THE CHEMISTRY OF FRESH MEAT AND ITS RELATION TO TENDERNESS AND OTHER PALATABILITY FACTORS

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The title of this paper implies that much is known concerning the fundamental nature of the quality in fresh meat. This is not the case. Consequently, this paper may differ basically from the others in this symposium in that the others cover areas where much more fundamental knowledge exists and in many cases has been commercially applied. So, perhaps it will not be amiss if we spend a moment to appraise the consumer's fresh meat problems from the point of view of a chemist.

America's eating habits have their very foundation on meat. The fact that the per capita meat consumption is almost the greatest in history while prices seem high indicates that the consumer wants even more meat. What kind of meat? Lean meat without too much fat; tender, and juicy meat; meat full of flavor, and lots of it at the lowest possible cost. Our expanding population will continue to put greater demands on our meat supply. We can ask what makes a good piece of meat. The chemist looks to find the answer in fundamental concepts of the chemistry of meat itself, or in the biochemistry, physiology, and nutrition of the meat animal, or in the breeding and feeding management practices in livestock production. He finds very little information on the relation of these factors to what the consumer really wants even though it is the consumer who should set the market.

It is not our desire to go into the many reasons for this state of affairs, but as one examines this situation, perhaps two things stand out: (1) the meat packing industry has spent vast sums for research resulting in many technical advances; yet has not, in the past, been very much concerned with fresh meat investigations as long as the consumer didn't complain about spoilage; (2) and more seriously, livestock production research in our universities and experiment stations both state and national, have been carried on for the most part without regard to the consumer quality of the resulting carcass except in a rather superficial way. More meat animals of known breeding and feeding management should be studied for yields of edible lean, tender and juicy meat at the lowest cost rather than production research stopping at the stockyard scales or stock show. Several research institutions are just beginning to carry on investigations incorporating the consumer's point of view into their meat and livestock production programs.

From the standpoint of the investigator, one great obstacle has prevented effective meat research from the consumer's point of view even though many have realized the desirability of studies in this area. The stumbling block has been methods. How can one determine consumer desires. If the consumer is indeed the one to be pleased then the desires of the consumer must necessarily be the primary standard. Livestock producers and marketers use expert judgments for appraisal of live animal and carcass values involving tremendous sums of money yet these same groups appear somewhat afraid to eat their product and then grade it as to its eating and table quality. To the biochemist such an approach may not be such an obstacle for he knows that bioassay
techniques brought forth the science of nutrition and developed many areas of quantitative biology. One may ask in an abstract way, "Does the superposition of an intellect make a biological system incapable of making quantitative evaluations?" The answer should be an obvious, NO! In the remaining time, I shall try to show what has been done in trying to understand in fundamental terms what makes a steak tender, juicy and full of flavor.

Since American's consume more beef than any other meat and since beef presents the greatest variations in quality, this paper will deal with beef unless otherwise indicated.

Generally, meat is skeletal muscle. The biochemistry and physiology of this tissue is being understood by the pioneering efforts of Szent-Gyorgi (1). Many properties of meat can be best interpreted from the wealth of fundamental information brought together by this eminent scientist. Another pioneer, E. C. Bate-Smith, carried on investigations on the chemistry of post mortem changes in muscle. His recent review of this subject is well known (2).

The histologists tell us that structurally meat may be considered as a group of long slender cells of thin wall and containing a fluid which might be called muscle plasma. These cells may be considered intertwined with blood vessels and spliced together transversely and longitudinally into bundles by connective tissue fibers. The muscle cell membranes themselves terminally converge to form connective tissue fibrils and finally tendons which attach the muscle to bone or other muscle. Quantitatively, the muscle plasma accounts for 50% more or less, of the muscle substance. This may be considered as a gel composed of highly hydrated protein. In these different tissues reside the answers to consumer's likes and dislikes. With this background let us proceed.

The consumer demands tender, flavorful and juicy meat at the lowest possible cost. If the meat is tough, it is generally objectionable, irrespective of all other qualities, and it is this quality that has been studied with the greatest degree of success.

