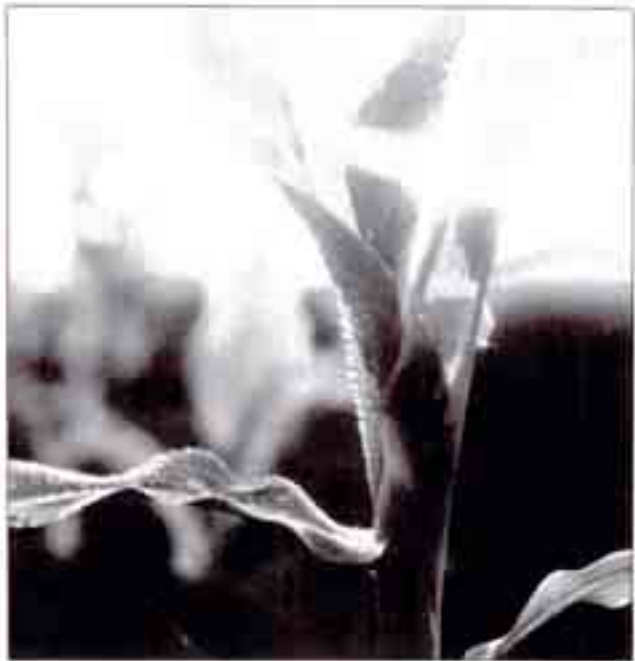


DIVERSITY



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* SAES and university officials discuss the role of the university in genetic engineering.

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CAPITOL VIEWS

White House Appoints First USDA Assistant Secretary For Science And Education

The Senate Committee on Agriculture unanimously confirmed September 30 the appointment of Orville Bentley, Dean of the University of Illinois College of Agriculture, to be the first Assistant Secretary of Agriculture for Science and Education. Full Senate confirmation is expected when Congress returns for a lame duck session in November. The new USDA position essentially replaces that of Director of Science and Education which was previously held by Anton Bertrand (see story p.4).

The September 10 White House announcement of the appointment came a no surprise to USDA and Capitol Hill observers who have anticipated the nomination for months. Many saw the move as proof of the Reagan Administration's intention to upgrade the nation's agricultural research capabilities.

Bentley will oversee the Agricultural Research Service under which the National Plant Germplasm System operates. "The U.S. program for plant genetic resources ranks high on the list of priorities we plan to focus on," Bentley told DIVERSITY following a September 29 Senate Agriculture Committee hearing on his confirmation. The new assistant secretary will also oversee the Cooperative State Research Service, the Cooperative Extension Service and the National Agricultural Library.

"The nation's scientific, Agricultural, and educational communities will look with great favor on this appointment," predicted University of Illinois Chancellor John Cribbet, who described Bentley as a "distinguished scientist and educator whose vision and leadership have been instrumental in maintaining the superb quality and productivity of American agriculture."

Prior to serving for seventeen years as Dean at the University of Illinois, Bentley served as agriculture dean at South Dakota State University. Highlights of his career include: a leading role in establishing the international soybean program (INTSOY) at the Champaign-Urbana campus and new experimental stations throughout the state; developing the long-range food for Century III program to enhance agricultural research; and establishing and promoting computer-oriented educational programs. Bentley has also served on R-PAC, an agricultural research policy (advisory) committee to USDA, and as a consultant to the Agency for International Development at the U.S. Department of State.

Congressman William Wampler (R-Va),

Ranking Minority Member of the House Committee on Agriculture, called the nomination a "superb choice" that "further indicates this President's support for a strong research and education program to maintain America's leadership position in Agriculture." The congressman credits Bentley with "more experience in transferring grass roots research requirements into agricultural research policy than any scientist or research administrator at the State or national level today." Wampler sponsored the legislation that established the position of Assistant Secretary of Agriculture for Science and Education.

House And Senate Vote To Support USDA Germplasm Budget Increase

The \$3.8 million increase proposed in the USDA budget for national plant genetic resources activities funded under the Agricultural Research Service (ARS) was retained in appropriations bills passed in late September by both the Senate and the House (see DIVERSITY, vol. 1, no 1, p 5). The increase will raise the total budget allocation for ARS germplasm activities to \$13,102,000. A conference committee is expected to meet soon to settle the few differences contained in both bills.

The Senate Report (No 97-566) accompanying the bill(s) (H.R. 7072) recommended "exclusion of bill language" proposed in the House bill to allow for the construction of a fruit and nut germplasm repository in Geneva, New York. While the House Report (No 97-800) was silent on the issue of a new facility in which to house the National Small Grains Collection (NSGC), the Senate Report urged the Department of Agriculture "to strongly consider Aberdeen, Idaho as the location of this new necessary facility." Both bills appropriated \$29,600 to fund 1983 activities of the National Plant Genetic Resources Board through the Cooperative State Research Service (CSRS). CSRS was also allocated \$902,000 in special research grants (unchanged from 1982), for germplasm resources activities.

The Senate recommended \$15,000 (\$7,000 over the House proposal) for the CSRS competitive research grants program for plant science, while both Houses recommended a \$149,295,000 allocation to CSRS for cooperative research under the Hatch Act. The Senate bill earmarked \$300,000 through CSRS for

potato research "to assist in accelerating the Eastern-Russett breeding program" at university breeding programs in Pennsylvania, Maine, New York, and Maryland. Both Houses appropriated \$4,430,000 for 1983 potato research through ARS.

The Senate bill also specified that rice research at the ARS facility in Stuttgart, Arkansas should continue "at least commensurate with recent year levels" and recommended \$100,000 for the continuation of pea and lentil research in the Pacific Northwest.

Both bills recommended a \$200,127,000 allocation for basic agricultural research through ARS. The House allowance for total ARS expenditures in 1983 totalled \$451,530,000 compared to the Senate appropriation of \$457,201,000. Both Houses recommended \$3,578,000 for international agricultural activities through the Office of International Cooperation and Development.



Photo by Peter Carlson

Bertrand Leaves USDA; Reflects On NPGS Progress During His Tenure

“Developing a higher level of trust among the many diverse components of the agricultural research system and then drawing upon that strength to put together program and budget requests that really make sense in terms of national needs.” These were the accomplishments Anson Bertrand identified as “the highlights” of his tenure as Director of Science and Education for the U.S. Department of Agriculture in an exclusive interview with DIVERSITY.

The interview was conducted just prior to Bertrand’s departure from the Department to take up his new responsibilities as Director of the Office of Agriculture in the Science and Technology Bureau in the U.S. Agency for International Development (AID). During the candid discussion, Bertrand talked about the progress made in the area of plant genetic resources since he was appointed by President Carter in 1978 and recounted the evolution of the National Plant Germplasm System (NPGS) from its position as a small and little-noticed program to its present stature as a high priority item on the current administration’s agenda. He also described the challenges he sees currently facing the NPGS and gave an assessment of how it and other USDA programs might be affected by the appointment of an Assistant Secretary for Science and Education. That appointment, which essentially replaces the position of Director, is a requirement of the Farm Bill passed by the Congress in 1981 (see story page 3).

Q. At the conclusion of the last National Plant Genetic Resources Board (NPGRB) meeting, over which you presided as Chairman. NPGRB Executive Secretary Clarence Grogan called you “the man on the front line [in the Department] for germplasm” and stressed that without your leadership much of the recent progress gained by the NPGS would not have occurred. Could you discuss some of the contributions you made?

A. I certainly don’t take credit for establishing this vital program, I just tried to move forward activities already underway. It was, you see, Secretary of Agriculture Earl Butz who appointed the first Plant Genetic Resources Advisory Board.

Q. What was the federal government’s policy regarding the National Plant Germplasm System when you were appointed USDA Director for Science and Education in 1978?

A. Well, as I said, the Advisory Board had been established and was within a few weeks of publishing *Plant Genetic Resources: Conservation and Use*, commonly known as the “Red Book.” when I came on board. It was a good report, reaffirming the views shared by many concerned agricultural scientists at the time that *something* had to be done to strengthen U.S. programs dealing with plant genetic resources. As I learned more about the NPGS, I discovered that it was a “system” in name only and so we set about to get the public and private sector plant scientists working together in various ways. At the same time, we knew it was essential that we bring the contents and recommendations of the “Red Book” to the attention of USDA Secretary Bob Bergland in order to increase his awareness as to the importance of the germplasm program. He needed to understand what collection, maintenance, and enhancement capabilities were needed to adequately develop this national resource.



Anson Bertrand

Photo courtesy USDA

Q. How did you go about briefing the Secretary on the specifics of the germplasm issue?

A. It happened over a period of time through a series of meetings we set up for the Secretary. The National Plant Germplasm Committee (NPGC), chaired by Wilson Foote, was instrumental in helping to develop specific recommendations for the Secretary. Our meetings also included members of the NPGRB, such as Harold Loden, President of the American Seed Trade Association; “Cotton” Robinson, Chancellor of Western Carolina University; and William Brown, Chairman of the Board of Pioneer Hi-Bred International, Inc. Some of the briefings also included the Department’s Deputy Administrator for the Budget and other USDA budget analysts. It was fundamentally through this kind of continued pressure that we were able to get the budget for germplasm turned around (see DIVERSITY, vol. 1, no. 1, p. 5 for NPGS budget details).

Q. How did you envision the organization and leadership roles for the newly defined NPGS?

A. This was not easy by any means because there were many different points of view as to how the NPGS should be organized. In my own personal view, there was only one way: to have one individual responsible for the national program who would make sure there was a truly coordinated network of curators, plant introduction stations, repositories, etc., throughout the country. This is the kind of program we ultimately established and, it is, as you know, overseen by the Assistant to the Deputy Administrator for Germplasm Quentin Jones.

Q. How do you feel about the National Plant Germplasm System as you leave it?

A. I'm very pleased with the NPGS. I hope that it will continue to work smoothly as it has the last few months and that we'll continue to have the strong cooperation we have now from the curators, the State Agricultural Experiment Station directors, etc. . . I think we have a good plan that is beginning to be implemented.

Q. Do you feel most people in the system are satisfied with this organizational plan?

A. There is still controversy, a lack of agreement that we have the best plan. Many wanted-and still do want-a special agency established within the Department for plant genetic resources-one with specific line item appropriation and a special administrator at the Agency level. Though it didn't specify such an agency, that is really what the General Accounting Office (GAO) was proposing in its recommendations last year (see DIVERSITY, vol. 1, no. 1, p. 6).

I still feel this would be an incorrect way to get the job done because it is so important that all germplasm activities be very closely integrated into what is going on in the State Agricultural Experiment Stations, the Agricultural Research Service, the extension services, and, of course, industry.

Q. What challenges do you see facing the NPGS today?

A. I would first like to see more emphasis on plant exploration and introduction and a closer examination of the germplasm we now have-and will collect-that must be evaluated. We must also move swiftly ahead with the information system [Germplasm Resources Information Network] that is now being implemented.

I would also like to see the Crop Advisory Committees move ahead and develop so that they really set the agenda for the crops. Such an agenda could then be used as a broad guide for the geneticist or breeder wherever he or she may happen to be.

As you know, the part of the NPGS that includes the regional germplasm centers is only partially developed. I hope that the whole projected network of clonal repositories will be developed in the years to come.

Q. Do you think the government will continue to support the expanded germplasm program that is now developing?

A. The budget for germplasm must continue to increase if it is to meet the challenge before us. And I think it will. The present climate is good for germplasm activities to continue as a high-priority item for several years to come. USDA is interested in germplasm and intends to make sure that there is a strong plant genetic base in this country.

Q. Is industry as involved with NPGS as it could be? What directions do you see the private sector taking in its involvement with the NPGS?

A. The recent announcement by the National Council of Commercial Plant Breeders (NCCPB) that thirty-two seed companies have volunteered to assist the NPGS in grow-outs [controlled regeneration] is a marvelous example of how the private sector can play an increasingly significant role in the network. Grow-out and observation have always been the weakest links in the network.

Despite some of the things one hears today, there has always been a good interchange between public and private breeders because they are all part of the same fraternity. This NCCPB proposal is just a natural outgrowth of a

cooperative relationship that has existed for years and is finally getting the attention it deserves and is being institutionalized.

Q. What, then, is the reason for so much controversy today over the appropriate roles of the public versus the private plant breeder?

A. There has been a major shift in the type of work done by public breeders since I began my career as a public scientist. At that time, public breeders produced many varieties and they were released as varieties. Most public geneticists today are working at germplasm manipulation at the more basic level. They rarely produce a variety except in certain specialty crops, such as some of the vegetable crops, for which no seed company has voiced an interest in developing.

Much of the confusion over roles in the system comes from the great diversity in crops. Some, like corn, are very systematized. The basic research is completed at the university and then the private breeder picks it up to develop the hybrid. But if you're talking about a small vegetable crop, the public breeder is the only one producing the variety. The Office of Management and Budget (OMB) has been examining how to more effectively define all public and private research activities (see DIVERSITY, vol. 1, no. 2, p. 1). The OMB plan is to appoint some industry representatives who will assist OMB and ARS officials in examining individual research projects to determine what research is needed and which sector would be the most appropriate to carry it out. Germplasm enhancement research efforts could be among the projects this group will look at.

Q. What role do you think the federal government will play in research pertaining to genetic engineering?

A. Genetic engineering-other than the basic work done at the universities-will be ultimately done commercially by private companies in my judgment. Most of the genetic engineering that takes a process that's been developed for moving germplasm (genes) will, for the most part, be done commercially because it moves quickly from that activity to a product.

Q. Last year the office of Technology Assessment (OTA) released a report on the U.S. food and agricultural research system that criticized the lack of adequately trained and coordinated technical staff at the U.S. Agency for International Development (see DIVERSITY, vol. 1, no. 1, p. 5). Will re-addressing these needs be one of your responsibilities as Director of AID's Office of Agriculture?

A. Yes-a major part of my responsibility will be to upgrade the technical staff at AID. The Agency is responsible for U.S. funding of the international agricultural research centers sponsored by the Consultative Group on International Agricultural Research (CGIAR). The United States funds 25 percent of the activities of the ten centers, many of which are involved in germplasm work.

Q. How do the international research activities of USDA interface with the AID program?

A. The Office of International Cooperation and Development (OICD) in the Department of Agriculture is the point of liaison between AID and USDA. AID also frequently contracts for USDA personnel for short-term assignments.

Prior to 1978, when Secretary Bergland created OICD, coordination of international agricultural research activities was the responsibility of the Division of International Agriculture under ARS. There is still, however, a coordinator of international programs within ARS who helps OICD

and AID tap the resources they need within ARS to help them accomplish their goals. Ben Kopacz, the current ARS coordinator for international programs, is also responsible for logistical support when ARS scientists go overseas.

Germplasm explorations to foreign countries, however, are an exception as they are still funded through the ARS rather than OICD. There is general agreement that it would be counterproductive to change that mechanism at this time.

