96th Congress }
2d Session }

COMMITTEE PRINT

1981 AGRICULTURAL OUTLOOK

Papers Presented at the Agricultural Outlook Conference Sponsored by the U.S. Department of Agriculture—Held in Washington, D.C., November 17–20, 1980

PREPARED FOR THE

COMMITTEE ON AGRICULTURE, NUTRITION, AND FORESTRY
UNITED STATES SENATE

JANUARY 1981

Printed for the use of the
Committee on Agriculture, Nutrition, and Forestry

U.S. GOVERNMENT PRINTING OFFICE
69-563 O WASHINGTON : 1981

FOOD AND AGRICULTURAL RESEARCH AGENDA FOR THE EIGHTIES

(By Anson R. Bertrand, Director, Science and Education Administration, U.S. Department of Agriculture)

The future of agricultural research must have seemed particularly promising in 1923 when the first of these outlook conferences was convened. That first conference was itself a response to the increasing effect of outside forces on the agricultural economy. Markets had begun to expand and farmers needed more information in order to make intelligent, effective production plans.

A new age of technology had also reached American farms. The lightweight gasoline tractor was just coming into its own. The breakthrough on hybrid corn had been accomplished and would be put to use in the 1930's.

All through those years, the seeds of the coming revolution in production continued to be sown by agricultural researchers—even as the country suffered through the Great Depression and our farmers endured countless tragedies caused by the Dust Bowl.

In the 1940's, America's farms set food production records that sustained us through World War II. Then followed the real liftoff powered by science: the wonder age of antibiotics; new pesticides; improved fertilizers; vertical integration; controlled livestock environments; mechanized farming; and cheap energy. Record yields followed one after another, carrying us through the 1950's and into the 1960's on a wave of "What will science think of next?" and "What will we do with all this food?"

One cannot look back on all those years of magnificent accomplishments without a degree of wonder at the naivete that took so much for granted. For much of that period the sheer abundance of food dazzled many, while others were occupied in finding ways to deal with it. Scientists themselves sounded many of the early warnings: resistance to insecticides; the loss of valuable germ plasm; the pollution of water.

By the midsixties, Rachel Carson had written her book, and much of the promise of the previous years had already begun to turn to protest. Those outside the scientific community learned what many within had always known: That science can create problems as well as solve them. Others still needed to learn that social values belong in any balance sheet financed for the "public good."

Now at the threshold of the 1980's we are entering a new era—one that holds challenges as tough as any faced in the nearly six decades since these conferences began.

I doubt that the participants of previous conferences who undertook to view the decade ahead could have seen before them such a broad array of problems already in place and threatening progress along so many fronts.

One also has to be struck with the fact that probably never before have we been able to see so clearly so many of the challenges that lie ahead of us. The view convinces me that no endeavor facing this Nation today is more complex or more important than that of increasing the ability of our food and agricultural system to produce and to do so within a framework that is compatible with so many competing interests.

Forces already in motion are shaping our future and compel us to gain a better sense of the broad range of alternatives that lie ahead of us.

I propose today to touch briefly on some of the broad issues facing us, and mostly within that context share with you some of the more promising, and the more difficult, items on our research agenda for the 1980's.

I. SOME GLOBAL CONSIDERATIONS

The Global 2000 Report [1] published earlier this year analyzes world expectations for the next two decades in terms of population, resources and environment. Serious stresses are clearly visible ahead. Among them:

Several inches of soil eroded from croplands all over the world;
Accelerated deterioration of soil nutrient supplies;
Soil compaction;
Salinization of land and water;
Crop damage due to increasing air and water pollution;
Severe regional water shortages;
Air quality worse as increased amounts of fossil fuels are burned;
More acid rain;
World water quality worse;
And more people—55 percent more than in 1975.

Some reviews of the Global 2000 Report hold that the projections understate the severity of the problems. Many hold only the hope that a keener awareness of the problems may induce changes that will alter the projected outcomes.

It is clear that the gap between the rich and the poor of the world will be a continuing part of the international scene. That gap will help account for the "hungry, quarreling, uneasy" world in which agriculture will have such a large role to play. We have not made much progress. We cannot ignore the evidence that there are today probably more hungry, malnourished people than there were 6 years ago when the World Food Conference in Rome focused attention on the world's hungry.