Tenderness (or any quality) must be measurable in quantitative terms in a reproducible manner in order to be studied. Furthermore, the consumer must set the primary standard. Many producers of food products, consumer goods, or even automobiles know that consumer's likes and dislikes can be determined by sampling a population in a statistically sound manner and then studying responses of these consumers. As a research tool, the taste panel has been found useful if applied in the same way. Indeed, a properly selected panel has been shown to evaluate tenderness on a quantitative basis as comparable and reproducible as many widely accepted bioassay techniques in common usage. The first rigid application of taste testing for tenderness was perhaps that of Cover (3,4,5,6) although some earlier attempts at taste testing have been made (presumably unsatisfactorily) following the scheme of the National Co-operative Meats Investigations Committee (7). In her technique, Cover used paired sampling for preference judgments only and has shown that roasts cooked to the well done stage are less tender than the same meat roasted to the medium rare stage, and also that rate of cooking effects tenderness---the slower the cooking the more tender the meat.

Deatherage and Reiman (8) reported a method for determining tenderness incorporating the features of Cover plus the evaluation of the tenderness level on a 0 to 10 scale with ten being perfect. A group of six judges using
segments of broiled steaks were found to be reproducible to 0.5 of a point. Husaini, et al (9) have confirmed this degree of accuracy. Recently in a survey of meat research methods in use in this country (10) several other laboratories indicated a similar degree of reproducibility.

There have been attempts to design instruments to measure tenderness in a so-called objective manner. The most widely accepted of these is the Warner-Bratzler shear machine (11). In our experience, it gives data which are not as reliable nor as reproducible as the taste panel data.

The machine of Vokodkevich (12) measures toughness as the area under a load displacement curve as the meat sample is compressed between two semi-cylinders. A detailed study of this, or a similar type of instrument (as Winkler's) (13) seems desirable.

If one reflects a moment on the nature of meat, it is immediately apparent that cooking meat involves denaturation and coagulation of the proteins and the higher the temperature that the meat gets the greater the degree of coagulation. This of course, explains the work of Cover in that the same meat cooked to the well done stage is tougher than if cooked medium rare. Of course, if meat is cooked sufficiently to convert the collagen to gelatin or to promote hydrolysis a tenderizing effect is noted. If there is protein degradation prior to cooking as in aging or slow cooking (for example, the barbecue pit or very slow oven), one should expect a softer coagulum and more tender meat.

What tissues are involved in these changes? Connective tissue was commonly considered as causing toughness. Steiner (14,15) using the tenderness tester of Vokodkevich (12), showed that both muscle plasma and connective tissue were involved. In a statistical analysis of taste test data on 438 different beef loins, Deatherage and Reiman (8) found evidence that at least two major factors appear to be involved in tenderness. Similar confirmatory data have been accumulated in Ohio, but not published. Deatherage and Harsham (16) also report evidence to support the view that both connective tissue and muscle plasma contribute to tenderness. These authors studied the relation of time of aging at 330° F. to tenderness over a period of 39 days and found that tenderness was not a smoothly increasing function with aging time. These results give some quantitative idea of the effect of aging on tenderness and also support the view of Steiner (14,15).

Quite a number of histological studies in different species indicate that initial post mortem changes involve the muscle plasma rather than connective tissue, so it may be that changes here are most important during initial aging period and that in later post mortem stages muscle plasma is less important than connective tissue in contributing to toughness.

In studying the contribution of each phase toward tenderness, one is immediately faced with both quantitative and qualitative considerations. For example, how much muscle plasma is there and how hard a structure is formed when it is cooked, or how much connective tissue and how strong is it? Two other perplexing problems confront those who are trying to understand meat quality and these are uncontrolled variations in animals necessitating detailed study of a large number of samples and the problem of sampling carcasses for accurate and meaningful data since meat is a very heterogeneous product.

