

who submits his/her name will be included upon agreeing to update the information as required. The directory will encompass general topics such as political implications as well as physiological and ecological projects of desert areas. The information will be stored on computer tapes and will be updated every 3 years. Interested members should write to Gordon L. Bender, Department of Zoology, Arizona State University, Tempe, Arizona 85281.

New Publications

The first semiannual 200-page supplement to *Professional Women and Minorities—A Manpower Data Resource Service* has just been published by the Scientific Manpower Commission. The new pages update all information on degrees granted in all fields through 1974 and include a largely new section on women and minorities in medicine and related health fields. Other new data are included in the fields of business, engineering, the natural and social sciences, and the professions.

The basic, comprehensive study, published in May 1975, brought together for the first time virtually all available data on manpower at professional levels, with special emphasis on women and minorities in the natural and social sciences, engineering, arts, humanities, education, and the professions. It was designed to assist those persons examining the available supply of trained manpower and those dealing with affirmative action programs.

Some 400 tables and charts in the original volume include totals and breakouts for women and/or minorities in enrollments, degrees, and the general, academic, and federal workforce, by field and subfield.

The original 320-page volume is available for \$40. The semiannual supplements are \$25 per year. The publication and its supplements are available from the Scientific Manpower Commission, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036.

* * *

A brochure describing the AAAS regional seminar program is available on request. In addition to providing an overview of the program, the brochure briefly outlines the procedures that local groups should follow if they are interested in co-sponsoring the seminars. Inquiries should be addressed to: Regional Seminar Coordinator, Division of Public Sector Programs, AAAS, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036.

Personnel Placement

Only those employers and individuals who do not discriminate on the basis of race, sex, religion, age, color, or national origin should submit Personnel Placement advertising.

POSITIONS WANTED: 40¢ per word; use of Box Number counts as 10 additional words. Minimum charge \$10. Prepayment required. This rate applies to individuals only; personnel agencies, companies, colleges, and universities take display rate for all advertising.

DISPLAY (POSITIONS OPEN, MARKET PLACE, AND SO FORTH): \$130 per inch, minimum, per insertion (1 inch is equivalent to 12 lines of 48 characters each). Ads over 1 inch billed to nearest quarter inch. No charge for Box Number. Rates net. No agency commission allowed for ads under 4 inches. No cash discount. Prepayment required for foreign advertising. Purchase orders and billing information must accompany all other advertising.

COPY for ads must reach SCIENCE by Wednesday, 3-1/2 weeks before issue date (Friday of each week) requested. Send copy for all positions wanted ads and display ads under 5 inches to:

SCIENCE, Room 207
1515 Massachusetts Ave., NW
Washington, D.C. 20005

Send copy for display ads, 1/6 page and larger, to:

Scherago Associates, Inc.
11 West 42 Street
New York, N.Y. 10036

BLIND AD replies should be addressed as follows:

Box (give number)
SCIENCE
1515 Massachusetts Ave., NW
Washington, D.C. 20005

POSITIONS WANTED

Analytical Toxicologist, Ph.D. Experience in drug analysis and modern analytical techniques. Seeking research/service/teaching position involving toxicity studies and drug analysis. Box 221, SCIENCE. X

Biochemist, Ph.D. Postdoctoral experience. Training in enzymology and metabolism. Seeks position combining research with teaching. Box 184, SCIENCE. X

Biochemist, Ph.D. 1972. Over 3 years of postdoctoral research in nucleic acid chemistry and metabolism. Publications. Seeks a position in industry or academia. Box 211, SCIENCE. 5/7, 14

Biophysicist. Seven years of research experience in enzyme structure and function plus drug trials in muscle disease. Medical and graduate teaching. Three years of postdoctoral research in enzymology and protein crystallography. Ph.D. 1969, experience in solid state physics. Available July 1976. Box 222, SCIENCE. X

Developmental Biologist/Teratologist. Ph.D. postdoctorate, senior staff scientist. Seeks industrial, government, or academic position. Publications in developmental biology, teratology, biochemistry. Box 213, SCIENCE. X

Electron Microscopist—Botanist. Ph.D. in plant pathology. Seeks research/teaching position in plant pathology, botany, biology, electron microscopy. Several years of experience, competence in TEM, postdoctoral training, publications. Box 223, SCIENCE. X

Groundwater Hydrologist. Ph.D. Extensive geological background, plus hydrochemistry, math, computers. Teaching experience. Recent research includes interpreting environmental tracer distributions in aquifers, modeling transport phenomena in hydrologic systems. Seeks applied research or teaching/research position. Box 224, SCIENCE. X

Neurophysiologist/Neurobiologist. M.D. currently assistant professor in medical school with own grants and publications. Seeks stable position in a healthy intellectual environment, preferably suburban. Box 217, SCIENCE. 5/7, 14

POSITIONS WANTED

Physiology (vertebrate and environmental), ethology, field biology, and human biology. Ph.D. Extensive teaching experience, publications, and postdoctorate. Desires teaching position with or without research. Box 226, SCIENCE. X

Research, Teaching, Administration: experience in cell biology, medical mycology, plant pathology, administration; Ph.D., postdoctorate, senior postdoctorate, tenured professor, publications, research in government/universities/industries in the United States and abroad. Box 227, SCIENCE. 5/7, 14

Toxicologist, Ph.D. 1965; industrial and academic experience; seeks administrative and/or laboratory position in safety evaluation and regulatory affairs, industry. Box 228, SCIENCE. X

POSITIONS OPEN

THE RAZI UNIVERSITY OF IRAN

Seeks qualified Persian-speaking candidates for academic positions in a new College of Animal Husbandry:

physics, chemistry, mathematics, biology, English, agricultural economics, business administration, agriculture, animal husbandry, nutrition and physiology, genetics and breeding, agronomy, dairy products, and veterinary science.

Ph.D. degree and teaching experience desirable.

Applications should be directed to:

CHANCELLOR
RAZI UNIVERSITY
KERMANSHAH, IRAN
or
DIRECTOR
THE INSTITUTE OF TECHNOLOGICAL ASSISTANCE
THE UNIVERSITY OF AKRON
AKRON, OHIO 44325

ADMINISTRATOR—DEPARTMENT OF BIOCHEMISTRY, Michigan State University. To manage multimillion-dollar department with respect to: budget, nonacademic personnel, laboratory facilities, acquisition of equipment and laboratory supplies, research project proposals and resulting grants, department information system. Will report directly to chairperson but will be expected to exercise considerable independence in implementing and interpreting established university policies. The candidate is expected to have a Ph.D. in one of the natural sciences plus teaching, research, or administrative experience. Ability to communicate with faculty, technical and nontechnical staff, and administrative officers of the university. Send curriculum vitae and names of three references to **Robert Barker, Chairman, Department of Biochemistry, Michigan State University, East Lansing, Michigan 48864.** An Equal Opportunity/Affirmative Action Employer.

