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varied, complex, rich. It remains only to answer the objections posed by many skeptics.

**Objection 1.** Only natural phenomena breed sciences, but computers are artificial, hence are whatever they are made to be, hence obey no invariable laws, hence cannot be described and explained. **Answer.** 1. The objection is patently false, since computers and computer programs are being described and explained daily. 2. The objection would equally rule out science large portions of organic chemistry (substitute “silicones” for “computers”), physics (substitute “superconductivity” for “computers”), and even zoology (substitute “hybrid corn” for “computers”). The objection would certainly rule out mathematics, but in any event its status as a natural science is idiosyncratic.

**Objection 2.** The term “computer” is not well defined, and its meaning will change with new developments, hence computer science does not have a well-defined subject matter. **Answer.** The phenomena of all sciences change over time; the process of understanding assures that this will be the case. Astronomy did not originally include the study of interstellar gases; physics did not include radioactivity; psychology did not include the study of animal behavior. Mathematics was once defined as the “science of quantity.”

**Objection 3.** Computer science is the study of algorithms (or programs), not computers. **Answer.** 1. Showing deeper insight than they are sometimes credited with, the founders of the chief professional organization for computer science named it the Association for Computing Machinery. 2. In the definition, “computers” means “living computers”—the hardware, their programs or algorithms, and all that goes with them. Computer science is the study of the phenomena surrounding computers. “Computers plus algorithms,” “living computers,” or simply “computers” all come to the same thing—the same phenomena.

**Objection 4.** Computers, like thermometers, are instruments, not phenomena. Instruments lead away to their user sciences; the behaviors of instruments are subsumed as special topics in other sciences (not always the user sciences—electron microscopy belongs to physics, not biology). **Answer.** The computer is such a novel and complex instrument that its behavior is subsumed under no other science; its study does not lead away to user sciences, but to further study of computers. Hence, the computer is not just an instrument but a phenomenon as well, requiring description and explanation.

**Objection 5.** Computer science is a branch of electronics (or mathematics, psychology, and so forth). **Answer.** To study computers, one may need to study some or all of these. Phenomena define the focus of a science, not its boundaries. Many of the phenomena of computers are also phenomena of some other science. The existence of biochemistry denies neither the existence of biology nor of chemistry. But all of the phenomena of computers are not subsumed under any one existing science.

**Objection 6.** Computers belong to engineering, not science. **Answer.** They belong to both, like electricity (physics and electrical engineering) or plants (botany and agriculture). Time will tell what professional specialization is desirable between analysis and synthesis, and between the pure study of computers and their application.

Computer scientists will often join hands with colleagues from other disciplines in common endeavor. Mostly, computer scientists will study living computers with the same passion that others have studied plants, stars, glaciers, dyestuffs, and magnetism; and with the same confidence that intelligent, persistent curiosity will yield interesting and perhaps useful knowledge.

**The Big Trouble with Scientific Writing . . .**

When I see articles, as I frequently do these days, exhorting authors to greater simplicity and clarity (1), I think of the first little scientific note I wrote, when I was an idealistic graduate student. I wrote it as simply and directly as I could. It began, "The big trouble with diffusion cloud chambers is low radiation resistance," and it went on in the same vein. My co-workers thought it needed a little more work. Secretly I did not agree, so I decided to attempt to make it into a parody of
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scientific writing. I borrowed impres-

sive but empty phrases from The Re-

view of Scientific Instruments. Each

sentence and each idea was made un-

necessarily complicated, without being

too obvious about it. The result be-
gan. “The principal difficulty encoun-
tered in the operation of an ordinary

high-pressure hydrogen cloud cham-
ber is inferior radiation resistance.”

I failed in my attempt, for now every-
one thought it read fine, and it ap-

peared in its complicated form in

The Review (2).

My point is not that scientific write-
ing cannot be parodied, but rather

that scientific writing is the way it is

because its readers actually prefer it

that way. People’s actions do not al-

ways correspond to their words. Ev-
e

one is against sin and bad writing,

unless given a free choice.

