easy to follow, well indexed and, for a work of such scope, remarkably consistent in its notation and presentation.

The material may be divided into two consecutive parts. The first six chapters are concerned with the basic physical principles of inelastic scattering. Starting from Maxwell's equations, derivations of the basic equations for spheres and cylinders are given. Both homogeneous and stratified particles are considered. It is to this section of the book, occupying 300 of the 620 pages, that the subtitle is primarily relevant. Current references from the literature to the theoretical derivations, experimental verifications and practical applications of the various aspects of the book are drawn from radio wave astrophysics, microwave radar meteorology and visible light particle analysis.

The second half of the book deals with the physico-chemical applications of light scattering. Here again, the material is well sectioned, not only in terms of particular types of scattering material but also by methods of experimental analysis and data handling (turbidimetric methods; dissymmetry; partial orientation; use of Tyndall spectra and the like). Together with its detailed literature survey, this makes the book an excellent hand-book.

I have two major criticisms. First, few readers will have a detailed interest in both sections of the book. Second, little practical information is given. Nothing is mentioned about apparatus design, calibration and correction factors for the same, sample preparation and the various practical difficulties that have until quite recently accompanied light scattering measurements. Some information on the limitations of the various procedures would also have been useful. For these reasons, it is not a book to give to a newcomer to experimental light scattering.

I have no hesitation, however, in recommending it as the most valuable sourcebook to date for anybody seriously interested in light scattering, especially if he is a physical chemist.

B. R. JENNINGS

that is, about one ten-thousandth of the possibly toxic level.

(c) No other chemical that gets into the food supply has been put under such a low tolerance relative to the toxic dose.

(d) The reason for this extremely low tolerance was the quasi-religious attitude towards cows' milk; higher DDT tolerances are permitted in baby foods.

(e) Only because of a remarkably low rate of DDT excretion in cows was it possible to get cows' milk down to this level.

(f) Puppies consuming maternal milk containing 600 p.p.m. of DDT in the fat show no symptoms of toxicity.

(g) It would undoubtedly be possible to show a linear positive correlation between infant health and DDT content of breast milk in tropical countries where, as Sir Macfarlane Burnet points out¹, malaria is the great killer of babies.

(h) The liver enzyme system induced by DDT in rats detoxifies aflatoxin² which is a potent carcinogen, and is thought to be a public health problem in Africa.

(i) During the WHO anti-malaria campaign, 535 million people and 130,000 spray operators were exposed to DDT when the interiors of homes were sprayed and there was not a single case of sickness attributable to DDT.

(j) The presence of DDT in human milk has been studied since the 1950s, and in 1966 a US Congressional committee reported that the study indicated that the amounts were harmless.

(k) The levels of DDT in human fat are trending downwards in the USA³, just as they are in Great Britain (*Nature*, **224**, 1249; 1969).

Yours faithfully,

THOMAS H. JUKES

University of California,
Berkeley, California.

¹ Burnet, Sir Macfarlane, in *Natural History of Infectious Disease*, second ed. (Cambridge University Press, 1953).

² McLean and McLean, *Brit. Med. Bull.*, **25**, 269 (1969).

³ Wolfe, H. R., Paper presented at DDT hearings, Seattle, Washington, October 14, 1969.

Correspondence

Alarums and Excursions

SIR,—In expressing trepidation over the presence of DDT in human milk, Shapiro *et al.* (*Nature*, **224**, 1337; 1969) have selected a singularly infelicitous example to give substance to their fear that the world faces immediate doom.

The human milk scare was one of the top science fiction horror stories of 1968. It was skilfully skyrocketed into the headlines by V. Yannacone, the "ringmaster" (*Science*, December 26, 1969, p. 1603) of the Environmental Defense Fund at Madison, Wisconsin. The announcement was made by a scientist who flew from Sweden to Wisconsin to announce that he had detected DDT in human milk.

