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Beginning with the basic principles, the text presents a comprehensive discussion of the geometrical and physical optics of fibers with the theoretical development of waveguide effects. Fiber optics technology, fiber drawing, assembly and testing are discussed, and specific applications in the fields of medicine, photography, high-speed photography, photoelectronics, infrared fiber optics, lasers and luminescent fibers are treated extensively in separate chapters.
November 1966, about 400 pp., approx. $12.50

VOLUME 1: Annual Conferences 1962, 1963, 1964
SOME RECENT ADVANCES IN THE BASIC SCIENCES
edited by A. Gelbart, Yeshiva University, New York
September 1966, 228 pp., $8.50

PRECIS OF SPECIAL RELATIVITY
by O. Costa de Beauregard, Institute Henri Poincare, Paris
Translated from the French
A detailed exposition covering all the non-spinorial aspects of the special theory of relativity. Such topics as the physical implications of asymmetric energy tensors and the relationship of the Wheeler-Feynmann emitter-absorber theory to the theories of Dirac and Wigner are included.
August 1966, about 125 pp., approx. $5.00

VOLUME 2
ADVANCES IN ATOMIC AND MOLECULAR PHYSICS
edited by D. R. Bates
The Queen's University of Belfast, Belfast, Northern Ireland and Immanuel Estermann, The Technion, Haifa, Israel
August 1966, about 475 pp., $16.50

MAGNETISM
A Treatise on Modern Theory and Materials
edited by George T. Rado and Harry Suhl
VOLUME 4: EXCHANGE INTERACTION AMONG ITINERANT ELECTRONS
by Conyers Herrings
Bell Telephone Laboratories, Murray Hill, New Jersey
Presents the most diverse aspects of ferromagnetism, ferrimagnetism, and antiferromagnetism in insulators as well as in metals. Included are discussions on quantum and classical mechanical and abstract statistical models, analysis of actual magnetic structures, theory of spin interactions in solids, phenomenology of ferromagnets, electronic and nuclear resonance effects, and neutron diffraction and optical phenomena in magnetically ordered materials. Both theoretical and experimental points of view are represented.
July 1966, 407 pp., $14.50

PHYSICAL ACOUSTICS: Principles and Methods
VOLUME 4 A: Applications to Quantum and Solid State Physics
edited by Warren P. Mason
ULTRAVIOLET AND VISIBLE ABSORPTION SPECTRA
Index for 1960-1963
by Herbert M. Hershenson
DISTRIBUTIONS AND THE BOUNDARY VALUES OF ANALYTIC FUNCTIONS
by E. J. Beltrami and M. R. Wohlers
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AN INTRODUCTION TO COHERENT OPTICS AND HOLOGRAPHY
by George W. Stroke
WAVELENGTH STANDARDS IN THE INFRARED
by K. Narahari Rao, Curtis J. Humphreys, and D. H. Rank
VOLUME 4
ADVANCES IN ASTRONOMY AND ASTROPHYSICS
edited by Zdenek Kopal

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It has a built-in electric eye system which virtually eliminates the uncertainties of exposure determination, reducing the entire operation to an almost automatic procedure.

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Another unique and ingenious accessory for the EFM, known as the EFM Bicam Adapter, permits two 35mm camera bodies or two M-35 camera backs to be mounted in tandem. One may be loaded with color and the other with black-and-white, or with any other two emulsion types desired. A rotating, internal prism reflects the image rays into one camera body or the other, permitting both to be exposed in quick succession with minimum lapse of time.

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(Simpson thinks $R = 100$ is a convenient choice.) The equation is, of course, the same as Calloway's, with the unit of time taken as $A_{\text{max}}/R = A_{\text{std}}$. It can also be put into the familiar form

$$A_n = A_{\text{std}} e^{\lambda n},$$

with $\lambda = (\ln R)/N$. (With Simpson's choice of $R = 100$, $A_n = 0.01 A_{\text{max}} e^{\lambda}$, $\lambda = 4.605/N$.)

The following table shows the ages of the members of a set for which $A_{\text{max}} = 70$ years, $R = 100$, and $N = 10$. (Note that the Calloway unit of time for this case is 0.70 year.)

