Twenty-Fifth Annual Briefing NEW HORIZONS IN SCIENCE

November 8 through November 12, 1987 The Westin William Penn Hotel, Pittsburgh

Council for the Advancement of Science Writing, Inc.

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David Perlman, Associate Editor/Science Editor, San Francisco Chronicle Ben Patrusky, Science Program Director, CASW

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Greater Pittsburgh Office of Promotion University of Pittsburgh

Sunday, November 8 6:30 p.m. to 9:00 p.m.

Registration and Welcome Reception William Penn Hotel

Monday, November 9 8:30 a.m. to 11:30 a.m.

THE CHEMISTRY OF COURTSHIP

Thomas Eisner, Ph.D., Professor of Biology, Section of Neurobiology and Behavior, Cornell University, Ithaca, NY

Female insects put would-be suitors through some tough chemical paces aimed at testing their sexual worth. The moth, for instance, favors males bearing an abundance of an alkaloid, derived from plants, that's transmitted with the semen. To gain acceptance, the male must first announce the magnitude of the nuptial offering by way of a "greeting card," a turn-on pheromone derived from this agent. Of what use the alkaloid? The semen-borne substance gets incorporated into the egg, making it distasteful to potential predators. This and other new and surprising findings about reproductive behavior, including a clearly defined role for Spanish fly as facilitator of beetle romance, may well apply to more than just insects.

ABZYMES

Richard A. Lerner, M.D., Director, Research Institute of Scripps Clinic, La Jolla, CA

Antibodies can recognize and selectively bind to an enormous range of substances. Enzymes, far less abundant in kind, not only bind with particular targets but also catalyze chemical reactions. But what if the catalytic function could be grafted onto antibodies? Endowed with this added prowess, such antibodies would significantly enhance the toolbox of molecular biologists, providing them with a vastly expanded array of protein-snipping agents. These antibodiescum-enzymes, or abzymes, also hold promise for medicine's arsenal, as weapons targeted to specific proteins of cancer cells, viruses and blood clots.

Monday, November 9 2:30 p.m. to 5:30 p.m.

THE MAYBE DISEASE(S)

Stephen E. Straus, M.D., Head, Medical Virology Section, Laboratory of Clinical Investigation, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD

Chronic fatigue. Malaise. Tired blood. The blahs. By whatever name, it's probably the most common medical complaint. Over the decades, in the absence of a clearly definable disorder and depending on medical specialty and cultural and philosophical bias, physicians have offered up all manner of diagnoses, from psychoneurosis to hypoglycemia to total allergy syndrome. Now another putative culprit has joined the ranks in a big way: the Epstein-Barr virus. But is it, in fact, a "fatigue" virus? Or is some other infectious agent at fault? And is chronic fatigue syndrome on the rise, as some medical specialists contend? Or do recent, highly publicized episodes represent something on the order of fashion-cum-media hype? Newly acquired scientific evidence should help resolve these questions.

NEUTRINO ASTRONOMY

John Bahcall, Ph.D., Professor of Natural Science, Institute for Advanced Study, Princeton, NJ

The 1987 explosion of a supernova in the Large Magellenic Cloud generated energy equivalent to the detonation of a million billion billion billion 10³³ Hiroshimalike atomic bombs. Most of the energy was released as neutrinos. Reaching earth, these elementary particles have brought important, new information, which — together with early results from a new solar-neutrino detection experiment — is providing crucial clues to many cosmological mysteries. Among them: the formation of black holes, the evolution of stars, the expansion of the universe, grand unification and the origin of heavy elements necessary for human existence.

6:00 p.m.

Hospitality Suite open. Free evening.

Tuesday, November 10 8:30 a.m. to 11:30 a.m.

... AND THEN ALONG CAME 'ECSTASY'

Lester Grinspoon, M.D., Associate Professor of Psychiatry, Harvard Medical School, Boston, MA

The search for pharmacological agents to enhance psychotherapy was first seriously addressed in Western medicine during the '50s and '60s. But in the mid-'60s, with enactment of legislation reflecting widespread public "hysteria" about LSD and its psychedelic ilk, such research came to an abrupt halt. There's now renewed professional interest in mind-altering agents. This time the excitement comes from MDMA — street name, Ecstasy. There's compelling anecdotal evidence, says the speaker, to warrant systematic exploration of its therapeutic potential. But restrictive classification by the Drug Enforcement Agency (a decision now being challenged in the Federal courts) makes clinical study of MDMA and the like all but impossible.