It is essential that less developed countries formulate long-term national food strategies. It is in our interest to help them do so. For many years the U.S. scientific and agricultural community has carried a heavy burden of research and development work for much of the rest of the world. Our European and Asian colleagues also make major

[1] "The Global 2000 Report to the President. Entering the Twenty-First Century," vol. I, Superintendent of Documents, Government Printing Office, 1980.

contributions, but some developed countries have not carried their fair share. New initiatives must be launched to encourage other nations to join with us in common research and development goals and to carry a larger share of this work.

We in the agricultural sciences are increasingly and inextricably bound to world events. The basic industries of agriculture and forestry are interdependent with other sectors of both the domestic and world economies. Agriculture depends today on a rapidly expanding export market for our farm food and feed commodities and our Nation relies on these exports to help offset a growing deficit in international trade. At the same time, elsewhere in the world, a dependence is established on our agricultural exports as a secure future food supply.

A major challenge on our research agenda is to find ways of maintaining and improving our technology base in food and agriculture—in production, in processing, in distribution—so that we can continue to participate as a principal contributor in world trade, without depleting our own natural resources.

II. DOMESTIC DEMOGRAPHICS

Few people today are aware of the dimensions of the changes that lie in store for us due not only to population growth but also to coming changes in the mix of our population by such factors as age, ethnic background, and economic levels.

We know these changes in our population mean changes in the numbers and kinds and whereabouts of our work force—our elderly—our young people—and that all of these and more will influence agriculture. But we do not know how it will be influenced.

There is also the matter of migration. In the past, migrations from east to west, south to north, and rural to urban have influenced us greatly. Now the trends are north to south and urban to rural. How long will these trends endure, and what do they portend? Communities that have spent years adjusting to population decline are now faced with providing and financing services to new residents. Resources are being strained in some areas to provide for increasing needs in education, health care, job opportunities and training. We need more data and more research to help us determine the nature and scope of these trends and how to resolve the problems that arise when the benefits and costs of this new rural economic expansion are unevenly distributed. We need to team demographers, sociologists, economists, and others to conduct research to develop the answers required for intelligent planning.

III. OUR AGRICULTURAL CAPACITY

The increasing concern we see today regarding our future agricultural capacity is justified in the face of projected increases in population; a larger role for our agricultural output in world trade; and the possibilities for using agricultural products as substitutes for nonrenewable resources or to augment supplies of otherwise scarce commodities.

Since both new land and new water for agricultural development are scarce, and the quantity and quality of our natural resource inputs must be carefully managed and husbanded, most of the capacity increases in the years ahead will have to come from productivity improvement.

A. Crop productivity

Traditional approaches to plant breeding and improving plant physiology have played an important part in achieving and maintaining high levels of crop yields in the United States. These approaches will continue to serve in the short run to improve crop yields and nutritional quality.

Plant breeders will continue to cut losses by developing plants that can better withstand environmental stresses associated with temperature, moisture, air pollution, soil salinity and acidity. Crops that can be grown economically on low-producing land must also be developed.

Of the emerging technologies, photosynthetic enhancement, holds particular promise in boosting productivity. The more sunlight absorbed by the plant, the faster photosynthate is produced and the greater the plant growth rate. Physical changes in plants can improve their ability to absorb sunlight. For example, growth regulators and hormones can be used to change the structure of a plant so that more leaf area is exposed to the Sun. New varieties of barley, wheat, and corn that are capable of intercepting more sunlight have already been developed.

A concentrated research effort is also needed to identify and define areas and methodologies to use our knowledge of DNA and its potentials for advances in the crop sciences and technologies. For example, genetic modification of cereal grain plants so that they are able to fix their own nitrogen would sharply reduce total energy requirements and costs of production, and would reduce the threat of environmental pollution from heavy applications of nitrogen fertilizers to cropland.

B. Animal productivity

The production of animals and animal products on farms represents at least one half of the total value of farm products. Animals and animal products, including poultry, supply many of the nutrients consumed by man. Grazing animals convert plant materials that would not otherwise enter the food chain into food for humans. Research and education on animal protection and production is essential to the continuation of the plentiful and economical supply of animal foods that the American consumer desires and enjoys.

A number of our problems in animal reproduction, genetics, nutrition and disease control, are particularly complex and will be difficult to solve. At the same time there are areas that seem especially promising and that could have important impacts on production efficiency.

