DDT-derived material in body fat averaged 12.9 ppm for the general population, and repeated surveys have shown that there has been no significant change since these levels were first measured in 1950.

The well established clinical picture of pesticide intoxication does not, of course, exclude the possibility that individual pesticides or groups of pesticides may have effects not yet detected. Certainly more objective study by professional toxicologists is needed, particularly concerning the means by which poisoning occurs. The fact that the use of biological threshold limits has proved difficult, as with mercury, brings us face to face with our ignorance of the dynamics of the storage of chemicals in the human body and the need for further research.

In any event, added Robert Blackwell Smith, Jr. (Medical College of Virginia), it is necessary to accept one fact of life: safety is a negative condition, the absence of hazard, and no amount of research or study will ever provide absolute assurance of safety. Concerning the use of insecticides on food crops there is no cause for alarm, for it is now possible to assure practical certainty of safety. And, as research improves our knowledge, the degree of assurance will improve, he said. In the future it may be possible to control many of our major insect pests with nonchemical or specific chemical methods without even the minimal hazards of our present methods. For the present, however, insecticides will be needed.

As for regulation, Parke C. Brinkley (National Agricultural Chemicals Association) said he believes that a good, strong regulatory program wisely administered at both the state and federal levels is in the best interest of all concerned. At the same time, needless laws, rules, and regulations discourage the developing and marketing of new and better products for farmers and public health officials.

To summarize, there are uncertainties in the use of pesticides, but the overt hazards are no greater today than a decade ago and are probably far outweighed by the advantages of food production and the potential control of some 27 diseases which afflict mankind.

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## Organic Solid State

The physics and chemistry of the organic solid state is a rapidly advancing field which recently has been very fruitfully explored by spectroscopists, chemists, and molecular biologists. Much of the discussion of this progress has been conducted at exclusive little meetings, which may account for the high quality of the work but tends to leave the rest of the scientific community unapprised of recent concepts and discoveries. A symposium on the organic solid state, held annually at the Franklin Institute, Philadelphia, Pennsylvania, serves as a channel of communication and discussion between specialists in this field and others whose interest is not so direct. The second symposium held 25 May 1964, presided over by M. M. Labes, consisted of four tutorial lectures by specialists in phenomena of excitation transfer, electron spin states, microbiology, and polymerization uniquely found in organic solids.

Recent experiments by G. W. Robinson, R. G. Kepler, and M. Silver, for example, have shown what happens when a photon interacts with a whole organic crystal. The photon migrates through the crystal as an exciton until it encounters either another exciton or a lattice site of special nature, or until its natural lifetime expires. The special mechanisms which permit this behavior were reviewed by J. Jortner; he presented a model of a molecular aromatic crystal whose molecules interact through electron exchange as well as by the usual electrical multipole forces. This mechanism for excitation and charge exchange is as intriguing as it is controversial, because it might be involved in the phenomena of photoconductivity and redox reactions in organic and biological structures. Jortner showed cases where transitions to these charge-transfer states are significant enough to explain the spectral features of other weakly allowed electron transitions in crystals of pure aromatic compounds.

The concept of electron exchange in homomolecular organic crystals is a generalization from charge transfer complex crystals. Such solids are often stoichiometric mixtures of electron donors with acceptors which interact very little even in the crystal. The excited states in which an electron is transferred from a donor molecule to an acceptor are observed spectroscopically and are often characterized by strong absorption of light in the visible region. Solids containing good donors and strong acceptors sometimes display this exchange as a ground state reaction and result in a class of paramagnetic organic solids. D. B. Chesnut discussed what is known about electron states and transfer in some of these systems. He noted in particular his own work on the fascinating radical-ion salts in which tetracyanoquinodimethan appears in two oxidation states, with concomitant opportunity for facile electron and excitation migration.