Q. From an international perspective, does the U.S. have an effective plant genetic resources program? Some observers say the Soviet Union is intensifying research activities and investment in germplasm work.

A. The U.S. is still the leader-by far-in the area of collecting, preserving, and utilizing germplasm. The Soviets are way behind in this field. They are, however, beginning to really move on the issue. The Soviet Union does have some very competent scientists and it would behoove our government to continue to work on plans through which we can exchange germplasm with them.

The same is true with China. We still need a great deal of germplasm from China that we haven't been able to get. The Chinese will not give U.S. explorers free access to an area and these restrictions hamper our efforts. They'll only

permit our people to take samples under certain conditions or do the sampling themselves and bring the seed in. This is certainly not like going into the wild and making the selections. The situation does seem to be loosening up a bit now.

Q. What was the reasoning behind creating the position of Assistant Secretary to essentially replace the position you held as Director of Science and Mucation?

A. It was the result of an effort strongly supported by the land grant universities and the agricultural industry. These groups were convinced that if they did not have a person with the title of Assistant Secretary going up to Capitol Hill, they would continue to get [what they considered to be] "second-rate" hearings and less attention from the Congress. This new status, they believe, will gain status for agricultural research issues on the Hill.

Q. Do you think such a change will result?

A. No. I don't believe their perceptions were correct. What they did was further politicize the system and the net result, in my opinion, has a good chance of being counterproductive. The Assistant Secretary will have to spend even more of his time on politics than I did and will have to make many decisions on other than a scientific basis. I hope it works.

National Study Calls For Increased Corn Research

The highest priority must be given to increased support for existing corn grain research if the United States-and the world-is to be assured that adequate supplies of corn are available to meet future needs, according to a recently released national corn research priorities study conducted by the National Corn Research Coordination Committee (NCRCC). "To meet the challenges of tomorrow, we must complete the research of today," asserted the study which was endorsed and funded by USDA through its Agricultural Research Service (ARS) and Cooperative State Research Service (CSRS) agencies. The work was carried out by the North Carolina Agricultural Research Service under a cooperative agreement with the two agencies.

The study, directed by NCRCC Chairman Paul Harvey of North Carolina State University, grew out of a request made by the National Corn Growers' Association in 1979 to Keith Huston, Director at Large, North Central Region, State Agricultural Experiment Station Regional Directors. It was conducted "to take an in-depth look at what corn scientists consider to be needed in the decade ahead to assure a reasonable supply of this most important agricultural commodity." The sixteen scientists appointed to the Committee represented the federal, state and private sectors.

Breeding/Genetic Research "Problem Areas"

The NCRCC study targeted eight

"problem areas" in the research category labeled "Breeding and Genetic Contributions to Corn Improvement," in which research should be maintained or expanded during the next decade. The problem areas, identified by one of three NCRCC Task Forces established to advise the Committee, were designated as follows:

■ Preservation, Maintenance, and Evaluation of Corn Germplasm Resources

The study stresses the need for an expanded and coordinated system of maintaining, preserving and distributing germplasm of many crop species already documented by the National Plant Genetic Resources Board. The more than 15,000 available collections for corn held by various agencies with divergent goals is, in many cases, difficult to secure and the viability, for many, is dangerously low, the NCRCC warns. The Committee calls for increased funding and facilities needed to begin immediate work in assembling the entire maize collection under the authority of one agency and to produce sufficient quantities of seed of these collections to satisfy preservation and evaluation needs.

■ Breeding Methods and Long-Term Selection Studies

-Noting that most selection systems studies have been based on selection for one trait (yield), the NCRCC claims that very little is known about the most effective ways of incorporating several traits-such as acceptable standability, pest resistance and improved

quality-into either short or long-term corn studies. The NCRCC study stresses the need to continue critical long-term studies to provide information on various aspects of genetics. Such studies would also provide "novel" genetic material which is useful in breeding programs, as well as for basic genetic studies.

- **Disease Control Through Host-Plant Resistance**-Although disease resistance is the most widely used means of controlling major corn diseases-and most present-day hybrids have some degree of resistance to several diseases-diseases and races of pathogens must be guarded against continually, according to the study, if the U.S. is to avoid catastrophes such as the 1970 southern corn leaf blight epidemic.
- **Host-Plant Resistance Employed to Reduce Insect Damage in Corn**-Development of corn strains which are inherently tolerant or resistant to one or more of the major insect pests would greatly reduce the cost of producing corn and would pose fewer pollution problems, says the NCRCC. Because resistant cultivars are also the base of the Integrated Pest Management (IPM) systems, they could also be used safely and easily with other systems, the study suggests.
- **Improving Genetically Derived Tolerance to Drought or Heat**-Genetic variation for drought resistance and heat tolerance are already present in U.S. germplasm now used. But these

traits are difficult to study and, therefore, require a significant ongoing research effort to make progress in these areas, the NCRCC asserts. The probability of success for these research areas is good and the benefits to farmers during hot, dry years would be very great, the study predicts.

- **Improvement in Photosynthetic Output and Partitioning in Nutrients and Assimilates into Grain-Corn** yields are a function of seasonal photosynthesis and the preferential partitioning of carbon compounds into grain. Research is needed to improve this partitioning, according to the NCRCC. Increasing the efficiency of nitrogen uptake and utilization should also be researched, especially in view of the critical environmental concerns and the high cost of nitrogen.
- **Genetic Engineering and Molecular Biology-It** is important for the corn industry to recognize that molecular biology is a very powerful technology that can dramatically reshape many of our corn improvement programs in the future, asserts the NCRCC. This technology will ultimately permit the isolation, modification and insertion of functional genes into corn plants to suit the breeder's needs. The benefit from genetic engineering to corn production in the future seems assured and such research should be encouraged, the study says.
- **Developmental Gene Systems and Biosynthetic Pathways-The** study asserts the need for basic research on gene families that show close DNA sequence homologies. For years, the organelle genomes were poorly understood because transmission genetics was an ineffective means of studying these systems. The advent of molecular genetics has provided powerful new techniques for analyzing these genomes, observes the NCRCC. Although small when compared with the nuclear genome, the mitochondrial and chloroplast genomes encode several very important genes, such as carboxylase (large subunits) and cytoplasmic male sterility and should be studied.

Research Teams Proposed

The NCRCC study noted that although corn breeding has been the basis for improving our capability to increase and sustain corn production for more than half a century, other disciplines, such as entomology, plant pathology, crop physiology and genetics play major roles in present-day research. "The complex problems now confronting the corn research

effort generally demand teams of scientists representing these disciplines to combine their efforts to improve corn germplasm," according to the NCRCC. A similar proposal for all crop germplasm research was recently offered by Douglas Dewey, National Technical Advisor for Germplasm Enhancement (see DIVERSITY, vol. 1, no. 2, p. 1).

In addition to assessing corn production research, the study assessed research in the areas of corn marketing, trade, and transportation and corn utilization. For copies of the NCRCC study and the NCRCC Task Force reports, write: Crop Science Department, North Carolina State University, Raleigh, N C 27650.

USDA Advisory Group Recommends BARC For Small Grains Collection

The Beltsville Agricultural Research Center (BARC) should be the location for a new facility to house the National Small Grains Collection (NSGC), according to long-awaited recommendations by a Site Assessment Working Group (WG).

The WG, appointed last March to advise ARS Administrator T. B. Kinney, agreed that the most suitable site for the collection would be the National Seed Storage Laboratory (NSSL) facilities at Fort Collins, Colo., if those facilities became available as a result of NSSL relocation during its expansion program. Because the Working Group could find no reasons to support such an NSSL relocation, the five-member WG, chaired by Calvin Qualset, University of California-Davis, unanimously recommended that a new facility be built at BARC, where the NSGC is currently housed.

The Group's report also recommends that formal recognition be given to the proposed Aberdeen, Idaho site as a component of the NSGC and that a new laboratory be built at the Idaho site for seed processing and temporary seed storage. (The Senate Committee on Appropriations report on 1983 agriculture appropriations recommended that USDA "strongly consider" locating the NSGC at Aberdeen, Idaho.)

Long And Controversial History To Site Decision

The decision regarding where to locate the National Small Grains Collection--the single largest working collection of germplasm in the National Plant Germplasm System and deemed by many to be a "national treasure"--has been complicated by complex political and bureaucratic turf battles on Capitol Hill and at USDA since it was decided that a new facility was "desperately needed."

ARS had previously rejected a 1979

recommendation by the Small Grains Assessment Task Group to move the NSGC to the Regional Plant Introduction Station at Pullman, Washington. ARS then instituted plans in 1981 to construct a new site at BARC.

Those plans were halted, however, after the release in October 1981 of the "Long Range Plan" (see DIVERSITY, vol. 1, no. 1, p. 1) which recommended that the NSGC be relocated at the Aberdeen Research and Extension Center in Aberdeen, Idaho. That Center has sponsored a federal cereals breeding program which has long served as a major evaluation and testing site for eminent cereals breeders. The Long Range Plan was authored by a Germplasm Task Force and a Germplasm Steering Committee appointed to evaluate crop genetic resources management in the U.S. under the direction of Charles Murphy, North Carolina State University.

After receiving the Plan (also known as the "Murphy Report"), Kinney appointed the Site Assessment Working Group to investigate the three proposed NSGC sites and come up with a final recommendation. The Group visited Beltsville, Md., Aberdeen and Fort Collins and evaluated each site according to site selection criteria provided by USDA. The WG also interviewed administrators and scientists at each site. The final Working Group report, forwarded to Kinney on August 27, cited the following factors to support the NSGC relocation at BARC: high accessibility to national and international visitors; and proximity to the scientific community and related entities such as: the Plant Introduction Office, the Germplasm Resources Information Network, Animal and Plant Health Inspection Service, Plant Taxonomy Lab, Economic Botany Lab, and the National Agricultural Library.

The report further recommended that BARC provide adequate greenhouse facilities close to the new NSGC building for seed increase and taxonomic classification and make provisions for controlled environment seed storage for at least three times the existing storage capacity. The Working Group also suggested that professional NSGC staff, including the curator, should assume a more active role in research on the germplasm collections.

In a letter to Qualset, Kinney commended the Working Group for an "excellent report" and said their recommendations "will be seriously considered as [we] move forward with deliberations regarding the National Small Grains Collection." Other WG members included John Bouwkamp, University of Maryland; Douglas Dewey, ARS, Utah State University; Willis Skrdla, ARS, Iowa State University; and Donald Schrickel, The Quaker Oats Company.

National Forum To Bring All NPGS Components Together

A series of national plant germplasm meetings designed to bring together for the first time all persons working in the National Plant Germplasm System (NPGS) nationwide is scheduled for June 20-26, 1983, at Des Moines, Iowa. The participants will include administrators and scientists from the business community as well as those from state and federal government. "All three components must be represented as each is vital to all NPGS activities," said a USDA official who is helping to plan the unprecedented gathering.

The week-long series of NPGS events will include:

- a joint meeting of all four regional technical committees in addition to meetings of the individual regional technical committees;
- a meeting of the newly-formed Plant Germplasm Operations Committee (PGOC) whose function is to assist the Office of the Assistant to the Deputy Administrator for Germplasm with day-to-day coordination of the NPGS;
- a Germplasm Workshop to include all NPGS curators and their staffs, the PGOC, and the National Plant Germplasm Committee;
- a Phytopathology Workshop to address all aspects of plant germplasm and related disease problems.

Those attending the meetings have also been invited to tour the Pioneer Hi-Bred International, Inc. facility at Des Moines and the Regional Plant Introduction Station at Ames, Iowa.

The proposal for the meeting was unanimously approved at an August 19 meeting of the *Pro-Tem* PGOC in Fort Collins, Colorado. All members of that committee agreed that the diffuse and complex nature of the continually expanding NPGS required a conclave that would involve all NPGS components and allow an opportunity for information exchange. "This will be an important series of germplasm meetings," said Assistant to the Deputy Administrator for Germplasm Quentin Jones, "and we suggest that all those involved mark their calendars and make the necessary prepara-



tions to attend." DIVERSITY will provide additional details regarding the meetings as they become available.

GermPlasm Operations Committee Established For NPGS

A Plant Germplasm Operations Committee (PGOC) to assist the Assistant to the Deputy Administrator for Germplasm in promoting more effective communication and operations throughout the National Plant Germplasm System (NPGS) was established at a meeting of the *Pro-Tem* PGOC in Fort Collins, Colo., last summer.

Quentin Jones, Assistant to the Deputy Administrator for Germplasm, called the meeting to address operations problems that have concerned many working in the NPGS. There is, Jones acknowledged to the 15-member panel he assembled, "a varying degree of validity" to perceptions that the NPGS is "totally bogged down by committees at all levels" and "is uncoordinated and lacking a perceptible focal point." The main responsibility of the PGOC will be to correct that perception, he said.

The establishment of the new committee makes it the third component of the now-streamlined system established to govern the NPGS. The primary component is the National Plant Germplasm Committee (NPGC) whose public and private sector members set policy for the NPGS. The PGOC will assist the NPGC in communicating those policies. The other major component is comprised of the various crop advisory committees that advise the NPGC on the needs of the user community (see DIVERSITY, vol. I, no. 1, p. 19).

Ample evidence that many differences of opinion do exist among those in the NPGS came during the *Pro-Tem* Committee's deliberations regarding the composition of the PGOC. After several hours of discussion that seemed to test both the patience and endurance of many of the participants, the following composition of 13 members was agreed to:

- 1 NPGS Coordinator, Chairman (Quentin Jones, ARS)
- 4 Regional Coordinators (Sam Dietz, ARS, W-6; Desmond Dolan, ARS, NE-9; Gil Lovell, ARS, S-9; and Willis Skrdla, ARS, NC-7)
- 1 Clonal Repository Coordinator (Melvin Westwood, Northwest Plant Germplasm Repository)
- 1 Director, National Seed Storage Laboratory (Louis Bass, ARS)
- 1 Plant Introduction Officer (George White ARS)
- 1 Plant Germplasm and Genetics Institute Chairman (Allen Stoner, ARS)

- 1 Chief, Plant Exploration and Taxonomy Laboratory (Robert Perdue, ARS)
- 1 Chief, Economic Botany Laboratory (James Duke, ARS)
- 1 Data Base Manager (Richard Cooper, ARS)
- 1 National Technical Advisor (Douglas Dewey, ARS)

The *Pro-Tem* Committee also decided to form a larger Plant Germplasm Working Group that would include curators, scientists at the Regional Plant Introduction Stations, chairpersons of all crop advisory committees, and other NPGS specialists. The *Pro-Tem* PGOC anticipates that the PGOC, and other advisory subcommittees it may appoint, would meet at least once a year. If feasible, the meeting would immediately precede the National Plant Germplasm Committee meeting. It is planned that all of these new groups will meet next June in Des Moines, Iowa.

