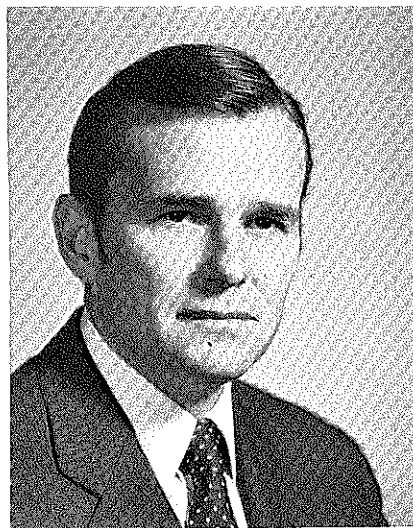
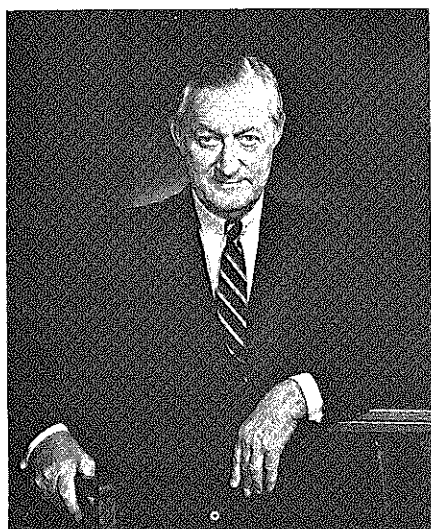




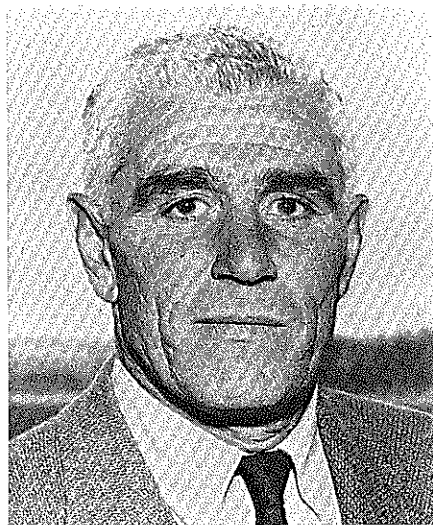
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Nicholas F. Brady, Chairman, welcoming the guests.



James B. Moseley addressing the guests.



Dr. Matthew Mackay-Smith addressing the guests.



A view of the Conference in session.



A view of the Conference in session.



A view of the Conference in session.

TWENTY-FIFTH ANNUAL ROUND TABLE CONFERENCE

ON MATTERS PERTAINING TO RACING

HELD BY

THE JOCKEY CLUB

AT THE

NEW SKIDMORE COLLEGE CAMPUS

SARATOGA SPRINGS, NEW YORK

SUNDAY, AUGUST 14, 1977

IN ATTENDANCE:

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- Taylor Asbury, Breeder, Owner
- William T. Ashton, New York State Racing Commission
- * Lt. Col. Charles Baker, Breeder, Owner
- Lazaro S. Barrera, Trainer
- William G. Barry, New York State Racing and Wagering Board
- Albert C. Becker, President, American Quarter Horse Association
- Richard H. Becker, Executive Director and General Manager, Ak-Sar-Ben; Director, Thoroughbred Racing Association
- John A. Bell III, Cromwell Bloodstock Agency; Breeder, Owner
- Stanley F. Bergstein, Executive Secretary, Harness Tracks of America, Inc.
- * James H. Binger, Breeder, Owner
- Ronald Blackwell, Executive Secretary, General Manager, American Quarter Horse Association
- Joseph H. Boyd, Jr., New York State Racing and Wagering Board
- * James Cox Brady, Jr., Breeder, Owner
- * Nicholas F. Brady, Chairman, The Jockey Club; Trustee, National Museum of Racing, Inc.; Trustee, American Horse Council; Breeder, Owner
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- * Baird C. Brittingham, Chairman, Delaware Racing Association; President, Thoroughbred Racing Association; Breeder, Owner
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- Herman Cohen, President, Maryland Jockey Club; Director, Thoroughbred Racing Association
- Charles Colgan, Racing Secretary, Handicapper, National Steeplechase and Hunt Association
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- * Leslie Combs II, Vice-President, Keeneland Association; Breeder, Owner
- Ed Comerford, Columnist, Newsday
- Mark Costello, Resident Manager, Saratoga Racecourse
- Ted Cox, Publicity Director, Calder Racecourse
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TWENTY-FIFTH ANNUAL ROUND TABLE CONFERENCE

ON MATTERS PERTAINING TO RACING

HELD BY

THE JOCKEY CLUB

August 14, 1977

MR. BRADY: Good morning ladies and gentlemen, and welcome to the 25th Annual Jockey Club Round Table conference. The schedule this morning will be to have Jimmy Moseley's remarks then the panel on lameness and we'll split for a minute in the middle of the panel, take recess, and then come back to hear the rest of the panel and Jim Ritchie's speech.

I want to thank you all for coming and thank again Donnie Ross for putting this exciting panel together.

I'd now like to introduce the dais. Mr. Paul Mellon, vice chairman of The Jockey Club, Mr. Louis Lee Haggin, treasurer of The Jockey Club, and of course the man who makes The Jockey Club work, Cal Rainey.

Our first speaker this morning is Jim Moseley. He's a steward of The Jockey Club; owner of race horses in his own right; and a man who's done an incredible amount of work putting forward the programs that we've had underway for The Jockey Club this year. Jim has been all over the United States, Puerto Rico and Japan, explaining the blood typing program and we're deeply indebted to him for the work that he's done. He's agreed this morning to bring us up-to-date on where we stand on the blood typing program. Jim.

MR. MOSELEY: Thank you, Nick. As many of you will recall, the primary topic of the 1976 Jockey Club Round Table conference was horse identification, or more specifically ways and means of upgrading the identification process at all levels.

In March of 1976, Nick Brady, Chairman of The Jockey Club, announced the formation of The Jockey Club Horse Identification Committee. This group consists of people from all segments of the Thoroughbred industry, including owners, breeders, veterinarians, sales company executives and others involved in various racing functions. The committee was urged to investigate as many methods of identification as possible with the ultimate aim of presenting specific recommendations to the stewards of The Jockey Club to improve the identification of foals. Those recommendations presented at last year's Round Table represent what promises to be the origin of a comprehensive identification program which will eventually have a positive impact at the farm, racetrack, and sales arena.

The recommendations were that in the beginning of 1977 all Thoroughbred stallions in North America should be blood typed with completion by the end of 1978. Secondly, beginning in 1979, samples should be taken from foals and their dams to provide for routine parentage verification. Thirdly, an experimental program should be commenced to develop a voluntary photo card system to aid in visual identification at the farm, at the sales, or during shipment. Fourthly, The Jockey Club should implement on January 1, 1977, a breeding stock ownership registry to identify, blood type, and record the ownership of all horses entering the stud.

The stewards of The Jockey Club passed each of the recommendations and the staff of the Club, under the direction of Cal Rainey, started to implement them. The blood typing program was established in our Kentucky office and headed by Dave Foye a doctoral candidate in animal genetics from Cornell University and a self-confessed horse nut. Dave and his staff with the guidance of the New York office began the enormous logistical task of originating the stallion blood typing system. Thanks to their hard work and the willing cooperation of the stallion owners, we have typed over 2,300 of the more than 8,000 stallions presently standing in North America. And the serology laboratory at the

University of California, at Davis, which is performing the testing function, reports that the samples are now arriving at a rate of more than 100 a week.

In addition to entering all stallion blood types in our computer file, we also positively are identifying each stallion prior to placing him in the ownership registry.

With the completion of this process we then have a comprehensive record of the stallion's identification, ownership and location. In the event a stallion changes ownership the transfer must be reported and the horse has to be re-identified. Thus, the trail of ownership and location is always maintained. The work that is now being done will lay the groundwork for an expanded program to include testing of mares and foals beginning in 1979. Additionally, we plan to identify and blood type all stallions and mares who enter the stud each year.

As you can see, we will eventually have an identification file which will contain the blood types and other identification of the majority of the breeding stock in North America. This will serve two significant purposes. One, it will allow routine parentage checks to be made on foals or other horses prior to sale or shipment. And it will expedite the foal registration process which is often slowed by the need to properly identify the stallion or mare.

Another aspect of the program which has commenced is the experimental photo card project which was initiated in Kentucky during the spring. With the cooperation of two leading breeders, we processed, confirmation and night eye photographs of approximately 200 brood mares. With this material the Pinkertons created a laminated five by eight card which is similar to the identification photographs used by The New York Racing Association. These cards can be shipped with the horse, used as stall identification cards or otherwise utilized as the breeder sees fit.

After two current users have had sufficient opportunity to determine the effectiveness of these cards, it is probable that the process will be offered to breeders on a voluntary basis. While the initial photographic work is relatively expensive, the cards can be reproduced very inexpensively and provide an excellent means of identification.

In summary, I think that we have made substantial progress toward development of an open-ended identification program which will continue to expand towards a comprehensive system insuring precise identification at farms, sales, and racetracks throughout North America. I would like to emphasize that The Jockey Club Horse Identification Committee will continue to function as an ongoing group coming up with the ideas and making recommendations to improve identification procedures.

I would like to thank the committee members, many of whom are here, for their efforts and interest in this program. I think that it would be appropriate to state that the entire racing industry should be grateful to this committee for their important work in horse identification as manifested by their efforts and recommendations.

I would also like to thank the staff of The Jockey Club for doing the nuts and bolts work to get the program started and keep it flowing smoothly.

It has been an interesting and an informative experience for me to serve as chairman of the Horse Identification Committee, as I am certain it has been for the other committee members. Identification is a crucial and complex area, and one that demands the attention and concern of all who are involved in racing. I am happy to be able to report the great progress that has been made thus far and I assure you that we will continue to work diligently toward the goal of an effective universal horse identification system. Thank you.

(APPLAUSE)

MR. BRADY: Thank you, Jim. We have time for a few questions if there are any. The program is new and we'd be glad to try and answer any questions if you have them. If not, we'll go on into the panel.

We're very pleased to have with us this morning Matthew Mackay-Smith, a doctor of veterinary medicine, practicing at the Delaware Equine Center. Matthew will conduct a panel entitled "Let's Prevent Lameness in Racehorses". Matthew.