<table>
<thead>
<tr>
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<th>$A_n$ (yr)</th>
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<th>$A_n$ (yr)</th>
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<tbody>
<tr>
<td>1</td>
<td>1.10</td>
<td>6</td>
<td>11.0</td>
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<tr>
<td>2</td>
<td>1.75</td>
<td>7</td>
<td>17.5</td>
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<tr>
<td>3</td>
<td>2.80</td>
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<td>28.0</td>
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<td>4</td>
<td>4.40</td>
<td>9</td>
<td>44.0</td>
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<tr>
<td>5</td>
<td>7.00</td>
<td>10</td>
<td>70.0</td>
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</table>

A. HERSCHMAN

The Physical Review,
Brookhaven National Laboratory,
Upton, Long Island, New York 11973

Computer-Time Allocation

In suggesting that a computation center, like a library, should provide its services free, Anthony Ralston (Letters, 29 April) has oversimplified a complex and increasingly important problem.

The demand for computing on any university campus is virtually unlimited if the service is free. When a university's computing power is multiplied by an order of magnitude, the new facilities are saturated within 2 or 3 years. Therefore, computing services must be allocated—the price mechanism being, of course, only one of several possible mechanisms. To simplify the problem, the "library" principle may be applied up to a limit: say everyone could be allowed $100 worth of free service per year. Allocation would then limit only large users. Some such policies are already in effect on many campuses.

The real question about large users, however, is not whether the accounting should be done in dollars or hours but who should make the allocations. One alternative is to create a process on the campus for weighing the competing claims of quantum calculations for large molecules, research in artificial intelligence, statistical analysis of the business cycle, and concordances of Goethe's works. Spare me from participation in that process!

A second alternative is to have the value of computing judged in relation to its value to the research projects it is supposed to serve—that is, as part of the regular foundation and government processes for making research grants. Chemical computing would then be evaluated by chemists, construction of concordances by humanists. There needs to be (and already is, of course) a substantial allocation for the development of computer science itself. This alternative is in the spirit of "program budgeting" or "cost-benefit analysis," now popular in the federal government.

It may be objected that the problem of balancing the chemist against the humanist simply reappears at a higher level—at the level of the federal budget for NSF and the Humanities Foundation. So it does, but that is unavoidable, and it is better that we make use of existing arrangements for these political decisions than that every campus duplicate such arrangements.

HERBERT A. SIMON
Graduate School of Industrial Administration, Carnegie Institute of Technology, Pittsburgh, Pennsylvania

Safety: A Parallel

Many individuals who have been following the accounts in Science of the current controversy over automobile and traffic safety will, I believe, be interested in reading "Bursting boilers and the federal power," by John G. Burke (Technology and Culture 7, No. 1, 1–23 (winter 1966)).

The story in a nutshell is this: "Marine boiler explosions . . . provoked a crisis in the safe application of steam power, which led to a marked change in American political attitudes. The change, however, was not abrupt but evolved between 1816 and 1852" and culminated in Congress passing "the first positive regulatory legislation and [creating] the first agency empowered to supervise and direct the internal affairs of a sector of private enterprise."

I found Burke's detailed account of the story to be fascinating reading against the background of current events.

CHURCHILL EISENHART
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SCIENCE, VOL. 153
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**Research and Development:** For highly precise laboratory temperature control. For auxiliary, supplementary or ambient measurements in physical, chemical and biological research. As ranging devices for AZAR (adjustable-zero, adjustable range) recorders.

**Testing:** As elements of pilot-plant instrumentation. For dynamic measurements in mobile vehicles. For efficiency measurements in heat exchangers and cryogenic installations. For motor, generator and bearing temperature measurements. For life tests of electronic components. For repetitive product testing (of resistors, etc.) by percent deviation.

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machinery of tensors and differential forms is introduced. It is at the end of this chapter that a first abstract form of Stokes's theorem is obtained. The final chapter defines manifolds and fields and forms on them, arrives at a general Stokes's theorem for manifolds, and finally, in the last four pages, presents the classical versions of Green's theorem, the divergence theorem, and Stokes's theorem.