1983 Plant Exploration Proposals Approved

The *Pro-Tem* Committee also reviewed 1983 plant exploration proposals and approved the following:

- Mexico wild tuber-bearing *Solanum* subsp.
- Pacific Northwest - Lupines
- Morocco - Forage legumes, grasses, shrubs, and *Rhizobium* bacteria
- China Fruit and nut
- North and Northwest Australia - *Gossypium* subsp.
- Romania *Astragalus cicer* L.
- North Peru - *Gossypium barbadense*
- Peru - *Ipomoea batatas*

Funding for the explorations will be handled through ARS and will, in some cases, involve the USDA Office of International Cooperation and Development (OICD) and the International Board for Plant Genetic Resources (IBPGR).

Robert Perdue, who recently took over as Plant Explorations Officer, told the Committee he is in the process of preparing an explorations manual that will address all aspects of exploration from the writing of the proposal through the final trip reports.*

The *Pro-Tem* PGOC also voted to give the NSSL resources for monitoring seed viability for all curators of seed collections in the NPGS on a schedule to be worked out between NSSL staff and curators. The Committee also discussed an offer from the Soil Conservation Service (SCS) to provide winter nursery facilities to the NPGS at Molokai, Hawaii. The PGOC will act on the proposal after it gets a cost estimate from SCS.

* For further information, contact: Robert Perdue, Plant Exploration and Taxonomy Laboratory, Bldg. 265, BARC-East, Beltsville, MD 20705 (301) 344-2431.

Seed Companies To Assist NPGS With Public Sector "Grow-Outs"

Few calls to support government projects needed to protect the public welfare result in donations by private industry to perpetuate those programs. Yet, that's exactly what happened when the National Council of Commercial Plant Breeders (NCCPB) informed its members that the National Seed Storage Laboratory (NSSL) and Regional Plant Introduction Stations lacked the funds to carry out all of the germplasm revitalization and replenishment activities ("grow-outs") necessary to ensure the germplasm maintenance and viability on which the National Plant Germplasm System (NPGS) depends.

Last summer NCCPB Secretary Robert Falasca informed NPGS officials that thirty-two of its member seed companies had volunteered to assist the public sector by growing out small quantities of seed from the NSSL on an annual basis (see accompanying list). Why did

these companies respond so favorably? "The members of the NCCPB are particularly aware of the need for the conversion of germplasm material for future plant breeding activities and are appreciative of the job being done to this end by the NSSL and the USDA plant introduction system," explained Falasca. "These companies wish to 'plug in' to the system, not only by depositing materials for storage, but also by helping to maintain and revitalize the stored materials."

Many in the NPGS have questioned whether private plant breeders do, in fact, support state and federal germplasm preservation efforts, said Robert Buker, Chairman of the NCCPB Germplasm Release Committee and a member of the National Plant Germplasm Committee (NPGC). "This generous offer should provide that answer," said Buker. To make his point, he asked, "If the U.S. Treasury had notified citizens of a gold

shortage, how many would have answered the call with a direct donation?"

NPGC Chairman Wilson Foote, Oregon State University, calls the NCCPB offer "one of the most important actions to date that illustrates the spirit of support for the NPGS coming from private industry in this country." Foote said the NPGC has asked the Regional Coordinators to follow-up with the individual NCCPB companies regarding the "grow-outs" of the specific crops which each coordinator curates. The NSSL materials will then be handled through the appropriate curator. The NPGC has directed NSSL Director Louis Bass to provide the 32 firms with a list of the NPGS curators.

Other companies interested in participating in the program should contact: Robert Falasca, National Council of Commercial Plant Breeders, 1030 15th Street, N. W., Suite 964, Washington, D.C. 20005 (202) 223-4082.

Agrow Seed Co. (subsidiary of Upjohn) Kalamazoo, MI	field corn, soybeans, sorghum	Land O'Lakes, Inc. Webster City, IA	sorghum
Cargill Inc. Seed Division Plainview, TX	cotton	NC+ Hybrids Hastings, NE	corn, sorghum
Cargill Inc. St. Louis Park, MN	corn, sorghum, sunflower, cotton, barley, wheat	North American Plant Breeders Mission, KS	soybeans, alfalfa
Chocolate Bayou Co. Alvin, TX	rice	North American Plant Breeders Berthoud, CO	spring wheat, hard winter wheat, spring barley
DEKALB AgResearch Axtell, TX	cotton	Northrup King Co. Research Center Stanton, MN	corn
DEKALB AgResearch DeKalb, IL	sorghum (temp), sorghum (trop), sunflower, corn	Pioneer Hi-Bred International, Inc. Cedar Falls, IA	soybeans
Del Monte Corp. San Leandro, CA	beets, peppers, spinach beans, peas, tomatoes	Pioneer Hi-Bred International, Inc. Johnston, IA	maize, soybeans, wheat
Delta & Pine Land Co. Scott, MS	soybean, sorghum	Pure Seed Testing Hubbard, OR	Kentucky bluegrass, perennial ryegrass, tall fescue, fine fescue, orchardgrass
Dessert Seed Co. Benoit, MS	cotton	Rogers Brothers Seed Company Idaho Falls, ID	peas, beans, sweet corn
FFR Cooperative W. Lafayette, IN	corn, millet, beans, forage legumes and grasses other than alfalfa, red clover, orchard grass, tall fescue, bluegrass and timothy, vegetables-annual or biannual	O. M. Scott & Sons Marysville, OH	bluegrass, fescue, ryegrass
Funk Seeds International Lubbock, TX	sorghum bi-color	SeedTec International, Inc. Woodland, CA	sunflower, safflower
Funk Seeds International Bloomington, IL	corn	Soybean Research Foundation, Inc. Mason City, IL	soybean
Gold Kist Inc. Ashburn, GA	soybeans, peanuts	Stoneville Pedigree Seed Stoneville, MS	cotton (upland)
GroAgri Seed Co. Lubbock, TX	cotton, grain sorghum	Sturdy Grow Hybrids Arcola, IL	white corn
Heinz U.S.A. Bowling Green, OH	tomato	V. R. Seeds Flora, IN	soybeans - maturing groups II, III, IV
Illinois Foundation Seeds, Inc. Champaign, IL	corn, soybean, maize	George Warner Seed Co. Hereford, TX	sorghum, small grains-wheat, oats, barley, rye
Jacques Seed Co. Prescott, WI	sunflower, soybeans, corn	W-L Research, Inc. Highland, MD	alfalfa
		R. C. Young Seed & Grain Co. Lubbock, TX	sorghum bicolor

ASTA Recommends Policy For Germplasm And Variety Release By Public Breeders

"The primary role of the public breeder should [involve] 'basic research,' the development and general release of improved germplasm, and the training of future plant breeders," according to a resolution passed by the American Seed Trade Association (ASTA) at its annual meeting last summer in Dallas, Texas.

The resolution, entitled "Recommended Policies for Release of Germplasm, Varieties and Related Technology From Public Institutions," calls for the continued close cooperation between public and private breeders that "has contributed materially to the successful introduction and utilization of new varieties" and encourages the "open exchange of germplasm and research information between these groups." "It is this cooperation," says ASTA, that "has enabled the seed industry in the U.S. to attain world leadership."

As a general principle, ASTA recommends that "varieties, germplasm, and related technologies developed at public institutions with public funds be released

on a non-exclusive basis." When a general release won't protect the integrity of the variety or ensure its availability on a continuing basis, thus making an exclusive release necessary, ASTA recommends that "appropriate notice be given to interested parties with opportunity to respond."

Public variety release on a royalty basis could, warns ASTA, "place public institutions in direct competition with private breeders." Public breeders should not, therefore, receive royalties or alternative forms of remuneration for varieties, according to the ASTA resolution, because "such remuneration may restrict free exchange of germplasm and general research information between public and private plant breeders." ASTA wants the release of germplasm, varieties, or techniques developed by "new technology" [genetic engineering and recombinant DNA techniques] to be treated in a similar fashion.

To address this potentially controversial issue, ASTA is recommending that

"public institutions and private industry join in evaluating the impact by the breeding and release of varieties by public institutions on a species and geographical basis." ASTA members believe that such an effort could help establish policies that "properly define the role of the public institution in serving its supporting constituency."

The ASTA resolution also voices support for "public or industry-wide funding of specific research projects and public institutions, rather than grants which may provide for selective release of research results."

ASTA has distributed the resolution to organizations representing both public and private breeders. The issue of public varietal release must be addressed, according to an ASTA spokesman, as it "threatens to escalate in visibility and complexity and become even more controversial."

For further information, contact: ASTA, 1030 15th Street, N. W., Washington, D.C. 20005.

NPGC Favors Team Approach To Germplasm Enhancement

The National Plant Germplasm Committee (NPGC) accepted "in principle" a national plan for germplasm enhancement whose key feature would be germplasm enhancement teams of state and federal scientists located at regional centers throughout the U.S. (see DIVERSITY, vol. 1, no. 2, p. 1). The NPGC considered the proposal when the committee met August 18 during a week of national and international germplasm meetings held in Fort Collins, Colorado.

Discussion regarding the enhancement plan, proposed by National Technical Advisor Douglas Dewey, ARS, centered on the need for germplasm evaluation activities to precede enhancement work. William Brown, Pioneer Hi-Bred International, Inc., noted that enhancement teams working on maize and other major collections "would not even know where to begin" if the necessary evaluation data were not available. Dewey agreed and indicated that a more adequate balance between short-term evaluation activities and long-term enhancement activities would be reflected in the 1984 budget.

The 15-member committee passed a motion to add one additional State Agricultural Experiment Station (SAES) representative to the NPGC membership. The representative would be drawn from one of four SAES Directors-at-Large and would join the SAES administrative advisors who have served on the NPGC

since its inception. The decision was incorporated into the NPGC bylaws passed by the Committee.

The group also adopted the Memorandum of Understanding (MOU) for germplasm curators that was reviewed at the last NPGC meeting. The MOU details the activities required by a curator to carry out the responsibility to "physically maintain, protect, control access to, and distribute specific plant germplasm." The NPGC directed the Office of the Assistant to the Deputy Administrator for Germplasm to expedite implementation of the Memorandum.



NPGC Highlights

Other action by the NPGC included:

- a recommendation to ARS to assess the feasibility of locating the **sweet potato collection** at the Regional Plant Introduction Station at Experiment, Ga., and prepare a project proposal for locating the collection there.
- a request to the S-9 Regional Coordinator at Experiment, Ga., to continue working with the Peanut Crop Advisory Committee (CAC) regarding **curatorial needs and location(s) for peanut collections**. The generally agreed-to

plan favored by the CAC is to keep the cultivated peanuts under a curator at Experiment, Ga., and the wild species at Stillwater, Okla.

- a motion that Melvin Westwood, Oregon State University, serve as **National Technical Advisor for Clonal Germplasm** beginning October 1. Westwood was asked to prepare a "white paper" on the research needs of the clonal repositories.
- a motion that the initial **implementation schedule for the Germplasm Resources Information Network (GRIN)** include all four Regional Plant Introduction Station projects.
- a request that the Assistant to the Deputy Administrator for Germplasm explore with the Germplasm Resources Information Project (GRIP) Coordinating Committee the **feasibility of having curators assign Plant Inventory (PI) numbers** at those times when a serious backlog of unaccessioned material develops at the Plant Introduction Office.
- appointment of a **task group**, chaired by NPGC Chairman Wilson Foote, Oregon State University, to **review the original plan for the national clonal repository system** and recommend actions on the feasibility and need for each proposed facility; construction and costs schedule; the addition of crop species to the original list for each repository; and a system for naming the new facilities. The NPGC postponed a decision regarding the addition of olives, figs, and persimmons to the clonal repository at Davis, Calif.
- a request that NPGC Executive Secre-

tary Quentin Jones respond to a letter from John Naegle, Cooperative State Research Service (CSRS) regarding the **appropriate channels for dealing with international germplasm exchanges.**

Jones was also asked to ascertain the policy recommendations of the ARS Administrator regarding liaison with the Office of International Cooperation and Development (OICD) on international germplasm matters.

The NPGC decided to continue meeting twice a year and suggested that the new Plant Germplasm Operations Committee (PGOC) schedule its work to provide timely development of background or issue papers for consideration by the NPGC. The Committee re-elected Wilson Foote as NPGC Chairman and elected Norman James, ARS, to serve as Vice-Chairman.

Advisory Group Reports On Cryopreservation

Rumors of program and personnel cuts that would all but wipe out USDA research initiatives focused on the cryopreservation* of plant germplasm, somewhat tempered the spirit of those serving on the National Plant Germplasm Committee (NPGC) Working Group on Cryopreservation. The group met in conjunction with the IBPGR Working Group on Tissue Culture at the Fort Collins germplasm conclave last summer.

The formal presentations on "Cryopreservation: Principles and Prospects in Maintenance of Crop Germplasm" to the joint IBPGR/NPGC workshop preceding the Cryopreservation Working Group's deliberations included papers on: "Seed and Pollen" by Phillip Stanwood, ARS, National Seed Storage Laboratory (NSSL); "Vegetative Material" by Lee Towill, University of Wisconsin; and "Curatorial Safety and Cost Aspects" by James Anderson, ARS, University of Arizona. The session was chaired by Eric Roos, ARS, NSSL.

Rumored threats to discontinue the U.S. cryopreservation research program seemed all the more ironic in view of the reported agreement among the twenty scientists and research administrators who participated in the Working Group's deliberations that "the application of cryopreservation techniques to plant germplasm is extremely desirable and worthy of unified program support and rapid implementation." Despite the sobered atmosphere, the NPGC Group hammered out an interim report to the NPGC on the current state-of-the-art of cryopreservation of plant germplasm material and recommended a framework for research needs and implementation.

The Working Group recommended

two basic project components to the NPGC: (1) research techniques, genetic conservation, and associated activities; and (2) a pilot project to bring research to a practical fruition. The report recognizes that plant materials, or combination of materials such as seed, pollen, apical meristems, callus, cell suspensions, etc., are all potentially important in providing the best overall scheme for preserving germplasm of specific species or genotypes. It was further recognized that some materials have been sufficiently researched that they can be placed immediately into a pilot project, e.g., many orthodox seeds, some orthodox pollens, and cold hardy buds, while other materials require considerable more research, e.g., recalcitrant seeds, fresh tissue, callus, and cell suspensions.

The report also included a table identifying plant material types and areas of research and implementation for each.

According to the working group, a specific implementation plan will have to be established which would require matching available resources to prioritized needs. The working group's preliminary estimate is that short-term research would require four to five science years; long-term research, two to three science years; and implementation, two to three science years annually. Since time required to satisfy individual objectives will vary considerably, some science year overlap from area to area is anticipated.

Proposed cuts in the cryopreservation research program would, warned the Working Group report, "result in the loss of trained personnel, program impetus, and in at least one case—a loss of biological material that took 2-5 years to develop." The Working Group, therefore, urged the NPGC to act expeditiously on the proposed cryopreservation projects.

The Working Group, chaired by Stanwood, included Roos, Anderson, Towill, C. Stushnoff from Canada, and K. W. Leonhardt, University of Hawaii.