ROBERT H. GOOD
Department of Physics, California
State College, Hayward 94542

Reference

Role of Intuition

In much recent writing about sci-
ence and scientific discovery a strong

distinction is purported to exist be-
tween intuition and ostensive logical

argument. Some authors attribute to

intuition a special quality giving its re-

sults a status almost as though ex

cathedra. In their view, intuition is

such that scientific advance is made

only on intuitive process while the ex-

ercise of intelligence and logic are

pedestrian activities of which the re-

sult is merely a confirmation of that

which was in the first instance ac-

cessible only to intuition.

Wilder’s article, “The role of intui-
tion” (5 May, p. 605), establishes a

more reasonable perspective. His argu-

ment that “mathematical intuition, like

intelligence, is a psychological quality

which stems possibly from a heredit-

arily derived faculty, but which is, at

any given time, principally an accumu-

lation of attitudes derived from one’s

mathematical experience,” supports a

view that intuition is logical process

unobserved.

In brief, intuition is an act of the

mind, in nonverbal apprehension of

significant relation. The quality of such

acts is a function of the quality of

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Protests Unexpected Editorial Changes

Science editors introduced five changes into my recent letter ("Basic research and public support," 14 July 1967), all without my knowledge; they altered the title and my address (although trivially), added the word "so" (creating the tautology "sufficiently so"), reworded the last sentence and deleted its final phrase, "as effectively as it can be done," and added!) the question whether biochemists can decide if biological systematists are competent, and vice versa (I asked whether either of these kinds of investigators can decide that the other field is wholly a waste of time, and therefore everyone in it by definition incompetent; the answers to the two questions are not the same). It says one's confidence to realize he cannot control what he says in print, even in a brief letter to a magazine called Science.

RICHARD D. ALEXANDER
Museum of Zoology, University of Michigan, Ann Arbor 48104
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scription of his scientific work in relation to that of predecessors, contemporaries, and successors. The most satisfactory articles will lead the reader to think through the problems and to understand them in relation to the state of scientific knowledge then and now. A carefully established selective bibliography should conclude each piece."

Each biography will be in one of four categories which will be determined by the editorial board prior to assignment to an author. Class A articles will consist of pieces ranging from 300 to 700 words. Scientists who fall into that category include Miguel Serveto, a 16th-century scientist who mentioned, in the course of a theological discussion, that some blood passes from the right to the left ventricle of the heart by way of the lungs, and Sir Christopher Wren, the 17th-century architect who was also a mathematician. Class B articles will range between 700 and 1300 words. Scientists covered in that class will include the 18th- and 19th-century French researchers, Guyton de Morveau, a chemist, and Francois Magendie, a physiologist. Class C essays will run from 1300 to 3600 words, and Class D from 3600 to 10,000 words. Examples of scientists to be covered in Class C are Hooke, Bernard, and Franklin. Archimedes, Einstein, and Newton will be included in Class D.

Gillispie and his nine associate editors have been responsible for all editorial decisions. The associate editors are all specialists in various fields of the history of science. Editorial board members are: Carl B. Boyer, Brooklyn College; Marshall Clagett, Institute for Advanced Study, Princeton; Erwin N. Hiebert, University of Wisconsin; Thomas S. Kuhn, Princeton University; Robert Mulhauf, the Smithsonian Institution; A. I. Sabra, University of London; Cecilia J. Schneer, University of New Hampshire; Leonard G. Wilson, University of Minnesota, and Harry Woolf, Johns Hopkins University. The managing editor is Marshall DeBruhl, a professional editor employed by Scribner's.

The first volume, covering Peter Abaillard through Maurizio Bufalini, is scheduled for publication sometime in 1968. A Scribner's spokesman said estimates for the price of the complete set of volumes has varied between $200 and $700, but no firm figure will be established until all articles are in and volume one has gone to press.

—KATHLEEN SPERRY

APPPOINTMENTS

Byron L. Youtz, the acting President of Reed College, has been appointed academic vice president of the recently created State University College of Old Westbury in Nassau County, New York. Youtz will be taking up his new position in June of 1968.

