Meetings

Wool Research

The third international wool textile research conference took place in the Maison de la Chemie in Paris from 29 June to 9 July 1965, l'Institut Textile de France acting, very efficiently and graciously, as the organizers.

The conference covered a wide range of topics—the morphology, physics, chemical properties and reactions of the wool fiber, and some technological aspects of the mechanical and chemical processing of wool. A policy of accepting all contributions falling within the prescribed subject areas led to a profusion of papers (185) and necessitated the running of as many as four concurrent sessions.

While some of the topics covered are of concern only to specialists in keratin or in textile processing, others are of more general interest. Indeed, those concerned with the soluble proteins may derive a new perspective by examining some of the problems encountered in handling such a material as an insoluble solid. Two of the survey lectures that highlighted the Paris conference—one by Stanford Moore, on the reactivity of disulfide bonds in proteins, and the other by Helmut Zahn, covering his work leading to the synthesis of insulin, and some of his related studies on the wool proteins —illustrated both the obvious dependence of keratin studies on knowledge of proteins in general and the less generally appreciated benefits derived by the protein field generally from keratin investigations.

Recent controversies concerning the structure of the keratin microfibril (the attempt to change the nomenclature to "filament" appears to have been given up) have become muted; it seems to be generally recognized that present tools do not permit unequivocal answers to such questions as how many protofibrils, and in what arrangement, constitute the microfibril, or whether the protofibril is composed of two or three polypeptide chains. Low-angle x-rays and electron microscopy are beginning to elucidate the long-range structure in the microfibril, and the interrelationship of the crystalline and amorphous regions of the structure.

It has been recognized for many years that the setting of a keratin fiber in a stable new configuration involves the rupture of covalent cross-links to permit stress relaxation; there have been prolonged controversies concerning the need for rebuilding of covalent bonds in order to stabilize the set, and concerning the nature of the bonds formed. Those in the field now appear to agree that, at least in setting by boiling water, steam, or alkali, sulfhydryl-disulfide interchange is a key mechanism for the stress relaxation; attempts to postulate the same mechanism for setting in reducing media met with skepticism.

With regard to formation of cross-linkage in setting and other processes, the only new developments relate to events in alkaline media. The formation of the "lysinoalanine" linkage (by reaction between lysine and a degradation product of cystine), first demonstrated by Ziegler a year ago, was discussed in more detail; another very interesting finding is that the rate of formation of lanthionine is not simply a function of *p*H and temperature, but is significantly affected by the nature and amount of ions present.

The chemistry and kinetics of the reaction of the keratin disulfide group with sulfite were considered in several papers, and some consideration was given to the recross-linking of sulfited keratin. However, a number of unanswered questions remain in this important field. The only other reducing agents studied were phosphorus derivatives—hypophosphites and tris-hydroxymethyl phosphine.

A good deal of work is being done on dyeing of wool, much of this work being concerned with the mechanism of diffusion of molecules into the fiber. Efforts to develop a physical picture to account for the observed phenomena have not so far been completely successful.

The interaction of keratin with water was examined by several contributors, all of whom were concerned with the effects of changes in the fiber—by cross-linking, sorption of organic materials, or removal of ionic groups. An interesting point which emerged is that a modification can affect the keratin so as to change the shape of the moisture sorption isotherm, so that the material may sorb less water at low humidity and more at high than originally.

A great deal of interest is being shown in the chemical and physical phenomena involved in the degradation of wool by oxidation, heat, light, and alkali. This has been largely stimulated by practical considerations—for example, the introduction of wash-and-wear garments has led to more severe exposure to degradative agencies—but it has also generated several fundamental studies.

Past work on the effects of exposure of wool to light was much bedeviled by apparently contradictory results of different investigators—some finding yellowing, others bleaching, under apparently similar conditions. It is now realized that the effects obtained are a function of the wavelength of the irradiation, the moisture content of the protein, and the presence of other materials. There is consequently at least some order in the data, but progress in the understanding of the mechanisms involved is slow. Clearly, a great many sites are attacked in various situations.

The properties of the fiber surface received remarkably little attention at this conference, except from one point of view, that of spreading of polymer films on the fiber. It was demonstrated that some polymers that ordinarily do not spread on an intact fiber can be made to spread by pretreatments of the fiber—for example, chlorination—which raises its surface energy above that of the polymer. The principle is a well-established one in surface chemistry; the delay in its application to a problem in wool finishing is an example of the "cultural lag" which appears to operate as much between fields of science as elsewhere.

Preprints of all the papers presented at the conference—four volumes totaling 1800 pages—were made

available to the participants, by a prodigious effort of organization, some 3 weeks prior to the meeting. The full proceedings will be published by l'Institut Textile in 1966.

The 1970 conference will be held in the United States; an organizing committee under the chairmanship of Harold Lundgren (Western Regional Research Laboratory, U.S. Department of Agriculture) has undertaken its planning.

