, "Only at the state level is this her job and may not be even at state level." Two respondents inquired concerning the meaning of "cooperating" and one of them commented:

There would be no objection to cooperating in the selection of personnel. If "cooperating" implies willingness to give help then the statement is sound. If it means being responsible for helping select personnel it would apply to state staff only. She is too busy to be involved in the selection of county staff, except to make records of students available.

A few respondents believed the administrative organization within the institution might affect the working relationships of the home economics department and the extension service

in such a way that the feasibility of this function would be affected. Other comments indicated the belief that the home economics administrator should not dictate the selection of personnel and suggested that a better statement would be "helping to find" rather than "cooperating in selection."

The intent of the function was that the home economics administrator should be available for consultation with the home demonstration agent leader in choosing personnel although the latter would initiate the procedure and assume the major responsibility for the final choice. When specialists need to be selected, resident staff members of the subject matter area concerned might be consulted by the home demonstration agent leader and might later interview applicants. In selecting personnel at the county level the proposal was that student records would be available to the home demonstration agent leaders; also that she be advised of students who had an interest in extension work.

Eight of the fourteen functions concerning intra-institutional activities were unanimously approved by the panel and, with the exception of two functions, the remainder were accepted by all but one of the members. Ten believed entirely sound the function concerning the encouragement of increased understanding and exchange of ideas with campus visitors for the improvement of the educational program. One panel member asked who the visitors might be and the

nature of their visit. The failure of one individual to react to one statement was explained by her comment that she had no basis on which to make a judgment.

Variation in acceptances of these two of the 14 functions as wholly sound by the administrative, resident and extension groups was more than 20 per cent:

Maintains working relationships with the agricultural experiment station in furthering research work by sharing in securing a competent staff.

Maintains working relationships with the agricultural extension service by cooperating in the selection of personnel, both at state and county levels.

In each instance the administrative group gave the function highest acceptance of the three groups while the extension staff members least approved the former function and the resident staff members the latter.

In Table 21 are summarized the beliefs of resident staff members, by academic rank, in regard to intra-institutional functions. Each of the four groups least commonly approved the function which related to the administrator cooperating in the selection of extension personnel.

Among the groups of professors, associate professors, assistant professors and instructors the differences in the percentages of respondents who judged a particular function completely sound ranged from 9 to 35. There were eight functions for which a variance of 20 per cent or more was

Table 21. Beliefs of Resident Staff Members, by Administrative Functions: Intra

Function		Profess ors		As
		No.	%	
Encourages the increased understanding and exchange of ideas for the improvement of the educational programs:				
Among staff members in specialized areas within the department	Sound	57	83.8	
	Partly sound	7	10.3	
	Unsound	4	5.9	
	No response	2		
Among staff members within the institution	Sound	60	89.5	
	Partly sound	6	9.0	
	Unsound	1	1.5	
	No response	3		
Between the community (local and state) and the department	Sound	49	73.1	
	Partly sound	18	26.9	
	Unsound			
	No response	3		
With campus visitors	Sound	44	66.7	
	Partly sound	20	30.3	
	Unsound	2	3.0	
	No response	4		
Maintains working relationships with the agricultural extension service by:				
Cooperating in the selection of personnel, both at state and county levels	Sound	24	34.8	
	Partly sound	31	44.9	
	Unsound	14	20.3	
	No response	1		
Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research	Sound	60	85.7	
	Partly sound	8	11.4	
	Unsound	2	2.9	
	No response			
Assisting in the provision of needed resources	Sound	44	62.9	
	Partly sound	23	32.8	
	Unsound	3	4.3	
	No response			

ent Staff Members, by Academic Rank, Concerning the Proposed
ive Functions: Intra-institutional Activities

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
57	83.8	54	79.4	60	88.3	56	82.4	227	83.5
7	10.3	13	19.1	6	8.8	11	16.2	37	13.6
4	5.9	1	1.5	2	2.9	1	1.4	8	2.9
2		1				1		4	
60	89.5	55	82.1	48	71.6	49	72.1	212	78.8
6	9.0	11	16.4	16	23.9	19	27.9	52	19.3
1	1.5	1	1.5	3	4.5			5	1.9
3		2		1		1		7	
49	73.1	49	72.1	52	77.6	45	66.2	195	72.2
18	26.9	19	27.9	15	22.4	21	30.9	73	27.0
						2	2.9	2	.8
3		1		1		1		6	
44	66.7	46	67.6	44	66.7	36	52.9	170	63.4
20	30.3	18	26.5	20	30.3	28	41.2	86	32.1
2	3.0	4	5.9	2	3.0	4	5.9	12	4.5
4		1		2		1		8	
24	34.8	30	46.2	33	50.8	14	20.9	101	38.0
31	44.9	27	41.5	24	36.9	44	65.7	126	47.4
14	20.3	8	12.3	8	12.3	9	13.4	39	14.6
1		4		3		2		10	
60	85.7	58	89.2	55	84.6	45	67.2	218	81.7
8	11.4	7	10.8	9	13.9	21	31.3	45	16.8
2	2.9			1	1.5	1	1.5	4	1.5
		4		3		2		9	
44	62.9	47	73.4	42	64.6	35	53.0	168	63.4
23	32.8	14	21.9	18	27.7	27	40.9	82	30.9
3	4.3	3	4.7	5	7.7	4	6.1	15	5.7
		5		3		3		11	

Table 21 (Continu

Function		Professors		Associate
		No.	%	No.
Maintains working relationships with the agricultural experiment station in furthering research work by sharing in:				
Planning and evaluating the program	Sound	47	68.1	51
	Partly sound	18	26.1	16
	Unsound	4	5.8	
	No response	1		2
Securing a competent staff	Sound	60	87.0	56
	Partly sound	8	11.6	12
	Unsound	1	1.4	
	No response	1		1
Providing physical resources	Sound	53	76.8	47
	Partly sound	15	21.8	20
	Unsound	1	1.4	
	No response	1		2
Planning and using the budget	Sound	47	68.1	49
	Partly sound	19	27.5	16
	Unsound	3	4.4	2
	No response	1		2
Maintains working relationships between home economics and other departments of the institution in:				
Developing programs to meet new needs which arise in the state and nation	Sound	57	83.8	59
	Partly sound	10	14.7	6
	Unsound	1	1.5	
	No response	2		4
Providing courses in family life basic to general education for students enrolled in other departments	Sound	59	85.5	58
	Partly sound	9	13.1	5
	Unsound	1	1.4	2
	No response	1		4
Offering courses to non-home economics students for their professional education	Sound	45	66.2	48
	Partly sound	17	25.0	12
	Unsound	6	8.8	3
	No response	2		6

Table 21 (Continued)

Professors		Associate professors		Assistant professors		Instructors		Total	
No.	%	No.	%	No.	%	No.	%	No.	%
47	68.1	51	76.1	59	89.4	47	70.2	204	75.8
18	26.1	16	23.9	5	7.6	19	28.3	58	21.6
4	5.8			2	3.0	1	1.5	7	2.6
1		2		2		2		7	
60	87.0	56	82.3	59	89.4	43	64.2	218	80.7
8	11.6	12	17.7	6	9.1	23	34.3	49	18.2
1	1.4			1	1.5	1	1.5	3	1.1
1		1		2		2		6	
53	76.8	47	70.1	56	84.8	38	56.7	194	72.1
15	21.8	20	29.9	9	13.7	28	41.8	72	26.8
1	1.4			1	1.5	1	1.5	3	1.1
1		2		2		2		7	
47	68.1	49	73.1	56	86.2	34	50.7	186	69.4
19	27.5	16	23.9	7	10.7	28	41.8	70	26.1
3	4.4	2	3.0	2	3.1	5	7.5	12	4.5
1		2		3		2		8	
57	83.8	59	90.8	61	91.0	50	73.5	227	84.7
10	14.7	6	9.2	6	9.0	18	26.5	40	14.9
1	1.5							1	.4
2		4		1		1		8	
59	85.5	58	89.2	58	86.6	54	79.4	229	95.1
9	13.1	5	7.7	7	10.4	12	17.7	33	12.3
1	1.4	2	3.1	2	3.0	2	2.9	7	2.6
1		4		1		1		7	
45	66.2	48	76.2	55	83.3	41	62.1	189	71.9
17	25.0	12	19.1	10	15.2	21	31.8	60	22.8
6	8.8	3	4.7	1	1.5	4	6.1	14	5.3
2		6		2		3		13	

noted; for each of these functions the instructors least often accepted while the associate professors or assistant professors most often accepted them. The greatest variation in agreement, 35 per cent, occurred for the function which pertained to the maintenance of working relationships with the agricultural experiment station in furthering research work by sharing in planning and using the budget. Perhaps instructors have little knowledge of the relationships of the department with the experiment station since their duties are usually confined to teaching. Two comments from respondents indicated the belief that this duty should be delegated to a home economics research administrator working as a co-administrator in the department and as assistant director in the experiment station.

The data in Table 22 revealed that of the seven administrative groups two of them, the home economics administrators and deans of agriculture, each unanimously approved one of the functions, but not the same function. Lowest acceptance of eight of the 14 functions occurred in the graduate dean group.

When the beliefs of the presidents and heads of home economics departments were compared, it was found that their responses varied 10 per cent or less for eleven of the functions. However, the differences between the proportion judging the three remaining functions entirely sound ranged

Table 22. Beliefs of Selected Groups of Administrative Functions: Intra-institutional

Function	President		Head of home economics		
	No.	%	No.	%	
Encourages the increased understanding and exchange of ideas for the improvement of the educational programs:					
Among staff members in specialized areas within the department	Sound	18	94.7	29	87.9
	Partly sound	1	5.3	3	9.1
	Unsound			1	3.0
	No response				
Among staff members within the institution	Sound	17	89.5	27	81.8
	Partly sound	2	10.5	6	18.2
	Unsound				
	No response				
Between the community (local and state) and the department	Sound	16	84.2	21	63.6
	Partly sound	3	15.8	12	36.4
	Unsound				
	No response				
With campus visitors	Sound	15	78.9	23	69.7
	Partly sound	4	21.1	9	27.3
	Unsound			1	3.0
	No response				
Maintains working relationships with the agricultural extension service by:					
Cooperating in the selection of personnel, both at state and county levels	Sound	16	84.2	19	61.3
	Partly sound	3	15.8	11	35.5
	Unsound			1	3.2
	No response			2	
Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research	Sound	17	89.5	33	100.0
	Partly sound	2	10.5		
	Unsound				
	No response				
Assisting in the provision of needed resources	Sound	15	78.9	24	72.7
	Partly sound	3	15.8	9	27.3
	Unsound	1	5.3		
	No response				

Reports of Administrators Concerning the Proposed Administrative
 Changes: Intra-institutional Activities

Department	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
94.7	29	87.9	26	89.7	23	88.5	24	88.9	19	95.0	15	83.3	154	89.5
5.3	3	9.1	2	6.9	3	11.5	2	7.4	1	5.0	3	16.7	15	8.7
	1	3.0	1	3.4			1	3.7					3	1.8
					1				1				2	
89.5	27	81.8	23	79.3	17	65.4	18	66.7	15	75.0	9	50.0	126	73.3
10.5	6	18.2	4	13.8	8	30.8	9	33.3	5	25.0	9	50.0	43	25.0
			2	6.9	1	3.8							3	1.7
					1				1				2	
84.2	21	63.6	22	75.9	17	65.4	17	63.0	13	65.0	12	66.7	118	68.6
15.8	12	36.4	6	20.7	9	34.6	10	37.0	7	35.0	6	33.3	53	30.8
			1	3.4									1	.6
					1				1				2	
78.9	23	69.7	21	72.4	15	55.6	18	66.7	13	65.0	10	55.6	115	66.5
21.1	9	27.3	5	17.3	10	37.0	9	33.3	6	30.0	8	44.4	51	29.5
	1	3.0	3	10.3	2	7.4			1	5.0			7	4.0
									1				1	
84.2	19	61.3	5	17.2	22	81.5	19	70.4	11	52.4	11	61.1	104	60.5
15.8	11	35.5	16	55.2	5	18.5	8	29.6	6	28.6	7	38.9	55	32.0
	1	3.2	8	27.6					4	19.0			13	7.5
	2												2	
89.5	33	100.0	26	89.7	26	96.3	24	88.9	18	85.7	14	77.8	158	90.8
10.5			3	10.3	1	3.7	3	11.1	3	14.3	4	22.2	16	9.2
78.9	24	72.7	18	62.1	17	63.0	19	70.4	15	71.4	11	61.1	119	68.4
15.8	9	27.3	10	34.5	9	33.3	7	25.9	4	19.1	6	33.3	48	27.6
5.3			1	3.4	1	3.7	1	3.7	2	9.5	1	5.6	7	4.0

Table 22 (Continue

Function		President		Head of home economics	
		No.	%	No.	%
Maintains working relationships with the agricultural experiment station in furthering research work by sharing in:					
Planning and evaluating the program	Sound	18	94.7	29	87.9
	Partly sound	1	5.3	4	12.1
	Unsound				
	No response				
Securing a competent staff	Sound	18	94.7	31	93.9
	Partly sound	1	5.3	2	6.1
	Unsound				
	No response				
Providing physical resources	Sound	16	84.2	24	75.0
	Partly sound	3	15.8	8	25.0
	Unsound				
	No response			1	
Planning and using the budget	Sound	17	89.5	27	81.8
	Partly sound	2	10.5	6	18.2
	Unsound				
	No response				
Maintains working relationships between home economics and other departments of the institution in:					
Developing programs to meet new needs which arise in the state and nation	Sound	17	89.5	30	90.9
	Partly sound	2	10.5	3	9.1
	Unsound				
	No response				
Providing courses in family life basic to general education for students enrolled in other departments	Sound	13	68.4	31	94.0
	Partly sound	5	26.3	1	3.0
	Unsound	1	5.3	1	3.0
	No response				
Offering courses to non-home economics students for their professional education	Sound	16	84.2	30	90.9
	Partly sound	2	10.5	3	9.1
	Unsound	1	5.3		
	No response				

Table 22 (Continued)

Percent	Head of home economics		Home demonstration agent leaders		Dean of agriculture		Director of experiment station		Director of extension		Graduate dean		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
4.7	29	87.9	28	96.5	22	81.5	24	88.9	18	90.0	13	72.2	152	87.9
5.3	4	12.1	1	3.5	5	18.5	3	11.1	2	10.0	5	27.8	21	12.1
									1				1	
4.7	31	93.9	25	86.2	27	100.0	26	96.3	17	85.0	16	88.9	160	92.5
5.3	2	6.1	4	13.8					3	15.0	2	11.1	12	6.9
							1	3.7					1	.6
									1				1	
4.2	24	75.0	21	72.5	24	88.9	23	85.2	14	70.0	14	77.8	136	79.1
5.8	8	25.0	7	24.1	2	7.4	4	14.8	5	25.0	4	22.2	33	19.2
			1	3.4	1	3.7			1	5.0			3	1.7
	1								1				2	
9.5	27	81.8	20	69.0	25	92.6	24	88.9	12	60.0	11	61.1	136	78.6
0.5	6	18.2	9	31.0	1	3.7	2	7.4	7	35.0	7	38.9	34	19.7
					1	3.7	1	3.7	1	5.0			3	1.7
									1				1	
9.5	30	90.9	28	96.5	24	88.9	23	85.2	18	85.7	13	72.2	153	87.9
0.5	3	9.1	1	3.5	3	11.1	4	14.8	3	14.3	5	27.8	21	12.1
8.4	31	94.0	28	96.5	23	88.4	23	85.2	16	80.0	10	55.6	144	83.7
6.3	1	3.0	1	3.5	2	7.7	4	14.8	4	20.0	8	44.4	25	14.5
5.3	1	3.0			1	3.9							3	1.8
					1				1				2	
4.2	30	90.9	28	96.5	22	81.5	24	88.9	15	71.4	11	61.1	146	83.9
0.5	3	9.1	1	3.5	1	3.7	2	7.4	6	28.6	5	27.8	20	11.5
5.3					4	14.8	1	3.7			2	11.1	8	4.6

from 20 to 26 per cent:

Encourages the increased understanding and exchange of ideas for the improvement of the educational program between the community (local and state) and the department.

