Does S/P give you more for your money than anyone, anyplace?

Does the snow fall?

When a laboratory equipment and supply distributor quotes you a lower price than S/P, it is probably too high. All things being equal, the only thing he has to sell you is service. So when he cuts his price, he may be simply cutting his service. His lower prices can hurt us a little, but he can hurt you a lot more. Our prices include more laboratory-trained representatives than anyone. Over 300 in 17 distribution centers from coast-to-coast. More servicemen than anyone, 150, including manufacturer-trained technical specialists for complex systems. More warehouse space than anyone. A whopping 13,553,000 cubic feet. More in-stock items than anyone. 129,000 separate items. More inventory than anyone. $28,000,000 worth. More delivery capabilities than anyone. Every major carrier and our fleet of 43 S/P trucks. More back up people than anyone. 1,580 strong. Our prices are competitive. But if anyone does offer a lower price, be sure to check his figures on service. You'll find S/P gives you more for your money than anyone else. Just as sure as the snow falls.

To take advantage of our More-For-Your-Money Service, call your S/P Representative or write Scientific Products, Division of American Hospital Supply Corporation, 1430 Waukegan Road, McGaw Park, Illinois 60085. S/P...a single source for laboratory equipment, supplies and scientific instruments.
What's smaller than a breadbox, has two channels and built-in preamps, and writes well under pressure?

Answer: the Brush 220.

The Brush 220. A rugged, two-channel recorder that's little to the tune of 25 pounds, accurate to 99.2% linearity.

Just plug it in. And then let Brush performance take over.

It starts with our pressurized ink system. A system that forces ink into the paper, instead of just laying it on. So you get traces that are clear, clean, and crisp. And a disposable ink cartridge holds a year's supply of ink.

Built-in preamps give you a measurement range of 1 millivolt per chart division to 500 volts full scale. And a choice of 20 signal conditioners give you an even wider range. Four chart speeds are push-button controlled. And two event markers are standard.

The Brush 220. It just may solve your recording riddles. To see the Brush 220 in action, call your Brush Sales Engineer. Or write for more information to Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114 or Rue Van Boeckel 38 Brussels 1140, Belgium.

BRUSH INSTRUMENTS

GOULD
Nicholas Wade makes a mistake shared by most scientists, publicists, and politicians who engage in the tricky problem of assessing the biological hazards of low-level physical insults. As one who has been involved in the almost isomorphic controversy regarding low levels of radiation, I can sympathize with both the "classical toxicologists, food technologists and agri-chemical engineers, who are trained to look for the short-term effects . . . [and the] microbiologists and geneticists . . . who are professionally concerned with the long-term effects of chemical contaminants on human health."

The point missed by Wade, as well as by most of the other protagonists, is that the seemingly simple question "What is the effect on human health of very low levels of physical insult?" can be stated in scientific terms; it can, so to speak, be asked of science, yet it cannot be answered by science. I have, in a paper presented to the Ciba Foundation last June, proposed the name trans-scientific for such questions that seemingly are part of science yet in fact transcend science—that is, are incapable of resolution by science.

Let me use as an example of a trans-scientific question the problem of low-level radiation dose. Here far more is known of a quantitative sort than in the case of chemical pesticides. The dose of x-rays, given all at once, that is necessary to double the spontaneous mutation rate in mice is often taken to be 30 rems. One may well ask, assuming the dose-response curve to be linear down to zero dose, how large an experiment would be required to demonstrate empirically that 170 millirems (which until recently was about the yearly dose allowed to be imposed by nuclear industry) would increase the mutation rate by the 0.5 percent predicted by the linear dose-response theory? The answer is that around $8 \times 10^9$ mice would be required to demonstrate a 0.5 percent effect at the 95 percent confidence level. So large an experiment is beyond practical comprehension. The original question as stated is therefore, in my terminology, trans-scientific.

One must note, further, that large experiments of this sort, when practical, are conducted on mice, not men; there is always a trans-scientific residue in any such experiments because of the inherent uncertainties in extrapolating quantitative dose effects from animal to man.

In a certain sense, Fitzhugh's attitude toward toxicology, which Wade somewhat sarcastically refers to as "refreshingly simple," is entirely correct: "... anything is safe if you go low enough, and anything is toxic if you go high enough." The point which has been lost is that any null experiment—that is, an experiment that shows no biological effect at low levels of insult—does not prove the insult is harmless, since a larger experiment might show effects. In the case of radiation, where massive quantitative data are available, the experimental population required to verify the linear hypothesis down to 170 millirems in mice is impossibly high.

As scientists, therefore, we must admit that some questions, including the most important ones raised by concern for the environment, are really trans-scientific, not scientific. When "... Ruckelhaus and Miller ..." were sur-
prised to find that scientists could disagree among themselves as much as lawyers do..." the disagreements in the main were over trans-scientific, not scientific, questions.