Robert B. Duffield, assistant director of the John Jay Hopkins Laboratory of the General Atomic Division of General Dynamics Corporation, San Diego, to director of the Argonne National Laboratory.

Appointed by NASA as scientist-astronauts are the following:

Joseph P. Allen, physicist, University of Washington; Philip K. Chapman, physicist, Experimental Astronomy Laboratory, M.I.T.; Anthony England, graduate fellow in geophysics, M.I.T.; Karl G. Henize, professor of astronomy, Northwestern University; Don ald L. Holmquest, doctoral candidate in physiology, Baylor College of Medicine; William B. Lenoir, assistant professor of electrical engineering, M.I.T.; John A. Lewellyn, associate professor of chemistry, Florida State University; Franklin S. Musgrave, postdoctoral fellow, University of Kentucky; Brian T. O'Leary, astronomer, University of California; Robert A. Parker, assistant professor of astronomy, University of Wisconsin; and William E. Thornton, former Air Force flight surgeon.

A. Adrian Albert, dean of the Division of Physical Sciences, University of Chicago, to chairman of the Consultative Committee which will plan the International Mathematical Union's 1970 International Congress of Mathematicians. . . . Alexander M. Schmidt, assistant dean, University of Utah College of Medicine, will extend his leave to become chief of the Continuing Education and Training Branch, Division of the Regional Medical Programs, NIH. . . . Robert W. Ramsey, Jr., chief of the Technical Policy Branch, Division of Operations Analysis and Forecasting, AEC, to scientific representative, AEC, Chalk River, Canada. . . . Roderick O. Middleton, deputy director of mission operations, Office of Manned Space Flight, Washington, D.C., to Apollo program manager, Kennedy Space Center. . . . John Napier, University of London, to Smithsonian Institution to examine the feasibility of establishing an International Center for the Study of Primate Animals. . . . Bogdan Maglic, CERN, to visiting professor, department of physics, University of Pennsylvania. . . . Richard T. Loutitt, chief, neuropsychology section, Behavioral Sciences Research Branch, NIMH, to acting chief of the Behavioral Sciences Research Branch, Division of Extramural Research Programs, NIMH. He succeeds Philip Sapir, who has become assistant dean, Albert Einstein College of Medicine. . . . Melvin Frey, professor of physiology, University of Florida, to assistant dean for graduate studies at the university. . . . Joseph C. Olson, Jr., professor of bacteriology, University of Minnesota, to director of the Division of Microbiology, FDA. . . . Charles M. Cameron, Jr., on leave from the position of professor of public health administration, University of North Carolina School of Public Health, to the Department of Administration, State of North Carolina, to begin the coordination of a comprehensive health planning program for the State of North Carolina. . . . Milton C. Kloetzle, interim vice president for academic affairs, University of Southern California, to vice president for research and graduate affairs, at the university. . . . Jerome Lederer, on leave from director, Cornell-Guggenheim Aviation Safety Center, to director of safety, Office of Manned Space Flight, NASA . . . . N. G. Van Kampen, Institut voor Theoretische Fysica der Rijksuniversiteit, Utrecht, Netherlands, to visiting professor of physics, Howard University during the fall semester 1967–68. . . . Jack Zfaffan, head of the department of experimental psychology, Lovelace Foundation for Medical Education and Research, to professor of psychology, University of Southern California. . . . Miller J. Tonkel, chief, Continental Shelf Coordinating Group, ESSA, to associate director of the Office of Hydrography and Oceanography, Coast and Geodetic Survey, ESSA.

Erratum: Annual subscriptions to Communications in Behavioral Biology are $45 for the original articles and $18 for the abstracts, rather than as previously reported. (8 Sept., p. 1149). Subscriptions should be sent to Academic Press, 111 Fifth Ave., New York 10003.

Erratum: In the report "Induction of drug-metabolizing enzymes in liver microsomes of mice and rats by softwood bedding" by Elliot S. Vessell (1 Sept., p. 1057), the last sentence in the table head (Table 1) should read "All differences are significant (P < .01)."