DR. MACKAY-SMITH: Thank you very much, Mr. Chairman. We as a group on the panel are extremely grateful to be here and feel that you will be stimulated by what we have to tell you in the next few minutes.

The concept of what we're talking about must be laid at the feet of Joe Solomon, who is the present president of the Equine Practitioners Association. Joe reached a conclusion (which should have been obvious to all of us a long time ago) that we're never going to get anywhere dealing with lameness if all we try to do is rescue those that are already lame; we must get at the roots of the problem and get it cured before it starts, as it were, or devise ways of preventing it.

DR. SOLOMON: A major branch of any medical discipline is preventive medicine. In human medicine, we are familiar with prevention of disease, prevention of injury and death from poisonings or automobile accidents, prevention of injury to athletes and many other things. In the veterinary art devoted to the horse, there is a great deal of preventive medicine: vaccination and de-worming, among others, save the Thoroughbred industry millions of dollars.

Today our panel is going to explore a new concept in preventive medicine, and that is the prevention of lameness. Stacks of radiographic film in my filing cabinets and in those of every other race track practitioner testify to the destructive forces which annually remove many of our horses from competition or cause them to devalue in class at an accelerating rate.

It has been suggested that the veterinarian's role begins at the moment of injury and things which may contribute to a horse's breakdown, such as faulty track surfaces, are not our concern. Nothing could be farther from the truth: the total health and welfare of the horse is our oath-bound pledge. Through scientific studies of the horse in motion and because of increasing sophistication of materials and techniques, we are discovering facts about stress and tissue breakdown never before dreamed of.

The panel you will now hear is part of an American Association of Equine Practitioners Committee appointed to investigate the feasibility of a prevention of lameness study. Its chairman is Dr. Mackay-Smith and I'll turn the panel back to him.

DR. MACKAY-SMITH: I'm not going to be didactic with you but I do want to give you an overall view of the way we see the problem so that the interesting illustrations which will follow will be more meaningful to you and so that the possibilities for a comprehensive study of this problem and a comprehensive solution to it will become apparent to you.

I don't know whether any of you are aware of the cost of lameness to racing. We do not have the hard dollar figures as yet to prove it, but each and every one of you has some acquaintance with the emotional cost of lameness as owners and trainers. You know the anguish and aggravation that a sore horse causes and the depreciation and devaluation that such a horse experiences and the expense of trying to keep that horse in training when his mechanical problems are piling up.

The public has some emotional investment in lameness as well. The kinds of breakdowns that occur on the track expose the racing public to the painful realities of horses suffering from the racing experience. Certainly this has an effect on the general public attitude toward racing and is a source of great concern to track operators and publicists and so forth.

The most compelling liability is the financial one: racing is an industry and as an industry it should be operated along industrial management precepts. Racing pays for lameness in terms of dollars spent in training which do not yield a result; in terms of loss of value of livestock resulting from lameness; in terms of the cost to track management in maintaining perhaps a twice as large an inventory of horses on the ground or available to the racing secretary as would be necessary if they were sounder; in terms of decreased betting revenue on horses that do not race formfully and of course the effect which that also has on the income to various taxing authorities. I think that probably a minimum figure of 250 million dollars per year and perhaps a figure which is as much as four to six

times that can be ascribed to lameness in all classes of racehorses, including the Standard-bred and Quarter horse racing industries as well as the Thoroughbred industry. We are dealing with a magnitude of financial loss or financial inefficiency which certainly justifies an industrial research approach to this problem.

What is lameness? Everybody knows what it is in a sense and yet it requires a definition. Simply it might be thought of as the failure of most animals mechanically to adapt their bodies to the preparation and experience of racing under present conditions. The cause of lameness involves destructive elements in the Ground Reaction. The Ground Reaction is a term that you will see used more and more as programs for preventing lameness and for studying lameness problems are brought to your attention, and I want you to understand it right at the outset. If the horse's feet never touched the ground he would never be lame. It is the job of the ground to hold the horse up, to prevent him from falling, to support him and to raise him and push him forward as he produces his gait. It is the job of the horse's legs to keep that experience within mechanically tolerable limits; otherwise he flies apart.

The Ground Reaction is the interaction between the horse and the ground and it's not a complicated concept, but in that tiny distance a tremendous number of complex mechanical events take place. Furthermore, a horse who is galloping in the surf experiences a different pattern of ground reaction from a horse who is galloping on the turf. There is a variation in this ground reaction which gives us an opportunity not only to analyze it but to modify it in such a way as to diminish its destructive effect on the horse.

In terms of size, duration and shape, the individual ground reaction for individual horses is determined by the horses conformation, his constitution, his preparation, his fitness and his racing experience. These are all factors in the horse which can be studied and which can be modified so as to minimize the effects of the ground on the horse. Properties of the ground which can be studied include geometry, mechanics and uniformity. They can be modified so as to minimize the effect of sustaining and propelling the horse forward. The geometry of the ground has to do not only with its local degree of consistency and smoothness, but has to do with the way the racing strip is laid out. Everyone's experience is that if a horse races in a straight line, these leg problems are greatly reduced. It is possible to devise a geometry for a circuit which mechanically feels to the horse, or has the effect on his legs as if it were a straight line. This type of investigation can be readily conducted and much of it has already been done.

The mechanics of the ground include its density, its elasticity and its uniformity and we can identify ideal densities, ideal elasticities and ideal uniformities within which the horse can adapt, or a much higher proportion of horses can adapt their bodies to this experience.

I said earlier that most horses cannot stand racing under present circumstances. Some horses can race effectively at satisfactory speeds with adequate numbers of starts per year to economically justify their existence. This indicates that if we study the successful horses we will learn a lot about the unsuccessful horses as well.

We note that horses at the same track develop different lamenesses. These indicate that there are factors within the horse that we can study and change. We also notice that horses at different tracks develop different patterns of lameness, or one kind of lameness will predominate under one set of circumstances, another under another. If we can identify these and correlate all the data we can find out how the individual racing conditions can be modified toward an improved survival of horses.

The causes of lameness are due to factors in preparation, factors in selection and factors in racing experience. There is a tremendous amount of research capability today in studying the effect on the horse's biology of the experience of running over the ground. Whenever you take a biological system and stress it, it responds in measurable ways. It may respond by deteriorating, in which case the stress is much too great, or it may respond by changing itself or improving its capacity. And these all carry measurable changes in the animal. Some of them are heat, some of them are changes in the conduction of electricity, change of conduction of ultra sound, and other factors which

you will hear more about after I'm done.

We know that selection is important in racehorses but we've never applied any scientific study to how selection should be undertaken. We know that animals of grossly inadequate conformation rarely survive. But we also know that animals of apparently similar conformation have various lameness experiences. It is now possible to conduct objective studies of these animals and to use that information to carefully set out in categories what their risk of breaking down at various speeds and under various conditions might be.

Jim Rooney and George Pratt will describe to you some fascinating mathematical and experimental data coming to light now which indicates that the mechanical tolerance of a particular horse can perhaps be determined before he ever sets foot on a race track. If we can develop the right kinds of information from the experience of horses now racing, we can probably develop predictors which will enable us to take an individual horse, determine what his ultimate capable speed may be and determine from his mechanical construction and other features what the likelihood of his withstanding that speed are.

And then we have the factor of the variability in racing conditions. There is a study that's been done by a man in Canada, Victor Todd, in which he has analyzed various factors affecting the racing conditions at Woodbine over a period of several years. He has assembled in excess of a million computer cards of individual instances; he finds that when the resultant of his computer analysis falls within a narrow range that the horses race more formfully. The complainers . . . excuse me, you'll get the connection in a minute . . . the trainers complain less about horses becoming lame. If these conditions persist for several days, not only does the lameness experience drop but the racing times improve and the closeness of the finish improves. He has been conducting this kind of retrospective study not knowing what the precise conditions are. He's not measuring what the track conditions are and he's not measuring what the horse's mechanical experience is. He's only looking back and determining that there is an optimal condition for every track and that if those optimal conditions are reached and maintained the horses racing on that track can handle it better.

Everyone of you has had the experience that horses moving to a new track have difficulty for a race or two over that surface. Some differences between surfaces may be unavoidable but science should tell us what is unavoidable and what can be reasonably modified.

There are a number of ways that we can change the composition. Not by a great upheaval of construction necessarily but perhaps merely by some simple modification if we better understood what the precise mechanical conditions were.

What we are proposing then is a pretty rigorous industrial research program. One which is demonstrated to be cost-effective. We are experiencing dollar losses now which certainly justify a general concern on the part of racing. Racing is beset from without by various economic stresses. Realize that it is also beset from within by tremendous economic losses much of which we are sure can be prevented and can be prevented by the expenditure of an effort and cost which would be many times paid out. This research program has to be goal oriented. We're not interested in blue sky research just to satisfy somebody's curiosity. We have to set out very specific goals of what we want to accomplish. We need to develop a very comprehensive program to study this very complex subject.

When we have the right information we can achieve better selection. From conformation studies we will be able to measure what is the probable durability of a given animal before he has ever been exposed to training. There's an indication, as you will see later, that we may be able to determine what the horse's ultimate speed is. If he's never going to be a racehorse let's not beat his poor body around and around in the effort to find out. Let's put that money into more cost-effective animals.

We can certainly study the way that we prepare our horses now. The trainers of this country and of the world unquestionably do a marvelous job of sensing how the preparation of their charges is coming along. But we now have technology that will enable

us to be much more objective about it. You'll hear a little more about that later. But we have the scientific capacity to do a very sophisticated job of determining the horse's response to the work and planning a course which will prepare his structure to the maximum possible extent with the least possible risk of his flying apart. It will enable us to select the optimal time at which to begin training. And I think we'll see some startling recommendations come out of that kind of study.

We should establish some criteria of when horses actually are ready to race; in other words, when have we induced the maximum preparedness into that particular individual. We are certainly going to see the opportunity to optimize the conditions under which horses race.

I and members of my profession, and Dr. Solomon who leads us, would very much like to see owners, track operators, veterinarians, all segments of racing get together and chart a comprehensive plan which would give us answers to these questions. This committee should supervise the programs and projects to be conducted, should make sure that the work that is paid for is done, and that the work done is meaningful. They should see that there is an implementation of the recommendation which is both sensible and productive.

Now that is where I'm going to leave you for the moment.

