THE CHESAPEAKE CHEMIST

MARYLAND SECTION
AMERICAN CHEMICAL SOCIETY

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"SNOWFLAKES"

THE CHESAPEAKE CHEMIST

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IN THIS ISSUE

The Chesapeake Chemist is published monthly September through May by the Maryland Section of the American Chemical Society. Address editorial comments to Lt. Col. Kenneth S. White, University of Maryland, 636 W. Lombard St., Baltimore, Md. 21201. Address advertising inquiries and plates to J. M. Maselli, W. R. Grace & Co., Washington Research Center, Clarksville, Maryland 21029.

FEBRUARY MEETING

DATE AND TIME:

Wednesday, February 17, 1965
At 8:30 P.M.

PLACE:

Eudowood Gardens, Lecture Room, Eudowood Plaza, Joppa Road near Goucher Blvd.

SPEAKER:

DR. DANIEL E. KOSHLAND, JR.
Senior Biochemist, Brookhaven National Laboratory

SUBJECT:

"Structure and Function in Enzyme Action"

(See page 10)

COCKTAILS AND DINNER:

Eudowood Gardens Dining Room
Price—$2.25 per person for cocktails (6:30 - 7:15) and hot buffet dinner (7:15). Free parking. Reservations must be received no later than February 15. Use reservation form on page 14.

We encourage you to bring your wife and friends to both dinner and meeting. As before, the dining room will remain open during the period of the meeting.

SOCIAL HOUR:

There will be a social hour after the meeting. Refreshments will be served. All are welcome.

THE COVER

"SNOWFLAKES"

Photo by CARL E. QUENSEN
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DR. DANIEL E. KOSHLAND, JR.

Dr. Koshland was born in New York, New York, in 1920. He received the B.S. degree from the University of California in 1941 and the Ph.D. from the University of Chicago in 1949. After a two year postdoctoral fellowship at Harvard, he joined Brookhaven National Laboratory in 1951 and has remained a member of that organization since that time.

Dr. Koshland is a member of the editorial boards of the Journal of Biological Chemistry and of Biochemica et Biophysica Acta. He is a member of the Biochemistry Study Section, U. S. Public Health Service, the Executive Committee, Division of Biological Chemistry, ACS, and of the Advisory Committee, College of Arts and Sciences, Cornell University.

Dr. Koshland was Walter Ames Lecturer, University of Washington (1964), O. M. Smith Lecturer, Oklahoma University (1963), and Visiting Professor, Cornell University (1957-1958).

CHEMICAL SAFETY NEWSLETTER

SHIELDS AND BARRICADES FOR CHEMICAL LABORATORY OPERATIONS

Chemists commonly encounter hazards from explosion, flying glass from apparatus which has failed under pressure or vacuum, ignition of escaping flammable vapors and the accidental release of toxic or corrosive materials. Useful guidelines for laboratory shielding and barricading have been described by David T. Smith of du Pont's Chambers Works (National Safety Council Chemical Section, Safety Newsletter, July and August 1963).

In the explosion of most chemicals, the reaction front, or shock wave, travels at subsonic speeds ("deflagration") with energy release of limited significance compared to detonable materials like TNT in which the shock wave travels at supersonic velocity. For most deflagrations, the blast wave pressure is a function of the bursting pressure of the container. Unless there is reason to believe a detonation can occur, protective design for chemical processes can be based on deflagation effects. Always limit the quantity of hazardous chemicals to minimize the effects of any accident.

For complete protection from missiles thrown by an explosion and from splash, spray and ricochet:

a. Avoid unshielded line-of-sight path between the apparatus and any part of the observer's body.

b. Avoid ricochet path where the angle of incidence with the deflecting surface exceeds 45°.

If the shield is intact, the only serious air blast hazards remaining in bench-scale work are the possibility of ear damage and injury resulting from involuntary or irrational reaction to the blast.

To ensure containment of flames and toxic, corrosive or flammable gases, vapors and dust, complete enclosure in an efficient, mechanically-ventilated fume hood is necessary. The important factors are adequate inward air flow (100 lineal feet per minute minimum velocity recommended by industrial hygienists), prevention of turbulence at the hood window opening and placement of equipment well back (6 inches minimum) from the hood face.

Personal protective equipment provides a second line of defense: safety spectacles, preferably with side-shields, as a minimum and additional eye and face protection for more severe potential hazards; flame retardent cotton clothing where fire hazards may be present; shirt sleeves rolled down and shirt fronts buttoned; aprons, jackets and gloves for further protection; respiratory protection for emergencies.

Select materials of construction for shields carefully. Transparent shields are satisfactory for reactions in most laboratory glassware where light missiles are developed. For heavy, energetic missiles of metal, ceramic or glass, use metal shields; for observation use mirrors, limited-area peepholes or other devices.

