SCIENCE

16 July 1971

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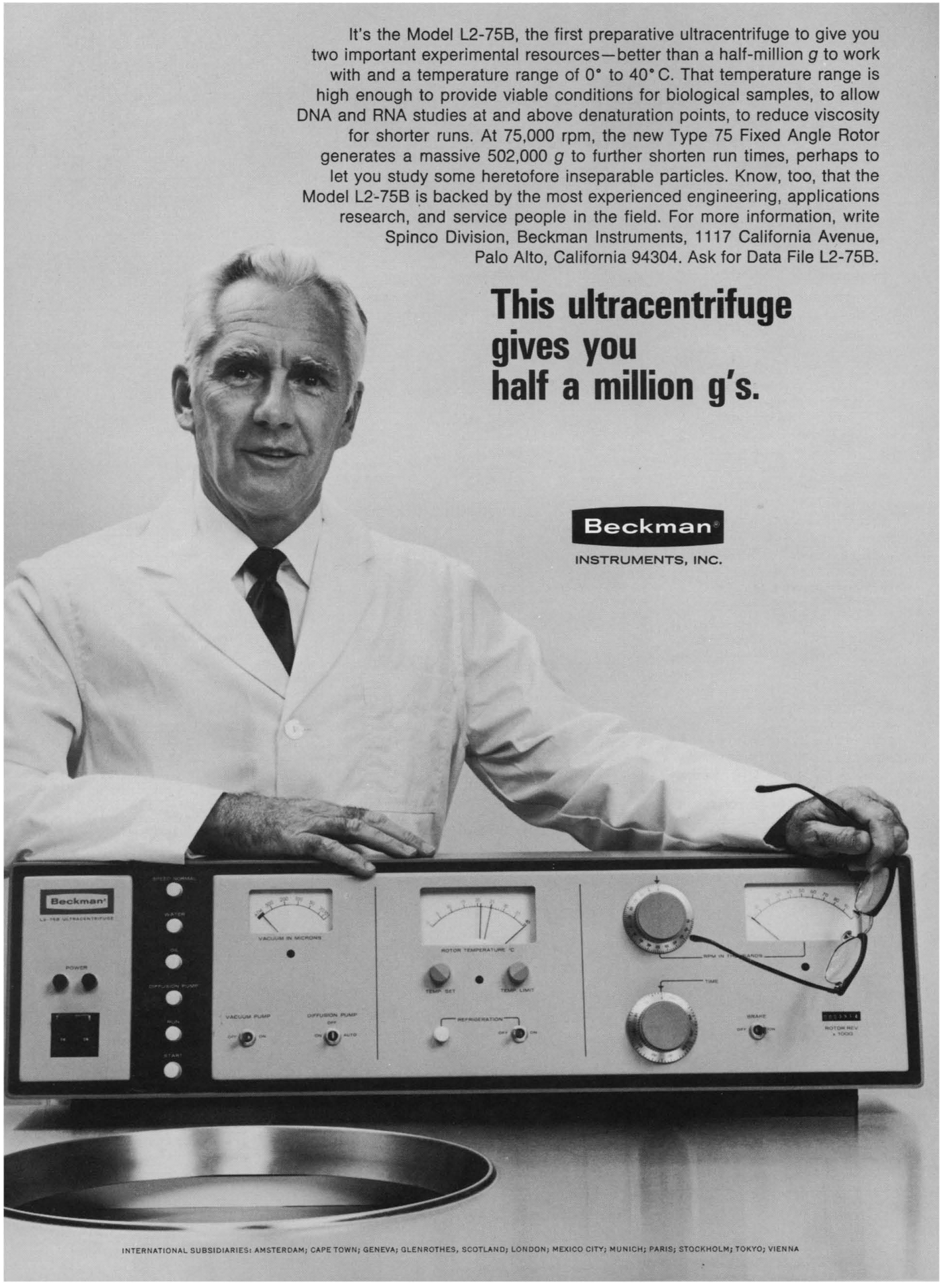
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE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We want to be useful ...and even interesting

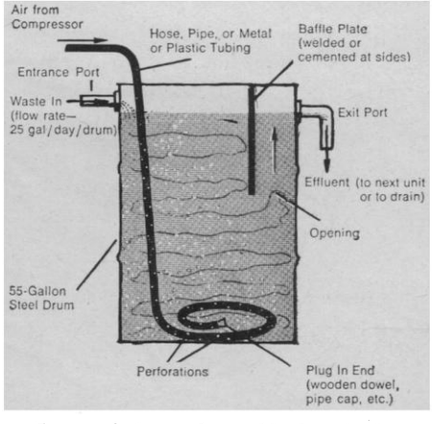
Kodak

Help the aerobes

25 years ago our ads in this journal simply pushed the idea that photography is a powerful tool of science. Whether the idea needed advertising or not, it caught on. Now into the laboratory come lots of Kodak film, photopaper, and photographic processing chemicals. And the latter, when done working, come back out through the plumbing. 25 years ago this seemed unimportant. A respected competitor has chided us openly for thinking it important now. He may be right. Certainly there are graver threats to the web of life than the tray drainings and the wash water from a day's work with the electron microscope.