For example, we are learning how to obtain and transfer embryos on a routine basis in cattle, and the process now needs to be improved and extended to other animals.

Control of the sex ratio and the number of offspring born may be possible within this decade if research progress continues. If each beef cow could be induced to give birth to twin male calves, productivity and profitability in the cow-calf business could be more than doubled. So would a rancher's ability to respond to changes in supply and demand.

We need to continue to improve our ability to evaluate early the genetic worth of animals and to maximize the use of superior germ plasm in animal breeding.

We need new vaccines and methods to control or eradicate disease—methods without environmental side effects. We must apply the genetic engineering of micro-organisms—gene splicing, mutation, and selection—in ways to attack livestock problems more effectively. The work underway now in developing a safe, effective, and inexpensive vaccine for foot-and-mouth disease through recombinant DNA techniques is an example. Many other possibilities lie ahead—genetic control of the animal's immune response to protect it from diseases and parasites, and genetic sterility for the pests, to name just two.

C. Pest management systems

Evidence of adverse effects of chemical pesticides have resulted in increasingly stringent constraints on their use. Given the magnitude of pest problems, research is urgently needed to advance environmentally safe and effective plant pesticide management strategies for a wide variety of commercial crops.

Scientifically designed integrated pest management (IPM) systems can help assure reliable long-term high productivity of farms and forests by slowing the development of resistant pests (which now number more than 460 species) and by preventing pests from developing biotypes that can overcome the genes for resistance bred into crops and livestock. In many cases, IPM will entail much greater reliance on biological control agents. All components of the system must be complementary with, and maximize the effectiveness of, biological control agents that exist in nature—such as parasites or predators that prey on the target pests. Some of these approaches currently exist, such as plant, insect, and nematode pathogens; pest-resistant plants; insect attractants, and cultural and mechanical methods for disease, insect, nematode, and weed control.

Thus, environmental concerns emphasize the need for integrated management systems to reduce losses caused by pests, reduce costs of pest control and other production practices, reduce environmental damage from pesticides and fertilizers and maintain profitability of production from superior crop management systems. The development of IPM has the potential for a large social return through environmentally safe and effective plant pest management strategies for a wide variety of commercial crops, and must be vigorously pursued.

D. Beyond the farm gate

We also know that agricultural efficiency does not stop at the farm gate. It extends into the marketplace—whether the processing plant, the supermarket, the roadside stand, the home, the restaurant, the fast food shop—wherever farm products are ultimately used. It means maintaining the quality and safety of products after they leave the farm. It means better methods of handling, processing, and distribution. And it means better utilization of all agricultural commodities—whether as industrial raw materials or as consumer end products.

IV. ECOLOGICAL CONCERNS

The great awakening of ecological consciousness that we have seen in the 1960's and 1970's is beginning to be matched with a realization of the true cost of cleaning up the environment—as well as the cost of not cleaning up the environment.

We must recognize that we have environmental problems caused by the way agriculture has functioned in the past. We have used pesticides and other chemicals to excess in some places; we have adversely affected the health of our neighbors by careless application methods; we have permitted excess erosion into our streams and lakes. All of this I might add took place while we were in the process of developing the most wholesome and abundant food supply in the world.

Agriculture has needed time to make adjustments to a less polluting mode of operation; time to make adjustments based on research findings that take into account all of the consequences and changes, including economic and social impacts.

However, the scenario is already set throughout our environment for conditions that will only get worse unless we plan intelligently on ways to deal with them.

Fluctuating weather patterns, drought, increasing decertification of the world's grazing lands, oil import problems, the gravity of the world food situation, increasing and competing needs, the finiteness of our land and water resources, and the impact of overuse and erosion of our lands on the environment, all influence the outlook for the future of our natural resources.

As the better land in some areas is removed from the agricultural base and farmers are forced to use less desirable land, the chances of environmental pollution, through erosion, for example, increases. We must develop farming practices to utilize the less-than-prime land more efficiently in the production of food and fiber. Before we can develop the technology we need, we must have more basic knowledge on the chemical and physical properties of soils.

A potentially very significant factor in soil conservation efforts is research that will permit extension of conservation tillage onto land where it cannot now be successfully practiced—for example on cold, wet soils. To reduce erosion significantly we must at least double the acreage on which conservation tillage is practiced.

