from the students. It is as cold and calculated a strategy as the southern strategy, but there are no two groups that have more in common than working people and students." In July, Wald wrote to U.A.W. president Woodcock and proposed a joint meeting, to which Woodcock agreed. Wald invited the university people; Woodcock invited the representatives of the labor unions.

Professor Wald's own view of the need for a labor-university channel is that labor, as well as universities, are threatened by backlash and current legislation aimed at tightening national security. "The attack on the universities," he told *Science*, "which now looms large, is only the coating on the pill. The interior of that pill is an attack on the working man." He believes some of the latest legislation in Congress can bring universities "under federal jurisdiction" through financial controls.—DEBORAH SHAPLEY

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Nobel Peace Prize: Developer of High-Yield Wheat Receives Award

Late in 1944, four young American agricultural scientists assembled in the hills outside Mexico City. Their mission was to export the U.S. agricultural revolution to Mexico. They believed that the application of science to agriculture could achieve the same results in the poor countries as it had in the United States. Like Mao Tse-tung, they believed that the future of these countries would be decided in the countryside. Last week one of these scientists, Norman Borlaug, was awarded the Nobel Peace Prize for his work in developing the high-yielding varieties of Mexican wheat which have so dramatically expanded the food supply of the hungry countries in recent years.

It is noteworthy that the prize was this year awarded to a scientist rather than to a statesman or political figure, a recognition of the extent to which scientific effort can constructively influence the human condition and the prospects for peace and stability. At a time when science is under increasing fire, the Nobel Awards Committee's action is somewhat reassuring to the scientific community.

Born of Norwegian stock in Cresco, Iowa, in 1914, Borlaug has devoted virtually his entire working career to the development of more efficient higher-yielding wheats. A product of the land-grant educational system, he received his degrees from the University of Minnesota—his B.S. in forestry and M.S. and Ph.D. in plant pathology. Borlaug has lived in Mexico most of his adult life, enjoying both the freedom given him by assured financial support from the Rockefeller Foundation and the challenge posed by the hunger that afflicts a major share of the human family. His Yankee ingenuity is widely appreciated by the wheat farmers of Mexico, who have recognized him with awards on at least three separate occasions.

The other members of that four-man team assembled in 1944 were Edward Wellhausen, corn breeder; William Colwell, agronomist; and George Harrar, plant pathologist. The composition of the group must be considered one of those fortunate coincidences of a few talented people being brought together and, as a result, influencing in a major way the course of history. This team was recruited and assembled by Harrar, who became president of the Rockefeller Foundation in 1961. Wellhausen is today director of the International Center for Corn and Wheat Improvement, an enlargement of the original Rockefeller effort, now jointly supported by the Ford Foundation and designed to serve the entire less developed world.

When the four young scientists arrived in Mexico in 1944, it was a hungry country, importing much of its food from the United States. By 1970, wheat production had more than tripled, and the average Mexican was consuming 40 percent more food. Wheat was being exported, and the economy was prospering.

Norman Ernest Borlaug

As director of the Rockefeller Foundation's wheat breeding program, Borlaug set out during the 1950's to develop a dwarf wheat that would perform well in the varied conditions of Mexico. He amassed germ plasm from Japan, the United States, Australia and Colombia, and then began growing two alternate crops of wheat each year at two different sites, a summer crop just south of the United States border and another crop in winter near Mexico City, some 800 miles away. The two sites differed in day length, or photoperiod, as well as in many other environmental factors. The combination of the cosmopolitan ancestry of his seeds and the two varying sites enabled Borlaug to produce a dwarf wheat variety that was remarkably adapted to a wide range of growing conditions. The Mexican dwarf wheats today are growing successfully throughout the broad latitudinal range from Turkey to Paraguay. This geographical adaptability was something new in cereal breeding, a distinguishing characteristic of Borlaug's dwarf wheats. Hitherto, most cereal varieties had performed well only under conditions comparable to those in which they were first bred.

The second distinguishing characteristic of the Mexican high-yielding wheats developed under Borlaug's direction is their high-yield potential. When farmers attempted to fertilize heavily the tall, thin-strawed traditional varieties of wheat, heavy sets of grain often resulted, but, because they were thin-strawed, the grain fell over, or in the agronomist's lexicon, "lodged." The new dwarf varieties, scarcely half as tall and with much stiffer straw, are very responsive to fertilizer. This imaginative feat of biological plant engineer-

ing represented a major breakthrough.

For Mexico, calculated social returns on the investment of the Rockefeller Foundation in agricultural research there comes to an astounding 700 percent annually. But even more astonishing, the principal returns on this investment are being realized outside Mexico: in India, Pakistan, Turkey, Afghanistan, and other countries. The acreage of Mexican wheat planted in Asia this year is several times that planted within Mexico, where virtually all wheatland is seeded to the high-yielding wheats. Perhaps even more important, the dwarf wheats became the new cereal prototype for the high-yielding rices which were to be developed at the International Rice Research Institute in the Philippines during the mid-1960's.

