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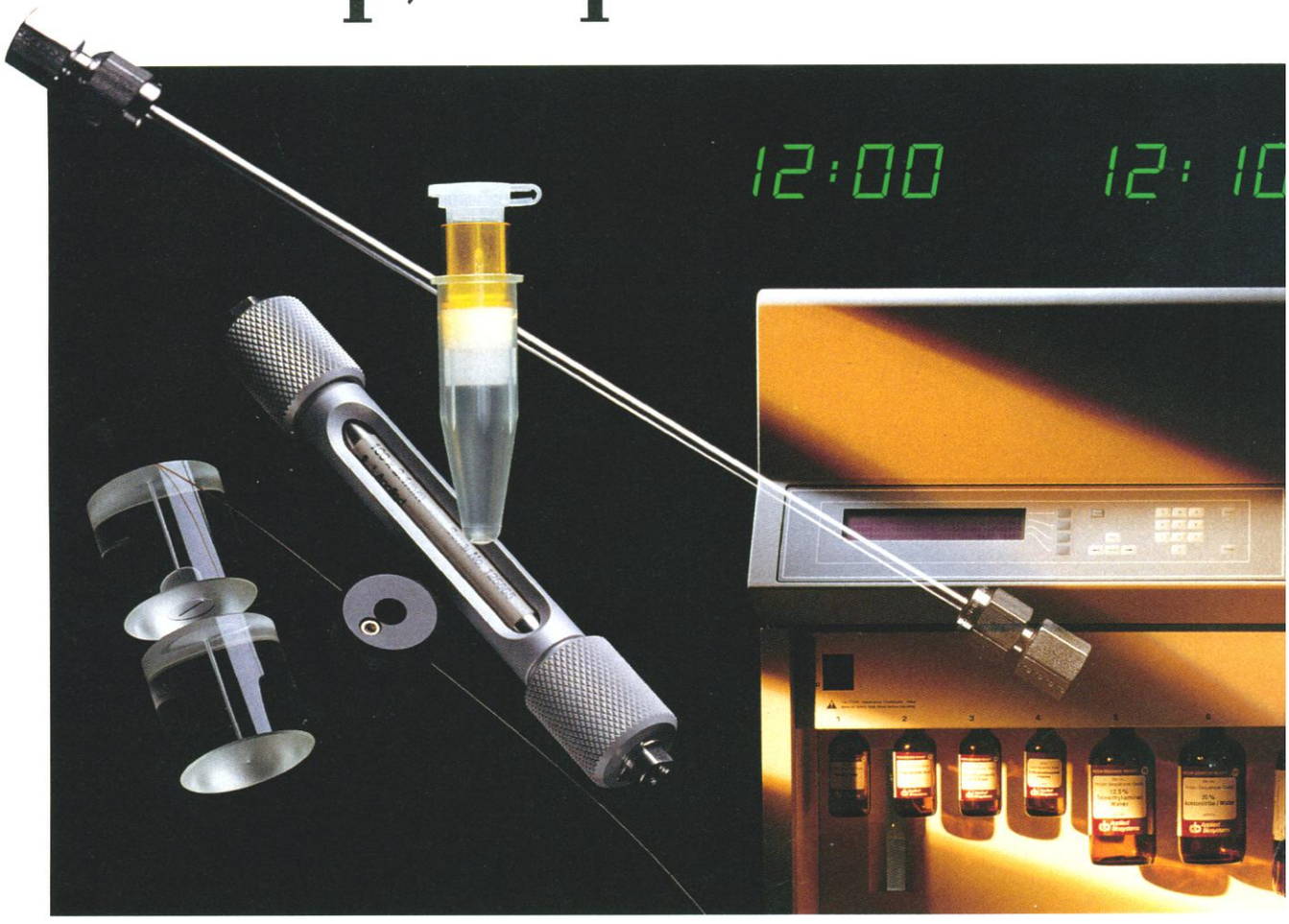