1418

SCIENCE, VOL. 157
drate bonding in plants, and the uses of commercial lignin products.

The author's familiarity with and attention to both the scientific and technological accomplishments in this difficult field will make his volume useful not only as a reference work but as a textbook; it should be appreciated by lignin investigators in both the academic and industrial spheres.

JOHN M. HARKIN
Forest Products Laboratory,
U.S. Department of Agriculture,
Madison, Wisconsin

Parts and Wholes in Biology


This multi-author volume contains eight essays which were presented as a lecture series at the University of Michigan in the spring of 1965. Thus from the start the reader faces the twofold disadvantage of a substantial publication lag (which is of considerable significance for some of the fast-moving areas reviewed here) and the discontinuities in style, approach, and orientation which often afflict books written by several authors. Moreover, similar treatments of the same subjects, often by the same authors, have appeared elsewhere. So why this book?

In my opinion its chief value lies in the collection of these essays into one small volume which can be read as a unit. For the "vertical sectioning" of molecular biology which this book as a whole represents drives home forcefully the basic notion that while cellular organelles and structures are made of molecules, the functions of these multi-molecular structures are often much more than the sum of their unorganized molecular parts. Yet it is also clear that the parts contain within them the implicit interaction potentials needed to bring about, under appropriate conditions of environment and perhaps sequential availability of components, the self-assembly of the whole into a functional array.

This theme is clearly stated in the editor's preface and can be traced through the book by the appropriately oriented reader. The book opens with a discussion by Anfinsen on the "self-structuring" of protein conformations on the basis of information contained in the amino acid sequence, followed by a review by Rich on the mechanisms whereby the nucleotide triplets of DNA are transcribed onto messenger RNA and then translated into sequenced polypeptide chains. Anderson then deals with the simplest type of multimolecular self-assembled system, represented by the bacteriophage, in which the whole is already much more than the sum of its parts. From here things become progressively more complex, and these complications correlate (of necessity) with a progressive loss of focus on the details of the molecular structure which is presumably responsible for the ever more complex edifices described: first Robertson on cell membranes, then Lehninger on mitochondria, Bogorad on chloroplasts, Dowling on visual receptors, and Gibbons on cilia and flagella.

The chapters are uniformly well written and profusely illustrated and provide something of value for each reader, be he a beginning student just becoming acquainted with molecular biology or a full-time research worker in one of the fields under discussion. However, it is likely that only the latter class of readers will be able to wring dry some of the more complex chapters.

But I hope that most readers will go through the entire book, for only in this way does the impact implicit in its organization come through. Both students and practicing investigators whose major interests fall on various parts of the spectrum of complexity presented here should be impressed and sobered: the molecular people with what an incredibly delicate balance of forces must be sorted out to "explain" the self-assembly of the complex structures from their constituent macromolecular parts, and the morphological people with the many levels of interacting organization which still remain to be fathomed before the beautiful structures they look at can be considered to be "understood."

It is a pity that even the paperback version of this book is expensive, since it is the sort of work that, if read by students, could help prevent the development and hardening of the "black boxes" which are often built around certain areas of subject matter as a consequence of the "horizontal" organization of many of our classical courses and research disciplines.

PETER H. VON HIPPEL
Department of Biochemistry,
Dartmouth Medical School,
Hanover, New Hampshire