ANIMAL PHYSIOLOGY (September). Assistant professor. Required: Ph.D.; background and experience to teach nurses anatomy and physiology; recent research and qualifications to develop teaching and research in specialty. Preferred field: neuro/electrophysiology, especially of invertebrates. Academic year salary \$12,500 or more depending on experience. Send curriculum vitae and have three references sent to **Dr. Helen H. Lambert, Chairperson, Physiology Search Committee, Biology Department, Northeastern University, Boston, Mass. 02115.** An Equal Opportunity/Affirmative Action Employer.

ASSISTANT PROFESSOR

Applications are invited from marine biologists for a new, permanent faculty position in a rapidly growing department. Successful candidates must have a record of active research, and a commitment to excellence in teaching. Send applications to: **Dr. G. C. Webster, Department of Biological Sciences, Florida Institute of Technology, Melbourne, Florida 32901.**

POSITIONS OPEN

ASSISTANT PROFESSOR: Ph.D. biochemistry. Anticipated opening. Postdoctoral experience in protein chemistry or enzymology or immunology. Teaching load of 1/3 to 1/2 natural science program for nonscience majors; remainder biochemistry, general chemistry. Direct research for B.S., M.S. students. Résumés, including summary of research ideas, three letters of recommendation, should be sent to **Clyde Riley, Chemistry Department, The University of Alabama in Huntsville, Huntsville, Alabama 35807**. Application deadline: 25 May 1976. *An Equal Opportunity/Affirmative Action Institution.*

ASSOCIATE PROFESSOR

A tenured position is vacant in the Chemistry Department, Aarhus University, Denmark, on 1 November 1976. The salary range is D.Kr. 127,000 to D.Kr. 160,000 per annum before taxes.

The position is to be filled with a scientist who has research experience and who can direct teaching and research in analytical chemistry. Preference will be given to applicants with experience in fields already established in the Department (spectroscopy, electrochemistry, chemical and biochemical separation techniques, automatization). Participation in analytical aspects of environmental problems is desirable. The successful applicant is expected to undertake an equal share with other members of the Department in teaching duties extending from elementary to graduate training, and eventually to teach in Danish. The report of the evaluation committee will be sent to all applicants. Applicants are requested to send three copies of curriculum vitae, including publications, and a brief description of research activities to the **Faculty of Science, Aarhus University, 1 Ndr. Ringgade, DK-8000 Aarhus C, Denmark**. Deadline: 1 June 1976.

ASSISTANT PROFESSOR, Ph.D., anatomist with 3 to 4 years of postdoctoral experience, to teach gross anatomy. Research expertise in electron microscopy evidenced by publications. Salary dependent upon qualifications. Applicants must include application, curriculum vitae, transcripts, and three letters of recommendation. Deadline is 21 May 1976. Send to **Dr. D. A. Ollerich, Anatomy Department, University of North Dakota, Grand Forks, North Dakota 58201**. *The University of North Dakota is an Equal Opportunity/Affirmative Action Employer.*

GEOPHYSICAL INSTITUTE UNIVERSITY OF ALASKA, FAIRBANKS

Applications are invited for the position of **assistant professor of applied science** in the field of satellite remote sensing, with emphasis on resource evaluation and land-use classification. Preference will be given to candidates who have experience in using satellite data for vegetation and forest mapping.

Candidates should have a doctoral degree in an appropriate branch of biology or geography, or the equivalent in training and experience. Applications will be judged primarily on documented evidence of the research, but attention will also be paid to experience in teaching.

Familiarity with arctic or alpine environments is desirable. A state-of-the-art knowledge of remote-sensing technology and a breadth of background in problem-solving are essential. Experience in the dissemination of scientific results to potential users, feasibility studies, demonstration projects, and liaison with federal, state, and local governments would be advantageous.

The appointee will be based at Fairbanks but may be required to spend considerable time at other Alaskan localities. A joint appointment with other institutes of the University may be arranged.

The University is an Equal Opportunity/Affirmative Action Employer; women and members of minority groups are encouraged to apply.

For further information, write to the **Director, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701**.

Innovative liberal arts teaching college seeks **BOTANIST**; teaching specialty in plant physiology preferred. Research interests in agriculture or limnology desirable. Starting July 1977 or before. Rank open; salary negotiable. *Minority and women candidates are urged to apply.* Please send letter stating ideas about teaching, curriculum vitae, and three letters of reference to: **Botanist Search, c/o Judith Wilson, School of Natural Science, Hampshire College, Amherst, Mass. 01002**.

POSITIONS OPEN

ASSISTANT PROFESSOR OF BIOLOGY. Ph.D. and teaching experience required. Effective 1 September 1976. One-year appointment with possibility of continuation. Generalist to teach undergraduate microbiology, introductory biology, and one or two courses within area of competence; coordinate course in health care delivery systems; advise undergraduate research. Experience and expertise in allied health areas highly desirable. Salary range: \$11,250 to \$13,500. Send curriculum vitae, transcripts, three letters of recommendation to: **Dr. Kenneth R. Gordon, Chairman, Department of Biology, Thiel College, Greenville, Pa. 16125**. *An Equal Opportunity/Affirmative Action Employer.*

ASSISTANT PROFESSOR—CHEMICAL OCEANOGRAPHER. Recent Ph.D.'s are invited to apply for a temporary (2-year maximum) position to replace a faculty member going on leave 1 July. Should the latter not return, his replacement would be in a favorable position for consideration for a more permanent status. Send résumé, transcripts, and three letters of reference prior to 1 June to: **Edward J. Green, Department of Oceanography, University of Maine, Walpole, Maine 04573**. Inquiries: telephone 207-563-3146.

An Equal Opportunity/Affirmative Action Employer

The Division of Earth and Physical Sciences, The University of Texas at San Antonio, invites applications for a faculty appointment at the **assistant professor level** in the area of **ENGINEERING PHYSICS OR APPLIED PHYSICS**. Candidates with a Ph.D. and expertise in any area of experimental physics related to engineering physics will be considered. Applicants should send curriculum vitae and three letters of support to **Dr. B. S. Thyagarajan, Director, Division of Earth and Physical Sciences, The University of Texas at San Antonio, San Antonio, Texas 78285**. *The University of Texas at San Antonio is an Equal Opportunity/Affirmative Action Employer.*

DEPARTMENT OF ENTOMOLOGY UNIVERSITY OF WISCONSIN, MADISON

A full-time position at the **ASSISTANT PROFESSOR** level will be available by November-December of 1976. Duties will include teaching introductory entomology and developing a research program. An entomologist with one of the following specialties would be of particular interest: (i) insect pathology, (ii) genetics/developmental biology, (iii) insect behavior.

