is cracked and the tiles are mostly gone. All the windows are out too, but I have two panes now so that we will have light in two rooms if within a few weeks we go back. Friends and family gave us some beds, chairs, a table, cups, plates and a few others of the most essential things for living. You can buy nothing except food on coupons. All the shops are absolutely and completely empty. For weeks I have tried to get a tie, on coupons, but without any results. I wear a dyed Allied uniform, discarded boots and a shirt from the U. S. Army, which, fortunately, I got from the Red Cross. This winter hundreds died here from starvation but we survived because of my name being rather well known in agricultural circles. Still, it was dangerous to go out for food because the Jerries pinched everybody under 50 for work in Germany and I had several narrow escapes. 65% of the Dutch Jews, about 120,000 were murdered in Germany and nearly the same number of other men and women. On top of that many thousands died of starvation and many more by bombing and shellfire. We too, had six weeks of intermittent shellfire at Bennekom, but we got more or less accustomed to it, though they shot part of a house away in which we slept upstairs for a few weeks. We were so calm then, that we went to sleep and not till next morning did anybody find out that we were hit.

Before America got in the war you promised to send me some papers and some material of aphids. You could do me a very great pleasure with whatever you can lay hands on, but I am especially in a hurry to examine if possible fresh alcoholic material of the various *Micromyzus* species from *Allium* species which you described just before the war. In England a *Micromyzus* on shallot has turned up, which is thought there to be new and for both the identification of their species and the purpose of including it in my monograph I should like, if possible, to compare it with material of your species.

The only things of interest which I published during the war were a short survey of fruit aphid in Dutch, of which I never received a reprint, but which will be reprinted eventually as a booklet, and an article on *Yesabura, Anuraphis* or whatever you want to call it, *crataegi* Theobald, from apple. The latter article is extensive and well illustrated, with an English summary, but though I got the last proof, it was not yet printed at the time of the Airborn landing near Arnheim and then the Jerries took all the better metal, but apparently the blocks still exist so that it should not be long until this is really published. Part 3 of my monograph got a permission from the Germans last summer to be printed in autumn, but after the landing all the printers' shops had to be closed. The manuscript is intact and the proofs may come in any moment. As soon as I have copies you will have them. Everything is still greatly disorganized here because so much is stolen. Everybody grows his own tobacco now but it stinks though it burns when lighted. The time that each small tobacconist sold about 200 brands of cigarettes is history now.

Well, Professor Essig, if you would please inform me how you did during the war, and if you could send me some material, you'll oblige me very much, really. My address after the middle of September will be 24, Selterskampweg, Bennekom.

With best regards and congratulations on the work your country did for us during the war and is still doing.

SCIENTIFIC NOTES AND NEWS

THE Nobel Prize for physiology and medicine has been awarded by the Karolinska Institute of Stockholm to Sir Alexander Fleming, of the University of London, the discoverer of penicillin, and two of his co-workers—Dr. Ernest Boris Chain, professor of chemical pathology at the William Dunn School of Pathology, Oxford, and Sir Howard Walter Florey, professor of pathology, also of the University of Oxford. The recipients will share equally in the prize, which amounts to about $30,000.

THE Gorgas Medal, awarded annually since 1942 for outstanding work in preventive medicine for the armed forces, was presented in Washington on October 29, at a dinner of the Association of Military Surgeons, to Captain Lowell T. Coggeshall of the Marines "for distinguished service to our military forces in establishing new principles in the management of patients suffering from psychic disturbances as well as physical deterioration from the effects of malaria and filariasis." Frank F. Law, vice-president of Wyeth Incorporated, which sponsors the medal, made the presentation of the medal and a check for $500.

THE eightieth birthday of Professor Charles Atwood Kofoid was celebrated on October 11 by the Department of Zoology of the University of California at Berkeley, by a reception in the Kofoid Library in the Life Sciences Building. Over three hundred friends and colleagues of Dr. Kofoid were invited. Many of those who were unable to be present sent congratulatory letters.

MEMBERS of the American delegation to the meeting of the Educational Conference of the United Nations, which opened on November 1 in London, include Dr. Arthur H. Compton, chancellor of Washington University, St. Louis, and Dr. Harlow Shapley, director of the Harvard College Observatory.

THE British Privy Council for Medical Research has appointed Dr. Patrick Alfred Buxton, F.R.S., professor of medical entomology in the University of London, and Sir Alexander Fleming, F.R.S., professor of bacteriology, members of the Medical Research Council.

