

Distributing research money

Aleksandr Solzhenitsyn has faulted the press of the West for not really being free in presenting solid alternatives to the "party line" on whatever matter. I do hope therefore that you will let me challenge the prevailing party line on the possible effects of reductions in R&D funding. I found the following paragraph in your editorial—which I grant is a most faithful abstract of the views of the majority of the research community—wholly unscientific and certainly debatable.

"Will the Senate and House act in the best interests of the country etc . . . exempting the fragile, but indispensable plants of basic research from the impending wholesale budget slashing or will more short-sighted attitudes prevail." (Emphasis added.)

GUEST COMMENT

by
Rustum Roy

Surely it is high time that we in the science R&D community quit making pronouncements on what is in the best interests of the country. Who in the world could pretend to know that any more? Now as to "indispensable." Really! Indispensable to whom? The human race? The world? The West? The nation? The poor whites in Mississippi or the black youth of Chicago? Do you really mean that some accelerator or telescope is even indispensable to "Science" or "Physics?" Why scare words like "wholesale budget slashing"? The overall science budget has never experienced anything but minor second derivative changes. Finally, again, how do you know whether a 25% increase or a 25% decrease in physics funding is really the longest-sighted policy in the long run?

My reading of the mood of the American people and the Congress is that R&D will experience a gentle decrease (certainly as a percentage of GNP) down to perhaps two-thirds of its present level in the next decade. I do not pretend to know whether this will be good or bad for the economy, the US, humanity or the world. I am certain that it will in any case

	(estimated budget outlays) in millions of dollars	
	FY 1978	FY 1979
High-energy physics		
Fermilab	59.1	57.3
Brookhaven	33.2	35.8
Argonne	16.6	
SLAC	31.7	
General R & D		
Total operating		
Total	33.0	98.7

	(estimated budget outlays) in millions of dollars	
	FY 1978	FY 1979
Magnetically confined fusion	88.7	98.7
Confinement systems	43.6	52.5
Development and technology	42.7	52.2
Applied plasma physics	18.1	17.5
Reactor projects		
Total operating budget	193.2	221.0
Total capital equipment*	29.4	25.6
Total construction*	93.8	83.4
Inertial-confinement fusion		
Advanced lasers	9.5	9.1
Development and technology	2.9	3.5
	3.9	3.0
	9.7	7.2
		8.4
		3.0

not be determinative. My considered estimate is that when the people of the US begin to understand the real content of the R&D we conduct with the public money, there will be even sharper changes for the science community. Do you know, the masses actually believe that most scientists are using the public money to bring them longer and healthier life, more security through more and better defense, clean air, and water, and so on? Yes, basic research is also sold only on the basis of such goodies, only a little further away in time. But when it comes to dividing up the money within science a very different set of dogmatic values prevails. Radioastronomy suddenly ranks orders of magnitude above, say, environmental chemistry. Why?