Research is critically needed in a number of other areas as well. Nonpoint pollution control is another example. The task is staggering when we consider the sheer amount of land involved and all the variables of soils, crops, cultural practices, weather, and so on.

We need to develop models to help us predict the effect of various management practices on soil erosion, on transport of agricultural chemicals and on water quality, taking into account the total environment, the flora and fauna, soil characteristics, the cultural practices, and the methods of water application.

A tremendous data base is necessary so that scientifically sound decisions can be made. The problems are of such magnitude that it will take the best efforts of all of us. Cooperative efforts are essential if we are to get the job done. Information on and techniques for, safely recycling industrial wastes and municipal sludges and effluents must also be developed. Legislation has mandated that we deal with these environmental problems, and it is to the best interest of every part of agriculture that we do so.

Dwindling supplies are fast making fresh water the limiting factor in food and fiber production. Some agricultural areas, now mining ground water, will run out of water for agriculture in the 1980's. There are opportunities through science and technology to develop management practices for utilizing water more efficiently. These practices include new distribution systems, irrigation scheduling, and recycling of waste water.

Science and technology can also assist in developing water-conserving farming practices, including plant varieties that require less water.

At the interface between water issues and agricultural productivity issues, there is a need for technical information on the fate and pathways of chemicals in the soil and associated water. With current and projected plant nutrient prices, data are not adequate for developing economically sound fertilizer rate and soil management recommendations. At the same time, water quality is difficult to predict. More basic research is needed to develop proven technical information of chemicals in the soils and associated ground water. A most pressing need is improved knowledge of nutrient cycling, especially nitrogen.

As the Nation moves to greater dependence on coal as an energy source, the acidity of precipitation is expected to increase, thereby potentially inhibiting increases in agricultural productivity by introducing yet another stress on plants, especially forests. We will have to have a better understanding than we do now of the extent and nature of acid rain and its effect on biological systems if sound decisions are to be made regarding regulatory controls for emissions and on agricultural efforts to ameliorate the effects of acid rain.

Other problems on our research agenda for the 1980's involve our range and forest resources. The harvesting of range forage by grazing livestock, for example, is likely to increase because it is one of the least energy-intensive forms of agriculture available, but what will be the environmental consequences? We know that in the Western United States 350 million acres of arid and semiarid lands have vegetative and soil conditions now that are at, or less than, 40 percent of their environmental potential, while population growth in these areas is much higher than average. Recent estimates indicate that 54 percent of the range in the 48 continguous States is already in unsatisfactory condition and some areas are in high risk of decertification.

As for our forest resources, during the past year we have seen a geometric increase in the use of wood to heat homes and provide fuel for small electric utilities and industries that are primarily wood-related. The Department of Energy has identified wood combustion as an area ready for commercialization. We have a real challenge here to see that these valuable forestry resources are used wisely and to their full potential. We must also expand our timber supplies through a better understanding of the dynamic nature of forests, through genetic improvement of our trees, and through other sound management practices.

V. ENERGY

Our agriculture's productivity has been based in the past several decades on increasing amounts of external inputs of chemicals, machinery, fossil fuels and research results. All of these externally generated inputs are in jeopardy.

As far as energy is concerned, it may be possible for agriculture to obtain enough energy resources for some time to come, but costs will be higher in terms of both money and environmental degradation. This is bound to force increasingly significant changes in agriculture—changes we must try to anticipate and deal with.

The Department of Agriculture has set the goal of making American agriculture net energy self-sufficient by the end of this decade. The overall plan encompasses three major areas that include deriving energy from as well as conserving it for agriculture:

a. Energy conservation and management in production, processing, and distribution. Research and education can play a major part here in such areas as reduced tillage; improved irrigation efficiency; crop drying techniques; increased efficiency in use of fertilizer by better soil testing; efficient use of forage by ruminants; and changes in marketing procedures to reduce fuel requirements for the distribution of agricultural products.

b. Development of new renewable crop sources of plant-derived hydrocarbons, and the use of biomass from field and forest through their conversion to methane, ethanol, or other usable fuels and chemical feedstocks. We see this as progressing in two ways—through commercial plants that would produce anhydrous alcohol for general use in gasohol and through small-scale, on-the-farm production of alcohol.