Maintains working relationships with the agricultural extension service by cooperating in the selection of personnel, both at state and county levels.

Maintains working relationships between home economics and other departments of the institution in providing courses in family life basic to general education for students enrolled in other departments.

More of the presidents who responded indorsed the first two functions than did the home economics administrators, but the latter group much more frequently approved the last function. Perhaps the reactions of the two groups to these functions indicate areas in which there is need for discussions between the president and the home economics administrator in some institutions concerning the principles involved in these functions.

Upon comparing the responses of the home economics administrators and the directors of experiment stations to the functions concerning the work of the agricultural experiment station, it was discovered that a larger percentage of the directors believed each of the four functions entirely sound. Some of the differences, however, were very small and none exceeded 14 per cent. The function approved by the smallest number in each group pertained to providing physical re-

sources; that approved by the largest number related to securing a competent staff.

Since one set of functions concerned the working relationships with the agricultural extension service, it is interesting to compare the responses of the administrator of the home economics department with those of the home demonstration agent leaders, the directors of extension and the deans of agriculture. A larger proportion, 86 to 100 per cent, of each of these groups judged as entirely sound the function which concerned encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research. The statement on cooperating in the selection of personnel was approved by only 17 per cent of the home demonstration agent leaders, 52 per cent of the directors, 61 per cent of the heads of home economics and 82 per cent of the deans of agriculture. Beliefs that this function was unsound were expressed by 28, 19 and 3 per cent of the home demonstration agent leaders, directors of extension and administrators of home economics departments respectively. No deans of agriculture believed the function unsound.

Of the 14 functions relating to intra-institutional functions, the resident staff members and home economics administrators differed more than 18 per cent in their approval of three functions. The administrators indorsed

more extensively than the staff members these functions:

Maintains working relationships with the agricultural extension service by

Cooperating in the selection of personnel, both at state and county levels

Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research

Maintains working relationships between home economics and other departments of the institution in offering courses to non-home economics students for their professional education.

The reaction of staff members would seem to indicate areas where the heads of home economics should assume leadership in helping them understand the issues involved in maintaining effective intra-institutional relationships.

Suggested additional functions

Individuals responding to the questionnaire were given an opportunity to suggest additional functions which they believed were important for the head home economics administrator in land-grant institutions to perform. Many comments were written in but the majority of them served to emphasize the functions proposed in the questionnaire. Two ideas prevailed in most of the suggestions: first, that the position of administrator of home economics entails numerous and important responsibilities and second, that these re-

sponsibilities must be shared with home economics staff members. A few comments illustrate these points:

It seems that I expect quite a bit from the home economics administrator. However, I assume that she will delegate responsibility where she needs to do this.

Above all a successful department head must know how to delegate responsibility.

One person would be extremely busy performing all these functions, particularly if the home economics unit were of any size. I am assuming that the administrator would delegate some of these functions to other people.

I realize a dean could not possibly be responsible for so much and do an effective job. It would seem more practical for her to know her staff and institution and state as much as possible and designate many of these duties to trained personnel and department heads and guide them.

This is quite a job! The administrator must delegate responsibility in many or most of these areas.

With a program such as the one here suggested there would have to be much delegation of authority.

Selection of Candidates for Administrative Units

Since the selection of candidates for the various units was a device used largely to induce respondents to weigh carefully the various qualifications of the candidates, the discussion of the data on the selections will be limited and that of the qualifications of candidates more extensive. Thirty-two, 28 and 34 individuals in the total group of 514 respondents and two of the panel members failed to select a

candidate for units I, II and III respectively. Reasons given for this failure included belief that an interview of a candidate was essential before making a decision, belief that none of the candidates was qualified for any of the positions described and lack of understanding of the directions for this section of the questionnaire. These comments indicate other reasons for failure to make a choice of candidates:

I believe it is impossible to select any staff member out of relation to the strengths and weaknesses of those already in the institution - or out of relation to the purposes, goals and philosophy of the institution.

Not enough information to answer, would need to know strengths of faculty of these units to make a choice.

One of the panel members wrote at length concerning the selection of candidates. The following excerpts are from his statement:

I would not select any of these candidates for any of these positions. Until others more satisfactory become available I'd designate someone already on the staff for Units I and II as acting head and put Unit III under a committee of three with chairmanship rotating each quarter or semester.

All candidates are excessively inconsistent in their qualities and attitudes; none could be a well integrated, liberal minded person One must look at the whole person. Since no one is all good or all bad some very bad qualities may outweigh some very good ones or the reverse. The specific situation also determines instances not covered by the institutional descriptions.

Brief resumes of the three units for which home economics

administrators were to be chosen will be presented in order that the discussion of the selection of candidates for them can be more meaningful.

Unit I was described as a home economics department administered as part of the school of agriculture, with 100 of the 730 women in the institution majoring in home economics, 40 women and six men who were non-majors taking courses in home economics, two students pursuing graduate work, 17 bachelor's degrees conferred in 1950-1951 and six full-time faculty members. The undergraduate curricula provided preparation for homemaking, teaching, extension and dietetics.

Unit II, administered as an independent branch of the institution, had 750 women in the institution, 390 of whom were majors in home economics; also three men were majoring in this area. Thirty-five women and five men were taking course work in home economics though they were not majors and five individuals were graduate students in home economics. The faculty consisted of 15 full-time staff members. During the 1950-1951 academic year 29 bachelor's and two master's degrees were conferred. Professions for which students might prepare included homemaking, teaching, extension, dietetics, commercial foods, textiles and costume design.

Unit III, the largest unit, was an independent branch of the institution and 680 of the 3,000 women, and 20 men students were majoring in home economics. Academic degrees

conferred in 1950-1951 consisted of 150 bachelor's, 11 master's and 4 doctoral. Forty-five individuals were studying at the graduate level. Non-majors enrolled in home economics courses consisted of 575 students of whom 250 were men. Fifty full-time faculty members participated in the home economics program which prepared students for six: homemaking, teaching, extension, dietetics, institution management and textile merchandising.

Five individuals were described in detail and presented as candidates¹ for these positions. Those receiving the questionnaire were asked to select one of the five for each unit, leaving two candidates unplaced. Data are presented in Table 23 concerning the selection of candidates for the three home economics units by the administrators, resident and extension staff members and panel members who responded to this section of the questionnaire.

The data reveal that a somewhat larger proportion of the total group of administrators, extension and resident staff members and panel members selected Candidate D for Unit I than any other candidate. This aspirant was characterized as having an M.S. degree plus additional graduate work in household equipment and as being a young, somewhat reserved individual who was divorced. She had had experience in teach-

¹For descriptions of candidates see questionnaire in the Appendix, page 233.

Table 23. Selection of Candidates by Administrators, Resident and Extension Staff Members and Panel Members for Administrative Positions in Three Home Economics Units

Unit	Candidate	Administrators		Resident staff		Extension staff		Total		Panel	
		No.	%	No.	%	No.	%	No.	%	No.	%
I	A	14	8.6	63	24.2	9	15.0	86	17.8	5	41.7
	B	41	25.3	46	17.7	11	18.4	98	20.3	1	8.3
	C	41	25.3	51	19.6	19	31.6	111	23.0		
	D	46	28.4	69	26.6	13	21.7	128	26.6	6	50.0
	E	20	12.4	31	11.9	8	13.3	59	12.3		
	No response	12		16		4		32		2	
II	A	23	14.2	37	14.0	3	5.0	63	13.0	1	8.3
	B	5	3.1	10	3.8	12	20.0	27	5.6	1	8.3
	C	54	33.3	95	36.0	24	40.0	173	35.6	5	41.7
	D	51	31.5	77	29.2	14	23.3	142	29.1	2	16.7
	E	29	17.9	45	17.0	7	11.7	81	16.7	3	25.0
	No response	12		12		4		28		2	
III	A	16	10.0	38	14.6	12	20.0	66	13.7	2	16.7
	B	3	1.9	3	1.2	1	1.7	7	1.5		
	C	30	18.7	85	32.7	14	23.3	129	26.9	6	50.0
	D	12	7.5	11	4.2	6	10.0	29	6.0		
	E	99	61.9	123	47.3	27	45.0	249	51.9	4	33.3
	No response	14		16		4		34		2	

ing, research and administration and possessed a good many administrative abilities.

The person chosen by the fewest respondents in the total group and by none of the panel was Candidate E who had a Ph.D. in nutrition, experience in extension, research and administration but was inflexible mentally and had a vision for home economics which consisted chiefly of applying basic scientific principles to home living. Among the sub-groups in Table 23 a slightly larger percentage of the administrators and resident staff members chose Candidate D than any of the other candidates for Unit I, whereas 10 per cent more of the extension group chose Candidate C than D.

More than one third of the total group designated Candidate C as the administrator for Unit II and 42 per cent of the panel concurred in this choice. Candidate C was described as having an Ed. D. degree; being experienced in college teaching and administration, well-poised, friendly and energetic; having a broad vision of home economics but failing to understand and be governed by many purposes and principles of administration. Candidate C was the choice most frequently of administrators, resident and extension staff members and panel members. However, Candidate D was a close second among administrators and the two other groups designated as a preference to head Unit II. The panel selected Candidate E over D to administer this unit.

Slightly more than one half of the total respondents, not including the panel, selected Candidate E for Unit III, the largest of the three departments described. This candidate, whose age was 57, was depicted as the oldest of the five, having outstanding mental ability, understanding the purposes and principles of administration and making application of them but having few interests in addition to professional work. Sixty-two, 47 and 45 per cent of the administrators, resident and extension staff members respectively chose Candidate E for Unit III. One half of the panel members, however, chose Candidate C for this largest unit.

Candidate B was described as having a B. S. degree, no college teaching but extension and administrative experience, an effusive personality, a broad vision of home economics but lacking in organizational ability. This candidate was never selected by more than 20 per cent of the total respondents, excluding the panel, as suitable to administer one of the units. The largest percentage of selections of this candidate were for Unit I. One panel member designated Candidate B as the choice for Unit I and another for Unit II. Comments from respondents indicated lack of academic training was a serious handicap to this candidate.

Qualifications of Candidates

Five candidates who were available as administrators for the home economics units described were each characterized as to 28 qualifications. These qualifications have been classified as personal, social, professional and administrative.

The directions asked the respondents to check only the five of the 28 qualities of the candidate that they believed would most help and the five qualities that would most hinder in administering a department effectively. Two of the 514 persons who completed the earlier section of the questionnaire concerning functions failed to respond to this section. In addition 86 of the remaining 512 and two of the panel did not follow the directions and checked more than five qualities that would help or hinder the candidates in administrative work. However, the total response in each group of those completing correctly the section on qualities was 50 per cent or more of the number receiving the questionnaire. The responses of those who did not follow the directions were summarized separately.

An important point to remember in the discussion of the qualifications of the candidates is that the individual quality was considered in relation to all of the qualifications of that candidate.

Personal

Qualities of home economics administrators considered as personal in nature were those related to age, sex, health, appearance, intellectual ability, poise and self-assurance and family situation. Beliefs of respondents concerning certain personal attributes of the five candidates which might affect administration are summarized in Table 24.

Somewhat more than 40 per cent, or 185, of the 426 respondents and four panel members indicated that an age of 57 was one of the five qualities which would be a hindrance in administration to Candidate E. More than one half of the administrators believed this candidate would be hindered by age. For the remaining candidates age was not considered a help or a hindrance by as large a number of respondents as some other qualities possessed by the candidates. An interesting observation is that of the 41 respondents who reacted to the age of Candidate D, 35, they were almost equally divided in believing this age a help and a hindrance to her.

Since men are participating somewhat more in the area of home economics as teachers and administrators of subject matter units, beliefs of respondents were sought as to whether sex would be a factor in the effective administration of a home economics unit. Less than one half of the total respondents and four of the 12 panel members believed that male sex was a hindrance in home economics administration to

Table 24. Beliefs of Administrators, Resident and Extension Staff 1

Qualifications of candidates	Administrators (144) ^a	
	Help	Hinder
Age		
A. 39	6	
B. 45	3	
C. 50		9
D. 35	10	6
E. 57		88
Sex		
A. Male		79
B. Female	3	
C. Female	2	2
D. Female	3	2
E. Female	4	
Maintains good health		
A. Physically and mentally healthy	50	
B. Underweight, sometimes tired, irritable		63
C. Overweight, anergic, alert		13
D. Physically and mentally healthy	49	1
E. Physically healthy, inflexible mentally	1	93
Has attractive appearance		
A. Dresses informally but neatly	1	
B. Dresses in latest fashion	3	
C. Well-groomed, dresses becomingly	15	
D. Dresses becomingly, grooming careless		23
E. Attractive appearance	22	1
Intellectual ability		
A. Keen mind	40	
B. Mentally alert	52	
C. Intellectually vigorous	56	
D. Intellectually vigorous	69	
E. Outstanding mental ability	70	
Possesses poise and self-assurance to meet most situations		
A. Lacks occasionally		85
B. Lacks frequently		92
C. Usually	21	
D. Usually	26	
E. Lacks occasionally		97
Family situation		
A. Married, 4 children	4	
B. Single, mother lives with her		2
C. Single		1
D. Divorced		39
E. Widow, 2 children	3	3

^aIndicates number of respondents in the group.