The numerous exercises are essential to the treatment, in two ways especially. First, they contain virtually all the (relatively) concrete illustrations that are given. Second, when an exercise is marked with an asterisk, this signals that there are subsequent developments in the text which depend on it. Of some hundred exercises in the first three chapters, more than 20 are marked in this way and used later.

The format is for the most part pleasant, and I noted only a few misprints. It is a minor annoyance that reference numbers labeling displayed equations appear, not at the margin, but right next to the equations themselves. An index would have been useful.

TRUMAN Botts
Department of Mathematics, University of Virginia, Charlottesville, and COSRIMS, New York

Biology

Biologists in these times follow many lines of investigation with a degree of success that even their immediate predecessors would find surprising. They have now reached the point of anticipating unbroken progress in their protein discipline and they draw immense satisfaction from the anticipation.

Yet the recent accomplishments partake more of chemistry, physics, and mathematics than of biology as such. To speak of "biophysics," "biochemistry" and "molecular biology" is to acknowledge this fact, which is, I think, disturbing to many.

For the great biological problems—that of organism in general and that of order within the biosphere—remain not only unsolved but have not as yet even been usefully posed. Most biologists know of these problems and are frustrated at being unable to deal with them. At present one can only cast about and hope for the best. In

Size and Cycle (Princeton University Press, Princeton, N.J., 1965. 227 pp., $7.50), J. T. Bonner has done just this. In my opinion, his failure is total and his subsequent refusal to cut the loss, unfortunate.

The avowed purpose of the work is to draw attention to the life cycle (zygote to zygote) as the proper unit of study for those who would comprehend the true biological significance of development and evolution. We are promised that changes in size as expressed by changes in length (why not by changes in total nitrogen?) around the life cycle will be established as the indicators of complexity and sophistication at all evolutionary grades.

Nothing ever comes of the promise because, insofar as size changes are such indicators, this has been realized long since and found to be unenlightening. Bonner pays his respects to the alleged theme on numerous occasions but no more than to a large number of other conceptions.

Size and Cycle is episodic to an acute degree, and the integration is minimal. Time after time Bonner announces that he is about to come to grips with some crucial issue but then falls back on restatements of the obvious. His account of the comparative merits of sexual and asexual reproduction is a case in point.

I believe that Bonner realizes he is in difficulty. At several points he becomes very defensive. On page 52, for example, he regrets that he must analyze life cycles into periods of size increase and size decrease when they really should be shown "simultaneously branching in all directions in three dimensions." He then makes this statement: "However I am not clever enough to discuss everything at once, so this bit of dissection and analysis, although imperfect, is unavoidable." Surely it is strange when a scientist regrets an analysis which he has just told us is to be the key to a new view of evolving organisms.

Rarely, there are oases in which interesting concepts (such as that of range variation) are presented, but their merits are their own and have nothing to do with sizes or cycles.

Size and Cycle contains 30 beautiful plates that have an aura of the 17th century about them. They are the best feature of the book, but in them we have art, not biology.

COURTNEY T. WEMYSS
Department of Biology, Hofstra University, Hempstead, New York

New Books

Mathematics, Physical Sciences, and Engineering


(Continued on page 226)
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SCIENCE, VOL. 153
cycle and during development. Brown summarized data from a variety of developmental systems in which early stages of embryogenesis are characterized by the absence of a nucleolus and lack of synthesis of ribosomal RNA. In these systems there appears to be a sufficient supply of maternal ribosomes to satisfy the early metabolic needs of the embryos. When nuclei from later stages are transplanted into unfertilized eggs, there is a disappearance of nucleoli and no further synthesis of ribosomal RNA until the embryo again reaches the later stage. Such experiments are believed to constitute evidence of a cytoplasmic control over the expression of the ribosomal cistrons. H. Barr (Wisconsin) speculated that this might be related to the much higher concentration of magnesium ions in unfertilized eggs as compared to the later stages. Adrienne Ficq (Brussels) described how the synthesis of cytoplasmic RNA, presumed to be predominantly ribosomal, occurs in the nucleolus of echinoderm oocytes prior to maturation and dissolution of the germinal vesicle.