Methane produced by anaerobic digestion is another biomass energy source of particular interest to agriculture because of the potential for converting feedlot wastes to methane for energy use.

Methane extracted from coal beds is also of interest to agriculture because of its wide availability in rural areas.

c. Utilization of alternate energy sources such as solar and wind energy, and

d. Providing economic assessments of energy alternatives in agriculture and making it a special responsibility of research and education in agriculture to consider incentives that will foster adoption.

VI. CLIENTELE CONCERNS

In the years ahead it will be increasingly necessary for us to pay more attention to the process of identifying problems, setting research priorities, defining the research to be done, and selecting the most appropriate mechanism for conducting and supporting the research.

There will be an increasing emphasis on the quality of the research conducted and on the adequacy of quality control mechanisms. Research will need to be increasingly efficient. Like agriculture itself, it will be necessary to increase research productivity within the constraints of competition for resources. We must improve communications among all elements of the agriculture research community, and strengthen the partnerships which characterize the agricultural research enterprise.

While there is still generally a strong belief in this country that there are net social gains from technological advances, there is a real need to anticipate the distributional impacts of each major new technology under consideration. Economists and social scientists are needed increasingly in the ranks of multidisciplinary teams to evaluate the differential impacts of new technologies before they are adopted, or when new technologies are projected but before they are adopted.

Another important function of research is, and will be, to provide research backup for action and regulatory agencies to help make the processes work better for all conerned. For example, such research can help regulatory methodology keep pace with food product and processing changes; take advantage of new analytical approaches; and improve the reliability, ease, speed, accuracy and versatility in monitoring the quality and safety of our food supply. We also need improved technology to identify the source of problems and to track the success of measures taken to alleviate them. The success we are having with sulfonamides in pork is an example. We can profitably aim more research efforts at helping improve regulatory actions in the 1980's or making them unnecessary by eliminating the problem they are designed to control.

Interest in the relationship between our diet and long-term well-being will continue and increase. Major thrusts will be directed toward critical areas of human health and well-being at the differing stages of life. For example, we need to know more specifically the nutritional needs of pregnant and lactating women; of infants and young children; of the elderly. More effort is also needed on the effects of nutrition on mental and physical development; on the impact of intervention programs upon nutrition status; and on improving methodology in every area of nutrition research.

In the biomedical and behavioral sciences, we need to assess the consequences of nutrient intake, and to investigate the metabolic and behavioral mechanisms involved in nutrient intake as well as the consequences.

In the food sciences, we will be primarily concerned with the nutritional quality, content, or composition of foods, and with the bioavailability of nutrients in foods.

In nutrition education we want to focus on studies of dietary practices, food consumption patterns, determinants of these practices and patterns, and on methods for informing and educating the public about nutrition health and dietary practices. We also need special efforts to bring nutrition research findings to the scientific and technical community.

VII. THE NEW INFORMATION TECHNOLOGY

We see the technology of computers and telecommunications and office automation influencing our daily lives more and more, and the momentum is increasing.

The new information technology—new ways of generating information, handling it, storing it, retrieving it, communicating it and using it—has also transformed the way we do science and will become even more critical in the future.

For example, we have on-line data systems gathering and dispensing information around the world on an interactive, live basis; and we have duplication of effort in building and utilizing these systems. One of the greatest challenges facing our food and agricultural research system is the development of logical and cohesive information systems with protocols that will meet the many and diverse needs of our cooperators and clientele.

We face serious problems in information overload. We are generating information faster than we can assimilate it. The rate of technological development has been so fast that many of the benefits go undefined in the next wave of innovation.

We have barely scratched the surface in the use of these powerful tools in agricultural research, development, and education. We must master their use and do it soon.

Of course, the best and most ingenious and creative research will be of use only if its results are communicated to users—other scientists and the public clientele—and if this is done rapidly to reduce the timelag before application. Among science-related problems of national significance, one of the more important is using scientific and technical information quickly for societal problemsolving. We must develop data bases and effective information delivery systems in the food and agricultural sciences and encourage their effective use in coordinating, planning, and implementing research, extension, and teaching programs.

VIII. BASIC RESEARCH

Before we can make the really dramatic improvements needed in agricultural productivity, in loss reduction, in energy use and generation, we must have more fundamental knowledge from which to launch new development efforts. We are lagging seriously in replenishing our store of basic information. We are lagging both in effort expended on basic research and in the transfer to the applied stage.