Nevertheless, every CH_3COO^- and every $S_2O_3^=$, harmless and diluted though it be, still demands its share of O_2. As for hydroquinone, its derivatives, and its oxidation products, they had better be given their O_2 before troubling any living creature.

Without depriving any aerobe of its rights, this can be conveniently done for spent photographic solutions and wash water up to 100 gallons a day with one to five 55-gal steel drums fitted out like this:



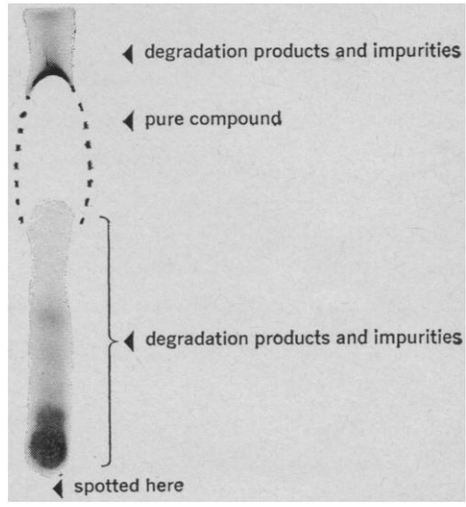
For such low-volume black-and-white processing operations Kodak Publication J-43, free from Dept. 412-L, Kodak, Rochester, N.Y. 14650, gives detailed suggestions. It suggests, for example, that the living creatures working in the drums be encouraged with a few bouillon cubes or a little buttermilk.

TLC, assisted by autoradiography

Autoradiograph fluorographically exposed on KODAK X-ray Film SB54 by 20 hours of contact with a chromatogram (EASTMAN CHROMOGRAM Sheet 6061) that has been bathed for 3 sec in 7% "PPO" (EASTMAN 13000) in ether.

Done to prove that an experimental photographic developer tagged by Wilzbach tritiation for tracing through a processing system had really accepted the label.

Conclusion: It had not!
We would have been badly deceived. A negligible amount of sundry side products had taken over the entire label.



Visible proof is desirable that when one started a tracer experiment, the label was where one thought it was. Otherwise, one's conclusions on where the label went may fail to convince.

As we travel around spreading the word on how to make thin-layer chromatography worthwhile, we note some reluctance to take advantage of autoradiography, which is often by far the best way to visualize the separations. Diffidence arises, we guess, from the feebleness of tritium in direct photographic exposure, combined with a certain parsimony of details on technique in papers by authors who have licked the problem and prefer to use their journal space for the results.

E. J. Hahn, Eastman Kodak Company, Rochester, N.Y. 14650 has prepared a guide on autoradiography of chromatograms. After you have read it and have looked up the literature references he gives, if you are still at a loss he will try to help.

GLC, assisted by microfilm

In *Eastman Organic Chemicals Catalog No. 46,** the section on products for thin-layer chromatography is followed by one on gas-liquid chromatography that offers 116 commonly used substrates and 27 reagents to form volatile derivatives of compounds not otherwise amenable to separation by GLC. The man at the Kodak Research Laboratories with whose counsel these lists were drawn up is Orion Edwin Schupp III, author of *Gas Chromatography*, a 437-page work (Interscience Publishers, New York, 1968). Dr. Schupp is not the first Kodak author to publish on the subject. Three other Kodak chemists wrote the first paper on gas chromatography published in the United States, way back in 1955.

Since then we have worked out a high-powered information system to keep track of the GLC data that we and the rest of the world accumulate. Our system has been adopted by the American Society for Testing and Materials as its own. As an intramural exercise with a computer output KODAK KOM-90 Microfilmer, there has been prepared a compilation on microfilm of ASTM's GLC data for about 6,000 compounds. It is sold by ASTM, 1916 Race St., Philadelphia, Pa. 19103.

*Available on request from Kodak, Dept. 412-L, Rochester, N.Y. 14650.