**Cryopreservation generally refers to preservation at minus 196 degrees Celsius, the temperature of liquid nitrogen (LN₂). The basic concept of LN₂ preservation is that, at this temperature, all metabolic processes in seeds are essentially stopped and held at suspended animation. Consequently, all sources of seed deterioration that are metabolically related are greatly reduced or stopped, thus providing "indefinite" preservation. According to some observers, cryogenic storage is not flexible enough to handle daily requests for germplasm and, therefore, will have limited application to working collections. The technique can serve effectively as a "back-up" to conventional storage, providing long-term storage capabilities and reducing the number of entries "working collectors" must deal with on a routine basis.*

Scientists Reap Benefits From Mexican Expedition

The most substantial evidence to date that natural introgression (gene transfer through hybridization) played an important role in the predomestication of the common bean was recently obtained in Mexico by George Freytag, a research plant geneticist with the Mayaguez Institute of Tropical Agriculture. Freytag was in Mexico to collect germplasm of *Phaseolus* (wild bean) species on the first of nine germplasm collection trips funded by the USDA Agricultural Research Service (ARS) in FY82 (see DIVERSITY, vol. I, no. I, p. 12). He and his assistant, Joseph Sullivan, of Puerto Rico's College of Agricultural Sciences' Crops Protection Department, filed a report with ARS describing two isolated sites in western Mexico where wild species of *P. vulgaris* and *P. coccineus* were found growing together "with all types of intermediates—and no sign of genetic infertilities or abnormalities—in what seemed to be completely natural habitats."

The two plant scientists consider this to be an important collection because it is the first one they have found in which these two species are growing together in a wild habitat; and which suggests that the origin of domesticated beans from wild species could have taken place "by selections in natural inter-specific hybrid populations."

Another significant "find" contributing to the overall success of the exploration occurred near Manantlan where the two plant scientists found *P. vulgaris* (wild bean) "growing extremely well in natural association" with *Zea diploperrenis* (wild corn). In and around a plot of several hundred square meters of the wild corn, Freytag and Sullivan observed the wild beans growing in an "unusually vigorous fashion and twining up the stems of the wild corn."

Their report notes that the existence of this natural association "seems to indicate that man could have adapted mixed cropping from natural habitats to his cultivated fields."

A third potentially important collection of cultivated *P. vulgaris* was found in a farmer's field near Telixlahuaca, Oaxaca, where Freytag had discovered a prevalent growth of *P. anisotrichus* several years ago. When revisiting the site on this trip, Freytag discovered the cultivated land races "unusually productive under extremely poor soil and drought conditions" and concluded that this circumstance "may be the result of introgression of *P. anisotrichus* germplasm."

Scientists may also benefit from a collection of *P. coccineus* subsp. *polyanthus* the researchers obtained from a high mountain range escarpment in Veracruz because subsp. *polyanthus* according to

the report, is very seldom found in such a truly wild habitat.

Team Accomplishes All Goals

The trip was deemed a significant success because the scientists accomplished all of the proposed exploration objectives. The combined efforts of the ARS team and those of scientists from several Mexican agricultural research institutions who accompanied them resulted in the collection of viable seed from six known species, and from three that remain to be identified, from various locations throughout Central Mexico. Freytag largely attributes the great success of the mission to this close collaboration.

The principal Mexican cooperating

institution was the National Institute of Agricultural Research (INIA). Dr. Francisco Cardenas, head genetic resources specialist at INIA, provided for field work assistance. The U.S. scientists also toured seed storage facilities at the Postgraduate College at Chapingo and visited the National Herbarium at the National University, Institute of Biology and the Institute of Botany of the University of Guadalajara.

Recommendations to USDA

As part of their final report, Freytag and Sullivan made the following recommendations to USDA based on their observations:

A. Immediate action should be taken by the Mexican people to preserve the

natural habitats where crop plants are presently found, or these areas of plant origin may be lost forever.

B. It would be highly beneficial to long-term interests of U.S. agriculture to enter into a collaborative agreement with the Germplasm Group of INIA to stimulate and assist them in this effort.

C. Efforts should be directed at collecting and ascertaining the distribution of the bean germplasm found on this exploration at the following areas:

- *P. coccineus* subsp. *formosus*-mountains around Mexico;
- Introgression of *P. vulgaris* and *P. coccineus* -Tapalpa and La Calverna; and
- Association of wild corn and beans-Sierra of Manantlan.

U.S. Germplasm Collection Team Makes Visit To USSR

An unexpected U.S. germplasm collecting expedition to the USSR last August resulted in over 400 accessions including 171 grasses and 168 legumes, as well as other forbs, tree, shrub, and berry materials. Negotiations for such a trip began four years ago after the Soviets completed a sunflower collecting expedition in the U.S. Though USDA had approved an exploration proposal by Melvin Rumbaugh, Utah State University, to collect rangeland grasses, forbs and legumes in the Soviet Union in 1979-80, the U.S. State Department cancelled the trip due to tensions over the political situation in Afghanistan at the time.

Rumbaugh was, therefore, surprised when he received a call from Eric Erickson, Office of International Cooperation and Development (OICD) in early August informing him that the expedition had been approved and that he and Kay Asay, Utah State University, should be ready to leave in mid-August. After briefings in Washington, D.C., the two scientists found themselves on their way to the USSR on August 16.

Rumbaugh said the team was received "very hospitably" and the only problems they encountered were related to the timing of the trip and the routing they were given after their arrival. Although the seasonal lateness of the trip prevented the U.S. team from taking advantage of the relative maturity of the grass species, U.S. officials decided to take advantage of the Soviet invitation in order to establish what they hope will be a continued exchange between the two countries.

Despite the timing problem and the fact that the Soviet routing for the team did not include the areas the team specifically requested, Rumbaugh feels the trip was "moderately successful" and antici-

pates that the materials collected will prove beneficial to U.S. scientists. Rumbaugh and Asay collected more than eighty genera from the southern parts of the USSR to which they were routed. Collection sites included Stavropol, Elista, Kherson, Tashkent, and Leningrad. At Leningrad, the scientists visited the Vavilov Institute, the major germplasm collection, storage, and research institute in the USSR which, according to Rumbaugh, is comparable to U.S. plant introduction stations. The U.S. team received some of the accessions they requested from the Institute, including *Medicago* and several other grass genera.

Negotiations for future expeditions should emphasize more appropriate scheduling to coincide with prime collecting seasons, suggests Rumbaugh. He also recommends that a possible USDA-Vavilov Institute joint expedition should be planned during which both teams could go into less inhabited field areas and camp, rather than being transported back to hotels each night as the Americans were on this trip.

More specifically, Rumbaugh recommends that the U.S. should send a team to the USSR in October to collect species which adapt well to desert areas. Rumbaugh was told that the Soviets have identified more than 150 ecotypes of the desert species *Kochia prostrata*, whose seed matures in the month of October. The Soviets have "a wealth of material that would do well in the Southwestern U.S.," according to Rumbaugh.

The USDA, through the offices of the Agricultural Research Service and OICD, provided transportation and per diem expenses for the U.S. team, while the Soviets provided for travel within the USSR and other expedition expenses.

Crop Advisory Committee Highlights

■ **The Alfalfa Crop Advisory Committee (CAC)** met on October 5 in Ames, Iowa in conjunction with the NC-83 meeting. Preparation of an alfalfa germplasm enhancement plan was the major discussion topic, as well as further discussion of the germplasm evaluation proposal. Contact: W. Skrdla, (515) 294-3265

■ Quentin Jones, Assistant to the Deputy Administrator for Germplasm, approved the membership for the **Clover and Special Purpose Legumes Crop Advisory Committee** submitted by the Eighth Trifolium Conference. The CAC members are to represent various genera and species, U.S. regions, seed production, and nitrogen fixation. Contact: R. R. Smith, (608) 262-9752.

■ **The Cotton Crop Advisory Committee** identified maintenance of currently held accessions as its top priority at an organizational meeting on June 8 in San Antonio, Texas. Maintenance of material in Phoenix, Ariz., continues to be a major problem (because of the photoperiod requirement) requiring use of the Winter Cotton Garden, in Tecoman, Colima, Mexico. The Committee has developed a five-year plan for cotton germplasm which includes acquisition, maintenance, evaluation, and enhancement activities, as well as assessing data management requirements. A second Cotton CAC meeting was held during the week of September 20 in conjunction with the RRP S-7, Preservation and Utilization of Germplasm in Cotton workshop and Cotton Breeding tour. Contact: R. R. Bridge, (601) 686-9311.

■ Deliberations at the Grass Breeders Work Planning Conference at Pennsylvania State University, July 7-8, resulted in

a decision to recommend establishment of four **Forage And Turf Crop Advisory Committees: Arid/cool, Arid/warm, Humid/cool, and Humid/warm.** Representatives from the Soil Conservation Service (SCS) and the Bureau of Land Management (BLM) will be asked to participate in these committees. based on their involvement in foliage breeding. Contact: R. Barker; (701) 663-6445, D. Dewey, (801) 750-3078.

■ The **Maize CAC** Plan for Preservation and Utilization of the Latin American Maize Accessions submitted to the NPGRB last year was received very favorably by the Board. which requested that ARS initiate action on the proposal. ARS redirected 540,000 of FY 1982 funds to assess alternate approaches and initiate planning that would lead to accomplishment of two major objectives:

1. A complete inventory, with "passport data" documentation of all Latin American maize collections. CIMMYT (Mexico). INIA (Mexico). ICA (Colombia). PCIM (Peru). and NSSL. (USA).
2. Increase and evaluation of accessions to provide adequate amounts of seed for duplicate safe storage (Mexico/USA, Colombia/USA, Peru/USA. CIMMYT/USA) and minimum descriptor evaluation data.

The next meeting of the Maize CAC is tentatively scheduled for early December in conjunction with the ASTA Corn and Sorghum Research Conference in Chicago. Contact: M. Goodman, (919) 737-2534; W. Brown, (515) 245-3587.

■ A meeting of the **Phaseolus CAC** has been tentatively scheduled for the week of January 10 1983 in conjunction with the W-150 meetings in Scottsdale. Ariz. Major topics will be finalization of both a germplasm evaluation proposal and a germplasm enhancement plan. Following the CAC's last meeting. the Bean Improvement Cooperative was surveyed to determine descriptor evaluation priorities. Contact: G. Freytag. (809) 832-2435.

■ Membership recommendations, based on deliberations of the American Society of Sugarbeet Technologists (ASSBT) and USDA scientists and curators. are forthcoming for the **Sugarbeet Crop Advisory Committee.** Pending approval of the Sugarbeet CAC nominees. a first meeting is tentatively scheduled for February 24, 1983 in association with the Biennial ASSBT meetings in Phoenix. Ariz. Contact: D. Doney (801) 750-3059.

■ The nominations submitted by the National Sunflower Association Board of

Directors for membership on the **Sunflower CAC** have been approved by Quentin Jones, Assistant to the Deputy Administrator for Germplasm. The group's first meeting is tentatively scheduled in conjunction with the National Sunflower Association Convention in Minot, N.D. in January 1983. Contact: I. Kleingartner. (701) 224-3019.

■ The **Oat CAC** met in June during a combined American Oat Worker's Conference and the First International Oat Research Workshop. Citing recent findings of the National Research Council report on "Diet, Nutrition, and Cancer" that the daily diet should include whole-grain cereals, the Oat CAC noted that oats are unique among cereal grain., especially with regard to nutritional properties and diversity of crop utilization.

The Committee reported that essentially all oat genetic research is conducted by state and federal workers at public institutions with very limited private sector oat breeding efforts. Therefore, the entire oat improvement effort from genetic research through germplasm enhancement and varietal release is primarily the responsibility of public agencies, and there is no basis for anticipating any change in the decades ahead. Citing a need for a coordinated national oat germplasm enhancement program, the Oat CAC stressed the need to capitalize on the strengths of industrial programs throughout the country and noted that material enhanced for one location may not be adapted to another geographic area.

The group called for specific enhancement programs to be coordinated by a team of oat workers at each germplasm

evaluation site under the overall leadership of a Germplasm Enhancement Coordinator. Aberdeen, Idaho was proposed as the core site for the oat germplasm enhancement program and the critical need for an oat cytogeneticist on the enhancement team was stressed. Germplasm evaluation priorities were also realized. Contact D. Wesenberg (208) 397-4181

■ The **Peanut CAC** held its first meeting July 13 in Albuquerque. N.M. in conjunction with the American Peanut Research and Education Society (APRES). As their top priority, the Committee members recommended that a full-time curator be named to maintain peanut germplasm, and that this position be located at Experiment, Ga. The curator will be responsible for all cultivated and seed producing material as well as coordinating maintenance of the wild material and its reproduction. By consensus, the group adopted the standard groundnut descriptors developed by the IBPGR and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Working Group as "core" descriptors for the Germplasm Resources Information Network. Noting the Importance of lowering production costs while improving quality, the Committee ranked micotoxins, leafspots, and quality factors as germplasm evaluation priorities. An evaluation proposal, as well as a germplasm enhancement plan. are now being finalized. The Committee reaffirmed that germplasm collection in South America remains a high priority and determined that funding will be required for the exploration of South America, Central America. Southeast Asia. and South Asia. Contact: J. C. Wynne, (919) 737-3281.



Photo by Dave Carlson

Rockefeller Foundation Helps Chinese Establish Germplasm Center

The Rockefeller Foundation is assisting the Chinese Academy of Agricultural Sciences (CAAS) in establishing a national long-term germplasm storage facility for the People's Republic of China. The facility—also referred to as a “national plant genetic resources center”—will carry out a broad range of activities that includes collecting, evaluating, cataloging, preserving, and distributing seeds and other plant genetic materials. The center will be located in Beijing (Peking).

Dr. Clarence Gray, Associate Director for Agricultural Sciences at the Rockefeller Foundation (RF) and the RF officer in charge of the project, sees the center as “the linchpin for building an effective nationwide program in China” and the catalyst for accelerating the participation and support of the provincial academies.

System Destroyed During Cultural Revolution

The decision to build the long-term storage facility is part of an extensive CAAS campaign to re-establish a national germplasm system in China that was essentially destroyed during the 10-year Cultural Revolution. Prior to that epoch, which ended in 1977, the Chinese had collected over 200,000 accessions representing more than forty field crop varieties.

In 1978, the CAAS, under the authority of the Ministry of Agriculture, established the Crop Genetic Resources Institute (CGRI) as a national germplasm research center, to provide leadership in resurrecting the major program begun by the Chinese in the 1950s to collect, conserve and use the country's vast plant genetic resources. (The Institute currently oversees eight specialized laboratories that conduct research on seed storage; evaluation for pest resistance; physiology-biochemistry and genetics; plant introduction; and rice, wheat, sorghum/millet, and maize/legume germplasm.)