I will entertain questions for a moment or two now to see whether there are any of these basic principles that I can clarify for you. And we want to make sure that you understand what applied science can do. This tremendous burden of lameness on racehorses is not an act of God to which you should meekly submit; like almost everything else in our environment, it is a matter which is subject to rigorous study and from which meaningful programs could be derived to change the status of things.

MR. GREEN: I have one question. Dr. Mackay-Smith, I believe you said that about a 250 million dollar loss occurred because of unsoundness in animals, part of which would be attributable to purse money. Is that correct?

DR. MACKAY-SMITH: No I didn't.

MR. GREEN: Nothing about purse money?

DR. MACKAY-SMITH: No, I didn't say anything about purse money.

MR. GREEN: I thought I heard you say that.

DR. MACKAY-SMITH: No, I don't know enough about purse money to say anything about that.

MR. GREEN: I was just going to say that as far as purse money, purse money would be the same, regardless of whether some horses were . . .

DR. MACKAY-SMITH: Right. I think that there are some obvious inferences to be made from this. In order for the average horse to pay himself out he has to be able to start often enough to have a crack at a fair share of the purse money. And horses that start only rarely have virtually the same training costs but have a much lower expectation of earning those costs back.

MR. GREEN: I agree with that. I was just thinking though that the total purse money is unchanged and it is distributed annually.

DR. MACKAY-SMITH: That is correct. The total purse money is unchanged but if the conditions for preserving soundness or preventing lameness were improved, both with respect to improving the individual horse's chances of surviving and improving the circumstances under which he races, we would have a smaller total population of horses

racing unless there was an enlarged opportunity for racing. But the horses that cannot make money (either that relatively small proportion are too slow or the relatively higher proportion are mechanically disabled) would be out of racing. You would have a sounder population, each of which had more opportunity to race because they could stand it better.

MR. GREEN: Thank you very much.

MR. MARSH: I have two questions. First, what will this study cost? And the second question is what percentage chance of success in relation to what you've said would be possible?

DR. MACKAY-SMITH: The kinds of information that would produce a precise answer to that question are only now being assembled. I want you to understand that the time frame in which we have been working has been roughly since January 1, 1977. And even with the most electric prodding that we could devise we don't have precise answers to this question. But let me say in general that we're talking about expenditure of single figure millions in the expectation of reducing losses of tens or hundreds of millions. When I speak to the researchers about the prospect of finding useful outlets for three to five million dollars per year they are overwhelmed by the prospect. Now if you've ever had to go after research money you know that research people have set their expectations lower and lower because of the difficulty of obtaining this kind of support. But I think that for a relative pittance some very very effective information can be found.

Now as to what the payout in dollars would be, I think this would depend almost entirely on how wholeheartedly racing wanted to accept these recommendations. My own feeling would be that we should look upon this as a ten or fifteen or twenty year program of progressive moderate changes with studies of the effects. The best science in the world is not a guarantee. It only gives you much better tools to work with. And the cost to racing for making the modifications depends upon what modifications seem to be appropriate. And this is why we need options for modification. We don't anticipate uprooting the whole thing: to start over from ground zero would be both impractical and insane.

MR. MARSH: Fifteen years is a long time for me to wait.

DR. MACKAY-SMITH: I judge by the . . .

MR. MARSH: We could give you ten million dollars right today, how long would it take you to make a comprehensive study and at the end of that X period what probability of success would you have in relation to what you just got through telling us.

DR. MACKAY-SMITH: I certainly expect you to be around for fifteen years from now, because I know that your curiosity on the subject is going to sustain you through whatever vicissitudes might be visited upon you. I'd like to give a pat answer but this is a complex subject. When I was younger and greener I worked out a nice set of figures which indicated to me that a significant turnaround could be achieved within five years, and that a markedly improved situation could be achieved within 15 years. But there are so many interdependent things, probably the largest of which is: what does it take to convince people that the information that you have obtained can produce the result which you claim. The only way you're going to get that done is to get people to try it, and it has been the experience of practical researchers and industrial researchers that you take these things one step at a time and that you prove the effectiveness of one method or one modification and then add others. The effort to remake the whole show from the ground up frequently meets the experience of the Bricklin or the Edsel: a massive change has been introduced and not found acceptance because the proof of the pudding was not sufficiently forthcoming. But the importance of beginning with a comprehensive study is

so that we don't get down the road and say for God's sake why didn't we think of that? That is what's really wasteful. But I don't think we're talking about tens of millions of dollars for the investigation and I don't think we're talking about decades to see the fruit of it. I think we're within that general frame.

On that note, I'm going to ask my friend, colleague and many times adversary, Dr. Jim Rooney. He is known to many of you for his accomplishments as a scientist and as a prophet and I hope that he will be found to be with honor in his own time.

DR. ROONEY: This prophet, if that's indeed what I am, is caught a little bit off because I fully expected a break to get my wits together before having to start speaking.

In answer, or to comment on the last thing that was said, about how soon can we expect some reasonable output from this input that we're talking about, there's an old story which I learned in my Kentucky days which I might repeat yet again though I'm sure many of you have heard it. An extension veterinarian was giving a talk to a group of pig farmers and telling them all the latest and newest things about how to raise pigs and gave a very learned discussion: it went on for about an hour. At the end he asked for questions. An old farmer in the rear stood up and said, "This was all very interesting, doc, but our knowin' is so far ahead of our doin' that we don't need to know no more."

Now to a certain extent I think that's true of the lameness problem: that a lot of things that we already know are not being put into effect, but even so we need to know a great deal more than we do now as Matthew has said.

What I'm going to try to do is rather briefly cover some general aspects of lameness research, how one tries to go about figuring out these various problems that we encounter. But there's one very clear point that has to be made I think in all of our discussion this morning. It's that no one approach or technique is going to solve the problems which we find in front of us, no matter how seductive or fascinating any one of these techniques may be. Whether it be ultra sound or some magic new machine which just looks at a horse and says, "Oh my heavens he can run a mile and a half and we better take him to England because he can't run here." There are no such machines. But even if they are available, no such single machine is going to solve our problems.

The earliest studies of lameness in horses go back to antiquity. They were originally and basically clinical descriptions of the disease process which was going on, and how people felt that it had occurred. Going on from there, very early in the game genetic studies began to appear. That is, certain horses, certain stallions seemed to throw offspring who tended to develop navicular disease or others tended to develop spavin. Registries were established in various European countries that stallions who tended to throw a high proportion of offspring that had navicular disease, for example, could not be registered for breeding purposes.

Some very early sophisticated studies were done by German anatomists back in the 1800's. They took bones and ligaments of horses and just simply stood around in their offices and manipulated them and began really the very earliest stages of a study of mechanics of horse motion: how joints moved, what bones did in relationship to the joints.

Also rather early French anatomists and horsemen began the work of mechanical analysis of the horse in motion. That is, they looked at pictures of horses or watched horses move and then applied the basic principles of physics and mechanics to the horse structure in an attempt to predict what function might be. In the present day we're still doing very much the same sorts of things that were done in antiquity except we're beginning to do them in a slightly more sophisticated way.

Clinical description and investigation of lameness problems is still an important and significant aspect of our understanding of lameness. Particularly when we get into that area of clinical medicine which is called epidemiology. That is, when we begin to put together the experience of many horses at many different tracks under many different racing conditions throughout the world.

These days also we have a rather solid background of information on the pathology of lameness. Now that might not sound very interesting to you but once we start getting

inside of a horse's leg and looking to see what is an osselet, what really is a bow tendon; ten years ago there was nothing but argument on what a bow tendon really was. All we knew was it was a thing that bulged out in the back and the horse was sore. Now we have rather clear description of what exactly goes on in the superficial flexor tendon to lead to its failure, ending up as a clinical bowed tendon.

So pathologic studies, the old blood and guts business in the post mortem room, for which I am well known, or ill known, have provided descriptions of lesions or changes which occur which are associated with the different kinds of lamenesses.

The mathematical type of mechanics which the Germans began by manipulating bones in their anatomy laboratories are still going on. They're becoming more and more sophisticated all the time, and we'll discuss that in a bit more detail in a few moments.

Experimental mechanics, particularly the use of high speed film and testing machines in experimental laboratories is just beginning, in the past five or six years, to be used in an extensive way; and is providing us very detailed and valuable information on how horses actually move; not how we think they might move, but precise descriptions in terms of mathematical models.

Exercise physiology is another area which is just beginning to be explored. By this in general I mean how cardiovascular function goes on, how an animal breathes, are they breathing effectively, how does one train a horse so that his heart and lungs as well as his legs are in condition for the kind of stresses which we apply to them during the course of racing.

An area which is just beginning to be tapped, it's just beginning barely to be opened up, is that which one might call the control system of the horse which is essentially his nervous system. We know he can't run if he doesn't have at least his spinal cord working. We're not sure how much brain he's using in all this but he has to have at least his spinal cord and a few lower centers to keep him going. And we know very very little at this time about the mathematics or even simpler common sense of how the horse's nervous system actually works to control him when he's at a high speed trot or pace which is probably one of the most difficult things to understand and what precisely the nervous system is doing, when he's galloping, when he's going over jumps as a show jumper or whether he's going over brush as a brush horse. This whole area of the neurologic system, the control system of the horse, as I say, is an area which we're just beginning to explore.

Now as an example of some of these things I've been talking about I'd like to just sketch through how one would approach investigating proximal sesamoid fractures in horses. We must start off, first of all, with a clinical description of the disease which is quite clearcut, well known. Radiographs tell us that the sesamoid bones are fractured. You are still acutely aware of the Ruffian situation which of course was sesamoid fracture.

Having a clinical idea of what this particular problem is, the next thing we look at is the epidemiology of sesamoid fractures. And we find immediately some very interesting things. One is that the Thoroughbred racing horse tends to have what we call base fractures of the sesamoid bone at the base of the bone while Standardbred horses tend to have fractures of the apex of the sesamoid bone. Even further than this the Thoroughbred tends always to break the bones in front while the Standardbred very frequently breaks them in the hind leg. This immediately gives us epidemiologic information about horses going at three different kinds of gaits; the pace, the gallop and the trot, and that they fracture the bones in somewhat different ways.

We also know from geographical studies of how these fractures occur, where they occur, that these are almost always associated with racing around turns. It is rare indeed for proximal sesamoid fractures to be seen in horses racing in England and Ireland, for example, where they do not race around the short, relatively short, turns that we do in this country.