Books Received


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22 SEPTEMBER 1967
communications as they relate to the patterns of associations and organization of cells into well defined structures. Dissociated skin cells of 8-day-old embryonic chicks, when placed in the chorioallantoic membrane, will form feathers. Older cells (12 to 14 days) will only form keratinized structures but no feathers. If skin cells are mixed with a heterologous population (liver, lung, kidney, or heart cells), the formation of feathers is completely suppressed, thus suggesting an incompatibility between different phenotypes. Moscona also studied interactions between cells of different genotypes, namely, skin cells of chicks and mice. When a mixture of skin cells (capable of forming hair follicles) from a 13-day-old mouse and embryos (capable of forming feathers) of 8-day-old chicks was placed in the chorioallantoic membrane, the following structures were produced: (i) feathers and hair follicles, (ii) sheets of cysts from either chick or mouse cells or chimeric mosaics with epidermal cells from both species, and (iii) feathers with mouse epidermal cells. On the other hand, chick epidermal cells never participated in hair follicle formation. When mouse epidermal cells (dermis removed by trypsinization) were mixed with total chick skin cells, their behavior was similar to that described previously. In addition, there were downgrowths of mouse epidermis attempting to form hair follicles which were associated with condensations of chick dermal cells, thus suggesting that induction was taking place with these genotypically different cells. When chick skin cells were mixed with epidermal or dernal mouse cells 13 days old, there was no interference with feather formation. However, if the mouse cells were older than 14 days, feather formation by the chick skin cells was suppressed. The author concluded that 14-day-old mouse skin cells have already established their phenotypic specificity so that they cannot participate in functions programmed in a different genotype.

The formation of interface materials during epithelial-mesenchymal interactions and their possible role in morphogenesis was discussed by Clifford Grobstein (University of California). When epithelia interact with mesenchyme through a Millipore filter, collagen fibers accumulate at the surface of the epithelium. Removal of the collagen fibers by collagenase seemed to interfere with epithelial morphogen-
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SCIENCE, VOL. 157
inary studies indicated that the thymus from the AKR mouse is more effective in stimulating lymphopoiesis in bone marrow than the thymus from nonleukemic lines \((C_3H)\). Since mesenchymal influences are responsible for thymus lymphoid differentiation, Auerbach raises the question as to whether leukemogenic changes may have occurred through an inductive affect of altered mesenchymal cells.

Sister Muriel Lippman (Nazareth College) is primarily concerned with the effect of natural acidic glycosaminoglycans in cell division. In her earlier work, she showed that heparin reduces mitotic index and tumor growth in Ehrlich ascites carcinoma. Several acid mucopolysaccharides were tested for their ability to reduce growth of mouse L-cells in suspension cultures. All of them including hyaluronic acid, chondroitin sulfate, dermatan sulfate, heparitin sulfate, keratan sulfate and heparin acted as inhibitors of growth in varying degrees. Since most acid mucopolysaccharides in vivo are bound to a protein, a protein-polysaccharide complex \((PP-L)\) obtained from bovine nasal cartilage was tested for its inhibitory effect on growth. The PP-L complex contains about 90 percent chondroitin-4-sulfate and about 10 percent of keratan sulfate. Both polysaccharides have marked inhibitory effects on growth. The results of this experiment were rather intriguing since the PP-L complex showed an initial marked stimulatory effect on growth rate, followed later by an inhibitory effect. Such results suggest that the protein fraction of the complex was already metabolized and let the free polysaccharide exert its inhibitory effect. Sister Lippman also showed that the polyanion polysaccharides are bound to the cell surface. In this regard, Ehrlich ascites cells treated with hyaluronic acid or heparin, and untreated controls, were injected into allogeneic or syngeneic hosts. While the untreated cells were promptly rejected, the treated ones developed into enormous tumors which metastasized and were transplantable. This suggests that the treated cells coated by the test material were not recognized as foreign by the host and consequently not rejected.

Ruppert E. Billingham (University of Pennsylvania) discussed the preservation of epithelial specificity through mesenchymal influences. A series of heterotypic recombination grafts from guinea pig skin (that is, epidermis from

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LIGHT SCATTERING OF BIOPOLYMERS

Looking for a suitable topic for this column, we flipped through the subject index for the year 1966 (Vol. 5) of "Biochemistry," monthly published by the American Chemical Society. Under "Light scattering," there were six papers mentioned, the authors, titles, and references of which were as follows:

(a) M. D. Stern (p. 2558), On the Estimation of Molecular Dimensions and Shape of Rigid, Asymmetric Macromolecules from Hydrodynamic Measurements.