Lehman (17) was perhaps the first to show a positive relation between the amount of connective tissue and toughness of different muscles. Mitchell, et al (18) expanded this work and so has Prudent (19). Husaini, et al (9)
reports that alkali insoluble protein (as an approximation of connective tissue) correlates well with tenderness at 15 days post mortem in a group of market cattle of wide difference in quality. In a more homogeneous group of cattle, this relation was not so close (20). This determination has much to be desired and it is being studied further. In this study no relation between other nitrogenous fractions and tenderness was observed. An interesting lesson in sampling may be reported here. We use a standard sampling technique using the shortloin for taste tests and chemical analysis. Samples are cut perpendicular to the spinal column. It has been observed that the loin is relatively uniform in tenderness. However, when samples are used from the anterior portion of the loin an excellent correlation is found between tenderness and connective tissue whereas when the posterior end is used only poor correlation results. At present this is interpreted as follows: at the posterior end the direction of the fibers change altering the sample for chemical study whereas the taster automatically adjusts the sample to give the greatest mechanical advantage on chewing. Hence the tenderness score is the same but chemical composition is more variable.

It is well known that meat increases in tenderness with post mortem age. Husaini, et al (9,20) were unable to detect changes in nitrogen fractions by the method of Van Slyke and Hiller (21) which could be related to tenderness changes. They did indicate a relation might exist between total muscle plasma and tenderness changes. Theses results are interpreted as meaning that the post mortem changes which give rise to the greatest changes in tenderness are much too subtle to be measured by classical techniques.

Some information might be mentioned which gives some insight into the nature of these changes in tenderness. It has been established that the rate of tenderization is a function of temperature. Disclosures in recent patents (22,23) together with other published information permit estimation of a temperature coefficient of 2 to 3 fold for each 18° above 32°F, until protein denaturation sets in. This explains the tenderization on slow cooking. This further lends credence to the assumption that tenderization on aging is enzymic and in particular proteolytic. It has been assumed (but not proved (24,25)), that the enzymes responsible for these post mortem changes are catheptic in nature. This group of enzymes have an optimum pH of about 4.7 which is in the range of the isoelectric point of most meat proteins. If this is the case then the natural anaerobic glycolysis after slaughter tends to develop a favorable condition for the proteolysis because the lactic acid developed brings most meat to a pH of 5.4 to 5.5.

It usually requires 40-48 hours for a carcass to reach the minimum pH and by this time it is usually chilled below 40°F. A recent patent (23) discloses that if an animal or carcass immediately after slaughter is stimulated while the musculature is still irritable the minimum pH will be reached in a few hours and before the carcass has chilled. This combination of low pH and higher temperatures while the carcass is chilling hastens natural tenderization.

There have been a number of reports that meat taken immediately at slaughter is tender on cooking and that the meat toughens as it chills out, and then it becomes tender again in aging. Ramsbottom and Strandine's report (25) is the most recent and complete. A possible explanation of this might be that at the high pH at slaughter the proteins occur as highly hydrated gels removed from their isoelectric point and the resulting coagulum on cooking is more hydrated and more tender while the same meat at 48 hours is nearer its isoelectric point and the coagulum is less hydrated and less tender. A critical study of the changes in tenderness in beef which has pH values higher than normal meat might clarify the relation of pH to tenderness.
It appears that changes in muscle plasma are more closely associated with increases in tenderness during early aging whereas tenderness at 14 days or more is largely a function of connective tissues. If this is true, one should expect a great variation in animals on the relative importance of the plasma and the connective tissue. Indeed, this is the case; some meat is never tough while some never seems to become tender on aging while still other meat shows great changes on aging. This interpretation on the nature of tenderness may serve as a guide for further meat and livestock production research. Even so it is not difficult to see that much more needs to be done to understand the nature of tenderness.