DR. LOUIS B. SLICHTER, professor of geophysics at the Massachusetts Institute of Technology, has been

appointed professor of geophysics at the University of Wisconsin. He will take up his new work at the opening of the second semester late in January.

DR. HENRY H. BLAU, in charge of research and manufacturing of the Federal Glass Company, has been appointed professor of glass technology at the Ohio State University.

DR. JOSEPH B. SPROWLS, JR., has been appointed professor of pharmacy and head of the department at the University of Buffalo.

DR. W. F. BUCHHOLTZ, of South Dakota State College, is returning to Iowa State College as associate professor in the department of botany and as research associate professor in the section of botany and plant pathology of the Agricultural Experiment Station. Dr. Robert Dean Schick, of the University of Oklahoma, will become assistant professor in zoology in the department of zoology and entomology.

DR. JAMES O'HARA MALONEY, of the department of engineering of the E. I. du Pont de Nemours and Company, Wilmington, Del., has been appointed head of the department of chemical engineering and director of the research foundation of the University of Kansas.

DR. W. STORRS COLE has been appointed professor of geology at Cornell University.

DR. GERHARD HERZBERG, professor of physics at the University of Saskatchewan, has arrived at the Yerkes Observatory at Williams Bay, Wis. He will serve as a member of the staff of the Yerkes and McDonald Observatories and as associate professor of spectroscopy in the department of astronomy and astrophysics of the University of Chicago.

DR. R. H. K. FOSTER, chief pharmacologist with Hoffmann-LaRoche, Inc., has been appointed associate professor of pharmacology at the School of Medicine of St. Louis University.

CONRADO F. ASENJO, assistant professor of chemistry at the School of Tropical Medicine of the University of Puerto Rico under the auspices of Columbia University, has been promoted to an associate professorship.

LIEUTENANT WARREN C. WHITMAN has returned to his work at the North Dakota Experiment Station. He was attached to the Eighth Air Force in England from October, 1943, to August, 1944, and to the Ninth Air Force in France until June, 1945.

DR. D. L. BLACKSTONE has returned to the University of Missouri as assistant professor of geology after three years spent on investigations of oil and gas for the Carter Oil Company, of Tulsa, Oklahoma.

DR. RALPH MUCKENFUSS has returned to his work as director of the bureau of laboratories of the New York Department of Health, following a tour of duty as commanding officer of the First Medical General Laboratories of the European Theater of Operations. For his work in the Army he was awarded the Legion of Merit.

MAJOR ALLAN HEMINGWAY, who, prior to his entrance into the AAF School of Aviation Medicine early in 1943, was assistant professor of physiological chemistry in the Medical School of the University of Minnesota, has been placed on the inactive list of the Army and will resume teaching and research.

DR. EARL W. FLOSDORF, for twelve years assistant professor of bacteriology in the Medical School of the University of Pennsylvania, has resigned to become director of research and development for the F. J. Stokes Machine Company, Philadelphia.

DR. CHARLES A. COOK, formerly in charge of the department of medical biochemistry at the Lambert Pharmacal Company, St. Louis, has been appointed research director of the E. L. Patch Company, Boston.

DR. ROBERT D. COGHILL, since 1939 chief of the Fermentation Division, Northern Regional Laboratory, U. S. Department of Agriculture, in Peoria, Ill., has been appointed associate research director of the Abbott Laboratories, North Chicago.

DR. R. E. BUCHANAN, director of the Agricultural Experiment Station at Iowa State College, has been named chairman of the technical advisory committee of the delegation of the Iowa Development Commission to attend the first meeting of the Food and Agriculture Organization of the United Nations, which opened in Quebec on October 16, and adviser to the official delegate from the United States, Secretary of Agriculture Anderson.

PROFESSOR R. P. LINSTEAD, F.R.S., has been appointed director of the chemical research laboratory in the British Department of Scientific and Industrial Research.

DR. E. ASHWORTH UNDERWOOD, medical officer of health of West Ham, during the past five years honorary secretary of the Section of the History of Medicine of the Royal Society of Medicine, has been appointed director of the Wellcome Historical Medical Museum and the Wellcome Historical Medical Library, London. Wing Commander C. J. Hackett, a research fellow in tropical medicine of the Medical Research Council, has been appointed director of the Wellcome Museum of Medical Science in succession to Dr. S. H. Daukes, who has served for the past twenty-six years.