Extension Staff Members and Panel Members Concerning Qualifications: Personal

Administrators (144) ^a	Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder
		5	2	1		12	2	
		4		1		8		
9	1	12		1	3	2	24	
6	8	12		2	3	20	21	1
88		91		1	6	1	185	4
79	5	78			23	5	180	4
	2			2		7		
2	2			1		5	2	
2	2					5	2	
	2					6		
	83			25		158		3
63	1	114			25	1	202	2
13	1	41			6	1	70	
1	93			20		162	1	4
93	4	146		1	32	6	271	1
	3	4		2	2	6	6	
	3	1		1		7	1	
	24			8		47		
23	2	43			14	2	80	1
1	16			7		1	45	1
	77			15		132		4
	88			16		156		6
	96			13		165		6
	90			19		178	1	8
	87			9		166		3
85	2	111		2	29	4	225	5
92	2	143			38	2	273	6
	33	2		11		65	2	2
	36	1		9		71	1	3
97	2	114			34	2	245	3
	5	4		3		12	4	
2		2					4	
1	1	2				1	3	
39		64			14		117	4
3	1	2			1	4	6	

Candidate A. Sixty of the 86 respondents who did not follow directions concurred in this belief. Approximately 50 per cent of the administrators and extension staff members but only one third of the resident group held this belief. Within the sub-groups, slightly less than one half of the presidents and home economics administrators checked male sex as a hindrance to Candidate A. These comments from various respondents indicate reasons for beliefs held regarding this quality:

No objection to a man per se - but there might be complications.

In the minds of most home economists being a male would be a hindrance.

Men can be, and in our college are very effective as teachers, researchers, extensioners and department heads. I do not think a person who represents a college (or total unit in home economics) to other deans and agencies should be other than a woman.

While I think men have much to offer home economics I believe it is more as teachers than as administrators at present.

We are at a turning point in relation to men as home economics administrators. Might hinder in some places.

Sex should not be a major consideration especially in a big job that demands executive ability.

By comments several respondents indicated the belief that administrative work in home economics would place a great demand on the health of the administrator. More than one third of the total group of respondents believed

Candidates A and D would be helped in administration by good physical and mental health. Since respondents were limited to checking only five qualities, Candidates A and D apparently had other qualifications considered more helpful than health in administrative work by almost two thirds of the respondents. When an inflexible mental attitude and good physical health were combined in Candidate E, more than one half of the respondents in the total group and in each subgroup indicated this trait as a liability in effective administration for Candidate E. A combination of underweight, sometimes tired and irritable was believed a handicap to Candidate B by two panel members and somewhat less than one half of the remaining respondents. Proportionately more resident staff members believed this a hindrance than did the other groups.

Candidate C who was characterized as overweight, energetic and alert was believed hindered by this quality to a much less extent than was Candidate D, depicted as being underweight, tired and irritable. One respondent stated the belief that there were "too many overweight home economics people in this world" and several others indicated overweight as the reason for checking that particular quality as a hindrance when combined with physical energy and mental alertness.

Intellectual ability much more frequently than any other

personal quality was considered a help to each of the five candidates by the total group; at least 75 of the 86 respondents who did not follow directions concurred in this belief. Three to eight panel members believed intellectual ability helpful to some candidate.

Beliefs of respondents were sought on whether poise and self-assurance would be helpful in meeting administrative situations. One candidate, B, who was characterized as frequently lacking in poise and self-assurance was believed hindered by almost two thirds of the total respondents and six panel members because of this quality. Further analysis of data in Table 24 indicated that sub-groups of administrators and resident staff members did not vary greatly in their beliefs regarding the lack of poise in Candidate B. When two candidates, A and E, were described as occasionally lacking poise and self-assurance, well over one half of the total group believed this a hindrance to each candidate. Three and five panel members held this opinion also. It is noteworthy that Candidates C and D, characterized as usually possessing poise and self-assurance, were considered helped by this quality in administration by fewer respondents than those who considered the other three candidates hindered by occasional or frequent lack of the quality. The combination of qualifications possessed by each candidate probably accounted for this variation.

Comparatively few responses were obtained regarding appearance and family situation as assets or liabilities in effective administration. The most respondents, 80, to qualities of personal appearance, indicated Candidate D who was characterized as dressing becomingly but careless in grooming would be hindered by such a quality. The largest number of responses, 117, concerning the family situation indicated the belief that Candidate D would be hindered by divorce. Four panel members also held this view. Comments such as these were made regarding this:

Would depend on reason for divorce.

Perhaps a hindrance because people of the state would assume it meant a failure in family relationships and thus would lower her prestige and that of home economics.

Since we're dealing with personal - family relations as a basis to our work, surely a divorced person could not be a convincing leader.

Social

Qualifications of candidates which concerned acceptance of people, relations with others and participation in community activities were classified as social. Since the home economics administrator needs to work closely with students, faculty members and people of the state, the opinions of respondents on these qualifications were sought. Their beliefs are presented in Table 25.

Table 25. Beliefs of Administrators, Resident and Extension Staff Member

Qualifications of candidates	Administrators (144) ^a		Res I
	Help	Hinder	
Approach to people			
A. Friendly	27		
B. "Gushes"	2	88	
C. Friendly	30		
D. Reserved, wears well	19	2	
E. Abrupt manner		110	
Accepts each individual for his own worth with freedom to develop			
A. Always	45		
B. Not some individuals		59	
C. Always	61]
D. Always	67	1]
E. Usually	14	2	
Participates in community activities			
A. Extensively	6	4	
B. Some	2		
C. Three or four	1		
D. Few		25	
E. Takes little time for this		56	

^aIndicates number of respondents in group.

Extension Staff Members and Panel Members Concerning the Qualifications: Social

Strators (144) ^a		Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help
88	28	109	5	26	60	2	223	2	4
2	23	8	7	1	60	11	68	1	1
110	42	172	7	47	68	329	2	9	
	1		1		2				
59	94	2	21	31	160	2	5	6	
1	3	119	21		3	209	5		
2	117	3	21	1	199	3	9		
	134	2	31		232	7	3		
	48	4	9		70	3	9		
4	11	6	1	2	18	12	2		
	4		4		10				
	6	1	1		8	1			
25	2	40		12	2	80			
56	2	78		25	2	159			4

In describing the approach of Candidate B to people the word "gushes" was used on the questionnaire. More than one half of the respondents in the total group and four panel members believed the trait would hinder this individual in being an effective administrator. Proportionately more administrators held this belief than resident or extension staff members. When the beliefs of the administrative group were analyzed by sub-groups, it was found that the home economics administrators, home demonstration agent leaders and directors of extension indicated effusiveness as a hindrance more often than the remaining administrative groups.

More than 75 per cent of the administrative, resident and extension staff groups thought an abrupt manner would hinder effective administrative performance by Candidate E. Nine panel members concurred in this belief. Within the resident group fewer of the associate professors than other academic groups checked this as a hindrance. Of the 86 respondents who failed to follow directions 74 believed an abrupt manner would hinder Candidate E.

Apparently most of those who responded thought other qualifications than friendliness and reserve possessed by Candidates A, C and D respectively were of more help or hindrance to them administratively than these.

Three candidates, A, C and D, were characterized as

always accepting each individual for his own worth with freedom to develop. More respondents in the total group and the panel believed Candidate D would be helped in administrative work by this qualification than Candidate A or C. Somewhat more than one half of the total group and nine panel members believed Candidate D would be helped by the trait. In weighing the qualifications of Candidates A and C other traits must have been considered more helpful than this particular one.

When the responses regarding Candidate B, described as not accepting some individuals, were tabulated, it was found that almost one half of the total group believed this characteristic would hinder her administratively. Six of the panel members who replied held this same opinion. Proportionately more resident staff members believed Candidate B would be hindered by such a qualification than administrators and extension staff members.

Since both the negative and positive aspects of this quality resulted in large numbers of responses from all groups, it may be concluded that considerable importance was attached to the ability to accept each individual for his own worth with freedom to develop.

Relatively few responses were made to the qualifications of candidates in regard to participation in community affairs.

The largest number of replies, less than one third of the total group and four panel members, indicated that Candidate E, who took little time for community activities, would be handicapped in administration by this characteristic.

Professional

Qualifications of candidates classified as professional concerned academic degree, area of subject matter training, experience, publications, activity in professional organizations, vision of home economics and interests. In Table 26 the reactions of respondents to these qualifications are summarized.

Two candidates, A and E, were described as having earned Ph. D. degrees and more than one fourth of the 426 respondents believed these candidates would be helped administratively by this degree. One third or less of the panel members thought this degree would be helpful to the candidates. A larger proportion of administrators than resident or extension staff members held this opinion. A few replies indicated the view that the Ed. D. degree of Candidate C would be a hindrance but considerably more believed it a help although the number was not large. Of the panel, three members believed the Ed. D. degree a help to Candidate C. More than one half of those replying to the questionnaire and four panel members considered Candidate B hindered in administra-

Table 26. Beliefs of Administrators, Resident and Extension Staff Members

Qualifications of candidates	Administrators (114) ^a		Resident Home
	Help	Hinder	
Academic degree			
A. Ph.D.	55		5
B. B.S.	2	65	
C. Ed.D.	26	12	
D. M.S. plus one year	27	10	
E. Ph.D.	56	1	
Experience in college teaching			
A. Child development	7		
B. None	1	29	
C. Home economics education	4	1	
D. Household equipment	3	2	
E. None		42	
Experience in extension and/or research			
A. Research in child development	2		
B. County extension agent and state specialist	6		1
C. None		32	
D. Research for manufacturing concern	6		
E. Extension specialist and nutrition research	11		
Experience in administration			
A. None		45	
B. State extension agent leader	31		2
C. Head of department, state supervisor	46		7
D. Director of home service department	17	3	1
E. Head, small home economics unit	20		4
Active in professional organizations			
A. Only within state		8	
B. Within state and nation	34		7
C. Through membership only		52	
D. Within state and nation and business	37		7
E. Nutrition organizations in state and nation	12	1	2

^aIndicates number of respondents in the group.

Extension Staff Members and Panel Members Concerning Qualifications: Professional

Administrators (114) ^a	Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder
	52	2	15		122	2	2	
65	5	84	2	16	9	165		4
12	33	6	8	1	67	19	3	
10	17	11	6	2	50	23	2	
1	48		12		116	1	4	
	6		1		14		3	
29		57		3	1	89	5	
1	6		2		12	1		2
2	3	2			6	4		1
42		80		12		134		4
	6	1	1		9	1		
	10	1	4		20	1	1	
32		41		7		80		2
	2				8			
	7	1	2		20	1		
45	1	82		16	1	143		4
	20		17		68		1	
	70		17		133		5	
3	10	5	1		28	8		
	40		14		74		2	
8	3	47	2	3	5	58		1
	74	3	12		120	3	4	
52	3	99	1	17	4	168		5
	79	2	19		135	2	4	
1	22	1	3	1	37	3	1	

Table 26 (Continued)

Qualifications of candidates	Administrators (114) ^a		Resid- Ho.
	Help	Hinder	
Has a broad vision of home economics including a deep concern for family life education and its place in higher education			
A. Deep concern for family life education, little interest in training for professional work	1	80	1
B. Broad	126		19%
C. Broad	119		19%
D. Use of labor saving devices basic to improving family living	2	86	3
E. Application of scientific principles basic to home living	24	35	3%
Maintains broad interests in addition to deep interest in professional work			
A. Many broad plus deep interest	44		9%
B. Many, no deep interest	16	3	6%
C. Many broad plus deep interest	40		9%
D. Few plus deep interest		82	3
E. Few, no deep interest		68	3
Area of training			
A. Child development	4	2	1
B. Home management	4		1
C. Home economics education	9	5	1
D. Household equipment		6	1
E. Nutrition	4		1
Publications			
A. Text on child guidance	2		1
B. Extension bulletins	1		1
C. None, interested in contributing		12	1
D. None, interested in contributing		11	1
E. Many research papers	18	1	1%

^aIndicates number of respondents in the group.

Table 26 (Continued)

Administrators (144) ^a	Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder
80	4	133	1	35	6	248		6
	191	2	49		366	2	9	
	192	2	45		356	2	10	
86	3	142	2	37	7	265		8
35	35	94	14	13	73	142	1	6
	95	1	25		164	1	2	
3	61	2	15		92	5	1	
	99	2	26		165	2	4	
82	1	135		34	1	251		8
68	3	115	1	25	4	208		6
	4	2	2	1	10	5		
	3	1	1		8	1	1	
5	7	3	4	2	20	10		1
6		7		3		16		1
	3	2		1	7	3		
	2	1	1		5	1		
	1		1		3			
12	4	5		3	4	20		2
11	2	11			2	22		2
1	15	1		1	33	3		

tive work by having only a B. S. degree. Comments by respondents indicated that more academic training would be needed by Candidate B to meet administrative situations and maintain the academic respect of other institutions.

There were comparatively few responses concerning the various types of experience given the candidates except those in administration. Slightly less than one third of the respondents selected lack of experience in college teaching by Candidate E as one of her five hindrances but fewer than one fourth signified this lack as a hindrance to Candidate B. Less than one fourth indicated that no extension and/or research experience was one of the important hindrances to Candidate C. No administrative experience on the part of Candidate A was believed a hindrance by one third of the total group and four panel members. Almost the same number expressed the view that Candidate C would be helped by experience as head of a department and state supervisor of home economics. Some others indicated the three remaining candidates would be helped by the administrative experiences assigned them, but the numbers of individuals expressing this reaction were relatively small in comparison to the total responding.