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Radiation and Terrestrial Ecosystems

The development of tracer studies by which normal processes in ecosystems can be investigated and the effects on ecosystems caused by ionizing radiation have been major problem areas in the field of radiation ecology. In order to discuss these subjects a symposium on radiation and terrestrial ecosystems was held at Richland, Washington, 3–5 May 1965. The symposium was the fourth in the series of Hanford Biology Symposiums. Over 200 persons from nine countries attended.

In the opening address E. P. Odum (University of Georgia) expressed the hope that radiation ecology will continue to be interdisciplinary and derive impetus from the many related fundamental and applied fields on which it verges. Descriptive phases of work have largely been completed, and the clarification of fundamental processes in ecology is the problem facing researchers.

The status of environmental radiation and radioactivity was reviewed with respect to man-made radionuclides in fallout as well as radionuclides from natural terrestrial and cosmic sources. Carbon-14 and tritium have been used, and with the development of more sensitive detection instruments other cosmic-induced radionuclides are being detected and should play a larger role as tracers in identifying mechanisms of cycling in ecosystems. Fourteen radionuclides were considered in the light of their origin, concentration, and entrance into biological systems. The extensive literature on fallout and terrestrial nuclides was apparent in reviews of these fields and the summary of this literature was helpful in giving perspective to man-made, as contrasted with naturally occurring, radioactive sources.

Mechanisms by which radionuclides enter into the plant portion of a food cycle were reviewed. Direct deposition is currently the major way in which fallout materials contaminate plants and will continue to be so until the rate of fallout is substantially reduced below that existing at this time. Deposition is largely as particulate material under 40 microns in diameter. Knowledge of the extent to which particulate deposits are retained on different plant surfaces is meager. Much of our present information is based on tests involving application of dissolved nuclides and the special circumstances surrounding bomb testing.

Ion retention on the exchange complex and factors which affect this retention are important in the movement of radioactive materials from soil into plants. Extensive work on soil-plant relationships provided data by which concentration factors for essentially all elements were presented. From the magnitude of these concentration factors, it appeared that plants are in general excluding ions rather than preferentially absorbing them.

S. A. Cain, (Assistant Secretary, designate, for Fish and Wildlife) described the current status and projected objectives being proposed under the International Biological Program. It was also of immense interest to us all to learn more about the problems which the United States faces in preserving intact natural areas in the face of the ever mounting pressure to "utilize" such areas to the fullest.

Reports were presented on cycling and redistribution of radionuclides. Fallout materials, naturally occurring radionuclides, and ecosystems to which tracers had been added were all reported on. Systems ranged from forest and forest understory to desert and arctic, and from observations of entirely natural systems to agricultural and laboratory studies.

Research on cycling through plant and animal communities has been carried out. However, there are few data on how microorganisms convert fallen organic matter, and radionuclides associated with it, into a form by which these nuclides may be recycled, fixed to soil, or consumed with the microorganisms.

Levels of cesium-137 in Lapps continue to parallel closely those levels in Eskimos. High human burdens are related to the ^{137}Cs concentration in reindeer and caribou, and these in turn to the consumption of lichens by these animals. It was interesting to note that lichens sampled in Georgia contained appreciably more ^{137}Cs than found in Arctic lichens. The southern lichens do not, however, enter significantly into a food chain. These higher levels only reflect changes in fallout as a function of latitude and climate.

The importance of the individuality of each ecological system was emphasized by a comparison of ^{137}Cs concentrations in Colorado deer and Alaska caribou. Burdens in deer rose during the summer months as the deer moved to higher elevations where rainfall and fallout deposition were higher. In caribou, the peak occurred during winter months because of a higher consumption of lichens when other plants were not available.

Although substantial amounts of alpha emitters were shown to be taken into crop plants of Brazil and India, no estimate was made of the relative importance of this uptake compared with the external radiation doses to which humans are exposed. This external radiation was reported to give doses of nearly 10 roentgens per year; this amount appears to be more in one year than can reasonably be projected as a 30-year dose to Eskimos and Lapps from the ^{137}Cs to which they will be exposed.

A panel discussion of approaches to a study of radiological hazards in the environment brought together the experiences derived from environmental monitoring in the vicinity of a nuclear industry, in a region of bomb testing, in an area planned to test peaceful uses of atomic bombs, and in the worldwide area where fallout is deposited. The opinion was given that the term "hazard" is a misnomer because none exists relative to the essentially trace levels of nuclides which now exist in our environment. Special interest was expressed in the problem of nuclear excavation of a sea-level canal and the kind of early studies which will assure adequate evaluation of potential effects to the ecosystems and to man.

One question of special pertinence to the problem of radiation in the environment was raised during the panel discussion. If nuclear release is predicted as potentially annihilating an animal population, but with no implications to man, would this be adequate basis for precluding the use of nuclear devices for a construction project? No answer was provided but it does illustrate the