

production of food fish "is governed solely by economic rather than biological determinants."

He told the participants in the symposium that, "exploitation of the world fisheries resources is nowhere near its potential, but what that potential is we now have no means of estimating with any degree of accuracy."

**The Sea Frontier.** Two symposia sponsored by the AAAS were concerned with the general problem of food production. One of these was entitled "Species Which Feed Mankind" the other was "The Sea Frontier."

Alfred C. Redfield of Woods Hole Oceanographic Institution presented a discussion of the general productivity of the seas. Dr. Redfield said that estimates of the total productivity of the seas may have been somewhat over-enthusiastic. He doubts that the oceans are 10 times as productive as the land and says that there is a need for a downward revision of estimates of this productive capacity. He explained that the bottleneck in the food chain is the rate of formation of organic matter by living plants. This rate is commonly referred to as productivity. The productive agents of the sea are the phytoplankton, microscopic foliating plants.

As a physical environment the sea is, in many ways, ideal for plant growth. The physical and chemical properties of the sea are practically the same everywhere and much more uniform than soil. However because of the great dilution of these small floating plants in the sea they cannot now be harvested economically as a source of food.

The larger animals, fish, can only be harvested in areas where they accumulate in unusual concentrations. As an example of the relatively small harvest of the sea by man Dr. Redfield pointed out that probably less than 1% of the total organic matter produced in the ocean is available for the growth of fish, and of this only about one third is harvested even in heavily fished areas.

Dr. Redfield believes that in attempting to foretell the potentials of the sea it would be realistic to assess the extent of unexploited areas of unusual productivity rather than to rely on estimates of the total productivity of the oceans.

**Fishery Management.** The chief hope of increasing the harvest of the sea lies in developing a science of dynamic fishery management, according to Lionel A. Wolford. In the symposium on the sea frontier, Dr. Wolford presented a discussion on the biological resources of the sea in relation to man.

He agreed with Dr. Redfield that there seems to be little hope of ever economically fishing up the plankton

from the open sea as a source of food. However, he believes that a vigorous research program aimed at an extension of knowledge about marine fishery stocks and management would pay off by vastly increasing world food production.

Dr. Redfield does not conceive of

the sea frontier as a physical entity but rather it is his contention that the real frontier here is the boundary between knowledge and ignorance. He believes that we are not making enough progress in pushing this frontier back, and we must find some means to accelerate this progress.

## DDT Residue Persistence High in Some Soils

BOSTON.—Organic insecticide residues in soils are presenting an important new phase of an old problem, according to Arthur Foster, USDA. Dr. Foster told the recent meeting of the American Association for the Advancement of Science here recently that while the effects of insecticide residues, such as arsenicals, on crops has been under study 45 years, some of the new organic products are presenting new aspects of the problem. DDT, apparently the most persistent, was recovered from certain soils seven years after application in more than 80% of the amount applied.

Describing work done at the plant industry station at Beltsville, Dr. Foster said that Greenhouse, cold frame, and field experiments all were used as bases for his conclusions. DDT in cold frame experiments varied from 70% recovery after seven years where 25 pounds per acre was applied to 88% where 1000 pounds per acre was applied.

The effect on plants was demonstrated most strikingly with beans, which are particularly sensitive to DDT. The presence of 100 pounds or more per acre of DDT in mineral soils showed toxic effects.

The impurity *o-p'*DDT in technical DDT was much more toxic than was the *p-p'*DDT. Alkaline soils high in iron oxide were less retentive of DDT.

**Great Variation and Specificity of Plants.** Where peach trees were sprayed with 25 pounds of DDT per acre annually during three consecutive years, accumulations in the soil apparently interfered with the growth of rye used as winter cover. Wheat was tolerant of DDT and showed little effect. Many other crops were highly tolerant, while some were retarded by as little as 25 pounds per acre. There was even striking variation of tolerance among varieties of a given crop.

DDT and the related compounds rothane and methoxychlor were the most persistent of compounds tested, dieldrin and toxaphene were intermediate, and chlordane and lindane were the least stable. The beta and delta isomers of BHC were more stable than other components of technical BHC.

In greenhouse studies, aldrin, dieldrin, BHC, and lindane were most generally toxic to a diversity of crop plants during one to three years following single massive doses.

**Optimism for Future.** George McNew, Boyce Thompson Institute, offered an optimistic note. The upsurge of organic chemicals, he pointed out, has provided chemists and biologists an opportunity to develop compounds more or less tailored to specification. Very encouraging results are being obtained in avoiding hazardous residues. Among examples he noted: New chemicals that are so selectively potent against crop pests that they can be used in very light applications; insecticides such as allethrin and malathion that are much safer for animal life than their predecessors; chemicals that volatilize, hydrolyze, or decompose shortly after application and before harvest. More data are needed on formulation of active compounds, he said, and also on interaction between various types of soil bacteria and artificially introduced molecules.

**Soil Conditioners.** The relatively high cost of soil conditioners excludes their use over large acreages at present according to S. J. Toth, Rutgers University, who reported on the present status of these compounds. However, he recognized the importance of soil conditioning chemicals in agriculture, especially on heavy-textured soils with poor structural characteristics. While crop returns do not justify their use unless effects are relatively long lasting, they may be used economically in greenhouses, plant beds, and home gardens.

### Industry

#### IM&C Splits Phosphate Division

Establishment of a phosphate chemicals division has been announced by International Minerals & Chemical Corp.

The new division is expected to provide for continued growth of international's phosphate chemicals operations,

which now include plants near Bartow, Fla., Wales, Tenn. and Tupelo, Miss. Heretofore the operation of these plants has been a part of the corporation's phosphate division.

Under the new production and sales program International will have two phosphate divisions. The phosphate minerals division, headed by George W. Moyers, vice president who has been in charge of the phosphate division, will be responsible for the mining and refining of phosphate ores in Florida and Tennessee. The new phosphate chemicals division, to be headed by Howard F. Roderick, recently elected a vice president of International, will produce phosphate and sell chemicals.

Mr. Roderick went to International from Wyandotte Chemicals, where he had been director of sales for its Michigan Alkali Division since 1950.

International's new phosphate minerals and chemical operation is typical of the vertical integration program being conducted by the company, according to Mr. Ware, and is in line with the planned growth and diversification program International has followed for a number of years.

The establishment of the phosphate chemicals division as separate from the corporation's other phosphate activities was timed with the completion of International's plant near Bartow. This plant, which represents an investment of approximately \$15 million, produces defluorinated phosphate for use as an animal feed supplement as its primary product. It also produces multiple superphosphate for plant food. As a by-product it extracts uranium compounds from the phosphate ore, for the Atomic Energy Commission.

### New Albany Plant of Davison Begins Operation

Fertilizer production has started at Davison Chemical's new \$1 million plant near New Albany, Ind. Facilities of the plant include a modern office building, welfare and shop facilities, in addition to processing and storage equipment.

The plant was built to replace older facilities at New Albany, which were located between the Ohio River and a new flood wall. The new plant has larger and more modern facilities than the old. Davison will make its granulated, homogeneous fertilizer product in the new plant.

The plant is all on one level, with flexible, mobile equipment permitting unloading of materials, manufacturing, and shipping to go on simultaneously without interference. Truck-loading facilities are protected from the weather.

J. L. Gayle, plant manager, said the plant would employ between 60 and 80 men, according to the season.

### Vitamin Feed Concentrate Unit Opens at Hiram Walker Plant

Hiram Walker put a new stillage refermentation unit into operation early this month at its Peoria, Ill., plant. The unit will increase the company's capacity for producing riboflavin concentrates for livestock feed by some 300%. Spent mash from the stills is refined to produce the riboflavin concentrate, using a process developed by the company.

In addition to the vitamin concentrates, spent mash is also a large source of protein for livestock. Hiram Walker estimates that protein feed from distilleries are produced at the rate of about \$20 million worth annually, not counting the vitamin feeds.

### Box Plant at Kansas City By Hinde & Dauch

Hinde & Dauch Paper Co. has announced plans for building a factory to produce corrugated and solid fiber shipping boxes in Kansas City. The company has acquired a 17-acre site there. No date for beginning construction has been set as yet, said the company.

### Fairfax Biological Buys Edgar A. Murray Co.

Fairfax Biological Laboratory of Clinton Corners, N. Y., has announced purchase of the Edgar A. Murray Co. of Detroit, Mich. The Murray company manufactures Doom packaged household insecticides. The purchased firm will be operated as a division of Fairfax. Financial details of the purchase were not disclosed.

#### On The Cover

#### Tools for Crop Protection

THE UNGAINLY MACHINE on the cover, resembling a device of war, is an example of the developments in equipment design which are leading to an increasing mechanization of farming practice. This mist sprayer is designed to apply sprays of pesticide mists to entire rows of trees, as it is towed through orchards.

Devices of this type have accelerated the practical application of research developments in agricultural chemistry.

Photo Courtesy University of California Citrus Experiment Station, Riverside, Calif.

### People

#### W. H. Garman to Join APFC as Agronomist

Willard H. Garman has resigned as experiment station administrator,



USDA, Office of Experiment Stations, to become agronomist for the American Plant Food Council. He succeeds John R. Taylor, Jr. Prior to his USDA work, Dr. Garman was head of the department of agronomy at the University of Arkansas experiment station.

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Calvin L. Dickinson has joined American Potash & Chemical as advisory engineer at the Trona, Calif., plant. He was formerly with Diamond Alkali as plant manager for the organic chemicals division at Houston, Tex. Frank A. Jessup, formerly with Pacific Indemnity Co., has joined American Potash as safety engineer for the Trona plant.

J. Russell Wilson has become vice president and general manager of the Monsanto's new research and engineering division. N. N. T. Samaras is assistant general manager of the division.

George N. Hoffer, midwest manager of the American Potash Institute, has received the Holbert Medal Award for significant contributions in the field of plant sciences.

Jesse M. Huffington, Continental Can Co. crops consultant, has been awarded a plaque in appreciation "for his numerous contributions to the welfare and advancement of the canning industry in the Keystone State" from the Pennsylvania Cannery Association.

Otto T. Aepli has been promoted from assistant chief chemist to chief chemist of Pennsylvania Salt's Wyandotte, Mich., plant. He succeeds Earl Sweetland, who recently retired.

### Deaths

Henry P. Rusk, dean emeritus of the University of Illinois College of agriculture, died Jan. 9 in Urbana, Ill., at the age of 69. Recognized for his contributions to agricultural education and knowledge of livestock, he served as a member of the agricultural task force of the Hoover Commission in 1948. He was awarded the American Farm Bureau's gold medal in 1947 for distinguished service to agriculture.