HOW TO MAKE A LIMB

Susan V. Bryant, Ph.D., Professor of Developmental and Cell Biology, University of California, Irvine, CA

It's one of the central mysteries of biology: How does a single cell, the fertilized egg, give rise to a complex organism? By what processes do embryonic cells go on to differentiate and form a spatially correct, predictable arrangement of discrete organs and tissues in individual after individual of the same species? In recent years, scientists have gathered an enormous body of evidence that goes a long way toward explaining how biological patterning happens and organisms come to be. Much of the new insight devolves from new work on the cellular and molecular choreography involved in the development and regeneration of vertebrate limbs.

Tuesday, November 10 2:30 p.m. to 5:30 p.m.

NEW LIGHT ON THE LIVING CELL

D. Lansing Taylor, Ph.D., Professor of Biological Sciences and Director, Center for Fluorescence Research in Biomedical Sciences, Carnegie Mellon University

Cell biology has entered a new era. Call it the era of enlightenment — literally — as scientists learn to light up the interior of living cells in ways that allow extraordinarily intimate study of the chemical and molecular dynamics responsible for its various functions. This new bio-spy technology combines specially designed fluorescent "reporter" probes with several pre-existing technologies (light microscopy, digital image processing, molecular biology). The new strategy holds enormous potential as a tool for basic research and for disease diagnosis and new-drug testing.

FRONTIERS OF GENETICS

David Botstein, Ph.D., Professor of Genetics, Massachusetts Institute of Technology, Cambridge, MA

The prospects for progress — both in analytic and synthetic genetics — appear especially rosy. On the analytic side look for: cartographic conquest of the human genome, with the resultant genetic and physical maps — and, ultimately, the complete sequence — aiding significantly in the identification and accelerated understanding of the root causes of many diseases; major discoveries related to the fundamentals of gene expression and regulation emerging from studies on transgenic mice. And on the analytic side: new advances in ideas and methods for producing an abundance of useful products, particularly new drugs.

6:00 p.m.

Hospitality Suite Open.

7:00 p.m.

THE ANNUAL CASW BANQUET

Presentation of the 1987 National Association of Science Writers' Science-in-Society Journalism Awards.

A special musical divertissement by Roger B. Dannenberg, Ph.D., Associate Director, Carnegie Mellon Center for Art and Technology.

Wednesday, November 11

A day at Carnegie Mellon University. Transportation departs the William Penn Hotel at 8:15 a.m. Continental breakfast will be available upon arrival at the campus.

9:00 a.m. to 12:30 p.m.

ARTIFICIAL INTELLIGENCE AND THE MIND

Allen Newell, Ph.D., University Professor of Computer Science, Carnegie Mellon University

The search for unifying theory is hardly the province of physics alone. Such a quest is also a major thrust for scientists exploring human behavior. To wit: What is mind? What is the secret of human cognition? Put another way: What is the architecture – the fixed structure, the hardware – of intelligence? Experts in artificial intelligence think they may be well on their way toward elaborating such an all-purpose theoretical construct – by way of a computer-based model called SOAR – and with it the wherewithal to design more effective thinking machines and better computer/human interaction.

ROBOTIC HORIZONS

Raj Reddy, Ph.D., Professor of Computer Science and Director, The Robotics Institute, Carnegie Mellon University

Here's some of what's coming: an automobile that drives itself; self-replicating factories for space; the "electronic book," the library of the future — all made possible by recent advances in robotic vision, speech recognition, object detection, fine motion control, tactile sensing, mobility and artificial intelligence. How soon? You'll get a chance to judge for yourself immediately after the lecture during an on-site tour and demonstration of some prototypic systems.

1:00 p.m.

Lunch at Skibo Hall Ballroom.

Wednesday, November 11 2:30 p.m. to 3:45 p.m.

BIOMOLECULAR ELECTRONICS

Robert R. Birge, Ph.D., Professor of Chemistry and Director, Center for Molecular Electronics, Carnegie Mellon University

It's a truism of computer design: smaller and denser means faster. Ingenious fabrication technology has made it possible to cram more and more electronic parts — hence, more circuits, more memory, more computing power — onto tiny, whisper-thin wafers of silicon. But designers are fast approaching the limit of semiconductor-chip capacity. What then? Look to molecular electronics, perhaps the last word in computer miniaturization and speed. This new technology calls upon organic molecules to do the job now being done by semiconductors. Recent development of ultra-tiny, ultra-fast devices using bacterial protein as the active component suggests that commercial application may not be too far in the offing.

4:00 p.m.

Transportation departs for William Penn Hotel.

5:30 p.m.

GALA RECEPTION AND DINNER CRUISE

We travel once again — this time for cocktails and sunset atop scenic Mount Washington, overlooking Pittsburgh and its glorious confluence of rivers. Next, we ride the incline down to the water's edge, there to board the *Gateway Clipper* for a grand, moonlit, music-filled, dinner cruise.

Thursday, November 12 8:30 a.m. to 11:30 a.m.

THE ORIGIN OF HUMAN CULTURE

Alan Mann, Ph.D., Associate Professor of Anthropology, University of Pennsylvania, Philadelphia, PA

In the common telling, the story of the emergence of human culture is one of gradualism: the first of our hominid ancestors were not much more advanced than apes; during the next several million years, there was a slow, incremental increase in the ability of our evolutionary forebears to master more complex behaviors until, finally, human levels of activity — e.g., tool making, burial of the dead, use of fire, language — were reached at the Neanderthal stage, beginning about 100,000 years ago. Lately, however, a number of anthropologists have begun to take strong issue with this classical version of the saga. According to their reading of the physical evidence, modern humans leapt on to the scene dramatically and abruptly no more than 30,000-40,000 years ago.

SUPERCONDUCTIVITY: UPDATE ON A REVOLUTION

Victor J. Emery, Ph.D., Senior Scientist, Brookhaven National Laboratory, Upton, NY

The recent discovery of resistance-free electrical flow in metallic ceramics at unexpectedly high temperatures spawned a welter of exhilarating visions: magnetically levitated trains, tiny superfast computers, high-powered electric cars, lossless transmission and storage of electrical energy. How real is all this? Hard to say. What's needed before anyone can hope to make solid if-and-when predictions is sound theory to explain the new phenomenology. At last count, about nine different hypotheses were in the running. The speaker, who will have come to us directly from an international conference on superconductivity, may likely have a new tally – and some other, late-breaking findings – to report.



4 Billingham, Somerville, MA 02144

About the Speakers/ CASW New Horizons 1987

JOHN BAHCALL, a native of Shreveport, Louisiana, completed his undergraduate work at the University of California, Berkeley, in 1956 and went on to earn his Ph.D. in theoretical physics from Harvard University in 1961. After a postgraduate research fellowship at the University of Indiana in Bloomington, Bahcall joined the physics faculty of CalTech in Pasadena in 1961. In 1971, he accepted a professorship at the Institute for Advanced Study. He is known for his theoretical work on nuclear beta decay, weak interactions in stars, models of the galaxy, missing matter in the universe, neutron stars, black holes, quasars and X-ray sources. Bahcall is a member of the National Academy of Sciences and the American Academy of Sciences. In 1970 he was awarded the Warner prize of the American Astronomical Society. (609/734-8054)

ROBERT R. BIRGE received his B.S. degree from Yale University in 1968 and his doctorate in chemistry from Wesleyan University in 1972. In 1975, following two years of postdoctoral research at Harvard University, he joined the University of California, Irvine. He moved to Carnegie Mellon University in 1984 as professor and head of the chemistry department and director of the Center for Molecular Electronics. His interest in molecular electronics grew out of research on the spectroscopy of biological molecules. A very popular teacher, he has lectured widely (60 major addresses over the last decade) and published extensively. Birge serves on the Board of Directors of the West Penn Hospital Foundation. (412/268-3125)

DAVID BOTSTEIN was born in Zurich, Switzerland. He graduated from Harvard College in 1963 and received his Ph.D. in human genetics from the University of Michigan in 1967. He then joined the biology department of the Massachusetts Institute of Technology, where he currently holds rank as Earle A. Griswold Professor of Genetics. Botstein's many research contributions include development of the idea of using restriction fragment length polymorphisms (RFLPs) to map the human genome. He serves on the editorial boards of *Genetics, Molecular and Cellular Biology*, and *The Journal of Cell Biology*. He has been a member of the National Academy of Sciences since 1981 and was elected to the American Academy of Arts and Sciences in 1985. (617/253-6725)

SUSAN V. BRYANT was educated in her native England, earning her B.Sc. (1964) and Ph.D. (1967) at the University of London. In 1969, after two years studying the role of nerves in limb regeneration at Case Western Reserve University, she became a member of the biology faculty at the University of California, Irvine. Bryant's research centers on pattern formation during vertebrate limb regeneration and development in amphibians and mammals. She is consulting editor of a widely hailed text, *Pattern Formation, A Primer in Developmental Biology.* She was program director for the NSF-Developmental Biology Program (1981-82) and is currently a division editor for the *Journal of Experimental Biology.* (714/856-7402)

ROGER B. DANNENBERG is Associate Director of the Carnegie Mellon Center for Art and Technology and a research faculty member in the computer science department where he earned his Ph.D. in 1982. His research interest lies in computer languages, man-machine interaction, real-time control and signals processing in connection with the problems of computer music. An accomplished musician, Dannenberg frequently performs experimental music for trumpet (and synthesizer) and has appeared in Amsterdam, The Hague and Paris. He also plays with George Gee and His Make Believe Ballroom Orchestra, which recently performed at the historic Apollo Theater in Harlem. He is a member of the Association for Gomputing Machinery and the American Federation of Musicians. (412/268-3827)

THOMAS EISNER was born in Berlin, Germany, in 1929. He received his B.A. (1951) and Ph.D. (1955) from Harvard University, where he remained for two years as a postdoctoral fellow. In 1957 he joined the faculty of Cornell University, becoming a full professor in 1966 and Jacob Gould Schurman Professor in 1976. He has had a long and abiding research in insects, particularly their behavior, ecology and evolution. His research-related photographs have appeared in many books and magazines, while his films have been incorporated into several prize-winning television programs. Eisner has been actively involved in many conservation and human rights issues. Author of five books and over 200 papers, he is the receipient of many scientific awards and holds membership in the National Academy of Sciences, the American Academy of Arts and Sciences, and the Explorers Club. (607/255-4464)

VICTOR J. EMERY was born in Boston, England. He received a B.S. degree from the University of London in 1954 and a Ph.D. (Theoretical Physics) from the University of Manchester in 1957. He is a Fellow of the American Physical Society and a Senior Scientist at Brookhaven National Laboratory where he has been since 1964. He has held faculty positions or visiting appointments at the Universities of Birmingham and Cambridge in England, the University of Paris, NORDITA in Copenhagen, the University of California, Berkeley, and IBM in Zurich. He serves on the editorial board of the *Journal of Low Temperature Physics*. (516/282-3765) LESTER GRINSPOON graduated from Tufts College in 1951, and earned his M.D. from Harvard Medical School in 1955. In 1961, he joined the Harvard faculty, where he is now associate professor of psychiatry. Grinspoon was executive director of the Massachusetts Mental Health Research Corporation 1973 and currently serves on the advisory boards of the National Organization for the Reform of Marijuana Laws. The Center for the Study of Non-Medical Drug Use, and the Beneficial Plant Research Association. Since 1984, he has been editor of the Harvard Medical School Mental Health Letter. He serves on the editorial boards of *The Journal of Psychiatric Research, Social Pharmacology* and the *Harvard Medical School Health Letter*. Grinspoon is the author or co-author of more than 120 articles and several books related to society's relationship to mind-altering drugs. (617/277-3621)

RICHARD A. LERNER graduated from Northwestern University and Stanford Medical School. After completing his internship at Palo Alto Hospital in 1965 and receiving postdoctoral training in experimental pathology at the Scripps Clinic, he accepted an appointment to the Wistar Institute in Philadelphia. He rejoined Scripps Clinic in 1970, becoming chairman of the molecular biology department in 1972. In 1987 he was appointed director of the Research Institute of Scripps Clinic. Author of more than 200 scientific papers, Lerner serves on the editorial boards of several journals. He is the recipient of many honors, including the 1978 Parke Davis Award. In 1985, Lerner was elected foreign member of the Royal Swedish Academy of Sciences and this year was awarded the Order of San Carlos, a knighthood bestowed by the Colombian government for his work in immunochemistry and infectious diseases. (619/457-8265)

ALAN E. MANN received his B.A. degree from the University of Pittsburgh in 1961 and his Ph.D. from the University of California, Berkeley, in 1968. He joined the University of Pennsylvania anthropology department the following year. His research has focused on the patterns of growth and development of early hominids (particularly the South African australopithecines). He has recently turned his attention to establishing an international repository safeguarding hominid fossils that have already been discovered so that they will be available to future generations of scholars. Mann is the co-author of a physical anthropology textbook now in its fifth edition and is the recipient of two awards for teaching excellence. (215/898-6986)

ALLEN NEWELL received his B.S. (physics) from Stanford University and, following graduate study in mathematics at Princeton University, went on to earn his Ph.D. in industrial administration in 1957 from the Carnegie Institute of Technology (now Carnegie Mellon). In 1961, after 11 years as a research scientist with the Rand Corporation, Newell joined the Carnegie Mellon faculty. In 1976 he was named U.A. and Helen Whitaker University Professor of Computer Science. His work in artificial intelligence, frequently in collaboration with Nobel Laureate Herbert Simon, includes the construction of the first program to prove theorems and research in speech understanding systems. Most recently, he has been concerned with applying information processing psychology to aiding communication between computers and their users. He is the recipient of many honors, including the 1985 A.M. Turing Award (jointly with Simon) and the 1985 Distinguished Research Contribution Award of the American Psychological Association. In 1987, he delivered the William James lectures at Harvard University on unified theories of cognition. Newell holds membership in the National Academy of Sciences and the National Academy of Engineering. (412/268-2602)

D. RAJ REDDY, a native of Katoor, India, did his undergraduate work at the University of Madras and then went on to earn his Ph.D. from Stanford University in 1966, when he accepted appointment to its computer science faculty. He moved to Carnegie Mellon in 1969, and was named full professor in 1973. He has been director of The Robotics Institute since 1980. His current research efforts center on speech and visual input to computers, artificial intelligence and machine architecture. Reddy is a member of the editorial boards of several journals, including *Proceedings of the IEEE, Spectrum, Computer Vision, Graphics and Image Processing, Cognitive Science, International Journal of Robotics* and Robotics. A consultant to many leading industrial organizations, Reddy is also a much-sought-after speaker, and has been invited to address a wide variety of national and international symposia. In 1984, he was awarded the Cross of the Legion of Honor of France. He is a member of the National Academy of Engineering. (412/268-2597)

STEPHEN E. STRAUSS grew up in New York City, studied biology at the Massachusetts Institute of Technology (B.S., 1968) and medicine at the Columbia University College of Physicians and Surgeons (M.D., 1972). He completed training in internal medicine and infectious diseases at St. Louis' Washington University in 1978. His interest in virology was kindled during a two-year postdoctoral research fellowship at the NIH, taken in the midst of his medical training. He returned to join the senior scientific staff of the NIH in 1979, where he now heads the NIAID's Medical Virology Section. In 1985, he was co-chairman of the NIH Workshop on Chronic Epstein-Barr Virus Infection. His current research efforts are addressed primarily to the molecular biology, pathogenesis and treatment of human herpesvirus infections. (301/496-5222)

D. LANSING TAYLOR, a native of Baltimore, received his B.S. degree from the University of Maryland in 1968 and his Ph.D. (cell biology) from the State University of New York at Albany in 1973. Following a postdoctoral research fellowship in biophysics at the Woods Hole Marine Biological Laboratory, Taylor joined the faculty of the Harvard University Biological Laboratories. In 1982, he accepted appointment as professor of biological sciences at Carnegie Mellon University, where he directs the Center for Fluorescence Research in Biomedical Sciences. From 1981-1985, Taylor served as editor of *The Journal of Cell Biology*. He is currently editor of *Cell Motility*, a post he has held since 1980. Taylor is the author of 80 research papers related to cellular dynamics and cell imaging. (412/268-3456)