In 1979, the CAAS held a national meeting on crop germplasm which brought together representatives of the provincial academies and other concerned groups. The participants agreed upon a division of responsibilities for the germplasm activities conducted by the CGRI specialized laboratories, the provinces, and the regional experiment stations.

“The founding of the CGRI and the holding of the national meeting marked a new phase of work on plant genetic resources in our country,” said CGRI Deputy Director, Y. T. Xu.

An initial collection effort to revive the system following the national meeting

resulted in the accumulation of 250,000 to 300,000 crop germplasm accessions.

With calculations that plant germplasm accessions would number more than 400,000 within ten years, Chinese officials realized that the country's already overburdened germplasm storage capability had to be expanded.

The CAAS proposal in 1979 to the Rockefeller Foundation for funding to help construct a new facility and train personnel to meet these needs grew out of initial discussions between Gray, in his capacity as chairman of the board of trustees of the International Rice Research Institute (IRRI), and CAAS Vice President He Guang-Wen. The CAAS then invited Gray and John Pino, Director for Agricultural Sciences for the Rockefeller Foundation, to come to China to discuss with members of the CAAS and CGRI a wide range of mutual interests and concerns regarding China's agricultural development needs. Of the several priority needs discussed at the 1980 meeting, the participants agreed that crop germplasm—specifically a national gene bank—would be an especially appropriate area for the Rockefeller Foundation's collaboration. The utilization of plant genetic resources has been a major thrust of Foundation assistance in agriculture in Asia, Latin America, and Africa over the past several decades (see following story).

Fascination With China Spurs RF Support

One of the reasons that the Chinese considered the RF for collaboration on the project was the Foundation's “long involvement and fascination” with China that began when the RF helped to establish a medical school there in 1917, Gray said in an interview. This long history with the Foundation has, in Gray's opinion, left the Chinese with a “residual of good will and the assurance that the goals of the RF are based on bettering mankind rather than profits.”

The Foundation's particular interest in China's germplasm system dates back to a 1974 U.S. Plant Studies Group on Chinese Agriculture. The RF project was directed by the late Sterling Wortman, a former Director of the Rockefeller Foundation's Agricultural Sciences Program who helped establish IRRI and the Consultative Group on International Agricultural Research (CGIAR). In an unpublished report following that group's study, Wortman reported:

For thousands of years Chinese peasants have selected their crops for adaptation, disease and insect resistance, and the ability to produce despite adverse weather conditions, floods, droughts, and low soil fertility. The result is a priceless

heritage of indigenous germplasm consisting of locally adapted, variable land-race populations of many species.

RF Team Assesses Chinese Germplasm System

Following the CAAS-RF agreement to collaborate on the construction of a germplasm facility, a six-man Rockefeller Foundation team, led by Pino and Gray, visited selected locations in China in 1980. Their mission was to observe current germplasm conservation and use programs and to develop a course of action that could lead to a national seed storage facility under the direction of the CAAS. Other members of the team included T. T. Chang of IRRI; Bruce Gibbs, Commonwealth Scientific and Industrial Research Institute; and RF staff members Norman Borlaug and Kenneth Rachie.

Noting the rapid growth and modernization of agriculture and industry in China, the team concurred with many Chinese agricultural specialists who viewed the collection and preservation of traditional landraces of crops and their near relatives as “urgent and critical.” “Utilizing the genetic diversity existing in the landraces of China is essential for China to achieve and sustain future high levels of crop production required for feeding its burgeoning population and for accelerating national economic development,” they asserted in a report filed upon their return. The team also agreed that without such a system, the Chinese “would be unable to be knowledgeable, fully cooperative participants in international germplasm exchange programs.”

The team members observed “valiant and enthusiastic” efforts to reestablish germplasm conservation activities at each location visited, according to the report. They agreed, however, that China's size; the volume and diversity of its crop genetic resources; the relative remoteness and isolation in certain areas; as well as the existing constraints to the expeditious movement of plant materials, information and personnel “pose special problems in designing and building a national system to conserve crop germplasm.”

The RF report concluded that it was “crucially important for the CGRI to secure and operate a national plant genetics resources center with adequate long-term seed storage facilities.” The team suggested that Rockefeller Foundation assistance in the areas of manpower training and facility design would be the most helpful way the Foundation could contribute to the initial stages of the project.

Rockefeller Foundation Vice President Laurence Stifel signed a Memorandum of Understanding with the Chinese in 1981 to develop a "master plan" and cost estimate for the design of the genetics resources center. Kiang Chao-Yu is the CGIAR/CAAS official heading the seed storage laboratory project for CGIAR/CAAS. Gray said that after this plan is completed, the Foundation may agree to additional cooperative efforts to assist on the project.

Program Nears Design Phase

A group of CAAS and RF engineers and technicians recently returned from a

visit to IRRI where they studied the technical and management features of that system. Dr. T. T. Chang, Chairman of the IBPGR-IRRI Rice Genetics Resources Program, serves as an advisor to the project. Other Chinese officials are currently assessing the capabilities of the National Seed Storage Laboratory in Fort Collins, Colo., as well as other facilities in European countries in order to gain an understanding of the state-of-the-art of germplasm storage before the final design is chosen by the project architects.

Members of the CAAS and CGIAR are now in the process of making a final decision on the exact location in Beijing for the facility, Gray said. When that decision has been finalized, the Founda-

tion will move on to the actual design work. Gray, who recently returned from a series of meetings with officials in China, said the group had decided that the RF should do the basic design which will then have to be translated into Chinese.

Gray also described a whole range of training levels the RF is providing for Chinese personnel involved with the germplasm project. Five Ph.D. candidates are currently attending U.S. schools. In addition, the Foundation plans to sponsor short-term non-degree specialized training at IRRI and other locations, as well as provide computer training after a data system for the Chinese germplasm center has been chosen.

Rockefeller Foundation Has Long History Of Support For Germplasm Research

The Rockefeller Foundation has appropriated over \$350,000 since 1972 for activities supporting world germplasm collections. In addition to supporting the establishment of the Consultative Group on International Agricultural Research (CGIAR) and the International Board for Plant Genetic Resources (IBPGR), the Foundation has contributed to preservation and collection efforts involving halophytes, rice, palms, sorghum and millets, conifers, leguminous trees, soybeans and *Amaranthus*.

Prior to 1972, the Foundation contributed to the development of many of the International Agricultural Research Centers (IARCs) now overseen by CGIAR. The first of these, the International Rice Research Institute (IRRI) was established in cooperation with the government of the Philippines in 1960. A major focus of the research currently conducted by the IARCs is germplasm collection and preservation.

As well as funding world germplasm collection efforts, the Rockefeller Foundation supports various agricultural research projects under the Foundation's "Conquest of Hunger" program. Projects receiving support under this program in 1981 included:

- International Maize and Wheat Improvement Center (CIMMYT), Texcoco, Mexico-for programs to develop superior maize and wheat germplasm (\$400,000).
- International Rice Research Institute (IRRI), Los Banos, Philippines-for developing and promoting improved strains of rice (\$150,000).

- International Center of Tropical Agriculture (CIAT), Cali, Colombia for research on developing new genetic strategies for stabilized blast resistance in rice (\$17,000).
- North Carolina State University, Raleigh, North Carolina-for use by the School of Forest Resources for surveying and evaluating the germplasm of potentially useful conifers of Central America (\$8,500).
- University of Arizona, Tucson, Arizona-for collecting, evaluating, and preserving germplasm of potentially useful halophytic plant species (\$35,000).
- University of California, Davis, California-for research on durable pest resistance in crop plants (\$50,000).
- University of Colorado, Boulder, Colorado-for research on the molecular basis of disease resistance in plants (\$29,589).
- University of Florida, Gainesville, Florida-for use by the Agricultural Research and Education Center, Homestead, Florida-for developing *in-vitro* methods for the improvement of bananas as basic food crop (\$30,000); and for use by the Institute of Food and Agricultural Sciences-to develop *in-vitro* cellular methodologies for breeding peanuts and cowpeas (\$29,925).
- University of Illinois, Urbana, Illinois-for use by the Department of Agronomy to explore and evaluate germplasm of the wild relatives of the soybean (\$5,900).
- University of Kentucky, Lexington, Kentucky-to continue research on mechanisms of induced systemic resistance in plants (\$33,000).
- University of Minnesota, St. Paul, Minnesota-for use by the Department of Agronomy and Plant Genetics to investigate cellular methods and somatic embryogenesis in maize improvement (\$30,000).

- University of Nebraska, Lincoln, Nebraska-for use by the Institute of Agriculture and Natural Resources to develop *in-vitro* cellular methodologies for breeding sorghums (\$30,000).
- University of Wisconsin, Madison, Wisconsin-for continued research on the physiology of induced resistance in plants (\$35,000).

The Foundation plans to conduct a formal review of the "Conquest for Hunger" program this year to reassess program goals and direction. One of the issues the RF plans to consider, according to Rockefeller Foundation President Richard Lyman, is how current breakthroughs in biotechnology ("genetic engineering"? will impact agricultural research and production.

Applications for RF Grants

No special form is required in making requests for Rockefeller Foundation aid. An application, from an individual or an institution, should be addressed to the secretary of the Foundation or to the director for the division in which the proposal would seem to fall at 113 Avenue of the Americas, New York, New York 10036.

The application should contain a brief description of the project and show the special qualifications and accomplishments of the person or persons who would undertake to carry it out, according to guidelines issued by the Foundation. In addition, applications should include a comprehensive plan for the funding of the project both during and, where applicable, after the proposed grant period.

The criteria for evaluation are: relevance of the project to the Foundation's program objectives and potential for contributing significantly to the well-being of mankind; extent of the applicant's effort to secure additional and subsequent funding from other sources; and the applicant's record of achievement.

IBPGR Sponsors Data Training Course In U.S.

The International Board for Plant Genetic Resources (IBPGR) held a training course on Documentation and Data Management for Plant Genetic Resources in the United States last August. The course was organized in cooperation with the United States Department of Agriculture, Beltsville Agricultural Research Center, which assisted in the provision of both facilities and personnel.

The course was designed to cover many aspects of germplasm data management, including: (1) the overall importance of documentation at a national and international level; (2) the importance of the use of standard descriptor lists; (3) manual documentation systems; (4) an introduction to micro-computers and computerized documentation systems; and (5) the interaction of data management with all areas of plant genetic resource work.

The course was presented as a series of lectures and workshops which were complemented by visits to relevant local facilities and laboratories. Course presentations included lectures on:

- the genetic resources information system in the U.S.;

- the use of germplasm to the plant breeder;
- the USDA Plant Introduction Office;
- USDA small grains collection; and
- variety registration in the U.S.

Participants in the course came from Spain, Colombia, Sierra Leone, Pakistan, Indonesia, India, Cyprus, and Ghana. Several of the Board's own officers also participated in the course so that they might better coordinate and advise on the documentation of genetic resources throughout the global network.

Courses on documentation are needed at all personnel levels, including administrative, scientific, and technical, according to IBPGR officials. Because of the general lack of training in the area of plant genetic resources work, the IBPGR structured the course so that further training sessions could be modeled on it. The structure of the IBPGR course allows for all sections to be given (e.g., to scientists who are actually working with germplasm data) or for only a few sections to be used as an introduction to the subject (e.g., to directors of research institutes). In addition, the course is not dependent on locality but is sufficiently flexible so that it can be considered a "roving seminar" and hence can be given in most global regions or countries.

of-the-art of tissue culture techniques in germplasm storage, chaired by Rockefeller Foundation Fellow Judith Lyman. Technical presentations included papers on: "The Role of *In-Vitro* Techniques in Germplasm Preservation," by E. A. L. de Langhe, Catholic University, Leuven, Belgium; "Acquisition and Exchange-Phytosanitary Requirements," by W. R. Rota, International Center of Tropical Agriculture (CIAT), and the results of a survey of the current activity and needs in the application of tissue culture techniques in germplasm storage by L. A. Withers, University of Leicester, England.

IBPGR Executive Secretary Trevor Williams set the tone for the joint workshop by offering the international group of plant scientists, researchers, and educators a challenge: "We're looking for vision; if it's not present in this room then we should all pack up..."

No one packed up, and Williams and the nine-member IBPGR Working Group on Tissue Culture,* charged with advising the Board "on all aspects of *in-vitro* culture for genetic conservation," seemed pleased, if exhausted, with their efforts by week's end. Those efforts resulted in a set of interim recommendations for the Board to consider when it convenes in 1983. At that time, the IBPGR will formally release the recommendations and announce any agreed-upon implementation strategies.

Both de Langhe, who chaired the Working Group, and Williams expressed gratitude to the NPGC and Quentin Jones, Assistant to the Deputy Administrator for Germplasm and the U.S. member on the IBPGR, for organizing the international workshop on germplasm conservation techniques. "This cross fertilization of ideas will benefit both U.S. and IBPGR germplasm preservation efforts," said Williams.

In addition to de Langhe, Williams, Withers and Rota, the Working Group included B. J. Finkle, Western Regional Laboratory, USDA; A. N. Rao, National University of Singapore; Oded Rueveni, Agricultural Research Organization, Israel; Akira Sakai, Hokkaido University, Japan; and W. R. Snowcroft, Division of Plant Industry, Australia.

A similar IBPGR Working Group completed a report on seed storage for the International Board earlier this year (see DIVERSITY, vol. I, no. 2, p. 4).

* *Tissue culture refers to the use of "in-vitro" methods for long-term storage of germplasm that cannot be preserved in storage using conventional techniques. The technique is based on introducing explants, callus or cell suspensions from plants of vegetatively propagated, mature perennials and plants with recalcitrant seeds (or from seeds) into sterile culture in order to maintain them in a secure, pathogen-free environment so as to be available for future use.*

IBPGR Sponsors Soybean Meeting In U.S.

The International Board for Plant Genetic Resources (IBPGR) held an expert international Working Group meeting last summer on the genetic resources of soybean and its wild relatives. The August 9 meeting was hosted by the International Soybean Program (INTSOY) at the Urbana campus of the University of Illinois. Members came from Japan, Australia, South Korea, Nigeria, and the United States. The IBPGR was represented by IBPGR Executive Secretary Trevor Williams and by U.S. member Quentin Jones, who acted as chairman. Staff from INTSOY, the University of Illinois, and USDA also attended.

The group reviewed existing collections world-wide, assessed how comprehensive these are, and identified priority areas for field collecting. Members put strong emphasis on the wild perennial species from Australia. A number of important recommendations were made which, according to Williams, will provide the framework for a five-year IBPGR action plan. At present, the report is restricted pending discussion and endorse-

ment by the IBPGR at its upcoming meetings in November 1982 and February 1983.

In addition to the five international Crop Advisory Committees that advise the Board on rice, maize, sorghum and millets, phaseolus, and wheat, the IBPGR has established seventeen other *ad-hoc* Working Groups on specific crops since 1977. These include banana, beet, *Capsicum*, cassava, coffee, cruciferous crops, groundnut, lupine, sweet potato, taro, *Theobroma*, winged bean, yam, barley, *Citrus*, sugarcane, and *Vigna* species.

