thick, films of various proteins produces characteristic patterns.

It is at the G. E. laboratories where Dr. Irving Langmuir and Dr. Katherine Blodgett have for several years been studying the methods of producing thin films on water surfaces, which have thicknesses of a few millionths of an inch.

When drops of the oil are applied to the center of such protein films the oil spreads into patterns having geometrical form, in many cases, like a star or circle. The exact shape can be used to identify the protein.

One protein used in the research was insulin, so important to persons having diabetes. When the monomolecular layer of insulin was spread on water the oil drop assumed one pattern. When certain salts were added to the water on which the insulin was resting, chemical reactions occurred with the insulin and the oil pattern changed its shape.

Soil Classification

A new way of classifying soil types—a fundamental problem of all scientific agriculture—was reported to the meeting.

Standard practice, but one not too satisfactory, is to run soils through sieves and determine sizes of the particles, said Prof. Richard Bradfield of Cornell University.

A more important characteristic of soils, however, is their ability to carry water and air to plant roots. Thus any real, exact classification of soils should include knowledge of the pore spaces in earth. Normal field soils, reported Prof. Bradfield, have from 40 to 60 per cent. of their total volume occupied by solid materials and the rest by pore spaces containing air and water in varying amounts.

It is not only important that the total volume of pore space be known, he added, but it is also necessary to have knowledge of the size of the pores, or channels, which carry down the vital air and water.

Studies reported by Prof. Bradfield describe a new way of answering this question. A sample block of soil is saturated with water and then an additional small hydrostatic head of water pressure is applied. This additional pressure forces out some of the water already in the soil. The flow is observed at different pressures and the resulting data can be plotted in the form of curves, which have characteristic shapes for different types of soils.

Science News Letter, June 18, 1938

ECONOMICS

Unbalanced Budget is Sweden's Instrument Against Hard Times

With Reduced Taxation and Increased Expenditure, Bad Years Show Deficit; Good Years Have Surplus

A GOVERNMENTAL budget, normally out of balance, that provides a remedy for economic depression and a guarantee of sound finance—that is a prescription offered to Washington experts by Prof. Gunnar Myrdal, Swedish economist.

Swedish experience shows that it is possible to operate public finance in such a way as to allow a very radical under-balancing of the budget. The Swedish method, cited by Prof. Myrdal, prevents economic slumps and, in fact, guarantees sound finance in the long run.

Prof. Myrdal is a young man who can speak of unbalanced budgets and great depressions with a keen wit and flashing smile, yet he combines in himself all these impressive offices: Senator in the Swedish Parliament, deputy member of the board of directors of the Bank of Sweden, member, Swedish Royal Population Commission, the Housing Commission, and the Agricultural Commission, and professor of economics and finance at the University of Stockholm.

By a perpetually unbalanced budget, he did not mean one that would constantly be in the red. The red and black should alternate with the business cycle, he explained. Depressions, he said, should be planned for not as isolated years, but in their frame of the recurring good years. Budgets should be planned, not by the year any more than by the day; they should be planned for long-time periods, the books being closed annually with a deficit or a surplus.

In the bad years it is wise, they have decided in Sweden, to spend beyond your means, decrease taxation, and deliberately to run behind and have a deficit. But this deficit is made up by planning for a surplus during the following years of boom. The deficit from one bad year is split into five parts tacked on to the budgets of succeeding years.

In bad times, taxation is lowered, but expenditures for schools, for roads, and for all the works of government are kept up and even increased. This relieves public officials from the absurd position of having to scrimp on necessary public expenditures at the same time that they are proud of spending billions otherwise.

Public works in Sweden are put on an investment budget separate from the ordinary expenses. This budget must always be in balance, but this is really just a matter of bookkeeping. Only real investments on which a return is expected may be put on this budget on a rational sinking fund basis.

If a government building is to be erected, this would go on the investment budget. But the bureau occupying the building is charged a rental, year after year, and this item is part of the regular budget.

Such public works are part of the plan of enlarged spending during depression times, but by the rental or other such scheme, they are paid for during the good times that follow.

Sweden is now having a boom. Plans are now being made for a great public works program; approval is being secured from Parliament; everything is being put in readiness so that when the unemployment ranks begin to form the machinery can be instantly set in motion.