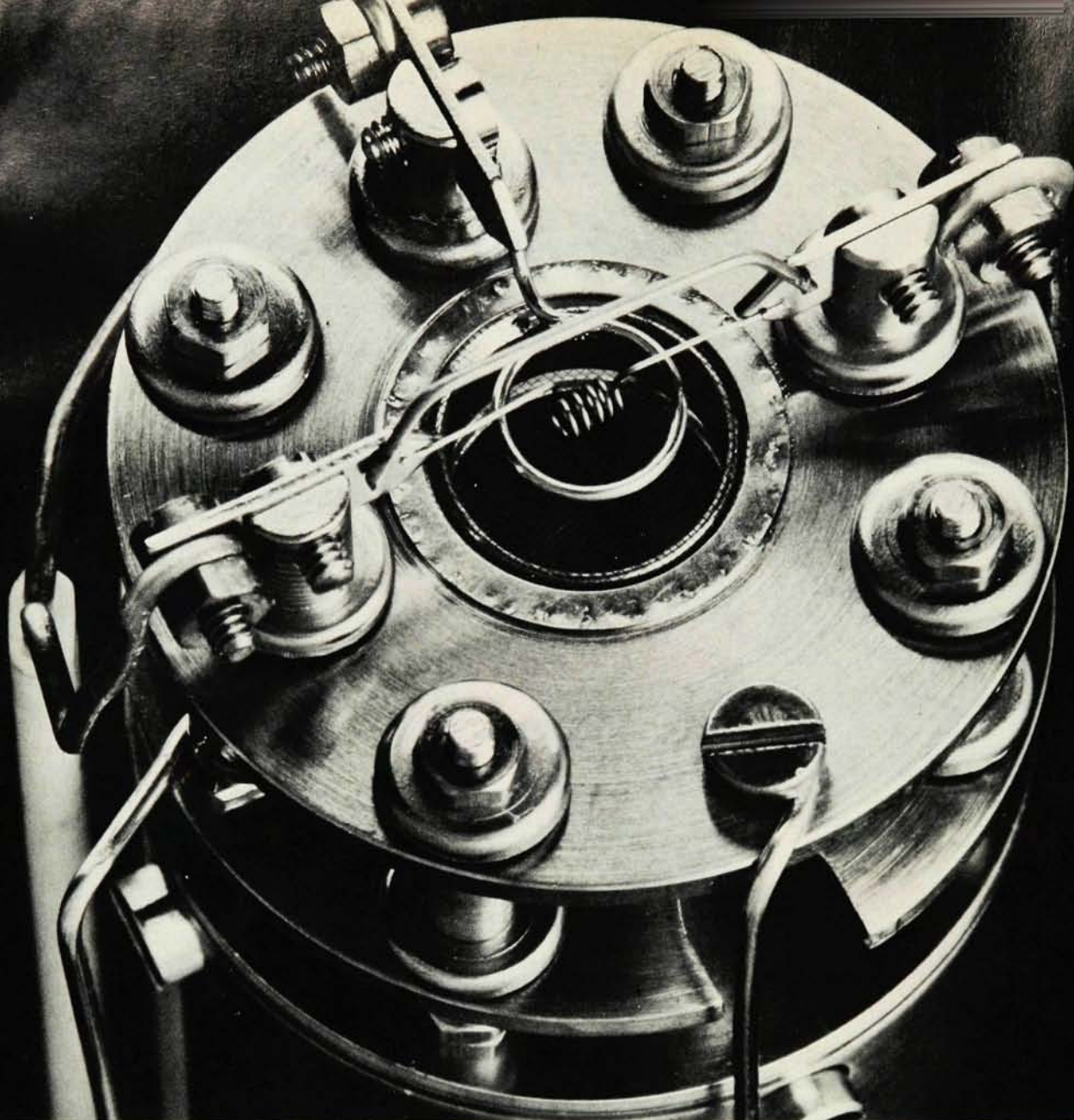
I wonder if an allusion to the People's Republic of China is any ground on which to base US national R&D policy. Recent studies give little or no comfort to the view that R&D investment is the cause of economic prosperity. (The causation is almost certainly the reverse.) Surely the distribution of basic research money among major research fields is the most unscientific, undemocratic, politicized budget allocation process in the entire Federal budget not excluding the Rivers and Harbors bill. As scientists it behooves us to attempt to bring the same measure of objectivity to examining R&D budget questions as we do to physics. I submit therefore the following problems:

On what basis can the claim be made

that spending let us say \$100 million on a new accelerator (generalizing to avoid any implication of a specific target) is good for physics? Have the following hypotheses been tested: (a) Spending \$100 million on other branches of physics would be much "better for physics?" (b) Cutting \$100 million and re-distributing the rest would be even more beneficial for physics. If it slowed the rate of data acquisition in some areas it might permit much more time for thinking and hence the planning and conduct of fewer but much more effective experiments. What I have said about physics could be generalized to the national R&D budget. Having struggled (rather successfully!) for 30 years with raising research support, I would, I can assure you, welcome a 25% increase in the Federal R&D budget as much as anyone. But I cannot produce, and have never seen in print, any scientific argument to show that this would be good for the nation or the world. And I believe that those who are making the case for slowing (not stopping or reversing) the pace of scientific advance have telling arguments.

