Opportunities for Industry, Academia and Government Cooperation

R.W. Bray*, Cooperator
R.B.Sleeth*, Cooperator
S.E. Zobrisky*, Cooperator
N.K. Cook, Recorder

R.W. Bray

Although the topic for today's discussion relates to the need for greater cooperation among meat scientists in industry, government and academic institutions, I must say that cooperation and communications are much better today than they were 40 years ago. At that time, there was really very little communication even among those in academic institutions – except for the time spent by meat judging team coaches while their teams were busy competing in the coolers of various packing plants around the country.

This began to change in the late 1920's when R.C. Pollock, the manager of the National Live Stock and Meat Board, provided the leadership to organize a conference called Cooperative Meat Investigations. This brought a small group of academics, government and industry people together to look at methodology for conducting research. Following World War Two, Mr. Pollock provided the leadership to do two things (1) establish the Reciprocal Meat Conference, and (2) along with O.G. Hankins in the USDA, won approval from the American Society of Animal Production to establish a separate meat section for meat researchers to report meat research findings. As I recall, scientists from Swift and Company also supported this effort. These very significant events have been followed by the American Meat Institute's support of an annual Meat Industry Research Conference and the establishment of the American Meat Science Association. The regional research program under the guidance of the Cooperative State Research Service has also led to several regional meat research projects that bring academic scientists together. Thus communications among academic, government, and industry meat scientists have been greatly enhanced during this period.

Another obvious change during this period has been a very significant increase in the number of meat scientists employed in academia, government and industry. Greater scientific knowledge has led to the training of scientists who now are delving into very basic research to solve complex problems facing the meat industry. These scientists are not as broadly trained and, consequently, are becoming highly specialized in such fields as microbiology, food safety, muscle chemistry, muscle physiology, etc. These developments are as they should be, but have enhanced the need for even greater cooperation and better communications.

Thus, I will give you a few thoughts of mine that I believe may help improve the situation and hopefully will stimulate you to challenge them or suggest other ideas for better communications.

Exchange of Scientists

I recognize that many academic institutions have sabbatical leave programs and that many meat scientists take advantage of them. I can't urge strongly enough that each of you in academia take advantage of such opportunities. Most sabbatical leaves are spent at other academic institutions. I suggest that communications with government scientists (USDA or in other Federal agencies) could be greatly improved if sabbaticals with these agencies could be arranged and, I might also add, vice versa. In my opinion, there is too much separatism between the university scientists and those in the Agricultural Research Service in the USDA. I observed this constantly as a research director, among the research administrators in the universities and ARS. This must change if communications are to be improved. We can help foster better relationships if we, as scientists, remember we have the same research goals and work for the same clientele. Cooperation between scientists in ARS and the state experiment stations must be deliberately sought. Why not consider a sabbatical at the U.S. Meat Animal Research Center at Clay Center, Nebraska or at one of the ARS Regional Laboratories or invite personnel at such locations to spend time in your laboratory?

Individual meat packing companies are generally envi-

R.W. Bray, Associate Dean and Director, Research Division, Agric. Experiment Station, Agric. Hall, University of Wisconsin, Madison, WI 53706

R.B. Sleeth, Vice President, Director R&D and Technical Services, Armour Food Company, Scottsdale, AZ 85260

S.E. Zobrisky, Animal Physiologist, Food Scientist, CSRS, USDA, Washington, DC 20251

N.K. Cook, Lamb Manager, Rocco Further Processing, Timberville, VA 22853

Reciprocal Meat Conference Proceedings, Volume 38, 1985.

sioned as being very secretive about their research programs and understandably so in view of the competitive advantage such research may have. However, I have long been an advocate of the exchange of scientists between industry, academia and government. Academia and government scientists are often described by industry as not knowing what's going on in the real world and, likewise, academia looks upon industry scientists as primarily product development researchers. No doubt both accusations are true in part, but why not do something about it? I suggest industry could provide a real world experience for academic scientists and that industry scientists could learn much from an experience at an academic or government laboratory. In order to accomplish such exchanges, the idea must be sold to the leadership of the involved institutions – but I firmly believe it can be done. The experience for meat scientists at universities can be in the research and development laboratories of meat packing companies that have significant programs. However, there is also a need to know first hand more about the changing technology being used by the industry. Likewise, an opportunity to observe such technology in action can be extremely helpful in a teaching program. I can testify to such benefits from personal experience. After World War Two, I negotiated with the Oscar Mayer Company to spend six weeks during the summer as an observer of plant operations. The plant manager informed the department heads that I would be assigned on certain days to them and that they would, through their foreman, move me through their departments. I was free to ask questions and the experience was, I believe, much like a mini-training program that many companies now use with new management employees. It was an invaluable experience, and I would urge academic meat scientists to explore this possibility.