Applicants must have a genuine interest in teaching and proven ability to carry out research in their field. Interested persons holding a recent Ph.D. degree should send, by 1 July 1976, a curriculum vitae, transcripts of undergraduate and graduate work, research papers, and a brief statement of research and teaching interests, and have four letters of recommendation sent to **Dr. G. M. Boush, Department of Entomology, University of Wisconsin, Madison, Wisconsin 53706**. *An Equal Opportunity/Affirmative Action Employer.*

ASSISTANT/ASSOCIATE PROFESSOR PHYSIOLOGY AND BIOPHYSICS

The Department of Physiology and Biophysics, University of Iowa College of Medicine, invites applications from well-qualified individuals for several openings at the assistant and associate professor level. Applicants must hold the M.D. and/or Ph.D. degree and have a minimum of 2 years of postdoctoral training in cellular physiology or biophysics with publications demonstrating productivity in original research. Candidates should be prepared to develop strong independent research programs and to participate in the medical and graduate teaching and doctoral training activities of the department. While a preference exists for individuals with well-defined interests and research accomplishments in membrane physiology and biophysics, cellular cardiovascular physiology, or cellular and molecular endocrinology, full consideration will be given to others showing promise of outstanding contribution to the research and teaching missions of this department. Please send curriculum vitae, including bibliography and a brief description of research interests, teaching experience, and career objectives, with names of at least three references, to:

**Dr. Robert E. Fellows
Department of Physiology and Biophysics
University of Iowa College of Medicine
Iowa City, Iowa 52242**

The University of Iowa is an Equal Opportunity Employer.

POSITIONS OPEN

The Department of Neurology, UCLA School of Medicine, San Fernando Valley Medical Program, is seeking applicants for the following full-time academic positions: **assistant professor level for NEUROLOGIST** with research interest in neurochemistry. **POSTDOCTORAL FELLOWS** in neurochemistry (Ph.D.) (protein synthesis and development, one; cyclic nucleotides, one). Applicants are requested to submit a curriculum vitae and reprints to **Claude G. Wasterlain, M.D., Head, Division of Neurology, Veterans Administration Hospital, Sepulveda, Calif. 91343**. *UCLA is an Equal Opportunity/Affirmative Action Employer and is desirous of receiving applications from minority and women candidates as well as other qualified persons.*

The University of Texas Health Science Center at San Antonio, Department of Obstetrics and Gynecology, invites applications for an **ASSISTANT PROFESSOR**. Applicants must have a Ph.D. in reproductive physiology, proven research ability, and teaching experience. The individual should have a knowledge of radioimmunoassays for steroid and protein hormones and prostaglandins and interest in developing a research program in fetal physiology correlated with fetal and maternal endocrinology, with particular reference to late pregnancy and initiation of parturition. Interested persons should send a letter of application, curriculum vitae, and names of three references by 31 May 1976 to: **Michael J. K. Harper, Ph.D., Department of Obstetrics and Gynecology, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio, Texas 78284**. *An Equal Opportunity/Affirmative Action Employer.*

DEPARTMENT OF PSYCHOBIOLOGY UNIVERSITY OF CALIFORNIA, IRVINE

A position is available for an outstanding candidate at the assistant professor level. Candidates should either be pursuing research in neurobiology or behavioral biology emphasizing neural or endocrine mechanisms. Postdoctoral research experience is preferred. Preference will be given to applicants whose research interests complement those of current faculty and whose research concerns some aspect of neural or behavioral plasticity. The position is available beginning fall 1976, but may be held open for fall 1977 if circumstances so warrant. Applicants should write to **Norman M. Weinberger, Chairman, Department of Psychobiology, University of California, Irvine, California 92717**, providing curriculum vitae, references, and publications. *Applications from all qualified candidates are welcome; minorities and women are encouraged to apply.*

ASSISTANT RESEARCH NEUROPSYCHOLOGIST wanted in a multidisciplinary clinical research program in epilepsy. Candidate must have Ph.D. in clinical and physiological psychology, an APA-approved clinical internship, and four or more years of postdoctoral experience. Previous experience is required in neuropsychological tests for epileptic patients, neurodiagnostic tests (WADA test) for speech and memory, electrophysiological techniques, and tests of autonomic and visceral functions. Research productivity must be demonstrated by prior innovative research contributions in significant numbers as first author in refereed journals. This position is offered in competition with an in-residence neuropsychologist. Must begin 1 July. Send résumé to **Myrna Beltman, University of California, Brain Research Institute, Los Angeles, California 90024**. *We are an Affirmative Action/Equal Opportunity Employer. Women and minorities are urged to apply.*

WOODS HOLE OCEANOGRAPHIC INSTITUTION ASSISTANT SCIENTIST

Will perform research in underwater acoustics. The research will involve fundamental investigations in sound propagation in the ocean and sea floor. Significant emphasis and interest in applications of underwater acoustics to oceanic studies is expected. The desired education is a Ph.D. in physics or engineering. Desired experience is an experimental and theoretical background in wave propagation, signal and data processing, and statistical communications. Should have performed significant research in at least one of these areas. Specific experience in acoustics is not a prerequisite. Two to 3 months of sea time per year is usual. If interested, contact the **Personnel Office, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543**.

Equal Opportunity Employer, M/F

POSITIONS OPEN

UNIVERSITY OF MICHIGAN INSTRUCTOR ASSISTANT PROFESSOR ASSOCIATE PROFESSOR OR PROFESSOR

Two (2) positions available in the Department of Radiology. Candidate must be Board-eligible or Board-certified. Entering level commensurate with qualifications and experience. The physician will take part in programs of patient care, teaching, and research carried on in the Department. He or she will supervise the activities of the resident staff and aid in teaching of residents and medical students. Codes #900H0 and #1200F0. Send résumé to **Box 225, SCIENCE. A Nondiscriminatory, Affirmative Action Employer.**

UNIVERSITY OF MICHIGAN ASSOCIATE PROFESSOR OR PROFESSOR AND DIRECTOR OF WAYNE COUNTY RADIOLOGY DEPARTMENT

Candidate must be Board-certified. Entering level commensurate with qualifications and experience. The physician will take part in the programs of patient care, teaching, and research carried on in the Department of Radiology. He or she will supervise the activities of the resident staff and aid in teaching of residents and medical students. In addition, he or she will carry the administrative responsibility for the entire department with supervision of the professional and nonprofessional personnel, the acquisition and operation of radiologic equipment, and planning for expansion of the department. Code #200D0. Send résumé to **Box 229, SCIENCE. A Nondiscriminatory, Affirmative Action Employer.**

BIOLOGY. Need instructor qualified to teach introductory microbiology, botany, and biology beginning late August 1976. Tenure-track position with academic year salary in the \$10,000 to \$11,000 range. Applicants should hold or be a candidate for the Ph.D. University of Wisconsin Center-Fox Valley is one of 14 2-year liberal arts and preprofessional campuses in the University of Wisconsin Center System located in the Fox Cities (Appleton, Neenah-Menasha). *Equal Opportunity/Affirmative Action Employer.* Send curriculum vitae and references to: **Appointments Committee, University of Wisconsin Center-Fox Valley, Midway Road, Menasha, Wisconsin 54952.**

BIOLOGY

Position available beginning in the fall 1976 semester for qualified Ph.D. to teach introductory cell biology courses and to assist supervise multisectioned biology laboratories for science majors. Duties will include developing laboratory exercises and materials, supervising teaching assistants, and coordinating laboratories with lectures. Preference will be given to candidates with credentials in human anatomy or physiology. Please respond by 20 May to:

**Dean
Science and Engineering Division
Gannon College
Erie, Pennsylvania 16501**

Gannon College is an Affirmative Action/Equal Opportunity Employer.

