properties of polymers with imidazole side chains."

31 January. P. H. Geil, "Polymer morphology, crystalline and amorphous"; H. D. Keith, "The formation of molecular linkages between lamellar crystals in polyethylene"; J. D. Hoffman, "Analysis of α-, β-, and γ-transitions in polyethylene and polychlorotrifluoroethylene"; Eric Baer and Jerome Lando, "Epitaxial phenomena in polymer crystallization and solid state reactions."

1 February. K. M. Sinnott, "Mechanical relaxations in polyethylene crystals"; J. M. Peterson, V. F. Holland, and P. H. Lindenmeyer, "Dislocations and dislocation processes in polymer crystals"; Paul J. Blatz, "Mechanical behavior of rubber-like polymeric materials"; Roger de Wames, "Molecular theories of polymers."

2 February. T. E. Helminiak, "Dilute solution properties of stiff-chain, high-temperature polymers"; Adi Eisenberg, "Silicate and phosphate glasses as polymers—a discussion of some physical properties"; F. E. Bailey, "Polyvinyl chloride—a modern view."

3 February. R. M. Fitch, "The initial transient in free radical polymerization rates"; conferees—general discussion of previous papers or new research results.

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Immunity, Cancer, and Chemotherapy

In the past, the principal aims in cancer chemotherapy have been to find drugs that show a higher toxicity against tumors than against normal cells and to use these drugs at the highest levels tolerated by the patients. The integration of immunological concepts into cancer chemotherapy will make it an aim of drug usage to reduce the suppression of the immune response generally caused by these drugs and to utilize the natural defense mechanisms that can be evoked against tumor antigens. These and many other facets of the immune response that may be relevant in the chemotherapy of cancer were discussed at an international symposium that was held at Roswell Park Memorial Institute and at the State University of New York at Buffalo on 20–22 September 1966, under the chairmanship of E. Mihich (Buffalo). The attendance at the symposium was limited to 200 scientists.

The areas covered most extensively were the mechanism of the immune response, the effect of chemotherapeutic drugs on the immune response, and antigenic expression in normal tissues and tumors. With regard to the mechanism of the immune response, G. L. Ada (Melbourne) reported that when a strong antigen is injected into rats, only ½ percent of the antigen retained within the body may localize in the lymph nodes. He reflected that the initial disposal of antigen is inefficient, and that the body is forced to use a special procedure—antibody production—to speed elimination of the antigen. Lymph nodes were studied particularly closely, because of their involvement in the immune response. Ada found that soluble antigen diffuses throughout the lymph nodes, but is cleared rapidly and remains only in relatively few cells (in some macrophages of the medulla, or else in some reticular cells of a lymphoid follicle). At this point, progressive changes occur, presumably in the cells that have taken up antigen; these changes were described by J. L. Turk (London). First, pyronin-positive lymphoblasts develop. Two types of response then appear to be possible, although these are seldom clear-cut. The lymphoblasts can differentiate into antibody-producing plasma cells, or else divide into two small lymphocytes that presumably contain cell-bound antibody and are immunologically active, for instance in delayed hypersensitivity reactions. Electron microscopic observations by S. L. Clark, Jr. (St. Louis) indicated that there is a gradual and continuous transition from large lymphocytes to lymphoblasts, and then to plasma cells.

Both in the primary immune reponse and in the secondary response obtained after repeated injection of an antigen, G. Biozzi (Paris) found that only a small number of cells, perhaps 1000 to 6000, respond initially within a given lymph node. In the secondary response, these cells then multiply for a shorter time interval, but at a rate almost twice as fast. Clark thought that the number of new cells produced —as evidenced by the development of lymph node follicles—parallels the intensity of the secondary response.

With regard to the 7*S* and 19*S* classes of antibodies, Clark thought that different cells may be responsible for their production. According to J. W. Uhr (New York), 7*S* antibody can either prevent or shut off production of 19*S* antibody, depending upon the time when it is passively administered. Persistence of antigen seemed necessary for the 19*S* response.

The question of whether one plasma cell can make antibody to two different antigens was discussed by both Ada and Biozzi. The consensus was that perhaps only 1 cell in 100 can respond to more than one antigen. Ada thought that when a favored antigen enters a cell, it triggers a process that locks the cell to production of the corresponding antibody. He used "favored antigen" in the sense of Burnet's clonal selection theory, that each immunologically competent lymphoid cell is genetically able to make antibody only against a closely defined antigenic specificity, that different such cells react to different antigenic specificities, and that the range of specificities to which antibody can be made is limited.