Juiciness is another mark of a good piece of meat but it is somewhat more difficult to measure. Here again the primary standard is the consumer. One might suppose that all that is necessary is to cook the meat, press out and measure the juice. This is not the case for the salivation of the consumer is very important. In common language the meat must make your mouth water. Sartorius and Child (27,28) noted that quantity of press fluid does not correlate with juiciness scores, and this has been adequately confirmed by others (10). They also point out that there is a positive correlation between tenderness and juiciness. This has been confirmed in our laboratory (29). Recently Gaddis and Hankins (30) showed a relation between juiciness scores and the petroleum ether soluble matter in the press juice. This report contradicts the work of Sartorius and Child but the differences are at once reconciled on examining the data in the later work. There appears to be a limiting value beyond which the amount of fat in the press fluid does not contribute to juiciness. This finding explains some results reported from Ohio regarding the effect of intramuscular fat or marbling on tenderness and juiciness.

In short, juiciness appears to be related to the other quality attributes of the meat and hence to the receptiveness of the consumer.

In flavor of meat the guiding principle has been that if the flavor is not objectionable it is satisfactory and with proper meat handling no objectionable flavor will develop. This is a rather negative attitude. There have been a few reports on the effect of ration on meat flavor but the greatest advances in understanding the chemistry of flavor and flavor development have been made in other fields. It is well known that cooking brings out the flavor. There are chemical changes going on such as the production of volatile water and ether soluble compounds and some of these perhaps contain sulfur (31). The more definitive reports of Bouthilet (32) mark a starting point in this almost totally unexplored field where techniques are just being developed as indicated by Peryam and Swartz (33).

As we think of tender, juicy and flavorful meat we naturally ask what is the relation between these factors and market grade? Up to now very little critical study of this has been made. This is an important question in economics as well as consumer desires for often grade and consumer quality may not go hand in hand (8,9,20). It is good that the American Meat Institute is now conducting such a study in cooperation with Federal meat grading authorities. A complete report of this comprehensive project will give all of us much useful information. A preliminary paper on this study is by Wang (34) on a histochecmical study of U. S. Choice and U. S. Commercial beef.

This paper has dealt with meat as it comes from the packer. The point of view has been that of a chemist studying meat quality in terms of
tenderness, juiciness and flavor. We would be negligent if we did not point out that consumer acceptance must also be understood from the production side; the biochemist, the physiologist, the geneticist, the nutritionist and the practical breeder, feeder, and merchandiser must cooperate to produce the animals that the consumer wants at the lowest cost per cut of meat. To do this it is essential that animal production research be guided by real consumer quality defined in fundamental terms. This has been and still is a neglected field. Here is where agricultural experiment stations can make a long needed contribution to the American way of life. By conducting meat research and carrying on live stock production programs from the consumers point of view as well as the producers, progress can be made similar to that made in many other areas of agriculture. I am reminded of a geneticist friend of mine who is a very successful soft wheat breeder. He insists that his new strains of wheat must be millable and make good cakes and cookies as well as being able to give high yields of a harvestable wheat. To illustrate what I mean in a different way. Another friend in sheep production research (lamb chops if you will) indicates that during the last sixty years the breeding of one of our important mutton breeds for show stock has resulted in a drop in lambs reared from 168 to 103 per 100 gestations (35,36). Not only did the twinning rate drop but also the size of the lamb and yield of meat. This means less attractive producer profits and fewer and costlier lamb chops.

As this paper is brought to a close we may say that meat research is truly a babe in arms. What can be done by an over all production-consumer research program is shown in a number of studies which are rather isolated. Bull and Rusk (37) showed that steers which were exercised made as good or better beef than strictly confined feed lot steers. Madsen and Earle (38) pointed out that many fattening rations are deficient in vitamin A yet the effect of this on meat quality is not known. In a recent study in Ohio where steers showing different rates of gain were investigated an incidental finding indicated that perhaps vitamin A deficiency might be related to marbling which haslong been considered a mark of quality in beef (29). In this same group of steers it was found that faster growing steers gave as good meat as slower growing steers and that there were no differences in yield of edible meat or waste fat. In still another group of steers the rates and efficiency of gain showed Herefords and Holsteins comparable on the same feeding management (20). Furthermore, when the meat was eaten it was not possible to tell which was which. We are currently concluding a study on the effect of age at castration on meat quality as well as meat production efficiency. Preliminary results indicate

