A Bright Spark for Your High Transformation Efficiencies

Stratagene’s most popular competent cell lines, XL1-Blue and Sure™ cells*, are now available as electro-competent ready cells.

Why spend time preparing your own cells when the convenience of electro-competent cells from Stratagene is now available. Stratagene’s cells need only be thawed, mixed with DNA and electroporated.

Stratagene’s XL1-Blue and SURE electro-competent cells are subject to stringent quality control standards and consistently produce high efficiency transformation. Stratagene’s electro-competent cells are ideal for cDNA construction and mutagenesis.

XL1-Blue Electro-Competent Cells
0.5 ml: Catalog # 200228

SURE™ Electro-Competent Cells
0.5 ml: Catalog # 200227

Please call Stratagene for information on our full line of products and for the distributor nearest you.

*Patents Pending
Introducing TopCount™ Microplate Scintillation and Luminescence Counter: Eliminates LS cocktail; counts luminescence, too!

TopCount, a new scintillation counting technology, will revolutionize the way you count radiolabeled samples. Beta and gamma labeled samples are counted in microplates, up to twelve samples at a time, with or without liquid scintillation cocktails.

TopCount is easy. No longer do you have to transfer your samples to vials or test tubes. Coated-well, adherent cell and harvested samples are all counted directly in standard 8 X 12 and 4 X 6 microplates.

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.
New Options In PCR Enzymes From

No matter what your application is, no matter how much PCR enzyme your laboratory requires, Perkin-Elmer can meet your needs. Now available in a selection of formulations and quantities, the AmpliTaq® family of recombinant Taq DNA polymerases offers you the most options for enhanced PCR performance, increased savings and greater convenience. All backed by our PCR Performance Guarantee.

New AmpliTaq® DNA Polymerase, LD is ideal for low copy number amplifications of bacterial targets. A proprietary separation process has been used to reduce background DNA to fewer than ten copies. You’ll find the same performance, the same consistency you expect from recombinant AmpliTaq DNA Polymerase.

AmpliTaq® DNA Polymerase, Stoffel Fragment meets special PCR needs such as amplification of G+C rich templates and multiplex PCR. AmpliTaq DNA Polymerase, Stoffel Fragment features increased thermal stability, optimal activity over a broad range of magnesium ion concentrations and lack of 5'-3' exonuclease activity.
Our Expanding AmpliTaq Family.

AmpliTaq<sup>®</sup> DNA Polymerase for DNA Sequencing is specially formulated for DNA sequencing. It can be purchased separately or as a component of the AmpliTaq<sup>®</sup> Cycle Sequencing Kit for direct sequencing of PCR products and double-stranded DNA or the AmpliTaq<sup>®</sup> Sequencing Kit for sequencing single-stranded DNA.

New savings for AmpliTaq<sup>®</sup> DNA Polymerase, the most published PCR enzyme and the enzyme of choice for most applications, including emerging techniques such as in situ PCR. Special quantity multipacks, containing 1000-unit and 250-unit vials, offer significant savings compared to the single 250-unit vial.

New AmpliTaq<sup>®</sup> DNA Polymerase, AS lets you save even more on AmpliTaq DNA Polymerase by specifying ambient shipping and lowering delivery charges. It represents an environmentally sound option.

In the U.S., call PE XPRESS at 1-800-762-4002 to order. Or call 1-800-762-4001 for technical information. Outside the U.S., contact your local Perkin-Elmer sales representative.
Displaying Archaeopteryx in a Late Jurassic gingko tree. Although Archaeopteryx has been envisioned as a cursorial predator, evidence from claw geometry suggests that Archaeopteryx was primarily an arboreal bird and a trunk-climber and does not represent a terrestrial stage in the evolution of avian flight and feathers. See page 790. [Acrylic painting: John P. O'Neill]
Why use a messenger when you can go to the source?

DNA to protein in a single tube... TNT™ Reticulocyte Lysate and TNT™ Wheat Germ Extract Systems

Eukaryotic coupled transcription/translation systems for rapidly producing protein in vitro.

- FAST - No RNA prep time. DNA to autoradiograph in 5-6 hours for TNT Reticulocyte Lysate, and 6-8 hours for TNT Wheat Germ Extract.
- EFFICIENT - Produces 2-6 times the protein of standard reactions.
- RELIABLE - Based on Promega's high quality Reticulocyte Lysates and Wheat Germ Extracts.

...only from Promega.

Reagents and a detailed protocol provided for 30 coupled reactions.

- TNT Reticulocyte Lysate Systems:
  SP6 promoter, Cat.# L4600
  T7 promoter, Cat.# L4610
  T3 promoter, Cat.# L4950

- TNT Wheat Germ Extract Systems:
  SP6 promoter, Cat.# L4130
  T7 promoter, Cat.# L4140
  T3 promoter, Cat.# L4120

Promega Corporation
2800 Woods Hollow Road
Madison, WI 53711-5399 USA
Telephone 608-274-4330
Fax 608-273-9967
Telex 62057092
800-356-9526
Fax 800-356-1970

*Patents pending
TNT is a trademark of Promega Corporation.
©1992 Copyright Promega Corporation. All Rights Reserved.

For more information request your copy of Technical Bulletin 126 and 165.
PCR Primer Selection

...It's Not For Humans

OLIGO® VER. 4.1

Primer Analysis Software selects optimized PCR primer pairs from any DNA/RNA sequence files and establishes optimal PCR experimental conditions in seconds.

By hand, you might invest days designing primers which perform less predictably.

OLIGO's multi-functional searches select PCR primers that are:

- Free of dimer, hairpin, homooligomer and sequence repeat structures
- Unique
- Highly specific
- Cross-compatible
- Within a defined Tm window

OLIGO automatically searches for sequencing primers and hybridization probes. In addition to primer selection, OLIGO calculates:

- Optimal annealing temperature
- PCR product composition
- Tm by nearest neighbor and two other methods
- Extinction coefficients

Whether your platform is PC or Mac, or your files are in GenBank, EMBL or ASCII format, find out why OLIGO is the most powerful primer analysis software program in the world.

Phone or fax us now for a free demo disk, and see why a helping hand from OLIGO makes scientific sense.

"We know that very little of your expertise can be replaced by computer software, but there are some things that OLIGO just does better than humans . . ."
Science, Technology, and National Goals

President Clinton has promised to create more jobs and to improve this country's competitiveness. Various mechanisms are likely to be tried, including efforts to couple the research universities more closely to industry and to establish priorities in federal support of research. Two issues of The Bridge, a publication of the National Academy of Engineering, contain articles bearing on these matters. Some major points from two of the articles are presented below.

Harold T. Shapiro, president of Princeton University, stated that discussion of the impact of universities on economic development has not been distinguished by its care or thoughtfulness. "The debate is...long on wishful thinking regarding the potential impact of new science and technology on economic growth, and short on credible analysis of...factors capable of driving a country to a position of economic leadership." Noting the gap between rich and poor countries, he asked, "Is the material affluence of certain countries due to their nationality, diligence, intelligence, natural abilities in science and technology, and hard work, or some other set of factors?"

Shapiro noted that technical progress has been one of the most potent forces in our history and that science and technology will continue to be of vital importance to the health of our society. A relatively advanced capacity in science and technology may be a necessary but not sufficient condition for productivity and economic leadership. Technological progress in advanced countries depends on many cultural and environmental factors, including public policy, political stability, values and attitudes (the relative prestige of such activities as economic production versus political activities), and attitudes toward risk and openness or resistance to change.

Shapiro stated, "...we have failed...not in science and advanced training but elsewhere in our national life...the critical issue for our country is which of the major elements has been lacking in more recent years and what this portends for the future." Two factors contributing to a decline in U.S. competitiveness that Shapiro did not explicitly mention are increasing inclinations to litigate and to regulate. These have affected the cost and quality of health care and discouraged expenditures for industrial research and development.

Shapiro expressed doubts about the wisdom of transforming the university research function toward a more market-oriented direction. He stated, "What may be required—in certain selected circumstances—is not a new market orientation of university-based research but a restructured set of relationships between a subset of university-based researchers, industry-based researchers, and the government....Finally even if a greater market orientation were thought necessary, it is not clear that there is an appropriate set of market signals for universities to respond to."

Comments by Ralph Gomory, president of the Alfred B. Sloan Foundation, follow. Gomory has had extensive experience in facilitating interactions of basic research, applied research, development, and production. Commenting on setting priorities for scientific work, he stated that the task was difficult only "...if we do not have clear goals. If we don't know where we are going, it is hard to have a sensible discussion about the fastest way to get there." Surveying the current scene, Gomory stated that support of basic research, especially the individual investigator, has been enormously successful and by far the most successful of government's roles. Despite the success, the attractiveness of a scientific career has deteriorated. Gomory noted the current travail that many scientists are enduring at research universities. He suggested, "We could have a goal of being world class in most major scientific fields while at the same time providing a decent life for those who pursue basic research."

Gomory expressed the position that ability to compete globally requires more than science, advanced technology, and innovations. He states, "To date quality, speed, and manufacturing have been the real strength of the competition...We need to set a goal—the goal of contributing to American industrial competitiveness through science and technology. We then need, in close cooperation with industry, to discover what science and technology programs will contribute to giving us competitive industry. We need to work back from the competitiveness goal rather than forward from the latest scientific event."

Philip H. Abelson
Better Cell Separations

Keep cells biologically active with Nycomed Media from GIBCO BRL.

For better cell separations, use Nycomed Density Gradient Media, now exclusively distributed in the Western Hemisphere by GIBCO BRL. Nycomed's separation technology and GIBCO BRL's cell culture expertise form a unique and unequalled partnership for better cell separations.

Nycomed offers exclusive, non-ionic, non-carbohydrate-containing media for cell separations. NYCODENZ® and NYCOPREP™ (liquid, ready-to-use NYCODENZ formulations) are second-generation, non-ionic separation media. NYCODENZ-based media have all the advantages of conventional media, and their lack of carbohydrates (which can bind to cell surface receptors) yields single cells with native-like surface membranes. In addition, NYCOPREP solutions have low endotoxins to reduce mitogenic effects. NYCOPREP solutions are available for the isolation of a variety of cells:

- **NYCOPREP, 1.077, Human** - for the isolation of human mononuclear cells
- **NYCOPREP, 1.077, Animal** - for the isolation of animal mononuclear cells
- **NYCOPREP Mixer, 1.100** - a one-step method for the isolation of human mononuclear cells
- **NYCOPREP, 1.150, Isotonic** - a universal medium for the isolation of cells, similar to Percoll® in applications
- **NYCOPREP, 1.063** - for the isolation of human blood platelets
- **NYCOPREP, 1.068** - for the isolation of human blood monocytes

When it says GIBCO BRL on the bottom of the page, you know the products are top of the line. For more information or to place your order, please call (800) 828-6686.

For laboratory use only. The Satisfaction Guarantee logo and TECH-LINE® are marks of Life Technologies, Inc. NYCODENZ® and NYCOPREP™ are marks of Nycomed Pharma AS. Percoll® is a registered trademark of Pharmacia P-L Biochemicals, Inc.

LIFE TECHNOLOGIES, INC.

Act now! And get a FREE centrifugation textbook with a $500 purchase! Call or send for more details. (a $25 retail value)

GIBCO BRL

Corporate Headquarters
8717 Grovemont Circle
P.O. Box 6009
Gaithersburg, MD 20884-9980 U.S.A.
(301) 840-8000
92-195

U.S.A. Orders
P.O. Box 68
Grand Island, NY 14072-0068 U.S.A.
Facsimile: (800) 331-2286
To order/TECH-LINE®: (800) 828-6686

Canada Orders
Burlington, Ontario L7P 1A1 Canada
To order/TECH-LINE®: (416) 335-2255

Satisfaction Guaranteed.
Gaia in Science

The description of Doug Zook's enthusiastic and competent leadership in "hands-on science" for teachers and students by John Travis ("Reading, writing, arithmetic . . . and microbes?", News & Comment, 20 Nov., p. 1299) is very welcome in this day of "rote memorization" and overuse of the "lecture method." The need to overcome our cultural "microphobia" at all levels is obvious. Peer review that reflected this microbe-hunting attitude even seems to have led Science to reject my article making this same point of respect for microbial metabolic virtuoses and extraordinary sexuality. The paper, "Biodiversity: molecular biological domains, symbiosis and kingdom origins," was published in a recent issue of BioSystems (1). About 400 reprint requests have been received so far. In that article I detailed an appropriate evolutionary classification for the microorganisms—one that escapes the dimwitted "plant versus animal" dichotomy. The article expresses the views of various investigators and educators in support of Zook's statement, "If the earth could speak directly to us, its language would be microbial."

However, Travis misrepresents James E. Lovelock's Gaia theory when he says that I am "best known as a fervent proponent of the controversial Gaia hypothesis, which sees the whole planet as a single organism. . . ." Because no single organism ever supports its growth solely by eating its own waste and entirely cycling the carbon, hydrogen, sulfur, and water so forth needed for its body, I have always clearly maintained that "the Earth is a single live organism" is not the Gaia idea. It is a misstatement that encourages critics and cranks to flourish and prevent the job, begun by Lovelock, of integration of Earth system science data. L. Joseph in his book Gaia: The Growth of an Idea (2) and Phil Shannon in his recent Skeptical Inquirer article "Gaia without mysticism" (3) both make this abundantly clear. A far more accurate short statement of Gaia, discussed in chapter 12 of my recent book (4), is that the surface temperature, chemistry of the reactive gaseous components, the oxidation-reduction state and the acidity-alkalinity of the Earth's atmosphere and surface sediments are actively (homeothermically) maintained by the metabolism, behavior, growth and reproduction of organisms (organized into communities) on its surface. Gaia is not an individual, it is an ecosystem.

When, by letter, I accused Science of misquotation and misrepresentation in Charles Mann's article "Lynn Margulis: Science's unruly Earth mother" (Profile, 19 Apr. 1991, p. 378), neither a retraction nor my complaints were published. Rather, shortly afterward, for the fourth time, a scientific paper, the one referred to above, was rejected. When I complained, editor Daniel E. Koshland, Jr., said mine, like all papers received by Science of course had gone through the standard procedures of peer review. To his credit, Koshland did publish Lovelock's letter of defense of our long-standing collaboration (14 June 1991, p. 1472), as well as write me a personal letter claiming that I was an "interesting, flamboyant, and controversial scientist."

In spite of Travis' misstatement, my "fervent" support centers less on Gaia and much more on symbiosis as a mechanism of evolutionary innovation. Indeed my involvement with Gaia theory derives from my conviction that Lovelock's is entirely the correct approach. As atmospheric chemist, independent scientist, and brilliant inventor, Lovelock deserves strong collaboration with knowledgeable biologists and ecological model-makers aware of the effects of population growth and gas exchange on the Earth's surface, rather than distortions like those of Travis and Mann.

Genuine coverage of the fruitful Gaia concept must be based not on personalities but on recent reviewed work, including Lovelock's paper on a numerical model for biodiversity (5) and the report of the unique American Geophysical Union meeting in 1988 (6).

Lynn Margulis
Biology Department,
Morrill Science Center,
University of Massachusetts,
Amherst, MA 01003

References

Published by the American Association for the Advancement of Science (AAAS), Science serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in Science—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

Advertising and Finance
Associate Publisher: Beth Rosner
Advertising Sales Manager: Susan A. Meredith
Recruitment Advertising Manager: Janis Crowley
Advertising Business Manager: Deborah Rivera-Wienhold
Financial: Julie Eastland, Manager; Andrew Joyce, Analyst
Marketing Manager: Laurie Hallowell
Traffic Manager: Tina Turano
Recruitment: Michele Pearl, Operations Manager; Dan Moran, Traffic Manager; Debbie Cummings, Milie Mufoz-Cumming, Angela Wheeler, Sales
Reprints Manager: Corinne Harris
Permissions Manager: Ariene Ennis
Marketing Associate: Allison Pritchard
Sales Associate: Carol Maddox
Send materials to Science Advertising, 1333 H Street, NW, Washington, DC 20005, or FAX 202-622-0816.

European Recruitment: Anne Marie Vis; +44-223-424-695, FAX +44-223-424-695; Other: For recruitment advertising inquiries contact Science Advertising: 202-326-6555; For product advertising inquiries contact 202-326-6544, FAX 202-682-0816.

Is your graphing program too hard to swallow?

No matter how you slice it, most scientific graphics programs are tough to digest. It's hard to concentrate on your data when you're faced with awkward help screens, confusing menus and cumbersome manuals. That's why GraphPad Software is pleased to offer InPlot, a more palatable choice.

**InPlot: Scientific Graphics.**

This versatile program makes it easy to quickly analyze your raw data and create polished graphs—complete with error bars, log axes and scientific symbols. Curve fitting with nonlinear regression has never been easier. Built-in help screens guide you step-by-step. There are even special features for radiogland binding and RIAs. And InPlot is so easy-to-learn, you can create your first graph in minutes.

**Statistics too.**

GraphPad also offers InStat. Unlike heavy-duty programs designed for statisticians, InStat® is designed for scientists. Even if your knowledge of statistics is a bit rusty, InStat’s clear language makes it easy to calculate t tests, nonparametric tests, one-way ANOVA, chi-square, Fisher’s test, linear regression and needed sample size.

Both programs are backed by an unconditional, 90-day guarantee and free technical support.*

Call (800) 388-4723 today for more information. Because analyzing and graphing data shouldn't cause indigestion.

---

**Big Physics and New Ideas**

In Faye Flam’s article “Big physics provokes a backlash” (News & Comment, 11 Sept., p. 1468), Melvin Schwartz is quoted as saying that large collaborations “suffocate new ideas and discourage initiatives.” I strongly disagree. Such experiments often provide opportunity for new initiatives that would not otherwise be possible in the current federal funding environment.

Innovative ideas are encouraged in the early phase of large experiments. Approval of an experiment by a laboratory or a funding agency is obtained on the basis of a compelling physics problem or class of problems. R&D funding then allows a variety of technological solutions to detector issues to be pursued, with the final choices made on the basis of prototype tests. An excellent example is the recent decision of the Superconducting Super Collider’s (SSC’s) Solenoidal Detector Collaboration (SDC) to choose an innovative solution to the problem of reading data out of a large detector at high speed with low noise, high precision, and a large dynamic range. This is the work of a rather young physicist, as was the competing proposal, which also performed well. In the “old days,” in general, such parallel R&D efforts could not have been carried out.

Large experiments have a long lifetime, and thus it is fair to ask whether such opportunities arise after a detector is built. The answer is a definite yes. Detectors have numerous upgrades in response to new accelerator conditions and new physics opportunities. In addition, new initiatives, for which a separate complete experiment would not be approved because of the cost, can be carried out within the context of an existing detector. An example from Fermilab’s Collider Detector Facility (CDF) is the use of neural network electronics to select B meson decays in a few microseconds. Young physicists proposed this, built the hardware, and are now testing it. An existing detector that was approved for other physics goals thus provided a platform from which new ideas and initiatives were encouraged. Building an entirely new “small” experiment would simply have cost too much and would likely have been rejected as being too risky.

The same opportunity for initiative exists for addressing physics issues. The CDF detector was approved on the basis of its capabilities for studying high mass (top quark, W, Z, supersymmetry, and so on) and high transverse momentum phenomena. However, once the detector was operating, its data could be used by CDF collaborators for whatever problems interested them. For example, a few physicists were interested in searching for new heavy stable particles. With the CDF data sample, they were able to carry out and publish this analysis.
There is another example that has had a major impact on our field. Although the CDF detector was not designed to be a high resolution meson spectrometer, a group of young physicists believed that rare, exclusive, final states in B meson decay, constituting less than 0.1% of B decays, could in fact be reconstructed in CDF, and that this would allow important properties of the B meson to be studied. They were successful and published the results. This convinced a previously skeptical high energy physics community that important studies of the electroweak interaction could be carried out with B decays at hadron colliders.

As mentioned in Flam’s article, Martin Perl’s success in discovering the tau lepton within the context of a large collaboration is an example of the ability of individuals to pursue their own physics interest. However, Flam notes Perl as saying that this was possible because the SPEARexperiment “was designed with one specific goal...” and Burton Richter as saying, “We wanted to look for new phenomena.” The implication is that the large experiments today are different, that they have, instead, single scientific goals. This is not so. The CDF and D0 experiments at Fermilab, the LEP experiments at CERN, as well as the SDC and GEM experiments at the SSC, were not approved for a single physics goal, but rather to search for new phenomena at the highest available energies in pp and e^+e^- collisions.

This is not to say that there are no problem with very large collaborations. There are certainly sociological problems, and great care must be taken so that the young physicists get the credit for their important contributions. But the view that there is no room for new ideas and initiative in large experiments and that the many talented scientists all move in lockstep toward a single goal is simply wrong.

Melvyn J. Shochet
Enrico Fermi Institute,
University of Chicago, Chicago, IL 60637

Flam’s article presents a rather one-sided picture of the dynamics of large collaborations. Perl’s discovery of the tau particle came about exactly because he was embedded in a group which at the time was very large! There is no less room for creativity within the Collider Detector Facility at Fermilab than there was in Mark II. The data stream is enormous, and it has been demonstrated that small groups or even individuals can mine that stream with great creativity.

There is yet another aspect of these collaborations not mentioned by Flam. In the old days that Schwartz describes in the article, a student could work at a small machine with a professor and maybe one or two other students. His exposure would come from presenting a paper at an American Physical Society meeting, perhaps only once. Contrast this with a large collaboration where the work in progress is reported every 2 weeks. When a student or postdoc presents his work, it will be heard by members of maybe 30 of the top institutions in the world. In addition, there are talks, as before, at the high energy physics conferences. Sources of help and criticism are much broader, and the student is exposed to a much greater spectrum of co-workers. Indeed, the best of the students and postdocs from CDF are now moving into tenured spots at top universities, which indicates that their work is well recognized.

I do not agree with Schwartz’s suggestion that we need a new breed of physicist called “detector builders.” In the 1970s, after strong focusing was invented, we first saw a split of this type. There were the accelerator builders, the bubble chamber builders, and a bastard army of graduate students who only knew how to run the TVGP and SQAQ reconstruction programs! Fortunately, the modern collider has closed this gap by entwining the detector and machine so completely that physicists are, once again, working and talking with each other. Students get well-rounded experience and have contact with many different types of experts.

We are entering a new era of physics, and there are problems with the large groups. CDF, with 400 members, is at a size where the democratic process can still function. I think the SSC detector groups will have to evolve new ways of coping with the problem of individual creativity as opposed to the discipline required by a detector that is well integrated and must be maintained for a long period after the original subcomponent builders have moved to other projects or as upgrades. I do not believe it will be an impossible task. The idea that these detectors will be manned by groups of 1000 physicists in “lockstep” with no exposure of their individual contributions is ridiculous! I wonder if Schwartz has ever been able to get even two physicists in lockstep?

Alvin V. Tollestrup
Fermi National Accelerator Laboratory,
Post Office Box 500,
Batavia, IL 60510

Corrections and Clarifications

In the Research News article “Pot, heroin unlock new areas for neuroscience” by Marcia Barinaga (18 Dec., p. 1882), the diagram of the molecule anandamide on page 1883 was incorrect. The correct structure appears on page 1948 of the same issue, in figure 1A of the report “Isolation and structure of a brain constituent that binds to the cannabinoid receptor” by W. A. Devane et al. (p. 1946).
The Densitometer For All Reasons

Densitometry for today's biologist — Get more out of your data.
You need to get more out of your data today than ever before. That's why we designed The Discovery Series™. With it, you can scan gels, films, photographs, DNA sequencing films, blots, petri and microtiter plates. If it can be scanned, our software will analyze it.

Quantitate, read sequence, match patterns, analyze 2-D gels, compare images — Get more out of your data.
Our four software packages give you the tools. Quantity One® quantitates all types of images. DNA Code™ reads DNA sequence. PDQUEST™ is the world standard for 2-D gel analysis, and our new RFLPrint™ sorts 1-D lanes based on similarity.

The hardware matches the software — Get more out of your densitometer.
The Discovery Series™ comes with Sun SPARCStation computers and the DeskTop™ scanning densitometer. Speed, performance and ease of use are built in. Any size images are scanned at 21μm resolution—fast. Then, results are just five minutes away.

Upgrades and Support. — Get more from pdi.
The Discovery Series™ always comes with free software upgrades and support during year one. You can always add more software. Call us today at 800-777-6834 for more information. We'll give you more.
From Test Tube to Test Market—
BIOSIS Helps Ensure Your Project’s Success!

Whether you’re developing a new product or analyzing your competition, be sure you have complete information to make successful research decisions. Search the online databases: BIOSIS Previews® and BioBusiness®!

BIOSIS Previews provides vital references to biological and biomedical research findings, including the discoveries of new therapies and techniques that affect your projects!

BioBusiness monitors business, trade and scientific publications for literature on the commercial applications of life science research. BioBusiness leads you to the latest news on U.S. patents, new products and marketing trends!

Call today for more information! Ask for your free copies of How to Search BIOSIS Previews and How to Search BioBusiness!

1-800-523-4806 (USA except PA)
(215) 587-4800 (worldwide)

Write to BIOSIS, Marketing Department S293TT, 2100 Arch Street, Philadelphia, PA 19103-1399 USA or to the Official Representative or Authorized Distributor in your area. Telex 831739; Fax (215) 587-2016. To contact BIOSIS via the Internet: BIOSIS@A1.RELAY.UPENN.EDU.

BIOSIS Information for Today’s Decisions and Discoveries
BIOSIS is a registered trademark of Biological Abstracts, Inc.

---

OLIGOS

$5.50 per base.

No setup charge!

Machine grade oligos are perfect for sequencing primers and PCR work. Guaranteed to ship in 3 days, most ship in just 2 days.

RPC Purification only $84.00

*Special Pricing for February Only!

1-800-5410-DNA
Lofstrand Labs Limited
7961 Cessna Avenue, Gaithersburg, Maryland 20879
Outside U.S. +1-301-330-0111 fax: 301-948-9214

---

New from AAAS Press!

Two books that are shaking the world of science...with laughter!

Chalk Up Another One
The Best of Sidney Harris
by Sidney Harris

Big Science
by Nick Downes

Only $10.95 each
(AAAS members $8.75)

Mail to: AAAS Books, P.O. Box 753
Department A69, Waldorf, MD 20604
Add $4 shipping per order. If you prefer, order by phone (VISA/MasterCard only) (301) 645-5643 (9am-4pm ET) and ask for AAAS or Fax (301) 843-0159.

American Association for the Advancement of Science
Discover New Research Solutions!

Science Innovation '93
The Conference on New Research Techniques

Hynes Convention Center, Boston  ♦  6–10 August 1993  ♦  Sponsored by AAAS and Science magazine

Technologies from all disciplines that have potential uses for biomedical research...hundreds of new techniques and applications...research tools you can use right now...presentations by Nobel laureates and world-class researchers...exhibits of essential equipment...industry-sponsored workshops...and more!

For complete details (or to submit suggestions for program topics), write: AAAS Meetings, 1333 H St., NW, Washington, DC 20005 USA, or call or fax:

Tel: 202-326-6450  ♦  Fax: 202-289-4021

Yes! I’d like to learn more about Science Innovation '93.
☐ Please send details about the scientific program and poster sessions.
☐ I’m interested in exhibiting. Please send an exhibit prospectus.

Name ____________________________
Institution ________________________
Address ____________________________
City/state/zip _______________________

Mail or fax this coupon to the address at left.
Materials Science from VCH

"Exclusively devoted to the technical and industrial applications of physics"

The 20-volume Encyclopedia of Applied Physics, edited by G. L. Trigg, contains 500 alphabetically arranged, in-depth articles on the most relevant current and future applications of physics.

More technical than a general purpose encyclopedia, this reference work will prove invaluable not only to physicists and engineers, but also to scientists in associated areas.

A major scientific undertaking, the Encyclopedia of Applied Physics is sponsored by the physical societies of various countries, e.g., the American Institute of Physics.

Coverage ranges from general devices and laboratory methods through condensed matter physics to aeronautics and space physics.

Cumulated subject indexes are published after every three volumes. The series can only be purchased as a complete set.

"Meeting the varying needs of the sensor community"

Sensors are a key element in the rapidly evolving field of measurement and instrumentation.

Each of the 8 volumes of the series Sensors - A Comprehensive Survey consists of three parts: specific physical and technological fundamentals and relevant measuring parameters; types of sensors and their technologies; and the most important applications with a discussion of emerging trends.

The volumes concentrate on Fundamentals (Vol. 1), Chemical & Biochemical Sensors (Vols. 2/3), and Thermal (Vol. 4), Magnetic (Vol. 5), Optical (Vol. 6), and Mechanical (Vol. 7) Sensors with a cumulative index (Vol. 8).

Series editors are W. Göpel, J. Hesse, and J.N. Zemel, and the volume editors and authors are internationally renowned experts.

The series can be purchased as a complete set or by volume.

"Sure to establish itself as a seminal work."

The phenomenal turnout of new products in all industries, from conventional to high-tech, owes its success largely to intensified efforts in materials research and development. The 18-volume series Materials Science and Technology - A Comprehensive Treatment is an in-depth, topic-oriented reference work created specifically to further these efforts.

The series covers the most important classes of materials: metals, ceramics, glasses, polymers, semiconductors, and composites.

Each volume deals with properties, processing, applications, or general phenomena associated with the above-mentioned materials.

Edited by R.W. Cahn, P. Haasen, and E.J. Kramer, the series began publication in 1990 and is proceeding at a rate of four to five volumes per year, each volume containing 10 to 20 contributions and averaging 500 pages. The series can be purchased as a complete set or by volumes.

ORDER FORM

Please send me a comprehensive prospectus on the series

- Encyclopedia of Applied Physics
- Sensors
- Materials Science and Technology

Name: ____________________________
Address: _________________________

VCH, Attn. Sabine Bischoff,
P. O. Box 101161, D-6940 Weinheim (FRG and all other countries)  
Fax: 0049 - 6201 - 60 6328

VCH, Hardstrasse 10,
CH-4020 Basel (Switzerland)  
Fax: 0041 - 61 - 271 06 18

VCH, 220 East 23rd Street, New York, NY 10010-4606 (USA and Canada)  
Fax: 001 - 212 - 481 - 0897

VCH, 8 Wellington Court, Cambridge CB1 1HZ (UK)  
Fax: 0044 - 223 - 313321

Circle No. 28 on Readers' Service Card
Bio-Rad: The Evolution of Gene Transfer

Earlier methods of Gene Transfer

Electroporation

Particle Delivery

1991 Bio-Rad introduces DuPont's Biolistic* PDS-1000/He particle delivery system to the world market for plant and animal applications.

Particle delivery system expands to accommodate live animal work including gene therapy and genetic immunization.*

1986 The Gene Pulser* system brings affordable electroporation to biochemists and molecular biologists.

1987 Bacterial electroporation efficiencies increased dramatically with the introduction of the Pulse Controller and 0.2 cm cuvettes.

1988 Bio-Rad pioneers 10* transformants/AU. E.coli protocol optimized.

1989 Bio-Rad guarantees high efficiencies with the introduction of convenient Electro-Competent* cells.

1990 Prokaryotic applications and efficiencies boosted by new 0.1 cm cuvettes.

1991 Bio-Rad introduces the E. coli Pulser* unit—the first dedicated pulser for efficient, economical library construction.

1993 Particle delivery system expands to accommodate live animal work including gene therapy and genetic immunization.*

At Bio-Rad we don't have a gene transfer instrument—we have a gene transfer program. One that Bio-Rad has pioneered, researched, and provided to the life science community. Plant and animal cells, bacteria, other cells: Bio-Rad not only gives you the tools to efficiently transform them, but also supports you throughout your research with unparalleled support, free telephone consultation, and unlimited access to published protocols and yet unpublished data. We have been dedicated to gene transfer since 1986, and we will continue to further your success with high quality electroporation and particle delivery products. Call 1-800-4BIORAD today to discuss your particular gene transfer needs.


Bio-Rad Laboratories, Inc.

Circle No. 11 on Readers' Service Card
A little of your precious sample goes a long way in our osmometer

Many times when you need to measure osmolality you may have only a limited amount of hard-to-come-by sample available. No problem if you're using the Wescor Vapor Pressure Osmometer. It routinely processes samples of only 10 μL and measures them with 1% accuracy. And it can be calibrated for samples as small as 2 μL.

Extremely simple to use and highly reliable, the Wescor VPO has another key advantage over the older freezing point osmometers. It accepts any biological sample including highly viscous solutions and tissue specimens.

The Wescor VPO has proven to be the ideal instrument for measuring osmolality in all areas of biological research. It's widely used in marine biology, tissue culture, soil and plant physiology, and laboratory animal studies. And you'll find it used for Q.C. work in the food, pharmaceutical, beverage, and ophthalmology industries.

Contact us for more details or to arrange a demonstration. Wescor, Inc. 459 South Main Street, Logan, UT 84321 USA. FAX 801-752-4127. Phone 1-800-453-2725.

Circle No. 16 on Readers' Service Card

INTRODUCING THE FPM-I™ FROM JOLLEY CONSULTING AND RESEARCH, INC.

- High Precision
- High Sensitivity
- Rapid Measurement (5 Seconds)
- Uses Disposable 12 x 75mm Test Tubes
- Four Static Modes of Measurement
- Four Kinetic Modes of Measurement
- User Programmable Protocols
- Hard Copy and RS232 Output

For further details call, fax or write to Jolley Consulting and Research, Inc.

34469 N Circle Dr., Round Lake, IL 60073
(708) 548-2026 • U.S. & Canada 1-800-685-0401 • Fax (708) 548-2025

Quixell — a revolutionary new system for the automated selection and transfer of single cells...

one cell at a time.

Selected cell being drawn into Quixell's glass micropipette. All other cells remain undisturbed.

Stoelting Co. 620 Wheat Lane Wood Dale, IL 60191 USA (708) 860-9700

Circle No. 1 on Readers' Service Card Circle No. 13 on Readers' Service Card
Introducing alamarBlue™

The new cell growth and cytotoxicity indicator dye that makes MTT obsolete. Use alamarBlue instead of MTT, XTT, ³H Thymidine, or Neutral Red.

- Water soluble — No extraction step required
- Nontoxic to cells — No metabolic interference
- Nontoxic to user — Noncarcinogenic
- Nontoxic to the environment — No organic waste disposal problems
- Stable in culture — Allows continuous monitoring of cells
- Flexible — Use any microplate spectrophotometer or fluorometer

Read your results on alamar's READar™, a microplate fluorometer designed for fast, precise, and cost effective data gathering.

alar

4110 N. Freeway Blvd.
Sacramento, CA 95834-1219
(916) 567-3475
Fax (916) 567-3887

New from alamar - Good things from out of the blue

Circle No. 25 on Readers' Service Card
THE NEXT STEP IN FILMLESS AUTORADIOGRAPHY.

A SMALLER PHOSPHORIMAGER.

FOR SMALLER BUDGETS.

Now get all the advantages of Molecular Dynamics' proven storage phosphor technology for less than ever before. The PhosphorImager SF is a smaller-format version of the PhosphorImager 425. It's perfect for autoradiography and analysis of samples up to 20 cm x 25 cm, such as Southern and northern blots, immunoblots, protein or nucleic acid gels, and TLC plates.

But there's nothing small about its performance. Like the large-format PhosphorImager 425, the PhosphorImager SF reduces exposure times by a factor of 10-100. Its large dynamic range allows you to image both weak and strong signals with a single exposure.

The PhosphorImager SF is also economical and easy to use. You don't need -70° freezers, darkrooms, or film processing chemicals. Plus, storage phosphor screens can be erased and re-used indefinitely.

For analysis, the compact PhosphorImager SF includes Molecular Dynamics' powerful ImageQuant software.

High-density gene mapping hybridizations such as this 4 x 4 x 8 x 12 array can be imaged on the PhosphorImager SF. Courtesy of Dr. G. Lennon, Human Genome Center.

ImageQuant allows you to quantify images directly – and without scintillation counting. Files are formatted for easy transfer to your favorite PC and Macintosh programs. Built-in Ethernet capability lets you send data and images to other computers.

So, if you've been waiting for a PhosphorImager that fits your budget, size up the PhosphorImager SF. Call today for a free copy of our new PhosphorImager brochure.

In the U.S., call 1-800-788-0634.
In Europe, call +44 732 62565.
In Australia, call (03)810-9572.

Molecular Dynamics, 880 East Arques Ave., Sunnyvale, CA 94086 Ph: 408-773-1222 Fax: 408-773-8343

©1993, Molecular Dynamics. All company and/or product names are trademarks of their respective companies.

Circle No. 18 on Readers' Service Card
AAAS-Newcomb Cleveland Prize

To Be Awarded for an Article or a Report Published in Science

The AAAS-Newcomb Cleveland Prize is awarded to the author of an outstanding paper published in Science. The value of the prize is $5000; the winner also receives a bronze medal. The current competition period began with the 5 June 1992 issue and ends with the issue of 28 May 1993.

Reports and Articles that include original research data, theories, or syntheses and are fundamental contributions to basic knowledge or technical achievements of far-reaching consequence are eligible for consideration for the prize. The paper must be a first-time publication of the author's own work. Reference to pertinent earlier work by the author may be included to give perspective.

Throughout the competition period, readers are invited to nominate papers appearing in the Reports or Articles sections. Nominations must be typed, and the following information provided: the title of the paper, issue in which it was published, author's name, and a brief statement of justification for nomination. Nominations should be submitted to the AAAS-Newcomb Cleveland Prize, AAAS, Room 924, 1333 H Street, NW, Washington, D.C. 20005, and must be received on or before 30 June 1993. Final selection will rest with a panel of distinguished scientists appointed by the editor of Science.

The award will be presented at the 1994 AAAS annual meeting. In cases of multiple authorship, the prize will be divided equally between or among the authors.
Low endotoxin carbohydrates for the life sciences

Many biotechnology and pharmaceutical processes require the use of carbohydrates which have very low endotoxin levels. Fermentations, tissue culture work and certain critical pharmaceutical processes are among those that require such sugars. Our in-house technology and production know-how have led to the development of extremely low endotoxin levels in sugars such as maltose, sucrose, D-galactose and others. If your process requires low endotoxin carbohydrates or related compounds, put our products to work.

PFANSTIEHL LABORATORIES, INC.
The source for carbohydrate chemistry

1219 Glen Rock Avenue/Waukegan, IL 60085-0439
Tel.: 1-708/623-0370/Toll Free: 1-800/383-0126
FAX: 708/623-9173
71-W

MAKING THINGS WORK

Call No. 22 on Readers' Service Card

SERUM TERMINATOR

- No Biological Variability
- Low Endotoxin
- No Extraneous Components
- Cost Effective

TCH™ is a fortified, low protein serum replacement providing outstanding results without the use of animal proteins, steroid hormones (i.e. estrogen or testosterone), or growth factors such as EGF, FGF, TGF, etc. At a 50x concentrate, a 500ml bottle of TCH™ will produce 25 liters of complete medium, compared to only 5 liters of medium containing 10% serum. By eliminating biological variability and extraneous components, TCH™ provides a consistent growth environment for a variety of cell types.

Call to Order: (800) 552-3569

CELOX Corporation
850 South Fifth Street
Hopkins, Minnesota 55343
Phone: (612) 933-2616
Fax: (612) 933-0217
Call No. 26 on Readers' Service Card
tion" to the sociology of science, and Cole, parenthetically (if incredibly) goes so far as to describe social constructivism as the "dominant" genre.

In truth, Cole’s book represents more a conversion than a compromise. He concedes much to the social constructivists, granting more to contingency and to "social factors" than even some constructivists have claimed. The "universalism" of Mer- tonian sociology is frankly given up; no special sociological basis is offered for de- marcationism; the moral norms of science that formed the centerpiece of Mertonian solutions to the social-order problem are scarcely mentioned; idealized portrayals of high degrees of scientific consensus are re- jected; the role of authority in shaping scientific judgment is freely acknowledged; and the positivist philosophy that under- pinned Merton’s treatment of scientific knowledge as a black box is abandoned.

The nakedness of conversion is, to be sure, covered by a generously cut fig leaf of eclecti- cism. Ideal typical positivist philosophers have, Cole says, unwarrantedly assumed that the logical assessment of empirical evidence was the ultimate arbiter of scientific judg- ment, while ideal typical social constructivists have "gone too far" toward the other extreme.

Cole sensibly sets himself against any position arguing that evidence from the natural world "has no influence" upon scientific belief. The proper view is that "social factors" play some role and that empirical evidence from nature plays some role. What role ought to be as- signed to each awaits detailed investigation.

The credibility of an eclectic position crucially depends upon the incredibility of the extremes between which it is placed. Between two sheer cliffs what wise person would not prefer the safety of level ground? Such is the instinctive appeal of eclectic middle ways that it is always worth giving them a quick check-over to see whether the extremes to be avoided have been correctly portrayed. In the present case one fears that an ideal-type has been transformed first into a straw man and thence into a punching- bag. After his initial flourish Cole has little to say about positivist philosophers and gets on with the job of identifying two main failures of social constructivism.

First, social constructivists are said to claim that "the content of science is determined solely by social variables" and accordingly to "argue that the empirical world has little, if any, influence." Such a position is rightly judged to be patently absurd. Second, social constructivists are said to have manifestly failed in their attempts to produce convincing demonstrations of their claims: they have "failed to generate a single example or case- study" that shows that social processes "actually influence the specific content of science." A sociology of scientific knowledge, as op- posed to a sociology of scientific foci of inter- est, remains impossible.

One would like to say that the first diagnosis of "failure" is simply a misunder- standing, albeit, unfortunately, a widely dis- tributed one. Here Cole apparently has in mind the "strong programme" of British sociologists Barry Barnes and David Bloor, yet he has evidently missed such continually repeated sentiments as these: "No consistent sociology could ever present knowledge as a fantasy unconnected with our experience of the material world around us" (Bloor, 1976), or "There is indeed one world, one reality, 'out there,' the source of all our perceptions" (Barnes, 1977). Recognition that some prominent social constructivists, at least, do not correspond to his ideal-type is buried in an endnote, where Cole blandly suggests that there may be "little or no difference between their position and that taken in this book." Adopting an interpretative position alien to his usual style, Cole then urges sociologists to be realists because scientists
working within “normal” traditions are realists. But that is to take for granted more than we know. Many scientists are instrumentalis-
ists and pragmatists, still more probably have not got a position on the issue, and the comparison between “normal” traditions is widely recognized to create substantial problems for realism.

Resolution of the second “failure” of SSK is not so easily arranged. If social constructivists were indeed in the business of causally demonstrating the exclusive role of social factors in the production and evaluation of scientific knowledge, then there would be little problem in agreeing that the enterprise had miscarried. Yet Cole’s familiarity with the SSK literature, in other respects quite impressive, fails him here. For a quite typical form of social constructivist case-study involves the examination of scientific controversy. How is one to account for variation in scientific judgment when both parties to a controversy have access to the same evidence and, presumably, to the same canons of right reasoning? Here social constructivists have argued that empirical evidence has a causal role but not a discriminating role. If nature is one and the same, then one has to look elsewhere to account for variation in belief and judgment. It is primarily for this reason that methodological—not ontological—relativism has recommended itself to sociologists of scientific knowledge.

Cole wants social constructivists to acknowledge the constraining role of nature in the formation of scientific belief. Amazingly, however, when he gets around to saying what he means by “nature” it turns out to overlap massively with what his opponents mean by “society”: “The accepted body of knowledge is the functional equivalent of nature.” For Cole the “accepted body of knowledge” is a “cognitive factor” to be juxtaposed eclectically to “social factors.” Yet the processes by which members come to acquire “accepted knowledge” are widely designated by the term “socialization,” just as the possession of different bodies of knowledge is a major means used to distinguish different social groups. On close inspection, Cole’s eclectic sociological compromise looks more well-intentioned than well-conceived. The battle continues.

Steven Shapin
Department of Sociology and Science Studies Program,
University of California at San Diego,
La Jolla, CA 92093–0102

General Inventor


If asked about technological innovation in the 20th century, most Americans today would tell you three things. First, they would insist that major breakthroughs come from science. Second, they would inform you that innovation is done by teams and that the age of heroic inventor is long gone. And third, most would tell you that innovation is performed by experts who devote their lives to mastering one esoteric subfield. In this well-researched book James E. Brittain challenges these assumptions by demonstrating how one broadly creative individual helped develop radio and electronics while working primarily in an engineering and not a scientific tradition.

Ernst Alexanderson was born in 1878 in Uppsala, Sweden, where his father taught at the university. Choosing engineering as his career, Alexanderson attended the Royal
dramatically between 1900 and 1950, but we do not learn how such changes influenced Alexander's work or how his accomplishments altered the firm.

With respect to the common assumptions about technological innovation, Britain persuasively shows that electronics did not spring entirely from theoretical physics. Much of the creative work involved translating the science into practical devices, and this work was done by engineers such as Alexander. In tracing how Alexander moved easily between power engineering and radio electronics, Britain reminds us that innovation is not the result of specialization as much as it is the product of cross-fertilization. Finally, he reveals how strongly electronics was shaped by the work of an individual. All too frequently, both contemporary observers and historians of R&D overemphasize the role of teamwork and downplay the role of individuals in providing original ideas, the vision of a new social and technical order, and the leadership needed to implement the vision. More than anything else, Britain demonstrates in this fine biography that individual engineers such as Alexander have indeed played a profound role in shaping both the technology and the culture of the 20th century.

W. Bernard Carlson
Humanities Division,
School of Engineering and Applied Science,
University of Virginia, Charlottesville, VA 22903

Female Functioning


Twenty-five years ago an activist women's health movement emerged in this country that had broad popular appeal; a representative text, Our Bodies, Ourselves, is now in its fourth edition, having sold more than three million copies and been translated into more than a dozen languages. Explicitly feminist, this movement was critical of received medical knowledge and practices on two grounds: diseases primarily affecting women were being neglected (both in federally funded health research and in clinical practice), and entirely expectable events in women's reproductive lives (childbirth, menopause, the late luteal phase of the menstrual cycle) were being interpreted as potential health risks requiring medical management.

Critiques of the latter practice came both from within and from outside scientific communities. It was argued that a reductionist "biomedical model" (a set of concepts embedded in the practices of medicine and other socially powerful institutions) often inappropriately "medicalized" women's lives by focusing on biological events in isolation from their social and psychological contexts. When these biologized representations of women are taken up in the broader culture, they sometimes are represented as offering a scientific basis for resolving controversial social questions. (For example, a July 1970 New York Times article was headlined "Women Unfit for Top Jobs" because of the "raging hormonal influences of the menstrual cycle.")

The two books under review report and summarize menstrual-cycle research shaped
The title of this book is derived from a symposium held in 1988 to celebrate the centenary of Ramon y Cajal’s “neuron doctrine.” The neuron doctrine, it will be recalled, was the germinal idea that individual nerve cells communicate with one another, and this once-speculative notion has now become the basis of all modern neuroscience. Like Cajal’s pioneering work, the present collection of research papers deals with the cerebellum and its related structures. The editors admit in the preface that the selection of which papers to include was a “personal choice of topics and an incomplete one at that.” They may be readily forgiven for the incompleteness, since the enormous quantity of recent cerebellar research would easily have surpassed the confines of a single volume. Both Llinás and Sotelo are well-known figures in cerebellar research, and I for one was very curious to know which papers they had selected.

The papers are grouped under three broad categories: morphological organization, the electrophysiology of the olivocerebellar system, and movement-related activity changes. Each section is given a brief introduction highlighting the important recent advances. In all there are seven chapters on morphology, three on the olivocerebellar system, and six on neuronal activity related to movement. Given the prodigious rate of change in the neurosciences, one might wonder whether these papers presented five years ago are still of value. Surprisingly, most of them do remain timely, and their bibliographies have been updated to contain references as recent as 1991. For this reader, though, the real appeal of this book is the convenience of having a guided tour of important regions of interesting cerebellar research, in many of which I consider myself a somewhat provincial tourist.

Once a decade, a book about the cerebellum appears that becomes a must-read for everyone in the neurosciences: Eccles et al.’s The Cerebellum as a Neuronal Machine (1967), Palay and Chan-Palay’s Cerebellar Cortex (1974), Ito’s The Cerebellum and Neuronal Control (1984). Although The Cerebellum Revisited does not attain this exalted status, the editors do deliver, as they promise, “a book to please both the specialist and the generalist.” Among the non-aficionados of the cerebellum who I suspect will find this book the most appealing are those interested in neural development, a field in which the cerebellum has been a key model for some time.

Particularly interesting in this regard are the chapters by Hawkes and Sotelo. For example, Hawkes and his colleagues, using a family of monoclonal antibodies called Zebrins, are able to distinguish 14 alternating labeled and unlabeled parasagittal bands of previously undifferentiated Purkinje cells. The outstanding precision of this organization is demonstrated by the fact that the narrowest Zebrin-positive band, straddling the midline, is sometimes only one or two cells wide. Although the functional interpretation of this startling revelation remains elusive, Hawkes points out that, because the parasagittal compartments are present before afferent connections are established, the system does not need to develop in a linear temporal se-
The final section of the book deals with cerebellar activity in movement and more particularly with learned movements. The perpetual riddle of the role of the climbing fibers is posed once again, but the varied answers failed to generate the heat and passion that characterized the debate on the same issue at a similar symposium in Turin a year earlier. Alas, there still appears to be no agreement in sight. Even the consensus that complex spikes diminish Purkinje cell responsiveness to parallel fiber excitation appears to some extent equivocal according to Bloedel and collaborators. Although more than half the book is devoted to elaborating the organization of Purkinje cells into narrow rostrocaudal bands, Thach adds evidence to support an old hypothesis that runs counter to the parasagittal bands both literally and figuratively. He suggests that in addition to the rostrocaudal organization, the long parallel fibers running mediolaterally serve to link the functionally different parasagittal bands of the cerebellum together to create specific muscle synergies for multijoint movements.

In some ways we have come full circle with this book since Cajal’s pioneering demonstration of the simple geometric arrangement of cerebellar neurons. Neuroscientists expecting that the simple geometric structure would soon follow by a similarly simple and elegant explanation of its function have been disappointed. Rather ironically, it appears clear from this excellent collection of papers that, after one hundred years of impressive progress, we have developed an elaborate neuron doctrine of the whole brain, but a simple explanation of cerebellar function has yet to be achieved.

Allan M. Smith
Centre de Recherche en Sciences Neurologiques,
Université de Montréal,
Montréal, Québec, Canada H3C 3J7

Books Received


Chalk Up Another One. The Best of Sidney Harris. AAA, Washington, DC, 1992. viii, 146 pp., illus. Paper, $10.95; to members, $8.75.


From a symposium, Nagoya, Japan, July 1991.


Separate Faster Now

Separate with ZapCap®-S Disposable Bottle-Top Filters.

- Higher throughput for faster cell culture media filtration.
- S&S pure Cellulose Acetate Membranes provide very low protein binding.

Faster flow rates for cell culture filtration with ZapCap®-S Bottle-Top Filters.

- Large diameter 76 mm membrane and ultra-efficient filter support produce very fast flow rates.
- Five times faster than competitive units.

Yes, I want to separate faster now. Send me a free sterile ZapCap®-S and a Product Guide.

Choose one sample:

- [ ] ZapCap®-S 0.2 µm/CA
- [ ] ZapCap®-S 0.45 µm/CA

Name ________________________

Title ________________________

Company/ Institution ________________________

Address ________________________

City ________________________ State ______ Zip ______

Phone ________________________

Circle No. 31 on Readers’ Service Card

Oligonucleotides, Chemical Synthesis. (Eds. Stephen R. Fodor, T. P. Nielson, L. J. Cotton, P. N. Bier) Oxford University Press, New York, 1991. 566 pp., illus. $29.95. "An excellent guide to the state of the art in oligonucleotide chemistry. It is essential reading for people involved in the field and a clear statement that the oligonucleotide chemistry is here to stay."