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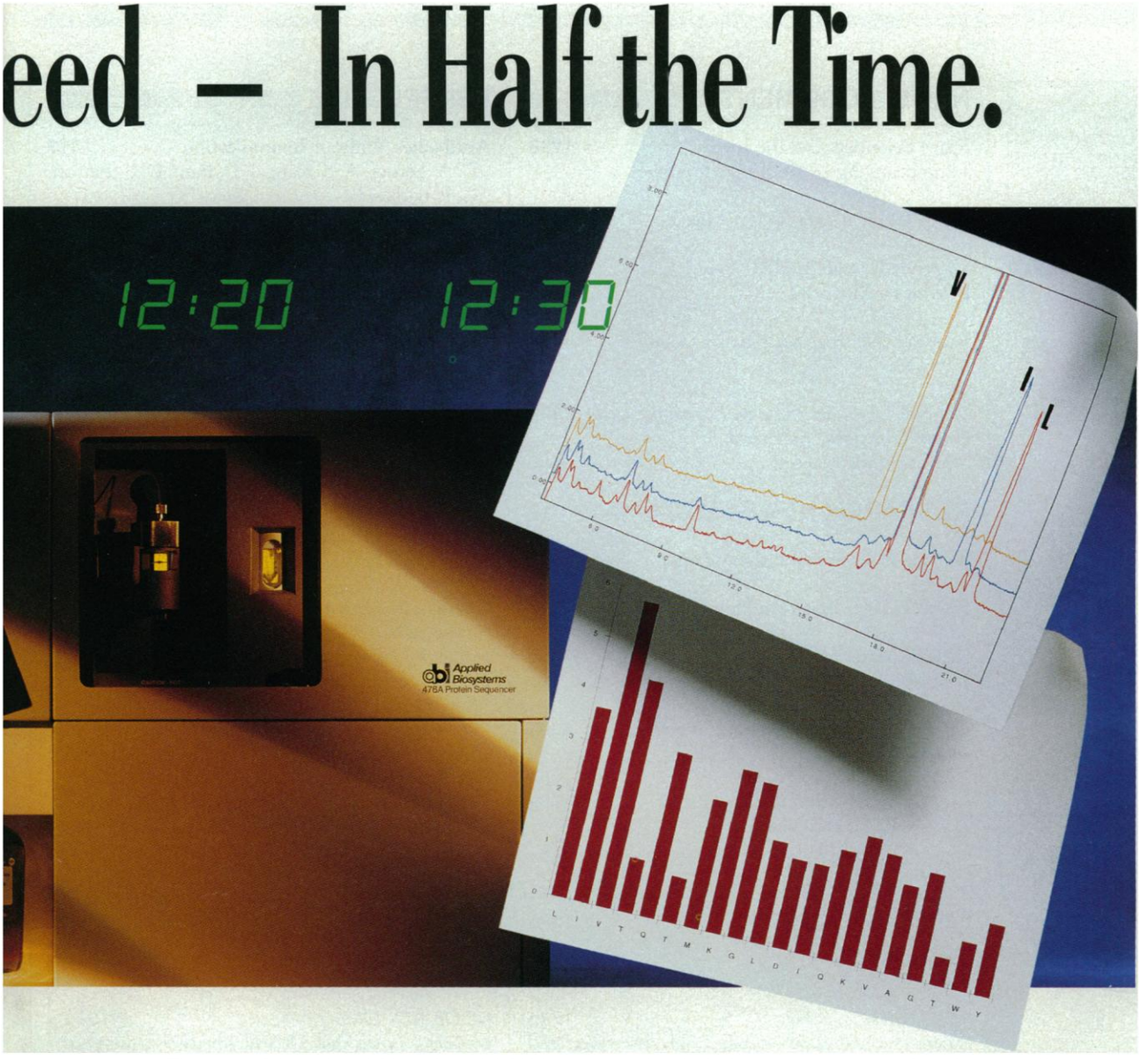

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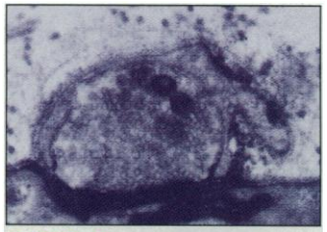


1304
Synapse formation

1350
Auxin-independent growth of plant cells

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVE

ARTICLE

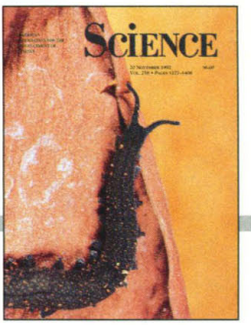
RESEARCH ARTICLE

REPORTS

DEPARTMENTS

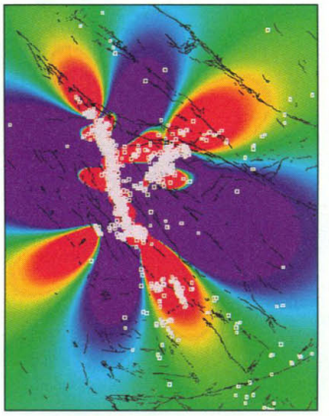
COVER

Onychophorans (velvet worms), such as this undescribed Australian species, are voracious predators in temperate and tropical forests. Although morphological evidence has not resolved their evolutionary relationships, analyses of their 12*S* ribosomal RNA sequences suggest that onychophorans fall within the phylum Arthropoda (invertebrates with segmented legs) and are closely related to spiders and scorpions. See page 1345. [Photograph: R. W. Taylor]