Methyl methacrylate offers a good over-all combination of physical characteristics and cost for laboratory shields. Polycarbonate is stronger and self-extinguishing, but is more expensive and easily attacked by organic solvents. One-quarter inch methyl methacrylate panels withstand, at a distance of 6 inches, ignition of a

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40-gram ball of nitrocellulose wrapped in paper masking tape or 3 grams of nitrocellulose in a 4-oz tightly stoppered glass jar.

Steel plate is about four times as effective as methyl methacrylate (i.e. use ⅛-inch steel plate for ½-inch methacrylate). For low-energy shielding, laminated safety glass is excellent. Avoid ordinary plate, rolled or tempered glass for any explosion shielding, and wire glass where there is severe blast effect.

Limit portable shields, constructed of not less than ¼-inch methacrylate, polycarbonate or laminated safety glass and firmly anchored against overturning, to low missile hazards and low blast pressures (withstand detonation of 0.5 grams TNT).

Conventional hoods, modified with overlapping ½-inch methacrylate horizontally sliding door shields and bottom guides and with ⅛-inch steel plate closure panels at exposed ends, may be safely used for nearly all bench-scale laboratory work with deflagration or pressure-failure explosions. They will also protect against detonations involving 2 grams TNT maximum per glass container located 12 inches from the shield (6 grams maximum per hood).

A special blast hood with 1-inch methacrylate sliding door shields, light plastic pressure-relief back and ¼-inch steel plate construction may be used for detonable materials with explosive energy equivalent of not more than 25 grams.

Heavy steel barricades are generally required for adequate protection against explosions in metal containers; equivalent protection is required for all exposed walls and doors. Each such installation should be individually designed.

Since distance is the single most effective protection against explosion, manipulate work with special tongs and tools and through special ports to avoid body exposure. For transporting or storing high-energy materials that may detonate outside a barricade, du Pont has developed "tote barricades" consisting of an elastomer cast around glass laboratory-size containers. A 1-pint casting over a small container has contained a 2-gram nitroglycerin blast; a 1-gallon casting has contained a 15-gram nitroglycerine blast.

In addition to blast and missile protection, consideration must be given to ear protection. A conservative safe limit of overpressure (i.e. above atmospheric) to prevent damage to unprotected ears is 0.01 psi, taking widely varying individual response into account. Good earmuffs, commercially available, will reduce air-blast overpressure on the ears by 90% or more; they seem to have the added benefit of decreasing observer panic after small blasts. A substantial continuous enclosure around the blast with no vents into the observer's space will also reduce the blast pressure to 1/10, if the enclosure is not penetrated by the blast wave.

Ernest Levens, Manager, Safety Aerojet-General Corp., Azusa, California

DEADLINE

Material for publication in the March issue should reach the Editor by February 15.

ACS MEETING-IN-MINIATURE

Details of the bisectional ACS regional meeting to be held on May 7, 1965 were published in the January issue of the *Chesapeake Chemist*. Members are reminded that abstracts of papers to be offered for presentation must reach the chairman of the appropriate session not later than March 5.

STRUCTURE-FUNCTION STUDIES OF ENZYMES

Specificity is one of the key phenomena which regulates the dynamics of the living system and its mechanism is presumably similar for such diverse systems as enzymes, antibodies, hormones and viruses. Some years ago it was proposed that the classical template theory of specificity proposed by Emil Fisher in the early 1900's would have to be modified to be consistent with newly developed information. The model that was proposed suggested that the substrate induced a conformation change in the protein so that a final fit between substrate and enzyme occurred, but only after the shape of the protein was deformed. Evidence for this hypothesis has been obtained in the intervening years in a number of ways. One of the most straightforward is the evidence that amino acid side chains, buried in the interior of the free enzyme, are exposed to a reagent when the protein interacts with its substrate. Physical tools have also been used and evidence from fluorescence studies, light absorption studies, and x-ray studies will be presented in support of the chemical studies.

To further these studies a new method of studying protein specificity has been devised. Molecules have been synthesized which consist of two portions, a "reporter" portion, having a physical parameter which is sensitive to changes in environment, and a "positioning" portion, having a reactive group which is specific for one type of amino acid residue. When the positioning group reacts with a specific amino acid residue in the enzyme, it leaves the reporter group covalently bonded to a specific position in the molecule. If this portion of the molecule is adjacent to the active site so that the substrate molecule comes in contact with it or if it is in a portion of the molecule which is undergoing a conformation change induced by the substrate, its physical characteristics will "report" these changes to a sensitive instrument. By testing the tagged protein with a variety of substrates, the signals so generated may be correlated with the specificity of the protein.

DR. FREDERICK C. BLANCK

Dr. Frederick C. Blanck, a distinguished member of the Maryland Section, died at the age of 83 at his home in Baltimore on January 11, 1965.