So all this is information we have. We can't explain anything by this. We can say well going around turns is associated with sesamoid fractures. But obviously we have to know something a bit more about the turns, what can we do to the turns to perhaps prevent such fractures.

We go on from that to anatomical studies. We begin to look more closely at the fetlock joint, the lower end of the cannon bone, the sesamoid bones. How precisely are they built? Can we find things there that will help us to explain why these fractures do occur? And we find things that do indeed explain how some of these fractures occur. The lower end of the cannon bone for example actually forms two joints; one on which the long pastern bone runs and another surface on which the sesamoid bones run. If the sesamoid bones run on that part of the surface which has been reserved for the long pastern bone we have base fractures of the sesamoid bones.

So anatomical studies can show us predisposing factors of the way the leg is built which will lead to certain types of fracturing.

We then go to pathologic studies. We begin to look at these fractures in horses that have had to be put down because the fractures were so severe. From this kind of information we tried to find out if the bones have been broken as a single event. That is, has the leg simply been overloaded once and the bones broken or has there been gradual fatiguing, wearing, predisposing factors developing in the bones which then lead to fracture. And it so turns out that in most sesamoid fractures they seem to be single event fractures. A single overloading of the bone which causes a failure without an accumulation of wear and tear over a period of time.

With the clinical, epidemiologic, anatomical, and pathologic information we then go to theoretic mechanics, theoretical or mathematical mechanics. We try to put all of this information together using the laws of mechanics, basic physics and try to construct a hypothesis: why would this horse break the bones as it runs around the turn? Now I'm not going to go into details of that. We'd be here for several hours.

We try to construct a hypothesis, putting together the information we have already collected on epidemiology, pathology and so on, and we apply mechanical techniques to this information and try to construct a hypothesis which will say to us this is probably how these fractures occur.

The next step in the process, of course, is to go to experimental mechanics and try to actually make these fractures occur. That is, we will test the hypothesis which we have constructed. Reasonably enough, not I nor anyone else I think in this room is going to go out and take a live horse and say I'm going to now impose on this horse conditions to break his sesamoid bones. I wouldn't want to be responsible for whoever was riding the horse!

We do have today, however, rather sophisticated testing machines and testing systems so we can take out part of a horse's leg after he has died, put it in the testing machine and load it with the same forces and at the same rates as occur in the live horse. And, remarkably, from just above the knee down to the hoof in a testing machine we can reproduce almost exactly the forces and loadings and geometry of the motion of a galloping horse. Therefore, we have a method by which we can attempt to produce proximal bone fractures. In fact, we have done this in testing machines fulfilling the conditions developed by all of these things I mentioned before and we can quite regularly fracture, produce base fractures of the sesamoid bones with a great deal of glee and fun. We can hear them cracking off in the laboratory and it's lots of fun for us.

So in any event, in this particular instance we have collected together a great deal of information which has taken years to collect. This all wasn't done last week. It's taken years to collect this information. It took a long time to construct the hypothesis. It took an even longer time to find a testing machine of quality enough to do this kind of work as we're talking about thousands of pounds of force we must exert on this leg. As an example the average thousand pound horse when he's galloping down the racetrack is exerting something like 2,000 foot pounds of force in his lead fore leg. About twice his body weight every time he puts a foot on the ground. And we have to reproduce those kind of forces with a testing machine.

Now just to finish up in rather more general terms I think what we are looking for in the kind of studies which we wish to do are both this experimental approach used in testing machines, using force plates, instrumented shoes and so on, as George Pratt will

probably mention a little bit though I don't want to bias his talk for him, and also theoretical studies. I know theoretical sounds like a dirty word. What's practical about theoretical? Well actually the most practical things in the world are theoretical. I don't mean theorizing; that I'm just going to sit with a beer in my hand and say gee I think maybe he bowed his tendon because he did so and so. What I mean by theoretical is when we take all the information we can possibly gather we try to subject it to decent rigorous mathematical analysis, try to make predictions which we can then go back and test in an experimental way. Certainly physics provides us with a model for this sort of thing where both theoretical and experimental physics have led to the tremendous advances that we know in physics today. We want to try to apply these same types of things to horse lameness and locomotion.

Very often we come up with some rather serendipitous findings. As one example of that, with which I'll conclude, is the study of the problem of rear leg lameness in Standardbred horses. In Thoroughbred horses we're all concerned primarily with the front end. Well the Standardbreds have taken all their problems and put them in their rear ends, which may give us another nice epidemiologic thing as well.

In studying the mechanics, just the theoretical aspects, how does a Standardbred pacer or trotter move as compared to how a Thoroughbred moves. We come up with the inescapable conclusion that the sacroiliac joints of the Standardbred horse must be subjected to much greater forces, movements and stresses than the sacroiliac joints of Thoroughbred horses. This comes simply from an analysis of how they move. With this information we go to the post mortem room and look at the sacroiliac joints, which is not an easy job in the horse, look at the sacroiliac joints of a series of Thoroughbreds and Standardbreds and compare the incidence of damage which we can see in those joints. And we find that the incidence is about twice as high, severe damage of the sacroiliac joints, twice as high in the Standardbred horse as in the Thoroughbred horse.

So far the theory and the pathology, the theoretical work and the pathology have fit together. Our next step is to try to go back to the live Standardbred horse who's hiking and stabbing his way down the racetrack and see if indeed, rather than stifle lameness as it's frequently called, we are dealing with sacroiliac lameness. This provides a completely different prevention problem and also a very different treatment problem.

We started out with the Standardbred horse, why is he hiking and stabbing behind? We now have very strong evidence that it's the sacroiliacs that are problems. In studying that we also find that the galloping horse, the Thoroughbred, moves his rear end much differently than the Standardbred horse and we should anticipate on the basis of our theories that the lumbo-sacral joint, it doesn't make too much difference where these are, they're just low down here where your back hurts, that the lumbo-sacral joint should be damaged in the Thoroughbred horse and not the sacroiliac. And we have begun, just begun, the pathologic studies and so far they indicate that indeed arthrosis, destruction of the lumbo-sacral joint is much more common in the Thoroughbred horse than it is in the Standardbred horse.

These are the beginnings of information. We're a long way from taking that kind of theoretical information and trying to put it into a testing machine or any kind of experimental situation. But obviously this is where we would like to go. Thank you very much.

(APPLAUSE)

DR. MACKAY-SMITH: I don't know how long George Pratt's interest in horses has been extant or even where it came from. And I don't even know whether he will share that with us. He is a professor of electrical engineering at M.I.T. and you might think he's a bit out of his water. But you will find that the range of his mind and the penetration and so forth have already produced some very stimulating results and that he has a great many more tricks up his sleeve.

And I know you will enjoy hearing what he has to say and questioning him further about it as the day goes along. George.

DR. PRATT: The purpose of this address is to bring into focus some specific research activities associated with the problems of breakdown and lameness in race horses. In particular, a biomechanical analysis of the stride of the horse will be reviewed which relates the "way of going" to one possible mechanism for breakdown. A method for quantitatively measuring the degree of distress in a limb will be discussed and an instrumented shoe described, combined with a telemetry system for measuring the forces on the legs of a horse running on the track. Much of this work has been done with Dr. James O'Connor. A recent study on the effect of anti-inflammatory drugs has been done with Dr. Richard Sheehan. The use of facilities at Rockingham Park, Suffolk Downs, and those of Mr. Norman Hall in Norfolk, Massachusetts are gratefully acknowledged.

ANALYSIS OF THE STRIDE

We mean here by "way of going" the precise timing of the action, i.e., how the legs move in relation to one another. Differences in timing of 1/100th of a second from one horse to another have been found to have a great influence on the relative performance and on the chances of staying sound. As an example, a film which was produced by The Jockey Club of the 1973 Marlboro Cup taken at 200 frames per second, shows SECRETARIAT passing RIVA RIDGE as both horses go on to break the World Record for 1 1/8 miles. Although SECRETARIAT took fewer strides per second each one of them was more than a foot longer than those of RIVA RIDGE. The increased length came not from longer legs, but from the timing of the footfalls. In order to understand the situation let us consider some of the details of the stride.

In every stride each leg goes through two phases. They are the stance, or weight bearing phase and the swing, or non weight bearing phase.

It is a remarkable result that the time required for the swing phase is to a good approximation constant — independent of how fast the horse runs. It is further something of a surprise to note that the trotter, pacer, and Thoroughbred all have very nearly equal swing times, about 0.32 seconds. No matter what the speed or gait, it takes the same length of time for the horse at speed to prepare each leg for the next weight bearing phase. Therein lies the connection between gait and breakdown.

Where does this timing come from in the first place? Evidently the timing, particularly how one leg moves in relation to the others, appears to originate in the nerve centers in the spine. The animal does not actively think about his action. It is not unlikely that a horse is born with a built in clock controlling his coordination and this clock ticking in hundredths of a second is very fundamentally related to his future performance and soundness prospects.

How is the constant swing time related to breakdown? The answer is quite simple. If the horse cannot provide himself with the required swing time, his leg comes down prematurely and this puts an excessive stress on his leg. Just before a leg contacts the ground it is being retracted, i.e., drawn back so that the foot will not hit the ground at the forward speed of the horse — but ideally so that the speed of the hoof relative to the ground is zero when it hits. Cutting this process short causes the horse to pound his feet into the track. This can have severe consequences as will be discussed later.

