in the benzene solution to form the S-layer are far less regularly spaced. The contact angles θ we have been discussing are measured by placing drops of liquid on the surface of a monolayer on a solid. This angle serves as a measure of the work of adhesion W given by

$$W = \gamma\ (1 + \cos\theta)$$

where γ is the surface tension of the liquid of the drop.

Zipper Angles: There is another angle, which we shall call the *zipper angle,* z, that measures the adhesion of a B-layer for an underlying surface. For example, a clean chromium slide is immersed in clean water and then an H-layer of stearic acid is spread on the water. The water appears to peel back from the slide as this is slowly withdrawn from the water, leaving the slide dry but with a B-layer which has been deposited on its surface. Actually, however, the water is forced out[13] from under the B-layer by attractive forces exerted by the polar groups of the B-layer upon the underlying polar atoms of the chromium surface—a kind of "zipper-like" action. The force of gravity is entirely inadequate as a cause of this phenomenon. The angle z is conveniently measured by withdrawing the slide from the water in an inclined position (its surface inclined from the horizontal by the angle z) and so altering z that the water surface remains horizontal right up to the line of contact with the plate. The angle is readily measured within about 10°.

Oleic or stearic acid B-layers deposited on glass from pure water gives $z = 0$; *i.e.,* the water is not forced out from under the B-layer. Such a B-layer is described as a *hydrous* B-layer, as it is separated from the underlying plate by a relatively thick layer of water (several microns at first). On standing a few minutes in the air the water film evaporates and the B-layer (then called a dehydrous B-layer) then comes into contact with the glass. If the glass has been previously treated with alkali, this B-layer becomes firmly anchored to the glass and can not be displaced by water or dissolved off by benzene.

Recent experiments have shown that B-layers of oleic, stearic and arachidic acids deposited on clean glass from H-layers on distilled water are hydrous, $z = 0$, even if the pH is adjusted to values from 4 to 9 by HCl, $NaHCO_3$ or NH_4OH.

B-layers of these acids deposited on a Shamva-polished chromium surface give zipper angles $z = 50$ to 60°, so that the plates emerge dry. These B-layers are firmly anchored to the chromium plates and are not displaceable by water or soluble in benzene.

Conclusion

The structure and surface properties of monolayers and multilayers are frequently determined by the orientations of individual molecular layers, but under certain conditions a layer may undergo an almost instantaneous reversal of orientation. This overturning may alter the chemical and physical properties.

It seems probable that the overturning of molecular layers may be a phenomenon of considerable biological significance. If the monolayers contain dipoles or ionic charges as well as hydrophobic and hydrophilic groups, the overturning of the layer may cause large changes of electric potential. Conversely, change of potential or of chemical composition of the liquid on one side of a membrane may cause an overturning of one or more of the monolayers and so change the properties of the film. The phenomenon of overturning may perhaps help explain the mechanism of the propagation of nerve impulses.

[24] I. Langmuir, *J. Franklin Inst.,* 218: 143, 1934, see p. 156.

SCIENTIFIC EVENTS

REPORT OF THE TRUSTEES OF THE BANTING RESEARCH FOUNDATION

A TEN-YEAR period has elapsed since the first group of grants was made by the trustees of the foundation. During this period grants have been made annually in accordance with the charter to the Department of Medical Research under Sir Frederick Banting; and also 184 grants have been made to 110 individuals distributed throughout Canada as follows: Brandon College 1; Dalhousie University 10; McGill University 18; Queen's University 2; University of Alberta 3; University of British Columbia 1; University of Manitoba 13; University of Saskatchewan 2; University of Toronto 56; University of Western Ontario 5.

During the year 1936–37, 28 workers received grants from the foundation and 24 papers have been published as the result of grants made in this or previous years. The following brief comments may be made on the grants made during the year:

B. F. Crocker, University of Toronto: A new method is being employed for the study of the process of digestion in dogs and satisfactory progress is being made. Dr. J. C. Goodwin, University of Toronto: A further payment was made in order to have a technical analysis of the report made on the observations made in regard to the relationship between the inter-racial origin of parents and the progress of labor. Dr. E. R. Grant, McGill University: On the cause of otosclerosis. Dr. A. W. Ham, University of Toronto: A valuable research was carried out on the changes in joint cartilage produced by vitamin C. Mrs.