I am also a strong supporter of student internship programs because of the real world experience they provide. Also, a very valuable spin-off of these programs is the required contact between supervising faculty and management personnel in the meat industry.

Basic Research Versus Product Development Research

In the late 1940's and early 1950's, I observed that the major packing companies, at that time, were engaged in quite basic research – but over time, this has changed. It is my impression today that most major packing companies are doing very little basic research (a casualty in some instances related to economic conditions of the industry) and are primarily involved in quality control and product development research. On the other hand, I have observed that university and government scientists are gradually becoming more involved in basic research. The role of government and academic scientists, in my opinion, should be to conduct basic research that provides new knowledge upon which we can draw to solve real world problems. However, it would be a mistake for meat scientists to do only basic research – someone needs to take the knowledge coming from basic research and use it in solving meat industry problems. There is little point in developing new knowledge through basic research unless someone utilizes it. I am not talking about product development since I believe this is industry's responsibility.

The universities have one responsibility that government and industry cannot share – that is the training of graduate students who may ultimately be researchers in academia, government or industry. However, I strongly support cooperative research projects between academia and government or industry that involve the graduate student.

Priority Setting of Research Problems

During my tenure in research administration, I found that the in-vogue activity in the research community was to set research priorities. Politicians at the national level were asking for studies leading to research priorities in order to determine budgets for research. We as administrators perpetrated such efforts. Plant scientists, animal scientists, rural sociologists, economists, etc. felt the need to do so to protect their turf. The priority setting process was led primarily by academic scientists. The USDA separately established its priorities. There was only token involvement by industry in either case. The products of these efforts by the animal and meat scientist were some nicely done publications, resulting in very little new funding for research. Where did we go wrong? It seems to me that we went wrong in that we did not have the three main actors, governmental scientists, academia and industry, equally involved. Thus, the end product did not have the full support of these three groups, and thus, the amount of political impact to really make a difference in budgetary support for animal and meat research. This is just another example of the need for improving cooperation and communications.

Cooperative Research

Today's complex problems require the research skills of more than one individual. The states, through the Cooperative State Research Service, have developed a system of cooperative research. The success of these projects is determined by how dedicated the scientists are toward achieving the objectives of each project. ARS scientists can also join these cooperative efforts and are encouraged to do so by their administrators. One failing in the system is that it does not allow industry researchers to join as cooperators. I believe we must find a way to have them join as official members of these cooperative research projects.

Extension

Extension personnel should become involved in applied research and this can be the bond that ties the mission-oriented basic research to those who utilize the results of research. The effectiveness of an extension person will depend on whether or not he or she becomes deeply involved in industry problems. He must make a point of seeing meat industry technology in action – know the plant personnel involved and thus appreciate the problems they face. I know that some university extension people regularly attend industry conferences in their states, but they should also become involved on the national scene. It is gratifying to see some of our extension people involved in the American Meat Institute, National Purveyor, West States Meat Packers Association and American Association of Meat Processor conventions.

Finally, I would like to leave you with a couple of thoughts. Meat science is a relatively young field of endeavor, but it is now gaining good recognition within animal science departments and colleges of agriculture and, I believe, also within the meat industry. However, the appreciation of meat science can only be enhanced through those of you involved in it today. You must constantly sell the value of your programs to your administrators. Further, I hope some of you will strive to become administrators in order that you may be in a position to further the status of meat science. Indeed, it is gratifying to see today several meat scientists in administrative roles. Keep it up. Secondly, I cannot urge each of you enough to always keep looking forward – change is inevitable and those who are out front with ideas will ultimately be in leadership roles. Are you going to be part of the solution or a part of the problem? Resisting change will only increase the problem – so remain progressive as you move forward in your careers.