The data on "syngeneic preference" presented by K. E. Hellström (Stockholm) were important, since they suggested that lymphoid cells from nonimmunized mice are able to recognize and react against foreign tumor cells on first contact. These data grew from Snell's finding that if a tumor of parent strain is injected into an F_1-hybrid, it grows less well than in the parent strain. The claim that the basis for syngeneic preference is genetic rather than immunological was challenged during the discussion by G. Cudkowicz (Buffalo), who presented evidence that Snell's F_1-hybrid effect is immunologically mediated.

Biochemical studies on the translation of the genetic code into proteins are of interest as models for immunoglobulin synthesis. In this context, P. Zamecnik (Boston) outlined the molecular series of events by which sRNA initiates protein synthesis; he also mentioned a new compound involved in this sequence, diadenosine tetraphosphate. L. Gorini (Boston) discussed the ambiguity in translation of the genetic code into proteins that is induced by streptomycin, while M. Fishman (New York) examined the role of macrophage RNA on antibody formation.

Many immunosuppressive drugs are cancer chemotherapeutic agents. The reason for this was clarified by M. C. Berenbaum (London), who reported that, in contrast to x-rays that act against all cells, the cytotoxic action of immunosuppressive drugs is mainly directed against rapidly dividing cells.

This was not, however, the only reason for their action on the immune response. R. S. Schwartz (Boston) thought it was more likely that these drugs inhibit the antigen-induced differentiation of immunologically competent cells into antibody-forming cells. This fitted with the finding of J. Sterzl (Prague) that inhibitors of DNA synthesis fail to inhibit the immune response despite their inhibition of cell division.

Sterzl reported on the action of the immunosuppressive drug 6-mercaptopurine (6-MP) in detail. The primary immune response is inhibited by 6-MP; so is the secondary response, but only if administration of 6-MP is continued. Schwartz showed that if the injection of 6-MP is carefully timed in relation to injection of the antigen, then specific deletion of reactivity to this (but not to unrelated) antigens is possible. One unexpected new finding was that administration of 6-MP is occasionally followed by marked hyperplasia of lymphoid cells and increased, rather than decreased, immunological reactivity.

Discussion of subjects bearing on the host immune reaction against cellular cancer antigens was begun by W. Boyle (Durham), who reported work on concentration of the antigenic activity of cell surface membranes by density gradient centrifugation. R. T. Prehn (Philadelphia) examined the evidence for a host reaction against chemically induced sarcomas, and posed thought-provoking questions as to the basic mechanism of the neoplastic change. He concluded that there was no direct relation between the nature of chemical or physical carcinogens and the antigenicity of the resulting tumor. He thought that all tumors may possess tumor-specific antigens, and had found that most carcinogens depress the immune response. He concluded that immunity does play a role in the natural history of tumors. M. Schlesinger (Jerusalem) reviewed experimental evidence that the physiological development and differentiation of an organ is paralleled by the development of isoantigens.

Following discussion of the action of complement by H. J. Müller-Eberhard (La Jolla), and of the antigenicity of synthetic polymers of amino acids in a paper read for P. H. Maurer (Philadelphia), the final paper, on organ transplantation, was given by T. Starzl (Denver). In common with Medawar and Russell, Starzl found het-

erologous anti-lymphoid serum to be a powerful immunosuppressive agent. By adding injections of such antiserum to use of a chemical immunosuppressive agent (azathioprine), the dosage of a potent third medicant, the steroid prednisolone, could be reduced to one-eighth the previously required amount. The clinical results obtained made Starzl quite optimistic as to the future of organ transplantation in man.

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Argonne National Laboratory: Educational Workshops

During the academic year 1965–66 faculty members representing 120 colleges and universities from 16 midwestern states participated in 70 two-day workshops or brought students to perform experiments at the instructional facilities of Argonne National Laboratory (ANL). Summer institutes and audio aids for on-campus use supplement these programs.

In 1955 as part of President Eisenhower's "Atoms for Peace" program, the Atomic Energy Commission established the School for Nuclear Science and Engineering at Argonne, Illinois. By 1963 this program had served its purpose of training nuclear engineering students from abroad. Some of the colleges in the Chicago area then requested the use of its facilities for supplementing their science and mathematics programs. The Office of College and University Cooperation set up shortly afterwards at Argonne directs the use of the instructional laboratories. Nineteen liberal arts colleges within commuting distance formed the Associated Colleges of the Chicago Area (ACCA) and for the past 3 years have worked with this office in planning faculty workshops and student experiments to meet the needs of their various departments. Students from these colleges accompanied by their professors spend half-days weekly or biweekly performing experiments in the ANL instructional laboratories.

Since these programs are open to all colleges and universities in the Midwest, over 70 institutions participated in the faculty workshops. Forty-five colleges from greater distances brought students for two or more days of experimental work. Last spring a Nuclear