Once it was discovered in the mid-1960's that the high-yielding Mexican wheats were adapted to growing conditions on the Indian-Pakistan subcontinent, the seeds were imported from Mexico in large quantities. Pakistan imported 42,000 tons of Mexican wheat for seed. This import, planted on 1.5 million acres, yielded enough wheat to seed all of Pakistan's wheatland the following year. Thus Pakistan was able to telescope the many years normally required for the research, development, and multiplication of new seeds. Over the past 5 years, since the large-scale commercial introduction of the Mexican wheats into West Pakistan, where their impact has been particularly dramatic, cereal production has nearly doubled. West Pakistan is now a net exporter of both wheat and rice. India's wheat crop, totaling 12 million tons 5 years ago, reached 21 million tons in 1970, a 75 percent increase. Its overall cereal crop is now expanding more rapidly than population.

The rapid spread of Borlaug's high-yielding wheats and the high-yielding dwarf rices modeled after them has not been without problems, as he himself has noted. But, for the most part, these are problems of success. Marketing systems are overloaded by the dramatic increases in production and even more dramatic increases in the marketable surpluses. An Indian villager marketing one-third of his wheat harvest with traditional varieties finds his yields doubled and his marketable surplus quadrupled with Borlaug's new seeds.

Acreage planted to the new wheats and rices in Asia, expanding from 200 acres in 1965 to more than 40 million acres in 1970, accounts for more than one-tenth of the more productive cereal land in Asia. The further spread of the new seeds at this point is being constrained in many areas by the lack of adequate water supplies. Farmers able to use the new seeds have increased their net incomes two-, three- or fourfold. But those unable to use the new seeds for lack of water or credit sometimes find themselves trapped with traditional technologies in a market depressed by the sharp increase in supplies. Distribution of the benefits thus becomes a major social and, increasingly, political issue. The threat of disease catching up with the exogenous varieties is very real, though often overrated.

It has become fashionable to criticize the "Green Revolution." Those who are prone to focus only on the second generation problems associated with the introduction and spread of the new seeds sometimes create the impression that it would have been better had the Green Revolution never occurred. Assessing the contribution of these new seeds is not that difficult. To appreciate the impact of the new seeds on the food supply one need only ask what would conditions be like in these countries in the absence of the new seeds. One need only recall the close brush with famine on the Indian-Pakistan subcontinent in 1966 and 1967, a famine that was averted only by shipping one-fifth of the U.S. wheat crop to India, and the projections of massive famine in Asia in the 1970's, to realize that the new seeds are a godsend.

Rapid increases in cereal production are but one aspect of the agricultural breakthrough. The new seeds are bringing far-reaching changes in every segment of society. They may be to the agricultural revolution in the poor countries what the steam engine was to the industrial revolution in Europe.

The new wheats and the high-yielding rices developed at the International Rice Research Institute and modeled after them, may possibly affect the well-being of more people in a shorter period of time than any technological advance in history. This is not to imply that the new seeds offer a solution to the food problem, but they do buy some precious time, perhaps an additional 10 to 15 years in which to stabilize population growth. If within 15 years we are not well on our way to stabilizing world population growth, Dr. Borlaug's monumental contribution will have been in vain. Let it not be so.

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NEWS IN BRIEF

● **METRIC CONVERT:** The National Aeronautics and Space Agency (NASA) has become the first federal agency to convert to the metric system. As of 14 November the agency will require all technical reports, notes and memoranda, contractor reports, and special publications to use the system, formally known as the International System of Units. NASA has been gradually adopting metric measurements since 1962. Of the world's industrialized nations, only the United States, Great Britain, Canada, Australia, and New Zealand use the English system; Britain is now changing over. The Bureau of Standards is studying the feasibility of expanding the use of the metric system in this country.

● **WEATHER'S NAME:** The Weather Bureau changed its name to the National Weather Service as of 3 October. The title reflects the new dignity conferred on weather as it becomes part of the National Oceanic and Atmospheric Administration (NOAA), a new agency in the Commerce Department. While the Service's functions remain unchanged, the Commerce Department says that its new title more accurately conveys its role as the nation's "Number 1 purveyor" of weather warnings and advice.

● **SCHOLAR FLOW:** The number of foreigners who came to the United States to study in the 1969–70 academic year increased by 11 percent over the previous year, while the number of Americans studying abroad declined slightly. And incoming scholars, totaling 147,618 last year, outnumber U.S. scholars abroad almost 5 to 1, according to *Open Doors*, a yearly publication of the Institute of International Education. President of IIE Kenneth Holland explains, "International education has lost its luster as a public and intellectual value," and notes that federal purse tightening and changes in university scholarship priorities have kept more students at home. *Open Doors*, which contains statistical tables on origins, places and fields of study, and sources of financial support for international scholars, can be obtained from IIE Publications Division, 809 United Nations Plaza, New York City 10017. The cost is $3 per copy, or $2.50 each for orders for ten or more.