UNIVERSITY OF ATHENS, GREECE DEPARTMENT OF BIOLOGY

Jobs are immediately available for recent Ph.D.'s, preferably with postdoctoral experience, at the level of *voithos* or *epimelitis*. Greek citizenship required. Special preference will be given to applicants in genetics and in cell biology. Please send curriculum vitae and two letters of recommendation, plus any inquiries, to **Dr. F. C. Kafatos, Department of Biology, Panepistimiopolis, Kouponia, Athens.**

CELLULAR IMMUNOLOGIST, CLINICAL MICROBIOLOGIST

The Department of Microbiology has two openings for assistant professors, one with strong background in cellular immunology and/or tumor immunology and the other with specialized training in medical microbiology. Please send a curriculum vitae and three letters of reference to **John M. McKenna, Chairman, Department of Microbiology, Texas Tech University School of Medicine, Lubbock, Texas 79409. Texas Tech University School of Medicine is an Affirmative Action/Equal Opportunity Employer.**

POSITIONS OPEN

ASSOCIATE DIRECTOR FOR MARINE SCIENCES

The Institute for Marine and Coastal Studies (IMCS) of the University of Southern California invites applications for this position which will be filled in September 1976. In order to balance marine science disciplines at USC, priority consideration must be given to applicants with Ph.D. in physical oceanography and extensive experience in air-sea interaction. Faculty rank will be full professor; therefore, candidates are expected to have the requisite academic background for this level. Demonstrated scholarly contribution, performance as a teacher, and extensive experience in the management and direction of large-scale oceanographic programs are all important considerations for selection. In addition, candidates should have had recent experience in university administration. The incumbent for this position will be expected to develop, coordinate, and manage IMCS marine science activities, as well as be involved in regular teaching and research work. Please send curriculum vitae and supporting materials to: **Dr. Don Walsh, Director, Institute for Marine and Coastal Studies, University of Southern California, University Park, Los Angeles, California 90007.** Applications for this position will close on 30 May 1976. *USC is an Equal Opportunity/Affirmative Action Employer.*

CHAIRPERSON, Department of Forensic Sciences. The Department of Forensic Sciences of The George Washington University invites applicants for the position of chairperson, effective 1 July 1976. The successful applicant will possess an earned doctorate in one of the natural or physical sciences and have significant teaching and professional experience, including demonstrated research and administrative capabilities. Rank will be based on experience; salary is competitive. Applicants should forward curriculum vitae and arrange for three letters of recommendation to be submitted. All credentials must be received by 15 May 1976. Write to: **Dr. Thomas F. Courtless, Search Committee Chairman, Department of Sociology, The George Washington University, Washington, D.C. 20052. The George Washington University is an Equal Opportunity Employer.**

CHEMISTRY: We invite applications for appointment to our chemistry faculty in September 1976 at the level of assistant professor. We seek candidates with research interests in physical-organic chemistry, especially those with interests in macromolecules and/or experimental x-ray crystallography. Address inquiries to **Michael Marron, University of Wisconsin-Parkside, Kenosha, Wisconsin 53140. Telephone: 414-553-2430.** Candidates should forward a résumé and have three recommendations sent to the same address. Closing date for applications is 15 May. *University of Wisconsin-Parkside is an Equal Opportunity Employer.*

CHIEF, ENDOCRINOLOGY SECTION—Louisiana State University Medical School in New Orleans, Department of Medicine, is recruiting for an M.D. to head the Section of Endocrinology. Demonstrated research interest and teaching experience required. Send curriculum vitae and references to **A. Lopez-S., M.D., Department of Medicine, Louisiana State University Medical School, 1542 Tulane Avenue, New Orleans, Louisiana 70112. Louisiana State University is an Equal Opportunity/Affirmative Action Employer.**

CORONARY PHYSIOLOGY RESEARCH ASSOCIATE

Persons who hold a doctoral degree and are interested in studying the coronary circulation please send a résumé to:

**Dr. Eric Feigl
Department of Physiology and Biophysics SJ-40
University of Washington Medical School
Seattle, Wash. 98195**

An Affirmative Action Employer

DIRECTOR, ANIMAL CARE RESEARCH FACILITY

Faculty position for Board-certified D.V.M. in laboratory of **Animal Care Research Facility, University of Nebraska College of Medicine, 42nd and Dewey, Omaha, Nebraska 68105.** Accredited animal care facility. Send curriculum vitae, list of publications, and names of three references to **Dr. Wayne Ryan, Assistant Dean for Research, The University of Nebraska is an Equal Opportunity/Affirmative Action Employer.**

POSITIONS OPEN

DEAN, SCHOOL OF PHARMACY

Ferris State College invites nominations and applications for the position of Dean, School of Pharmacy. The School of Pharmacy is among the largest undergraduate programs of its kind in the United States. Applicants should present evidence of significant academic and administrative experience, as well as an educational background in pharmacy and experience in pharmaceutical education. Salary is open and will be based upon the qualifications of the person employed.

Ferris State College is located on a 600-acre campus and enrolled approximately 9500 students during the fall quarter 1975-76.

It is preferred that the appointment of the Dean be effective in July 1976, or as soon thereafter as possible. Nominations and applications with current résumés and references should be submitted as soon as possible to:

**James V. Farrell, Chairperson
Search Committee for Dean
Ferris State College
Big Rapids, Michigan 49307**

An Equal Opportunity/Affirmative Action Employer

DEAN OF PHARMACY

The University of Arizona invites applications for the position of Dean, College of Pharmacy. Applicants should have a doctoral degree; a demonstrated capability for administration and management; knowledge about extramural sources of funding and support; a sensitivity to balancing the needs of a Pharmacy College with those of the state in which it is located; and a willingness to maintain strong ties with registered pharmacists in the state through, but not limited to, programs in continuing education. Applicants should forward a curriculum vitae to **Vice President for Health Sciences, Arizona Medical Center, Tucson, Arizona 85724. The University of Arizona is an Equal Opportunity/Affirmative Action Employer under state and federal laws and regulations including Title IX, 1972 Education Amendment.**

DIRECTOR DIVISION OF APPLIED SCIENCE AT NEW YORK UNIVERSITY

to supervise academic programs in energetics and fluid dynamics and to

coordinate and conduct research in energetics, fluid dynamics, and atmospheric sciences.