State control of railroads and waterfalls (that means power) and the tobacco and liquor businesses provide a large field for possible public investment. Coffee and oil are now being discussed as possibly to be brought under public control.

Railroads are now planning construc-

tion work for a ten-year period, but all actual work is being delayed until the need for work comes.

Now with incomes high, taxation is being raised to pay for the hard times of the future. When that time comes, business men will not be afraid to run the government into the red again.

Sweden's way of solving great social problems is by study in a Royal Commission. The problem of recurring depressions was tackled by a Royal Commission on Budget Structure. On this sat experts from the universities and from the administration, including five economists and five members of higher administration. Prof. Myrdal was one. The ideal of a royal commission is to reach an agreement of all members so far as is possible and to define all disagreements.

Sound finances are desired by the Socialists (now in the majority in Sweden) in order that they may put through their long-time program of social reforms; they are equally desired by the Conservatives. The principle of the unbalanced budget now meets the approval of both, Prof. Myrdal said, and the plan is in effect.

All extraordinary borrowings during the last depression are now paid back and the Swedish government operated within its budget for the fiscal year 1936-1937.

"It works," Prof. Myrdal declared.

Science News Letter, June 18, 1938

• Radio

Every Friday at 7:30 p. m. EDT, 6:30 p. m. EST, 5:30 p. m. CST, 4:30 p. m. MST, or 3:30 p. m. PST, Science Service cooperates with the Columbia Broadcasting System in presenting over the Columbia coast to coast network a new series of "Adventures in Science" presenting dramatizations of important scientific advances and discussions by eminent scientists.

AERONAUTICS

New Giant Air Transport Exceeds Expectation in Tests

See Front Cover

THE GIANT Douglas DC-4, America's largest air transport, scored "perfect" on its initial hour-and-a-quarter flight test in the hands of Major Carl Cover, test pilot and vice-president of the Douglas Aircraft Company, makers of the plane.

The big plane, developed as a type for America's five major air lines, carried a gross load of 53,000 pounds at takeoff. It required less than half of the 2,800-foot runway of Clover Field to get into the air.

Two months of further flight testing by its makers will now follow. Seats and special instruments for eight flight observers have been installed in the plane, on which two years and $1,700,000 have already been spent.

Prior to its flight test, the 65,000-pound giant, was successfully put through a bewildering array of novel load and "indoor flight" tests, without ever leaving its hanger, devised to guarantee that the 42-passenger plane would be able to stand strains more than three times as great as any it will meet when it goes into service on United States airlines, officials of the Douglas Aircraft Company, its builders, announced. The picture on the front cover of this week's SCIENCE NEWS LETTER shows one of these tests.

"Indoor flying," never before attempted as part of the checking of a new airplane, was provided by wind tunnel and vibration tests reproducing conditions far more severe than any it will ever meet, it was stated.

The great plane, which weighs two-and-a-half times as much as the Douglas DC-3 plane now used on almost every major airline in America, was loaded with hundreds of thousands of pounds of lead during the test.

Its tricycle landing gear, the first ever placed on a large transport, was dropped 50 times to simulate "landings" of the hardest pancake variety. Each "landing" duplicated an impact of 120,000 pounds on the main wheels and 54,000 pounds on the nose wheel. The novel landing gear will enable the plane to rest horizontally on the ground as well as land safely under less favorable wind conditions than those required for the present type of landing gear.

Harry H. Wetzel, general manager and vice-president of the company, pronounced the great craft's performance "eminently satisfactory."

A load of 175,000 pounds was placed on the wings as one part of the checking. In a final test, conditions of a "high angle of attack," such as the plane entering a climb of 2,000 feet a minute from level flight of 235 miles an hour, were duplicated.

Two special steel structures, each built from 20,000 pounds of steel, were built to reproduce forces acting on the plane's wings during flight. Cables running over pulleys exerted an upward pull while hydraulic jacks applied pressure beneath the wings as part of the tests, designed to check in advance any possibility of structural failure.

Science News Letter, June 18, 1938

DOCUMENTATION

Scientists Can Now Publish Research Upon Microfilm

A WAY in which scholars and scientists can publish the complete record of their researches without large subsidies now often necessary was presented to the Special Libraries Association by Watson Davis, director of Science Service.

By using microfilms, which are reduced-size photographic images upon 35 mm. film, it is now practical to furnish at low cost any text, pictures or other