H. T. Malloy and K. A. Evelyn, McGill University: On the determination of bile in blood, using the new photo-electric colorimeter. B. Schachter, University of Toronto: Purification of the gonadotropic substance in human pregnancy urine. Drs. D. L. Selby and R. W. I. Urquhart, University of Toronto: on the effect of experimental unilateral nephrosis on the secretion of urine. Dr. S. Weinstein, University of Toronto: An attempt to crystalize prolan. Drs. R. F. Wilkinson and R. G. MacKenzie, University of Toronto: A clinical study of the prevention of thrombosis in man by means of heparin. R. J. Wilson, University of British Columbia: A study of the type of staphylococcus which produces food poisoning in man. Dr. B. Chown, University of Manitoba: On some types of kidney disease which are probably due to an excess of mineral secretion. Dr. D. Beall, University of Toronto: An attempt to introduce an amino group in oestrone and oestrodiol. Dr. G. H. Ettinger, Queen's University: An endeavor to account for the large amount of acetylcholine contained in the placenta. E. J. Reedman, University of Toronto: On free and combined vitamin C.

V. E. HENDERSON
A. W. HAM
Honorary Secretaries

CHANNEL ISLANDS NATIONAL MONUMENT

BY proclamation of President Roosevelt, two of the Channel Islands, off the coast of southern California, have been transferred from the Bureau of Lighthouses of the Department of Commerce to the Department of the Interior, to be established as a national monument by the National Park Service.

Five islands are included in the Channel Islands group, which were discovered in 1542 by the Portuguese navigator, Juan Rodriques Cabrillo, whose remains are buried on San Miguel. The two now given national monument status are Santa Barbara and Anacapa. The latter is in reality three small islands, but these lie so nearly in a straight line, with such narrow channels between them, that they have long been considered as a single island. Combined length of the three is approximately four and a half miles, with a maximum width of about half a mile. High sea cliffs, almost perpendicular, are characteristic of the Anacapa group, with numerous wave-cut caves eroded into their forbidding declivities. The highest elevation is 980 feet. Santa Barbara's length is one and a half miles; its maximum width, one mile. There are so few breaks in its bold, precipitous shores that but one landing place is possible, and that is accessible only in mild weather. Except for two hills, one 547 feet in elevation, the top of the island is a comparatively flat expanse, bordered by steep cliffs.

The monument has been established to conserve the unique geological and biological features of the two islands. Both present fascinating geologic stories; both consist largely of volcanic rocks of the Miocene age. In some places three distinct elevated beaches are clearly defined by terraces along the high cliffs. In these a wealth of fossils has been found, ranging from marine invertebrates to Pleistocene elephants and fossil trees.

More than eight endemic flowering plants, some thirty endemic mammals or birds, and sixteen land mollusks add further to the scientific fascination of the two islands. As research reserves, available for study, the islands will not for the present require any development.

THE ENDOWMENT OF THE BIOLOGICAL SCIENCES AT THE UNIVERSITY OF CHICAGO

THE Rockefeller Foundation has made a conditional grant of $1,500,000 to the University of Chicago for the endowment of research in the biological sciences on condition that an additional sum of $500,000 can be obtained from outside sources before June 30, 1941.

During the next three years the foundation will provide $180,000, at the rate of not more than $60,000 a year, for biological research. This grant has been made so that the equivalent of the income of the capital sum of $1,500,000 will be available to the university during the period allowed for raising the matching sum of $500,000. Should the university be able to meet the condition in a shorter period, the temporary annual grants will be cancelled. Since 1929 the foundation has provided grants for the support of basic laboratory research in fundamental biological problems. The endowment will support permanently this work on a somewhat larger scale than in the past.

Dr. Robert Maynard Hutchins, president of the university, made a statement in which he said:

> Because this grant is one that is vital to the university's research in the cause and treatment of disease, we shall make every effort to secure the matching funds from friends of the university.
>
> Fundamental research in the biological sciences must be carried on to achieve systematic advance in medicine. When the General Education Board gave us $3,000,000 in December, 1936, to develop our Medical School, it specifically recognized this relationship.
>
> The university's clinical work, conducted for research purposes, is in close cooperation with the natural sciences departments. We recently appointed an eminent physicist, Dr. James Franck, to a professorship in physical chemistry to study a biological problem. Medical research at the university to-day is a cooperative enterprise reaching from the hospitals into such remote fields as botany. The offer of the foundation, therefore, is of great importance to our program.

Many of the investigators at the university and much of its important research work have been supported in part by the annual grants of the foundation