New York University is committed to the principle of Equality of Opportunity in Employment.

Please send nominations and résumés to:

**Professor Benjamin Bederson, Chairman
Search Committee
New York University—Washington Square
Physics Department
4 Washington Place
New York, New York 10003**

FACULTY POSITION: assistant professor; undergraduate institution. Ph.D. required. Strength in vertebrate physiology and one of the following: ichthyology or mammalogy. Opportunity for research. Reply with current curriculum vitae and graduate transcripts by 15 May 1976 to: **Chairperson, Biology, Hilo College, University of Hawaii at Hilo, Box 1357, Hilo, Hawaii 96720.** Position subject to state funding. *An Equal Opportunity/Affirmative Action Employer. Minority and women candidates are encouraged to reply.*

FACULTY OPENING HARVARD UNIVERSITY

The Harvard School of Public Health has two positions open at the level of **assistant or associate professor of economics.** Applicants should have an academic background in health economics, environmental economics, or in the general problems of regulation policy. Teaching will be primarily centered at the School of Public Health, with graduate students and executives from the health field who return to school for short, intensive courses. There is also a likelihood of teaching responsibilities in the Economics Department of Faculty of Arts and Sciences and/or at the Kennedy School of Government. Ph.D. in economics required. Ph.D./M.D. preferred. Send curriculum vitae to **Box 219, SCIENCE.**

Harvard University is an Equal Opportunity/Affirmative Action Employer.

POSITIONS OPEN

EXECUTIVE POSITION IN SCIENTIFIC AND TECHNICAL INFORMATION

The Smithsonian Science Information Exchange (SSIE) invites applications from qualified individuals for the position of **Vice-President and Director of the Science Division**. Candidates should possess a Ph.D. in one of the physical sciences. Research experience, demonstrated management abilities, and an interest in the techniques involved in the organization and processing of scientific and technical information are essential.

Responsibilities include direction of SSIE's science staff and management of major contract service activities through which SSIE applies the research information in its data base to the analysis, planning, and research program management needs of its major users. This is a career position which offers excellent opportunities for professional interaction with both the research and the information sciences communities.

Interested applicants should send a curriculum vitae to **Dr. David F. Hersey, President, Smithsonian Science Information Exchange, Room 300, 1730 M St., NW, Washington, D.C. 20036**. SSIE is affiliated with the Smithsonian Institution and is an Equal Opportunity/Affirmative Action Employer.

FOOD REGULATIONS ADMINISTRATOR

Applicants must have B.S. degree in food technology, chemistry, microbiology, or any scientific discipline with food processing experience. Courses in law desired. Serve as liaison to all levels of management concerning application of food and drug laws. Only résumés containing salary history will be considered. **SUNKIST GROWERS, INC., P.O. Box 7888, Van Nuys, California 91409**. Affirmative Action/Equal Opportunity Employer, M/F.

ASSOCIATE/SENIOR BIOCHEMIST

General Foods Technical Center is seeking a person with MS or Ph.D. in Biochemistry, and knowledge of mammalian physiology. This bench-level position requires 1-2 years experience in biochemical techniques. Experience in enzymology and microbiology helpful. Good written and oral communications skills necessary.

Position provides commensurate salary and full range of benefits. Reply fully with resume (please do not phone) and salary requirements to Personnel Associate,



GENERAL FOODS CORPORATION
555 South Broadway
Tarrytown, New York 10591

an equal opportunity employer, m/f

POSITIONS OPEN

HISTOLOGY LAB DIRECTOR AND TECHNICIAN

1) **Scientist** with Ph.D. and several years of experience to head service histology laboratory at private research institute. Must be versed in preparation of tissue, analysis of structure, and autoradiography with both light and electron microscopy. Must have experience working with neural tissue. Person will collaborate with other staff members on existing research projects.

2) **Technician** with at least 3 years of experience in areas specified above.

Salaries negotiable.

Please send curriculum vitae and references to **Dr. L. Reif-Lehrer, Eye Research Institute of Retina Foundation, Boston, Mass. 02114**.

INVERTEBRATE ZOOLOGIST

Assistant or associate professorship available August 1976. Applicant must have the Ph.D. and substantial training in freshwater invertebrate zoology with research and teaching interests in this field. Duties will include teaching at graduate and undergraduate levels and maintaining an active research program. Send curriculum vitae including reprints, statement of teaching and research interests, graduate and undergraduate transcripts, and three letters of reference by 1 June 1976 to:

**William H. Darden, Chairman
Department of Biology
P.O. Box 1927
University of Alabama
University, Alabama 35486**

An Equal Opportunity/Affirmative Action Employer

Rosenstiel School of Marine and Atmospheric Science, Division of Marine Geology and Geophysics, University of Miami. Vacancy for **MARINE GEOPHYSICIST** on the faculty, with responsibilities for some teaching and the development of a marine geophysics program. We desire someone with broad interests, who wishes to go to sea, and who will interact with other members of the Division. Level of appointment will be based on experience. Applications should be sent to **Dr. C. G. A. Harrison, Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, Florida 33149**. The University of Miami is an Equal Opportunity/Affirmative Action Employer.

PATHOLOGY POSITIONS available: Department of Pathology, Louisiana State University School of Medicine-Shreveport. Academic pathologists with service capabilities and special interests needed. Should be Board-certified. Interested pathologists considered at any academic level. Inquiries or curriculum vitae should be sent to **Dr. A. G. Smith, Department of Pathology, Louisiana State University School of Medicine-Shreveport, Box 3932, Shreveport, Louisiana 71130**. An Equal Opportunity Employer.

TWO POSTDOCTORAL POSITIONS PSYCHOBIOLOGY

Beginning between 1 June and 31 December 1976 for 2 years. (i) Mechanisms of action of hallucinogenic drugs and the physiological and behavioral roles of CNS serotonin using electrophysiological, pharmacological, neurochemical, and behavioral approaches. (ii) Visual functions of inferotemporal cortex in anesthetized and behaving monkeys (previous experience in single neuron electrophysiology desirable).