DR. REID B. GRAY has been appointed director of the Reynolds Research Institute, subsidiary of the

Reynolds Metals Company. He succeeds Dr. Warren J. Mead, of the Massachusetts Institute of Technology, who recently resigned.

THE Smith, Kline and French Laboratories have made a grant of $2,500 a year for two years to Professor Amedeo S. Marrazzi, head of the department of pharmacology and therapeutics of the College of Medicine of Wayne University. The grant is for the further study, by electrical methods, of drugs acting on the autonomic and central nervous systems.

DR. GEORGE HERRMANN, professor of medicine at the Medical Branch at Galveston of the University of Texas, recently spent two weeks in Mexico City as the guest of the Institute of Cardiology and of the University Medical School.

PROFESSOR JOHN R. DUNNING, of Columbia University, addressed the Faculty Science Club of Hunter College on October 16. The title of his lecture was "Nuclear Fission."

A JOINT meeting of the American Philosophical Society and the National Academy of Sciences will be held in Philadelphia on November 16 and 17. The meeting will be devoted to "Atomic Energy and Its Implications." The sessions on Friday will be held in the auditorium of the University Museum of the University of Pennsylvania, 33rd and Spruce Streets, and on Saturday at the Hall of the American Philosophical Society, Independence Square. These meetings will be open to the public.

THE American Association of Physics Teachers will hold its fifteenth annual meeting jointly with the American Physical Society at Columbia University on January 24, 25 and 26. At this meeting the fifth Richtmyer Memorial lecture will be delivered by Dr. Paul Klopsteg; presentation of the Oersted Medal will be made; joint sessions will be held with the American Physical Society, and there will be exhibits of newly developed instructional equipment.

THE New York Academy of Medicine announces the availability of the Louis Livingston Seaman Fund for the furtherance of research in bacteriology and sanitary science. One thousand dollars is available for assignment in 1945. The fund has been made possible by the terms of the will of the late Dr. Louis Livingston Seaman, and is administered by a committee of the academy under the following conditions and regulations: (1) The committee will receive applications either from institutions or individuals up to December 1. Communications should be addressed to Dr. Wilson G. Smillie, chairman of the Louis Livingston Seaman Fund, 1300 York Avenue, New York 21, New York. (2) The fund will be expended only in grants in aid for investigation or scholarships for research in bacteriology or sanitary science. The expenditures may be made for (a) the securing of technical help; (b) aid in publishing original work, and (c) purchase of necessary books or apparatus.

THE Paul-Lewis Laboratories, Inc., of Milwaukee, Wis., has established an annual award for outstanding work in the field of enzymes, and has requested the American Chemical Society to administer the award in a manner similar to other awards administered by the society. The award is to be made for the purpose of stimulating fundamental research in enzyme chemistry in the United States by young men educated in a college or university in the United States. It will consist of $1,000 and a bronze medal (or diploma). An additional amount up to $150, or as much thereof as necessary, is available to the recipient toward traveling expenses to the national meeting of the American Chemical Society at which the award will be presented. To be eligible, a nominee shall be a citizen of the United States and a graduate of a United States college or university, shall not have passed his thirty-sixth birthday on April 30 of the year of the award, and shall have accomplished outstanding research in enzyme chemistry. For the purpose of this award the presence of an enzyme action must be unequivocally demonstrated in the nominee's work. Nominations for this award, as well as members of the award committee, are limited to non-commercial chemists. J. J. Willaman, of the Eastern Regional Research Laboratory of the Department of Agriculture, has been appointed chairman of the canvassing committee.

A SUM of $500,000, from funds raised during the cancer campaign in the spring of 1945, is being made available by the American Cancer Society for initial steps in a cancer research program sponsored by Dr. C. P. Rhoads, chairman of the research committee formed by the National Research Council in cooperation with the society. Appropriations will be made for chemical, biological and clinical research, and for research in physics. The sum of $50,000 is recommended for fellowships to be given scientific men released from the Army who will engage in cancer research.

THE University of Notre Dame, South Bend, Ind., has received a gift of $1,000,000 from Peter C. Reilly, of Indianapolis, to be known as the P. C. Reilly Science Fund. Its income will be used in the field of chemistry and chemical engineering.