R.B. Sleeth

My presentation will be in two major segments. One, the role of industry, academic and government research as I view it, and secondarily, how I see cooperative efforts between these affecting the future of R&D.

It has long been recognized that the economic health of the nation depends on technological innovations, whether it be aerospace, steel or agriculture and food. Technological innovation means the creation of new technology in the laboratory, with its subsequent introduction into use. So, irrespective of whether technical developments are achieved in the academic, government or industry laboratory, our challenge as scientists is to effectively marshal our human institutional and material resources for the betterment of mankind. More than ever, we are living in an environment dominated by technology.

The role of each segment in the application of science and technology is varied. While my assignment is to elaborate the industry role, I will venture into Bob and Steve's areas just momentarily. The government must continue to have responsibility for the major portion of basic research since it is concerned with fundamental discovery in areas of long-term payoff and broad societal gains. However, the government is faced with the difficulty of operating with budget restraints and this places pressure to exercise strict priorities. From the university standpoint, I believe the principal product of university research is designed to train graduate students. With reduction in funds for this activity, I see a major problem with the long range prospects of high-caliber faculty replacements for meat scientists who will retire over the next five years. Scientific leadership in government and industry will also suffer. So, we as an association need to be cognizant of this situation and continue to encourage outstanding students into the graduate programs so they may ultimately fill these positions.

The second product of academic research is the technological support offered by universities to industry as basic research becomes more important to competitive strengths. They should provide leadership in new science that will force technology forward in a company. However, there have been some questions raised as to how effectively the university programs are directed to usable results and how these results can be utilized and are utilized by the industry.

The primary functions of industry R&D personnel are to assist in improving overall profitability and to assure the total technological competitiveness of all the corporation's operating divisions. To keep any company viable, and this is very important from our stand-point at least, a constant stream of new products must be made available to marketing, and this unquestionably is our primary function. Most products, with the exception of a few already entrenched brands, are short lived in the market place and must either be replaced or modified in some manner from time to time. The average of any product on the market is two to three years and then it is generally replaced either in kind, color, shape or function. Additionally, we are listening in the industry to and directing our activities more than ever to the wants and needs of the consumer. Consumer product focus interviews and questionnaires and market trends are now elementary procedures before any new product development endeavor. Industrial research also concentrates on increasing productivity, lowering manufacturing costs, reducing energy usage and improving product quality. In the food industry, only the very large companies devote assets to basic research. To my knowledge, there is only limited basic research conducted in the dwindling number of research facilities in the meat packing industry. This is certainly true in my own company.

The remainder of my remarks will be devoted to some views on the promulgation of a more cooperative spirit and support between academia, government and industry that will lead us to a more productive utilization of the research dollars available.

The need for cooperation between academia, government and industry in research is vital. Such cooperation can most readily be achieved through communications, mutual trust, interest, commitment and lasting relationships. In recent years, research and development management has taken on greater responsibility for leadership, including justifying and sustaining society's confidence in research and technology. The total U.S. R&D establishment is decentralized and specialized. It is also huge and requires total responsibility on the part of the researchers. The U.S. will invest $110 billion in research and development in 1986, which is 2.7% of the U.S. gross national product. Looking towards the future with the potentials of R&D in mind and the number of dollars that are going to be spent, a cooperative partnership involving university, industry and government is essential. There is a need for a broad base of close personal relationships between researchers in order to develop a joint effort and mutual guidance.

Since the early 1950's, universities have received a steady flow of funds for basic research from the federal government. However, the Reagan administration is faced with the difficulty of huge budget deficits and this places pressure on the federal science community to exercise its strictest priorities. Now, disenchanted and concerned with the drop in federal funding, universities are beginning to solicit cooperative research arrangements with industry. Industry seems receptive as it is actively exploring academic research to stretch its budgets, particularly in the basic research arena. Universities are eager for an infusion of corporate dollars and companies are anxious to tap some of the top research talent available to them.

Even though the industry/academic relationship is fairly good, there are several hurdles that must be overcome if the relationship is to become productive and effective. First of all, differences in goals, motivations, philosophies and perspectives have created a gap which must be closed. Secondly, there is a need for the corporation to have something tangible to show for the research expenditures when justifying them to management. That is important to us in industry who provide grants to know where the dollars are going and what we're getting for them. Thirdly, at universities, the need for publication. An example of how this problem could be resolved is illustrated by an agreement between Carnegie Mellon University and Westinghouse Corporation where Carnegie Mellon has the right to publish but agrees to withhold publication for a limited time if publication would endanger the patents. And lastly, existence of poor pre-production and development facilities in many universities. Closer links between industry and universities and the establishment of university development companies can solve this problem.

The following are a few examples of how industry and academia are now working together. And while these are non-agriculturally related, I think they could serve as a basis for some food for thought in terms of how we in our own specific areas might work more closely together. A joint venture now exists between General Motors, United Auto Workers and University of Alabama who have developed applied research facilities. The Council for Chemical Research, which is a consortium of 43 companies and 142 universities, was chartered to fund basic research at the universities in chemistry and chemical engineering. In June of 1984, it provided a million dollars to 34 faculty members for basic research. Its government relations committee is pushing for increased federal funding for new research instrumentation and equipment. State governments in many parts of the country are at some stage of establishing R&D centers linking industry to universities. Monsanto has set up a corporate clearinghouse to weigh all university grant proposals. A score of industry/university R&D centers are operating under the auspices of the National Science Foundation's Industry and University Cooperative Research Council. And lastly, MIT's industrial liaison program has 11 full-time liaison officers who act as member company's personal representatives as far as soliciting funds for R&D at MIT. That has been a very, very successful program.

While the above examples are non-agricultural, I believe they serve as a format to methods universities may utilize in extending and funding their research efforts. I have not dwelt much on government funding because of the current climate of reduced spending. It is difficult or nonexistent for industry to cooperate with government on cooperative research programs at this point in time. However, the FDA's Dr. Sanford Miller said recently that, "It may be time to reevaluate the traditional methods for funding and promoting research in food policy areas, suggesting that a consortium of industry and government resources administered by a quasi-public institution may be one solution. Government and industry must work together to provide funding for research in new biological strains, new technology, new products." And he said, "We need new science to better regulate and new science to better process." I'd also like to just briefly comment on a suggestion Bob made with regard to exchange of scientists from university to industry and vice versa. I reviewed a presentation I made to this group 10 years ago where I suggested that a personal exchange program between industry and academia would be excellent training for each segment. We see that as one way that we ought to move and certainly one that could work to establish additional cooperative activities.

And finally, it's going to require much effort on the part of government, academia and industry working together to upgrade U.S. science and engineering education to meet future needs. There are many exciting possibilities for new contributions to the nation's progress and well being which I believe can come about through these joint cooperative efforts in conjunction with the outstanding scientists that we now have conducting research and training our future leaders.

S.E. Zobrisky

The coordinator of this session asked for some specific insights into the sources of the Federal Government's research funds. This overview may help our association's members to become more familiar with current federal research expenditures. This information may possibly open some channels of communication that may result in more collaborative research between the American Meat Science Association members and federal agencies that conduct and often need additional research capacity.

Secondly, Dr. Schwartz asked for a discussion of the current role of the Federal Government in research. These two suggestions come into focus in the following tables that depict fund sources as well as the role of federal research.

Federal research and development obligations for 3 fiscal years are presented in Table 1. These "organizations" represent the most probable candidates for collaborative research in the animal meat science areas. Some of the organizations listed in the footnote of Table 1 also occasionally require research capacity in animal and meat sciences. Note that while defense funding increased significantly, the percent of

Table 1. Federal Research and Development

Organization	*FY 1975*	*FY 1980*	*FY 1985 Estimate*
Total Obligations (millions)	$19,023	$31,682	$50,958
	------ Percent of Total ------		
U.S. Department of Defense	47.2	44.0	63.4
National Institutes of Health	N/A	10.0	9.5
National Science Foundation	3.2	2.8	2.7
U.S. Department of Agriculture	2.2	2.2	1.8
All Others*	47.4	41.0	22.6

*Includes: Department of HHS, Energy, Transportation, Interior, Commerce, Education, Justice, Labor, HUD and Treasury; TVA, SI, C. of Engr. FEMA, EPA, AID, VA, NRC, NASA

Source: Special Analyses, Budget of the U.S. Government, Table K-2/P-3, Conduct of Research and Development of Major Departments and Agencies.

total dollars decreased for the other organizations. Published information indicates that about 2% (more than a billion dollars) of the total federal R&D budget in the United States goes for support of all foods and agricultural research. Published sources indicate that contributions from the states are about equivalent to that from the federal system. Thus, total of the public sector (federal and state) contributions may approach 2 billion dollars. This figure more than doubles again if we "assume" that the investments and expenditures of the private sector more than equal that from the public sector. Of course, it has not been possible to determine what the precise total of all the agricultural research expenditures are in any given year, but it probably is between 3 and 4 billion dollars. Conservatively, the 3-billion dollar figure is often quoted. These dollar inputs for agricultural research might impress upon scientists where the American public places its research emphasis.