Send résumé with three references to:

**Dr. Barry Jacobs or Dr. Charles Gross
Department of Psychology
Princeton University
Princeton, N.J. 08540**

POSTDOCTORAL POSITION to participate in work on the molecular basis of globin gene expression with interest in fetal hemoglobin production in tissue culture. Send curriculum vitae and two letters of recommendation to:

**Dr. Arthur L. Beaudet
Department of Pediatrics
Baylor College of Medicine
Houston, Texas 77030**

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Ph.D. MARINE BIOLOGIST

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**Director of Personnel
PANDULLO QUIRK ASSOCIATES
Gateway 80 Office Park
Wayne, N.J. 07470**

MICROBIOLOGY

Faculty position available. 1 September 1976. Assistant professor of microbiology (\$19,000-\$20,500). M.D. (preferred), D.D.S., or Ph.D. with at least 3 years of postdoctoral experience in teaching and research in medical microbiology and immunology. Position requires: (i) teaching microbiology and immunology to medical, dental, graduate, and undergraduate students and supervision of graduate student research; (ii) establishment of research activities in clinical immunology and immunopathology. Send curriculum vitae and list of publications to **Dr. Felix Milgrom, Professor and Chairman, Department of Microbiology, Box F, 203 Sherman Hall, State University of New York at Buffalo School of Medicine, Buffalo, N.Y. 14214**. State University of New York at Buffalo is an Equal Opportunity/Affirmative Action Employer, actively seeking women and minority candidates.

PLANT ANATOMY AND GENERAL BIOLOGY: The Biology Department, Utah State University, has a position available as assistant professor with a beginning salary of \$12,000 to \$12,500 on a 9-month contract. The position will provide an excellent opportunity to develop an independent research program. Candidate must have a Ph.D. and a broad training in botany, especially in plant anatomy. Deadline for applications will be 15 May 1976. Send curriculum vitae, reprints, and three references to **Professor Arthur H. Holmgren, UMC 45, Utah State University, Logan, Utah 84322**.

POSTDOCTORAL POSITION to participate in research on the role of cyclic nucleotides in the control of smooth muscle tone. Major emphasis will be an investigation of phosphoprotein phosphatases and kinase modulators. Experience in biochemistry desired, experience in tissue culture helpful. Available 1 August 1976. Send curriculum vitae and letters of recommendation to: **Dr. Howard Sands, National Jewish Hospital, Division of Molecular and Cellular Biology, Denver, Colorado 80206**.

POSTDOCTORAL RESEARCH POSITION. Interactions of near-UV radiation and cells. Ph.D. in biological sciences or biochemistry required. Training desired in two of the following: membrane studies, biochemistry, bacteriology, physics. Two-year position. Indication of ethnicity and sex for Affirmative Action statistical purposes is requested but not required. Send curriculum and letters by 1 June to **Dr. John Jagger, The University of Texas at Dallas, Box 688, Richardson, Texas 75080**. An Affirmative Action/Equal Opportunity Employer.

POSTDOCTORAL RESEARCH ASSOCIATE

Position available for recent Ph.D. trained in mammalian genetics, to work on genetic relationships in hypertension. Training in the genetics of continuously varying traits is desirable. Send curriculum vitae and names of three references to: **Dr. E. P. Cronkite, Chairman, Medical Department, Brookhaven National Laboratory, Upton, Long Island, N.Y. 11973**. An Equal Opportunity Employer, M/F.

RESEARCH ASSOCIATE IN PHYSICAL OCEANOGRAPHY. Ph.D. in physical sciences, working background in hydrodynamics, meteorology, or physical oceanography, and capability to initiate independent research. Strong interests in relationship of ocean circulation theory to observations and willingness to plan and participate in field programs. Initial 2-year appointment will be supported primarily by ongoing research programs. Apply to **Dr. Peter Niiler, School of Oceanography, Oregon State University, Corvallis, Ore. 97331**. An Equal Opportunity Employer.

AUDIOLOGIST (GS-665-13/14)

or

PSYCHOLOGIST (GS-180-13/14)

COMMUNICATIVE DISORDERS PROGRAM
NATIONAL INSTITUTE OF NEUROLOGICAL DISEASES
AND STROKE, NIH, PHS

REQUIRED: Minimum of three years experience in experimental design, research methodology and experimental evaluation procedures. Successful candidate should possess a Ph.D. or equivalent in the hearing sciences.

DESIRABLE QUALIFICATIONS: Clinical audiology experience with infants, children and adults; demonstrated research competence in acoustics, noise trauma and auditory rehabilitation (amplification and speech reading); and experience in the administration of grants and/or contract clinical research programs.

The Communicative Disorders Program is responsible for the planning, coordination and conduct of research aimed at the diagnosis, treatment and prevention of varied disorders of human communication and other sensory systems. Incumbent assists the Director in planning and formulating the Institute's communicative disorders research program, including the development of scientific policy, evaluation of the current status of programs, and the development of recommendations concerning areas for program emphasis. Incumbent's primary responsibilities will be developing, encouraging and overseeing research projects, with special concern for problems of audition. Although incumbent's responsibilities involve primarily research administration, it is possible that opportunities for independent research will exist. This position is in the Career Civil Service.

TO APPLY: Submit SF-171 to:

NINCDS Personnel Office

NATIONAL INSTITUTES OF HEALTH

Public Health Service

Bldg. 31, Room 8A-23, Bethesda, Md. 20014, (301) 496-6334

Deadline for receipt of application is May 31, 1976

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General Foods Technical Center has immediate opening for a Manager of Nutrition and Physiology Research. Candidate we seek must have a proven record of accomplishment in research, an interest in the pharmacology of food-related materials, and demonstrated managerial abilities.

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Edited by Daniel Jean Stanley & Donald J. P. Swift

Describes principles of continental margin sedimentation and their application to marine environmental management. Four major sections feature: patterns of water circulation, mechanics of sediment entrainment and transport by flowing water, regional patterns of sedimentation, and fluid dynamics and principles of sedimentation applied to environmental management problems—for those concerned with problems of sediment transport in the marine environment. Discusses management of mineral resources, food resources, beach and harbor defense, waste disposal, construction of offshore structures, more. 0-471-02540-2 1976 \$35.00

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POSITIONS OPEN

Am Zoologischen Institut I der UNIVERSITÄT HEIDELBERG ist zum WS 1977/78 die Stelle eines

ordentlichen Professors (AH 4)

wieder zu besetzen. Der Stelleninhaber soll in Forschung und Lehre Morphologie, Ökologie, und Systematik (vorzugsweise der Evertebrata) vertreten.

Bewerbungen mit Schriftenverzeichnis und Lebenslauf werden bis zum 31 Mai 1976 an die Universität Heidelberg, Postfach 105760, 6900 Heidelberg 1, Federal Republic of Germany, erbeten.