TECHNICAL COMMENTS

1325 & 1328
Effects of Landers earthquake



◩ **Indicates accompanying feature**

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edited by PHIL SZUROMI

Rolling the DICE with climate change

What policy achieves the optimum for reducing emissions of greenhouse gases while minimizing economic impact? Nordhaus (p. 1315) presents a dynamic integrated climate economic (DICE) model designed to evaluated the costs and benefits of the various policy options on economic growth and climate change and the effects of emphasizing continued consumption of fossil fuels, investment in new capital, or forced emission reductions. Evaluation of five approaches suggest that a modest tax designed to encourage reduction of greenhouse gas emission is the optimal approach, whereas rigid emissions controls might have serious economic costs.

■

Bypassing initiation

A synthetic hybrid oligonucleotide that combines a DNA duplex strand with an RNA single strand to form a "bubble structure" can induce transcription by RNA polymerase without proceeding through the formation of the initiation complex. Daube and von Hippel (p. 1320) synthesized a construct with an internal, noncomplementary sequence in the DNA strand that allowed the 3' end of the RNA to hybridize to one of the DNA strands, leaving a noncomplementary 5' RNA tail. When RNA polymerase from *Escherichia coli* or bacteriophage T7 was added to this construct, RNA was synthesized from this primer sequence with high efficiency. Formation of the initiation complex is not necessary to produce a stable and functional elongation complex. Other constructs could be synthesized to systematically explore transcriptional elongation.

Nanoengineered catalyst

Metal catalyst are often dispersed as nanometer-scale particles on oxide supports. The rate or the selectivity of such catalysts can depend on the size of these particles, an effect that may be due to the high ratio of surface area to volume in such small particles. Zuburtikudis and Saltsburg (p. 1337) constructed model catalysts with alternating nanometer-scale layers of nickel and silicon dioxide. By etching grooves into this material, they could expose nickel strips that could be varied in thickness but that have a relatively low ratio of exposed surface to particle volume. A reaction that exhibits a rate maximum as a function of metal particle size, the hydrogenation of ethane, showed a similar maximum in strip thickness on these model catalysts. This result suggests that the origin of size effect does not arise from changes in surface-to-volume ratios or in the number of atoms.

Increasing stress

The Landers earthquake sequence of June 1992, which included a magnitude 7.4 main shock, occurred on several faults just west of a part of the San Andreas fault that has not ruptured in a great earthquake in more than 100 years. Juamé and Sykes (p. 1325) and Stein *et al.* (p. 1328), in independent studies, evaluate the effect that this sequence may have had on stresses on the nearby San Andreas fault. Both studies conclude that the Landers sequence increased stresses on the San Andreas fault near San Bernardino by at most a few bars. Such an increase may be sufficient to hasten the next large earthquake on this part of the San Andreas fault by up to a few decades.

■

Rethinking ozone destruction

Spectroscopic studies of the photodissociation of chlorine nitrate ($ClONO_2$) by Minton *et al.* (p. 1342) raise questions about the fate of this reservoir species for active chlorine and nitrogen oxides as well as the main cycle thought to be responsible for the destruction of polar dimerization of the stratospheric ozone. Laser excitation of $ClONO_2$ at both 248 and 193 nanometers gave comparable yields of two sets of products, Cl and NO_3 as well as ClO and NO_2. The latter represent an unreported pathway but one that breaks the weakest bond in the molecule. If analogous reactions occur in the photolysis of the ClO dimer, then the efficiency of the proposed ozone destruction cycle would be reduced.

■

Arthropod analysis

The evolution of the arthropods and the phylogenetic position of the onychophorans (velvet worms) has been much debated. Ballard *et al.* (p. 1345) have used analyses of 12S ribosomal RNA to examine the phylogenetic relations of the onychophorans and the arthropods. Based on these studies they propose that arthropods are monophyletic and include the onychophorans.

■

One way or the other

When grown in rich media, *Escherichia coli* divides so rapidly that several DNA polymerases (DNAPs) must be active to replicate the chromosome. At the same time, RNA polymerases (RNAPs) are transcribing genes but at a much slower rate. French (p. 1362) used electron microscopy to determine how the inevitable collisions between DNAP and RNAP complexes are resolved. An inducible replication origin, ColE1, was inserted either upstream or downstream of *rrnB*, a ribosomal RNA gene. When DNAPs overtook RNAPs moving in the same direction, the RNAPs were displaced without slowing the rate of DNA replication. Head-on collision also dislodged RNAPs but also slowed replication.