(b) K. Banerjee and M. A. Lauffer (p. 1957), Polymerization—Depolymerization of Tobacco Mosaic Virus Protein, VI. Osmotic Pressure Studies of Early Stages of Polymerization.

(c) H. T. Miller and R. E. Feeney (p. 952), The Physical and Chemical Properties of an Immunological Cross-Reacting Protein from Avian Egg Whites.

(d) D. B. Millar and R. F. Steiner (p. 2289), The Effect of Environment on the Structure and Helix-Coil Transition of Soluble Ribonucleic Acid.

(e) P. S. Sarfare, G. Kegeles, and S. J. Kwon-Rhee (p. 1389), Relationship between Active Sites and Polymerization Sites in α-Chymotrypsin.

(f) E. Chiancone, M. S. Bruzzesi, and E. Antonini (p. 2823), Studies of Dextran and Dextran Derivatives. X. The Interaction of Dextran Sulfate with Lysozyme.

The first paper listed above deals with some theoretical aspects of the evaluation of the lengths of different models for the rigid asymmetric macromolecules. A comparison has been made with the lengths derived from the radius of gyration as measured by light scattering. Such a comparison offers a possibility of distinguishing between different models, for paramyosin, light meromyosin, tropomyosin B, and tobacco mosaic virus were discussed.

Paper (b) presents mostly the osmotic pressure results of the polymerization of the protein moiety of the tobacco mosaic virus. Some light scattering measurements by means of the transmittance technique were also made and compared with the osmotic pressure data.

The other four papers describe, among other information, the results of light scattering investigations, in all of which the reference is Phoenix light scattering photometers with horizontal geometry. In addition to the usual molecular weight determination, the interactions of biopolymers and small ions and molecules, as well as the interaction of biopolymers with other biopolymers were explored by means of light scattering. Miller and Feeney (c) of the Department of Food Science and Technology, University of Davis, California, found for the molecular weight of an immunologically cross-reacting macroglobulin in chicken egg white a value of approximately 8 $\times$ 10$^6$, in agreement with the value obtained from sedimentation-diffusion.

The influence of magnesium ion, neutral salt, and ribonucleotide concentration on the molecular weight of soluble ribonucleic acid (s-RNA) was studied in paper (d). Millar and Steiner at the Naval Medical Research Institute, Bethesda, Md., s-RNA exhibits a polyelectrolyte behavior as evidenced by the effect of the ionic strength of the medium on the apparent molecular weight. A molecular weight (at infinite dilution) of about 23,000 to 25,000 is indicated. Magnesium ions cause an increase in the molecular weight of the apparent molecular weight. In the presence of Mg++, it exists largely in associated form in 0.02 M Mg++ at concentrations greater than 2 mg/ml. and at 25°C.  

Sarfare et al. (e) at Clark University, Worcester, Mass., investigated the polymerization of α-chymotrypsin using a technique that is active sites of the enzyme monomer units. To this effect, the dependence of the weight-average molecular weight was studied as a function of enzyme concentration in the presence of various amounts of is-phenylpropionate, a competitive inhibitor. The results have been compared with the predicted molecular weights computed for several models involving the existence of various distinct polymeric species. It was confirmed that the active sites were accessible regardless of the polymerization of the enzyme.

Finally, the interaction between two biopolymers were studied in paper (f) at the University of Rome. Since lysozyme carries a net positive charge at neutral pH and dextran is negatively charged, a strong interaction between the two was expected on electrostatic grounds. Depending on the conditions, both soluble and insoluble (precipitated) macromolecular complexes were formed. The tendency to precipitate increases at low ionic strength, pH and temperature. A quantitative evaluation of the results obtained for soluble complexes has been attempted on the basis of models involving a reversible association-dissociation equilibrium and different stoichiometric ratios.