H. Morawetz discussed some novel chemical reactions whose course is directed by the crystalline environment when they proceed in the pure solid. Some newer developments were polymerization reactions in which the symmetry of the monomer lattice is impressed upon the resulting chain molecule. The spectacular systems discovered by Okamura were described. Single crystals of trioxane were polymerized to yield polymeric methylene oxide in the form of oriented fibers ordered in three-dimensional arrays. Vinylstearate and *p*-acetaminostyrene crystals also polymerize to give an oriented product, but only when the reaction is conducted below the glass transition temperature $T_g$ of the polymer. Above $T_g$ the product is isotropic, showing that this temperature is characteristic of local disordered regions of the crystal and of the finished polymer.

The general relevance of various topics of solid-state chemistry and physics to the biological sciences were surveyed by G. Tollin. The ordering present in chloroplasts, mitochondria, rod cells of the eye, and myelin sheaths are at least suggestive of solid crystalline structures. The evidence for such organization in chloroplasts was outlined: spectral shifts and polarization, energy transfer, photovoltaic and photoconductive effects, thermoluminescence, and delayed fluorescence. The appearance of photochromism at 1°K indicates that electron transfer, stimulated optically, must occur. Evidence can also be cited for solid state processes in mitochondria and in eye rod-cells, in both of which energy or electrons must travel through ordered structures over distances of 0.1 micron. Projected experimental approaches must overcome problems of low contrast in electron microscopy and permit electrical and spectroscopic measurements in vivo. Perhaps, it was sug-

gested, monolayers can serve as a suitable analogue for evaluating solid state concepts as applied to biological systems.

Many of these notions currently exist in biochemical and biophysical circles. It is clear that the continuing experimental and theoretical progress made on organic solids, particularly in the areas of spectroscopy, photoconduction, and reactivity, must be monitored carefully and critically by workers whose interests primarily concern fundamental life processes.


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## Forthcoming Events

### August

*23–26.* **Soil Conservation** Soc. of America, 19th annual, Jackson, Miss. (SCS, 7515 Northeast Ankeny Rd., Ankeny, Iowa)

*23–28.* American Inst. of **Biological Sciences**, annual, Boulder, Colo. (AIBS, 2000 P St., NW, Washington, D.C.)

*23–28.* American Congr. of **Physical Medicine and Rehabilitation**, Boston, Mass. (G. Gullickson, Jr., 30 N. Michigan, Chicago, Ill.)

*23–28.* **Conservation Education**, conf., Tacoma, Wash. (C. Boyce, Office of the Superintendent of Public Instruction, Olympia, Wash.)

*24–26.* American Inst. of **Aeronautics and Astronautics**, Los Angeles, Calif. (AIAA, 1290 Sixth Ave., New York, N.Y.)

*24–26.* Society for **Cryobiology**, annual, Washington, D.C. (V. P. Perry, Tissue Bank Dept., National Naval Medical Center, Bethesda, Md.)

*24–26.* **Education in the Nuclear Power Era**, conf., Gatlinburg, Tenn. (M. L. Nelson, Education Div., Oak Ridge Natl. Laboratory, P.O. Box 117, Oak Ridge, Tenn.)

*24–26.* **Mathematical** Assoc. of America, summer meeting, Univ. of Massachusetts, Amherst. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

*24–27.* American Soc. for **Pharmacology** and Experimental Therapeutics, Univ. of Kansas, Lawrence. (E. B. Cook, The Society, 9650 Wisconsin Ave., NW, Washington, D.C.)

*24–27.* **Biological Photographic** Assoc., annual, New York, N.Y. (C. H. Weiss, 81 Bedford St., New York 14)

*24–27.* American **Hospital** Assoc., Chicago, Ill. (E. L. Crosby, 840 N. Lake Shore Dr., Chicago 11)

*24–27.* **Toxicology and Occupational Medicine**, 4th inter-American conf., Miami Beach, Fla. (W. Machle, Univ. of Miami School of Medicine, Coral Gables, Fla.)

*24–28.* International Council of the **Aeronautical Sciences**, 4th congr., Paris,