If one were to accept for argument's sake my model for the gentle decrease in total Federal R&D expressed as a boundary condition, I believe that we could focus the creative energies of the community of scientists in a much more fruitful direction. Namely: Improving the devastatingly low efficiency of the process for distributing research money. I cite one data point for your consideration of what we could all do for ourselves, instead of continually expecting more public money. I have asked a dozen senior scientists in the solid-state sciences if they would accept 75% of the amount of basic research support they had been averaging in recent years, if they had to write only one succinct report per year and be judged on some long-range productivity formula. They all say yes.

I suggest that PHYSICS TODAY put out a call to readers for suggestions on improving the national processes for research money allocation and distribution. The APS should then appoint a small commission on the topic. Its resulting deliberations should go to OSTP, NSF, DOE, DOD, and so on, and PHYSICS TODAY could also devote a whole issue for



Our attention to detail makes the best quadrupole mass spectrometer

The quality in the ion source for our most powerful quadrupole mass spectrometer, the Model QMG 511, is reflected throughout the system. In the laboratory, you'll discover the QMG 511 has reliability that comes from our process control background, and in manufacturing, you'll see refinements from our experience in research applications.

The QMG 511's digital circuitry provides excellent signal stability; detection limits are at the parts-per-billion level. With mass ranges up to 1023, the system is adapted

to problem-solving across many fields, and advanced computer compatibility makes possible control of virtually all operational parameters.

Many of these features are also available in our Model QMG 311, an extendable quadrupole mass spectrometer for research and production, and in the Model QMG 111B,

our compact residual gas analyzer. And the quality in all three of these systems is in all of our other high vacuum, thin film, and mass analyzer products.

BALZERS

For literature about the QMG 511, QMG 311, and QMG 111B mass analyzers, write Balzers Corporation, 8 Sagamore Park Road, Hudson, NH 03051.

quest comment

a Great Debate on the subject: What should be the size of the R&D budget and how should it be distributed among fields and subfields? Invite the views of leading scientists in all fields, and see if we can come to any consensus.

RUSTUM ROY

Pennsylvania State University
University Park, Pennsylvania □

Physics Briefs *Physikalische Berichte*

Physics Briefs is a new abstracts journal covering the fields of physics, but it follows the long tradition of excellence established by the German publication *Physikalische Berichte* which it supersedes in 1979.

Beginning in 1979...

Physikalische Berichte
changes its title to
Physics Briefs.

Physics Briefs is published
completely in English.

Physics Briefs is published in
cooperation with the American
Institute of Physics.