Data in Table 2 represents the total research appropriations within the U.S. Department of Agriculture for 3 fiscal years. Again, the agencies presented are the "most likely" candidates for collaborative research in the animal and animal product area. Note that while the percentage figure decreases relative to total U.S. R&D dollars in Table 1, the actual dollars in Table 2 have increased over the same period. The total annual USDA research budget is approaching a billion dollars. This represents approximately 2% of the total USDA budget. The ARS budget represents slightly more than one-half while the CSRS budget represents less than one-third of the total USDA research budget. CSRS can be viewed as the representative of the States in Washington, DC, because it serves that end between the USDA and the State Agricultural Experiment Stations and 1890 institutions.

Within CSRS, appropriations have been allotted as presented in Table 3. Research that impacts on animal products is conducted under each of these fund sources. The Hatch Act and Evan-Allen funds are allocated by formula to respective SAES and the historically black land grant universities of 1890. Some special research grants are awarded on a discretionary basis for specific research at specific institutions and others are awarded competitively within the land grant system. There is a specific special research grant "earmarked" for animal health research. The animal health and disease funds appropriated under Section 1433 of the 1977 Farm Bill are allocated by formula to state agricultural experiment stations and colleges of veterinary medicine.

Competitive research grants are funded through a competitive system open to any institution, organization, and individual with the capacity to conduct the research. The increase in competitive research grants funds appears to be growing faster than in the other areas. For the first time, in FY 1985, animal science was included as an area under competitive research grants.

The meat and animal societies provided a needed stimulus for these funds in the competitive research grant area.

Table 2. U.S. Department of Agriculture Research Appropriations

	(Millions)		
Agency	*FY 1975*	*FY 1980*	*FY 1985 Estimate*
Agricultural Research Service*	$208.9	$358.0	$489.0
Cooperative State Research Service*	$101.6	$185.9	$274.3
Economic Research Service	$19.9	$26.1	$46.6
Human Nutrition Information Service	$4.4	$7.1	$7.5
Agricultural Marketing Service	$0.8	$1.3	$1.6
Office of Transportation	$0.6	$0.8	$0.5
Other**	$74.3	$108.3	$138.2
Total	$410.5	$687.5	$957.7

*Excludes construction/facilities funding.

**Includes SRS, ACS, OICD, FS, FGIS

Source: USDA Special Budgetary Tables, Table 9.

Table 3. Cooperative State Research Service Research Appropriations

	(Millions)		
Source	*FY 1975*	*FY 1980*	*FY 1985*
Hatch	$ 77.0	$118.6	$156.5
Evan-Allen	11.8	17.8	23.5
Special Research Grants	3.4	14.0	27.3
Competitive Research Grants	N/A	15.5	46.0
Animal Health and Disease (1433)	N/A	6.0	5.8
All Other	9.5	14.1	25.2
Total	$101.7	$186.0	$284.3

Source: CSRS-OD-1229

Table 4. Cooperative State Research Service Funding by Research Program Group (RPG)

	(Millions)		
	FY 1980	*FY 1984 Estimate*	*FY 1985 Estimate*
1. Natural Resources	$15.7	$ 19.4	$ 19.4
2. Forestry	12.9	16.2	20.9
3. Crops	71.5	91.9	97.7
4. Animals	50.3	62.3	68.3
5. People, Communities and Institutions	12.0	12.9	13.3
6. Competition, Trade Adjustments, Price and Income Policy	9.4	10.6	11.0
7. General Resource Technology	—	4.7	24.4
8. Food Science and Human Nutrition	12.4	16.3	16.6
Total	$84.2	$234.3	$271.6

Source: CSRS: PDBS: BO

The food science area is a likely candidate for competitive research funds in the future.