If all their carcasses are studied for consumer quality one of the most complete projects of this kind will be that currently underway in Great Britain where a large number of cattle including a beef breed, Hereford; a dairy breed, Fresian, and dual purpose, Shorthorn, are being fed on four different feeding managements. This study comprises 6 spring crops of calves, and was begun in 1946. The interim report (39) indicates that a well fed calf to 8 months and changed to a moderate grass fattening ration produces beef at the lowest cost in contrast to a so called high diet throughout life, or a limited diet for 8 months followed by either high or limited diet to slaughter. Similar comprehensive meat research is not beyond the scope of many research institutions. Much livestock production research is going on. It needs to include the consumer in its planning and a more complete study of the carcasses of known history and management now being produced in these institutions. Indeed, often the most fruitful and the least expensive research in the long run is the most complete and carefully planned program.
I hope that this paper has served a dual-purpose—to review the chemistry of fresh meat in relation to consumer quality as tenderness, juiciness and flavor and to show the need for intensified investigations on how all of us may have more delicious meat cheaper. To accomplish this it is necessary to have the interest and cooperation of the cattle breeder, feeder, packer and consumer, agricultural economists and scientists. All along the way the chemist must contribute toward putting more good meat into more mouths, more often.

**Literature Cited**


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DR. JOHNSON: I might say that at the Florida station during the last year they have made a comparison of organoleptic determinations, comparing them with the Warner-Bratzler shear test method, and they determined a coefficient correlation of 7.2. Maybe Dr. Pearson would like to enlarge on that report.

DR. PEARSON: I might say in that regard that they actually had 12 people on the panel. There were six men and six women and most of the men on the panel had previous palatability experience and the girls had been selected on threshold tests. Actually, the girls were from the horticultural department who maintain a panel at all times. We ran them separate to see if we found any difference between the girls and the men. We found identical correlations in each group.

DR. JOHNSON: Anyone else have anything to contribute? I guess everybody is ready to rush to the door.

MR. COLE: I would like to ask how important you think these threshold tests are. I am of the opinion that maybe getting the panel acquainted with what they are doing is about as important as threshold tests. In other words, getting them acquainted with what is good and what is not good. Has anybody anything to offer on that?
DR. KASTELIC: I think that would be all right, but what will you use as your sample? Take lard for example. You are going to say that you have a good lard. Where are you going to get it? Who is going to describe it for you in order to use it? I realize that my asking that question might sound silly on the surface but it is a job.

MR. COLE: Well, I have, for instance, a sample like this. Take meat that is pot roasted, we will say, one that is braised, and another one that is broiled. The broiled meat may be tougher. You may have more flour in the braised meat and the braised will be more tender but not have the flavor. You might have some people who think that tenderness is the ideal and others go to flavor. I think just a simple thing like that is about as important as whether we can tell bitter from sweet and sweet from sour.

DR. KASTELIC: Well, I had in mind, too, Mr. Cole, the idea of some people not wanting to eat rare meat. You have a panel and you want to test, say, the cooking temperature on the palatability of beef. Some people almost faint at the sight of red meat. Others want it cooked until it is the consistency of shoe leather. Are you suggesting that we should select a panel that will find one kind acceptable as contrasted to the other kind?

DR. JOHNSON: My own experience with a palatability panel was with bacon. After going over the data from that I decided that as far as acceptability was concerned and flavor, probably in generalities it told me something. But as for any one specific trait, I think very little was learned by the use of the panel. I think there are a few things to consider when you do use a taste panel. That you do not have too many factors that you want to obtain information on. In other words, you don't want to obtain information on tenderness, color and rancidity on about six or seven of them all at once or you will get nothing on all of them.