International Advisory Group Reports On Tissue Culture

International Board of Plant Genetic Resources (IBPGR) activities in the United States last summer culminated with an August 1620 workshop in Fort Collins, Colo., sponsored jointly with the U.S. National Plant Germplasm Committee (NPGC) on "The Application of Tissue Culture and Cryogenic Storage Techniques in Preservation of Crop Germplasm." (See story p. 11.)

The week-long workshop began with a presentation of papers detailing the state-

Politics And Economics Of Genetic Diversity

by David Wm. McClintock

It may seem presumptuous for a political scientist to venture into print in the "hard science" area of genetic diversity. However, many of the challenges faced by government and private scientists in the area of species preservation are more political than scientific in nature. The tendency to look for solutions within the scientific community probably can be explained by the fact that little understanding of the diversity problem exists in other circles. Species loss may be occurring at a rate that alarms knowledgeable observers, but it is hardly a visible or imminent threat to the uninitiated. Unfortunately, so many environmental and resource "crises" have surfaced in this complex final quarter of the twentieth century that both governmental decision makers and the public at large are at an overload stage. Even the best policy intentions regarding global resources and our implicit obligations to future gene generations frequently must give way to concern for more visible and immediate problems. Let's take a closer look at the germplasm conservation challenge in this latter context.

Technical and Institutional Challenges

On the technical side, we must be concerned with locating, identifying, collecting, storing and exchanging plant (as well as animal and microbial) specimens. Since financial resources always will be less than what is needed for the job, scientific judgements will have to be rendered on what is to be saved. Technical expertise will have to be applied to the tasks of building adequate data storage and retrieval systems, assigning priorities to *in situ* vs. *ex situ* maintenance and to countless other decisions that will determine how much diversity limited resources will buy. In one sense, it is comforting to realize that many of these challenges can be met with existing knowledge. However, we may be over-focusing on this technical side while forgetting (or trying to forget) how many of the challenges reside outside the comparatively comfortable world of science.

The recent Strategy Conference on Biological Diversity (see DIVERSITY, vol. I, no. I, p. 21) provided ample evidence that the most vexing problems are institutional, financial, administrative or legislative, or a combination of the foregoing. On the institutional side we have an impressive but far from perfect National Plant Germplasm System on the domestic level. Globally, the Consultative Group on International Agricul-

tural Research and the FAO-based International Board for Plant Genetic Resources have made impressive contributions to the germplasm conservation cause. Frankly, however, the international "system" is more a patchwork of organizations, only some of which are living up to their individual potential. Internationally, communication among conservation entities-to the extent it takes place at all-tends to be more horizontal than vertical. For example, plant breeders, national repositories, and university-affiliated experiment stations all facilitate the process of collecting, storing and exchanging germplasm; however, the tendency is to accomplish this laterally through similarly structured organizations. Despite the totally symbiotic relationships among plants, animals and microbes in the natural world, communication on genetic diversity problems is tenuous across these man-made dividing lines. This leads to the conclusion that now, and in the immediate future, collegial interaction among individual scientists constitutes the real international network for conservation activities. Indeed, in the absence of communication and exchange of specimens at this individual scientist level, the international system would be woefully inadequate.

The "Money Problem"

The proposition that preserving genetic diversity is more of a politico/economic than a scientific challenge relates not only to the above-mentioned institutional problems but also to a resource scarcity which is familiar to all institutions-money. While the seed industry generates enormous revenues, their partial re-investment in conservation understandably is in the area of commercially valuable species. Numerically speaking, however, most of the species requiring protection are not commercially valuable at present. The major domestic and international conservation mechanisms, therefore, end up being quasi-governmental in both structure and operation because of this non-profitability factor. The money problem looms even larger when one considers the many competing priorities for government spending projected for the 1980s and 1990s and the budgetary pressures confronting developed and developing nations alike. Regardless of the governmental system or developmental stage, political decision makers in every nation have a tendency to focus on visible, immediate problems that are occurring "on their watch." Preserving genetic diversity may be extremely important for Mankind over the long term, but it is difficult to convince non-scientist policy makers with a full platter of visible problems why this one is of

comparable importance.

Political Ramifications

Obtaining funding for communications and data facilities and for institution-building is difficult enough, but on the international plane there are additional-essentially political-problems that will affect the basic decisions as to how these institutions will be structured. There appears to be an emerging difference of opinion between the few developed nations now carrying the conservation burden and certain developing nations having diverse and primitive plant species in need of collection as to whether storage should be centralized or diversified, and whether cooperation should be enhanced through a series of bilateral national agreements or a single universal convention or protocol. The first option; i.e., the existing system, provides more viable funding sources, political and (hence physical) security for collections, and puts specimens within arm's reach of highly-trained scientists. On the other hand, the developing nations argue they are relinquishing specimens that in many instances will be returned only with the good will of the repository nations, or that serve mainly to support hybridization efforts by seed companies enjoying patent protection and currently monopolizing the world trade in "improved" varieties. The practical issue at stake is not who is right, but rather how will these views be resolved and what institutional arrangements will emerge? Realistically speaking, a significant part of this ongoing dialogue at the nation-to-nation level will occur between governmental representatives who are not trained geneticists.

Communication: The First Step Toward Resolution

It is easy enough to catalogue bureaucratic challenges but, more difficult to suggest ways in which they can be overcome. With the diversity issue, many of the approaches will involve patience and a slow rate of return on investment. For example, the task of educating non-scientist policy makers necessarily must occur over a long period of time. Newsletters such as this one, if distributed to a wide enough audience, could help considerably. Likewise, communicating through newspapers and other media such as television and popular periodicals would make the issues more understandable to non-scientists.

With regard to institutional support and funding on both the domestic and international levels, the U.S. Congress is a potentially valuable ally whose services are not adequately sought. Several members of Congress and many staffers are surprisingly well-informed about the

diversity problem and are ready to help. Plant scientists represent the agriculture industry and hence a larger constituency than they may realize; thus better communication and strategy-formation efforts on Capitol Hill should lead to good results.

The problems of organizing the recent Strategy Conference on Biological Diversity underscore the difficulties of communicating among scientists across the boundaries of the plant, microbial and animal spheres, and in linking domestic

with international activities simultaneously *within* each sphere and across the three. A chart produced by this author for the conferees' use in reviewing what institutions are now operating in this global macro-system revealed that it is indeed a patchwork affair. Accordingly, it is worth remembering that the United States already has a viable plant germ-plasm system built on the more than century-old land grant university base. We thus have a working mechanism that can be applied as easily to politico-

economic challenges as to scientific ones, and an organizational model that could be used in building a better international system. It is time to start building.

David McClintock recently retired from the Department of State where he was Food and Agriculture Advisor to the Science Bureau (DES). He is currently Professor of International Relations at Berry College, Mt. Berry, Georgia, and consults on international agricultural issues.

Genetic Engineering: New Techniques And Their Potential

by Carole P. Meredith

In one sense, genetic engineering of plants is really nothing new. Since the beginnings of agriculture, when crop species were first domesticated, people have modified plants to suit their needs. In saving seed from only their best plants, ancient farmers practiced genetic selection. Systematic and scientific plant breeding began about 200 years ago and has evolved into a powerful technology. Crop plants are now deliberately improved through controlled pollinations to achieve defined objectives. But although genetic engineering is in a way as old as agriculture itself, in current usage the term refers collectively to a number of very new techniques for changing plants genetically - techniques that do not rely on pollination, but instead involve genetic manipulations at the cellular and molecular levels. Thus technology promises to be a powerful adjunct to modern plant breeding.

The history of the new technology is very brief, beginning around 1970. At about that time plant protoplasts were shown to be capable of regenerating entire plants. Other aspects of plant cell and tissue culture, such as mutant selection and protoplast fusion, were also developing rapidly, and plant scientists were beginning to recognize the potential of cultured plant cells for genetic research.

Recombinant DNA

Simultaneously, breakthroughs in molecular biology led to the development of recombinant DNA techniques by which a gene could be isolated from one kind of organism and introduced into another organism permanently changing the genetic makeup of the recipient. Within the last few years, plant molecular biologists have been able to isolate specific important plant genes and study

their structure and regulation. Research with several plant pathogens has contributed significantly to the development of techniques for transferring genes into plant cells. The simultaneous advances in all these areas are rapidly bringing together the components necessary to genetically engineer crop plants.

But what does the new technology offer that existing plant breeding technology does not? In quantitative terms, great savings in time and space are foreseen. It will become possible to engineer, in one step, a specific genetic change that would require several generations in a breeding program. Whereas existing breeding programs commonly require considerable amounts of land for planting and evaluating the progeny of each cross, plant scientists employing the new technology can grow and evaluate 100 million cells, each a potential plant, in a single small flask.

Obstacles Remain

The most awesome aspect of the new technology is certainly the vastly extended range of genetic variability that will become available to the plant breeder. No longer will a breeding program be limited to those characteristics that already exist within a species or its very near relatives. Protoplast fusion, for example, permits a breeder to use desirable traits from other species that are related to the crop, but not closely enough to permit standard crossing. Other techniques, such as mutant selection, can generate new genetic variants within a crop species. The rapidly developing recombinant DNA technology may ultimately enable us to use genes from any other organism to improve a crop.

These are dazzling notions, certainly, but the new technology is still in its infancy, and a number of major obstacles must be overcome before genetic engineering can become generally useful for crop improvement. At present, most of the new techniques are limited to very few crop species - those in which plants can be regenerated from single cells. Progress in this area is steady, however, and the list of tractable crops is growing.



Photo by Grant Matthews

Genetic changes other than those being sought often arise in regenerated plants. We don't yet know how to control this phenomenon. Some important traits - yield and flavor, for example - are extremely complex and are the net result of many interacting components. It will no doubt be quite some time before we understand these traits well enough to orchestrate them successfully at the cellular and molecular levels. Even many less complex aspects of plant function are still not well understood.

The ultimate practical value of genetic engineering will vary from crop to crop. Some major agronomic crops, such as corn, can already be engineered quite effectively as a result of highly sophisticated breeding technology that has developed around them. Genetic engineering, in the cellular and molecular sense, will be an alternative only for specific breeding objectives that cannot otherwise be achieved. At the other end of the spectrum are the crops that are difficult to breed by existing techniques, typically the large woody perennial plants. Their size, genetic complexity, and long generation time severely restrict breeding progress. With these crops, genetic engineering

has become the method of choice for many breeding objectives.

Prospects for crop improvement are expanding, not only because of cellular and molecular techniques, but also as a result of advances in breeding technology. New cytogenetic strategies enable breeders to move specific chromosomes into crop species. Crosses between distant relatives are facilitated by novel embryo rescue techniques. Isozyme technology is emerging as a powerful analytical tool for several aspects of plant breeding.

An Exciting Time

Impressive as all these new techniques

are, they are not likely to replace conventional plant breeding. They will instead be combined with the existing methods in an integrated approach to crop improvement, each technique being used when it is the most effective and economical means to an end.

The prospects for manipulating plants genetically have spurred plant scientists to unprecedented levels of activity. They are involved at all levels, from discovering new knowledge about plant genes to assessing agricultural needs. New techniques are being integrated with old in a wide range of specific crop improvement programs. For agricultural research, it is indeed an exciting time

Carole Meredith, Assistant Professor of Horticulture and Entomology at the University of California at Davis, coordinated the recent "Genetic Engineering of Plants" Conference at Davis (see brief, p. 21).

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The views expressed are not necessarily those of the editors. DIVERSITY welcomes the submission of articles by all interested parties in an effort to provide a forum for discussion of issues pertinent to the plant genetic resources community.

The Editors

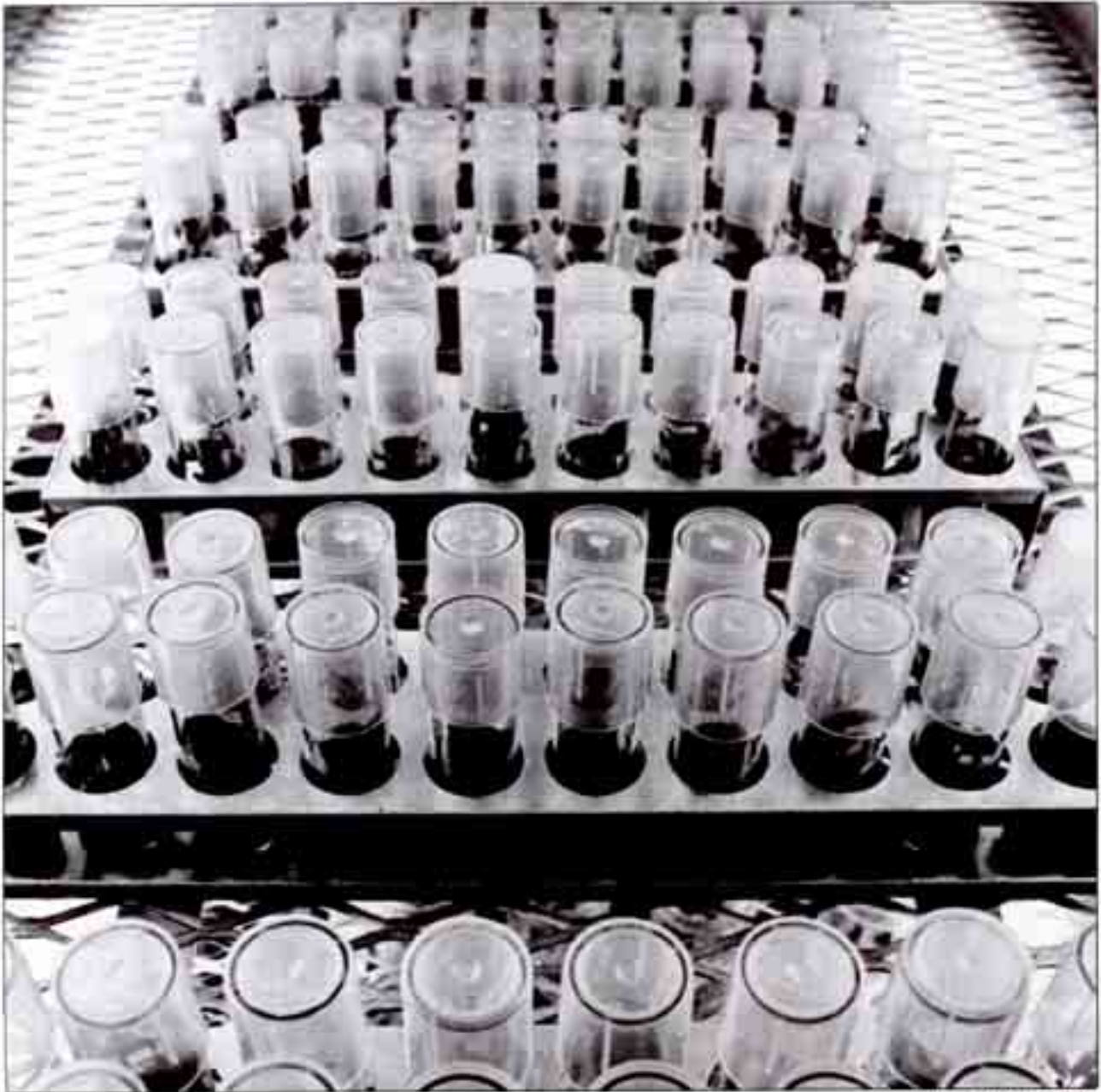


Photo © Grant Hedman

■ **An unreleased report based on a recent joint White House/Rockefeller Foundation conference on agricultural research** is expected to call for USDA to "re-establish its role of leadership" in agricultural research and stress the need for federal, state and private researchers to change the emphasis from "agricultural science to science for agriculture." According to sources, the hard-hitting report asks USDA "to assess each Agricultural Research Service (ARS) facility to determine its utility to the mission of ARS" and on that basis -Decide to: retain the facility under ARS; turn the facility over to the host state with federal funding for a specified period on a declining basis; sell the facility to a public or private university or private industry; or close the facility.

