

Newton for mere 10^5 dynes \sim 1/4 lb force is sheer waste of a great name.

(4) A minor point: Dante's inferno was not at a very high temperature. Liquids and solids were visible. In fact, the central portion of inferno, filled with the foulest, was found frozen.

Yours, etc.,

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More About the Units

SIR,—The internationally agreed symbol for 10^6 is M and this is the initial letter of million. Would it not be logical and convenient to turn this happy accident into a principle and use G, the internationally agreed symbol for 10^9 , as the initial letter of the word for 1,000,000,000? That number would thus be called a gillion. Whether the g should be hard or soft is a matter of opinion. I incline to hard because of the derivation from giga.

Yours faithfully,

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Science Not Applied

SIR,—It is gratifying, if in a rather pessimistic sense, to find the Swann committee confirm what increasing numbers of QSEs have come to realize in recent years, namely the growing disillusion with applied science among newly qualified young people. The ills of industrial research are well known; perhaps the report will encourage the general transformation needed in our educational structure, and, one hopes, stimulate a more enlightened view in that most conservative of all our institutions—British industry. To promote science for the sake of the economy is, however, rather like making an offering to propitiate the rain god; the result is unpredictable. Until economic forecasting progresses beyond the primitive use of first and second derivatives ("trends" and "levelling off" respectively) and can take some account of mutual interactions the possibility of the proposed measures triggering off limit-cycle behaviour (as exemplified by "stop-go" policies) will always be with us.

Yours faithfully,

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Chemists into Economists

SIR,—In your issue of October 5 (220, 6, 1968) you published an account of a meeting of a group of economists and chemists held recently at ICI Mond Division, Runcorn, to discuss whether economics can be usefully introduced into undergraduate chemistry courses. The possibility of creating "new courses in which chemistry and economics stand in equal partnership" was mooted and it was stated that a combined chemistry and economics course had been proposed at Oxford.

The purpose of this letter is to point out that such a course has been in existence in the University of Exeter since October 1965. The course is one of the options in the Inter-Faculty BSc degree in science, social studies and philosophy which is a combined honours degree in either chemistry or physics and either economics or sociology or politics or economic history with ancillary mathematics and, at present, philosophy. This is just the sort of degree course which is being widely advocated at the present time. The response to the provision of this course has been very disappointing to those of us who were instrumental in setting it up, believing it to be a useful and desirable new development. This year, for twenty available places,

there were only twenty-five applicants, of whom four have, in the event, come into residence, two to read chemistry and economics; this represents a marked decrease in applications in comparison with the previous three years.

It is possible that this poor response is in part due to the somewhat uninformative description of this course (Exeter 24/85000/SSSP) in the UCCA handbook (*How to Apply for Admission to a University*, 1968 edition). I hope very much that publication of this letter will stimulate many more potential candidates to apply for admission to this course, the nature of which is so much in keeping with modern trends and ideas.

Yours sincerely,

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Superconductors in Power Plant

SIR,—Some of the comments made by Mr Wilkinson about the IRD superconducting motor in the article "Superconductors in Power Plants" (*Nature*, 219, 1317; 1968) have now been retracted, but the implications were so damaging to our work that an answer is necessary.

The development of superconducting machines has been in progress at IRD for 5 years, and following the success of a 50 H.P. machine over two years ago we are now constructing a 3,250 H.P. motor with the support of NRDC. We have established that there are good market prospects for both superconducting d.c. motors and generators and many designs are at an advanced stage. We have not yet published details of our work for reasons of commercial and military security, and Mr Wilkinson's remarks will be answered in detail when we publish next year. However, we took strong exception to his main comment (now retracted) that copper could replace the superconductor and that the cost of the refrigerator would pay for the copper, power supplies and capitalized value of the losses.

If the superconducting winding of our motor, which I wish to emphasize is a prototype for much larger machines, is replaced with 99.999 per cent pure copper the power consumption would be 14 MW which is quite impractical. This neglects magneto-resistance effects which would increase the loss significantly and assumes the same average current density as the superconducting winding. The capitalized cost of the losses at the modest figure of £100 per kilowatt is £1.4m. If the current density is reduced to a more realistic value of 10,000 amp/inch² the power loss is 5.7 MW but the useful magnetic flux of the machine is reduced by 20 per cent because of the large coil volume. Further reductions in current density bring the machine flux to an even more unrealistic level. Cryogenic cooling is no better than water cooling in these machines; the total loss (joule heating and refrigerator power) is 30 MW for liquid nitrogen and 20 MW for liquid hydrogen. The only practical way to use copper windings is in conjunction with an iron magnetic circuit that is the conventional type of machine; our reason for departing from conventional machines was to achieve cost and weight reductions and there is a very sound case for superconducting machines which will be published later.

Finally, I must add that we (and others who have been collaborating with us in this field) performed many similar calculations to the aforementioned over the last 5 years and substantial sums of our own and public money have not been committed without extremely careful checks of our calculations.

Yours faithfully,

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