MR. HANKINS: Don't we have two different jobs there? This isn't new. I think we have all talked about it. There are two ways of doing the job. One is to evaluate with respect to tenderness, flavor and what have you, whatever you take into consideration in the particular case and the other is preference. They are two different things. You have all heard that discussed. Obviously, you cannot get a very good preference job done unless you have a relatively large group of people. On the other hand, you may get a right decent kind of job done on evaluation with respect to tenderness and flavor and maybe two or three other things on a half dozen pieces of meat with a panel of three, five or seven people. So it seems to me we have to keep that obvious difference in mind.

MR. COLE: Mr. Hankins, I should like to ask this question. Suppose your school says, "We want to set up an organoleptic panel," are you ready to say that they need threshold tests before they can start this panel?

MR. HANKINS: I think it would be highly desirable and to leave those out who have a very high threshold, who don't taste anything until you get way up there somewhere.
DR. HALL: One other little point. Sometimes a person gets on one of these committees for judging meat who habitually avoids all fat. That person is asked to judge the desirability of fat in the sample that is presented to be judged, and will obviously have a very different idea about the desirability of fat since he does not like fat anyhow in the first place than one who can eat the entire cut. I think some screening from that standpoint is really necessary.

DR. JOHNSON: I think the panel has to be selected. I don't think you can go on the street and pick up ten people.

MR. HANKINS: Maybe Larry Kunkle has something to say on this point.

MR. KUNKLE: I prefer to be a listener, O. G. I think some of you have heard us say before -- and I will just repeat -- that we were doubting Thomases until we got into it, and if our experience is worth anything to you, it is simply this: You will be amazed as six people sit at a table and sample unidentified samples in duplicate and report by number and find out that they do eat for tenderness remarkably alike. I will agree that we have had some experiences. One fellow in our own experience thought his seat was worth $50 in the event there was to be any change in the panel. In another instance we had an individual who was over-imbued with the importance of the job, and she felt that she had to use her eyes as well as her jaws and her brain to decide how these numbers matched up. She was finally excused because she confessed she thought that No. 19 and No. 7 were mates, and she scored one too low or she scored them alike, and, of course, one was from a bull and one was from a choice steer.

I suspect if there is any consolation to pass on it would be this: For those who have not tried this panel business for evaluating the tenderness of samples of beef, I would recommend that perhaps it be included in next year's order of business and if possible we organize ourselves to try it out right here.

DR. KASTELIC: I think we should concur with you.

MR. HANKINS: Is there anything else?

I don't regret that we don't have much of a report to be adopted at this time, but I suppose we ought to go through the formality if I can find someone to make such a motion.

MR. KUNKLE: I will so move.

DR. PEARSON: Second.

MR. HANKINS: All in favor say "aye"; opposed. It is actually passed. Thank you very much.

Have we omitted anything? If not, that concludes our presentation, and we thank you very much.

CHAIRMAN BRAY: Thank you, Mr. Bankins.

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Before we turn to the business session, let's have a two-minute stretch.

(Recess)

CHAIRMAN BRAY: I think the first order of business is to have presented at this time some of the resolutions that the committee has formulated for your consideration. I have appointed members of the Executive Committee to take care of the resolutions. So I will call upon them one at a time to give their resolutions and ask for your wishes in the case of each.

Charles Adams, will you give yours, please?

MR. ADAMS: "Be it resolved that we, the members of the Fifth Annual Reciprocal Meat Conference, do hereby extend our sincere appreciation to the National Live Stock and Meat Board for the following services:

"1. Assisting in the formulation of the program for 1952.

"2. Providing registration personnel, meeting room facilities, and conference materials.

"3. Furnishing secretarial service in order that our proceedings may be assembled and mimeographed for distribution.

"4. Providing room reservations at the Conrad Hilton Hotel and caring for other necessary conference details."

CHAIRMAN BRAY: Thank you. Is there any question regarding this resolution? Any amendment.

MR. BULL: I move that it be approved and copy transmitted to the National Live Stock and Meat Board.

(The motion was seconded.)

CHAIRMAN BRAY: The motion has been made and seconded that this resolution be approved and a copy of it be transmitted to the National Live Stock and Meat Board. Any questions? Any discussion?