A modest amount of search of the literature, however, would have shown Shapiro the following:

(a) The detection of DDT in milk, penguins, the kitchen sink, etc., is a tribute to vapour phase chromatography, and it is also possible to detect arsenic, lead, gold, radioactivity and smog in all protoplasm by suitable measuring instruments. (There is a saying in the USA that a conservationist is a person who insists that the 40 billion gallons of raw sewage that are dumped annually into Lake Erie must contain absolutely no DDT.)

(b) The tolerance for DDT in cows' milk was set at 1 per cent of the tolerance in other foods some years ago,

On Which Side are the Angels?

SIR,—May I take issue with some of the opinions on the prospective applications of molecular genetics expressed in two leading articles (*Nature*, **224**, 834 and 1241; 1969) commenting on a report by Dr James Shapiro and his Harvard colleagues (*Nature*, **224**, 747; 1969) on the isolation of the lactose-operon DNA of *E. coli*? In your leading articles you defend the assertion that science and technology will contribute to the solution of daunting problems—as if that obvious proposition were being challenged—and then warn, correctly, that misguided notions are being generated in the public mind about science being a source of danger rather than of benefits to humanity.

In my opinion, the responsibility for the distorted public evaluation of science and technology is not that of persons like Dr Shapiro or myself who raise warnings about potential misuses of new technologies in our society. The responsibility rests on the way new technologies have in fact been put to mischievous or trivial uses, alongside positive ones, in present-day societies. Suffice it to mention nuclear weapons, the man-on-the-Moon programme, the automobile-highway boondoggle in the United States and the unchecked filling of our environment with pollutants and irreducible heaps of trash. None of these problems is created by a malevolent science or technology. They are generated by misapplications of science and technology in profit-driven or power-ruled societies.

In fact, more science and technology rather than less of them—a social science and social technology of human

living—may have to be developed and applied fast in the political arena if we are to secure a society that will no more turn the fruits of natural science to anarchistic, irrational uses.

By misrepresenting current criticism of the misuses of technology as a criticism of the scientific enterprise, and by flippantly dismissing thoughtful warnings about the mischief to which new technologies may soon be put in our society, you are doing a disservice to the very cause of scientific progress and its financial support which they wish to uphold.

Yours faithfully,

S. E. LURIA

Massachusetts Institute of Technology,
Cambridge, Massachusetts.

The leading article referred to dealt only in passing with the letter from Dr Shapiro and his colleagues—Editor, *Nature*.

Secondary Amines in Cooking

SIR,—No doubt those food chemists working on the nitrosamine problem will want to comment on the Lijinsky and Epstein paper (*Nature*, **225**, 21; 1970). My own observations are that, in spite of the general excellence of this essay, it has the element of scariness to which you draw timely attention in "How to Ban Chemicals without Scaring People" (*Nature*, **225**, 3; 1970). I am concerned, in particular, with the paragraphs based on the hypothesis that the cooking of food possibly affords a series of secondary amines which then proceed to be converted by nitrite present in the stomach into carcinogenic materials. More specifically, "Pyrolysis of protein and cooking of protein food might produce free amino-acids such as proline, arginine and hydroxyproline". If this theory required testing, then the most useful protein to evaluate the validity would be collagen, particularly because proline and hydroxyproline are scantily represented in other protein sources associated with food. The imino and amino-acid content of a typical bovine collagen would include proline (14 per cent), hydroxyproline (14 per cent) and arginine (8 per cent) which, on the Lijinsky and Epstein hypothesis, could represent an enormous toxic danger in producing these imino and amino-acids in the free form for potential reaction with nitrite. The cooking of collagen is a regular research procedure in these laboratories, employed to melt out gelatine, and temperatures between 60° and 100° C are used. Although we have frequently had cause to look for free amino-acids in extracts of collagen, there has never been any sign of proline, hydroxyproline or arginine, nor have they appeared as small peptides. This is not surprising. Different pairs of amino-acids take part in peptide bonds resulting in a variety of thermal stabilities. Those bonds with the highest labile character are those of Gly.Gly (ref. 1) while peptides containing proline seem to be unusually stable². In the protein situation it is likely that extra stability will occur as a function of the position of dipeptide unit in the overall sequence. It invariably requires the drastic conditions of strong acids or bases at high temperatures to reduce collagen to peptide proportions, and even here free proline, hydroxyproline and arginine are unlikely, although ultimately the dipeptides Gly.Pro (ref. 3) and Hyp.Gly (ref. 4) become evident in acid hydrolysates. This is not to deny a possibility that cooking might promote the reaction of secondary amines with *in situ* nitrite to the nitroso derivative, but rather to distrust the suggestion that the secondary amines could be proline, hydroxyproline or arginine in the free state. Again, although the chemistry of the route to piperidine and pyrrolidine from the diamines, cadaverine and putrescine is not in dispute, it seems unlikely that a consistent ingestion by humans,