This does not mean that all questions underlying establishment of emission standards are trans-scientific; as Wade points out, the concentration of 2,4,5-T in food chains is a bona fide scientific question that science is proficient in answering. But I must stress that where low-level effects are concerned, there will always be a trans-scientific residue. To decide on standards when science can say neither yes nor no requires some procedure other than the one usually used by scientists in resolving bona fide scientific questions. Some version of an adversary procedure, whether formal, as in the licensing of a nuclear reactor, or informal, as described in Wade's report, probably is the best we now have for resolving the trans-scientific questions that underlie so many of the conflicts between science and technology, and society.

Alvin M. Weinberg
Oak Ridge National Laboratory,
Oak Ridge, Tennessee 37830

We have just returned from another inspection of the impact of war on the environment of Indochina, where the following situation came to light. Its gravity is reinforced by EPA Administrator Ruckelshaus's recent decision that public health considerations demand the maintenance of severe restrictions on the use of 2,4,5-T.

After the laudable suspension of the use of the military antiplant agent Orange (a mixture of 2,4-D and 2,4,5-T) last year (News and Comment, 24 Apr., 1970, p. 453), there remained unused in South Vietnam some $5.2 \times 10^6$ liters of Orange containing about $3 \times 10^6$ kilograms of 2,4,5-T, enough to treat over 200,000 hectares at standard military dose rates. We received conflicting reports as to whether the United States or South Vietnam currently has legal jurisdiction over this material.

Although the application of all antiplant agents in South Vietnam by U.S. armed forces was officially suspended in early May of this year, the South Vietnamese armed forces continue to apply them. The South Vietnamese currently employ agents White (a mixture of 2,4-D and picloram) and Blue (dime thyl arsenic acid), but it is our fear that the stores of Orange will also be used by them in the future. Our attempts to obtain clarification of this potentially serious situation met with frustration. An official spokesman for the South Vietnamese armed forces refused to comment. An official spokesman for the U.S. Embassy limited himself for the record to the statement that these unused stores of Orange "had not been forgotten." Unofficially, he commented that he wished he knew of a ready means of disposal for them. Finally, an official spokesman for the U.S. Military Assistance Command informed us in no uncertain terms that the Orange was the property of the Vietnamese government, that it was their country, and that they could employ it if, when, and as they wished.

It would be the height of bureaucratic nearsightedness for our government not to cut through any necessary red tape in order to have the remaining Orange destroyed before it is too late. The $21.9 \times 10^6$ kilograms of 2,4,5-T contained in the Orange, with which we inundated South Vietnam between 1962 and 1970, were applied prior to a knowledge of the medical (toxic and teratogenic) dangers; they are now known.

Arthur H. Westing
Windham College,
Putney, Vermont 05346

E. W. Pfeiffer
University of Montana,
Missoula 59801

Lindsay's Record

In Bazell's report on health research in New York City (News and Comment, 17 Sept., p. 1108) I was quoted as saying: "May or Lindsay is a typical liberal arts major who flunked science in prep school, so now he doesn't like scientists."

That statement looks harsher in print than it sounded or was intended when spoken—in hyperbole and in illustration of another point.

For all I know, John V. Lindsay may have had high marks in science at prep school; in political science, he undoubtedly led his class. As for his relations with scientists, his friends in New York count upon him to lead the way to change in the national political arena away from the anti-intellectualism that blights the support of science from Washington today.

Gerard Piel
415 Madison Avenue,
New York 10017

When safety comes first...

New Nalgene Pipetting Aids.

Now, eliminate the hazards of mouth pipetting without the need for special, complicated techniques. The new Nalgene Pipetting Aids provide fast, simple, one-hand operation—function just as if you were using the pipet alone.


Five sizes, 0.5, 1, 2, 5, and 10 ml, are color-coded and for use with all pipets, including measuring (Mohr) type (Cat. No. 3780). Assorted case places one of each size at your fingertips (Cat. No. 3781). Order from your Lab Supply Dealer. Ask for our Catalog or write Dept. 4211. Nalgene Labware Division, Rochester, N.Y. 14602.

NALGEC SYBRON CORPORATION

Nalgene® Labware...the permanent replacements.
New Clark-type electrode assembly can be used with Gilson Model KM or Model K Oxygraphs without modification. The Clark-type electrode eliminates the problems which occur when using a bare platinum electrode with high protein concentrations and particle suspensions such as whole blood and bacteria, and permits the use of the polarographic method in nonconductive solutions. The response time is only slightly greater than that of the bare platinum electrode.

- SENSITIVITY
- RESPONSIVENESS
- STABILITY

A recording oscillating oxygen cathode, the OXYGRAPH is a specific application of polarographic analysis. A single polarizable micro platinum cathode is coupled by a saturated KCl salt bridge to a nonpolarizable saturated calomel reference anode. Instead of recording a complete current-potential curve, only the limiting current (that current which is limited by the concentration of oxygen in solution) is recorded at an applied constant polarizing voltage, of about -0.6 volts with respect to the anode, across the indicator polarizable cathode.