MR. WANDERSTOCK: Do you want to include the dinner tonight as a special item, even though we haven't had it yet?

MR. ADAMS: I don't believe that has been included in past resolutions. It can be added if you wish.

CHAIRMAN BRAY: I would guess that is adequately covered in the way in which the resolution has been stated. All those in favor of the adoption of the resolution indicate by saying "aye"; opposed the same sign. The motion is carried.

Bill Cole, will you read your resolution, please?
MR. COLE: This is a resolution to the deans and heads of departments and will probably have a familiar ring from last year's because I thought it was a pretty good one.

"The membership of the Fifth Annual Reciprocal Meat Conference wish to express our sincere appreciation to our respective deans and department heads for making our attendance possible.

"This accumulation of knowledge to further our teaching, research and extension in our own institutions is of inestimable value, and we individually and collectively desire to convey our gratitude.

CHAIRMAN BRAY: Thank you. You have heard the resolution. What are your wishes?

MR. BULL: I move its adoption.

MR. WANDERSTOCK: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. Any discussion? If not, all those in favor indicate by saying "aye"; those opposed the same sign. The motion is carried.

Davey, will you read yours, please?

MR. MACKINTOSH: "Whereas, In the death of Professor E. J. Wilford, head of the Meats Section of the University of Kentucky, we of the Fifth Reciprocal Meat Conference have suffered the loss of a beloved associate and friend, and

"Whereas, Professor Wilford was a regular attendant at this Conference and took an active part in all of the sessions, and in his chosen field put the fullest measure of devotion into his daily tasks, and

"Whereas, In his passing, his institution has lost a faithful worker, whose energy was a potent factor in the classroom and throughout the state in a better understanding of meat problems; therefore be it

"RESOLVED, that we extend our deepest sympathy to the members of his family and to his associates at the University of Kentucky. His influence in our conferences will be sorely missed, but the inspiration of his life will ever inspire us to greater zeal in our work."

CHAIRMAN BRAY: You have heard this resolution. Will some one move its adoption?

MR. ADAMS: I so move.

MR. NAUMANN: Second.

CHAIRMAN BRAY: The motion has been made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. The motion is carried.
Lowell, you have a resolution.

MR. WALTERS: "Intercollegiate Meat Judging Contests, since their beginning, have received the generous support of a man who recognized early the merits of such contests. He has given generously of his time, his counsel, and facilities for the conduct of meat judging contests and grading clinics.

"The participants of the Fifth Annual Reciprocal Meat Conference are, indeed, appreciative of his support and by this resolution wish to express again their sincere appreciation to a real friend, Mr. Thomas E. Wilson and to Wilson and Company."

CHAIRMAN BRAY: You have heard this resolution. Will someone move its adoption?

MR. KUNKLE: I so move.

DR. PEARSON: Second.

CHAIRMAN BRAY: Motion has been made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. The motion is carried.

One more resolution, Tom Zeigler, please read your resolution.

MR. ZEIGLER: Those of us in attendance at the Fifth Reciprocal Meat Conference do, by this resolution, express our deep regret that Mr. Tomhave was unable to lead us in this annual meeting and desire to express our wish for his speedy recovery."

You have heard this resolution. Will someone move its adoption?

MR. WANDERSTOCK: I so move.

MR. HENRICHS: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. All those in favor signify by saying "aye"; those opposed the same sign. The motion is carried.

MR. MACKINTOSH: Bob, before we disband, we have had the good fortune to have with us several whom we might describe as outside our group. While we did not think it possible to make a resolution, I should like to make a motion that our secretary be instructed to write a letter of thanks and appreciation to J. D. Gallery, D. H. Williams, J. E. Young, E. S. Clifton and R. G. Schott, for their valuable contributions to our conference.

MR. ADAMS: Second.

CHAIRMAN BRAY: I think that is an excellent idea and I am glad you thought of it, Davey. You have heard the motion. Is there discussion regarding it? All those in favor of the motion indicate by saying "aye"; opposed the same sign. The motion is carried.