Activity in professional organizations within the state and nation was viewed as one of the assets of Candidate B by more than one fourth of the respondents and four of the

12 panel members. Activity in business as well as professional organizations within the state and nation was specified as helpful administratively to Candidate D by almost one third of the total group and four panel members. The largest response concerning activities in professional organizations was to that described as being limited to membership. More than one third of the respondents and five panel members believed this quality of Candidate C a hindrance administratively. Apparently when respondents were limited to selecting only five qualities that would hinder and five that would help each candidate in effective administration, other qualifications than the activity in professional organizations as characterized in these candidates were considered of greater importance.

Qualifications of candidates regarding their vision of home economics elicited a large number of responses of help and hinder. Candidates B and C, described as having broad vision including a deep concern for family life education and its place in higher education, were believed by more than three fourths of the respondents to be helped by this qualification. Nine panel members held this same belief for Candidate B and 10 for Candidate C. In the sub-groups of the administrators, all but one of the presidents, home demonstration agent leaders and extension directors believed the quality of vision assigned to Candidate B would be help-

ful in administration. All of the presidents chose this as one of the qualities most helpful to Candidate C. When a candidate, A, was characterized as having a deep concern for family life education but little interest in training for professional work, 50 per cent or more of all respondents, including the panel, selected this trait as one of ^{his} her hindrances in effective administration. Sixty-four of the respondents who did not follow the directions considered this qualification a hindrance also. This reaction may reflect the emphasis placed on professional training in home economics.

Candidate E was described as seeing home economics as the application of basic scientific principles to home living. One third of the administrators, extension and resident staff members believed this vision would be one of her handicaps as did six panel members. More than one half of the entire group, however, implied that Candidate D, who envisioned the improvement of family living as occurring chiefly through the use of labor saving devices, would be hindered by such a qualification. From the responses to the characteristics of these candidates it would appear that most of the respondents believe that vision of home economics is one of the most important qualifications for home economists seeking administrative positions.

Maintaining broad interests in addition to a deep interest in professional work, as characterized in Candidates A and C, was one of the qualities believed to help these individuals by more than one third of the respondents. Proportionately, more of the staff members held this opinion than administrators. Only two or four panel members concurred in this belief. Almost 60 per cent of the respondents believed Candidate D would be hindered by having only a few interests plus a deep interest in professional work. Fewer respondents thought Candidate E would be hindered by few interests and lack of deep interest in professional work. The latter candidate apparently had other assigned qualifications which were considered a greater hindrance than this particular one.

Area of academic training and type and amount of publications, as represented in the candidates, did not appear to be considered of large importance to administrative work by the respondents, since no more than 33 of them checked either of these as one of the five qualities helping or hindering any candidate.

Administrative

Beliefs of respondents were secured regarding the helpfulness or hindrance of certain administrative abilities in relation to effective administration. The views of the

administrators, resident and extension staff members and panel are compiled in Table 27. Inspection of the data in this and earlier tables revealed that respondents more frequently indicated the administrative qualifications described were a help or a hindrance than the personal, social or professional qualifications of the candidates.

Seventy-five per cent of all respondents believed Candidate A would be hindered because of the characterization: partially understands the purposes and principles of sound administration and sometimes fails to practice them. Even more, 407 of the 426 individuals replying, thought it a hindrance to Candidate C to possess the quality of failing to understand the purposes and principles of sound administration and to be governed by them. Ten panel members held this opinion as did 77 of the 86 respondents who did not follow directions. Well over one half of the respondents and six panel members considered Candidate D hindered in administration by failure to apply sound administrative practices. On the other hand, Candidate B, who was described as understanding administrative purposes and principles and usually practicing them, was considered by more than three fourths of the group to be helped by this qualification. The quality of Candidate E, depicted as having a clear understanding of the purposes and principles of sound administration and being governed by them, was indicated by even more re-

Table 27. Beliefs of Administrators, Resident and Extension Staff Members :

Qualifications of candidates	Administrators (144) ^a		Res
	Help	Hinder	
Understands the purposes and principles of sound administration and is governed by them			
A. Partially understands, sometimes fails to practice	1	103	
B. Understands, usually practices	114		
C. Fails to understand and practice	1	136	
D. Understands, sometimes fails to practice	7	85	
E. Understands clearly, practices	127	2	
Arrives at decisions through careful consideration of human values as well as efficiency of operation			
A. Always	110		
B. Seldom	3	112	
C. Always	107	1	
D. Occasionally disregards		121	
E. Usually	86	3	
Has skill in evaluating relative importance of matters requiring attention			
A. lacks	3	198	
B. Fair amount	35		
C. Little		133	
D. Much	121		
E. Much	88	1	
Takes action in situations at appropriate time			
A. Seldom		131	
B. Always	112	2	
C. Usually	40	1	
D. Always	104		
E. Usually	26		
Uses experimental approach to solution of problems, when feasible			
A. Sometimes		25	
B. Usually	28		
C. Seldom	1	90	
D. Usually	36		
E. Usually	22		

^aIndicates number of respondents in the group.

Extension Staff Members and Panel Members Concerning Qualifications: Administrative

Administrators (144) ^a		Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help
103	1	174		44	2	321		9	
	176	1	44		334	1	9		
136	2	217		54	3	407		10	
85	3	145	1	39	11	269		6	
2	190	3	50	1	367	4	10		
	215	2	42		365	2	9		
112	3	184		51	6	347		11	
1	203	2	45		355	3	10		
121	3	185		44	3	350		7	
3	153	2	40		279	5	8		
		129		47	3	374		11	
198	41	3	14	1	90	4	1		
	2	220		53	2	406		11	
133	183	2	42		346	2	8		
1	154	2	33		275	3	7		
		196		49	2	376		11	
131	2	2	37		308	4	6		
2	159	7	14	3	97	11		1	
1	43	1	37		284	1	4		
	143	2	11		82	2			
	45								
		45		15	3	85		3	
25	3	1	13		111	1	4		
	70	1			2	272		9	
90	1	146		36					
	69	1	26	2	131	3	3		
	50		13	1	85	1	3		

Table 27 (Continued)

Qualifications of candidates	Administrators (114) ^a		Re
	Help	Hinder	
Possesses skill in helping staff and students assume some departmental responsibility			
A. Much	55		
B. Lacks	1	69	
C. Some	1	6	
D. Much	82		
E. Helps staff, not students	2	33	
Able to organize department so parts contribute to effectiveness of the whole			
A. Able	106	1	
B. Unable		107	
C. Able	116	1	
D. Partially able	4	46	
E. Able	97	1	
Gives credit to staff for contributions to departmental affairs			
A. Always	42		
B. Always	52		
C. Occasionally		46	
D. Seldom	1	131	
E. To some individuals	48	5	
Communicates effectively with staff, students, administration, professional and lay groups			
A. Effectively	94		
B. Usually	61		
C. Often ineffectively	3	128	
D. Fairly effectively	15	14	
E. Fairly effectively	6	19	

^aIndicates number of respondents in the group.

Table 27 (Continued)

trators (144) ^a		Resident staff (228) ^a		Extension staff (54) ^a		Total (426) ^a		Panel (12) ^a	
Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help	Hinder	Help
	89	1		27		171	1	6	
69	2	93			34	3	196		6
6	8	9		6	2	15	17		
	136	1		38	3	256	4	8	
33	2	79			27	4	139		3
1	161	2		36		303	3	8	
107	3	180			35	3	322		9
1	175	3		42		333	4	9	
46	8	55		5	10	17	111	1	2
1	159	2		42	1	298	4	10	
	54	1		12		108	1	2	
	84	2		19		155	2	5	
46	1	66		1	17	2	129		4
131	3	187		1	46	5	364		11
5	89	7		17	5	154	17		7
	154	1		36		284	1	8	
	87			21		169		7	
128	3	218			53	6	399		11
14	35	18		9	3	59	35	1	1
19	26	26		8	9	40	54	1	1

spondents as one of the five most helpful administratively. There seems to be no doubt that the majority of respondents believed understanding and practicing principles of sound administration were essential to effectiveness in administration.

Two candidates, A and C, depicted as always arriving at decisions through careful consideration of human values as well as efficiency of operation, and Candidate E who usually did so, were believed helped by these qualifications by a majority of the respondents and the panel members. When reactions to the qualifications of Candidates B and D, described as seldom following and occasionally disregarding human values in securing efficiency respectively, were noted, it was found that more than 75 per cent of the group considered these a hindrance. Eleven and seven of the 12 panel members concurred in this opinion as well as 74 of the 86 respondents who did not follow directions. Of all qualifications assigned to these five candidates, that concerning consideration of human values in efficiency of operation was one of those believed by at least one half of the respondents to be among the five which would help or hinder them in effective administration.

Candidates D and E were described as having much skill in evaluating the relative importance of matters requiring attention. Considerably more than one half of the respondents

believed this qualification one of the assets of Candidate E, whereas over three fourths thought it one of Candidate D's assets. When only a fair amount of skill in this area was portrayed in Candidate B, less than one fourth believed it a help. One candidate, A, lacked skill in deciding which matters were of most importance and more than three fourths of the total group and 11 panel members considered this characterization one of her handicaps. Candidate C, depicted as having little skill in this respect, was believed hindered because of this qualification by 406 of the respondents and 11 panel members. Responses of those who failed to follow the directions for this section of the questionnaire followed the same pattern as other respondents in reacting to these qualifications. These responses indicate a general belief in the importance of skill in evaluating the relative importance of matters requiring attention for individuals in administrative work.

Ability to always take action in situations at the appropriate time described Candidates B and D. More than two thirds of the total group and four and six panel members considered this qualification one of the five that would help these candidates most in effective administration. More administrators, proportionately, than resident and extension staff members expressed this opinion. When Candidate A was characterized as seldom able to take action in situations at

the right time, considerably more than three fourths of all respondents indicated this quality as one of the principal hindrances of the candidate.

When asked to react to the use, when feasible, of the experimental approach in the solution of problems as one of the important qualifications, somewhat more than one half of the total group and nine panel members responded that Candidate C would be handicapped because of seldom using this type of approach. Proportionately more resident and extension staff members held this view than administrators. Between one fourth and one third of the respondents believed Candidates B and D would be helped if they usually used the experimental approach to problems. However, fewer individuals believed the same qualification one of the five most helpful to Candidate E. Other qualifications were undoubtedly considered of more help to Candidate E by some respondents than this particular one.

Written comments from many individuals returning the questionnaire indicated a strong belief that an important function of the home economics administrator should be the sharing of responsibility in the performance of administrative duties. Candidate D, depicted as possessing much skill in this area, was considered helped by this qualification by more than one half of the total group, eight panel members and 80 of those who did not follow directions, but only about

one third indicated this as one of the strengths of Candidate A. Eight and six panel members respectively concurred in these reactions. When Candidate B was characterized as lacking skill in helping staff and students assume some departmental responsibility, somewhat less than one half of the group believed this qualification one of the hindrances. Not sharing departmental responsibility with students was considered a hindrance to Candidate E by about one third of the total group and three panel members.

The organizational ability of three aspirants for administrative positions, A, C and E, was depicted as sufficient to organize the home economics department so the parts contributed to the effectiveness of the whole. Slightly less than one half of the total group believed this one of the qualifications of most help to Candidates A and E, whereas more than one half held the same belief for Candidate C. Three fourths or more of the panel concurred in this opinion. Approximately 75 of the 86 respondents who did not follow the directions also believed this characteristic helpful to the three candidates. Candidate B was portrayed as being unable to organize the department adequately and one half of the total group plus nine panel members thought such a trait one of the hindrances to this individual. Fewer of the extension staff members, proportionately, than respondents in other groups believed such a qualification a hindrance to Candidate

B. Since this candidate was characterized as having had considerable experience in extension work, it may have influenced the reaction of the extension group to this quality.

When two candidates were described as always giving credit to staff for contributions to departmental affairs, only about one fourth and one third of the total respondents signified that Candidates A and B respectively were aided by this qualification. On the other hand, only one third indicated that one of the qualities helping Candidate E was giving credit to some individuals for their contributions to the department. Seldom recognizing the departmental contributions of the staff, as depicted in Candidate D, was checked by more than three fourths of the total group and 11 panel members as one of the hindrances to this candidate. All but 10 of those failing to complete the questionnaire as requested held the same view of this qualification of Candidate D.

The final administrative quality upon which opinions were sought was effectiveness in communicating with staff, students, administration, professional and lay groups. Candidate A was portrayed as able to communicate effectively and about two thirds of all groups thought this qualification one of the strengths of Candidate A. The number of respondents considering some degree of this qualification helpful dropped considerably when Candidate B's ability was described as usually

effective. Apparently other qualifications of B were considered more helpful than this particular one by about two thirds of the respondents. Of the 426 in the total group more than 75 per cent expressed the opinion that Candidate C would be hindered in administration by being ineffective often in communication. Eleven panel members and 79 respondents who checked more than five qualifications also held this belief in regard to Candidate C. When the two candidates, D and B, were depicted as able to communicate in a fairly effective manner with staff, students and other groups, few individuals selected this as one of the five most or least helpful. The large number of responses to the qualifications described in relation to communication would indicate that administrators, resident and extension staff members and panel members placed considerable importance on the possession of this ability as a factor in effective administration.

SUMMARY AND RECOMMENDATIONS

The purpose of this study was to determine the beliefs of selected administrators and home economics staff members regarding the functions and qualifications of the home economics administrator in land-grant institutions. The writer believes that the functions judged as sound by a majority of the respondents and the qualifications considered important in effective administration will be of help to general institutional administrators, home economics administrators and staffs in selecting administrators, evaluating and improving administration in home economics, guiding individuals into administrative work and training prospective administrators.

Statements of 70 functions and 28 qualifications were formulated, based on democratic principles of administration. A panel composed of 14 individuals from eight institutions of higher learning and one governmental agency, chosen because of their experience and belief in democratic principles of administration, judged the proposed statements on the basis of soundness, clarity and completeness. Using the refined statements as a basis, a questionnaire was prepared to secure the beliefs of selected administrators and home economics staff members as to the soundness of the proposed functions and the helpfulness of the qualifications in effective administration.

Forty-two land-grant institutions which met these criteria were selected for the study: granted degrees in home economics, participated in home economics research and extension work and located in continental United States. Institutions for Negroes only were excluded.