What limits the horse in his ability to maintain the constant swing time? To answer this we have to ask how the swing phase fits into the stride. While a given leg goes through its swing phase, the other 3 go through their stance phases plus there is an airborne phase where all legs are off the ground. If we call the duration of the airborne phase t_{air} then the

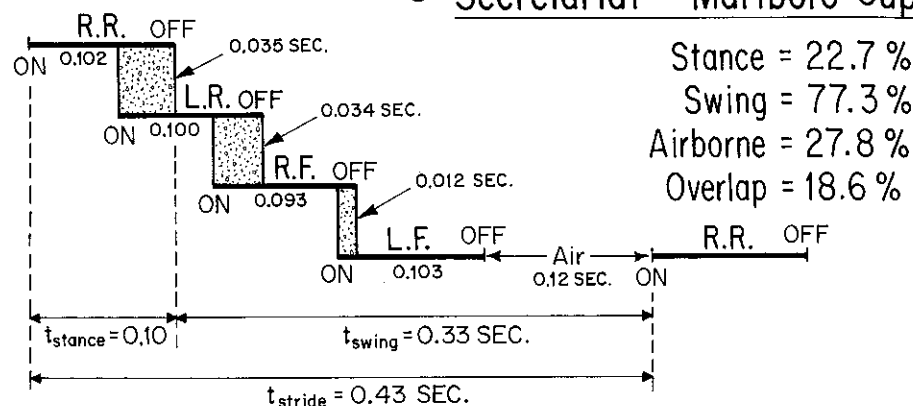
swing time is

$$t_{swing} = t_{air} + 3t_{stance} - t_{overlap}$$

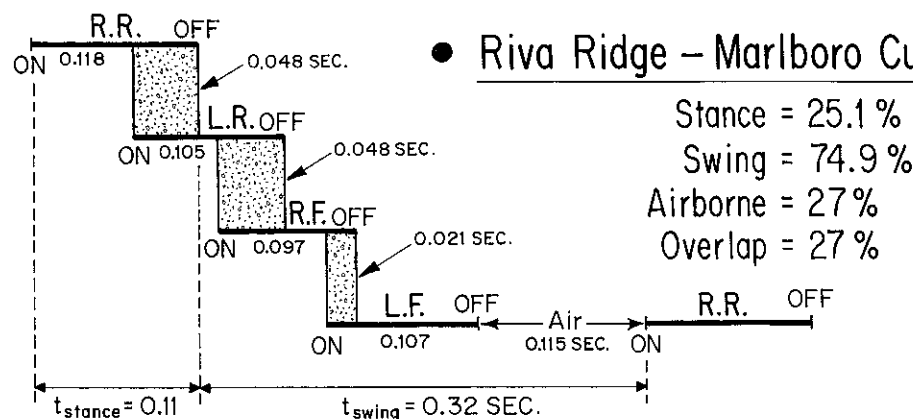
The overlap time is the total time during the stride when two legs are simultaneously on the ground, i.e., when the legs overlap one-another. Overlap greatly affects the

performance potential of the horse. It may possibly be a "built in" quality, stamped on the nervous system at birth. The really significant difference between SECRETARIAT and RIVA RIDGE was just this overlap aspect. The percentage of the stride time when two legs were down, i.e., overlapping was 18.6% for SECRETARIAT but 27% for RIVA RIDGE. This is shown graphically in Figure 1.

● Secretariat – Marlboro Cup



● Riva Ridge – Marlboro Cup



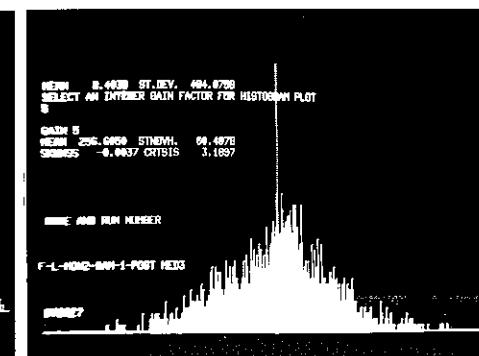
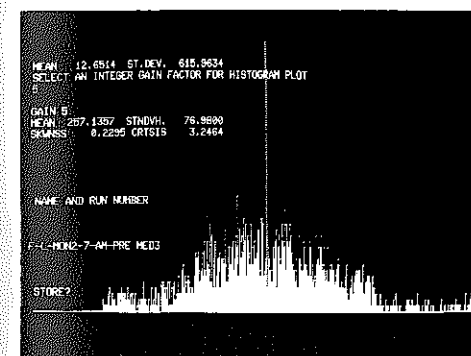
As the horse runs faster, the legs complete their ground contact more quickly. Therefore, t_{stance} and $t_{overlap}$ decrease which means that t_{air} has to increase in order to keep t_{swing} constant. Thus, the faster the horse runs, the faster he has to get into the air and the longer he has to stay there. This becomes more difficult as the horse tires. We can define the safe speed as the maximum speed at which the horse can run and still maintain t_{swing} . The safe speed starts out high and continually drops as fatigue sets in. The actual speed of the horse increases from the start, peaking in a sprint after 9 or 10 seconds and then dropping back. It can be shown that the safe speed depends very strongly on the overlap in the gait. Figure 2 below illustrates the results of a computer analysis of a sprint. In a typical situation the actual speed exceeds the safe speed after

1/16th of a mile and this persists until 1/2 mile from the start subjecting the legs to high stress for about 100 strides. However, the horse with low overlap never exceeds his safe speed.

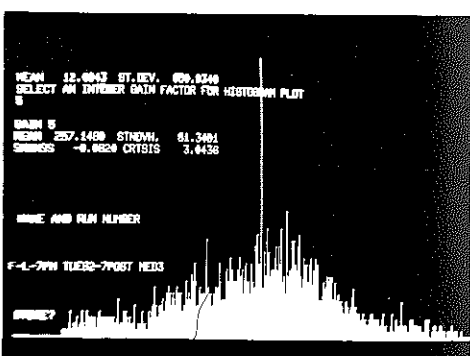
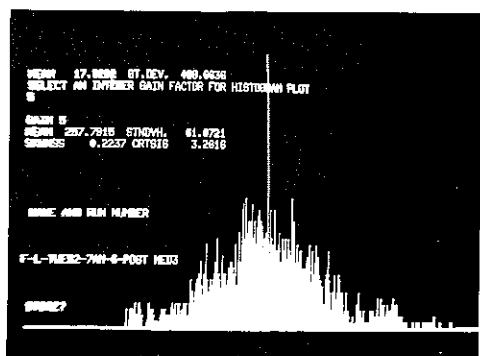
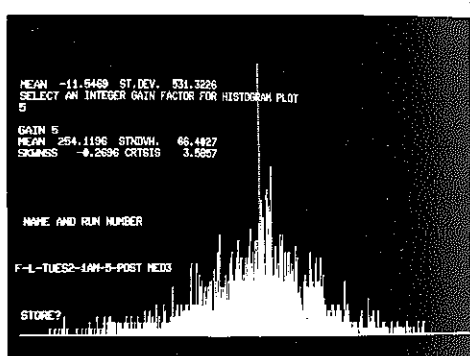
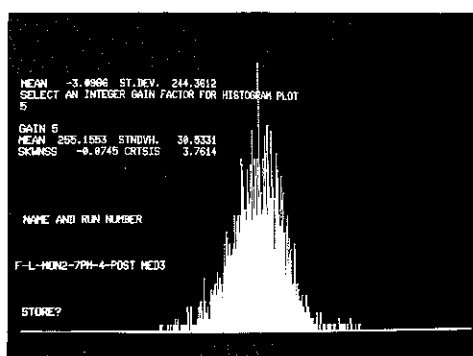
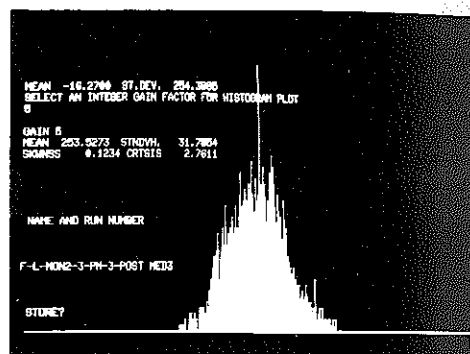
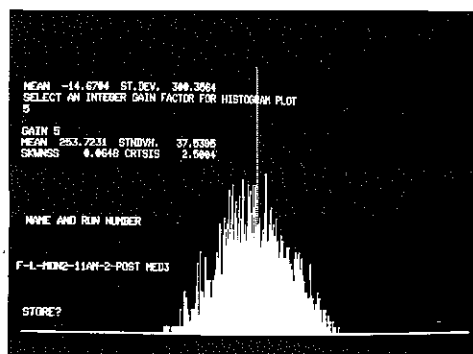
What are the consequences of severe loading of the legs? One theory states that bone absorbs shock by micro-crushing of the walls of the cellular bone structure. This weakens the bone. However, a remodelling process repairs the damage and additional bone develops in the region of greatest stress with the eventual strengthening of the bone. Bone strength is, therefore, a dynamic factor depending on how far along the remodelling process has progressed since the last high stress experience. Laboratory tests have shown that the breaking strength of the bones drops sharply under repeated impact. Under a single loading, the cannon bone breaks at approximately 16,000 pounds, while repeated loading can drop it to the 9,500 pound range. Force plate measurements indicate that this is in the range actually experienced during a race. Thus, the strength of the cannon bone, for example, could drop to a level where it simply snaps. Running too fast, too often, before the repair work can be done, is very likely a basic ingredient in some breakdowns. We are now experimenting with ultrasonic techniques to determine the strength of the bones before and after a race.

A MEASUREMENT OF LAMENESS

The force plate is an instrument that measures the force exerted by the hoof on the plate surface. It is usually used as the horse walks or runs over the plate. However, just by standing the horse on the plate it is possible to determine the degree of distress in a leg. Suppose one fore leg is on the plate and the other leg held up. The plate measures the weight borne by the supporting leg but more importantly the variations about that weight. That is to say, it measures how steady the horse is on the leg. Dr. O'Connor and I have found that these variations are affected by pain. Working with Dr. Richard Sheehan, we have been able to follow the response of the horse to anti-inflammatory drugs such as phenylbutazone, as shown in Figures 3a-3h. Each picture shows the distribution of force fluctuations about the average force. The horizontal scale shows the difference between



the actual force exerted by the leg on the plate and the average force during the 10 second data sample. This difference is sometimes positive, sometimes negative. The vertical scale shows the number of times during the 10 second sample that a given force fluctuation was achieved. Put in very simple terms, prior to medication the horse is very unsteady on a sore leg and large excursions away from the mean force take place. As the medication, which was two grams of bute given by stomach tube, takes effect, these excursions are reduced. After 12 hours the horse is quite steady on the sore leg. Pictures 6-8 show the



effect of the drug wearing off with a return to the original situation after 36 hours. These pictures, called amplitude histograms, were calculated and displayed using a computer. The significance of these pictures is that now we have a method of determining just how sore a leg is and of following the healing process. I am now developing a simple force plate system with a built in electronic calculator that will automatically compute and display numerical lameness values for any pair of legs of the horse. This instrument should be useful to trainers and veterinarians in assessing the condition of a horse before or after a race and in following recovery from injury.

