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**COVER:** In the infinite largeness of time, is there also an infinitely small interval that separates "adjacent" moments? For some mathematicians there is, but the language of mathematics is often sorely strained to deal with such concepts. Hence, "metamathematics," a linguistics for the language of numbers, but which is also turning out to have practical value as a modeling tool in fields ranging from economics to fluid mechanics. See p. 108. (Illustration: Ann Lunsford)

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February 15, 1975

# To the Editor

## The arithmetic approach

With regard to the arithmetic approach to Newtonian and special relativistic mechanics (SN: 1/18/75, p. 38), I would like to make three comments.

First, such an approach allows the use of new types of models, called discrete models. These are formulated in the spirit of classical molecular mechanics and conserve exactly the same fundamental invariants as do continuous models, but they are governed by arithmetical dynamical equations. Such new models are now available for studying fluid flow, elasticity, heat transfer, gravitation and wave generation. A survey paper on these matters will appear in the AMERICAN JOURNAL OF PHYSICS about August 1975.

Next, it should be noted that the arithmetic approach has also been applied in nondeterministic physics. For example, the study of the dynamical interaction of three particles in quantum dynamics has proved to be formidable, and primarily because the number of dimensions involved is computationally restrictive. Thus, within the last several years, there have emerged quasi-quantum mechanical methods in which potentials are calculated from Schroedinger's equation while the particle trajectories are calculated from deterministic equations.

Finally, it should be noted that the arithmetic approach could be important at all educational levels, not just that of the high school. For example, the miasma of the "new math" could be replaced by conventional arithmetic with additional study of high-speed arithmetic. In this fashion, since digital computers are now becoming more economical to obtain and maintain, mathematics which is understandable, applicable, and exciting could be made available to all.

Donald Greenspan  
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## KMS on fusion

As you may expect, our attention was caught by the article "KMS Fusion Claim Revisited" (SN: 1/25/75, p. 56). You refer to our report of the first observations of neutrons from thermonuclear reactions, made in May 1974. This is followed by your statement "now in the Jan. 13, 1975, PHYSICAL REVIEW LETTERS, KMS scientists present a supporting argument based on compression of glass shells, etc." The implication is that no new results had been published between the two dates.

The production of fusion neutrons by compression of thermonuclear fuel has, indeed, been substantiated, and by numerous experiments at KMSF. Significant advances have been reported by KMS Fusion, since the original announcement of compression neutron yields in May 1974. At the American Physical Society meeting in Albuquerque, N.M., in October 1974, neutron yields of  $4 \times 10^6$  were reported, an increase of a factor of 10 over the first successful experiments. At the 5th IAEA Conference on Plasma Physics and Controlled Nuclear Fusion in Tokyo in November 1974, a further increase in yield to  $7 \times 10^6$  neutrons was reported. These advances have confirmed our original interpretation of the neutron production mechanisms and have, we believe, dispelled much of the initial skepticism mentioned in your article.

The paper in PHYSICAL REVIEW LETTERS upon which your report was based was submitted for publication to help dispell some of the doubts that have been raised about stability of a glass shell under ablation-driven implosion. It was not intended to deal with neutron production by fusion which had been dealt with in the papers cited above. Compression analyses similar to those described in the PHYSICAL REVIEW LETTERS have been performed on gas-filled targets and reveal a strong correlation between observed compression and neutron yield.

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President

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## Responsibility for fluorocarbon

The attitude of DuPont's technical products manager to the fluorocarbons study (SN: 11/30/74, p. 341) only illustrates the unfortunate initial response of large corporations to possible necessary changes in an established product. The probabilities of ozone damage have not discredited the hypothesis. The research or acceptance of any data is the responsibility of the damager, and the corporation certainly can afford to develop and phase in alternatives now. The chance taken by neglect here is simply too great.

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