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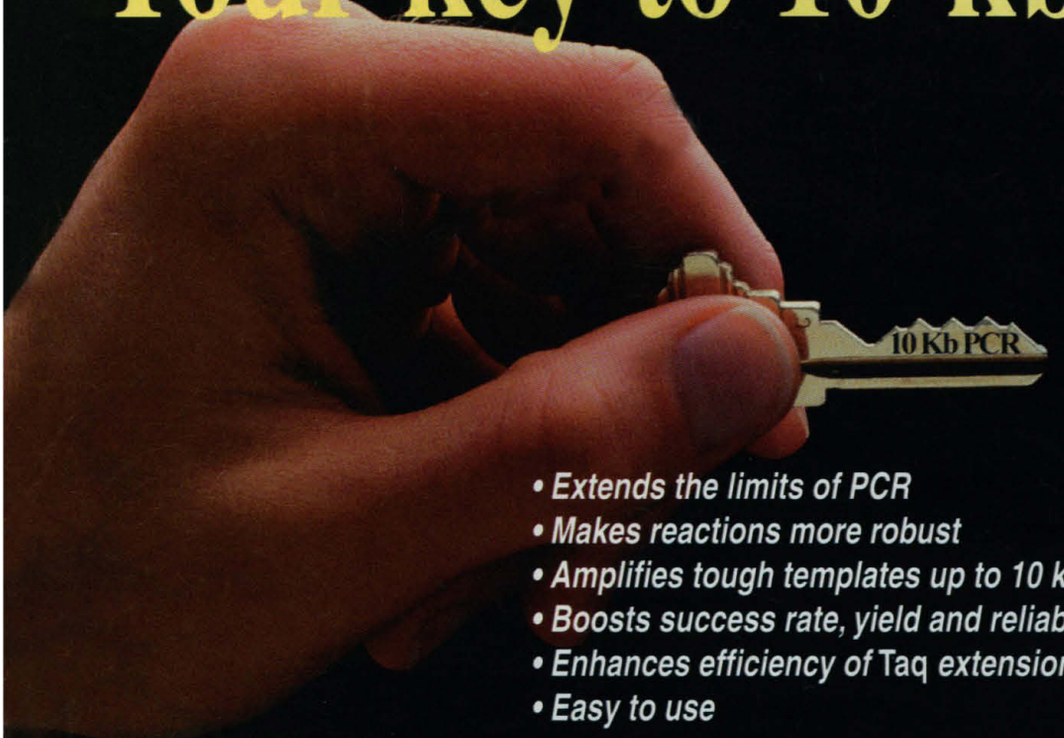

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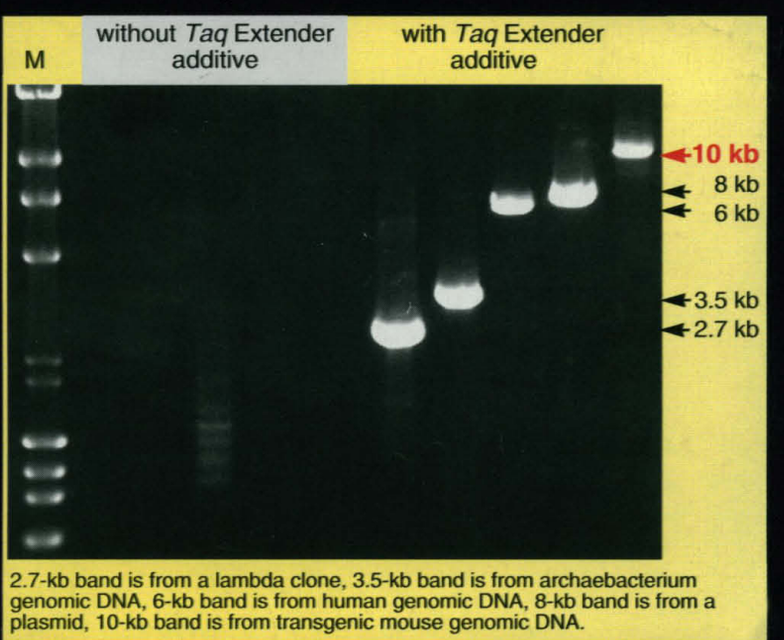

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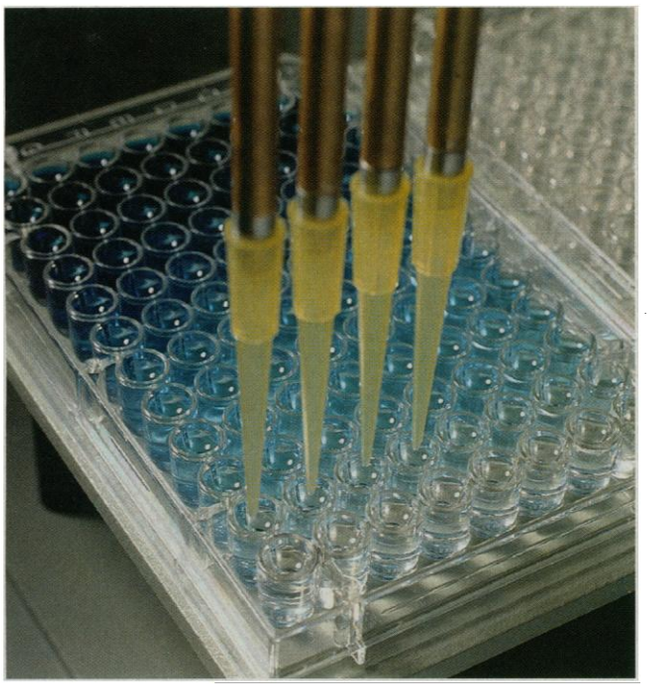