■

Vaccine variation

The principal route of the heterosexual transmission of the virus responsible for AIDS (HIV) is through the cervicovaginal mucosa. In previous studies, immunization has protected nonhuman primates from intravenous challenges with the HIV-related virus, SIV, but not from vaginal transmission. Lehner *et al.* (p. 1365) immunized macaques vaginally and orally. This immunization strategy resulted in the production of antibodies to the SIV protein immunogen in the vaginal fluid, genital lymph system, and the blood serum.

■

Poxvirus ploy

Cells infected with myxoma virus, a poxvirus that is highly virulent in adult domesticated rabbits, secrete a 37-kilodalton protein that is a homolog of interferon-γ (IFN-γ) receptor. Upton *et al.* (p. 1373) found that this protein specifically binds rabbit IFN-γ. Inhibition of this cytokine can affect many aspects of the host animal's immune response.

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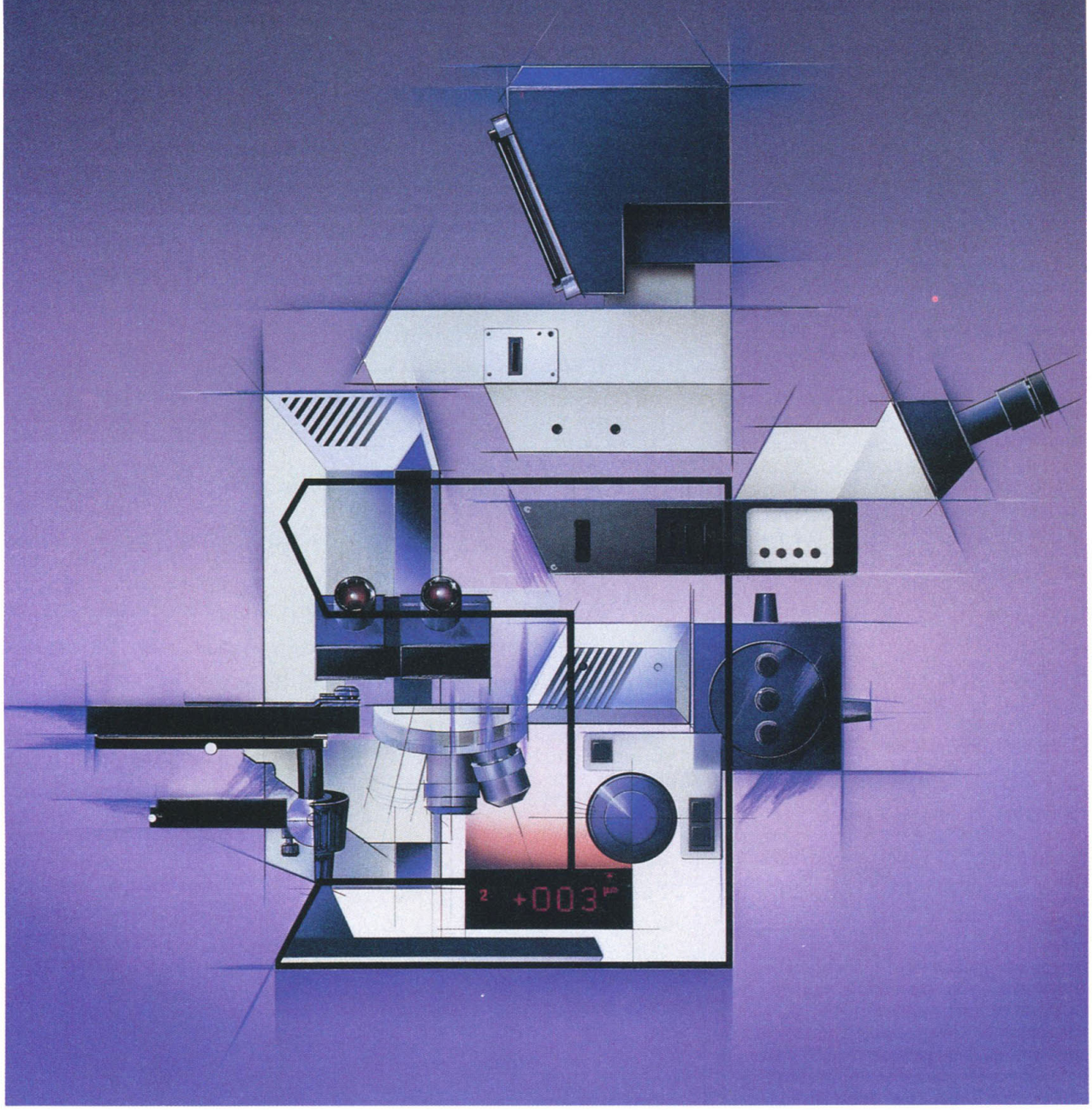

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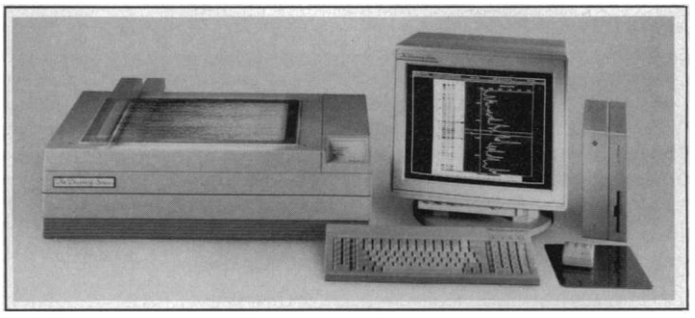

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News & Tips on Microscopy NUMBER 3

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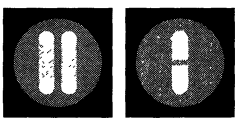
- Wear safety glasses.
- Wear lint-free gloves or use lens tissue when handling the bare bulb.
- Let the burner cool completely before removing the bulb.
- Unplug the power supply.

PROCEDURE

1. Move collector lens away from bulb (knob on lamp housing) or remove lens entirely. Separate socket from lamp housing (retaining screw).
2. Remove copper wire from post (thumb screw) then pull bulb upwards from socket (loosen lug nut at base; special wrench). Remove heat sink (silver cap on bulb; set screw).
3. Reverse steps 1-2 to reinstall new bulb, being careful not to put strain or stress on bulb when tightening fittings. (For 50W HBO burners, make sure flat sealed surface is facing to side.)
4. To align arc, remove an objective, rotate empty space into viewing position and place a white card flat on stage, revealing real and mirror arc images. Focus images using collector lens and align (see diagram) using centering screws on lamp housing.



(L) HBO 50

(R) HBO 100, XBO 75

5. Defocus images to evenly illuminate field; reinstall objective.

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- Never switch high pressure burners on and off quickly.

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TopCount is fast. Counting times are reduced from hours to minutes, without sacrificing accuracy. TopCount's improved throughput has been proven for liquid and solid scintillation applications, as well as filtration and scintillation proximity assays (SPA), and for radionuclides including ^{3}H, ^{125}I, ^{51}Cr, ^{14}C, ^{35}S, and ^{32}P.

TopCount cuts costs. Samples are counted with minimal cocktail or without cocktail at all. Unique solid scintillation LumaPlates™ eliminate the use and disposal of scintillation solvents.

And, best of all, TopCount measures LSC and luminescence samples in the same system. Now you can step into the future with non-isotopic luminescence technology without giving up the proven performance of radioassays.

So why wait? Before you count another vial or open another cocktail bottle, call Packard and ask for TopCount.

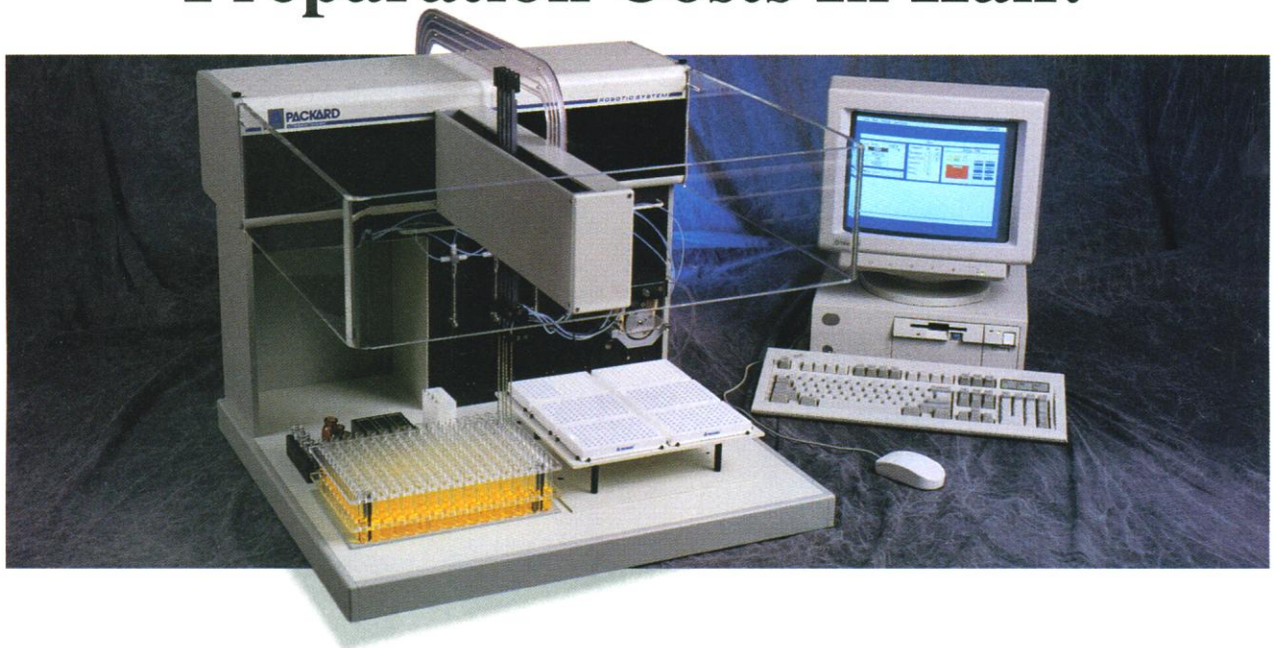
PACKARD
A Canberra Company

Packard Instrument Company, 800 Research Parkway, Meriden, CT 06450 U.S.A.
Tel: 203-238-2351 Toll Free: 1-800-323-1891 TX: 643251 FAX: 203-235-1347

Packard International Offices:
Australia, Victoria 008-335638, Mt Waverley 543-4266; **Austria**, Vienna 43-1-302504-0; **Belgium**, Brussels 32-2-4668210; **Canada**, Ontario 1-800-387-9559; **Denmark**, Greve 45-42909023; **France**, Rungis (33) 1 46.86.27.75; **Germany**, Frankfurt (49-69) 663010; **Italy**, Milano (02) 33910796; **Japan**, Tokyo 81-3-3-866-5850; **Netherlands**, Groningen (050) 413360; Tilburg (013) 423900; **Sweden**, Uppsala 46-18 556900; **Switzerland**, Zurich (01) 481 69 44; **United Kingdom**, Pangbourne, Berks (44) 0734 844981.

Circle No. 18 on Readers' Service Card

Packard Cuts Liquid Sample Preparation Costs In Half!



Introducing Packard's MultiPROBE™ - Everything You Need in a Liquid Handling System at a Price You Can Afford.

MultiPROBE - a new robotic multichannel liquid handling system from Packard with features that will make your sample preparation more efficient.

- **Multiple tips** - provide processing speeds of *over 1200 samples per hour*, but at half the cost of high-end, multi-tip systems.
- **Varispan** - a new cost-effective multichannel sample processing technology providing automatic variable spacing between sampling tips. This enables any combination of test tubes, microplates or vials to be processed without reducing throughput. Now you can perform the work of four single tip systems for the price of just one.
- **Efficient sample probe washing** - reduces carry-over with high volume/high throughput washing, in many cases eliminating the cost of disposable tips.
- **Accusense*** - Packard's exclusive liquid level sensing technology, reduces sample volume requirements to less than 50 µl - unmatched by any other system.
- **Easy-to-use software** - simplifies programming of today's applications through a graphical-user interface and simple user prompts. You don't need to be a programming specialist to operate a MultiPROBE.

Efficiency without complexity in a cost-effective package... the new Packard MultiPROBE.

**Patent pending.*

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Circle No. 19 on Readers' Service Card

Gordon Research Conferences – *"Frontiers of Science"*

	Colby-Sawyer College (N) New London, NH	Colby-Sawyer College (S) New London, NH	New Hampton School New Hampton, NH	Kimball Union Academy Meriden, NH	Tilton School Tilton, NH
June 13-18	*Neuroimmunology L. Lampson	*Wound Repair J. Davidson	Nucleic Acids J. Szostak K. Sprague	Second Messengers & Protein Phosphorylation G. Johnson	Proteins K. Dill Y. Patterson
June 20-25	Polyamines G. Luk O. Heby	Mammary Gland Biology H. Farrell	Molecular Energy Transfer D. King J. Stephenson	Atherosclerosis S. Coughlin J. Witztum	Animal Cells & Viruses R. Lamb K. Holmes
June 27-July 2	Catalysis K. Taylor	Molecular and Biochemical Aspects of Parasitism D. McMahon-Pratt	3D Electron Microscopy of Macromolecules T. Baker	Lipid Metabolism G. Garman	Polymer Colloids D. Bassett
July 4-9	Nuclear Chemistry R. Janssens	Origins of Solar Systems J. Wood	Heterocyclic Compounds T. Goodwin	Mechanisms of Toxicity R. M. McClain	Carbohydrates B. Fraser-Reid
July 11-16	Fiber Science J. Spruiell	Applied & Environmental Microbiology C. Cerniglia	Organic Reactions & Processes E. Grabowski	Bones & Teeth J. Heersche	Biocompatibility and Biomaterials J. Brash
July 18-23	Corrosion – Dry J. Smialek	Structural Macromolecules & Assemblies: Collagen S. Adams M. Van De Rest	Natural Products R. Volkman	Enzymes, Coenzymes & Metabolic Pathways P. Cook M-D Tsai	Hydrogen-Metal Systems P. Jena H. Wipf
July 25-30	Genetic Toxicology C. Aaron	Epitaxial Thin Films & Interfaces R. Hull	Statistics in Chemistry & Chemical Engineering R. Hoerl	Molecular and Genetic Basis of Cell Proliferation T. Curren	Nuclear Physics R. McKeown
August 1-6	Medicinal Chemistry D. Triggle	Coatings & Films A. St. Clair	Photosynthesis, Biochemical Aspects of B. Diner	Hormone Action R. Maurer	Epithelial Differentiation and Keratinization J. Rheinwald
August 8-13	X-Ray Physics J. Hastings	Chronobiology W. Schwartz	Analytical Chemistry L. D. Rothman	Elastin R. Senior	Quantitative Structure- Activity Relationships H. Kubinyi
August 15-20	*Predictive Theories in Biological Oceanography P. Jumars	Solid State Studies in Ceramics R. Cannon	Science of Adhesion H. Clearfield	Chemical Oceanography P. Froelich	Inorganic Geochemistry R. Bodnar
August 22-27					

NEW CONFERENCES FOR 1993

*Biorheology of Cell Adhesion
*Calcium Signalling
*Ciliate Molecular Biology
*Impact of Volcanism on Climate
*Matrix Metalloproteinases
*Neuroimmunology
*Neurotrophins
*Predictive Theories in Biological Oceanography
*Wound Repair

The 1994 Winter Gordon Research Conferences will be held January-March in California. Fixed Conference fees have not been established at this time. The detailed program will be published in the October 8, 1993 issue of *Science*.

GENERAL INFORMATION

The Summer Gordon Research Conferences will be held June 13-August 20, 1993 in New Hampshire and June 20-August 27, 1993 in Rhode Island. GORDON RESEARCH CONFERENCES ADMITS SCIENTIFICALLY QUALIFIED CONFEREES OF ANY SEX, RACE, AGE, COLOR AND NATIONAL ORIGIN.

The Chair of each Conference is requested to have a detailed program in our office December 15, 1992, and the entire Summer program with application will be published in the February 19, 1993 issue of *Science*.

Requests for applications to the Summer Conferences, or for additional information should be addressed to: Dr. Alexander M. Cruickshank, Director, Gordon Research Conferences, Gordon Research Center, University of Rhode Island, Kingston, RI 02881-0801. Tel. (401) 783-4011 or (401) 783-3372. FAX No. (401) 783-7644.

EUROPEAN CONFERENCES

SPRING – ITALY

San Miniato, May 2-7
Biodegradable Polymers

Volterra, May 2-7
Biological Structure & Gene Expression

Il Ciocco, Barga, May 9-14
Organic Superconductors

FALL – GERMANY

Schwaebisches Bildungszentrum
Isree, Germany

September 26-October 1
Complex Fluids

October 3-8
Chemotheraphy of Cancer

October 10-15
Photosynthetic CO_2 Fixation and Metabolism

1993 Schedule – New Hampshire & Rhode Island

Proctor Academy Andover, NH	Holderness School Plymouth, NH	Brewster Academy Wolfeboro, NH	Plymouth State College (N) Plymouth, NH	Plymouth State College (S) Plymouth, NH	New England College Henniker, NH	Salve Regina University Newport, RI
Biorganic Chemistry P. Bartlett G. Trainor	Biological Regulatory Mechanisms C. Georgopoulos	Plant Cell & Tissue Culture P. Meliga	Analytical Pyrolysis R. Lehrie Estuarine and Coastal Ocean Circulation M. Bowman	Water & Solute Exchange in the Microvasculature R. Jain	*Biorheology of Cell Adhesion M. Frojmovic	
Developmental Biology E. Wieschaus	Physical Organic Chemistry M. Etter	Liquid Crystals J. Doane	Zeolitic & Layered Materials J. Newsam	Calcium Oxalates H. Horner	*Calcium Signalling D. Gill	Atmospheric Chemistry D. Golden M. Prather
Cell Contact & Adhesion L. Reichardt	Mechanism of Membrane Transport Proteins H. R. Kaback	Condensed Matter Physics D. Cox	Thermosetting High Performance Materials C. Feger	Holography and Optical Signal Processing F. T. S. Yu	Polymers R. Ottenbrite	Molecular Mechanisms of Microbial Adhesion R. Curtiss III E. Rosenberg
Plant Molecular Biology W. Briggs	Bioenergetics R. Gennis	Atomic Physics W. Phillips	Phagocytes C. Nathan	Extrachromosomal Elements: Plasmid and Chromosomal Dynamics J. Broach	Supramolecules & Assemblies J. Trend	Purines, Pyrimidines & Related Substances W. Plunkett
Molecular Membrane Biology I. Mellman	Drug Metabolism J. Parli	Magnetic Resonance M. Conradi	Ion-Containing Polymers D. Schulz	Laser Diagnostics in Combustion K. Smith	*Ciliate Molecular Biology R. Hallberg D. Allis	Organometallic Chemistry H. Turner I. Horvath
Plant & Fungal Cytoskeleton D. Fosket	Muscle: Contractile Proteins J. Sellers	Neural Plasticity M. Kennedy	Mycotoxins & Phycotoxins P. Hart	Methanogensis J. Konisky	Gravitational Effects on Physico-Chemical Systems N. Singh	Elastomers, Networks, and Gells B. Gunesin
Catecholamines M. Zigmond	Free Radical Reactions M. Newcomb	Inorganic Chemistry W. Evans	*Neurotrophins N. Heinrich	Population Biology J. Ruth	*Impact of Volcanism on Climate L. Walter	Organic Photochemistry R. Cadwell
Dynamics of Gas-Surface Interactions H. Metiv	Forested Catchments C. Driscoll	Nonlinear Optics & Lasers D. Anderson	Membranes: Materials and Processes S. Matson J. Anderson	Physical Metallurgy J. Cohen G. Olson		Molecular Genetics D. Cox
Staphylococcal Diseases G. Peters	Chemistry & Physics of Liquids C. Knobler	Metals & Semiconductor Clusters M. Kappes	Red Cells J. Engel	Solar Plasma & MHD Processes J. Finn		Hormonal Carcinogensis S. Sukumar
Dyamics of Simple Systems J. Friar	Fertilization & & Activation of Development L. Jaffe	Molten Salts & Liquid Metals J. Wilkes	*Matrix Metalloproteinases C. Brinckerhoff H. Nagase	Barrier Function of Mammalian Skin G. Flynn		Cancer B. Zetter
						Reactive Polymers, Ion Exchangers and Adsorbents C. Horvath

FIXED CONFERENCE FEES, 1993

FIXED FEES (New Hampshire Sites)

Conferee (double occupancy) $480
($430 if postmarked 3 weeks prior to Conference)
Conferee (single occupancy – IF AVAILABLE) $530
($480 if postmarked 3 weeks prior to Conference)
Non-Resident Conferee (meals, no room) $440
($390 if postmarked 3 weeks prior to Conference)
Guest (double occupancy) $390
($340 if postmarked 3 weeks prior to Conference)
Guest (single occupancy – IF AVAILABLE) $440
($390 if postmarked 3 weeks prior to Conference)

FIXED FEES (Rhode Island Site)*

Conferee (double occupancy) $495
($445 if postmarked 3 weeks prior to Conference)
Conferee (single occupancy – IF AVAILABLE) $545
($495 if postmarked 3 weeks prior to Conference)
Non-Resident Conferee (meals, no room) $440
($390 if postmarked 3 weeks prior to Conference)
Guest (double occupancy) $405
($355 if postmarked 3 weeks prior to Conference)
Guest (single occupancy – IF AVAILABLE) $455
($405 if postmarked 3 weeks prior to Conference)

*All rooms at the Rhode Island site are double with bath.
Children under 12 years of age are not permitted in the meeting rooms, dining rooms, or dormitories or any host sites.

1. Payments of Fixed Fee by Visa and MasterCard are permitted.
2. Full fixed fee will be charged regardless of time conferee attends Conference. Please note fees.
3. Fixed fee cannot be prorated or reduced for anyone (speakers, discussion leaders, conferees).
4. Non-resident conferees are expected to eat all meals in the conference dining room and, therefore, the Fixed Fee for non-resident includes the full meal charge.
5. Refunds – See General Information under cancellations.