If you would like reprints of the previous articles in this series as well as complete information on the instrumentation described in the above study, write Phoenix Precision Instrument Co., 3803 N. 5th Street, Philadelphia, Penna. 19140.
the ear combined with dermis from the sole) were transplanted to an appropriate host. Histologic examination of these combined grafts strongly suggested that epidermal specificity was determined by the underlying dermis. On the other hand, epithelia from mucosae (tongue or esophagus) retained its original characteristics when recombined with ear or sole dermis. However, when mucosal epithelium was recombined with trunk dermis, it acquired the characteristics of trunk epidermis. In order to study cytodifferentiation and morphogenetic potentials of epidermal cells in a nondermal mesenchymal environment, suspensions of epidermal cells were inoculated in muscle, spleen, and beneath the renal capsule. Histologic examination of these cellular implants revealed not only formation of epidermal cysts, but more complex structures. Sebaceous glands and hair follicles with papillae, surrounded by a connective tissue with a structure resembling that seen in the dermis, were noted.

The behavior of adult epidermal cells in vitro and in vivo, as it relates to organization, differentiation, and mitotic activity was reported by Eugene J. Van Scott (National Institutes of Health). Adult epidermal cells cultured in a suitable medium and placed in contact with a glass or plastic surface develop, after 2 to 3 weeks, an outgrowth of several layers with a distinct gradient of cell maturation. Mitotic activity was seen only in the first two lower layers of basal cells. The next three to four layers consisted of basal cells, whereas the uppermost layers, in contact with the nutrient medium, consisted of mature epidermal cells undergoing keratinization. Thus, adult epidermal cells in vitro can organize and differentiate (tonofibrils present) in the absence of connective tissue. However, in these experiments, keratohyaline granules and a stratum corneum did not develop. This study suggests that the connective tissue may play a role in promoting the full manifestation of epidermal cell behavior. The control of mitotic activity of the germinative cells in the hair follicles is determined by the surface area of the dermal papilla, since only those cells in contact with it divide. Keratinization or cell death takes place when a follicular cell is separated from the stroma by a distance of 100 microns. Further studies on the interdependency of the follicular epidermis and its corresponding papilla were re-
ported by Roy F. Oliver (University of Birmingham, England). He showed that implants of follicular epidermis from vibrissae, where the tubular arrangement was preserved, would regenerate a papilla and whisker while similar implants of flat follicular epidermis failed to do so. Thus, the spatial arrangement of follicular epidermal cells seemed to be a prerequisite for morphogenesis to take place. Transplantation of vibrissa dermal papillae to the upper half of vibrissae follicles induced whisker growth. However, induction of follicle or hair formation did not take place when epidermis from the ear (which contains hair follicles) or from a follicular scrotal sac epidermis were implanted into ear skin in proximity with vibrissa dermal papillae. Both types of epidermis did, however, become organized locally into "matrices" around the papillae. This lack of inductive effect may be due to several factors. The stimulating effect of the papillae was not intense enough; some epithelia are more refractory to dermal influences than others; and the effect of local dermal influence(s) on the site of implantation overrides the inductive properties of the vibrissa dermal papillae.

Clyde J. Dawe (National Institutes of Health) reported that the induction, in vitro, of tumors in salivary gland rudiments by polyoma virus, requires the presence of both epithelium and mesenchyma. If trypsin-isolated epithelial and mesenchymal components are exposed separately to the polyoma virus, neither component causes the development of tumors. The appearance of tumors in the salivary gland rudiments was accompanied by some morphogenetic changes of the epithelium. These experiments also revealed that tissue from polyoma-virus induced tumors is capable of supporting growth and normal adenomere formation of isolated salivary gland epithelium. It is not known whether this morphogenetic effect is due to the neoplastic or to the stromal components of the tumor.

Johannes Holtfreter (University of Rochester) and C. B. McLoughlyn (University College, London) were unable to attend the meeting but their contributions will be included in the publication of the full-length papers. The Williams and Wilkins Company will publish the proceedings.

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12-15. Communications, 15th intern. congr., Genoa, Italy. (Secretary, Instituto Internazionale Delle Comunicazioni, Viale Brigate Partigiane, 18, Genoa)
16-18. Canadian Chemical Engineering,