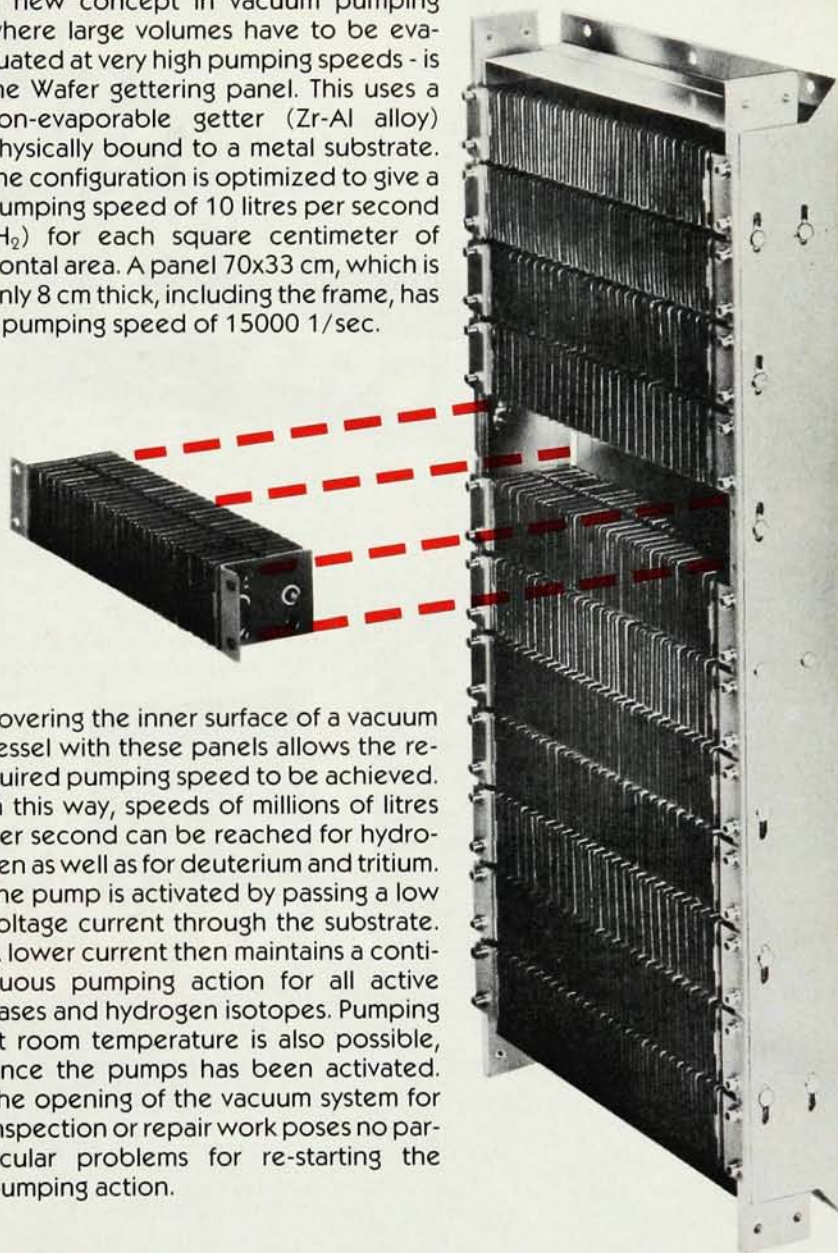
For additional information, write to:
American Institute of Physics
MARKETING SERVICES
335 East 45 Street
New York, NY 10017

HIGH CAPACITY GETTER PUMPS

saes[®]
getters

15000 Litres/sec per wafer panel

A new concept in vacuum pumping where large volumes have to be evacuated at very high pumping speeds - is the Wafer gettering panel. This uses a non-evaporable getter (Zr-Al alloy) physically bound to a metal substrate. The configuration is optimized to give a pumping speed of 10 litres per second (H_2) for each square centimeter of frontal area. A panel 70x33 cm, which is only 8 cm thick, including the frame, has a pumping speed of 15000 l/sec.



Covering the inner surface of a vacuum vessel with these panels allows the required pumping speed to be achieved. In this way, speeds of millions of litres per second can be reached for hydrogen as well as for deuterium and tritium. The pump is activated by passing a low voltage current through the substrate. A lower current then maintains a continuous pumping action for all active gases and hydrogen isotopes. Pumping at room temperature is also possible, once the pumps have been activated. The opening of the vacuum system for inspection or repair work poses no particular problems for re-starting the pumping action.

In the USA Wafer panels,
using SAES Wafer modules,
are also manufactured and sold by
Westinghouse Electric Corp.,
I-G Tube Division, Westinghouse Circle,
Horseheads, New York 14845
(607) 796-3261.

SAES GETTERS S.p.A.
Via Gallarate 215
I - 20151 MILAN
Italy - (02) 306208