His career had been devoted to food chemistry, in which field he attained national prominence. He was a past president of the American Association of Agricultural Chemists, and a Fellow of the Institute of Food Technology, of which he was one of the founders. During World War II, Dr. Blanck served as a consultant on field rations to the Army Quartermaster Corps and later was a member of President Truman's Committee on Food and Nutrition. After serving for a number of years in the Bureau of Foods and Soils of the Department of Agriculture, he joined the H. J. Heinz Company in Pittsburg in 1939. Upon his retirement in 1947, Dr. Blanck became an advisory chemist to the Mellon Foundation. He returned to Baltimore in 1957 and remained active as a private consultant on food chemistry.

Dr. Blanck joined the American Chemical Society in 1905. He was one of the twenty signers of the petition addressed to the Council of the American Chemical Society, on June 1, 1914, requesting the formation of the Maryland Section, ACS. In compliance with this request, the Charter establishing the Maryland Section was granted on September 23, 1914. Dr. Blanck served as Chairman of the Maryland Section from 1919 to 1921.

On the death of Dr. Blanck, we mourn the passing of an esteemed colleague and one of our Founders, and offer to his family our deep sympathy and condolences.

MARYLAND SECTION NEWS

GOVERNMENT

FORT DETRICK

Mr. Orley R. Bourland is attending the Army Command Management School, Fort Belvoir, Virginia.

Lt. David van Ormer has joined the Army Medical Unit. Prior to coming to Fort Detrick, he taught at Radford College, Radford, Virginia.

Mr. Arthur E. Hougland, recently released from active service with the Army Medical Corps, where he taught Microbiology for two years, has joined E & E Office, Directorate of Medical Research.

EDGEWOOD ARSENAL

Lt. Col. Erwin P. Loeffler has been named Deputy Commander of the U. S. Army Edgewood Arsenal Chemical Research and Development Laboratories, replacing **Lt. Col. Zim E. Lawhon** who recently transferred to Scranton (Pa.) University as Professor of Military Science. From 1960 until his recent assignment as Deputy Commander, Col. Loeffler served as security officer and chief of the administrative staff of the laboratories.

Mr. Luther M. Hardin, supervisory physical scientist in the Evaluation Division of the Nuclear Defense Laboratory, received an outstanding performance award for his contribution to the evaluation of nuclear radiation effects studies which greatly increased the available knowledge of the laboratory and the U. S. Army.

Dr. Ira L. Baldwin, Chairman of the Edgewood Arsenal CBR Advisory Council, was honored at a ceremony conducted at the Officers' Club recently. Dr. Baldwin received a certificate of achievement for his work as chairman of the council from 1958 through 1964. Dr. Baldwin's citation read as follows: "During this period his excellent background together with his knowledge of the needs and operation of the Chemical Corps, have enabled him to guide the council in furthering the scientific progress in all related areas in the Edgewood Arsenal complex".

ACADEMIC

WOODSTOCK COLLEGE

Dr. James Dehn, S.J., Dr. John Marzolf, S.J. and the **Rev. James F. Salmon, S.J.,** are investigating the properties of meteorites by means of Mossbauer studies. They are being assisted by three former high school teachers at the masters or bachelors level. Father Salmon reports that this research is being done during spare time and ". . . is our form of recreation and relaxation from the full time theology program . . .".

JOHNS HOPKINS UNIVERSITY

The Spanish Government has honored Dr. Paul H. Emmett, professor of chemistry at J.H.U. with its highest award for scientific achievement, a medal and an appointment as honorary councilor of the Consejo Superior, the Superior Council for Scientific Research.

PESTICIDES

Excerpts from speech
by
Dr. George R. Ferguson, President, Geigy Agricultural Chemicals, division of Geigy Chemical Corp., delivered Jan. 11, 1965 to 17th Annual Pesticide School, School of Agriculture and Life Sciences, North Carolina State University, Raleigh, N. C.

"Prior to the last war, pesticide sales at the basic manufacturer's level were in the range of $27 to $35 million during the 1930-40 period. In 1949 . . . sales had increased to $110 million. The current estimate for 1964 is about $380 million. . . . Some industry leaders have predicted a one billion dollar industry by 1975. I am equaly optimistic."

* * * *

"In May 1963, the President's Science Advisory Committee released its report on 'Use of Pesticides'. This report included many recommendations. President Kennedy issued a directive that these recommendations be implemented by the appropriate Departments of the Government. During this same month of May 1963, Senator Ribicoff opened hearings on the general topic of 'Interagency Coordination in Environmental Hazards'. It is rather revealing to review the outcome of these two major governmental investigations. As of today virtually every recommendation either has been implemented or is in the process of being implemented, mainly within the framework of existing law".