THE INSTRUMENTED SHOE

Finally, at M.I.T. we are developing a force plate built into the shoe of the horse. Using a telemetry system, donated by the Motorola Corporation, we will be able to pick up the forces on the legs of the horse as he leaves the gate, accelerates, goes around a turn, comes home, and pulls up. The jockey, wearing a small transmitter, broadcasts the data from the shoes to a receiver from which it is fed into a computer for analysis. This system has gone through successful preliminary testing. With a range of over a mile it will be possible to follow a horse around any track. The results will provide many answers as to how the horse times his gait and if his overlap times can be affected by training or fatigue. Combined with a look at the soil mechanics of the track itself, we should be able to better understand how the track composition can influence lameness and breakdown.

SUMMARY

All athletes are engaged in a struggle with their bodies, the horse is no exception. The research of the type described above will not eliminate lameness nor breakdown. However, it can lead to a more intelligent understanding of the causes of lameness, it may prevent some injuries, and it certainly is the least we can do on behalf of the horse.

Thank you.

(APPLAUSE)

DR. MACKAY-SMITH: As I warned you, the possible implications that some of the work that these researchers are getting into is almost mind-boggling. I know you'll want to have a chance to talk to all of them in the moments that ensue this meeting.

I want to ask our rock in a stormy sea, who is always a source of conservative restraint on any hyper-enthusiasm we might develop to say a word or two to you because he's so well known to you and his reputation for straight thinking is so irreproachable. Manny Gilman, would you just make a remark or two to close out our panel. Manny has one flaw. He always carries toys around with him.

DR. GILMAN: Ladies and gentlemen, I think we are very fortunate to have gentlemen of this caliber to study the lameness problem that we're all aware of and one that affects all of us. We just finished a sale at Fasig-Tipton. Everybody was enthusiastic and bought horses for large prices and have many dreams for their future. The big problem we are all faced with is to keep them sound. Nobody can train a horse if he's lame or sore. Nobody can go on with a horse if he has to be destroyed. So we certainly have to do all we can to prevent lamenesses in race horses.

Scientifically, we have to study why horses break down. Why can a whole field of horses run over a certain strip on a track and one horse breaks his leg? Why can a horse run for six years with nothing happening to him and all of a sudden break his leg? These are questions that research may be able to answer.

But, no matter what we do we'll still have a certain number of breakdowns. That's characteristic of this business. We must keep them at a minimum. In keeping them to a minimum, I think everybody must try to maintain the racetracks at their very best at all

times. A study of racetracks is very important, and the maintenance of racetracks are very important. Periodically, a magnet should be run over every racetrack and any foreign piece of steel or metal picked up. The shoes that come off a horse during a race should be picked up. Any harrow teeth that fall out should be picked up, etc. It doesn't take much, particularly on a sloppy track, to make a horse take an uneven step, when he is traveling 30, 33 miles an hour and cause him to break a leg.

Now after they do break down, there's a lot of talk today about hospitals. I'll say a couple of words about this subject. Our present thinking about hospitals is that the closer the hospital is to the injured horse, the better is his chance of survival. I think every racetrack, at least every racing center, should have an equine hospital available. It should be modern and well-staffed. However, there are certain times when a local hospital can't compete with a university. There are certain pieces of equipment that are necessary for the survival of an individual horse, while transporting him to a university. A man by the name of Glenn Thiele builds truck bodies and made this little model. It is a containerized unit that fits into a three horse trailer. You take it out on the track, and put the injured horse in it. Once the horse is in this container, he can be secured so that he can not go down or jump out.

If you want to work on the right front leg, you lift the door next to the leg and there's plenty of room to work. If you want to give the horse an injection, you can give the horse an injection very easily. You pull this little containerized unit with the aid of an electric winch right into this three horse trailer or in a regular horse ambulance. The horse can be taken to the barn, he can be taken to a local hospital, or he can be taken to the airport, and flown to a university. The horse never has to take another step on the injured leg until he gets to his destination.

This is a pretty good and simple unit and it is not too expensive. I think we will look into it to see if we could have one to use in our own ambulance.

That's about all I have to say. Thank you.

(APPLAUSE)

DR. MACKAY-SMITH: Thank you very much, Manny. I know that we're just as proud of continuing efforts to salvage the unfortunate, as we are in anticipation of an effort to prevent them from ever happening. We want to thank the Chairman and the organization for inviting us, and I want to tell you that we're all very much available to answer any questions that you might have.

MR. ROBERTSON: May I ask a question of Dr. Pratt?

DR. MACKAY-SMITH: A question of Dr. Pratt. I think we're perhaps getting a little behind so we'll have one question.

MR. ROBERTSON: The overlap time, is it a function of class or of speed? In other words, if Secretariat was working out 6 furlongs in 12, would his overlap time still be shorter than a claiming horse winning a race in this identical time?

DR. PRATT: I'm quite sure that the overlap time in the horse is something which is very innate to that animal. Now if the animal works out at a comparable speed, let's say Secretariat works out at some speed, the same as a claimer is going to work. Secretariat's gait is something which I think is stamped in him, probably at birth, and he can't change it and he wouldn't want to, obviously; but, yes, it's an indelible thing on the animal.

MR. ROBERTSON: Does he spend more time in the air in order to maintain a constant overlap time? How does he slow down?

DR. PRATT: Well, with a horse like that, he gets more further forward travel on his legs, and he has to spend less time in the air per stride in order to get that swing time. The

less talented animal's legs will overlap. As a matter of fact, the less talented animal will very often have three legs on the ground at the same time. Under those circumstances, that horse has to spend a considerably longer period in the air in order to get that swing time.

DR. MACKAY-SMITH: The Chairman has kindly given us another minute or two. It would probably take another day or two to answer all the questions that are going through your mind. If there is another question, I'll direct it toward whatever member of the panel you would like to hear from.

MR. McKELLAR: Have you taken into consideration that in all jurisdictions represented none except M. Romanet of France, races are run on a declining speed curve. The first quarter is the fastest, and each subsequent quarter is run at a slower rate. On the other hand, in most racing abroad, races are longer and the speed curve is ascending in that the first quarter is slowest and the last the most rapid. Veterinarians in M. Romanet's country would be completely bewildered by your approaches and tentative findings. The profession is far more biochemically oriented. Which leads me to the second part of my question, have you taken notice of, and/or consideration of the work of Dr. Steel of Melbourne, Australia on the evaluation of heart scores?

DR. MACKAY-SMITH: We're very grateful for opening up all those areas. They could give us a whole other Round Table. Basically, reasonably heavy turf is so tiring to a horse in his swing time, in other words, in the preparation for the next stride, that if they raced away from the barrier under those conditions they would be falling down from pure exhaustion before they ever got near the finishing post. So, their race is a matter of early strategic preparation and then a run for the last period. And the conditions under which they race dictate how the horse will have to strategically put his race onto the course. To some extent, they have made a modification in their condition which favors running the horse in such a way that there is less of this very high speed destructive period.

To answer the question about Dr. Steel's work, yes, there is unquestionably an association between the cardiovascular capacity and the horse's ability to win races. But, the thing which Dr. Steel's work does not take into account is how the horse produces his gait. This is what Dr. Pratt is referring to. If you take all the horses who produce their gait ideally, then you can distinguish their probability of success, within a frame, by determining what their cardiovascular capacity is. If you take all the horses of the same cardiovascular capacity you will have some hopeless plodders and you will have some that are great horses. Let us say that there are no great horses that aren't great in both respects.

MR. ENSOR: At what time in the horse's life would the research as to unsoundness and the prevention thereof start, would it be at the time of weaning, the time of breaking or when the horse is actually participating in races?

DR. MACKAY-SMITH: If I might rephrase the question for you. As I understand your inquiry, do we feel that the research should begin at a particular time in the horse's development. Is that the question?

MR. ENSOR: Yes, that's the question.

DR. MACKAY-SMITH: Our research would begin before conception. We are interested in every conceivable influence on the end product. Again, I will take you back to industrial research. All the good industrial research produces information about the industrial process from the earliest stages of the raw material to the final marketing. And that's the kind of approach that we are talking about. We certainly want to know something about the adaptation of the foal's skeleton to various systems of raising them. And to various

kinds of surface on which they are raised. We want to know something about the tolerance of the very young skeleton to organize. There is a theory of which I particularly happen to be a proponent that you see no world class athletes, I'm talking about human athletes, who started their athletic careers when they were 17 or 18 years old. The adaptation to their sport began when they were five or six years old, and with properly supervised programs such as the Little League, there is some attrition. There are some kids who are damaged early on, but the great ballplayers all come out of that tradition. The great Cuban ballplayers, the first thing those kids do, they are given a ball and they start throwing when they're two or three years old.

And so it may be, and here comes the bombshell, that we will find that we're starting much too late, but with that, if it turns out to be the case, we will also need far more sophisticated ways of supervising the exercise of the very young because they will also be much more fragile.

So there's no point in the whole thing, as I say, from the time you plan the mating until the time the horse's racing career is done, that we're not interested in it, and we don't feel that the approach has to be rigorous and comprehensive.

MR. BRADY: Matthew, maybe Larry was talking about measuring the swing time. How early could you measure the swing time? Could you take a foal and take pictures of it and decide whether you had a Secretariat or a Plater.

DR. MACKAY-SMITH: There is an implication that the research would conceivably lead in that direction. But the information is not sufficiently developed, as yet, to say with certainty, but there are certain elements of it which raise that question in the researcher's mind, and certainly, that is another bombshell. But think of the time and effort wasted in horses that turn out to be no-hopers. It would be great fun to get rid of them early.

MR. SALMON: Are wobblers caused by injury to the backbone?

DR. MACKAY-SMITH: The question is addressed to Dr. Rooney. I'll rephrase it. I think I can restate the question so everybody can hear it. The question is, "Is wobbling, or are wobblers a disease of the backbone?" It's addressed to Dr. Rooney and I think he can give us about at least a one word answer. His answer is yes.

MR. SALMON: Thank you.

DR. MACKAY-SMITH: There's an internal deformity in the neck, in the construction of the neck.

MR. VEIT: It seems to me that the implications here for commercial breeders of some of this research that's been described are tremendous. If there is any relationship between the overlap time of the sire and the overlap time of the foal I could see a time coming when John Finney gets up and says "Here's hip number 22 with a 28% overlap time, out of a mare with a 32% overlap time," and that sort of thing. I think the potential is enormous, and I would recommend that The Jockey Club or one of the other associations represented here engage in, or fund some basic research on this point. This sounds very, very interesting, and promising.