Questionnaires were sent to the following administrators in each of the 42 institutions: president, head of the home economics department, home demonstration agent leader, dean of agriculture, director of the experiment station, director of extension and dean of the graduate school. In addition, questionnaires were submitted to 500 resident and extension staff members selected by a random sampling procedure.

Of the 786 questionnaires mailed to administrators and staff members, 514 or 64 per cent were returned. The largest percentages of responses received in the administrative group were from the heads of home economics and the home demonstration agent leaders. The response from each of the four academic ranks in the resident staff group ranged from 68 to 70 per cent, whereas 64 per cent of the extension group replied.

The section of the questionnaire pertaining to functions was devised to secure the beliefs of individuals regarding the soundness of each of the proposed statements. Respondents were given an opportunity to indicate one of three degrees of soundness: sound, partly sound or unsound. When

responses of the 514 individuals who replied to this section of the questionnaire were analyzed, it was found that the function believed wholly sound by the most respondents, 97 per cent, stated that the home economics administrator helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution. The function approved least frequently, 37 per cent, was the following: works with professional and non-professional staffs toward the general betterment of staff living arrangements. This function was also judged unsound by the largest percentage, 16. Written statements made by the respondents indicated they seemed to believe this latter function was a personal matter in which the home economics administrator should not become involved.

The 70 proposed functions were divided into seven categories and examination of the data showed exceptionally high acceptance was given to 11 functions. Ninety per cent or more of all respondents believed entirely sound four of the 10 classified as institutional, four of the 10 concerning staff growth and welfare, two of the six pertaining to staff selection and orientation and only one of the 11 categorized leadership functions. Acceptances of functions as completely sound in the other three categories, staff responsibilities, students and alumnae and intra-institutional, were 87 per cent or below.

Of the 70 functions to which respondents were asked to react, these 67 were believed wholly sound by at least 50 per cent of the total group and of the panel:

Assumes leadership in

Formulating departmental goals (both general educational and professional) that are sound

Seeing that these goals are consistent with the institutional goals

Developing and evaluating the departmental curriculum (curricula)

Helping the staff improve the quality of teaching

Helping the staff to build an educational philosophy and to scrutinize and revise it, as needed

Helping the staff develop an awareness that one of its major goals is the development and general welfare of the students

Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living

Stimulating staff to participate effectively in general institutional activities.

Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning

The departmental budget

The recommendation of individuals for appointment to the staff.

Promotes work of the department by

Assisting staff members in defining their duties clearly

Assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest

Cooperating in the coordination of specialized interest and activities of staff members into an effective total organization

Stimulating staff to participate effectively in departmental efforts

Allowing adequate flexibility for staff members to "grow" in ability to take responsibility

Recommending for selection, administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area

Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department

Encouraging evaluation of the use of resources.

Makes provision for

Applicants for staff positions being informed of the philosophy of the institution and department

Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance, pensions, etc.

Newly appointed staff members being helped to understand the operational details of the institution and department necessary for effective work

Staff having a clear knowledge of departmental and institutional policies

Staff and students participating in development and revision of policies regarding matters of general departmental concern.

Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material rewards) for

The contributions of staff members

The professional growth of staff members

The professional growth of students.

Provides, as far as possible, conditions which stimulate staff members to

Do professional creative work (research, writing, painting, designing, etc.)

Continue professional development (teaching, counseling, research, etc.)

Contribute to professional organizations through membership, active participation and attendance at meetings.

Works with professional and non-professional staffs toward

Attainment of a reasonable balance among work, home and outside activities

Maintenance of a friendly atmosphere.

Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to

Keep the general public informed of the departmental program in cooperation with other institutional agencies

Help families of the state with their problems

Cooperate with various agencies concerned with family life education.

Helps to keep channels of communication functioning effectively among general administration, faculty and students.

Cooperates with administrative officers and faculty in

Developing institutional goals

Executing institutional policies

Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies

Promoting the establishment of policies of mutual benefit to professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement

Conforming to institutional business procedures

Preparing statements, for use in informing state officials, of the accomplishments and needs of staff and students of the department.

Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution.

Exercises leadership in providing conditions by which students may be helped to evaluate

Their own development

The extent to which the curriculum meets their needs.

Helps create a program that will foster the understanding among students that education is a life-long process.

Makes self available and urges staff to be available for contacts with students (individually and in groups) as one means of becoming familiar with their needs and interests.

Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus.

Maintains contacts with alumnae to

Indicate personal interest and help them develop professionally

Seek their evaluation and suggestions for improvement of the departmental program.

Stimulates general administration, faculty, students, extension personnel and alumnae to

Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics

Encourage prospective students to avail themselves of these opportunities.

Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in

Placing of students and alumnae in positions

Keeping personnel records of students and alumnae in an up-to-date, permanent form for the use of professional staff and prospective employers

Counseling of students on educational, personal and vocational problems.

Encourages the increased understanding and exchange of ideas for the improvement of the educational program

Among staff members in specialized areas within the department

Among staff members within the institution

Between the community (local and state) and the department

With campus visitors.

Maintains working relationships with the agricultural experiment station in furthering research work by sharing in

Planning and evaluating the program

Securing a competent staff

Providing physical resources

Planning and using the budget.

Maintains working relationships with the agricultural extension service by

Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research

Assisting in the provision of needed resources.

Maintains working relationships between home economics and other departments of the institution in

Developing programs to meet new needs which arise in the state and nation

Providing courses in family life basic to general education for students enrolled in other departments

Offering courses to non-home economics students for their professional education.

These three functions were accepted as sound by less than 50 per cent of the respondents in the total group but by more than 50 per cent of the panel:

Works with professional and non-professional staffs toward the general betterment of staff living arrangements.

Participates vigorously in general institutional activities.

Maintains working relationships with the agricultural extension service by cooperating in the selection of personnel, both at state and county levels.

From comments added by respondents there is indication that rewording of the last two statements would make them more acceptable. Consequently the following restatements are suggested:

Participates actively in general institutional activities.

Maintains working relationships with the agricultural extension service by helping to find personnel.

After studying the data and the written comments of respondents, the investigator believes the following addition should be made to the list of functions:

Delegates responsibility, with sufficient authority, to qualified individuals or groups for the performance of designated functions.

Comparison of functions accepted by the presidents and heads of home economics departments revealed that these two groups varied more than 15 per cent in their acceptance of 11 of the 70 functions. A larger proportion, 20 to 26 per cent, of the home economics administrators than presidents believed the following functions sound:

Assumes leadership in helping the staff keep constantly in mind that one of its major goals is the strengthening of family living.

Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning the departmental budget.

Makes provision for staff and students participating in the development and revision of policies regarding matters of general departmental concern.

Cooperates with administrative officers and faculty in

Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies

Promoting the establishment of policies of mutual benefit to the professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement.

Maintains working relationships between home economics and other departments of the institution in providing courses in family life basic to general education for students enrolled in other departments.

Twenty to 23 per cent more of the presidents than heads of home economics departments judged these functions entirely sound:

Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material) for the contributions of staff members.

Maintains working relationships with the agricultural extension service by cooperating in the selection of personnel, both at state and county levels.

Encourages the increased understanding and exchange of ideas for the improvement of the educational program between the community (local and state) and the department.

The differences in beliefs regarding the 11 functions by the two administrative groups may be suggestive of administrative areas in which the presidents and home economics administrators might profitably discuss the philosophies, policies and procedures involved.

Since the working relationship of resident staff members and their administrative head needs to be a close one, the extent of their agreement regarding the functions of the home economics administrator is important. Comparison of the beliefs of the two groups revealed that their disagreement was least on those functions concerning staff growth and welfare. Differences of 15 per cent or more in ac-

ceptions of functions were found for 12 of the 70 functions.

In each instance more of the home economics administrators believed these functions sound than did the staff members:

Assumes leadership in

Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living

Stimulating staff to participate effectively in general institutional activities.

Takes final responsibility for, but creates machinery through which staff members may participate in, decisions concerning recommendation of individuals for appointment to the staff.

Promotes work of the department by recommending for selection administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area.

Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to cooperate with various agencies concerned with family life education.

Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus.

Maintains contacts with alumnae to indicate personal interest and help them develop professionally.

Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in counseling of students concerning educational, personal and vocational problems.

Cooperates with administrative officers and faculty in facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies.

Maintains working relationships with the agricultural extension service by

Cooperating in the selection of personnel, both at state and county levels

Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research.

Maintains working relationships between home economics and other departments of the institution in offering courses to non-home economics students for their professional education.

These variations in beliefs indicate a need for consideration by home economics administrators and their staff members of the importance of family life education, the welfare of students and alumnae, cooperative relationships within the institution and participation in administrative procedures.

The number of times respondents failed to react to the soundness of a function totaled 131 for the entire group. One hundred and eleven of these "no responses" occurred in the group of instructors which may indicate either unwillingness to record their judgment or lack of an opinion due to inexperience.

Comparison of the acceptances of functions by the four academic ranks of the resident staff members showed that fewer of the instructors accepted 50 of the functions as entirely sound than any of the other three groups although the percentages of difference were slight in some instances.

Perhaps this reaction is again a reflection of the inexperience of the instructors.

The 14 panel members concurred unanimously that 25 of the 70 functions were wholly sound. They were equally divided in their beliefs as to whether two functions were partially or entirely sound: furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards for (1) the contributions of staff members and (2) the professional growth of staff members. Not more than three panel members rejected any of the functions as unsound. One member failed to react to three, giving as the reason insufficient information and experience to make a judgment. The remaining 43 functions were accepted as wholly sound by nine to 13 of the panel members. In only one instance did as many as five believe a function only partially sound. This function stated that the home economics administrator promotes work of the department by assisting the staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest.

For the section of the questionnaire pertaining to the choice of candidates for administrative positions three institutional situations were described. Data were given concerning the size of the department, its program of work, including the extent of its graduate program, and its place

in the administrative organization of the institution. The qualifications of five candidates, who were presumably available for these positions, were stated and respondents were asked to select one of the five candidates for each of the units. Analysis of the data concerning the choices of candidates for the administrative positions in the three home economics units showed that only one candidate was selected by more than one half of the total group of respondents. Fifty-two per cent selected Candidate E as the one best suited to administer Unit III, the largest department, but one half of the panel members chose Candidate C for this unit. For Unit I, Candidate D was most frequently chosen, 27 per cent, and for Unit II, Candidate C was selected by the largest number, 36 per cent.

The directions for the section of the questionnaire on qualifications of candidates limited the respondents to the selection of five qualities of each of the five candidates that would help and the five qualities that would hinder the candidate in becoming an effective administrator. Thus the choices were made in relation to the degree to which each candidate possessed the 28 qualities. Responses to this section of the questionnaire numbered 426 or slightly over 50 per cent of those who received the questionnaire. In addition, 86 individuals checked more than five qualities that helped and five that hindered each candidate in effective

administration; their responses were summarized separately.

When the responses of the group concerning the 28 qualifications of the candidates were analyzed, it was found that more respondents believed the ascribed administrative abilities would help or hinder the candidates than the personal, social or professional qualities. Fifteen of the 28 qualities upon which each candidate was characterized were believed by 50 per cent or more of the respondents to affect the candidates in administration when possessed to a high or low degree. Fifty per cent or more of the respondents and the panel believed that possession of this qualification to a high degree would help the candidate in administration: has skill in helping the staff and students assume some departmental responsibility.

One half or more of the individuals replying, including one half of the panel, thought that the following qualities when possessed to a low degree would hinder the candidate:

Has a friendly approach to people.

Maintains good physical and mental health.

Possesses poise and self-assurance.

Uses the experimental approach to the solution of problems, when feasible.

Gives credit to staff for contributions to departmental affairs.

Maintains broad interests in addition to deep interest in professional work.

When the candidates were characterized in relation to the following qualities, 50 per cent or more of the respondents believed they would be helped or hindered by them in effective administration depending upon the extent to which the qualities were possessed:

Has a broad vision of home economics including a deep concern for family life education and its place in higher education.

Understands clearly the purposes and principles of sound administration and is governed by them.

Arrives at decisions through careful consideration of human values as well as efficiency of operation.

Has skill in evaluating the relative importance of matters needing attention.

Takes action in situations at the right time.

Organizes department so the parts contribute to the effectiveness of the whole.

Communicates effectively with staff, students, administration, professional and lay groups.

Accepts each individual for his own worth with freedom to develop.

The importance attached to the 15 qualities by the respondents indicates perhaps that means should be found to help prospective candidates for administrative positions develop these qualities.

As this study has progressed there have been several points at which the writer believes improvements might have been made. Securing the beliefs of selected administrators

and home economics staff members in land-grant institutions regarding both the functions and qualifications of the home economics administrator proved to be a large undertaking. Investigating only functions or qualifications at one time would have allowed a more detailed and thorough study of each of them and would probably have obtained a larger percentage of respondents.

The device used to gather the data was thought by some respondents to be a good one as evidenced by requests for copies of the questionnaire for personal use, discussions with staff and students. However, others thought it very poor, indicating it was too time consuming, the directions were not clear and that the statements were not sufficiently controversial. To alleviate some of these difficulties the study might have been confined to functions. Using the functions which the panel believed sound as a basis, administrative situations might have been proposed to which respondents would be asked to react. The results of such a procedure would perhaps be more sound than those of the present study.

The cover letter which accompanied the questionnaire should have explained the purposes of the study more thoroughly and indicated which administrators at the institutions were receiving the questionnaire and the reasons for selecting

the particular administrators. Letters from respondents indicated that some of the questionnaires sent to deans of agriculture, directors of experiment stations and graduate deans were routed to the home economics administrator who had already received a questionnaire. Consequently the responses of some of these groups were reduced in number.

Since directions to the section of the questionnaire on qualifications were not followed by 86 respondents, it is evident that they were not as clear as they should have been. If the directions had been placed on the page with the descriptions of the candidates, they could have been referred to more easily. Perhaps a clarification of the reason for requesting the choice of candidates for the three home economics units might have prevented some respondents becoming unduly concerned with this choice. This concern may have affected both the number returning the questionnaire as well as the failure to follow directions.

The present study indicates the beliefs of selected administrators and staff members concerning the soundness of proposed functions of the home economics administrator in land-grant institutions. Using the functions which a majority of these respondents agreed were wholly sound as a basis, a study might be made concerning the conditions under which administrators could perform these functions. Rather than taking the form of a survey or evaluation of

conditions which exist in institutions, such a study might attempt to set forth the conditions necessary for fulfilling the duties of the home economics administrator.

Additional data concerning respondents as to age, area of training, years of experience, academic degrees and size and type of institution are available for study. The responses of the resident staff members might well be analyzed further to determine whether differences are statistically significant.

Several comments by respondents to the questionnaire indicated that the list of proposed functions for the home economics administrator might overwhelm those contemplating or participating in administrative work. Although such endeavor is arduous the number of individuals pursuing administrative work indicates there are also satisfactions derived from administration. A study to determine the nature of these satisfactions would be a contribution to administration in home economics.

Since the present study was confined to land-grant institutions for non-negroes, the functions of the head home economics administrator in liberal arts, teacher-training and negro institutions might well be investigated. Similarities in beliefs about functions in different types of institutions could be revealed through such a study.

Certain qualifications have been indicated as helpful

to persons in administrative work. Another investigation suggested by the present study relates to means of identifying these qualifications in candidates for administrative positions. Perhaps an additional study which would be of considerable value might concern training programs for administration in home economics.

BIBLIOGRAPHY

- Andrews, Wade. The qualifications and training necessary for the chief administrative officer of the public junior college. Unpublished Doctoral Dissertation. Austin, Tex., University of Texas Library. 1952.
- Arnold, Dexter Otis. Teacher sharing in school administration. Unpublished Doctoral Dissertation. Boston, Mass., Boston University Library. 1951.
- Barnard, Chester I. Functions of the executive. Cambridge, Mass., Harvard University Press. 1950.
- _____. Organization and management. Cambridge, Mass., Harvard University Press. 1948.
- Benjamin, Harold. (ed) Democracy in the administration of higher education. Tenth Yearbook of the John Dewey Society. N. Y., Harper & Bros. 1950.
- Benne, Kenneth D. and Muntyan, Bozidar. Human relations in curriculum change. N. Y., Dryden Press. 1951.
- Brownell, S. M. Current concerns in college administration. Col. and Univ. 25: 26-36. 1949.
- Burns, Norman. (ed) The administration of higher institutions under changing conditions. Adm. Off. of Higher Insts. Inst. Proc. Vol. 19. 1947.
- Burns, Norman. Methodology in the study of higher educational administration. Rev. Educ. Res. 22: 375-385. 1952.
- Butts, R. Freeman. The college charts its course. N. Y., McGraw-Hill Book Co., Inc. 1939.
- Campbell, Clyde M. (ed) Practical applications of democratic administration. N. Y., Harper & Bros. 1952.
- Cantor, Nathaniel. Dynamics of learning. Buffalo, N. Y., Foster & Stewart Pub. Corp. 1946.

- Carl, Mary Kathryn. The influence of work and social environments upon the behavior of two high level groups. Unpublished Doctoral Dissertation. College Park, Md., University of Maryland Library. 1951.
- Chamberlain, Leo M. and Kindred, Leslie W. The teacher and school organization. N. Y., Prentice-Hall, Inc. 1949.
- Chapin, Mildred R. A study of the concerns of home economics administrators in land-grant institutions as revealed in the Proceedings of the Association of Land-Grant Colleges and Universities from 1919 through 1944. Unpublished study on file in the Dept. of H. Ec. Educ. Columbus, Ohio, Ohio State University. 1946.
- Cleeton, Glen U. and Mason, Charles W. Executive ability: its discovery and development. Yellow Springs, Ohio, Antioch Press Co. 1934.
- Cole, R. M. Basic philosophy of administration. Am. Sch. Ed. J. 118: 27. 1949.
- Commission on Teacher Education. Teachers for our times. Wash., D. C., American Council on Education. 1944.
- Cronkhite, Bernice Brown. (ed) A handbook for college teachers. Cambridge, Mass., Harvard University Press. 1950.
- Eckert, Ruth. Ways of evaluating college teaching. Sch. and Soc. 71: 65-69. 1950.
- Educational leaders, their functions and preparation. Sch. Executive. 68: 61-70. 1949.
- Educational Policies Commission. Policies for education in American democracy. Wash., D. C., Nat. Educ. Assoc. and Am. Assoc. Sch. Adm. 1946.
- Ekstrom, Doris Evangeline. The bearing of the experimentalist's approach to general education upon home economics in higher education. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1947.
- Falvey, Frances E. Student participation in college administration. N. Y., Bur. of Pub., Teachers College, Columbia University. 1952.

- Faulkner, Donald. An inquiry into the principles of higher educational administration. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1939.
- Fayol, Henri. Industrial and general administration. Translated from the French by J. A. Coubrough. Croydon, H. R. Grubb, Ltd. 1930.
- Franklin, Carl M. Democratic budget-making procedures. J. Higher Educ. 23: 245-254. 1952.
- Gilmore, Doris Eloise. The application of criteria appropriate to democratic values of selected administrative patterns in home economics in higher education for the purpose of refining the criteria and reconstructing practice. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1948.
- Hawkes, Herbert E. and Hawkes, Anna L. Through a dean's open door. N. Y., McGraw-Hill Book Co., Inc. 1945.
- Henderson, Algo D. and Hall, Dorothy. Antioch college, its design for liberal education. N. Y., Harper & Bros. 1946.
- Henderson, Grace Mildred. Proposals for the administration of home economics in higher institutions in the light of co-ordinated community educational efforts in home and family life. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1944.
- Henry, Nelson B. (ed) Changing conceptions in educational administration. Nat. Soc. Stud. Educ. Yearbook 45, part 2. Chicago, Univ. of Chicago Press. 1946.
- Hopkins, L. Thomas. Interaction, the democratic process. Boston, D. C. Heath & Co. 1941.
- Hoslett, Schuyler Dean. Human factors in management. N. Y., Harper & Bros. 1951.
- Jensen, Frances. The role of home economics in education for home and family living as a part of the general education of students in six land-grant colleges. Unpublished Doctoral Dissertation. (abstract) Ithaca, N. Y., Cornell University Library. 1952.

- Jones, Ray W. (ed) The human element in college and university administration. Third informal conference of deans of arts and sciences and their administrative associates. Stillwater, Okla. Oklahoma A. & M. College, Aug. 8-12. 1949.
- Justin, Margaret. Preparing home economists for administrative management. Assoc. of Land-Grant Colleges and Univ. Proceed. 57th Annual Convention. Chicago, 1943. pp. 193-194.
- Keezer, D. M. Human element in college and university administration. Col. and Univ. 25: 213-232. 1950.
- Kefauver, Grayson, N. Reorientation of educational administration. Nat. Soc. Stud. Educ. Yearbook 45, part 2: 1-6. 1946.
- Kelley, William F. The inservice growth of the college teacher. Omaha, Nebr., Creighton University. 1950.
- Klein, Arthur J. Survey of land-grant colleges and universities. U. S. Off. of Educ., Bul. 1930, No. 9.
- _____ and others. Adventures in the reconstruction of education. Columbus, Ohio, Col. of Ed., Ohio State University. 1941.
- Koopman, G. Robert, Miel, Alice and Misner, Paul J. Democracy in school administration. N. Y., D. Appleton-Century Co., Inc. 1943.
- McCormick, C. F. Clues to better administration. Clearing House. 23: 131-135. 1948.
- McDonald, Ralph W. (ed) Current trends in higher education. Fourth Annual National Conference on Higher Education. Chicago, Ill., April 4-7, 1949. Official Report. Dept. of Higher Educ., Nat. Educ. Assoc. Wash., D. C. 1949.
- McPhee, Julian A. Blind spots in educational public relations. Col. Pub. Rel. Quart. 3: 32-35. 1952.
- Mace, Myles, L. The growth and development of executives. Boston, Div. of Res., Grad. Sch. of Bus. Adm., Harvard University. 1950.
- Melby, Ernest O. Problems of the professional personnel. Amer. Assoc. of Sch. Adm. Official report, 1946-47. pp. 225-229. 1947.

- Miller, Van. (ed) Providing and improving administrative leadership in America's schools. Fourth report of the Natl. Conf. of Prof. of Educ. Adm. N. Y., Bur. of Pub., Teachers College, Columbia University. 1951.
- Miller, Ward Ira. Democracy in educational administration: an analysis of principles and practices. N. Y., Teachers College, Columbia University. 1942.
- Mort, Paul R. Principles of school administration. N. Y., McGraw-Hill Book Co., Inc. 1946.
- Oppenheimer, J. J. and Britton, Joseph H. Faculty morale. J. Higher Educ. 23: 383-386. 1952.
- O'Toole, Lela. The purposes and organization relating to large home-economics units in ten land-grant colleges and universities with proposals for effective organization. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1949.
- Pigors, Paul John W. Leadership or domination. N. Y., Houghton Mifflin Co. 1935.
- President's Commission on Higher Education. Higher education for American democracy. N. Y., Harper & Bros. 1947.
- Reller, T. L. Reconciliation of democracy and efficiency in educational administration. Educ. Adm. and Sup. 35: 165-174. 1949.
- Report of the work shop on administrative management for home economists in the Association of Land-Grant Colleges. Longs Peak Inn, Colo. July 24-29, 1944. (Mimeographed)
- Report of the work shop on administrative management for home economists in the Association of Land-Grant Colleges. Tapoco Lodge, Tapoco, No. Carolina, Oct. 16-20, 1949. (Mimeographed)
- Roudebush, Alma R. A study of the utilization of student judgment in curriculum revision in the home economics division at the New York State College for Teachers at Buffalo. Unpublished Doctoral Dissertation. Columbus, Ohio, Ohio State University Library. 1951.

- Scott, Dorothy DeLong. An approach to the development of the college curriculum for students in home economics. Unpublished Doctoral Project. N. Y., Teachers College, Columbia University. 1945.
- Simon, Herbert A. Administrative behavior. N. Y., Macmillan Co. 1947.
- Smith, Howard. Developing your executive ability. N. Y., McGraw-Hill Book Co. 1946.
- Spafford, Ivol. (ed) Home economics in higher education. Wash., D. C., American Home Economics Association. 1949.
- Starch, Daniel. How to develop your executive ability. N. Y. Harper & Bros. 1943.
- Tead, Ordway. The art of administration. N. Y., McGraw-Hill Book Co., Inc. 1951.
- _____ College education and character. The Educ. Forum. 14: 133-144. 1950.
- _____ Democratic administration. N. Y., Association Press. 1945.
- _____ New adventure in democracy. N. Y., McGraw-Hill Book Co., Inc. 1939.
- _____ Trustees, teachers, students: their role in higher education. Salt Lake City, University of Utah Press. 1951.
- Thorne, Lulu B. Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations. U. S. Dept. Agr., Agr. Handbook. No. 35. 1951.
- Urwick, L. The elements of administration. N. Y., Harper & Bros. 1943.
- U. S. Office of Education. Division of Vocational Education. Home economics in degree-granting institutions. U. S. Office of Educ. Misc., 2557. Wash., D. C. Rev. 1952.
- Waldo, Dwight. The administrative state, a study of the political theory of American public administration. N. Y., Ronald Press Co. 1948.

Wiles, Kimball. Supervision for better schools. N. Y.,
Prentice-Hall, Inc. 1950.

Williams, Chester Spring. Improvement of college teaching,
an evaluation of administrative plans. Unpublished
Doctoral Dissertation. New Haven, Conn., Yale Uni-
versity Library. 1949.

Wilson, Logan. The academic man. N. Y., Oxford University
Press. 1942.

Woodburne, Lloyd S. Faculty personnel policies in higher
education. N. Y., Harper & Bros. 1950.

_____ The qualifications of superior faculty members.
J. Higher Educ. 23: 377-383. 1952.

ACKNOWLEDGMENTS

The author wishes to express her sincere appreciation to Dr. Hester Chadderdon of the Home Economics Education Department, under whose direction this study was made, for encouragement and guidance,

Dr. Hildegarde Johnson of the Home Economics Education Department, for suggestions and help in planning the collection of data for the study,

the Iowa State College staff members who served as the first panel,¹ for their useful suggestions,

the individuals who composed the second panel,² for their judgment of the statements of functions and qualifications and helpful suggestions for additions and revisions,

the pretest group: Harriet Adams, Dr. John Bath, R. K. Bliss, Dr. Roy Kottman and Harriet Roberts,

President Charles E. Friley, Dean Helen R. LeBaron, Dean Floyd Andre and Louise M. Rosenfeld for writing the letters which accompanied the questionnaire and

the large group of administrators and home economics staff members in the 42 land-grant institutions for responding to the questionnaire. Without their cooperation the study could not have been completed.

¹For names of the first panel members see the Appendix, p. 225.

²For names of the second panel members see the Appendix, p. 226.

APPENDIX

FIRST PANEL

Composed of Iowa State College Staff Members

Dr. W. H. Bragonier, Head of the Department of Botany and
Plant Pathology

Dr. Gertrude E. Chittenden, Head of the Department of
Child Development

Dr. Ercel S. Eppright, Head of the Department of Foods and
Nutrition

Miss Florence Fallgatter, Head of the Department of Home
Economics Education

Miss Fannie Gannon, Extension Associate Professor of Home
Management

Dr. Mary Lyle, Professor of Home Economics Education

Dr. P. Mabel Nelson, former Dean of the Division of Home
Economics

Neil J. Raudabaugh, Associate Professor of Extension Studies

Dr. Pearl P. Swanson, Assistant Director of Home Economics
Research

SECOND PANEL

- Miss Edna Amidon, Chief, Home Economics Education Branch
United States Office of Education, Washington, D. C.
- Dr. Karl W. Bigelow, Professor of Education
Teachers College, Columbia University, New York, N. Y.
- Dr. Helen Judy Bond, Head, Department of Home Economics
Teachers College, Columbia University, New York, N. Y.
- Dr. Wendell H. Bragonier, Head, Department of Botany and
Plant Pathology, Iowa State College, Ames, Iowa
- Miss Ardenia Chapman, Dean, College of Home Economics
Drexel Institute of Technology, Philadelphia, Pa.
- Dr. Gertrude E. Chittenden, Associate Director
Merrill-Palmer School, Detroit, Michigan
- Miss U. Vivian Crowe, Head, Department of Home Economics
Carnegie Institute of Technology, Pittsburgh, Pa.
- Dr. Harvey H. Davis, Provost
State University of Iowa, Iowa City, Iowa
- Dr. Laura W. Drummond, Professor of Home Economics
Teachers College, Columbia University, New York, N. Y.
- Dr. H. Gordon Hullfish, Professor of Education
Ohio State University, Columbus, Ohio
- Dr. Arthur J. Klein, former Dean, College of Education
Ohio State University, Columbus, Ohio
- Dr. Flemmie P. Kittrell, Head, Department of Home Economics
Howard University, Washington, D. C.
- Miss Wylie B. McNeal, former Head, Department of Home Economics
University of Minnesota, University Farm, St. Paul, Minn.
- Dr. E. L. Prestwood, Associate Coordinator, Cooperative
Program in Educational Administration
Teachers College, Columbia University, New York, N. Y.
- Dr. Ordway Tead, Chairman, Board of Higher Education
New York City, N. Y.

February 27, 1953

President John Doe
Orient State College
College Station, Orient

Dear Dr. Doe:

Miss Frances M. Hettler, who is studying for a Ph. D. degree in Home Economics here at the Iowa State College, needs your views on some important questions. She is interested in ascertaining the views of certain Land-Grant administrators as to the functions and qualifications necessary in the field of home economics for a home economics administrator in a Land-Grant institution.

We have agreed to help Miss Hettler in her study and are contacting you because we believe that out of this work some helpful suggestions of value to Land-Grant people might be obtained.

Very truly yours,

Charles E. Friley
President

Jvp

IOWA STATE COLLEGE
OF AGRICULTURE AND MECHANIC ARTS
AMES, IOWA

DIVISION OF HOME ECONOMICS
OFFICE OF THE DEAN

February 25, 1953

Dear Home Economist:

Miss Frances Hettler, a candidate for her Ph.D degree in Home Economics Education at the Iowa State College, is making a study of the functions and qualification of home economics administrators in Land Grant institutions. We are confident that her study will result in material that will help all our institutions as they search for qualified persons to take administrative positions.

Your assistance in filling out the enclosed questionnaire will be a significant contribution to this study.

Sincerely yours,



Helen R. LeBaron
Dean

IOWA STATE COLLEGE

OF AGRICULTURE AND MECHANIC ARTS

AMES, IOWA

-229-

DIVISION OF AGRICULTURE
EXPERIMENT STATION • EXTENSION SERVICE

Dear Friend:

Miss Frances M. Hettler, who is studying for a Ph.D. degree in Home Economics here at the Iowa State College needs your views on some important questions. She is interested in finding the reaction of certain land-grant administrators to the functions and qualifications necessary in the field of home economics for a home economics administrator in a land-grant institution.

We have agreed to help Miss Hettler in her study and are contacting you because we believe that out of this work some helpful suggestions of value to land-grant people might be obtained.

Sincerely yours,



Dean and Director

Floyd Andre:aw

COOPERATIVE EXTENSION WORK
IN
AGRICULTURE AND HOME ECONOMICS

IOWA STATE COLLEGE OF AGRICULTURE
AND U. S. DEPARTMENT OF
AGRICULTURE COOPERATING

EXTENSION SERVICE

STATE OF IOWA

-230-

AMES, IOWA

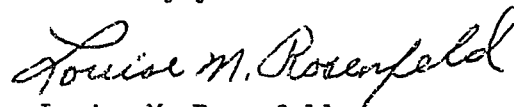
February 27, 1953

Dear Extension Home Economist:

Miss Frances Hettler, a graduate student working on her Ph. D. degree in home economics education at the Iowa State College, needs your assistance. The questionnaire she is asking you to fill out provides you an opportunity to give your opinion regarding the functions and qualifications of the head home economics administrator. Miss Hettler's study is concerned with the effectiveness of administering the total home economics program in land-grant institutions. Since Extension is part of this total program we have much to gain from a study of this kind.

By responding to this questionnaire you can make a significant contribution to this study.

Sincerely yours



Louise M. Rosenfeld
Assistant Director
(Home Economics)

mp

203 Campus Avenue
Ames, Iowa
February 25, 1953

HAVE YOU EVER WONDERED WHAT MAKES FOR
EFFECTIVE ADMINISTRATION OF HOME
ECONOMICS IN LAND-GRANT INSTITUTIONS?

Your assistance is being sought in a study to determine the beliefs of faculty concerning functions and qualifications of the head home economics administrator in land-grant institutions. A group of administrators and a sample of home economics staff members in each degree-granting land-grant institution are being asked to participate.

This study is an attempt to determine the functions and qualifications of the home economics administrator in land-grant institutions in the hope that:

1. Qualified individuals may be challenged to serve home economics in an administrative capacity.
2. Institutional administrators may obtain help in selecting new home economics administrators.
3. Home economics staff and administrators may clarify for themselves the job of administration and their part in it.

Will you please fill out all sections of the attached material and return to me in the enclosed self-addressed stamped envelope by March 10, if possible? Pretests indicate that approximately an hour will be required to fill out the forms.

Your reaction is very important if we are to determine the beliefs of administrators and staff members concerning effectiveness of home economics administrators. A summary of the findings of the entire study will be sent to the home economics administrator in your institution.

Sincerely yours

Frances M. Hettler

203 Campus Avenue
Ames, Iowa
March 12, 1953

Do you remember receiving a questionnaire about March 1 concerning the functions and qualifications of a home economics administrator in a land-grant institution? Could you find an hour in the next day or two to fill it out and drop it in the mail? If your reply is already in the mail, please disregard this reminder.

Your reply will be a significant contribution to this study.

Sincerely,
Frances M. Hettler
Frances M. Hettler

203 Campus Avenue
Ames, Iowa
March 23, 1953

Returns from your group to the questionnaire concerning the functions and qualifications of the home economics administrator in land-grant institutions have been gratifying. But your reply is also needed if the study is to set forth the beliefs of administrators and staff members concerning these functions and qualifications. Could you fill out the questionnaire in the next day or two and drop it in the mail?

Sincerely,
Frances M. Hettler
Frances M. Hettler

SECTION I

Qualifications of a Head Home Economics Administrator In Land-Grant Institutions

The purpose of this section is to determine what qualifications you *believe* the head home economics administrator in a land-grant institution should possess in order to do effective work. You are asked to select a head administrator for the home economics unit in the three land-grant institutions described below. Five candidates are available for these positions. Their qualifications are listed separately. If some qualification which you believe important is not listed, assume it to be average.

Description of Home Economics Units

	<i>Unit I</i>	<i>Unit II</i>	<i>Unit III</i>
Unit administered in the institution as	part of school of agriculture	independent branch	independent branch
Total women in institution	730	750	3,000
Home economics majors			
Women	100	390	680
Men	0	3	20
Non-majors in home economics courses			
Women	40	35	325
Men	6	5	250
Graduate home economics majors	2	5	45
Full-time home economics faculty	6	15	50
Degrees conferred in 1950-51			
Bachelors	17	29	150
Masters	0	2	11
Doctors	0	0	4
Nursery school and home management house	Yes	Yes	Yes
Vocations or professions for which home economics undergraduate curricula provide preparation	Homemaking Teaching Extension Dietetics	Homemaking Teaching Extension Dietetics Commercial Foods Textile and Costume Design	Homemaking Teaching Extension Dietetics Institution Management Textile Merchandising

Directions:

After studying the positions and qualifications of the candidates:

1. Place in the blanks provided on the next page the *letter* of the candidate which you selected for each unit, leaving two candidates not placed.
2. For all 5 candidates mark X in the *circles* before the 5 qualities which you believe would *contribute most to effectiveness* as an administrator of a home economics unit in a land-grant institution.
3. For all 5 candidates mark X in the *squares* before the 5 qualities that you believe would *most to hinder effectiveness* as an administrator of a home economics unit in a land-grant institution.

(over)

Guide to Candidate Qualifications	Candidate A		Candidate B	
	HELP <input type="radio"/>	HINDER <input type="checkbox"/>	HELP <input type="radio"/>	HINDER <input type="checkbox"/>
1. Degree	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
2. Area of training	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
3. Experience in	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
a. College teaching	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
b. Extension and/or research	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
c. Administration	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
4. Publications	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
5. Age	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
6. Sex	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
7. Personality	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
8. Health	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
9. Appearance	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
10. Intellectual ability	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
11. Poise	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
12. Family situation	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
13. Professional contacts	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
14. Vision	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
15. Understanding and practice of sound administration	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
16. Human values vs. efficiency	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
17. Evaluating importance of matters	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
18. Timing	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
19. Experimental approach	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
20. Sharing responsibility	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
21. Organization	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
22. Recognition of contributions	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
23. Communication	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
24. Acceptance of people	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
25. Citizenship	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>
26. Broad interests	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>

SECTION I

(write in letter) Unit I _____ Unit II _____ Unit III _____

Candidate B	HELP HINDER		Candidate C	HELP HINDER		Candidate D	HELP HINDER	
	<input type="radio"/>	<input type="checkbox"/>		<input type="radio"/>	<input type="checkbox"/>		<input type="radio"/>	<input type="checkbox"/>
management	<input type="radio"/>	<input type="checkbox"/>	1. Ed.D.	<input type="radio"/>	<input type="checkbox"/>	1. M.S. plus one year of graduate work	<input type="radio"/>	<input type="checkbox"/>
me	<input type="radio"/>	<input type="checkbox"/>	2. Home economics education	<input type="radio"/>	<input type="checkbox"/>	2. Household equipment	<input type="radio"/>	<input type="checkbox"/>
me demonstration agent state extension specialist	<input type="radio"/>	<input type="checkbox"/>	3. a. Home economics education b. None	<input type="radio"/>	<input type="checkbox"/>	3. a. Household equipment b. Research on equipment for manufacturing concern	<input type="radio"/>	<input type="checkbox"/>
te home demonstration nt leader	<input type="radio"/>	<input type="checkbox"/>	c. Head of home economics department and state supervisor of vocational home economics	<input type="radio"/>	<input type="checkbox"/>	c. Director of home service department for utility company	<input type="radio"/>	<input type="checkbox"/>
ision bulletins on home gement	<input type="radio"/>	<input type="checkbox"/>	4. None, interested in contributing to educational literature	<input type="radio"/>	<input type="checkbox"/>	4. None, interested in contributing to educational literature	<input type="radio"/>	<input type="checkbox"/>
e	<input type="radio"/>	<input type="checkbox"/>	5. 50	<input type="radio"/>	<input type="checkbox"/>	5. 35	<input type="radio"/>	<input type="checkbox"/>
es" over people	<input type="radio"/>	<input type="checkbox"/>	6. Female	<input type="radio"/>	<input type="checkbox"/>	6. Female	<input type="radio"/>	<input type="checkbox"/>
weight, sometimes tired rritable	<input type="radio"/>	<input type="checkbox"/>	7. Friendly person	<input type="radio"/>	<input type="checkbox"/>	7. Reserved in relations with people but wears well	<input type="radio"/>	<input type="checkbox"/>
es in latest fashion	<input type="radio"/>	<input type="checkbox"/>	8. Overweight, energetic and alert	<input type="radio"/>	<input type="checkbox"/>	8. Physically and mentally healthy	<input type="radio"/>	<input type="checkbox"/>
lly alert	<input type="radio"/>	<input type="checkbox"/>	9. Well-groomed, dresses becomingly	<input type="radio"/>	<input type="checkbox"/>	9. Dresses becomingly, grooming sometimes careless	<input type="radio"/>	<input type="checkbox"/>
poise and self-assurance ntly	<input type="radio"/>	<input type="checkbox"/>	10. Intellectually vigorous	<input type="radio"/>	<input type="checkbox"/>	10. Intellectually vigorous	<input type="radio"/>	<input type="checkbox"/>
, mother lives with her	<input type="radio"/>	<input type="checkbox"/>	11. Usually poised and self-assured	<input type="radio"/>	<input type="checkbox"/>	11. Usually poised and self-assured	<input type="radio"/>	<input type="checkbox"/>
e in professional organiza- within state and nation	<input type="radio"/>	<input type="checkbox"/>	12. Single	<input type="radio"/>	<input type="checkbox"/>	12. Divorced	<input type="radio"/>	<input type="checkbox"/>
a broad vision of home mics including a concern mily life education and its in higher education	<input type="radio"/>	<input type="checkbox"/>	13. Participates in professional organizations within the state and nation through membership only	<input type="radio"/>	<input type="checkbox"/>	13. Active in professional and business organizations in state and nation	<input type="radio"/>	<input type="checkbox"/>
stands purposes and prin- of sound administration usually governed by them	<input type="radio"/>	<input type="checkbox"/>	14. Has broad vision of home economics including deep concern for family life education and its place in higher education	<input type="radio"/>	<input type="checkbox"/>	14. Believes use of labor saving devices is basis for improvement of family living	<input type="radio"/>	<input type="checkbox"/>
s at decisions without l consideration of human as well as efficiency of ion	<input type="radio"/>	<input type="checkbox"/>	15. Fails to understand many purposes and principles of sound administration and to be governed by them	<input type="radio"/>	<input type="checkbox"/>	15. Understands purposes and principles of sound administration but sometimes fails to apply them in practice	<input type="radio"/>	<input type="checkbox"/>
skillful in evaluating the importance of matters re- g attention	<input type="radio"/>	<input type="checkbox"/>	16. Arrives at decisions through careful consideration of human values as well as efficiency of operation	<input type="radio"/>	<input type="checkbox"/>	16. Arrives at decisions occasionally without careful consideration of human values as well as efficiency of operation	<input type="radio"/>	<input type="checkbox"/>
action in situations at ropriate time	<input type="radio"/>	<input type="checkbox"/>	17. Has little skill in evaluating the relative importance of matters requiring attention	<input type="radio"/>	<input type="checkbox"/>	17. Has skill in evaluating relative importance of matters requiring attention	<input type="radio"/>	<input type="checkbox"/>
experimental approach to on of problems, whenever e	<input type="radio"/>	<input type="checkbox"/>	18. Usually takes action in situations at the appropriate time	<input type="radio"/>	<input type="checkbox"/>	18. Takes action in situations at right time	<input type="radio"/>	<input type="checkbox"/>
skill in helping staff and ts assume some depart- l responsibility	<input type="radio"/>	<input type="checkbox"/>	19. Seldom uses experimental approach to solution of problems	<input type="radio"/>	<input type="checkbox"/>	19. Uses experimental approach to solution of problems, whenever feasible	<input type="radio"/>	<input type="checkbox"/>
e to organize department ts contribute to effective- f whole	<input type="radio"/>	<input type="checkbox"/>	20. Has some skill in helping staff and students assume some departmental responsibility	<input type="radio"/>	<input type="checkbox"/>	20. Has skill in helping staff and students assume some departmental responsibility	<input type="radio"/>	<input type="checkbox"/>
credit to staff for contri- s to departmental affairs	<input type="radio"/>	<input type="checkbox"/>	21. Able to organize department so parts contribute to effectiveness of whole	<input type="radio"/>	<input type="checkbox"/>	21. Partially able to organize department so parts contribute to effectiveness of whole	<input type="radio"/>	<input type="checkbox"/>
y communicates effectively staff, students, administra- , professional and lay	<input type="radio"/>	<input type="checkbox"/>	22. Occasionally gives credit to staff for contributions to departmental affairs	<input type="radio"/>	<input type="checkbox"/>	22. Seldom gives credit to staff for contributions to departmental affairs	<input type="radio"/>	<input type="checkbox"/>
not accept some individuals eir own worth with free- o develop	<input type="radio"/>	<input type="checkbox"/>	23. Is often ineffective in communicating with staff, students, administration and professional and lay groups	<input type="radio"/>	<input type="checkbox"/>	23. Fairly effective in communicating with staff, students, administration, professional and lay groups	<input type="radio"/>	<input type="checkbox"/>
ates in some community es	<input type="radio"/>	<input type="checkbox"/>	24. Accepts each individual for his own worth with freedom to develop	<input type="radio"/>	<input type="checkbox"/>	24. Accepts each individual for his own worth with freedom to develop	<input type="radio"/>	<input type="checkbox"/>
many interests in addition fessional work.	<input type="radio"/>	<input type="checkbox"/>	25. Participates in 3 or 4 community activities each year	<input type="radio"/>	<input type="checkbox"/>	25. Participates in few community activities	<input type="radio"/>	<input type="checkbox"/>
	<input type="radio"/>	<input type="checkbox"/>	26. Maintains broad interests in addition to deep interest in professional work.	<input type="radio"/>	<input type="checkbox"/>	26. Has few interests in addition to deep interest in professional work.	<input type="radio"/>	<input type="checkbox"/>