- A micro platinum cathode for recording rapid changes of oxygen concentration in solution
- Large 20-cm span along the y-axis for a high degree of accuracy
- Sensitivity from ten- to a thousandfold greater than that of conventional gasometric methods for \( \text{O}_2 \) determinations
- Rapidity of measurements and ease of continuous recording permit accurate determinations of very rapid reactions involving molecular oxygen in solution

WRITE!
GILSON MEDICAL ELECTRONICS
Middleton, Wisconsin 53562
Telephone 608/836-1551
**Amino Acids—14C Labeled**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(SEE ADVERTISEMENT THIS PAGE)*

**Amino Acids—1H Labeled**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(SEE ADVERTISEMENT THIS PAGE)*

**Amino Acids—15N and 35S Labeled**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(WRITE FOR INFORMATION)*

**Amino Acids—Reconstituted Protein Hydrolysates (14C, 1H)**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(WRITE FOR INFORMATION)*

**Amino Acids—Special Contract Orders**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(WRITE FOR INFORMATION)*

**Amino Acids—Boc**
Schwarz/Mann
We supply virtually every starting material needed for peptide synthesis; 33 Boc-amino acids, 22 14C and 1H labeled Boc-amino acids, 12 Boc-amino acid resin esters, etc. Write or call for brochure.
Orangeburg, New York 10962 (914) 359-2700

*(WRITE FOR INFORMATION)*

**Amino Acids—Unlabeled**
Schwarz/Mann
Orangeburg, New York 10962
(914) 359-2700

*(WRITE FOR INFORMATION)*

**Amino Acids—**

**Where to buy it**

---

**14C Amino Acids from Schwarz/Mann**

**Division of Becton, Dickinson and Company**

Examples of the unusually high specific activities available from Schwarz/Mann:

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Specific Activity</th>
<th>Amino Acid</th>
<th>Specific Activity</th>
<th>Amino Acid</th>
<th>Specific Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-[14C] Alanine</td>
<td>159 mc/mM</td>
<td>L-[14C] Lysine</td>
<td>320 mc/mM</td>
<td>L-[14C] Valine</td>
<td>455 mc/mM</td>
</tr>
<tr>
<td>L-[14C] Arginine</td>
<td>320 mc/mM</td>
<td>L-[14C] Methionine</td>
<td>255 mc/mM</td>
<td>L-[14C] Phenylalanine</td>
<td>455 mc/mM</td>
</tr>
<tr>
<td>L-[14C] Asparagine</td>
<td>212 mc/mM</td>
<td>L-[14C] Tyrosine</td>
<td>212 mc/mM</td>
<td>L-[14C] Threonine</td>
<td>212 mc/mM</td>
</tr>
<tr>
<td>L-[14C] Leucine</td>
<td>320 mc/mM</td>
<td>L-[14C] Lysine</td>
<td>320 mc/mM</td>
<td>L-[14C] Threonine</td>
<td>212 mc/mM</td>
</tr>
</tbody>
</table>

Further re our high specific activities: ALL of our 14C amino acids are higher than 50 mc/mA. About purity, Every lot of phenylalanine and tyrosine is repurified every month. Every lot of everything else: reassayed every ten weeks and repurified if necessary. And all assay and re assay data goes onto the Product Analysis Report that you receive. About availability: these compounds are available from stock. For the complete story on our complete labeled amino acid line call (914) 359-2700 or write: Schwarz/Mann, Orangeburg, New York 10962, Division of Becton, Dickinson and Company.

(914) 359-2700

*(SEE OUR OTHER ADVERTISEMENT AND LISTINGS ON THIS PAGE.)*

---

**3H AMINO ACIDS FROM SCHWARZ/MANN**

Examples of the unusually high specific activities available from Schwarz/Mann:

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Specific Activity</th>
<th>Amino Acid</th>
<th>Specific Activity</th>
<th>Amino Acid</th>
<th>Specific Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-[3H] Alanine</td>
<td>6 mc/mM</td>
<td>L-[3H] Arginine</td>
<td>10 mc/mM</td>
<td>L-[3H] Lysine</td>
<td>6 mc/mM</td>
</tr>
<tr>
<td>L-[3H] Histidine</td>
<td>8 mc/mM</td>
<td>L-[3H] Lysine</td>
<td>6 mc/mM</td>
<td>L-[3H] Phenylalanine</td>
<td>7 mc/mM</td>
</tr>
<tr>
<td>L-[3H] Valine</td>
<td>8 mc/mM</td>
<td>L-[3H] Threonine</td>
<td>5 mc/mM</td>
<td>L-[3H] Leucine</td>
<td>1 mc/mM</td>
</tr>
</tbody>
</table>

These high specific activity 3H-labeled amino acids are reassayed every ten weeks— as is every radiochemical we make — and repurified when necessary. All relevant analytical data gets forwarded to you. For detailed information, call (914) 359-2700 or write: Schwarz/Mann, Orangeburg, New York 10962, Division of Becton, Dickinson and Company.

*(SEE OUR OTHER ADVERTISEMENT AND LISTINGS ON THIS PAGE.)*

---

For the rest of the Schwarz/Mann amino acid story write or call Schwarz/Mann
Orangeburg, N.Y. 10962
(914) 359-2700

---

SCIENCE, VOL. 174