* * * *

"The serious allegations against pesticides by anti-pesticide spokesmen have been investigated in depth. Results of these investigations bear testimony to the adequacy of existing legislation in the protection of the public health and public interest.

"Aside from the technical problems involved in the additional test requirements for new products and their resulting higher costs, let us take a candid look at the response of the business and agricultural communities. During the two years of this controversy, industry sales of pesticides at the basic manufacturer level have increased from an estimated $326,000,000 in 1962 to an estimated $384,000,000 in 1964. This is a much faster growth rate than the chemical industry as a whole.

"The problems of milk residues resulting from drift or misapplication and the development of insect resistance to various insecticides have had much more profound effects on the patterns of use of industry products than any of the factors given wide publicity as a result of 'Silent Spring'.

"The development of new analytical techniques in the past three years has introduced legal problems which have been confused with toxicological problems by the general public. No-residue registrations must aways be predicted on the sensitivity of an analytical method. In addition, the sensitivity of the analytical method must be correlated with toxicological data before a no-residue registration is finalized. A new analytical procedure which now 'sees' residues which older methods could not 'see' does not make that pesticide more toxic as well. It only makes the pesticide residue illegal".

* * * *

"Some of the short-range agricultural changes now taking place may not be recognized until 1970 or 1975. There is little controversy over the predictions of a substantial population increase over the next decade or two, together with a change in age distribution within the population. This increased population will consume more food. This increased population will require more acres for housing, highways, factories and recreation. Available farm land will be reduced.

"Thus, with an increasing population and a decreasing acreage for agricultural usage, pressures will continue to mount to increase productivity per acre.

"If we assume that our over-all national economic growth will continue for the next several years, or even decades as some experts predict, then we can assume that the demand for better quality food and also specialty foods will increase.

"Partly in response to the above demands to feed more consumers and to provide for their luxury whims and desires, but largely due to its own capacity for change and innovation, agriculture itself will undergo fundamental changes. We have already seen some basic geographical shifts. More will come. The center of the meat packing industry has moved from Chicago to Omaha. The center of gravity of cotton production has moved westward, and were it not for acreage allotments, it would have moved more rapidly.

"Another area of change that is going on and which will increase in intensity is that of cultural practices in crop production. Mechanization and chemicalization have not yet profoundly affected crop production practices. Row spacings are still basically the same. Tillage practices have been modified but have not changed drastically, even with the use of herbicides. We have seen or read about such things as skip-row planting of row crops, minimum tillage, broadcast planting of silage corn and others, but none of these have established themselves as basic cultural practices. Mechanical picking of such crops as tomatoes and soft fruits will relieve the pressure of farm labor shortage, but there is no evidence yet that mechanization of this type will basically change cultural practices as such.

"The tractor has replaced the horse as a source of power. Machines and chemicals have replaced farm labor. We have taken advantage of the research of the geneticists to increase productivity, but this really amounts to substituting one variety or strain for another with-

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PESTICIDES *(Continued from page 12)*

out really making basic changes in cultural practices. The really profound break-throughs of the future in agriculture will, in my opinion, come from basic and fundamental changes in cultural practices in crop and animal production.

"The changes of the future, whatever they may be, will demand higher and higher levels of technological sophistication. This is the basis of progress as we know it today in all industries.

"High standards of performance for all new products are already a prerequisite. But standards of performance are measured by today's needs and cultural practices. What about standards of performance and products characteristics for tomorrow's needs?

"Standards of pesticide performance are already being interpreted on a much broader basis than in the past and the base will broaden in the future. Even at the present time performance against the target pest is often secondary to such side effects as residues resulting from drift on forage crops, persistence in the soil and sensitivity of analytical methods. The number of personnel engaged in analytical laboratories, toxicological laboratories and other supporting activities is increasing at a much faster rate than personnel engaged in the testing and development of new products . . ."

"In addition, our research efforts in the area of new product development and introduction are more and more guided by the marketing and legal aspects involving the side effects of the product rather than upon the intended use of the product. It is not difficult for the synthetic chemist today to come up with a new, patentable and highly active molecule. The difficulty is to find one with superior performance, more economical and devoid of undesirable side effects. Now sales efforts are being directed more and more toward selling the absence of undesirable side effects rather than pest control itself."

———— Tear-Out Dinner Reservation Form ————

There is enclosed $..... ($2.25 per person)* for cocktails and dinner at Eudowood Caterers, Eudowood Plaza, on Wednesday, February 17, 1965 for the following persons.**

Name (Please Print or Typewrite) Address

***Make checks payable to Maryland Section, ACS and mail together with reservation form to Dr. George M. Steinberg, Physiology Division, USA Edgewood Arsenal CRDL, Edgewood Arsenal, Maryland.**

****Return by February 15. Please be prompt. If required, it is possible to accommodate a few late reservations.**

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