POLITICAL SCIENTIST/POLICY ANALYST TO DO TECHNOLOGY ASSESSMENT

The Science and Public Policy Program and Department of Political Science are seeking a political scientist (policy analyst) for a minimum 2-year visiting professor position as a member of an interdisciplinary technology assessment team. The position will be available 1 June 1976. Although primarily a research position, there will be teaching opportunities. Required qualifications are a background in policy analysis, preferably applied, and the ability to work as a part of a team comprised of natural scientist, engineers, and social scientists. Rank and salary will be commensurate with qualifications.

The University is an Equal Opportunity Employer; women and members of minority groups are encouraged to apply. Please send a copy of your curriculum vitae, letters from three professionals, and reprints or copies of any papers you deem appropriate to **Don E. Kash, Director, Science and Public Policy Program, University of Oklahoma, 601 Elm Avenue, Room 432, Norman, Oklahoma 73069.**

POSTDOCTORAL POSITIONS available at the University of California—San Diego.

- 1) Somatic Cell Genetics—Dr. Immo Scheffler.
- 2) Molecular Biology of Tumor Viruses—Dr. Melvin H. Green.

Send résumé and two letters of recommendation to one of the above:

**Department of Biology B-022
University of California—San Diego
La Jolla, California 92093
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POSTDOCTORAL POSITION

Available 1 September 1976, a 1-year postdoctoral appointment at \$10,000. Research on cytogenetics of mesophyll protoplasts of potato and of plants regenerated therefrom. Training in plant cytogenetics and experience with plant cell tissue cultures preferred. Send résumé and two letters of reference to:

**James F. Shepard
Department of Plant Pathology
Montana State University
Bozeman, Montana 59715**

POSTDOCTORAL RESEARCH FELLOW

Ph.D. in biochemistry with interest and competence in protein chemistry. To study biosynthesis, structure, and function of human hemoglobin variants, including investigation of the sickling phenomenon. Available 1 July 1976. U.S. citizens and permanent residents. Salary: \$10,000 to \$12,500 depending on relevant experience. Submit curriculum vitae, three letters of reference, and brief statement of research interests to **Dr. H. Franklin Bunn, Peter Bent Brigham Hospital, Boston, Mass. 02115. Harvard Medical School is an Equal Opportunity/Affirmative Action Employer.**

RESEARCH ASSOCIATE. Experimentalist required for research on turbulent and lower-hybrid resonance heating of laboratory plasmas, some supervision of graduate students, and occasional teaching of laboratory plasma courses. Ph.D. in plasma physics, relevant research and teaching experience, and a substantial publications record are required. Salary: about \$16,000. Send letter of application and curriculum vitae before 1 June 1976 to: **F. W. Crawford, Chairman, Institute for Plasma Research, Stanford University, Stanford, Calif. 94305. An Equal Opportunity/Affirmative Action Employer.**

POSITIONS OPEN

PHYSICAL OCEANOGRAPHER

The Chesapeake Bay Institute of The Johns Hopkins University has an opening for a physical oceanographer. Applicants should have a Ph.D. or equivalent research experience and an interest in working on either theoretical or practical estuarine and coastal problems. Experience in numerical modeling helpful. Rank and salary negotiable, depending on experience. Initial appointment will be made in summer 1976. Applicants should submit a résumé and names of three references to **Chairman, Search Committee, Chesapeake Bay Institute, The Johns Hopkins University, Baltimore, Maryland 21218. The Johns Hopkins University is an Equal Opportunity/Affirmative Action Employer.**

UNIVERSITE LAVAL DEPARTEMENT DE PHYSIQUE POSTE DE PROFESSEUR EN ASTRONOMIE OPTIQUE

Le département de Physique de l'Université Laval requiert les services d'un professeur pour des tâches d'enseignement et de recherche en astronomie optique. Le candidat devra participer à la mise au point de l'équipement scientifique d'un nouvel observatoire astronomique dont l'instrument principal sera un télescope d'environ 1,5 mètre d'ouverture. Il pourra profiter en outre d'un télescope de 0,5 mètre. Enfin sa collaboration avec d'autres équipes de recherche du département, comme par exemple en spectroscopie ou en traitement des images, sera vivement souhaitée.

Le rang professoral et le traitement seront en fonction des qualifications et de l'expérience. L'engagement se fera durant l'été 1976.

Les candidats sont priés de faire parvenir leur curriculum vitae, deux lettres de référence, et toute autre documentation appropriée à:

**Le Directeur
Département de Physique
Université Laval
Québec G1K 7P4
Canada**

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Opportunities exist at the Jet Propulsion Laboratory for recent or imminent doctoral graduates to participate in an ongoing program of high-resolution astronomical infrared spectrometry. (Awards will be made on a competitive basis.) The principal instrumentation employed is a 1-6 micrometer Connes-type Fourier spectrometer at the 2.7-meter telescope of the McDonald Observatory, University of Texas. Although the program (operated jointly with the University of Texas at Austin) covers both late-type stars and planets, preference will be given to applicants interested in solar system astronomy.

Further details on the research program can be obtained from

**Dr. Reinhard Beer
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103**

General information and application materials can be obtained from

**National Research Council
Associateship Office (JH 606-j)
2101 Constitution Avenue, NW
Washington, D.C. 20418**

POSITIONS OPEN

VICE CHANCELLOR FOR RESEARCH AND ADVANCED STUDY UNIVERSITY OF ALASKA, FAIRBANKS

The Vice Chancellor will have overall responsibility for the research and advanced study beyond the baccalaureate degree at the University of Alaska at Fairbanks, subject to the general policy and intent of the Chancellor. This person will represent the University's research interests at the international, national, and state level.

Qualifications include high academic achievement (Ph.D. or equivalent in training and experience) and superior record of scholarship as demonstrated by research publications and professional recognition; broad interests in scholarly endeavors and advanced study; administrative and organizational capability, including financial management; familiarity with the policies and programs of federal and state agencies.

Salary is dependent upon qualifications and experience. Applications and résumés should be sent to: **Dr. Charles Ray, Chairman, Search Committee, School of Education, University of Alaska, Fairbanks, Alaska 99701.** Applications must be postmarked by 21 May 1976. *The University of Alaska is an Equal Opportunity/Affirmative Action Employer.*

VIROLOGIST. Position available immediately to join research group working on mammalian RNA oncogenic viruses. Experience in tissue culture and viral technology required. Rank and salary will be determined by qualifications. **Box 230, SCIENCE.**

ZOOLOGICAL LIMNOLOGIST

Must be able to teach invertebrate zoology, teach and/or coordinate general zoology. Ph.D. required. Appointment (teaching-research) at assistant professor level. Position is tenure earning. Postdoctoral or industrial experience desirable. Salary competitive, based on experience. Send curriculum vitae, copies of all undergraduate and graduate transcripts, and three names for references to:

**Chairman of Search Committee
Department of Biology
The University of Alabama in Huntsville
Huntsville, Alabama 35807**

Application deadline is 15 June 1976.

The University of Alabama in Huntsville is an Affirmative Action/Equal Opportunity Employer.