MR. BUTLER: Mr. Chairman, I have this resolution for Mr. Bratzler.
CHAIRMAN BRAY: I am sorry, O. D., will you read it, please?

MR. BUTLER: I have written:

"Conspicuously missing this year due to illness is our first elected Chairman of the Reciprocal Meat Conference, L. J. Bratzler. He has made great contributions toward the institution, implementation, and perpetuation of this Conference.

"As our first Chairman he set a high standard of leadership, dependability and achievement for those who follow. His wisdom, diplomacy, and tact smoothed many rough spots on the road of progress. His absence has left a noticeable gap in our group.

"Be it resolved that the participants in this Reciprocal Meat Conference, acting individually and severally, send to him our greetings.

"Be it further resolved that we extend to him this gift of a record cabinet as a token of our esteem, along with a copy of this resolution signed by all members present.

"With this we convey our very best wishes and hopes for his complete and speedy recovery and return to our ranks."

CHAIRMAN BRAY: Thanks. You have heard this resolution. Will someone move its adoption?

MR. WANDERSTOCK: I so move.

MR. ADAMS: Second.

CHAIRMAN BRAY: The motion is made and seconded that we adopt this resolution. All those in favor indicate by saying "aye"; opposed the same sign. (Carried.)

(Announcements.)

CHAIRMAN BRAY: At this time I want to thank all of the chairmen for the excellent work they have done during the past year in getting this material rounded up that you have listened to for the past two days. Those of you who are on committees probably do realize the amount of correspondence and work that your chairmen have put in. I certainly want to express my appreciation to them at this time.

In addition I also want to thank the members of the Executive Committee for their help during the past year. As most of you probably know, it meant two or three trips to Chicago for them, where we sat down and talked about these things and then it meant considerable correspondence. These men have been very good in helping me to set up this program and I want to thank them at this time.

I have enjoyed acting as Chairman of the Program Committee and I hope that you have gotten as much from the conference as I have.
We have a new Executive Committee now, you know, and at this time I am going to turn the meeting over to the chairman of the new Executive Committee. I know that Bill Cole will do a grand job for you next year. So at this time I want to turn it over to Bill Cole.

(Mr. Cole assumed the Chair. Applause)

CHAIRMAN COLE: Thank you, Bob, and I don't think we need to go into this matter of democracy. If you are interested in the details, contact one of the members. I will assure you, it was purely and simply railroading.

I think first of all, we should pat Bob Bray on the back for the excellent job he has done. I think at this time it is fitting and proper that we show him what we think of his job the past year. (Applause)

I hope that next year's Conference will be as successful.

I think that is the first point of business we want to bring up, that is, whether or not we should have a Sixth Reciprocal Meat Conference. I should like to entertain a motion to that effect.

MR. BUTLER: Mr. Chairman, I move that we have a Reciprocal Meat Conference again next year.

MR. PEARSON: Second.

CHAIRMAN COLE: The motion has been made and seconded that we have the Sixth Annual Reciprocal Meat Conference. Those in favor let it be known by saying "aye"; opposed. Carried unanimously.

I think, gentlemen, from these letters that I have here that Bob Bray passed over to me, which are mostly your recommendations, that we have sort of come -- I don't know whether it is to a turn in the road or a fork in the road, but we have come to the place where the next Reciprocal Meat Conference is probably due for some changes.

Briefly, most of the suggestions are hinting that we should do more in the way of research and research reporting. I think we should mention, however, in passing that a very good suggestion, I believe, has come from someone to the effect that the production men in our various departments should possibly be represented next year and present their ideas of what they think a meats man should do, what his job is.

I, for one, am highly in favor of doing service work. I think that is certainly in our line of duty. I think that we may not get our name on the paper, but I do think that service work to other projects is a very important job of a meats man. That was a suggestion for next year.

There are many other suggestions.

Incidentally, the Executive Committee has thought it wise that we retain the committees that we now have.

The Committees for the Sixth Conference are as follows: