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StrataClean resin is designed for extraction of restriction endonucleases and many DNA modifying enzymes from nucleic acids. Quantitative removal of restriction enzymes from DNA can be accomplished in a matter of minutes with StrataClean resin and eliminates the hazards associated with liquid phenol extractions. The StrataClean resin extraction relies on the use of patented hydroxylated silica particles which exhibit characteristics similar to phenol\(^2\).

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1. U.S. Patent Serial No. 4,923,978
2. Strategies Vol. 3 Number 4

**Figure 1** is a photograph of a silver stained SDS-PAGE gel. Lane 1 represents twenty micrograms of protein molecular weight markers. Lane 2 represents the residual protein following StrataClean resin extraction of twenty micrograms of the molecular weight markers. Lane 3 represents the residual protein following phenol/chloroform extraction of twenty micrograms of the protein markers.

**Figure 2.** Ethidium stained agarose gel. Lane 1: control uncut plasmid DNA. Lane 2: the same DNA after standard StrataClean resin extraction. Lane 3: plasmid DNA digested with 4 units Pvu II. Lane 4: plasmid DNA after standard StrataClean resin extraction then digested with Pvu II. Lane 5: 24 units Pvu II extracted with StrataClean resin from 20 microliters of 1X Universal buffer, plasmid DNA then added and incubated at 37°C for 18 hours.
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<th>PURIFICATION METHOD</th>
<th>TRANSFORMATION EFFICIENCY</th>
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<tr>
<td>StrataClean Resin</td>
<td>3.30 x 10⁶/μg</td>
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<td>Phenol/Chloroform</td>
<td>2.70 x 10⁶/μg</td>
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The table lists the results from triplicate sets of transformation experiments. Ten micrograms of control cestum banded pBS DNA was digested with Eco RI. Five micrograms of the digested control DNA was purified using phenol/chloroform and 5 micrograms was purified with StrataClean resin. Samples were quantified, ligated and transformed according to XL1-Blue competent cell protocol.

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This Week in *Science*

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Cover Earth’s magnetosphere, created by the interaction of the supersonic solar-wind plasma (blue) with the geomagnetic field. The plasma sheet (red) is a reservoir of hot (~1 kiloelectron volt) plasma originating in the solar wind and in the ionosphere. The solar wind–magnetosphere interaction drives a circulation of plasma that populates the Van Allen radiation belts (red dots) and powers auroral optical and radio emissions. See page 410. [Source, T. W. Hill; illustration by Susan Nowoslawski]
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<tr>
<th>A Lot of Time</th>
<th>A Little Time</th>
<th>No Time</th>
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<tbody>
<tr>
<td><strong>Weigh out 100 g Oncor® Dextran Sulfate powder.</strong></td>
<td><strong>Go to Bob’s lab and get your Oncor® 50% Dextran Sulfate Solution.</strong></td>
<td><strong>Find your Oncor Hybrisol™</strong></td>
</tr>
<tr>
<td><strong>Place in flask/bottle.</strong></td>
<td><strong>Thaw out, dilute, and add remainder of ingredients to prepare hybridization solution.</strong></td>
<td><strong>Total Time Required:</strong></td>
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<tr>
<td><strong>Add 300 ml dH2O.</strong></td>
<td><strong>Total Time Required:</strong></td>
<td><strong>10 minutes</strong></td>
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<tr>
<td><strong>Incubate at 37°C to 45°C for 60 minutes or until powder is dissolved.</strong></td>
<td><strong>(Time to start another experiment.)</strong></td>
<td><strong>(it had better be in Larry’s lab)</strong></td>
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<tr>
<td><strong>Thaw out, dilute, and add remainder of ingredients to prepare hybridization solution.</strong></td>
<td><strong>Adjust volume to 1 L.</strong></td>
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<td><strong>Total Time Required:</strong></td>
<td><strong>2.5 hours</strong></td>
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Astrophysical Plasmas

Stars, galaxies, and fusion reactors all contain a substance that simultaneously obeys the laws of electromagnetism and fluid dynamics. In 1928, Irving Langmuir named it “plasma” and the recipe is simple: take matter and heat until ionized. The result is a collection of charged particles possessing all of the qualities of a fluid but with added twists and turns caused by electric and magnetic fields. Although the use of plasmas for controlled thermonuclear fusion has received the most scientific attention, plasma physics is an essential part of many astrophysical phenomena. The five articles in this issue of Science examine plasmas in astrophysical settings, from the densest stars to the most rarified planetary magnetospheres.

Van Horn describes the state of plasma under extremely high pressure, as might be found in white dwarf stars, neutron stars, the giant planets, or the still hypothetical “brown dwarfs.” The electrons are packed so tightly that the exclusion principle of quantum mechanics, rather than electrical repulsion, keeps them apart. Stars in this condition exhibit unusual properties: the stellar structure, for instance, is almost completely independent of the plasma on the other hand, the cores of white dwarfs and the surfaces of neutron stars can freeze solid if the temperature is low enough. Calculations of heat transfer, nuclear reaction rates, and equations of state for dense plasmas allow the evolution of such bodies to be understood.

Jets of plasma associated with stars and galaxies are among the largest and most energetic objects in the universe. De Young surveys the observational evidence and theoretical understanding of these jets. Instead of the spherical outward flows of ionized gas that all stars emit, stellar jets are highly directional. Extragalactic jets are more vigorous, and they take many shapes and sizes. Although much has been learned, the specific energy sources and mechanisms for stellar and extragalactic jets are still puzzles.

McKee and Draine consider another energetic phenomenon: interstellar shock waves. Stellar winds push the surrounding interstellar medium outward at velocities of ten to hundreds of kilometers per second; supernovae generate shock waves that travel up to about 10,000 kilometers per second. The way these shocks collide with the ambient interstellar medium tells much about the nature of that tenuous plasma. Such shock waves are believed to accelerate the cosmic rays that are observed on Earth. Shock waves have also been observed in molecular clouds, the large clumps of neutral gas in the interstellar medium. In this case, the coupling of even small amounts of ionized gas to the neutral matter by magnetic fields can completely alter the structure of the shock wave.

The sun emits a plasma too, the solar wind, and although of low density, it is highly ionized and hot. Neugebauer describes the properties and acceleration mechanisms of the solar wind plasma. It exists in two states: the quasi-stationary solar wind, which fluctuates over time scales of months, and the transient wind, caused by explosive ejection of plasma from the solar corona. Differences in the properties of these two states have been elucidated by interplanetary space probes, but questions still remain about the processes involved. A picture has emerged over the last decade in which the acceleration of the solar wind is closely tied with the heating of the solar atmosphere.

What happens when the solar wind interacts with the magnetic fields of planets to form magnetospheres? Before direct exploration of the solar system by spacecraft, the concept of a magnetosphere—the region where a planet’s magnetic field dominates the solar wind—was unknown. Hill and Dessler discuss the six planets in the solar system that have well-developed magnetospheres: Mercury, Earth, Jupiter, Saturn, Uranus, and Neptune. A comparative approach to studying the motions of plasma within these magnetospheres may lead to a basic understanding of more remote astrophysical systems.

Because they follow two sets of rules, electromagnetic and hydrodynamic, plasmas display a rich array of phenomena. The degrees of freedom are many and the intracacies can be a source of astonishment. Wherever plasmas are located in the cosmos, their complexity continues to challenge observers and theorists alike.—DAVID VOSS
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Enrollment is limited to 50 students. Students will be selected on the basis of their scientific merit and will represent all countries from which applications have been received.


Additional information about applications and travel grants can be obtained from Laura Linzi - International School of Neuroscience - Via Ponte della Fabbrica, 3/A - 35031 Abano Terme (Padova) Italy - Fax 049/810653-810340.

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Assessing Higher Order Thinking in Mathematics
Edited by Gerald Kulm

Teaching higher order thinking is essential in today's world. And what is taught must be tested. Unfortunately, most mathematics tests focus primarily on rote computational skills and memorized facts rather than on higher order thinking. This book addresses such concerns. The authors explore new approaches to mathematics assessment, provide directions for reforming mathematics testing, and give examples of innovative test items. It is especially valuable for teachers, test publishers, researchers, and federal and state educational policy makers.

Topics include: A new world view of assessment in mathematics; power items and the alignment of curriculum and assessment; assessing student growth in mathematical problem-solving; computer-based mathematics assessment; calculators and mathematics assessment; students' theories about mathematics and their mathematical knowledge; assessing schema knowledge for arithmetic story problems; critical evaluation of quantitative arguments; investigation of structured problem-solving items; and new directions for mathematics assessment.

The Liberal Art of Science
Agenda for Action

This report presents the conclusions and recommendations of the AAAS Project on Liberal Education and the Sciences. It discusses the level of scientific understanding necessary for optimal participation in 21st century life and the type of undergraduate science education required to achieve such a level of understanding. In addition, this volume supports the idea that science is a liberal art and should be taught as such. It recommends goals for liberal education in the sciences, outlining the multidisciplinary curriculum and teaching strategies necessary to achieve them.

An appendix includes descriptions of existing courses and programs, offered at institutions nationwide, that are consistent with the project’s recommendations. This report is of particular interest to undergraduate science educators as well as to all people committed to quality science education.

Topics include: Agenda for action; faculty responsibility; resource commitment; teaching materials and technologies; assessment instruments; the nature of scientific explanation; historical context; pedagogical techniques; integrating multidisciplinary content; programmatic approaches to liberal education in science; and liberal education for special groups such as future science teachers, the underrepresented in science, people with disabilities, and science and engineering majors.

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Indirect Costs

In the coverage in Science (News & Comment, 22 Mar., p. 1420; ScienceScope, 22 Feb., p. 863) and elsewhere of recent accusations of the padding of indirect costs at Stanford, no one has made the point that the real scandal is not the illegal activities of those who defraud the federal government; the scandal is what is legal (1). Direct costs of research grants receive meticulous scientific review and are now routinely pared to the bone by study sections. All of us must know of microscopes or other necessary pieces of equipment cut from grants on the grounds that they were not absolutely needed for full-time use and surely could be borrowed from another laboratory.

Indirect costs, on the other hand, which have over the past decade been rising at nearly five times the rate of direct costs in real terms [calculated for National Institutes of Health RO1 grants in (2)], receive no review for scientific appropriateness. Thus for Stanford University to charge its flowers, sailboats, sports programs, and antiques purchases to the expenses reimbursed by the indirect cost rate may well be legal and consistent with its other indirect costs accounting practices, however embarrassing it appears to be when brought to public notice. Few scientists realize that the question relevant to indirect costs is the extent to which they were incurred in support of the research as opposed to the teaching or public service activities of a university (3). Whether or not those expenses were necessary for the research, or even whether they actually facilitated research, does not enter in. Scientists simply do not participate in making these judgments. If a university administrator wants to install gold-plated benches in a laboratory not used for teaching, indirect costs will pay for them.

Indirect costs at some level are clearly necessary. No one wants to destroy our great university centers for research, which have flourished under federal support over the past 50 years. Nor do most scientists wish to continue working in old, crumbling buildings without hope of their renovation or replacement. Under the present rules, however, indirect costs are restrained only by the probity and innate frugality of most university administrators, who for the common good put their own institutions at a competitive disadvantage to those with more skillful accountants.

The capture of huge indirect costs from our limited research budgets by some universities deprives all working scientists of funds needed to conduct their research and threatens the public support for science. Movement toward a uniform national indirect cost rate for universities appears to me to be the only answer, forcing the universities to compete on the basis of the efficiency of their services rather than on the ingenuity of their accountants.

Michael P. Stryker
Department of Physiology,
University of California,
San Francisco, CA 94143-0444

REFERENCES AND NOTES

ScienceScope (22 Feb., p. 863) reports that Stanford University President Donald Kennedy was not prepared for an interview on the ABC news show "20/20." Those who watched the program may agree. Those who did not watch the program know that it is not important for a university president to prepare himself for ABC's "20/20." What is important is for him to be prepared to run a university, and Donald Kennedy has done an admirable job over the past 10 years.

The present controversy over improper charges to the U.S. government stems from mistakes on the part of all of us, but it is Kennedy who is taking the brunt. If not Kennedy, then who? We, the faculty, are the beneficiaries of the research funding on campus, and we should not push the blame onto a single person. We should have been more diligent in tracing the charges. Mistakes have been made, such as the charging of the yacht as well as expenses related to the Stanford Shopping Center. They were not made in the president's office, but in the accounting office.

The accounting system must be corrected. Kennedy has appointed a committee of well-qualified people to review the current reporting procedures and make recommendations to effect a more accurate system.

Kennedy has been a strong president in leading a research and teaching institution that is part of our national pride and has an international reputation. We must not let this present controversy diminish what Stanford has accomplished. We must continue to work at improving the quality of both our research and teaching.

C. F. Quate
Edward L. Ginzton Laboratory,
Stanford University,
Stanford, CA 94305-4085

NSF Directorates

We would like to correct the impression that there is unanimity among the organizations testifying on the issue of a separate National Science Foundation (NSF) directorate for the social and behavioral sciences (Briefings, 15 Feb., p. 742). Not all organizations "disagreed" with the doubts expressed by Mary Clutter and others within NSF.

The recently circulated testimonies of the
54 organizations representing various social and behavioral sciences reveal that 37 organizations voiced definite opinions, while 17 conveyed no preference. Of those registering an opinion, 20 organizations supported a new directorate and 17 were opposed.

While organizations within the social and behavioral sciences were generally more in favor of a separate directorate than were organizations within the biological sciences, several did not support separation. These included the American Anthropological Association, the Society for American Archaeology, the American Speech-Language-Hearing Association, the Society for Complex Carbohydrates, the Society for Research on Biological Rhythms, the Animal Behavior Society, and the International Society for Chronobiology.

An important reason to maintain the existing structure, cited by several of these organizations, is the intellectual “bridge” they constitute within the existing biological, behavioral and social sciences directorate. Disciplines such as anthropology and archeology, especially, share philosophical concerns and research methods with both the social sciences and the biological sciences. A separate directorate would sever these valued connections and work against the multidisciplinary foundations of our research.

Jane Buikstra
President
American Anthropological Association,
1703 New Hampshire Avenue, NW
Washington, DC 20009

Prudence Rice
President,
Society for American Archaeology,
808 17th Street, NW;
Suite 200,
Washington, DC 20006

AIDS Research at NIH

“NIH: The price of neglect” by Rick Weiss (News & Comment, 1 Feb., p. 508) brings up some of the problems that impede or threaten to impede the work of the National Institutes of Health (NIH). However, a reference to the “AIDS funding bonanza” misrepresents the situation within the Division of AIDS (DAIDS) of the National Institute of Allergy and Infectious Diseases (NIAID).

Rather than “heady times,” the DAIDS is experiencing a chronic inability to fill allocated staff positions, including those of several branch chiefs. At present, 20 (16%) of these positions are unfilled. Excluding eight that have been vacated within the last 6 months, these positions have remained unfilled for an average of 14 months each. There has been, for example, no chief of the Medical Branch since December 1988. This has created a situation in which the DAIDS suffers from “enormous stresses on existing staff, creating rapid burnout and high turnover rates” (1). Those of us in the activist community can only be appalled by the toll this takes in human lives.

On a more positive note, the Federal Employees Pay Comparability Act of 1990, when fully implemented, will enable DAIDS and NIH to solve their staffing problem. This legislation will raise salaries, provide recruitment bonuses of up to 25% of annual salary, and supply a variety of other financial remedies that will improve the situation of all “general schedule” federal employees (2). Prompt implementation of this legislation and congressional action to allocate necessary funds will surely enable NIH to jump start its sputtering engine.

Steve Brown
Jon Ende
Treatment and Data Committee,
ACT UP/New York,
515 East 5th Street,
New York, NY 10009

REFERENCES

1. D. Hoth, Director, Division of AIDS, NIAID, personal communication.
4 Out of 5 Electroporation References Specify the Bio-Rad Gene Pulser® System

Gene Pulser References

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* The Gene Pulser is cited in 86% of all published bacterial electroporation articles (gathered from on-line databases).
nuclear arms race and includes, along with discussions of weapons testing, potential civilian casualties, and the Strategic Arms Reduction Treaty, a debate with Edward Teller and an analysis of the attacks on critics of the Strategic Defense Initiative. There follow groups of three essays each on automobile energy efficiency and nuclear reactor safety, with a final essay “Blessed are the troublemakers.” Alone among the first three volumes of the series, von Hippel's has a section of references and notes at the end.

All the volumes include indexes and, under the heading “Acknowledgements,” list original sources of the essays and identify coauthors. Also included are notes “about the author” and “about the series,” which is being produced under the editorship of Robert Ubell with an advisory board of physicists.—K.L.

Headline News, Science Views. DAVID JAR- 

Another attempt on the part of a learned body to reach a general readership is Headline News, Science Views, whose publication by the National Academy of Sciences is timed to coincide with National Science and Technology Week, 22–29 April. Rather than mining a variety of professional and semi-professional sources as do the AIP volumes, the Academy for its contributions draws on material distributed to some 250 subscribing newspapers by its Op-Ed Service. As befits the medium for which they were prepared, the 75 essays are brief and uniform in length (a little over two pages each) and are intended to be intelligible even to those who found high school chemistry a struggle. The authorship of the items is varied, including not only natural and social scientists from academia, government, and industry but lawyers, ethicists, and others concerned with issues of science and public policy. An opening section, led off by Bill Cosby, deals with public perceptions and understanding of science, with most of the authors feeling that the state thereof needs to be improved. A group on technology in everyday life includes commentary on such topics as automobile and airplane traffic jams, affordable housing, and natural disasters. Under the rubric “sustainable future” are discussed the greenhouse effect, the state of the sea turtle, radioactive waste disposal, and various issues pertaining to agriculture. With respect to “the nation’s health” there are discussions of diet, alcohol abuse, fertility and maternity services, AIDS, and even tobacco chewing. Among the problems specifically designated as social that are dealt with are race relations, the gender gap in wages, child care, and drug treatment. Future prospects involving science that are discussed include missions to Mars, seabed exploration, a post-Iraq energy crisis, and the human genome project. International matters such as technological competitiveness, analytic “tools” to facilitate Soviet democratization, food and agriculture, and vaccination are then taken up, followed by discussions of ethical issues ranging from those posed by the “new diagnostics” to the use of animals as laboratory subjects. The book ends with reflections on the recruitment of future scientists and engineers, problems considered ranging from “kindergarten stress” and math anxiety through the challenge of creationism to the “mommy track” and the representation of blacks. Issues of keeping the scientific household in order do not loom large in the collection, though there is one contribution on fraud. In addition to the text (which, it is reported, is reproduced as originally published) the volume contains a number of cartoons emanating directly from newspapers that have used the written material. An index has also been add- ed.—K.L.