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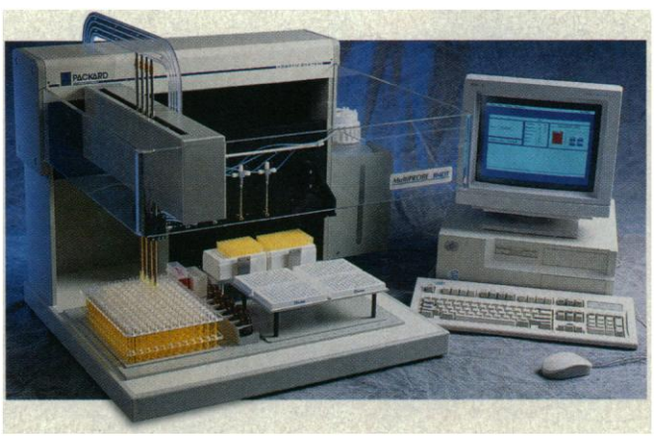

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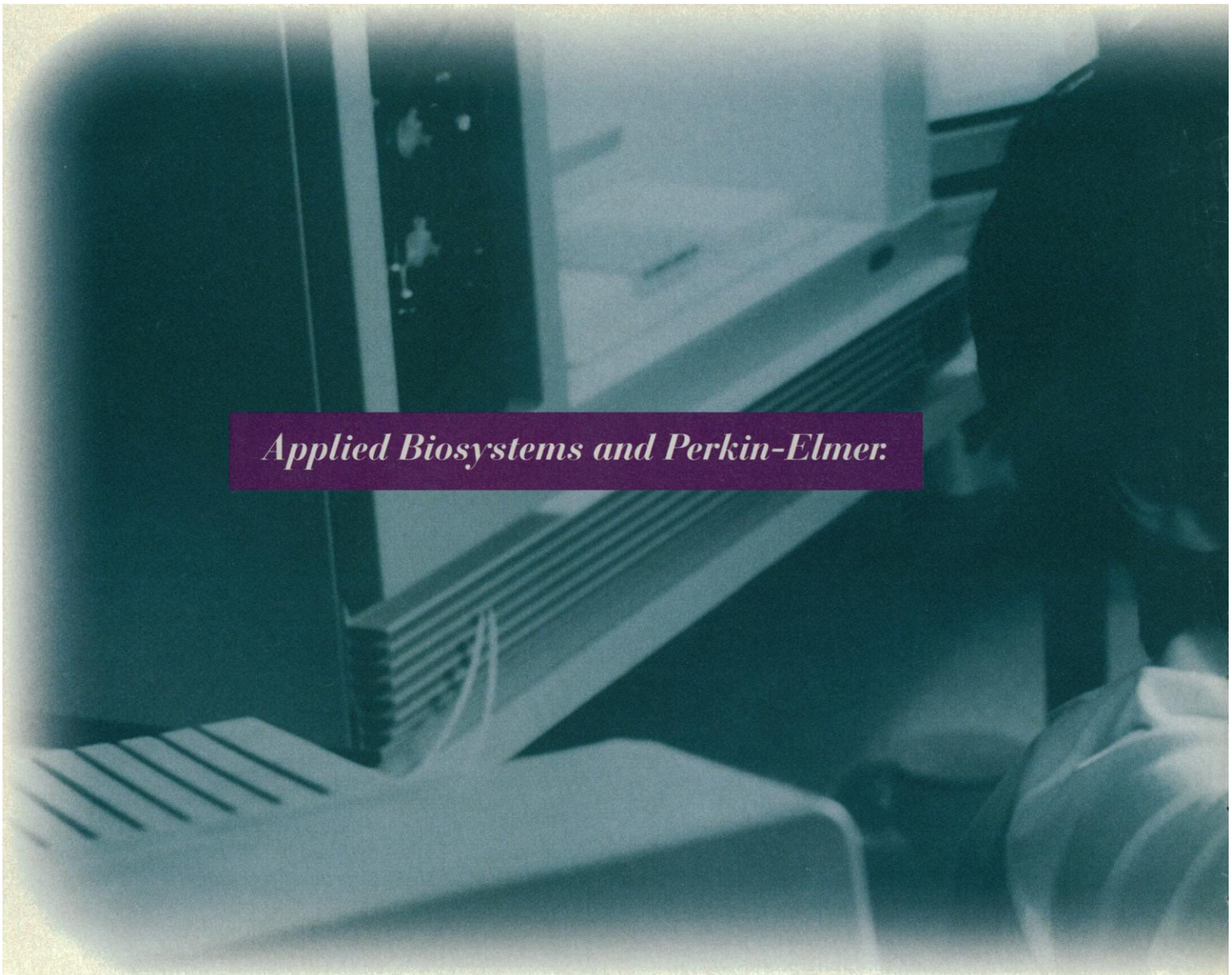
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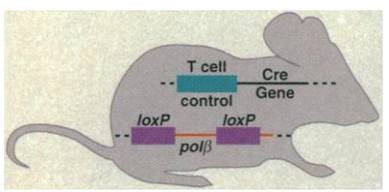
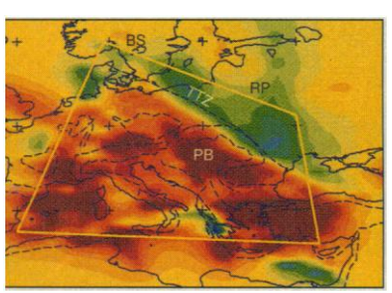


26 & 103
Tissue-specific gene knockout created



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The underside of Europe

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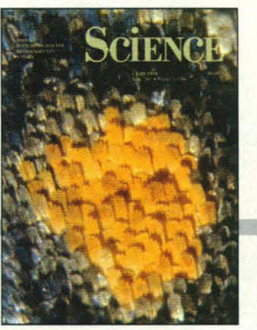
COVER

An eyespot (2 mm across) on a *Precis coenia* (buckeye) butterfly wing. The size, color, and number of eyespots and other patterns are determined in the developing wing imaginal disc (a field of undifferentiated cells in the caterpillar) several days before the adult pattern appears. Genes involved in insect wing formation are expressed in various patterns in butterflies to create detailed patterns within the butterfly wings. See page 109 and the Perspective on page 44. [Photo: Steve Paddock]



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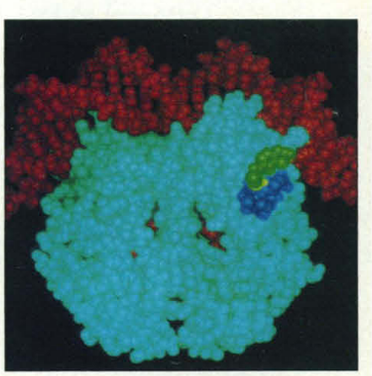
TECHNICAL COMMENTS



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Shining a light on transcription

Indicates accompanying feature

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Bioluminescence from an adult *Drosophila* expressing luciferase fused to an *hsp70* promoter, imaged using an intensified CCD camera. Photo courtesy of Dr. Steve Kay, NSF Center for Biological Timing.

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edited by PHIL SZUROMI

Molecular needles in solid haystacks

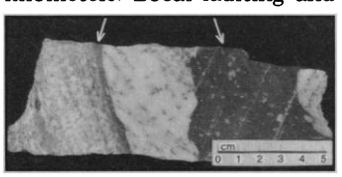
The effect of a molecule's surroundings on its physical properties is almost always studied in the aggregate. Spectroscopy of impurity species, for instance, is usually done on an ensemble of guest molecules and the results represent averages. Recently, optical techniques for probing individual molecules have been developed. Moerner (p. 46) reviews key results in this growing field, including investigations of vibrational mode shifts, spectral diffusion, and single molecule magnetic resonance. One goal is the use of single molecules as data elements in an optical storage medium.

East meets west

Seismic tomography is now allowing a detailed view of the nature of the upper mantle immediately beneath continents that can be used to understand the relation of the underlying mantle to recognized continental tectonic episodes. Zielhuis and Nolet (p. 79) present a tomographic map of the uppermost mantle from stable eastern Europe to western Europe, which has had a complex tectonic history that includes the alpine orogeny. Despite the long tectonic history, the boundary in the mantle between eastern and western Europe is sharp.

Faults and friction

Friction during faulting can cause local melting and form a vein known as a pseudotachylyte. Most pseudotachylytes have been recognized in the cool upper crust where rocks are strong and brittle. Austrheim and Boundy (p. 82) now describe pseudotachylytes in the Bergen arcs of western Norway that apparently formed at 800°C and depths in the crust of about 60 kilometers. Local faulting and



melting may have been related to the phase transition of the rocks to eclogite, which involves a large reduction in volume.

Promoting activator binding to DNA

Enhancement of transcription by multiple gene-specific activators in yeast requires the SWI/SNF protein complex. One current model suggests that the SWI/SNF complex assists transcriptional activators by antagonizing a repression caused by chromatin. Côté *et al.* (p. 53) describe the purification of the SWI/SNF complex and its function. This complex has 10 subunits and shows DNA-stimulated adenosine triphosphatase activity but lacks helicase activity. The binding of derivatives of GAL4 to nucleosomal DNA was stimulated 10- to 30-fold in the presence of the SWI/SNF complex. This binding did not require a functional transcription activation domain. These data support a model in which the SWI/SNF complex functions by promoting transcription activator binding to nucleosomal DNA.

Martian water

The atmosphere of Mars is enriched in deuterium compared to that of the Earth but the planet's interior composition has been assumed to be similar to that of the Earth. Watson *et al.* (p. 86) find, however, that the deuterium to hydrogen abundance ratios in SNC meteorites, which are thought to be fragments of martian rocks, are significantly greater than the terrestrial value. The lack of geological activity on Mars ought to mean that mineral compositions should have essentially primordial values. The authors suggest that the igneous rocks typified by the SNC meteorites were altered in composition by prolonged exposure to water in the martian crust, which like the atmosphere was enriched in deuterium.

Magnetism and carbon

Electronic properties of C_{60} and carbon nanotubes have been revealed by the magnetic susceptibility measurements. Ramirez *et al.* (p. 84) found that near the molecular ordering-disordering transition for C_{60} at 259 K, a jump in the susceptibility occurs that may correspond to changes in lattice forces. The susceptibility of the nanotubes is much greater than that of other forms of carbon on a per atom basis and implies a graphite-like band structure.

Magnetism and bees

Bee behavior is influenced by external magnetic fields. Hsu and Li (p. 95) used electron diffraction to show that the iron-containing particles in the tropocytes of honeybees are superparamagnetic magnetite. Electron microscopy shows that these particles are embedded in a cytoskeletal network, which could possibly relay changes in particle size due to magnetic fields to the nervous system.

Modifying morphology

The relation between evolution and morphological change is a fundamental biological problem. Sommer and Sternberg (p. 114) have related knowledge about the development of the vulva in the free-living nematode *Caenorhabditis elegans* to several other worm species that also have an invariant cell lineage. In contrast to the centrally located vulva in *C. elegans*, the vulva in the three species examined lie in the posterior. Surprisingly, these posterior vulva develop in these species from the same precursor cells that form the vulva in *C. elegans*. Unlike *C. elegans*, posterior induction of the vulva in these other species is independent of contact with the gonad.

Right on target with gene deletion

Gene deletion is a powerful method for exploring genetic function, but the usual method of inactivating genes in embryonic stem cells inactivates the gene in all cell lineages and often results in a phenotype that is lethal to the embryo. Gu *et al.* (p. 103; see news story by Barinaga, p. 26) present a method for inactivating an essential gene, that for DNA polymerase β (*polβ*), in only T cells of adult mice. The site-specific recombinase Cre from bacteriophage P1 induces reciprocal recombination at *loxP* sites; flanking a gene with *loxP* sites targets it for deletion. Expression of *cre* was controlled by a promoter that is active only during certain stages of T cell differentiation. About 40 percent of the $CD4^+CD8^+$ cells in the mice were homozygous for the *polβ* deletion; the authors suggest ways in which this efficiency could be improved.

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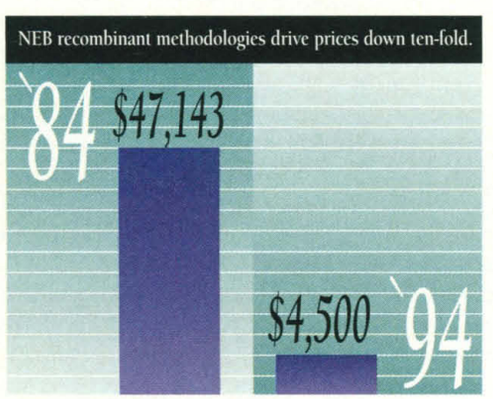

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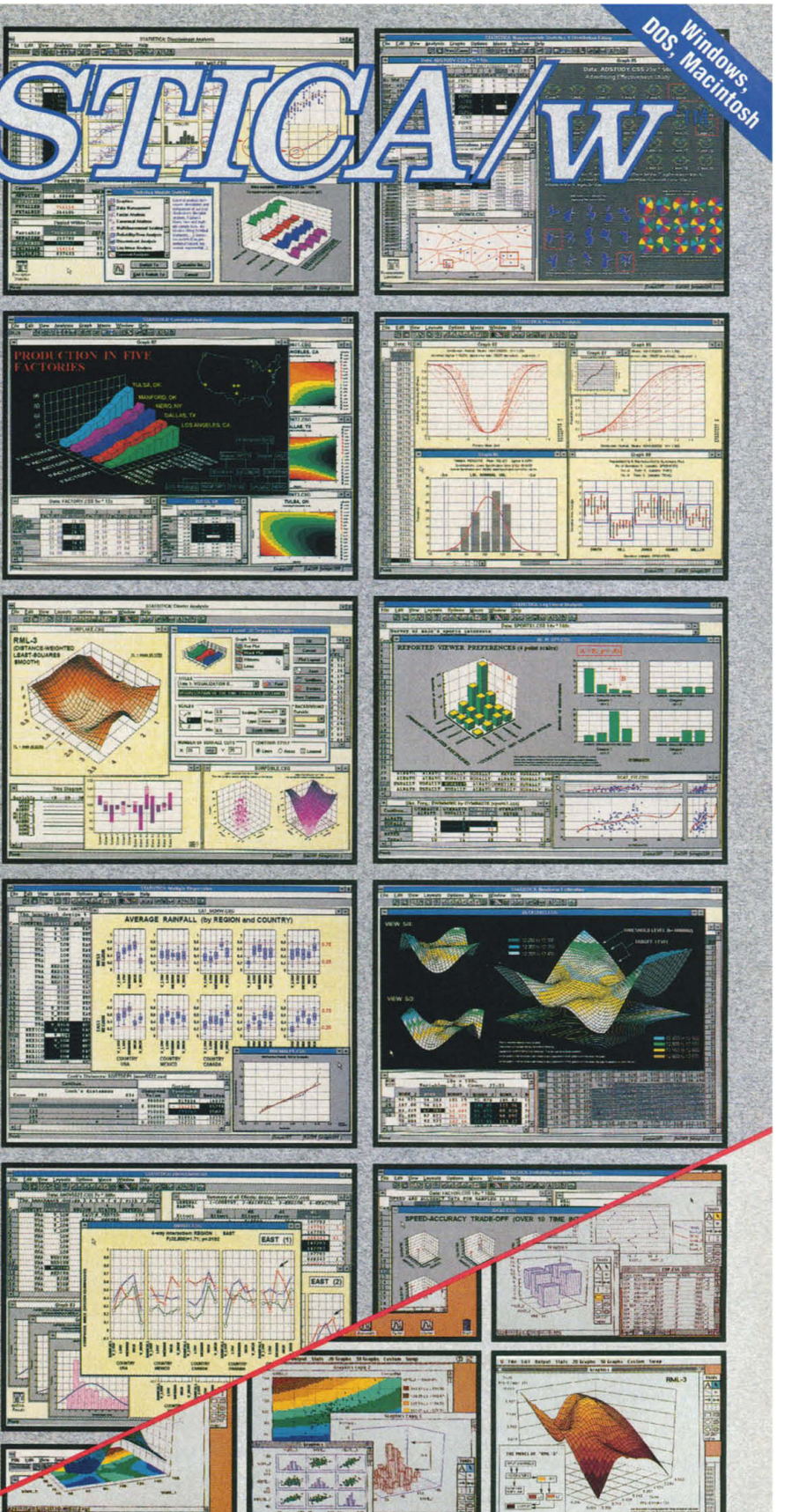

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GRAINCOLLECTION
HUMANS' NATURAL ECOLOGICAL NICHE

SERGIO TREVIÑO
Translated by:
Rebeca San Martín-Feeney

The logically harmonious thesis contained in this work will revolutionize our current way of thinking about human origins and behavior.

Ernst Mayr, Professor of Zoology, Emeritus, at Harvard University, considered by many to be the greatest evolutionist of the century, has written to the author:

> "...I am rather inclined to accept your thesis of the role of graincollecting in the history of mankind, persuaded by your arguments and those of others.
> Thank you very much for your interesting and closely argued book!"

How did bipedalism, the loss of body hair, and tool use originate? After more than 130 years of scientific research, the origin of these basic human characteristics is still unknown. Bipedalism, the loss of body hair, and tool use originated 14 million years ago, when our very distant ancestors, *Ramapithecus,* turned graincollectors. Erroneously, we still equate biological evolution with "progress", and therefore, believe humans descend from knuckle-walking, hairy, unskilled tool users who resembled the living great apes, when, in fact these apes descend from bipedal, naked, skilled tool users, who resemble modern man.

The large intestine, humans' largest internal organ, is presently used only to absorb water and electrolytes, although its sacculated nature indicates an evolutionary adaptation to digest cellulose. This intestine's movements are so slow that the first radiologist to observe it said it presented a picture of still life. Much of this inactivity can be attributed to mankind's omnivorous diet. Nonetheless, it follows that, when following an **exclusively** granivorous, cellulose-digesting diet, our large intestine proves to be much more useful and efficient, since our ancestors up to 50 thousand years ago **always** used it to digest cellulose fiber. We are presently neglecting a very useful capability that our ancestors adaptively acquired. Humans, as **all** other primates, were meant to be vegetarian cellulose-digesters and have slim bodies. The size of the human mouth is small for almost any type of omnivorous feeding, making this feature, as well as our powerful teeth, characteristic more of seed-eaters than of carnivorous or omnivorous mammals.

It is inconceivable to think that hominids and their protohominid ancestors lived in the savannas for millions of years and never developed the practice of feeding from gramineous seeds until the discovery of agriculture, or until fire was used to cook food. If we take into consideration that early hominids were already **bipeds and tool users,** and **the seeds from grasses would lightly touch their hands as they walked in the long-grass grasslands,** it would be illogical to assume that, in spite of the many vicissitudes they suffered during so many million years of living in the savannas, they never tried to feed from these seeds or that they never thought of removing the seeds with their hands. The author argues that when injuring themselves by removing the seeds, they used a **natural** small stone tool to protect their hands, which achieved an unanticipated advantage: they improved their efficiency in removing and threshing seeds.

We invite you to read this book and explore in it the scientific bases of these arguments, upholding the importance of the role of graincollecting in human evolution and behavior.

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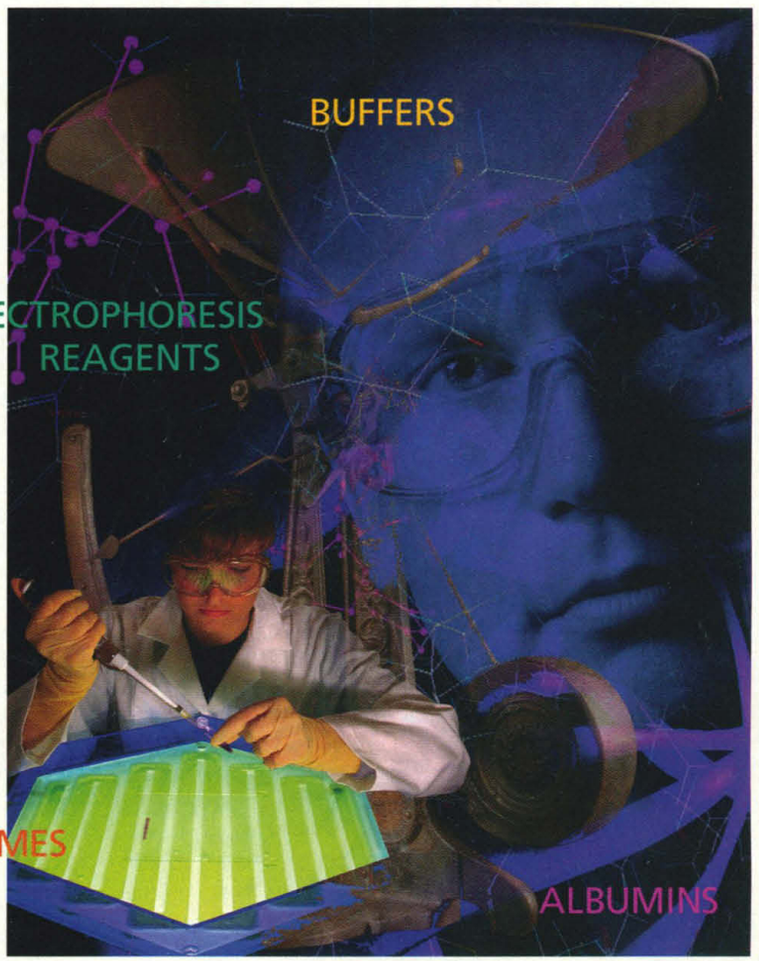

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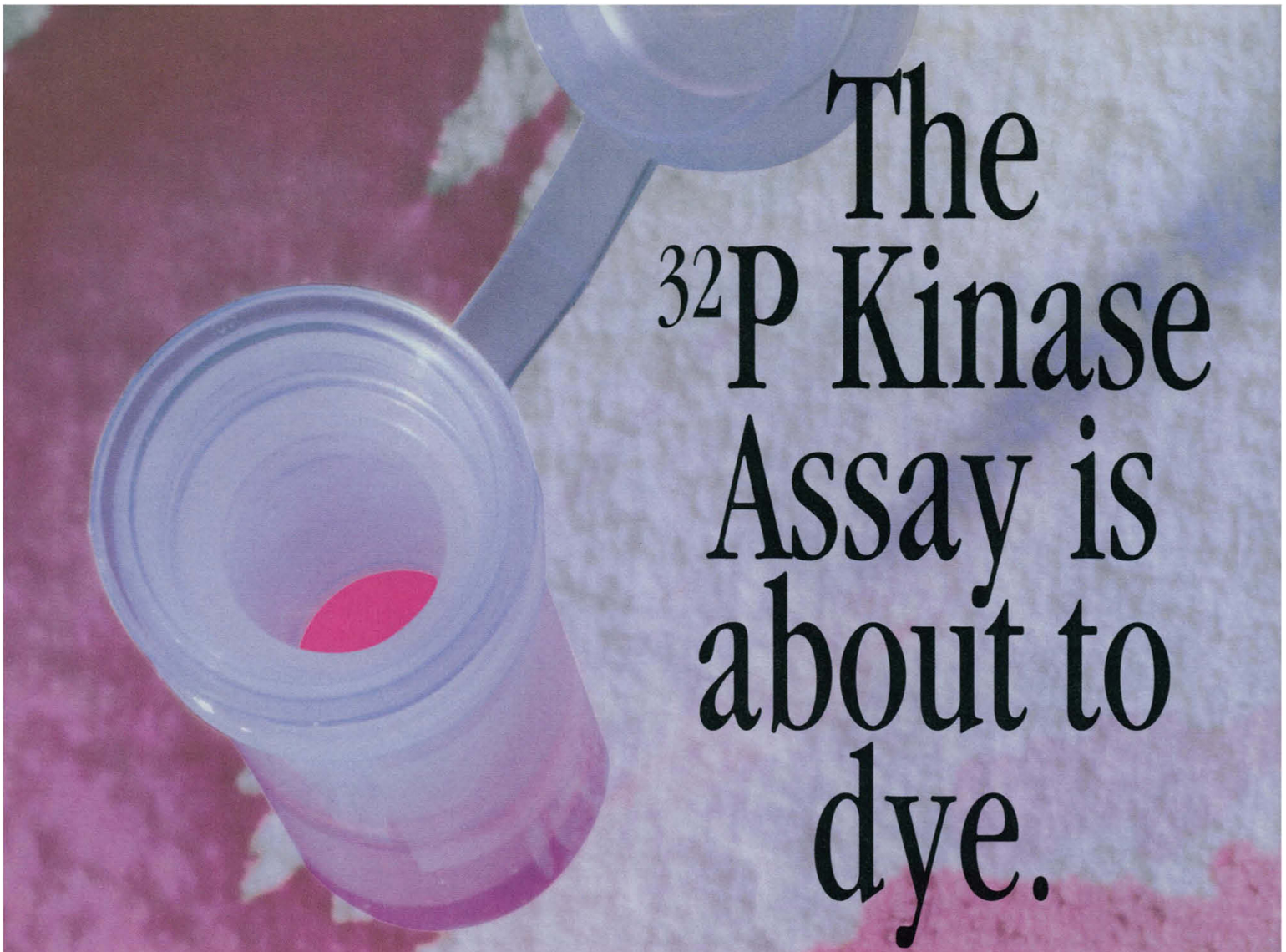

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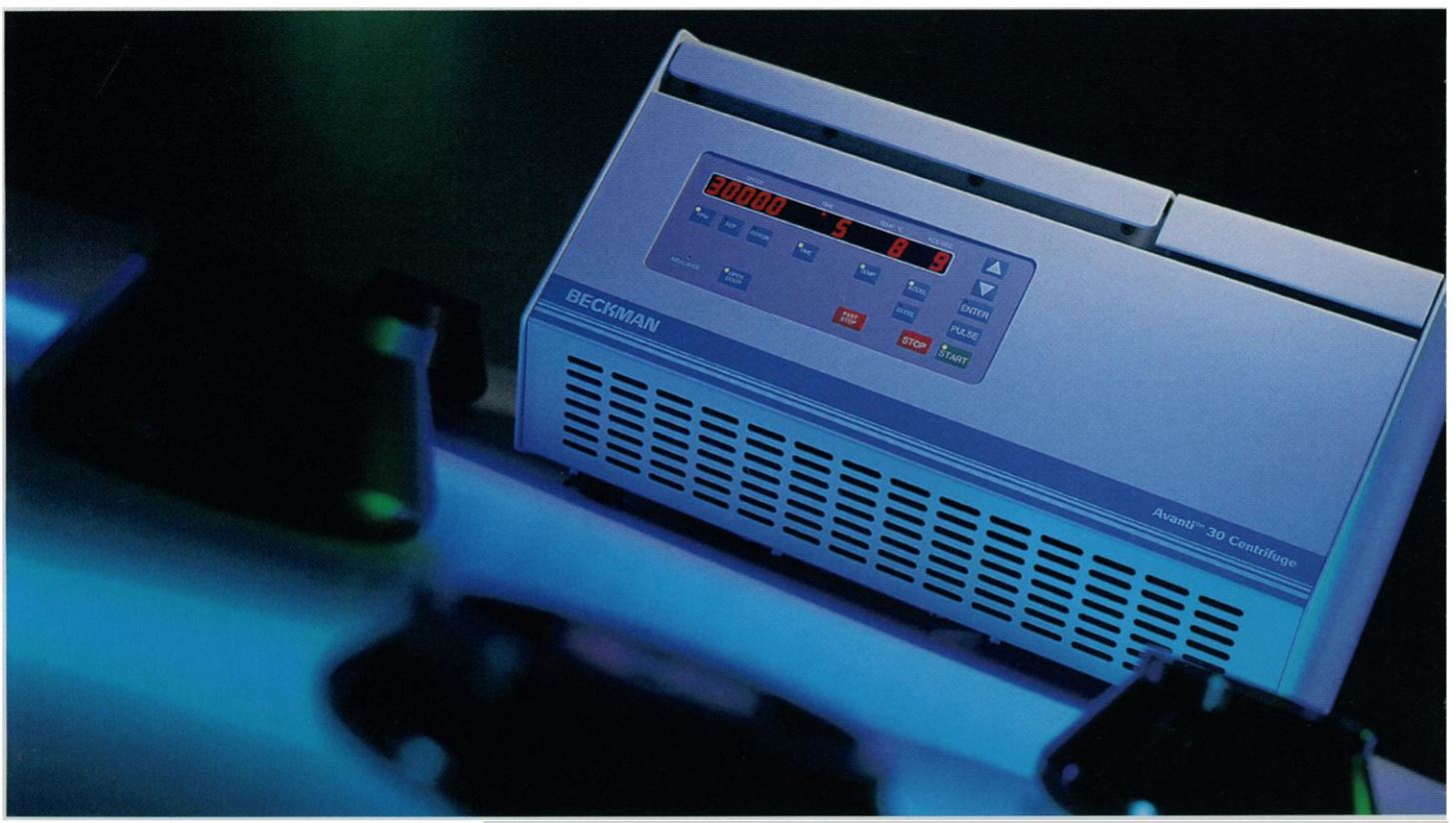

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Highly Sensitive and Specific Determination via PCR: Capable to detect at least five Mycoplasmas from one CFU (*colony forming unit*). A primary PCR is performed with primers hybridizing to the ribosomal genes. A secondary PCR is performed using a specific primer that detects the well conserved Mycoplasma spacer region. This nested PCR is the key to the high specificity and sensitivity of this methodology.

Wide Spectrum Detection of Mycoplasmas: Eliminates detection failure in general by amplifying at least 12 species that include those frequently and mainly found in cell culture. They are 11 *Mycoplasmas* and 1 *Ureaplasma*:
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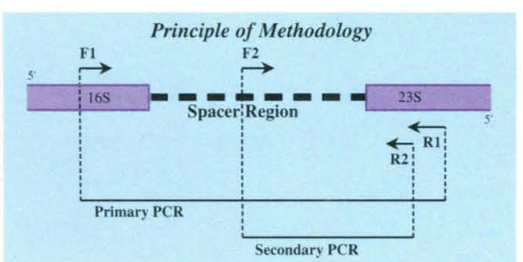
Synchro-Monitoring in PCR Amplification: Verifies and assures PCR performance. A positive control provided in the Set is a template that can be easily distinguished because it has a much longer spacer sequence than those of ordinary contaminants.



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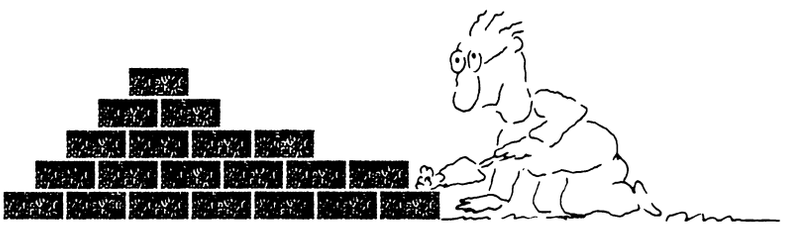

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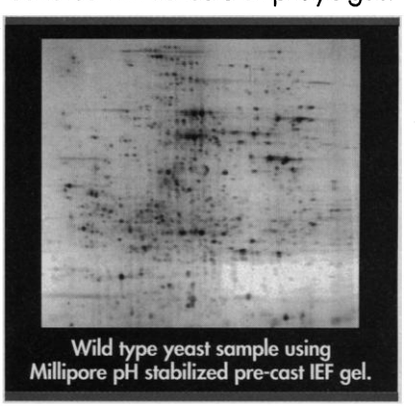

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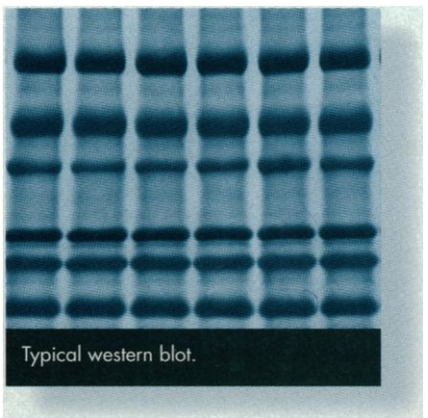
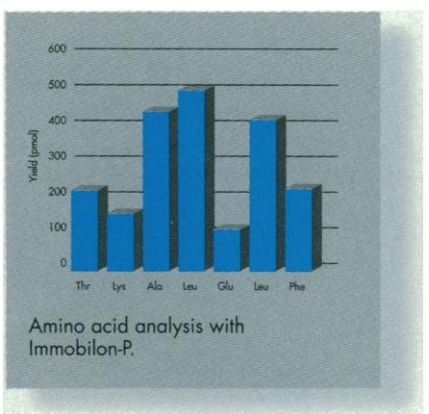
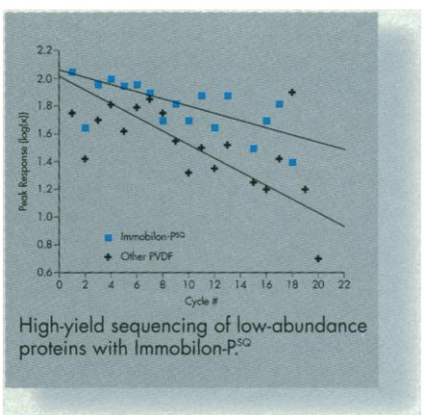


Typical western blot.

Information.



Amino acid analysis with Immobilon-P.



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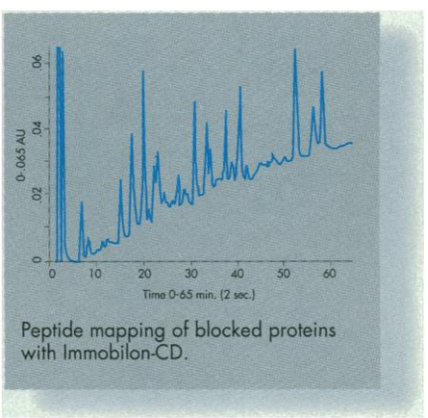

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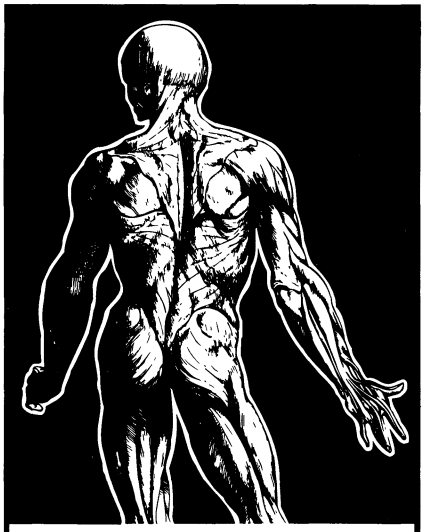

HUMAN GENOME 1994

THE GENES AND BEYOND

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OCTOBER 2–5, 1994

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CONFERENCE AGENDA

SUNDAY, OCTOBER 2

Welcoming Reception

MONDAY, OCTOBER 3

Plenary Session I: Genome Analysis – The New Frontier

"Human Gene Identification by Positional Cloning"
Dr. Francis Collins, National Center for Human Genome Research

"Genetic Basis of Human Colorectal Cancer"
Dr. Bert Vogelstein, Johns Hopkins Oncology Center

"Mapping Genes and Genomes: Genetic Dissection of Complex Traits"
Dr. Eric Lander, Whitehead Institute/ MIT

"Human Genome Diversity"
Dr. Mary Claire King, University of California, School of Public Health

"Manipulating Cancer Genes in the Mouse"
Dr. Harold Varmus, National Institutes of Health

"Intellectual Property: DNA and its Offspring"
Dr. Kate Murashige, Morrison & Foerster

"Presymptomatic Diagnosis of Self and Progeny"
Dr. C. Thomas Caskey, HUGO

Concurrent Sessions

M1 *"New Methods of DNA-Based Diagnosis"*
Dr. Stephen P.A. Fodor, Affymetrix, Inc.

M2 *"Human Gene Identification"*
Dr. Kay E. Davies, Institute of Molecular Medicine, University of Oxford

M3 *"Social and Scientific Issues in Genetic Testing"*
Dr. Nancy Wexler, Hereditary Disease Foundation

M4 *"Gene Therapy"*
Dr. Inder M. Verma, The Salk Institute

TUESDAY, OCTOBER 4

Plenary Session II: Development and Signal Transduction

Special Guest: Donna Shalala, U.S. Department of Health and Human Services

"MYOD & Myogenesis"
Dr. Harold Weintraub, Fred Hutchinson Cancer Research Center

"Genome Analysis in the Mouse"
Dr. Shirley M. Tilghman, Princeton University

"Pax: Genes for Mice and Men"
Dr. Peter Gruss, Max Planck Institute of Biophysical Chemistry, Germany

"From an Interferon Clone to the Regulation of Oncogenesis"
Dr. Tadatsugu Taniguchi, Institute for Molecular and Cellular Biology, Osaka University

"C. elegans Genome Project"
Dr. Richard Wilson, Washington University Medical School

"Small GTPases – Switching on Biological Responses"
Dr. Alan Hall, MRC Laboratory for Molecular Cell Biology, U.K.

Concurrent Sessions

T1 *"Gene Targeting"*
Dr. Elizabeth Robertson, Harvard University

T2 *"Sequence to Function"*
Dr. Temple F. Smith, Biomolecular Engineering Research Center, Boston University

T3 *"Education and the Human Genome Project"*
Dr. Paula Gregory, National Center for Human Genome Research, NIH

T4 *"Chromatin Structure and the Regulation of Gene Expression"*
Dr. Gary Felsenfeld, Laboratory of Molecular Biology, NIH

WEDNESDAY, OCTOBER 5

Plenary Session III: Mapping

"Toward the Ultimate Generation of an Integrated Map of the Human Genome"
Dr. Daniel Cohen, C.E.P.H., France

"Application of High Resolution Genetic Maps to Studies of Common Disorders"
Dr. Jeffrey C. Murray, University of Iowa

"Yeast Genome Project"
Dr. André Goffeau, Université Catholique de Louvain, Unité de Biochimie Physiologique

"The Drosophila Genome Project – a Progress Report"
Dr. Gerald M. Rubin, University of California

"Status and Prospects for the Complete Human Genome Sequence"
Dr. Richard A. Gibbs, Baylor College of Medicine

"High Speed DNA Sequencing: Present and Future Technologies"
Dr. Lloyd M. Smith, University of Wisconsin

"Towards a Complete Set of Human Genes"
Dr. J. Craig Venter, The Institute for Genomic Research

Plenary Session IV: Mapping and Applications

"Vertically Integrated Mapping and Sequencing of Human DNA"
Dr. Maynard Olson, University of Washington School of Medicine

"Interpreting Genes and Genomes"
Dr. David J. Lipman, NIH, National Library of Medicine

"Some Applications of a Genome Library"
Dr. Melvin Simon, California Institute of Technology

"Huntington Disease"
Dr. James F. Gusella, Massachusetts General Hospital

"Ancient DNA"
Dr. Svante Pääbo, Zoologisches Institut, Universitat Munchen

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