DR. MACKAY-SMITH: That's what we're here for; to tell you that we recommend some research, and certainly the possibility of tremendously refining the process of selection of matings and of selection of individuals right here in our hands. You know some people are going to have to bite the bullet when they find that the stock that they had great hope for is not, perhaps, as good as they had hoped, but at least they won't waste a fortune trying to prove it. Thank you very much.

(APPLAUSE)

MR. BRADY: Matthew, we want to thank you very much for a most interesting panel and also your panel members. Now we'll take a break of about five minutes before we hear from Jim Ritchie.

(BREAK)

MR. BRADY: We are very fortunate to have with us this morning Mr. Jim Ritchie, former executive director of the Commission on the Review of the National Policy Toward Gambling. Jim, thanks for being with us.

MR. RITCHIE: Thank you, Mr. Chairman. Ladies and gentlemen, many of you have heard me tell you that the gambling policies in this country are a failure. You've heard me talk about how incapable our criminal justice system seems to be and how ineffective it is toward enforcing the policies against gambling that exist. You've heard me relate to you the statistics from this great state that in a five year period with 20,000 arrests for gambling that it resulted in only nine people going to jail. You've heard me talk about the new sweep of gambling arrests that exist in this country and the fact that 80% of the arrests for gambling violations are arrests for cards and dice, as opposed to bookmaking. You've heard me say that our law enforcement system is really just a licensing process which operates a revolving door but does not deter anyone from violating the law.

I've explained in the past that we're to blame for this because we are essentially a hypocritical society. We say we're against gambling and yet we create demands for it. In every state, we allow one form or another of wagering but, it seems we very consciously forbid any attempt for that form of wagering to be competitive. That's attributable to the tax policies of this country and that's what I want to speak with you about today.

Everyone was as shocked as I was when I got into this particular work to discover that the United States is the only civilized country in the world to impose an income tax on gambling winnings. The Commission, which Commissioner Gimma who is present here today, was of course a member of, came to some recommendations about who should solve these problems. And essentially we said that it was the people of the United States acting within the forum of their state governments that should express themselves and resolve their policy. We said very clearly that the role of the federal government is to assist the states and not interfere with them. We said this because of the diversity among our various states and the fact that our views as individuals differ on these matters of gambling or wagering. We found very clearly that state agencies were far more flexible and far more capable of dealing responsibly and responsively to the people than were the agencies of the federal government. We said that the federal government should insure that it does not interfere with whatever policy decision is made by state governments.

On the issue of taxation we said that the federal income tax on gambling winnings, and there are other federal tax policies, is the most obstructive to state efforts. It prevents states from raising revenue that it could raise. It hampers states in any effort to deal with illegal gambling. In fact, the Commission's analysis of the federal tax policies show that it doesn't raise any revenue to the United States government. In fact, it only effects legal gambling. It does not effect illegal gambling which was its stated purpose.

I prepared for you an open letter which gives you the benefit, without worrying about gambling commission reports, of the analysis that led to the Commission's recommendation that winnings from legal entities, legal gambling entities be excluded from federal income tax. I've explained that particular proposition a number of times and when it is repeated to me I always found that there are certain things that the Commission struggled with which are lost in the recitation.

The tax recommendation as Commissioner Gimma will tell you was the most controversial and the most sensitive for the Commission. We've had enough crazy commissions in this country, spending taxpayers money, that recommend things that are totally out of reason. We were afraid of being branded with that same broad brush but the Commission did, in the words of Dr. Mackay-Smith, bite the bullet. They said we must change the tax policies at the federal level and also the states have a responsibility to

change it at their level. Why? The tax policies of this country cause evasion of the tax law. If in fact we tax gambling as we do other investments it is inequitable to do so without allowing a carry forward or carry back provision as we do with other investments. We say the clear evidence is that it encourages people to participate with illegal operators and to require, as we do in this country, for a person to prove his losses in gambling endeavors without giving him any guidance as to how one can do that and letting the courts treat him almost as if he were the criminal when he tries to prove gambling losses are inequitable. Because IRS will readily accept a win. They'll say well if you say you won we'll accept that, but if you say you lost you must prove it to us. This policy clearly deters people who wish to wager from the legal system and towards the illegal system.

The Commission said that if Congress allows the states to establish a form of wagering for the purpose of raising revenue, or even for the purpose of combating crime, that the Federal tax policy must be changed. Else we are interfering with state policies.

I hope that all of those here will agree with that recommendation. I think that that type of change in our gambling policy in this country would create less hypocrisy in us as a nation. I think it would free up the courts and law enforcement agencies to do other more important work. I think it would generate new revenue to the states and to the industry. And in a period of time, as we have seen in Great Britain, I think the illegal operators would disappear. I think that there are sensible strategies of dealing with this problem to make us a less schizophrenic society.

The Commission considered another problem which is currently looming on the horizon. We considered withholding in anticipation of taxes. Now you understand that the history of withholding is that the amount withheld must be justified because it bears some relation to the tax that is owed. However, IRS and the Treasury and even Congress in the 1976 Act said gambling is different. IRS will agree as they did in the conference report that on an annual basis there are very few net winners because you may deduct your losses. But they believe that gamblers under-report winnings. Consequently you saw in the 1976 Act a rather harsh treatment of this particular segment of our society. The Commission evaluated the prospect of withholding. We said it won't raise additional revenues to the United States despite the view of the then Commissioner of the Internal Revenue Service that it would. We said it clearly will accelerate the number of persons to the illegal operators. We saw no national interest to be preserved by withholding. We said it interfered with state policies, it increased an administrative burden to the operators of legal industries, and ultimately it would lead to a decrease of revenues to state government.

Before the Ways and Means Committee and indeed before the Senate Finance Committee the Commission's views were presented. I don't want to tell you that Congress reacted favorably to those views. What changed that discriminatory practice was a unified front by racing. And I want to single out the organization in Washington, the American Horse Council and its distinguished director, Rich Rolapp, for an outstanding job of bringing together all facets of pari-mutuel wagering; including The Jockey Club and the other organizations that are represented here, who said we are tired of this discriminatory treatment. And Congress reacted to that. They modified the withholding so that on the 18th of May, as you're aware, pari-mutuel wagering must report \$600 winnings if the odds were 300 to 1 and withhold 20% if it's more than \$1,000. Two new bureaucratic terms came into being, the W-2G form and the form 5754. Preliminarily your own organizations have assessed the impact of even the changed law. Rich Rolapp said it is "disastrous." Jack DeFee of the HBPA said the effect is "devastating" and he's getting his information from the people that handle the money, the mutuel clerks.

IRS did follow one other recommendation of the Gambling Commission. The commission said Congress should re-examine this particular section requiring withholding and reporting. Well, IRS is going to do that. They are going to conduct a "study" of all reporting and all withholding for the calendar year 1977. This pari-mutuel industry will produce about 250,000 forms. IRS is going to randomly sample by industry and by forms of wagering those forms that are filed. They then will match those forms with the

individual's federal income tax return for 1977 and report to Congress prior to 1979. That means beginning May 18, through December 31, of this year, this industry is creating the forms W-2G and 5754. The end of February 1978 this industry will file those forms with the Internal Revenue Service as required by law. Individuals on who have won a particular reportable wager or who have had withholding imposed have also won the chance to be audited, and when they file their returns on April 15, 1978, they then become subject to a study and an analysis by IRS that will be concluded by December of that year according to their timetable. And then in 1979 that report will be filed with the Congress.

This study from IRS's perspective is very simple. They want to determine not only the wins, if you want to call them that, or payouts that are reported on these forms correctly declared, but also, are all other non-reported wins declared by the gambling public as gross income. If an individual itemizes his deductions and declares losses to offset any of those wins, are those losses substantiated to the satisfaction of IRS. This will give IRS the ability to compare by form of wagering, both by industries within the pari-mutuel industry, and by type of wagering, the levels of compliance with the tax law, and whether or not withholding should be required at a lower level because there is a high percentage of noncompliance. Also it will give them the ability to study whether or not the withholding should perhaps be raised. A nonresident alien in this country on nonexotic wage has a 30% requirement for withholding presently.

I ask you the question, and the figure that I have been given by various persons in the industry — if a hundred million dollars is withheld in 1977, and that is a "net" gain to the government, what are the odds that Congress will change the law to allow that money to be returned to your industry? Let's assume that all legal gaming industries have 100% compliance in reporting and withholding but the patrons have a low percentage of compliance with reporting it accurately on their individual tax return. Do you think that the IRS will be sympathetic to your industries by saying yes you're doing your job? No, you are absolutely dependent upon the patrons of your industry for your success in changing the tax laws.

If gamblers, and I use that term because that's the term used in Congress, don't declare their winnings accurately and cannot establish losses I ask you — is Congress going to be receptive to any effort to help those individuals in spite of the fact that they support your industry and your industry supports your states by producing revenue?

I think that you have to understand that the pari-mutuel industry and other gaming industries have a golden opportunity here. It's as if you were the trial attorneys that were formulating the facts to be presented at the trial in 1979 in Congress. This study which is being conducted provides you the opportunity to prove: that withholding doesn't produce additional revenues; that will require some way to establish losses to offset the hundred million "win"; that withholding drives people to illegal bookmakers; it interferes with state policies; you lose the "churn"; it provides an administrative burden unnecessarily to a legal industry and that the loss of revenue to the state is clearly measurable.

If for example the hundred million dollars that we're talking about, which IRS has as of February 1978 in their hands, is reduced through an effective loss program, "loss record" program, to 20 million and the industry can show that the loss of revenue to the state and federal government and the administrative burden to themselves account for that 20 million. That accomplishes a complete wash, a "zero" to the government. I think that that will provide the necessary momentum in Congress to change the tax laws.

Specifically, I am submitting to you that the industry has to have a taxpayer program. You need to provide information to the patrons of not only the existence of the "study" and how you establish losses, but a method to assist your patrons. In my discussions with behavioral psychologists and people that are able to project behavior patterns they say that a negative such as losses is something which people do not want to recognize so they won't write that down. They'll write down their winnings without too much difficulty.

So the industry needs to provide some method of assisting these patrons to establish losses to offset these wins. Then, through an effective loss reporting program, Congress will agree with what the Commission found — that the majority of bettors on an

annual basis have no net wagering gains.