We know that it is the pool of basic knowledge that sets the foundation and limits of applied and developmental research, which in turn can be translated into technologies for application and use. We know that many costly and inefficient applied efforts can be avoided if sufficient effort is devoted to generating new knowledge through basic research. Increased basic research is a big priority for the 1980's.

The plain fact is that we do not know enough today to be able to increase significantly the efficiency of food production, preservation, processing and usage. Without planned and accelerated basic research efforts and some major breakthroughs, the rate of growth of our food crops and animal production will not keep pace with needs.

Nowhere is there more exciting promise for us than along the whole broad frontier of genetics—in both plant and animal agriculture. We know that a better understanding of the mechanisms and functions of living cells means advances all across the food and agricultural sciences; increasing our ability to develop more productive, higher quality crops and livestock; to control diseases and pests; to maintain the quality of our farm products all through the marketing process; to preserve and enhance our environment; to make better use of our energy resources; and to improve the nutritional well-being of all our people.

We know that to increase plant production we must develop plants that are more photosynthetically efficient—and to create such plants requires knowledge we don't have. We must learn more about the mechanisms of photosynthetic conversion and carbon fixation, about processes which directly control the utilization of photosynthetic products, and about the control mechanisms which specifically influence the maintenance of chloroplasts.

Some recent work on photorespiration is an example of the kind of pioneering work I'm talking about. In trying to eliminate the energy-wasteful process of photorespiration, scientists have created plant strains in which photorespiration has been turned into a lethal characteristic. These genetically altered plants now survive only in a laboratory of enriched carbon dioxide. If we can succeed in developing offspring of these plants that will survive in normal air, the implications are astounding. The elimination of photorespiration could increase photosynthesis and biomass production by 45 percent in most crop plants. Think of the possibilities for making soybeans, wheat, beets, and alfalfa as productive as sugarcane, corn, and sorghum.

The possibilities are great for basic research in animal agriculture as well. More work is needed at the cellular level and we need to get started on attempts to find ways of utilizing genetic engineering techniques in livestock. The cell and its genetic machinery is vital to every process important in animal production. We must probe it deeper than we have in the past.

Other basic research areas needing more attention include physiological and biochemical factors and their relation to diet; the effects of nutrient availability on regulation of cell differentiation, growth, and function; hormone/enzyme effects in reproduction and growth; micronutrient effects on gene expression; the relationships of nutrients to membrane structure and function; the role of cell-mediated immune responses; and the genetic control of fat distribution. All of these areas are important and can contribute valuable, much-needed information.

The base of fundamental knowledge from which most of us in science are working today is not very great. It is, in fact, a very thin foundation.

I don't believe that the general public—whose human needs are in the forefront in setting our priorities—has the slightest idea of how precarious our position is or what it takes to make significant progress.

A good illustration of this can be seen in the accomplishments that are now being reported on work with recombinant DNA. From many of the press accounts, it would seem that these accomplishments were pulled from a hat just yesterday and that their promise today will be reality tomorrow. But as Lewis Thomas put it so well in one of his columns earlier this year:

> These things had their beginnings in lines of work so far removed from today's enterprises that it is already difficult to track back through the network of experiments to find the beginnings. * * * Recombinant DNA techniques could

69-563 O - 81 - 5

not have evolved without the 30-year background of research in virology and molecular genetics—almost all of it done without the faintest inkling that anything like recombinant DNA lay ahead.[2]

Thomas also points out the stake that private industry has in basic research and the need for more stable funding of such long-term work. The comments are pertinent for Federal and university researchers who are operating in a climate of extremely tight budgets and accountability, where basic work must compete with quick payoffs and defensive research.

With this review, one can easily see that problems of population, energy, and our environment will with certainty be influencing the future of the world's and the Nation's food supply in the decade ahead.

Our research agenda is being set now for the required advances in the sciences that undergird agriculture and for the ensuing technology that will be needed under the different and more difficult conditions that lie ahead. It will take time, effort, and resources to do the job, but by the time this decade is over we may well have passed the point where they are as important as is the decision to commit ourselves to the task today.

---

[2] "Notes of a Biology Watcher; On Science Business," New England Journal of Medicine, vol. 302, No. 3, pp. 157–8. Jan. 17, 1980.