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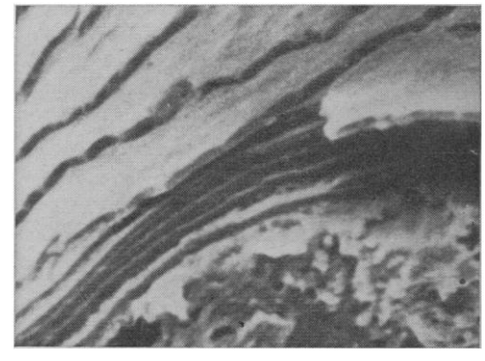

(Cover) Scanning electron micrograph of human hair (× 5000). Ends were sliced off, revealing a central medulla (inner dark circle), cortex, and cuticle. (Above) Scanning electron micrograph of a human hair (× 775), sliced transversely, shows six layers of cuticle surrounding cortex. Cortex appears rough, unlike smooth surface seen in cover photo. [Emil Bernstein and Eila Kairinen, Gillette Company Research Institute, Rockville, Maryland]

lees with whom I became acquainted in OEO's Work, Experience, and Training Program were friendly, most courteous, and grateful for the "pay" they got from their "jobs." The supervisors and administrators of the program were dedicated and competent. Many if not most of them were indigenous to Appalachia. They had been away to school and came back. They did not want to live or work elsewhere. I tried to recruit some of them without success. They were much related to each other and to the civic and political leaders. This was inevitable in view of their social and geographic isolation. I can't see how any extensive program in Kentucky Appalachia could operate without the relatives of its leaders. For the most part they are the only ones who are trained, who empathize with the people, and know how to deal with the complex interpersonal relationships in this isolated area. . . .

MILTON B. JENSEN
1405 Jacobson Circle,
Sun City Center, Florida 33570

My feelings regarding the OEO's Comprehensive Health Care Program in Floyd County were misrepresented in Bazell's article.

I tried to convey in my interview that all persons involved in the program everywhere should forget all pride and power and come together in unity to formulate a good health care program.

I did not intend to place blame on any one individual or group of individuals for the present status of the program.

RUTH JAMES
318 Central Avenue,
Prestonsburg, Kentucky 41653

Santa Cruz: A Misunderstanding

In commenting on Carter's article (15 Jan. p. 153) about the University of California at Santa Cruz, W. F. Eberz (26 Mar., p. 1200) shows such misunderstanding that some correction —even one as informal as mine—seems useful in these columns.

1) UCSC does not select "those with the highest grades." As a campus of the University of California system, UCSC is bound to admission criteria adopted by the whole system. To select among the applicants to this particular campus, grades are used only as part of a much broader array of criteria. Selecting applicants would be immensely more informed if pass-fail, with written evaluations of students' work, were adopted in secondary schools and so available to us. If we now use grades to judge applicants' strictly academic schoolwork, it is because grades are all that most schools currently present.

2) UCSC does not "deny . . . distinction to those who accomplish the most" nor deny graduate schools or others the means of "selecting the most fitting applicants." Quite the contrary, we believe pass-fail, with written evaluations of a student's work, provides a far more comprehensible, just, complete, and explanatory "grade" than can a list of more familiar but simply opaque digits or ABCDF.

What the university has been trying to do since 1965 is to evaluate students' work and accomplishment, rather than merely to shell out coinage for courses "taken." The endeavor can be faulted on some counts—demands on faculty time, initial uncertainties as to how best to achieve the aims of the task, difficulties in evaluating students' work in large classes—but we are aware of these dilemmas and trying hard to resolve them. What pass-fail and UCSC's other efforts simply cannot be criticized for though is any such hypocrisy as Eberz's letter implies.

TODD NEWBERRY
719 High Street, Santa Cruz, California

Calvert Cliffs Project

One of the crosses borne by a paleontologist is that of being called an archeologist. It happens all the time in the newspapers and we get pretty used to it, but it's a blow when it happens in *Science* (21 May, p. 826). This is not the only inaccuracy in Holden's article. The Baltimore Gas and Electric Company did not postpone construction to allow scientific excavation of the power-plant site. The company did, however, give excavation privileges at the site to the Maryland Academy of Sciences, which organized the Calvert Cliffs Paleontology Project with grant support from the National Science Foundation, Ford Foundation, the State of Maryland, National Geographic Society, Blaustein Foundation, and several corporate members of the Maryland Academy.