I think you need to do something else. I think you need to design an industry "impact" program to measure your own administrative cost, out of pocket cost for carrying out this program. You need to be able to design and be prepared to send to Congress a model of the loss of the "churn" to the industry, to the state revenues and to the federal government through corporate taxes. Not unlike your Pugh-Roberts report which The Jockey Club has sponsored in the past.

You don't have a lot of time. You have 139 days in this calendar year to design the solution and implement it. You need to prepare yourselves to do a number of things to our tax laws. The repeal of the withholding tax, a redefinition of adjusted gross income so that you don't have to declare all of your wins in your gross income and declare your losses in an itemized return; there's no reason that you can't "net" it on a separate form. You need to enact a statute to provide for carry forward/carry back, to get away from a 12 month calendar year, as is done in other investments. You need to change the reporting levels, as long as they are required, to where they are more representative of "windfall" if we're talking about gains over losses. There are many other steps but these are all intermediate accomplishments toward changing the tax treatment for gambling winnings.

The Commission that I was privileged to serve with established that in this country the minority of the people are telling the majority of the people what to do. And the Commission recommended change. The Commission found that the anti-gambling policies that exist really effect only legal gambling and have a direct benefit to illegal gambling. The tax policies in this country discriminate against you. I don't mean to say that this is the only discrimination you suffer, but clearly in this particular instance, your industry is sought out and is discriminated against. You don't deserve it. The Commission agreed that you don't deserve it.

The Commission found that yours is a great industry in the best tradition of free enterprise and sport, providing recreation to untold millions of persons in this country and employment to hundreds of thousands of others.

I've told you before in many addresses that you need to become activists and I say it again. You must assume the burden of changing these discriminatory tax policies. Nobody will do it for you.

I ask in the true spirit of empathy for this discriminatory treatment that you have suffered, that you begin now in that effort and continue until you have changed the tax policies. I have the utmost confidence in your effort and your ultimate victory.

I've been very privileged to address you. I want you to know that I have always appreciated your courtesy. I am very flattered by your attention.

MR. BRADY: Jim, thank you as always for a wonderful talk. I think we're all very lucky to have had a fellow like Jim Ritchie at the head of the government's investigation of gambling.

I want to thank you all again for coming. We had 280 people this year, which is the most we've ever had. I think we're about at our limit. I hope all of you will join me in thanking Mickey Smithers who put a lot of hard work into seating people and getting all the arrangements made. Mickey, thank you very much.

(APPLAUSE)

Penny Tweedy told me that a lot of work that Dr. Pratt did on measuring the swing time and other parts of the measurement process was done from The Jockey Club film "Thoroughbred," which we produced two or three years ago.

I hope all of you, when you get a wrong name sent to you or have a little bit of something missing on the registration process, will forgive us. We're trying our very best to do those things right and also to be of service to the industry.

Thank you very much for coming. Hope to see you again next year.

(APPLAUSE)



A view of the Conference in session.



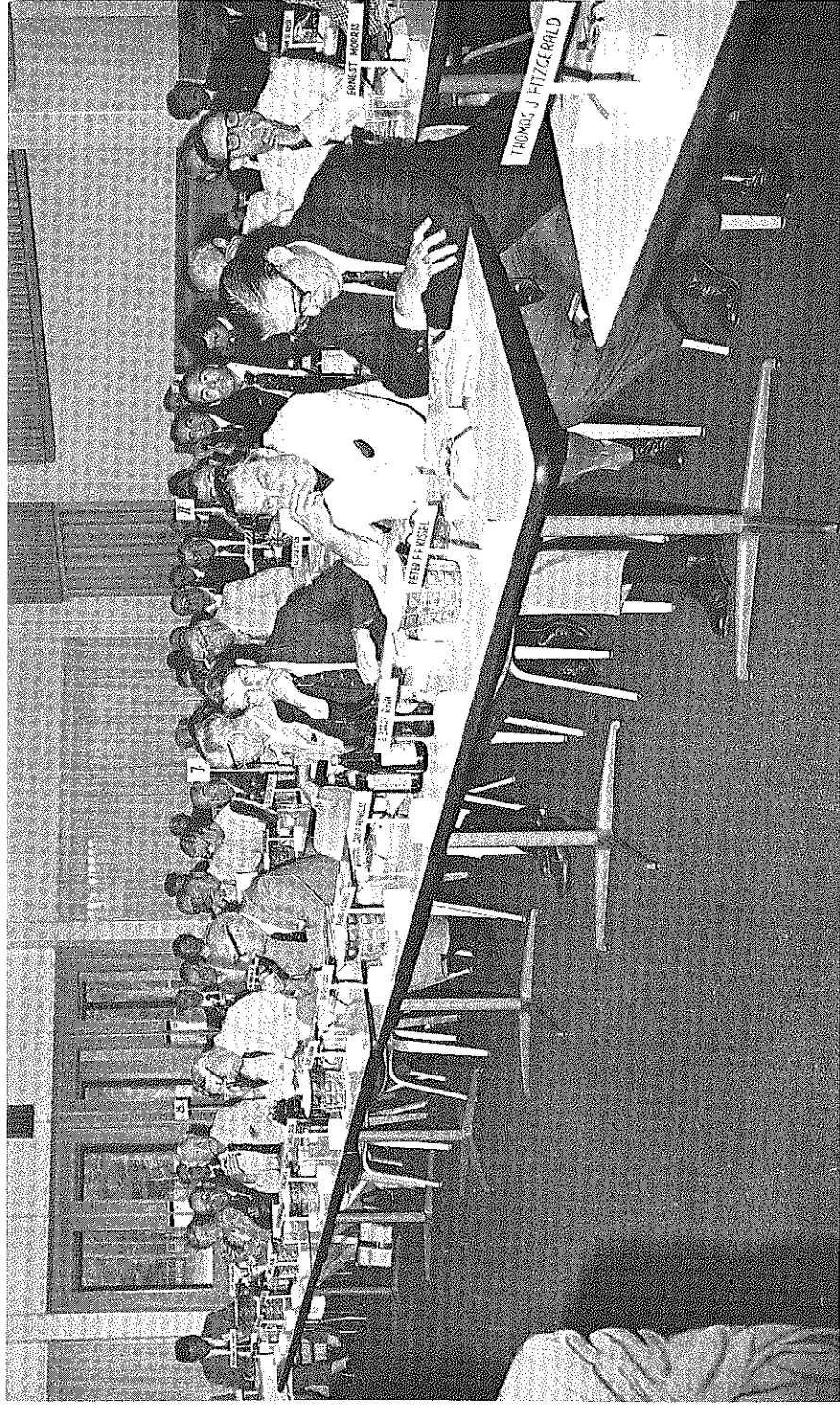
A view of the Conference in session.



A view of the Conference in session.



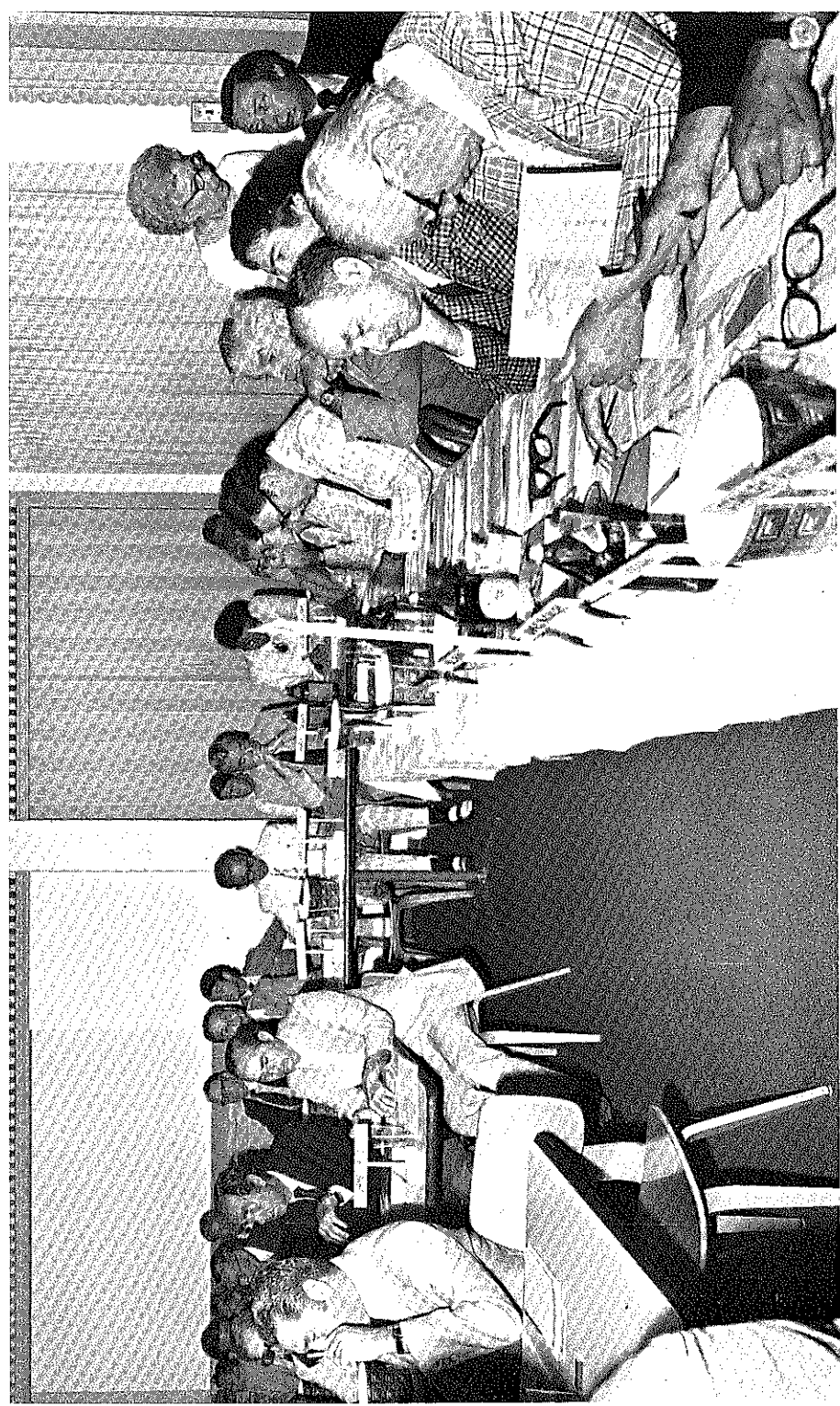
A view of the Conference in session.



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A view of the Conference in session.