Another way to look at the distribution of research funds within Cooperative State Research Service (CSRS) is by Research Program Group (RPG) (Table 4). Note the relationship of animal research to other RPGs. Most of the meat and muscle science research funds are within RPGs 4 and 8, Animals and Food Science, with smaller amounts in RPGs 3 and 5. It is questionable if the small increase in funding for most of the RPGs over the years has kept pace with inflation.

The source of funds at state agricultural experiment stations and cooperating institutions for three years is shown in Table 5. The total research funds have increased to over a billion dollars annually. Slightly less than one-third of these funds are from federal sources. CSRS appropriations account for about 18%, while all other USDA agencies account for less than 4% of total SAES research funds. More than half of the SAES research funds come from state appropriations. Industry input to these funds has been increasing and recently has been about equal to funds from product sales. Note that industry funds are greater than those from "other USDA" sources which include all USDA agencies except CSRS.

Funds from CSRS have increased on an average of 7% to 8% over each of the last 6 years.

Dr. Schwartz asked, "What is the difference, if any, between government and academic research?"

Attempting to describe the difference between academic and federal government research is analogous to trying to fight your way out of quicksand – the more you struggle, the further out of sight you go – downward. Essentially, there is little difference in the scientific research except for the influence of the source of funding. In the end, the final beneficiary is the public at large. Federal agricultural research is often described, not for what it often is, in fact, but in terms of what it perhaps should be relative to other agricultural research; that is – basic, high risk, generally long term, initially high cost/benefit, and potential pay-off is often long delayed. However, it is research that is considered necessary for advancement that other, smaller, less endowed organizations are not willing to undertake, without government undergirding, for these very same reasons.

This is not meant to imply that more directly applicable research is not considered by the government. Much of this type of research is done by agencies with research capabilities (for example, ARS) for another agency (like APHIS) without research capabilities in need of specific information that is not available. Federal government agricultural research often is conducted to fill a need that is not being fulfilled elsewhere.

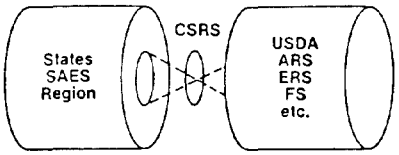
Table 5. National Inventory of Agriculture Research Funds at State Agricultural Experiment Stations and Other Cooperating Institutions

Source	*FY 1975*	*FY 1980*	*FY 1983**
Total funding (millions)	$499.4	$853.1	$1,096.7
	------ Percent of Total ------		
CSRS	18.4	19.1	18.7
Other USDA	2.2	3.2	3.5
Other Federal	7.1	8.4	8.7
Non-Federal Sources			
State Appropriations	57.0	53.5	52.5
Product Sales	7.5	6.5	6.0
Industry	4.8	5.7	6.1
Other	3.0	3.6	4.5

*Latest State Data available.

Source: Current Research Information System (CRIS), Table IV-B.)

THE PARTNERSHIP



Close coupling exists between state research programs and federal agencies. The principal focal point for the state-federal partnership is the Cooperative State Research Service (CSRS). CSRS is the federal agency that administers USDA funds appropriated by Congress for the State Agricultural Experiment Stations. CSRS acts as a lens focusing the broad programs of agricultural research in the states and facilitating communications and planning with other federal agencies.

Source: Research 1984. SAES, ESCOP, CSRS, p. 2.

Discussion

B. Moody: I'd like to address this question to Dr. Bray, and maybe some of the other members of the panel can comment on this. Bob, it seems to me that when I heard R.B. Sleeth's talk, his comments were that perhaps the universities need to be doing more basic research. I know we have a blend of that, both basic and what we call applied research. But, am I not correct in thinking that in our university system a few years ago we kept telling ourselves we had to do the type of research that had an immediate pay-off because the tax payers were expecting this sort of thing. Did we not get ourselves sort of in a bind in that respect? How do we get people to fund basic research, when they're not willing to wait for the results or they want them immediately? It seems to me that this thing is kind of in a tailspin.

R.W. Bray: I think you raised a good point. I think universities have to be engaged in basic research and I think they are becoming more heavily involved in basic research. I think it's a matter of identifying the source of funds that support basic research vs. the kind of research you're talking about. If we're talking with industry about funds, very obviously we have to