The White House and Rockefeller Foundation plan to distribute the report widely. The report should be finalized by November.

■ **The Plant Variety Protection (PVP) Board, an advisory group to the Secretary of Agriculture on the Plant Variety Protection Act, met in Washington, DC.,** September 28 and 29 to report on plant variety protection (PVP) status; review the PVP office; develop measures to make PVP self-funding; consider changes in reciprocity arrangements with other countries; and consider a change in regulation to conform to the International Union for Protection of New Varieties of Plants by extending the eligibility period as it applies to foreign varieties. For details, contact: Kenneth Evans, Executive Secretary, Plant Variety Protection Board, National Agricultural Library Building, Beltsville, MD 20705 (301) 344-2518.

■ The Man and the Biosphere (MAB) program sponsored an **International Symposium and Workshop on the Application of Genetics to the Management of Wild Plant and Animal Populations** in Washington, D.C. last August. The purpose of the 5-day symposium was "to transfer current scientific data and state-of-the-art technical applications that can be used to update and improve biological resources management." The sponsor's intent was "to short cut the decades normally required for such information to filter from academic circles to the remote field locations where resources management actually takes place." Included in the over 50 presentations given were papers on "The Place of Management in Genetic Conservation" by Sir Otto Frankel, Australia; "Some Merging Plant Populations," by Jack Harlan, University of Illinois; and "Extinction of Annual Plants" by Subodh Jain, University of California. For further information, contact Christine Schonewald-Cox, Div. of

Natural Sciences, National Park Service-494, Dept. of the Interior, Washington, D.C. 20240 (202) 523-5139.

■ Representatives from the United Nations Food and Agriculture Organization (FAO) and the International Agricultural Research Centers (IARCs) met at International Center of Tropical Agriculture (CIAT) last June for an **International Consultation on a System for Safe and Efficient Movement of Germplasm.** The meeting focused on a study of the current phytosanitary measures adopted at the IARCs and the plant quarantine services of their respective host countries. For further information, contact Douglas Laing, Director for Crops Research, CIAT, Apartado Aereo 6713, Cali, Colombia.

■ Quentin Jones, Assistant to the Deputy Administrator for Germplasm, and Wilfredo Salhuana, Pioneer Hi-Bred International, Inc., returned October 2 from meetings in Colombia and Peru with agricultural officials to make arrangements for **regeneration, maintenance, and evaluation of Latin-American maize** collections and to negotiate a backup set of these collections for the U.S. National Plant Germplasm System. This activity was recommended by the Maize Crop Advisory Committee, chaired by William L. Brown, Pioneer Hi-Bred International, and agreed to by the National Plant Genetic Resources Board.

■ **The Council for Agricultural Science and Technology (CAST) awarded the first Distinguished Achievement Award in Food and Agricultural Science to Norman Borlaug** for his "many contributions to improving food production around the world." CAST represents 25 of the major scientific societies in food and agriculture. The presentation was made at the organization's tenth anniversary ceremonies in Ames, Iowa on July 29. Borlaug won the 1970 Nobel Peace Prize for his development of the "miracle wheats" which contributed significantly to the "Green Revolution." He is currently working with the International Maize and Wheat Improvement Center (CIMMYT).

■ Plant Inventory (PI) documentation was completed on 12,792 items during 1981, according to the **annual Germplasm Resources Laboratory Report to the Regional Technical Committees.** In addition, 9,567 items were received from foreign sources and the bulk forwarded to NPGS curators or cooperators. The U.S. sent more than 800 items to 56 foreign countries in support of Agency for International Development (AID) activities. **PI numbers were assigned** for the following 1981-June 1982 exploration/collections: *Helianthus* -Domestic (PI

468414468897); Sorghum-Yemen (PI 464942-465964) and Ethiopia (PI 452502-457915); Millets-India (PI 462383-464582); Medicago-Turkey (PI 464657-464828) and U.S./Canada (PI 467885-468057); *Arachi* subsp.-Argentina, Brazil, Bolivia, Paraguay (PI 468177-468372); Maize-Brazil (PI 466750-466853) and Paraguay (pending PI assignment); and *Cucurbita* and others-Argentina and Paraguay (PI 458652-458743).

■ Over 5,000 samples received by December 31, 1981 brought the **total of catalogued germplasm accessions in storage at the National Seed Storage Laboratory (NSSL)** to 164,099, according to the 1982 NSSL Report to the National Plant Germplasm Committee and Regional Technical Committees on Plant Germplasm. The NSSL received 325 samples of germplasm from three foreign countries through the International Board for Plant Genetic Resources (IBPGR). In addition to the catalogued accessions, the U.S. seed lab received 3,859 samples of rice seeds from the International Rice Research Institute (IRRI), according to NSSL Director Louis Bass. The facility hosted visitors from 25 states and 18 foreign countries during 1981.

■ The **weedy species** listed in the October 2, 1981, *Federal Register* (vol. 46, no. 191, pp. 4868948692) have recently been approved for inclusion in the **Federal Noxious Weed Act of 1974.** Final rules dealing with permits for handling these are currently being written and may become regulated by the end of the year. **The Technical Committee for the Evaluation of Noxious Weeds (TCENW)** is also compiling a list of additional species for possible inclusion in the Act. USDA Plant Introduction Officer George White says it is now estimated that the total listing will encompass 800 to 900 species. "An efficient permit system will be necessary to avoid undue delays in moving germplasm included in the Act," according to White. For more information, write: C. R. Gunn, TCENW Secretariat, Plant Exploration and Taxonomy Laboratory, Bldg. 265, BARC-East, USDA Agricultural Research Center, Beltsville, MD 20705.

■ **The fast implementation phase for the Germplasm Resources Information Network (GRIN) began in August** with a preliminary installation at the W-6 Regional Plant Introduction Station (RPIS) at Pullman, Wash.

GRIN has been developed as a cooperative project between USDA/ARS and the Laboratory for Information Science in Agriculture (LISA). The program was initiated as the Germplasm Resources Information Project (GRIP) in 1977 (see DIVERSITY, vol. 1, no. 1, p. 17). Quentin Jones, Assistant to the Deputy

Administrator for Germplasm, serves as coordinator of the project that is staffed with technical team members from LISA and the USDA Economic Botany Laboratory.

The information network will serve the germplasm user community by providing tools and mechanisms to register accessions as they enter the National Plant Germplasm System (NPGS), maintain seed inventories; monitor viability of collectons, process seed orders : exchange information with other "suppliers," and generate summary reports Users with access to a computer terminal with telecommunications capability will be able to receive information on accessions (including germplasm characteristic data and location in the system) as well as request samples on a timely basis once the system is completely installed. "Completion" of a release phase at a site will mean that new terminals and software are in place. The staff has been trained, documentation is available, and critical system data has been acquired and entered. Depending upon resources, additional NPGS sites, such as the clonal repository system, will be added and system features and capabilities will be enhanced.

The recent installation at W-6 will serve as a "test case" for the system from which the LISA team may make modifications for future training, according to Steve Snyder. Head of LISA User Services

Snyder expects system modifications, necessary to make W-6 fully operational, to be completed by early 1983.

■ **The California Gene Resources Program (CGRP) has completed genetic resources assessments and management plans** for strawberry, barley and Douglas-fir genetic resources. The CGRP hopes these and future reports can serve as "models for other state or national assessments of other economically important commodities." For copies of the reports, write: California Gene Resources Program, National Council on Gene Resources, 2855 Telegraph Avenue, Suite 216, Berkeley, California 94705.

■ **What does genetic engineering offer that conventional plant breeding does not?** How can these new techniques be integrated with existing plant breeding methods for crop improvement? What limits crop productivity and quality today? These were some of the controversial questions addressed by over 700 agricultural researchers who recently attended a conference on "Genetic Engineering of Plants" hosted by the University of California, Davis (UCD) The five-day meeting, cosponsored by the UCD College of Agricultural and Environmental Sciences, the California Agricultural Experiment Station and various private foundations and companies, attempted to "realisti-

tally assess the agricultural potential of the new genetic technology" in relation to recent advances in the areas of plant molecular and cellular biology. Major topics covered included: An Overview of Crop Improvement. Genes, Vectors, Gene Structure. Somatic Cell Genetics. Crop Productivity and Quality. Challenges to Crop Improvement and a roundtable discussion on Research Priorities. Conference proceedings will be published by Plenum Press and will be available directly through the publisher in February 1983. Cost is expected to be \$70.00. Contact: Plenum Publishing Corporation, 233 Spring St., New York, NY 10013.

Research Briefs

■ **Dr. Gideon Schaeffer and associates in USDA's Cell Culture and Nitrogen Fixation Laboratory at Beltsville, Md., may be the first scientists to make a significant nutritional improvement in the seed of a major crop through tissue culturing,** according to USDA spokesmen.

New rice plants created in the USDA laboratory produce grain with 10 percent more protein than other rice varieties. The new plants also provide protein that is more "complete" for human nutrition.

The new rice has improved nutritional value because it also contains more of the "essential" amino acid, lysine, than ordinary rice, according to Dr. Gideon Schaeffer, a plant physiologist with USDA's Agricultural Research Service.

"By using plant tissue culture techniques we succeeded in finding a high-lysine rice in only a couple of years," said Schaeffer, who works at USDA's Beltsville Agricultural Research Center. "Our new selection techniques will allow plant breeders to produce new varieties much faster and much more profitably than ever before."

Schaeffer's experimental high-lysine rice plants will be cross-bred with popular varieties of rice, in an effort to transfer the ability to produce improved protein. Rice is the third largest food crop in the world. USDA predicts the technique could open research doors for similarly improving many other food and forage crops, especially when combined with new genetic engineering techniques.

■ **Seed from nine tropical plant species previously thought unsuited to storage in liquid nitrogen proved successful in tests at USDA's National Seed Storage Laboratory (NSSL), Fort Collins, Colo.**

The nine plants that survived storage in the minus 321 degree Fahrenheit liquid were: strawberry guava, passion fruit, ceara rubber, dwarf shefflera, common guava, papaya, apple of sodom, prickly poppy, and seaberry. When removed

from storage, the seeds had relative germinations ranging from 91 (strawberry guava) to 128 (apple of sodom) as a percent of control samples not subjected to the liquid. The technique enhanced the germination rate so that some, apple of sodom, ceara rubber, and prickly poppy, actually did better than seeds of the same species that were not subject to freezing before regrowing, said Phillip C. Stanwood, agronomist with the NSSL. Stanwood says properly reducing the seeds' moisture content before immersing them in the liquid nitrogen is the key to success when using the process. Stanwood cooperated with Kenneth Leonhardt, University of Hawaii, and Michael R. Becwar, former Colorado State University graduate student, in the study

■ **A new soybean line has been developed at the Asian Vegetable Research and Development Center (AVRDC) near Tainan, Taiwan.** It has been released to farmers in Malaysia.

The soybean variety, designated T30050 by Malaysian authorities, was released by the Ministry of Agriculture after extensive evaluation by the Rural Development Corporation in Sabah. AVRDC soybean breeder S. Shanmugasundaram said in trials at AVRDC, this soybean selection has given stable yields ranging from 2.0 to 3.3 t/ha. In two different trials in Sabah, where there is no local soybean cultivar, T30050 had an average yield of 2.5 t/ha. "We think this selection can make a significant contribution to Malaysia's efforts to step up soybean production," Shanmugasundaram said. The variety was chosen for its high yield and resistance to lodging, drought and occasional flooding.



AVRDC soybean breeder S. Shanmugasundaram rating new selections. Many AVRDC lines are capable of producing 3 tons per hectare or more.

■ **Strawberry plants can be rejuvenated by propagation in test tubes**, according to USDA researchers, Drs. Gene Galletta and Richard Zimmerman. Their research indicates that propagation in laboratory tissue culture increases strawberry yields, and the berries taste as delicious as fruit produced by conventional methods.

Galletta and Zimmerman of USDA's Agricultural Research Service, working with Dr. Harry J. Swartz at the University of Maryland, demonstrated last year that the technique stimulates yield increases for strawberry varieties 'Earl-glow,' 'Redchief,' and 'Guardian,' which are widely grown in the U.S. The group's research is being awarded the George M. Darrow Award for excellence in viticulture and small fruits research.

■ **Two new lines of corn with multiple disease resistance are now available** to help corn breeders increase the genetic diversity of corn grown in the U.S. Plant pathologist Herman L. Warren, ARS, who developed the new lines in cooperation with Purdue University, says the new inbred line H110 is resistant to maize dwarf mosaic virus, maize chlorotic dwarf virus, races 1 and 2 of northern leaf blight, southern leaf blight and anthracnose leaf blight. H 1 11 is resistant to races 1 and 2 of northern leaf blight, anthracnose leaf blight and stalk rot, Stewarts wilt, southern leaf blight and *Diplodia* stalk rot. For further information, contact Warren at (317) 749-6545.

Industry Briefs

■ **DEKALB AgResearch, Inc., and Pfizer, Inc., recently formed a joint venture, DEKALB-Pfizer Genetics**, for the conduct of their combined seed businesses. The joint-venture company, owned 70% by DEKALB and 30% by Pfizer, will be headquartered in DeKalb, Ill. An extensive line of agricultural seeds, including hybrids of corn, sorghum and sunflower seeds and proprietary soybean and alfalfa seeds will be offered. DEKALB-Pfizer Genetics will combine the seed research, marketing and other operations of the two companies. The joint venture will also have access to all seed applications from molecular-biological research conducted at Pfizer's Groton, Conn., Central Research facilities.