Return

Col. 2,3,4-
Col. 5,6 -
Col. 7 -
Col. 8 -
Col. 11 -

SECTION II
(Administrators)

Disregard the numbers in the box at the top right corner. They are code numbers to identify institutions, size and type of institutions and positions of respondents. In summarizing the data individuals will remain anonymous.

The information requested here about you is of a general nature and will be used in summarizing and comparing the data received. Please place an X in the appropriate blanks below:

1. Highest degree held

- a. A.B. or B.S.
- b. M.A. or M.S.
- c. Ph.D. or Ed.D.

2. Age (as of last birthday)

- a. 20-29 years
- b. 30-39 years
- c. 40-49 years
- d. 50-59 years
- e. 60-69 years

3. Number of years of experience in a land-grant institution (include this year)

- a. 0 - 5 years
- b. 6 -10 years
- c. 11-15 years
- d. 16-20 years
- e. 21-25 years
- f. over 25 years

SECTION III

FUNCTIONS OF A HEAD HOME ECONOMICS ADMINISTRATOR IN A LAND-GRANT INSTITUTION

DIRECTIONS:

The purpose of Section III is to obtain your opinion of the functions of the head home economics administrator in land-grant institutions. Do not consider your institution alone but, in so far as possible, think of land-grant institutions generally. Will you analyze each statement of function as to whether you believe it is sound from the standpoint of effectiveness in administering the home economics unit in a land-grant institution?

Circle the number in the appropriate column at the left that most nearly expresses your opinion.

EXAMPLE:

Sound	Partly sound	Unsound	THE HOME ECONOMICS ADMINISTRATOR:
1	2	3	Works toward maintaining a department that attains its goals and merits institutional recognition.

Return

Col. 2,3,4-
Col. 5,6 -
Col. 7 -
Col. 8 -
Col. 9 -
Col. 10 -

SECTION II
(Staff Members)

Disregard the numbers in the box at the top right corner. They are code numbers to identify such things as, institution, size and type of institution, position and rank of respondents. In summarizing the data individuals will remain anonymous.

The information requested here about you is of a general nature and will be used in summarizing and comparing the data collected. Please place an X in the appropriate blanks below:

1. Highest degree held

___ a. A.B. or B.S. ___ b. M.A. or M.S. ___ c. Ph.D. or Ed.D.

2. Age (as of last birthday)

___ a. 20-29 years ___ d. 50-59 years
___ b. 30-39 years ___ e. 60-69 years
___ c. 40-49 years

3. Number of years of experience in a land-grant institution (include this year)

___ a. 0-5 years ___ d. 16-20 years
___ b. 6-10 years ___ e. 21-25 years
___ c. 11-15 years ___ f. over 25 years

4. Area of work (check the one which now consumes the greatest amount of your time)

___ a. Applied Art ___ g. Household Equipment
___ b. Child Development ___ h. Institution Management
___ c. Family Relations ___ i. Textiles and Clothing
___ d. Foods and Nutrition ___ j. Extension Supervision (adult or 4-H)
___ e. Home Economics Education ___ k. Other (list)
___ f. Home Management

SECTION III

FUNCTIONS OF A HEAD HOME ECONOMICS ADMINISTRATOR IN A LAND-GRANT INSTITUTION

DIRECTIONS:

The purpose of Section III is to obtain your opinion of the functions of the head home economics administrator in land-grant institutions. Do not consider your institution alone but, in so far as possible, think of land-grant institutions generally. Will you analyze each statement of function as to whether you believe it is sound from the standpoint of effectiveness in administering the home economics unit in a land-grant institution?

Circle the number in the appropriate column at the left that most nearly expresses your opinion.

EXAMPLE:

Sound	Partly sound	Unsound	THE HOME ECONOMICS ADMINISTRATOR:
1	②	3	Works toward maintaining a department that attains its goals and merits institutional recognition.

(over)

Return

PROPOSED LIST OF FUNCTIONS OF A HEAD ECONOMICS ADMINISTRATOR
IN A LAND-GRANT INSTITUTION

Consideration is given in the formulation of these statements to the fact that the administrator must operate within the general framework of the institution.

Sound	Partly sound	Unsound	
			1. Assumes leadership ¹ in
1	2	3	a. Formulating departmental ² goals (both general educational and professional) that are sound
1	2	3	b. Seeing that these goals are consistent with the institutional goals
1	2	3	c. Developing and evaluating the departmental curriculum (curricula)
1	2	3	d. Helping the staff ³ improve the quality of teaching
1	2	3	e. Helping the staff to build an educational philosophy and to scrutinize and revise it, as needed
1	2	3	f. Helping the staff develop an awareness that one of its major goals is the development and general welfare of the students
1	2	3	g. Helping the staff keep constantly in mind that one of its major goals is the strengthening of family living
1	2	3	h. Stimulating staff to participate effectively in general institutional activities
			2. Takes final responsibility for, but creates machinery ⁴ through which staff members may participate in decisions concerning
1	2	3	a. Departmental budget
1	2	3	b. Recommendation of individuals for appointment to the staff
			3. Promotes work of the department by
1	2	3	a. Assisting staff members in defining their duties clearly
1	2	3	b. Assisting staff in the equitable division of duties among its members on the basis of capacity to contribute and, as fully as possible, in accordance with individual interest

DEFINITIONS:

¹Leadership is used in this study to mean primarily the initiation and implementation of cooperative action and thought.

²Department refers to the organization within which all home economics subject matter areas operate; includes schools, colleges and divisions of home economics as well as departments.

³Staff unless otherwise indicated refers to the professional personnel employed in the department part or full-time. (Non-professional staff includes secretaries, custodians and service employees.)

⁴Machinery as here used indicates some scheme of representation (committee, council, etc.) to channel staff thinking.

Return

-2-

Sound	Partly sound	Unsound	
1	2	3	c. Cooperating in the coordination of specialized interests and activities of staff members into an effective total organization
1	2	3	d. Stimulating staff to participate effectively in departmental efforts
1	2	3	e. Allowing adequate flexibility for staff members to "grow" in ability to take responsibility
1	2	3	f. Recommending for selection, administrative heads of units within the department on the basis of overall interest in home economics as well as qualifications of leadership in a specific area
1	2	3	g. Assisting in the improvement and maintenance of an environment conducive to working cooperatively and effectively toward the goals of the department
1	2	3	h. Encouraging evaluation of the use of resources
			4. Makes provision for
1	2	3	a. Applicants for staff positions being informed of the philosophy of the institution and department
1	2	3	b. Applicants for staff positions being informed of arrangements that affect their personal welfare such as insurance, pensions, etc.
1	2	3	c. Newly appointed staff members being helped to understand the operational details of the institution and department necessary for effective work
1	2	3	d. Staff having a clear knowledge of departmental and institutional policies
1	2	3	e. Staff and students ⁵ participating in development and revision of policies regarding matters of general departmental concern
			5. Furnishes opportunity, without developing tensions, for the staff to evaluate and recommend rewards (both material and non-material rewards) for
1	2	3	a. The contributions of staff members
1	2	3	b. The professional growth of staff members
1	2	3	c. The professional growth of students
			6. Provides, as far as possible, conditions which stimulate staff members to
1	2	3	a. Do professional creative work (research, writing, painting, designing, etc.)
1	2	3	b. Continue professional development (teaching, counseling, research, etc.)
1	2	3	c. Contribute to professional organizations through membership, active participation and attendance at meetings

⁵Students refers to all graduate and undergraduate students majoring in home economics.

Return	Sound	Partly sound	Unsound	
				7. Works with professional and non-professional staffs toward
	1	2	3	a. Attainment of a reasonable balance among work, home and outside activities
	1	2	3	b. General betterment of staff living arrangements
	1	2	3	c. Maintenance of a friendly atmosphere
				8. Stimulates the staff and facilitates their use of such means as press, radio, TV, short courses, talks, demonstrations, etc. to
	1	2	3	a. Keep the general public informed of the departmental program in cooperation with other institutional agencies
	1	2	3	b. Help families of the state with their problems
	1	2	3	c. Cooperate with various agencies concerned with family life education
				9. Helps to keep channels of communication functioning effectively among general administration, faculty and students
	1	2	3	
				10. Cooperates with administrative officers and faculty in
	1	2	3	a. Developing institutional goals
	1	2	3	b. Executing institutional policies
	1	2	3	c. Facilitating the participation of home economics staff members in the formulation and evaluation of institutional policies
	1	2	3	d. Promoting the establishment of policies of mutual benefit to professional and non-professional staff and the institution, such as salary, promotion, tenure and retirement
	1	2	3	e. Conforming to institutional business procedures
	1	2	3	f. Preparing statements, for use in informing state officials, of the accomplishments and needs of staff and students of the department
				11. Participates vigorously in general institutional activities
	1	2	3	
	1	2	3	12. Helps the general institutional administrator, as needed, to develop and maintain a sound understanding of the field of home economics and see its relationship to the broad purposes of the institution
				13. Exercises leadership in providing conditions by which students may be helped to evaluate
	1	2	3	a. Their own development
	1	2	3	b. The extent to which the curriculum meets their needs
				14. Helps create a program that will foster the understanding among students that education is a life-long process
	1	2	3	

Return
Sound Partly Unsound
 sound

-4-

- | | | | |
|---|---|---|---|
| | | | 15. Makes self available and urges staff to be available for contacts with students (individually and in groups) as one means of becoming familiar with their needs and interests |
| 1 | 2 | 3 | |
| 1 | 2 | 3 | 16. Shows active interest in providing facilities for the physical, spiritual, civic and social growth of all students on the campus |
| 1 | 2 | 3 | 17. Maintains contacts with alumnae to |
| 1 | 2 | 3 | a. Indicate personal interest and help them develop professionally |
| 1 | 2 | 3 | b. Seek their evaluation and suggestions for improvement of the departmental program |
| 1 | 2 | 3 | 18. Stimulates general administration, faculty, students, extension personnel and alumnae to |
| 1 | 2 | 3 | a. Familiarize prospective students and their parents with the possibilities for personal growth and professional opportunities in home economics |
| 1 | 2 | 3 | b. Encourage prospective students to avail themselves of these opportunities |
| 1 | 2 | 3 | 19. Cooperates with existing institutional agencies, or helps improve them if such are not adequate, in |
| 1 | 2 | 3 | a. Placing of students and alumnae in positions |
| 1 | 2 | 3 | b. Keeping personnel records of students and alumnae in an up-to-date, permanent form for the use of professional staff and prospective employers |
| 1 | 2 | 3 | c. Counseling (educational, personal and vocational) of students |
| 1 | 2 | 3 | 20. Encourages the increased understanding and exchange of ideas for the improvement of the educational program |
| 1 | 2 | 3 | a. Among staff members in specialized areas within the department |
| 1 | 2 | 3 | b. Among staff members within the institution |
| 1 | 2 | 3 | c. Between the community (local and state) and the department |
| 1 | 2 | 3 | d. By campus visitors |
| 1 | 2 | 3 | 21. Maintains working relationships with the agricultural experiment station in furthering research work by sharing in |
| 1 | 2 | 3 | a. Planning and evaluating the program |
| 1 | 2 | 3 | b. Securing a competent staff |
| 1 | 2 | 3 | c. Providing physical resources |
| 1 | 2 | 3 | d. Planning and using the budget |

AC 101

Sound Partly Disound
Sound Sound Sound

22. Maintains working relationships with the agricultural extension service by
- | | | | |
|---|---|---|---|
| 1 | 2 | 3 | a. Cooperating in the selection of personnel, both at state and county levels |
| 1 | 2 | 3 | b. Encouraging the exchange of ideas between resident and extension staff members regarding program planning, subject matter and research |
| 1 | 2 | 3 | c. Assisting in the provision of needed resources |
23. Maintains working relationships between home economics and other departments of the institution in
- | | | | |
|---|---|---|---|
| | | 3 | a. Developing programs to meet new needs which arise in the state and nation |
| 1 | 2 | 3 | b. Providing courses in family life basic to general education for students enrolled in other departments |
| 1 | 2 | 3 | c. Offering courses to non-home economics students for their professional education |

Write here any additional functions which you believe should be included:

Comments: