suggest explanations or interpretations for what he has seen.

After sufficient time has been allowed for the students to make independent observations they are called together and the observations on the assigned area summarized. On the first field trips some individuals will not only have more to report than others, but their findings will be more correct because of the wide range in the natural ability of students to observe critically.

The class is next asked to justify the summarized observations by the geological evidence at hand and by the previous study in the course. Such a procedure provides a discussion in which the students are the active participants, while the instructor serves to keep the subject open until all the evidence is weighed and conclusions reached.

If the previous experience of the class and the evidence at hand are sufficient to justify sound conclusions the problem may be followed through to a complete solution at this time.

If, however, an adequate solution of some of the field problems lies beyond the present state of the students' learning, such problems may well be left open for the present, to be taken up later in the classroom or in the field, when the course work has progressed to the required stage.

One incompletely solved problem may lead to other related ones. It may be used to stimulate student interest in these problems and to challenge their ability to solve them.

The procedure in each case will be such that the instructor serves to direct the students' attention to the problem for study, to stimulate more accurate observation and to see that the discussion comes to sound conclusions. This process of solving a problem is a cooperative venture wherein the observations of all are pooled and evaluated. The thinking of the students is sharpened and their faculties for critical observation and judgment are developed. The field trip becomes a period of discovery for the group as a whole and of development for the individual.

As students are thus given an opportunity to share in the responsibility of solving field problems the trip becomes increasingly purposeful to them and there is marked advance in the attainment of the desired objectives set up for this part of the geological program.

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AGRONOMIC SCIENCE, 1838–1938

ALONG with other scientific contributions of which 1938 marks the centenary, agronomists should not let pass unnoticed those of the Frenchman Boussingault. Just a century has passed since Jean Baptiste Boussingault, adventurer, traveler, chemist and "farmer of Bechelbronn," made his first fundamental contribution toward the solution of the problem of nitrogen assimilation by plants. In two papers published in 1838 in volumes 47 and 49 of *Annales de Chimie et de Physique* he reported results of carefully conducted experiments which showed that certain legumes grown in sterile soil "acquired a very appreciable quantity of nitrogen" and that "wheat and oats (non-legumes) grown in the same circumstances . . . showed no increase in nitrogen after their maturity." A little later Boussingault conducted field experiments with crop rotations, some of which contained legumes. The harvested crops were carefully weighed and analyzed. Boussingault stated, "it was with the purpose of substituting positive facts for mere guesses" that he undertook the work. His experiments virtually mark the beginning of agronomic science.

A. B. BEAUMONT

REPORTS

THE DEPARTMENT OF AGRICULTURE APPROPRIATION ACT, 1939[1]

APPROPRIATIONS made in the act for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1939, as signed by President Franklin D. Roosevelt on June 16, 1938, aggregated $742,040,279, plus $187,105,000 of reappropriated funds. If to this are added $152,023,958 for the so-called "permanent" appropriations, which automatically become available, $825,000 carried in the Second Deficiency Act, $7,000,000 transferred from the War Department for flood control surveys and $387,000,000 available under the Work Relief and Public Works Appropriation Act of 1938, the total for the year becomes $1,475,994,237. The comparable aggregate for the preceding year, including deficiency appropriations, was $984,005,456, of which $850,794,177 was derived from the appropriation act.

By far the largest allotment is that for the conservation and use of agricultural land resources. The act itself appropriates $345,000,000 and reappropriates $155,000,000, while $356,024,893 additional will be available from other sources for parity payments to producers of wheat, corn, cotton, rice and tobacco and for other price adjustments. Second in size only to these appropriations are the grants for roads. The Bureau of Public Roads receives $187,500,000, an increase of $20,000,000, mainly for more rapid elimi-

[1] From the *Experiment Station Record.*

nation of grade crossings and the construction of federal-aid feeder roads, and in addition $14,000,000, an increase from $12,500,000, is made available for forest roads and trails. A third major allotment is that of $175,000,000 to the Farm Security Administration for loans, relief and rural rehabilitation.

Other large items relate to the carrying into effect of recent legislation, such as the Sugar Act of 1937, for which $48,000,000 is provided, and the Farm Tenant Act, with $25,000,000 for loans to farm tenants, $2,000,000 for the liquidation and management of resettlement projects and $5,000,000 for land utilization and the retirement of submarginal land. A reappropriation of $25,500,000 is made under the Federal Crop Insurance Act of 1938; $1,800,000 is granted for the retirement of cotton pool participation trust certificates; and $500,000 is allocated to develop facilities for water storage and utilization.

The special research fund of the department under the Bankhead-Jones Act (E. S. R., 73, p. 289) is increased from $1,200,000 to $1,400,000. Authorization is also given to utilize not to exceed $100,000 of funds available under the Agricultural Adjustment Act of 1938 to conduct a survey to determine the location of the regional research laboratories provided under that act (E. S. R., 78, p. 437) and the scope of the investigations to be made, and to coordinate the research work now being carried on.

For what are termed the "ordinary activities" of the department the allotment is $93,747,611, a decrease from $99,314,204. The largest item under this heading is that for the Soil Conservation Service, which shows an apparent decrease from $24,390,780 to $23,525,000. Of this amount $425,135 represents transfers to other bureaus of the department, and the remainder is a curtailment for operations, demonstrations and information. The allotment for soil and moisture conservation and land-use investigations is $1,510,601.

A total of $19,560,400 is provided for the Forest Service. Its net increase of $668,218 is largely in the funds for administration of the national forests and for increased cooperation in forest fire control, farm forestry and private forestry.

An apparent increase from $10,373,098 to $14,136,731 for the Bureau of Animal Industry is more than offset by a reduction from $15,864,000 to $6,600,000 in the funds reappropriated for the campaign against tuberculosis and Bang's disease, making the new total for this purpose $12,003,000. The remaining allotments of the bureau are continued without substantial change.

The funds administered by the Extension Service are increased from $17,490,083 to $17,917,583. The full authorized increase of $1,000,000 in Bankhead-Jones funds is provided, but $645,000 has again been deducted from certain supplementary funds hitherto available under a sliding-scale arrangement looking toward their complete replacement by Bankhead-Jones funds in 1940. An increase of $3,000 is made for extension work in Alaska, raising the total to $21,418, while $45,000 is allotted to extend the Bankhead-Jones Act to Puerto Rico.

Under the Office of Experiment Stations a total of $6,770,230 is provided, of which $6,541,250 represents payments to the States, Hawaii, Alaska and Puerto Rico for agricultural experiment stations, including $720,000 each under the Hatch and Adams Acts, $2,880,000 under the Purnell Act, $2,100,000 under the Bankhead-Jones Act, and a total of $121,250 under supplementary legislation (of which Hawaii receives $55,000, Alaska $23,750 and Puerto Rico $42,500). This is an increase of $308,750 over the previous year, of which $300,000 is under the Bankhead-Jones appropriations. For the administrative expenses of the office itself, $161,735 will again be available, while the supplementary administrative allotment of 2 per cent. of the special research fund of the department under the Bankhead-Jones Act automatically increases from $24,000 to $28,000. In addition $67,245 will be available for the maintenance of the Federal Experiment Station in Puerto Rico, but in Hawaii participation by the office in the management of the station maintained in recent years jointly with the University of Hawaii is terminated as planned as of July 1, 1938.

The allotments for the Bureau of Agricultural Economics show a total of $6,566,483 and a net increase of $353,785. The items of increase include $225,483 to carry into effect the provisions of an act approved on April 13, 1937, for classification and information service in communities organized for cotton quality improvement; $90,000 and $65,000, respectively, to strengthen the enforcement of the Tobacco Inspection and Warehouse Acts; $45,302 to extend the market news service; and $23,500 for additional market inspection of farm products. Offsetting them in part are decreases of $30,000 for studies of farm management and practice, $35,000 for studies in marketing and distributing farm products, $15,000 for crop and live-stock estimates, $3,000 for studies of foreign competition and demand, and $10,000 under the Cotton Futures and Standards Act.

The funds provided for the Bureau of Entomology and Plant Quarantine are decreased from $5,711,398 to $5,701,867, but $700,000 additional is made available in the Second Deficiency Act for the control of grasshoppers and other pests and $10,000 for the use of the Mediterranean Fruit Fly Board. Increases are made in the allotments from $296,800 to $446,800 for Thurberia weevil control, from $381,580 to $461,580 for truck crop and garden insects in order to construct a

tobacco laboratory at Oxford, N. C., and from $182,600 to $191,000 for insects affecting man and animals. The decreases are distributed among seven projects, the largest being the control of screw-worms, Japanese beetles and gipsy and browntail moths, the insecticide and fungicide investigations and the insect pest survey.

The total for the Bureau of Plant Industry shows a decrease from $4,909,048 to $4,741,675, distributed among 12 items, the largest reductions being $106,200 for sugar plant investigations, $67,413 for the National Arboretum and $64,750 for the studies of dry-land agriculture. These are offset in part by an increase of $119,700 for studies with fruit and vegetable crops, particularly tung-oil investigations. The latter will be supplemented by chemical studies under an allotment of $30,000 to the Bureau of Chemistry and Soils. This bureau is also given an increase of $39,957 for work in the industrial utilization of farm products and by-products, especially sweetpotato drying and citrus byproducts. Despite slight reductions on its other projects, the total for the Bureau of Chemistry and Soils rises from $1,425,431 to $1,457,508.

The Bureau of Biological Survey is granted an allotment of $1,000,000 under a 1937 act for federal aid to the states in wildlife restoration projects, as well as $25,000 additional for the development of fur resources investigations. Its total appropriation is increased from $2,127,840 to $3,248,340.

The remaining work of the department is provided for much as at present. The Weather Bureau receives $4,987,870, a net increase of $284,821, available entirely for additional aerological work; the Bureau of Dairy Industry $717,405, an increase of $13,711 for investigations; the Bureau of Home Economics $305,085, an increase of $60,000 to be divided equally between investigations of family economics and cotton hosiery; the Commodity Exchange Administration $635,000, an increase of $135,000; and the Bureau of Agricultural Engineering $510,000, an increase of $49,231. An apparent increase of $220,640 to the Office of Information raises its total to $1,474,770, but it is made up entirely of transfers from the Soil Conservation Service and provides no additional funds. The Food and Drug Administration again receives $2,227,758, the Library $105,420, and the Beltsville Research Center $85,000 (an increase of $10,000).

SPECIAL ARTICLES

RECOVERY OF THE VIRUS OF EQUINE ENCEPHALOMYELITIS FROM THE BRAIN OF A CHILD

ON August 31, 1938, brain material from a twenty-months-old boy was received through the courtesy of Dr. H. M. Ginsburg, Dr. Newell and Dr. S. Simon, of the Fresno County General Hospital, Fresno, California. The child was admitted to the hospital on August 27 after a two-day illness. He became progressively worse, developed muscle spasms, became comatose and died on August 30, or 5 days after the initial onset, with the diagnosis of acute encephalitis.

A portion of the brain stem was ground in Ringer's solution to make a 10 per cent. suspension and was injected intracerebrally, intraperitoneally and intranasally into young Swiss mice. Most of them died in 3 to 5 days, while the others were sacrificed upon showing neurological symptoms; tremor, initial excitability followed by drowsiness and later complete prostration. The brains were removed and were found to be free from bacteria. A 10 per cent. suspension was inoculated into normal mice, who succumbed with similar symptoms. Berkefeld N filtrates were also infectious for mice, and it was found that the active agent could be carried in serial passage in these animals.

Mouse brain suspensions were then inoculated intracerebrally into monkeys, guinea pigs, young rabbits and rats. All developed typical encephalitic symptoms of fever, tremor, twitchings of the extremities, drowsiness, spastic convulsions in the case of the monkeys, and became completely prostrate in 4 to 5 days. Spinal fluid of a monkey removed at the height of the temperature, 40.7° C, contained the virus upon inoculation of mice. Brain material from this monkey was infectious upon removal post mortem. The disease could be transmitted by the intranasal and the subcutaneous routes of inoculation in both mice and guinea pigs.

From the incubation period of 4 to 5 days, from the general clinical picture, especially in the guinea pig and from the fact that the virus could be transmitted to such a variety of animals by various routes of inoculation, the virus of equine encephalomyelitis, western type, was suspected. Further confirmation was obtained by neutralization, complement fixation and cross-immunity tests. Using methods previously described,[1] it was found that this new (Br) virus neutralized hyperimmune serums of the western type of equine encephalomyelitis but not those of the eastern nor the Moscow No. 2, nor was there any neutralization with immune serums of the viruses of lymphocytic choriomeningitis, the Japanese B nor the St. Louis types of human encephalitis, respectively. Guinea pigs immune to the western variety were unaffected by an intracerebral inoculation of the new strain, while two monkeys immune to poliomyelitis

[1] B. F. Howitt, *Jour. Immunol.*, 33: 235, 1937.