particularly of decayed meat and fish, would make these a practical suggestion as a secondary amine source.

Yours faithfully,

A. COURTS

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Birmingham 12.

¹ Synge, R. L. M., *Biochem. J.*, **39**, 351 (1945).

² Conden, R., Gordon, A. H., Martin, A. J. P., and Synge, R. L. M., *Biochem. J.*, **41**, 596 (1947).

³ Heyns, K., Anders, G., and Becker, E., *Z. Physiol. Chem.*, **287**, 120 (1951).

⁴ Schroeder, W. A., Kay, L. M., LeGette, J., Honnen, L., and Green, F. C., *J. Amer. Chem. Soc.*, **76**, 3556 (1954).

Palaeontological Data

SIR,—A recent issue of *Nature* (**224**, 636; 1969) contained a report of a plan for a proposed archive of palaeontological data in Great Britain. In this report mention was made of a central file of palaeontological data based on the New Zealand Geological Survey. This national file, established in 1951, is administered through regional masterfiles held at the geology departments of four universities and seven offices of the New Zealand Geological Survey^{1,2}. The file is the result of outstanding collaboration between institutions and geologists in New Zealand, and is a valuable source of stratigraphic and palaeontological data. The present content of the file is summarized by Speden³.

At its annual general meeting held in Dunedin on December 1, 1969, the Geological Society of New Zealand accepted recommendations to assume responsibility for the New Zealand Fossil Record File and to encourage computerization of the file⁴, and a standing committee to supervise the file has been established. A pilot project on computerization of the file has been in progress since 1965⁴ and is now being developed at the national level.

Yours faithfully,

I. G. SPEDEN

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NZ Geological Survey,
PO Box 30368, Lower Hutt, New Zealand.

¹ Fleming, C. A., *Geol. Soc. NZ Newsletter*, **5**, 27 (1958).

² Speden, I. G., *Geol. Soc. NZ Newsletter*, **27**, 25 (1969).

³ Speden, I. G., *Geol. Soc. NZ Newsletter*, **27**, 31 (1969).

⁴ Scott, G. H., *NZ Geol. Survey Report* (July 1967).

University News

Dr J. V. Armitage, at present senior lecturer in mathematics at King's College, London, has been appointed to the Chair of Mathematical Education at the **University of Nottingham**. Dr Armitage will also act as director of the Shell Centre for Mathematical Education.

Mr Neil Spoonley has been appointed director of the **University of London Computer Centre**.

Dr Brian D. Nellist has been appointed as the first director of the Industrial Centre for Design and Manufacturing Engineering, **University of Salford**.

Appointments

Mr Donald Rowley, executive director of the British Aircraft Corporation's Electronic and Space Systems Group, has been appointed chairman of the **National Industrial Space Committee**.

Three new members have been appointed to the **Social Science Research Council**: **Professor Harry Kay** (University of Sheffield), **Professor N. Lichfield** (University College London) and **Professor L. W. Martin** (King's College London).