Evidence that the nucleolus is active in RNA synthesis throughout most of interphase, with the possible exception of a brief period in early S phase, was provided by F. Kasten (Pasadena Foundation for Medical Research). N. Das (Berkeley) found that in certain organisms nucleoli continued to actively synthesize RNA well into mitotic or meiotic prophase.

In the closing session C. H. Waddington (Edinburgh) provided an incisive and much appreciated summary of the symposium. Swift presented the report of a special nomenclature committee who undertook the task of attempting to assimilate the totality of morphological and biochemical data into a unified terminology. Final remarks were made by A. Hollaender (Oak Ridge) and F. Saez (Montevideo), president and vice president of the symposium.

This conference was the fifth in a series of biological meetings sponsored by various Latin American institutions with the cooperation of the Biology Division of the Oak Ridge National Laboratory. Sponsors for the Montevideo meeting were the Departmental Council of Montevideo, National Council of Scientific and Technical Research of Uruguay, Organization of American States, United States Atomic Energy Commission, United States National Science Foundation, and the University of Pittsburgh. Proceedings of the conference, including a full transcript of the discussions, will be published as a monograph of the National Cancer Institute. It is intended that this volume, which is scheduled to appear before the end of the year, will serve as a valuable reference source and guide for present and future generations of nucleophiles.

ROBERT P. PERRY
Institute for Cancer Research,
Philadelphia, Pennsylvania 19111

Forthcoming Events

**August**


11–18. Animal Production, 9th intern. congr., Edinburgh, Scotland (Congress Secretary, 5 Hope Park Sq., Edinburgh 8)


14–18. Canadian Pharmaceutical Assoc., 59th conv., St. John, New Brunswick. (P. W. Bell, 175 College St., Toronto 2B, Ont.)

14–19. American Inst. of Biological Sciences, 17th annual, Univ. of Maryland, College Park. (AIBS, 3900 Wisconsin Ave., Washington, D.C.)

The following societies will meet in conjunction with the AIBS. Additional information is available from AIBS or from the program chairmen listed below.

- American Bryological Soc. (W. B. Schofield, Dept. of Botany, Univ. of British Columbia, Vancouver, Canada)
- American Fern Soc. (I. Knobloch, Dept. of Botany and Plant Pathology, Michigan State Univ., East Lansing)
- American Fisheries Soc. (L. E. Cronin, Natural Resources Inst., Administration Bldg., Univ. of Maryland, College Park)
- American Genetic Assoc. (S. Burhoe, American Univ. Graduate School, Washington, D.C.)
- American Microscopical Soc. (R. M. Cable, Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.)
- American Soc. for Horticultural Science (A. H. Thompson, Dept. of Horticulture, Univ. of Maryland, College Park)
- American Soc. of Plant Physiologists (R. S. Loomis, Dept. of Agronomy, Univ. of California, Davis)
- American Soc. of Plant Taxonomists (L. R. Heckard, Dept. of Botany, Univ. of California, Berkeley)
American Soc. of Professional Biologists (A. Dickman, 1415 W. Erie Ave., Philadelphia, Pa.)
American Soc. of Zoologists (L. E. Delaney, Wabash College, Crawfordsville, Ind.)
Animal Behavior Soc. (E. M. Banks, Dept. of Zoology, Univ. of Illinois, Urbana)
Biometric Soc.—ENAR (J. Meade, Univ. of Arkansas Medical School, Fayetteville)
Botanical Soc. of America (W. A. Jensen, Dept. of Botany, Univ. of California, Berkeley)
Ecological Soc. of America (G. M. Woodwell, Dept. of Biology, Brookhaven Natl. Lab., Upton, L.I., N.Y.)
Mycological Soc. of America (P. L. Lentz, Crops Research Div., USDA, Beltsville, Md.)
Natl. Assoc. of Biology (W. K. Stephenson, Earlham College, Richmond, Ind.)
Nature Conservancy (Local Representative: W. Van Eck, Dept. of Agronomy and Genetics, West Virginia Univ., Morgantown)
Phi Sigma (Local Representative: R. G. Stross, Dept. of Zoology, Univ. of Maryland, College Park)
Phycological Soc. of America (B. C. Parker, Dept. of Botany, Washington Univ., St. Louis, Mo.)
Society for Industrial Microbiology (J. Coats, Upjohn Co., Kalamazoo, Mich.)
Society of Protozoologists (R. W. Hull, Dept. of Biological Sciences, Florida State Univ., Tallahassee)
Tomato Genetics Cooperative (Local Representative: F. Angell, Dept. of Horticulture, Univ. of Maryland, College Park)
Wildlife Disease Assoc. (C. Herman, Patuxent Wildlife Disease Assoc., Laurel Md.)