A SUBSTANTIAL part of the engineering library of the late Robert E. Horton, hydraulics engineer, of Voorheesville, N. Y., has been received by Albion College, Michigan, of which he was a graduate. The

bequest was accompanied by an endowment of $5,000 for the extension and maintenance of the library.

THE first issue of *Wrightia,* the botanical journal of the Southern Methodist University at Dallas, has appeared. Each volume, which will contain approximately five hundred pages, will consist of a series of numbers to be issued at irregular intervals.

AS an aid in the study of legislation on science now before the Congress, the Subcommittee on War Mobilization of the Senate Military Affairs Committee has issued a select bibliography on "The Social Impact of Science." The bibliography has been prepared by the Library of Congress. It lists more than five hundred titles of books, pamphlets, articles and Congressional bills and reports dealing with the social and economic problems arising from scientific progress. A special section covers the available literature on atomic power, including several volumes yet in press.

SPECIAL ARTICLES

FORCES INVOLVED IN THE REACTION BETWEEN ANTIGEN AND ANTIBODY MOLECULES

THE nature of the reaction between antigen and antibody molecules is far from being completely understood at the present time.[1] Though of major importance from the standpoint of biology, the reaction also offers a very interesting example of the physical forces involved between large molecules. Thus for the past few years the author has been engaged in a study of the serological reactions occurring between a film of antigen deposited on a metal slide and a solution of antibodies brought in contact with that slide. From this work, which will be published shortly in detail, some surprising facts have recently come to light which appear to be of sufficient interest to justify their publication in this note.

Previously published work has shown that the specific fixation of homologous antibodies occurs even when the antigen molecule is completely unfolded and 6 to 8A thick.[2] The specific fixation of antibodies has been demonstrated by an increase in the adsorbed layer on the plate after treatment with homologous antibodies. The accuracy with which small increments in film thickness can be measured is now greatly improved by an apparatus named the "ellipsometer," recently described, which permits the measurement of film thickness increments with an accuracy of $\simeq \pm 0.3$A.[3] The method is based on the change that takes place in ellipticity of the light reflected after a metal slide has been coated with films whose thickness is of molecular dimensions. The technique employed is briefly this: Highly polished stainless steel slides are first covered with an optical gauge of 1 and 3 (or 2 and 4) layers of a reference film (stearic acid). Films of antigen (bovine albumin, egg albumin) spread on an Adam Langmuir trough are transferred on the slides according to the procedure of Blodgett and Langmuir.[4] Two unfolded films 6 to 8A thick can easily be transferred on such slides.

It is very difficult to transfer more than two layers. However, if the slide is first treated with a dilute solution of uranyl acetate, a very large number of protein films can be transferred. This demonstrates that the uranium ions strongly polarize the first layer, which in turn polarizes the second, and so on along the successive layers. This polarization prevents the films from slipping back on the surface of the trough when the slides are taken out. A drop of the antisera to be tested, diluted 1/10 in buffered saline solution, is deposited on slides covered with the antigen films. After a few minutes, the slides are washed with saline and water and the increment of thickness is determined. Some of the results have been condensed in Table 1.

TABLE 1

SPECIFIC REACTION OF FILMS OF BOVINE ALBUMIN WITH RABBIT ANTIBODIES

Number of bovine albumin layers	Increase in thickness in A units after adsorption of antibovine albumin serum	Increase in thickness in A units after adsorption of antiegg albumin serum
1	39	4
2	57	4
4	104	−3
6	136	−8
8	149	

It is evident from the data that films of bovine albumin react in an unexpected way. The amount of adsorbed antibody molecules increases with the number of underlying layers of bovine albumin up to four double layers. Thickness increments of antibodies obtained with five underlying double layers are about the same as those obtained with four double layers.

Quite a different result is obtained with egg albumin. With films of this protein, the amount of adsorbed homologous antibodies is independent of the number of underlying layers of antigen. Constant increment of antibodies of about 20A is obtained and

[1] K. Landsteiner, "The Specificity of Serological Reactions," Cambridge, Harvard University Press, p. 262. 1945.

[2] A. Rothen and K. Landsteiner, *Jour. Exp. Med.,* 76: 437, 1942.

[3] A. Rothen, *Rev. Sci. Inst.,* 16: 26, 1945.

[4] K. B. Blodgett and I. Langmuir, *Phys. Rev.,* 51: 964, 1937.