SYMPOSIUM

The **THIRD ANNUAL NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH (NCTR) HORMONE RESEARCH SYMPOSIUM** will be held 15 to 17 November 1976 at Little Rock, Arkansas. The 1976 symposium will consist of formal presentations by invited speakers and informal poster sessions by attendees desiring to exhibit posters related to topics discussed by the invited speakers. Topic areas are hormonally active substances in the food chain, regulatory mechanisms involved in estrogen-gonadotropin secretion and action, metabolism, toxicity and clinical studies with oral contraceptives, and hormone receptors and cellular response in reproductive tissue.

For additional information, please write **Michael Norvell, Ph.D., Chairman, Third Annual Hormone Research Symposium, NCTR, Jefferson, Arkansas 72079.**

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STAFF PHYSICIANS

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The Southwestern Field Studies Section, Epidemiology and Field Studies Branch, National Institute of Arthritis, Metabolism and Digestive Diseases, National Institutes of Health, Phoenix, Arizona, invites applications for the positions of Staff Physician for openings in July 1976 and July 1977. Successful candidates will be commissioned in the PHS Commissioned Corps and will be eligible for Variable Incentive pay (a yearly bonus of from \$11,000 to \$13,500). Candidates will also be entitled to allowances for tax free quarters and subsistence.

The work will focus primarily on the epidemiology of diabetes mellitus, and in particular on its distribution in the Pima Indians. The initial group of Pima Indians studied has now been under surveillance for diabetes for a ten year period. As a consequence of the length of follow-up it is now possible to evaluate factors which precipitate diabetes and which accelerate, precipitate, or ameliorate

the vascular complications of diabetes mellitus. The availability of this ten-year follow-up data provides the most extensive information ever gathered on the natural history and development of diabetes and on its vascular complications.

Incumbent of position will also have opportunity to participate in in-patient clinical investigations into metabolic problems prominent among Southwest American Indians—cholesterol cholelithiasis, cholesterol metabolism, diabetes mellitus, and obesity.

The passage of the "National Diabetes Mellitus Research and Education Act" has focused wide attention to the emphasis placed on efforts to conquer this disease. Worldwide interest is turning toward the availability of the collaborative basic and clinical research possibilities in the Phoenix projects and the data available.

Any physician interested in becoming a part of this exciting effort, please contact:

Dr. Peter H. Bennett, Chief Epidemiology
and Field Studies Branch, NIAMDD

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Telephone: (602) 261-3568

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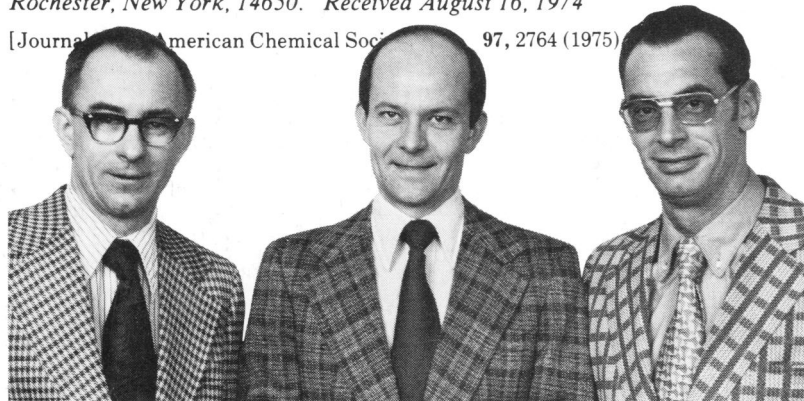
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Quenching of Singlet Molecular Oxygen in Solution by Azomethine Dyes

Wendell F. Smith, Jr., William G. Herkstroeter, and Kenneth L. Eddy

Contribution from the Research Laboratories, Eastman Kodak Company, Rochester, New York, 14650. Received August 16, 1974

[Journal of the American Chemical Society, 97, 2764 (1975)]



Background: The two valence electrons of the O_2 molecule in its lowest energy state have parallel spins. This is unusual. Most molecules with an even number of electrons have singlet ground states. "Singlet" implies that every electron is paired with another of opposite spin. For the oxygen molecule, that state (written 1O_2) represents excitement. To attain it, radiation must be absorbed or energy must be acquired from some other excited molecule. Evidence has been accumulating in recent years that singlet molecular oxygen is

involved in the formation of air pollutants and in such fundamental business as photosynthesis and the digestion of microbes by white blood cells. While the list of molecules which will react with 1O_2 is growing rapidly, the list of molecules which will quench 1O_2 back to O_2 is much smaller. This is because the excitation energy of 1O_2 is unusually low; a quencher molecule to relieve 1O_2 of this energy must have an even lower excited state.

Gist: A new class of 1O_2 quenchers has been discovered: azomethine dyes. Yellow azomethine dyes, absorbing light in the blue, are the least efficient 1O_2 quenchers. The most efficient are the cyan ones, absorbing in the red, the low-energy end of the visible spectrum. Magenta dyes, which absorb green light,

are intermediate in their quenching efficiency. The quenching proceeds by the formation of an excited complex of the dye with 1O_2 . The binding energy of the excited complex varies with the structure of the particular azomethine dye.

An inquisitive outsider to this field might ask these chaps:

Are azomethine dyes new?

Eddy: Not exactly. All three dyes in Kodak color prints and negatives and in Kodachrome and Ektachrome slides have been azomethines. An azomethine contains this structure:



Does efficiency in quenching singlet molecular oxygen influence dye stability as a practical matter?

Smith: Quenching of singlet oxygen by the dye is a reaction

that competes with the reaction of dye destruction by singlet oxygen. Therefore the faster the quenching reaction relative to the chemical reaction, the better.

What is the significance of the binding energy of the excited complex?

Smith: Other things being equal, the greater the binding energy, the better the dye would be as a quencher.

What happens to the azomethine dyes after they have been quenched?

Herkstroeter: The quenching reaction with singlet oxygen raises them from their ground state to their lowest excited electronic state. Because of their ability in this state to twist about the carbon-nitrogen double bond, the return to the ground state is rapid. The overall result is to protect the dye.

A published paper like the above is fallout from a continuing prime effort directed toward improved dye stability in color films and color prints. Conditions that foster long life for photographic color images are low temperature, low humidity, pure air, and darkness. For display, tungsten illumination with its low ultraviolet content is usually less damaging than fluorescent lights. If satisfactory color appearance demands daylight viewing, make it indirect daylight. For long-term storage

of color transparencies and negatives, we recommend 35°F or lower and moistureproof wrapping. (The lower the better.) Detailed suggestions are offered in Pamphlet E-30, "Storage and Care of KODAK Color Films," available on request from Dept. 55W, Kodak, Rochester, N.Y. 14650.