16. International Assoc. for the Prevention of Blindness, general assembly, Munich, West Germany. (J. P. Baillart, 47, rue de Bellechasse, Paris 7, France)
16–17. Central Nervous System Effects of Analgesic Drugs, symp., Santiago, Chile. (J. Mardones, Inst. of Pharmacology, Univ. of Chile, Casilla 12967, Santiago)
16–19. International Assoc. of Milk, Food, and Environmental Sanitarians, Minneapolis, Minn. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind. 46176)
19–28. Geology, 23rd intern. congr., Prague, Czechoslovakia. (Organizing Commitee, Ústrední ústav geologicky, Malostranské náměstí 19, Prague 1)

20-25. Diseases of the Chest, 9th intern. congr., Copenhagen, Denmark. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago, Ill. 60611)


21-25. Electron Microscopy Soc. of America, San Francisco, Calif. (G. Thomas, Dept. of Mineral Technology, Univ. of California, Berkeley)

21-26. Hematology, 11th intern. congr., Sydney, Australia. (F. P. Walsh, 1 York St., Sydney)


21-7. British Assoc. for the Advancement of Science, 128th annual mtg., Nottingham, England. (Secretary, 20 Great Smith St., 3 Sanctuary Bldg., London S.W.1)

22-24. Computer and Information Sciences, symp., Columbus, Ohio. (J. T. Tou, Communication Science Research Center, Columbus Laboratories, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio 43201)


22-27. Food Science and Technology, 2nd intern. congr., Warsaw, Poland. (A. Borys, Inst. Przemyсу Miesnego, Rakowicka 36, Warsaw 12)

22-27. History of Medicine, 20th intern. congr., Berlin, Germany. (Secretary, Augustastr. 37, 1 Berlin 45)

22-27. Pan American Federation of Associations of Medical Schools, 1st general assembly, Bogota, Colombia. (E. Braga, Caixa Postal 26-ZC-39, Rio de Janeiro, GB, Brazil)


23-30. Luminescence, intern. congr., Budapest, Hungary. (G. Szigeti, Research Inst. for Technical Physics, Hungarian Acad. of Sciences, P.O. Box Ujpest I, No. 76, Budapest)

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25. Scandinavian Pharmacologists, mtg., Turku, Finland. (K. Hartiala, Dept. of Physiology, Turku Univ., Turku)
26–29. Low Temperature Calorimetry, conf., Otaniemi, Finland. (O. V. Lounasmaa, Dept. of Technical Physics, Inst. of Technology, Otaniemi)
28–4. Electron Microscopy, 6th intern. congr., Kyoto, Japan. (Chairman of the Organizing Committee, Inst. for Virus Research, Kyoto Univ., Kyoto)
29–31. Mathematical Assoc. of America,
29-31. **Metallurgists**, 5th annual conf., Toronto, Ont., Canada. (Canadian Inst. of Mining and Metallurgy, 906 Drummond Bldg., 117 St. Catherine St., W., Montreal 2, P.Q.)


29-2. **Internal Medicine**, Czechoslovak congr., Prague. Czechoslovakia. (O. Riedl, 4th Medical Clinic, Faculty of General Medicine, Charles Univ., U Nemocnice 2n, Prague 2)


30-1. **Association for Computing Machinery**, 21st natl. conf., Los Angeles, Calif. (B. R. Parker, P.O. Box 4233, Panorama City, Calif. 91412)


30-2. **Collection and Processing of Field Data**, symp., Canberra, Australia. (E. F. Bradley, Div. of Plant Industry, P.O. Box 109, Canberra)

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