# Thirty-Fifth Annual Briefing NEW HORIZONS IN SCIENCE

November 2 through 6, 1997 The Hotel Roanoke and Conference Center Roanoke, Virginia

AN

Council for the Advancement of Science Writing, Inc.

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### Sunday, November 2 6:30 p.m. to 9:00 p.m.

WELCOME RECEPTION The Hotel Roanoke and Conference Center

# Monday, November 3 8:30 a.m. to 11:30 a.m.

FIBRINOGEN FROM TRANSGENIC LIVESTOCK: PROSPECTS AND PROMISES William H. Velander, Ph.D., Associate Professor of Chemical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

A visionary scientific partnership launched in 1987 appears to be on the verge of a major payoff. One member of the team has been looking into the therapeutic potential of fibrinogen, a component of blood, with the growing expectation that it will prove of immense benefit in a number of clinical situations (i.e. as surgical sealant; delivery vehicle for drugs; template for bone reconstruction). But how to get enough of this material to meet the anticipated need? Enter partner #2, who has finally succeeded in generating this blood factor in recombinant abundance in the milk of transgenic livestock.

#### 'SMART' NOISE

Frank Moss, Ph.D., Director, Center for Neurodynamics, and Professor of Physics and Biology, University of Missouri, St. Louis, MO

Noise is a nuisance, a hindrance to communication, something to squelch. Right? Not always. Under the right circumstances, noise can enhance information transfer. Such "cooperation" between signal and noise – a process called stochastic resonance – has been demonstrated in a variety of high-tech devices, including lasers and tunnel diodes. (It has also been cited as an explanation for the ice ages.) Now it appears that this phenomenon also plays a critical role in biology – knowledge that promises to yield major benefits, from improved cochlear implants to ways to prevent falls in the elderly.

### Monday, November 3 2:30 p.m. to 5:30 p.m.

#### THE MUON COLLIDER

Robert B. Palmer, Ph.D., Senior Scientist and Head, Center for Accelerated Physics, Brookhaven National Laboratory, Upton, NY

Some would argue that the Large Hadron (proton-antiproton) Collider under construction at CERN and versions of the Next Linear (electron-positron) Collider (NLC) now in advanced planning stages at SLAC and elsewhere will suffice in providing particle physicists with the means to nail such quarry as the Higgs boson and to explore other lingering mysteries regarding the nature of matter. So why the sudden surge of interest in a muon-antimuon collider? Proponents in growing numbers say it would not only be cheaper to build than a linear collider of equal energy but would also eat up far less real estate. NLC scientists call it a pipe dream.

ROCK ART: THE SCIENCE Carolyn E. Boyd, Department of Anthropology, Texas A&M University, College Station, TX

For decades, believing that the meaning of rock art was forever lost along with the artists who created it, researchers throughout the world have generally accepted the idea that one person's interpretation was as good as another's; that research geared toward interpretation could not be accorded objective, scientific validity. But now, in light of a new approach to the study of 4,000-year-old rock art in the Lower Pecos region in southwestern Texas and northern Mexico, there is reason to think that it can indeed serve as a trustworthy window on the lifestyles, thought processes and belief systems of prehistoric peoples.

## 6:30 p.m. to 7:30 p.m.

MELODIC MINGLER Share music and libations with Appalachian Spring.

## Tuesday, November 4 8:00 a.m.

Buses depart for sessions at the Donaldson Brown Hotel and Conference Center on the Virginia Tech campus in Blacksburg.

### 9:00 a.m. to 12:00 Noon

#### ANTIBIOTIC-INDUCED DISEASES

Tracy D. Wilkins, Ph.D., J. B. Stoobant Professor of Agricultural Biotechnology, and Director, Fralin Biotechnology Center, Virginia Polytechnic Institute and State University

As bacteria grow ever more resistant to antibiotics, larger and larger amounts have to be administered to quell infections. This practice introduces a problem of its own. These stepped-up doses destroy the bacterial communities that normally dwell in the body, thereby allowing alien, disease-causing microorganisms to take root. Perhaps the greatest threat comes from a potentially lethal species that attacks 4% of all hospitalized adults in the U.S. at an annual cost of about a billion dollars. In the works: non-antibiotic approaches to the prevention and cure of such opportunistic ills.

#### CRAFTING NEW MATERIALS AND NOVEL DEVICES A symposium featuring reports by Virginia Tech researchers.

#### SUPRAMOLECULAR SYSTEMS Karen J. Brewer, Ph.D., Associate Professor of Chemistry

MOLECULAR RINGS, STRINGS, CHAINS AND ABACAE Harry W. Gibson, Professor of Chemistry

#### CONNECTING THE QUANTUM DOTS

Richard O. Claus, Willis G. Worcester Professor, Bradley Department of Electrical Engineering and Computer Engineering, and Director, Fiber & Electro-Optics Research Center

With the advent of advanced techniques for probing the architecture and properties of molecules in fine detail in conjunction with fresh schemes for assembling novel molecular constructs from smaller building blocks, researchers now have the means to design and manufacture a plethora of original materials for incorporation in a host of innovative nanodevices. Among the possibilities: highly efficient solar-energy converters; DNA-binding agents for treatment of cancer; submarine radar shields.

### Tuesday, November 4 12:15 p.m.

Lunch

# 1:30 p.m.

#### THE COMING WORLD OF WIRELESS Theodore S. Rappaport, Ph.D., James S. Tucker Professor of Electrical and Computer Engineering, and Director, Mobile & Portable Radio Research Group

From a cellular phone market that numbered in the thousands in 1980, the user count worldwide today stands at 160 million – and climbing at a rate of 60% a year. In countries like China and Brazil it's closer to 300%. What this adds up to is a revolution that is fast transforming the way we go about our business. And given the ever-increasing reach of untethered communication via the webs of satellites and ground stations that make even the most remote regions of the world accessible – together with a string of technological developments now in the offing – the wireless revolution has, in fact, only just begun.

## 2:45 p.m. to 4:00 p.m.

An opportunity to visit Virginia Tech research facilities and meet with investigators. Return buses depart at 4:00 p.m.

### 6:30 p.m.

RECEPTION AND CASW ANNUAL BANQUET The Hotel Roanoke

Presentation of the 1997 National Association of Science Writers' Science-in-Society Journalism Awards.

Featured Speaker: Marshall Fishwick, Ph.D., Professor, Center for Interdisciplinary Studies, Virginia Polytechnic Institute and State University, previews our techno-cultural future in a talk entitled "Everything Nailed Down Is Coming Loose."

# Wednesday, November 5 8:30 a.m. to 11:30 a.m.

#### CLEARING BLOOD-BORNE PATHOGENS

Ronald P. Taylor, Ph.D., Professor of Biochemistry, University of Virginia School of Medicine, Charlottesville, VA

How's this for a strategy to rid the blood of disease-causing microorganisms? Fashion monoclonal antibodies that target and bind to two different entities. One is a molecule on the surface of red blood cells; the other, one or another variety of bacteria or virus. As the now-bound red cell sweeps through the circulation, the unanchored end of the antibody snares the pathogen it's directed against. The ensemble travels to the liver, where the antibody-pathogen complex gets chewed up, while the now-unburdened red cell returns to the fray. Among potential applications: protecting travelers against malaria, dengue fever and a host of other maladies; neutralizing antibiotic-resistant bacteria.

### "... BUT WHAT DOES THE GENE DO?"

Allan C. Spradling, Ph.D., Director, Department of Embryology, Carnegie Institution of Washington, and Investigator, Howard Hughes Medical Institute, Baltimore, MD

Most human genes have now been at least partially sequenced and the expectation is that the entire human genome will be deciphered within the next decade. But large-scale sequencing has brought an old dilemma to the fore: figuring out what the genes do. Methods for determining function have not kept pace with the flow of incoming data. Of late, however, molecular biologists have come up with a variety of strategies for speeding up the process. Some of the most powerful take advantage of the startling realization that the basic functions of many, if not most, genes have been conserved to some degree in all multicellular organisms.

# Wednesday, November 5 2:30 p.m. to 5:30 p.m.

#### HOW THE MIND WORKS

Steven Pinker, Ph.D., Professor of Brain and Cognitive Sciences, and Director, McConnell-Pew Center for Cognitive Neuroscience, Massachusetts Institute of Technology, Cambridge, MA

What is intelligence? How did the mind evolve? How does it allow us to see, think, feel, laugh, interact socially, enjoy beauty, ponder life's mysteries? In a newly published, farreaching synthesis of recent research in cognition, the author strives to answer these core questions. Invoking the principles of "reverse-engineering" – figuring out what natural selection designed the mind to accomplish – it addresses such other imponderables as why children are bratty and why fools fall in love, offering arguments that are sure to fuel debate and spawn new lines of scientific inquiry.

MENTAL CONTROL: WHEN THE ANTIDOTE IS THE POISON Daniel M. Wegner, Ph.D., Professor of Psychology, University of Virginia, Charlottesville, VA

The mind also plays tricks. Perhaps its most frustrating bit of tomfoolery is doing precisely what we wish it not to do. Thoughts, emotions and actions have a way of persisting not only despite but because of our best intentions to avoid them. (Try counting to ten without thinking of elephants.) Now, in the wake of recent studies, researchers think they may finally have a handle on the mechanism underlying this phenomenon – dubbed the "ironic effect of mental control" – and, with it, the potential to revolutionize treatment of such psychological disorders as insomnia, depression and anxiety.

### 6:30 p.m.

GALA RECEPTION AND DINNER Hosted by Virginia Tech.

### Thursday, November 6 8:30 a.m. to 11:30 a.m.

THE HIGHEST-ENERGY COSMIC RAYS: IN SEARCH OF SOURCES James W. Cronin, Ph.D., Professor of Physics, University of Chicago, Chicago, IL

Thirty-five years have passed since the initial discovery of cosmic rays packing energies far in excess of anything observed previously. Since then, perhaps ten additional sightings have been reported. Problem is, no known astronomical object capable of accelerating nuclei or protons to such energies lies anywhere near the trajectories of these cosmic rays. So what is their source? In search of answers, scientists from 19 nations have banded together to construct two huge cosmic-ray observatories, each the size of Rhode Island, one in the Northern hemisphere (Utah) the other in the Southern (Argentina).

#### THE EARTH'S WATERY WOES

John D. Milliman, Ph.D., Graduate Dean and Professor, School of Marine Science, College of William and Mary, Gloucester Point, VA

With concern centered on rising sea levels due to greenhouse-driven climate change, other critical factors bearing on the Earth's watery future have not received the attention they deserve. Consider: in many parts of the world land is sinking faster than the seas are rising. Ergo: coastal lowlands are imperiled more by subsidence than global warming. Making matters worse are efforts to divert and dam rivers that discharge to the lowlands. Some predict that by the year 2100, Egypt disappears; New Orleans resembles Venice. The good news: with proper planning, undeveloped coastal lowlands can avert this doomsday scenario.

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