
CORRESPONDENCE

Science and audit

First I should like to congratulate the Editor for taking an innovative step by opening a page for discussion of issues that affect the doing of science *satisfactorily* and *effectively*. The financial aspects of supporting science (*Curr. Sci.*, 58, 673) are one such issue; and given the present disposition of finance departments *vis-à-vis* scientists, it is only natural that much heat is generated when such issues are discussed. But what we need is the generation of light.

While Satyamurthy's statements may injure the feelings of some scientists, Venkataraman's over-protective reaction does not provide any soothing effect. We must therefore objectively analyse the major statements of Satyamurthy.

Satyamurthy says that huge sums of money are being spent now, compared to some twenty years ago, on science and technology. In absolute numbers, yes; but are we really spending huge amounts considering the declining purchasing power of the rupee, the tremendous growth in population, etc.? If we are truly committed to the goal of realizing social transformation and better living conditions through science and technology, then no amount is too big and no return is too insignificant. There is some truth in the statements made by Satyamurthy. For example, there is proliferation (to almost undesirable levels in some cases) in the cultivation of science and technology, like in many other fields. There is also lack of co-ordination among the various science and related departments of our government. In this, and in many other areas of science cultivation, the academies of science have a role cut out for them. But the point is: are they willing to shoulder the responsibility? I do not think scientists in India are profligate, as Satyamurthy would like the public to believe. On the contrary, the scientific community has, by and large, not been able to imbibe from other sectors of society the dubious virtue of being profligate. I can agree with Satyamurthy if he modifies his statement to say that there is lack of commitment to use monies effectively by some scientists or scientific organizations; but I cannot agree when he says that money is no problem for science. It is a big problem, especially for conscientious scientists who are not 'operators'. See the way our university-based scientists are

languishing. Satyamurthy refers to the give-money-and-do-not-ask-questions syndrome among scientists. I do not think there is even a grain of truth in this statement. The finance departments must learn to ask pertinent questions and not those of the harassing type. We only hear about *audit objection*. Why can't we hear about *audit co-operation* or *audit assistance*?

The finance departments must cultivate the habit of functioning as referees or reviewers (like those existing for judging scientific papers for publication in a journal) rather than as hangmen. This attitude will help foster the much-needed endearing environment between the scientific and financial communities, even if the latter wish to have the so-called *control* called *audit*. The referee of a scientific paper takes pains to offer such criticism that would make the paper acceptable for publication; similarly auditors can and should offer constructive criticisms rather than funnel out audit objections.

I think in all fairness to Satyamurthy he should be invited, at some stage after scientists have expressed their views on this subject, to have his say in these columns, since it is not uncommon to hear statements that the press has misquoted someone.

S. V. PAPPU

Dept of Electrical Communication Engineering,
Indian Institute of Science,
Bangalore 560 012.

Mr Satyamurthy has been contacted about replying to all the reactions by scientists.

—Editor

The 'impossible experiments' of Martin Fleischmann and his school

Martin Fleischmann has a remarkable track record of discoveries that were the results of unconventional experiments. To understand the phenomenon of adsorption of molecules on metallic surfaces, Martin Fleischmann used many new techniques, including Raman spectroscopy. In

1974 Fleischmann *et al.*¹ were the first to report enhancement of the intensity of Raman scattering by molecules of pyridine adsorbed on an electrolytically roughened silver surface. There was first much scepticism about this report till it was shown^{2,3} without doubt that the enhancement is 10^6 times that predicted from the scattering cross-sections for bulk pyridine. The phenomenon is now known as surface-enhanced Raman scattering (SERS). It has been reviewed by Fleischmann and Hill⁴ and is the subject of a monograph⁵ published in 1982.

In the early eighties Fleischmann and his students opened up yet another area in electrochemistry. They found that shrinking the size of electrodes to a few microns was accompanied by many unexpected advantages⁶⁻⁹, e.g. (a) they do not pose problems of charging current, (b) they could be used to electrolyse gases¹⁰! Such electrodes have been used to construct a scanning electrochemical microscope¹¹ with nanometre resolution. This has ushered in the era of microelectrodes in electrochemistry.

Martin Fleischmann always had a flair for the unconventional, a spirit that he has transmitted to his students. The world of science is waiting for an explanation for another of his new 'impossible experiments' (with Stanley Pons)—whether the observations are really due to cold fusion.

1. Fleischmann, M., Hendra, P. J. and McQuillan, A. J., *Chem. Phys. Lett.*, 1974, **26**, 163.
2. Jeanmaire, D. L. and Van Duyne, R. P., *J. Electroanal. Chem.*, 1977, **84**, 1.

3. Albrecht, M. G. and Creighton, J. A., *J. Am. Chem. Soc.*, 1977, **99**, 5215.
4. Fleischmann, M. and Hill, I. R., In: *Comprehensive Treatise of Electrochemistry*, (eds.) R. E. White, J. O'M. Bockris, B. E. Conway and E. Yeager, Plenum Press, New York and London, 1984, vol. 8, pp. 373-432.
5. Chang, R. K. and Furtak, T. E. (eds.), *Surface-enhanced Raman Scattering*, Plenum Press, New York, 1982.
6. Fleischmann, M., Pons, S., Rolison, D. and Schmidt, P. P., *Ultramicroelectrodes*, Datatech Science, Morganton, NC, USA, 1987.
7. Bond, A. M., Fleischmann, M., Khoo, S. B., Pons, S. and Robinson, J., *Indian J. Technol.*, 1986, **24**, 492.
8. Swan, P. N., Ph.D. dissertation, University of Southampton, 1980.
9. Mark Wightman, R. and Wipf, David, O. In: *Electroanalytical Chemistry*, (ed.) A. J. Bard, Marcel Dekker, New York and Basel, 1989, vol. 15, pp. 268-353.
10. Goroghchian, J., Dunmore, G., Pons, S. and Fleischmann, M., *Anal. Chem.*, quoted in ref. 7.
11. Bard, A. J., Fan, Fu-Ren F., Kwak, J. and Leu, O., *Anal. Chem.*, 1989, **61**, 132.

S. R. RAJAGOPALAN

Materials Science Division,
National Aeronautical Laboratory,
Bangalore 560 017.

ANNOUNCEMENT

INSA—SPONSORSHIP AND FINANCIAL ASSISTANCE FOR HOLDING CONFERENCES/ SEMINARS/SYMPOSIA IN INDIA DURING 1989-90

Proposals for holding Conferences/Symposia/Seminars/Workshops in India are invited by the Indian National Science Academy for sponsorship with partial financial support. The Academy normally provides Rs. 5000 to Rs. 10,000 for a national conference/workshop and Rs. 10,000 to Rs. 20,000 for an international conference. The

annual type of conferences/symposia are not encouraged by the Academy.

The application form may be obtained from the Project Officer (Basic Sciences), Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110 002.