■ Private plant breeding programs have increased extensively since the passage of the Plant Variety Protection Act in 1970 and, in some cases, **the number of private breeders working on some**

major crops exceeds that of public breeders, according to a preliminary report by the National Council of Commercial Plant Breeders (NCCPB). The report is based on a survey of U.S. seed companies by Robert Kalton, Land O'Lakes, Inc. In a status report to the NCCPB annual meeting in Dallas last summer, Kalton, who serves as Vice Chairman of the National Plant Genetic Resources Board, said the preliminary findings indicate "the sophistication of many private breeding programs, including utilization of plant pathological, entomological, statistical, and genetic tools is far greater than many public researchers believe." Research expenditures by private companies total at least \$102,000,000 per year according to the survey. The NCCPB expects the final report to be completed by the end of the year.

■ **FFR Cooperative**, a seed-breeding firm in Lafayette, Ind., recently announced the **discovery of a "major gene controlling corn maturity."** According to FFR scientists, the gene causes inbred corn lines (parents of hybrid seed corn) to produce mature flowers-tassels and silks-eight to ten days earlier than normal. FFR General Manager Robert Buker hopes the mutagenic technology can be applied to developing single gene controls for standability and yield traits. Buker says hybrid corn with the new, early maturity gene could be available to farmers in 1985. For more information, contact: FFR Cooperative, 41 12 East State Road 225, West Lafayette, Indiana 47906 (3 17) 567-2 I 15.

■ **The International Plant Research Institute**, Palo Alto, Calif., and **Sine Darby Berhad**, Kuala Lumpur, Malaysia, announced the recent **formation of Asian Biotechnology, a joint venture for the improvement of crop plants.** The new company will attempt to increase the disease resistance of native crops like rice, rubber trees, and palm trees using micro-propagation and protoplast fusion and hopes to use genetics to adapt other crops like corn and soybeans to certain Southwest Asian localities.

■ The first of a 3-year **Plant Breeding Research Forum series sponsored by Pioneer Hi-Bred International, Inc.** was held August 11-13 in Des Moines, Iowa. The symposium, **"The Relationship Between Public and Private Breeding Efforts and the Outlook for Funding"** was attended by participants from USDA, State Agricultural Experiment Stations, public and private universities, funding agencies, private industry, and various foreign countries. The purpose of the meeting was to identify existing plant breeding needs and then consider how those needs can best be met under current budgetary constraints.

Announcements

A SPECIAL NOTE TO CURATORS FROM USDA: If you have not yet received a letter and questionnaire from the Office of the Assistant to the Deputy Administrator for Germplasm, USDA/ARS, regarding your interest in becoming an NPGS Curator, you are not an ARS employee, and you are currently maintaining a plant germplasm collection(s), and believe that you should become an NPGS Curator, please contact the Assistant to the Deputy Administrator for Germplasm either by phone at (301) 344-3311, (301) 344-4275, or by mail at USDA/ARS Room 415, Building 005, BARC-W, Beltsville, MD 20705. Although it is not the intention of the NPGS to proliferate germplasm curatorships, USDA does not wish to overlook any important germplasm collections which should be included in the NPGS.

INFORMATION REQUESTED: A biography of Frank Meyer, agricultural explorer for the USDA, will be published soon by Iowa State University Press. The author needs information regarding the location of surviving Meyer introductions or plants derived from Meyer introductions. Please send data to: Isabel Cunningham, 212 Wardour Drive, Annapolis, MD 21401, or call collect (301) 268-2384.

CORRECTION: A reference to John Patrick Jordan in DIVERSITY, vol. 1, no. 2, p. 8, should have listed Jordan's affiliation as State Agricultural Experiment Station (SAES) Director, Fort Collins, Colorado. Representatives of SAES and the Cooperative State Research Service (CSRS) have appointed Clarence Brogan, CSRS, to write an article on the significant contributions made by CSRS and SAES to the National Plant Germplasm System in a future issue of DIVERSITY.

Discussions followed the presentation of position papers by: Robert Hougas, University of Wisconsin; Virgil Johnson, USDA/ University of Nebraska; Steve Eberhart, Funk Seeds International; G. F. Sprague, University of Illinois; and Vernon Ruttan, University of Minnesota. William Brown, who chaired the Pioneer symposium, said formal recommendations by the group will be forwarded later this year to those who make funding and policy decisions on plant breeding in the U.S. Complete proceedings of the symposium will be available to the public at that time. The series will focus on "Preservation and Use of Exotic Germplasm To Improve Varieties, Broaden Genetic Base" in 1983 and on "Exploring New Genetic Engineering Techniques" in 1984.

A Chronical of Plant Variety Protection. Kalamazoo: Asgrow Seed Company Publications, 1982, 20 pp. The publication defines plant variety protection; summarizes the U.S. Plant Variety Protection Act and lists similar laws in other countries; offers various data from the U.S. Plant Variety Protection Office; and discusses specific protected varieties and their reported resistance. For copies, write: Leo Zaroni, Asgrow Seed Company, Subsidiary of Upjohn Company, Kalamazoo, MI 4900 1.

Agricultural Research Policy. Rutan, V. W., Minneapolis: University of Minnesota Press, 1982, 370 pp., \$32.50, paper \$13.95. The book contains a series of essays on the strategy, organization, and management of agricultural research based on the experiences and observations of a leading agricultural economist.

Annual Wheat Newsletter. Heyne, E. G., Nell, J. S. and Porter, K. B., eds., Kansas State University and Canada Department of Agriculture. Manhattan, KS.: Ag Press, vol. 28, 1982, 180 pp. For copies, and manuscript submission for vol. 29, contact: J. S. Noll, Agriculture Canada Research Station, 195 Dafeo Road, Winnipeg, R3T 2M9, Manitoba, Canada; or J. S. Quick, Agronomy Department, Colorado State University. Fort Collins, CO 80523.

Barley Genetics Newsletter. Haus, T. E., Ramage, R. T., and Tsuchiya, T., eds. Fort Collins: Dept. of Agronomy, Colorado State University, vol. 12, 1982, 180 pp. For copies, and manuscript submission for vol. 13, contact: T. Tsuchiya, Department of Agronomy, Colorado State University, Fort Collins, CO 80523.

California Agriculture, Special Issue: Genetic Engineering of Plants. Berkeley: California Agricultural Experiment Station, vol. 36, no. 8, August 1982, 36 pp. The entire issue is devoted to genetics to celebrate "a new era [of an] old subject" and "the development of a new tool genetic engineering." Limited copies are available at \$1.00 per copy; make checks payable to The Regents, University of California. Write to: California Agriculture, 317 University Hall, 2200 University Ave., Berkeley, CA 94720.

Catalog of the Tobacco Introductions in the U.S. Department of Agriculture's Tobacco Germplasm Collection (*Nicotiana tabacum*). Chaplin, James F., et. al., Agricultural Research Service, Agricultural Reviews and Manuals, Southern Series, No. 27, October 1982. The catalog describes over 1,000 tobacco introductions in the USDA tobacco germplasm collection. Seed from the collection are available to plant breeders, geneticists, and other researchers in tobacco and other plants; to experiment stations; and to public and private research organizations for research and

breeding purposes. The Department advises, however, that seed are not available in bulk quantities for commercial planting. For copies, contact: Tobacco Research Laboratory, Route 2, Box 16-G, Oxford, N.C. 27565.

Collection, Preservation and Characterization of Tropical Forage Germplasm Resources Handbook. Alejandro, J. C., and Mott, G. O., eds. Cali, Colombia: CIAT, 1979, 96 pp. The publication is the result of an International workshop on the topic held at CIAT in 1978. An appendix of the handbook contains "a list of descriptors in wide use by plant collectors interested in tropical forage germplasm," according to Mott. For copies, contact: Centro Internacional de Agricultura Tropical (CIAT), Apartado Aereo 6713, Cali, Colombia, SA.

FAO/IBPGR Publications on plant genetic resources. Many items of general and specific interest, including the areas of crops, descriptors, regions, and conservation. Also available are newsletters, FAO/IBPGR annual reports, and directories of germplasm collections. For information, write: IBPGR, Executive Secretariat, Crop Genetic Resources Centre, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100, Rome Italy.

International Rice Research Newsletter. Contact: International Rice Research Institute, PO Box 933. Manila Philippines.

MOSAIC. Washington, D.C.: National Science Foundation, vol. 13, no. 3, May; June 1982, 52 pp. The issue focuses on the complexities involved with the study of plant genetics and includes articles on the application of genetic engineering to plants; breeding for stress tolerance; germplasm preservation, photosynthesis, and photorespiration. MOSAIC is "an interdisciplinary magazine of basic and applied research for non-specialists" published six times a year. Single copies are available. Write: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Mutation Breeding Newsletter. Published by the Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development, International Atomic Energy Agency, Vienna. Contact: International Atomic Energy Agency, Vienna International Centre, PO Box 100, A-1400 Vienna Austria.

Plant Gene Resources of Canada (PGRC) Newsletter. The PGRC Newsletter is an informal report on plant gene resources activities and programs in Canada and elsewhere. The bilingual (French and English) newsletter is published periodically and contains meeting highlights of such groups as the Canadian Expert Committee on Plant Gene

Resources (ECPGR); priority lists of plants, taxa, and areas for Canadian plant collecting explorations, etc. The editor is Dr. Roland Loiselle, Head, Central Office for the Plant Gene Resources of Canada. To subscribe, contact: Plant Gene Resources of Canada, Ottawa Research Station Research Branch, Ottawa, Ontario K1A 0C6.

Proceedings of the U.S. Strategy Conference on Biological Diversity, November 1981. Washington, D.C.: Department of State Publication 9262, IOC Series 300, 1982, 126 pp. For copies, contact: Office of Food and Natural Resources, OES/ENR, Room 7819, U.S. Department of State, Washington, DC 20520.

Research Perspectives, Biotechnology Issue. Raleigh: North Carolina Agricultural Research Service, North Carolina State University, vol. 1, no. 3, July 1982, 24 pp. The issue profiles some of the programs related to biotechnology at North Carolina State University. Write to: Editor, Research Perspectives, PO Box 5037, NCSU, Raleigh, NC 27650.

Sunflower Species of the United States. Rogers, C. E., Thompson, T. E. and Seiler, G. J., National Sunflower Seed Association, Bismarck, ND, 1982, 5 pp. The objective of the publication is "to aid scientists in better understanding the sunflower species and in recognizing their potential for agronomic or other utility." For copies, contact: National Sunflower Association, Box 2533, Bismarck, ND 58502.

MEETINGS

November 6-9 **Western Seedmen's Association Meeting and American Seed Trade Association (ASTA) Farm Seed Conference** to be held at Crown Center Hotel, Kansas City, Mo.

November 15-17 - **The Executive Committee of the IBPGR** will hold its 24th meeting at the World Bank, Washington, D.C. Included will be a joint discussion session with all **North American Chairman of IBPGR Crop Committees and Working Groups.** The IBPGR will be convening a press conference on the 19th. November 28-December 2 - **Annual Meeting of Entomological Society of America (ESA)** in conjunction with Entomological Society of Canada and Entomological Society of Ontario at The Royal York, Toronto, Ontario. In Canada contact: F. L. McEwen, Dept. of Environ. Biology, Uni of Guelph, Guelph Ontario N1G 2W1. In U.S. contact: ESA, 4603 Calvert Rd., College Park, Md. 20740.

November 28- December 3 - Annual Meeting, **American Society of Agronomy, Crop Science Society of America,**

and **Soil Science Society of America**, Anaheim, California. Contact: Dr. M. Stelly, (608) 274-1212.

December 6-10 - **International Conference on Chemistry and World Food Supplies-The New Frontier (CHEMRAWN II)**, Manila, Philippines. Contact: Joyce Torio, CHEMRAWN II Coordinating Office, International Food Policy Research Institute, 1776 Massachusetts Avenue, N. W., Washington, D.C. 20036.

December 7-8 **American Seed Trade Association (ASTA) Soybean Seed Research Conference**, Chicago, Ill. Contact: ASTA Office (202) 2234080.

December 8-9 - **American Seed Trade Association (ASTA) Corn & Sorghum Industry Research Conference**, Chicago, Ill. Contact: ASTA Office (202) 223-4080.

December 10 - **Maize Crop Advisory Committee Meeting** (tentative) in conjunction with the **ASTA Corn and Sorghum Research Conference**, Chicago, Ill.

January 1983 - **Sunflower Crop Advisory Committee Meeting** (tentative) in conjunction with the National Sunflower Convention, Minot, N. D.

January 10, 1983 - **Phaseolus Crop Advisory Committee Meeting** (tentative) in conjunction with the W-150 meetings in Scottsdale, Ariz.

February 14- 16, 1983 - **National Council of Commercial Plant Breeders (NCCPB) 1983 Workshop**: NCCPB Plant Breeding Workshop, West Lafayette, Ind. Contact: Dr. H. Ohm, (317) 494-8072.

February 24, 1983 - **Sugarbeet Crop**

Advisory Committee Meeting (tentative) in conjunction with the Biennial American Society of Sugarbeet Technologists (ASSBT) meetings in Phoenix, Ariz.

June 20-26, 1983 **National Plant Germplasm System, National Germplasm Forum**, Des Moines, Iowa. Contact: (301) 344-331 I.

December 12-21, 1983 - **15th International Genetic Congress**, New Delhi, India. Symposium theme: "Genetic Conservation-Microbes to Man." Contact: Prof. V. L. Chopra, Secretary General, XV International Congress of Genetics, PO BOX 2841, New Delhi- 110 060, INDIA. Telephone: 588783, 585080. Cable: Prof. V. L. Chopra, Genetics, KRISHIPUSA New Delhi. DEADLINE for receipt of registration materials-May 1, 1983.

DIVERSITY extends an invitation

Although the first issue of DIVERSITY appeared only a short time ago, the enthusiastic response from all sectors of the NPGS has been overwhelming. Clearly, this unique, non-profit publication is fulfilling a need, serving as a vital communications link for all segments of the NPGS. Our goal is to continually improve our service to you. This is, after all, your publication-your forum.

Initial funding from Pioneer Hi-Bred International, Inc., The Quaker Oats Company, DEKALB Ag-Research, Northrup King, Funk Seeds International, and Del Monte Corporation has been invaluable. DIVERSITY's subscription campaign is also well underway (see enclosed brochure). To further serve this enthusiastic community and to continually improve DIVERSITY, we are seeking even broader based support. That is why DIVERSITY is extending an invitation, and an opportunity-to all organizations involved in the plant genetic resources community.

... and an opportunity

The invitation? To become a Sustaining Member of DIVERSITY. The opportunity? Accepting our invitation gives you the chance to become an active participant in, and supporter of, the only communications network designed for *all* of the NPGS.

In order to accommodate the broadest possible spectrum of companies and organizations within the diverse NPGS community, DIVERSITY is offering varied levels of funding participation:

Contributor - \$ 250 annually
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As an expression of appreciation for your support, the name and affiliation of each Sponsor, Patron, and Sustaining Member will be published in every issue.

Remember, your support of DIVERSITY will not only benefit the entire NPGS, but will also help to ensure the successful use and preservation of plant genetic resources.

DIVERSITY

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