The project is mainly paleoecologic in nature, and is being carried out by

paleontologists and sedimentologists from various institutions. The cliffs at the site are 100 feet high and consist of portions of the Calvert, Choptank, and St. Mary's formations of Miocene age. With cooperation from the construction companies involved, five giant steps were cut in a hill that is truncated by the cliff (visible in the right background of the power plant photograph). This allowed extensive sampling of the bedding surfaces thus exposed—a marked advantage over the usual sampling at the intersection of a bed with the cliff face. Two-cubic-foot samples were taken, and their invertebrate fauna was analyzed in detail as to identity, stage of growth, position, parasites, number of specimens of each species, and many other parameters. Sediment samples were taken for mineralogical and microfaunal analysis. Fossil vertebrates (mostly marine mammals) were collected wherever they could be found.

The field phase of the project is complete, and data analysis is under way. We hope that a useful paleoecologic report will result from this combination of a mass of data and the efforts of a group of workers in a number of specialties.

FRANK C. WHITMORE, JR.
Geological Survey,
Washington, D.C. 20242

Confused

I RED RWN's artikle on M-O R&D in the 2 APR issue (p. 29) & was fascinated, EVN if I did not DIG the meaning of all the LETR groupings. R&D, DOD (DoD?), AEC & NASA were not 2 hard, and HEW has been much in the public print lately. U.S., of course, I got immediately. NBS? GAO (General Acceptance Othority?) & NSF were harder. But I quickly appreciated Congressman Daddario's HSoSR&D. And I agree with RWN that people DO want to solve problems of ddt, sst, abm, 1sd, and SMOG and SO (so on). And how about that CSEA he mentions, and the "NIforR&AS" (my abbreviations, not his— how come he din't?). RWN writes good, and I enjoyed reading his piece. Wish I knew more about the things he was talking about—like I do about any abbreviations I don't happen to know about. They sure make me feel DUM.

KENNETH DEARDORF
3613 Alberta Street,
St. Louis, Missouri 63116

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Reservations Concerning Gene Therapy

The attention recently given the prospects of gene therapy requires a realistic appraisal of the potential as well as a sober consideration of the liabilities of this therapeutic approach.

There is no doubt that the development of techniques for transfer of genes and chromosomes in laboratory studies of mammalian cells will provide a powerful research tool toward comprehension of both normal and abnormal cellular processes and will ultimately provide a rationale for the treatment of many human diseases. Gene therapy, however, involves direct application of this technology to individuals suffering from genetic disease. Possibilities under discussion include: introduction of DNA or of chromosomes either directly or by somatic cell fusion; transfer of genetic material from one host to another by virus-like particles containing DNA of the host cell; infection with active or inactive virus containing genes that can determine some particular biochemical function; or infection with a viral nucleic acid to which some cellular gene has been coupled.

Although the number of newborns suffering from disorders that can be described as genetic is very large, only a small fraction of these disorders would even in principle be amenable to intervention by any of these techniques. Neither genetically dominant disorders, nor multigenic traits, nor disorders resulting from extra chromosomes could be alleviated. The major remaining class is that of the recessive "inborn errors of metabolism." These occur with a collective frequency of about 1 per 1000 individuals and include, conservatively, between 100 and 1000 different disorders. Gene therapy would be likely to involve the isolation of somatic cells from a diseased individual, the alteration of their genetic endowment in vitro, and their replacement in the individual. For example, it seems unlikely that sickle-cell anemia would be relieved if a few percent of the blood-forming cells were replaced by cells capable of producing normal hemoglobin, or that the consequences of phenylketonuria would be relieved by the presence of a few somatic cells capable of converting phenylalanine to tyrosine. On the whole, it does not seem probable that more than a small fraction of the inborn errors could be helped by these techniques, and, with new developments in the understanding of the immune response, these disorders will probably be treated more easily and effectively by tissue transplantation or some sort of enzyme therapy.

Furthermore, there are certainly hazards, both known and unknown, that accompany the presently conceived strategies. Many of the procedures are likely to be mutagenic, and who can guess how many dominant effects, visible only in the whole individual, might appear? Most of the viruses under consideration as vectors are tumor-producing. Even the fractionated virus-like particles containing cell DNA are certain to include some particles containing viral DNA. Damaging alterations of regulatory processes and even uncontrolled tumor-like growth could easily be the consequences of introducing additional chromosomes or a host of viral genes.

The promises offered by the proponents of gene therapy largely ignore its limitations and hazards. To mislead the public in this regard risks another period of disappointment and reaction. We are still primarily in a descriptive phase in our understanding of human genetics, with little, if any, idea of how to intervene safely at any level. Let us not do to ourselves what we have done to our environment. Let us now seek public support for research toward a better understanding of normal and abnormal human biology, rather than promise quick glamorous cures.—MAURICE S. FOX, *Massachusetts Institute of Technology*, and JOHN W. LITTLEFIELD, *Harvard Medical School*

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