facie evidence for the origin of EETA 79001 on or near the surface of Mars.

The next question is exactly that posed by Ott and Begemann[1]: is there direct evidence in the noble gases that ties the SNC meteorites together and thus to the same parent body? If EETA 79001 is from Mars, are they all? As pointed out earlier, these meteorites do resemble each other in many respects. One of the most powerful ways to explore such interrelationships is by use of isotope ratios; perhaps the most convincing evidence at present for a common SNC parent is their shared distinctive oxygen isotope signature[12].

In their study, Ott and Begemann look for the isotopic and elemental signature of the EETA 79001 noble gas component in the Shergotty, Nakhla and Chassigny meteorites. The results are mixed — literally. While not seen in pure form (undoubtedly due, as noted by the authors, to the absence of the unusual macroscopic glass nodules that are the principal trapping sites in EETA 79001), there is convincing evidence for the presence of these noble gases in Shergotty, where they appear mixed with a second kind of gas component that may be represented, more or less, by that in the Chassingny meteorite.

Wiens *et al.*[13] have found just this situation within EETA 79001 itself, with clear indications of two independent nitrogen and noble gas components. One, dominant in the glass, is attributed to the martian atmosphere; the other seems likely to derive from the mantle source region for these basalts. The only real departure from a coherent two-component mixing pattern in Ott and Begemann's data appears in Fig. 1*b* of their paper, where the points for the Nakhla meteorite fall above the mixing line. This could require a third gas component, rich in ^{129}Xe, as the authors suggest. Another possibility is that the high ^{129}Xe/^{132}Xe ratio is due, as in Shergotty, to the presence of atmospheric gases, but with relative elemental abundances severely fractionated by whatever the processes were that led to their incorporation into Nakhla. Fractionation of the Kr/Xe ratio by about a factor of five would be needed to account for the data. It is a pity that the large amount of spallation-produced argon in Nakhla masks so completely the trapped ^{36}Ar abundance. If this were not so, the prediction of a very low trapped Ar/Xe ratio resulting from mass frationation of this order could be tested.

In large part, the scientific excitement generated by the SNC–Mars association comes from the potential for using these meteorites to address questions about Mars that cannot be answered, or even adequately explored, using only the data now in hand from Earth-based and Viking observations. One important class of problems concerns the initial inventory and subsequent history of volatile elements and compounds — the noble gases, nitrogen, carbon dioxide and water — on Mars. Here, for believers, the SNC meteorites will certainly play a leading role in meeting the challenge of understanding the origin and evolution of the martian atmosphere, and the relation of martian volatiles to those on Earth, Venus and the more usual meteorite parent bodies. One example is Ott and Begemann's discussion of a central question: how, if at all, do noble gases of the type found in Chassigny relate to the present atmosphere of Mars? Did the atmosphere derive from this kind of mantle reservoir or are we dealing with some independent source of atmospheric gases? The fundamental difficulties they encounter in deriving the current atmosphere from Chassigny-type sources may force attention to an alternative model: a gas-bearing veneer of primordial, late-accreting matter that could well be unrepresented in the contemporary meteorite population.

All this should not be taken to mean that there are no outstanding problems with a martian origin for the SNC meteorites. The gravitational potential well of Mars is deep, and calculation of the mechanics of a meteorite impact on the surface reveals difficulties in ejecting from the planet fragments of the crust a metre or more across[14]. The residence times of these meteorites in space, given by their cosmic-ray exposure ages, imply ejection at different times and therefore by more than one impact event. This is troublesome if the chemical and chronological similarities within the SNC suite are interpreted to mean that they all derived from a very restricted area of the martian surface, so that more than one large meteorite strike into the area during the past 10 Myr or so becomes improbable.

Discovery of meteorites from the Moon has verified that at least fragments can be liberated from relatively large bodies without being destroyed in the process. Given eight SNC meteorites from Mars, however, several of which have been observed to fall in the past two centuries, there remains the question of whether we should not be up to our necks in lunar meteorites — that is, what would be the expected relative fluxes of objects from

Paul J. Flory (1910 –1985)

On 9 September, Paul Flory died of a heart attack at his holiday home in Big Sur, California three months after his many friends, colleagues and past students had celebrated his 75th birthday with a scientific symposium at Stanford University.

Paul Flory was awarded the Nobel Prize in chemistry in 1974, in recognition of enduring contributions to polymer science, a field that he, as much as anyone, helped to found. To salute his achievements, Stanford University Press this year published three massive volumes entitled *Selected Works of Paul J. Flory*, edited by past and present associates. A notion of the impact of Flory's contribution on the development of polymer and related sciences can be gained by turning the pages of this magnificent testimony to human endeavour, spanning half a century of unceasing achievement.

Flory published his first papers on the kinetics and mechanism of polymerization and molecular weight distributions in high polymer systems in 1936, while employed in the group of Wallace H. Carothers, the inventor of nylon, in the research laboratories of the Du Pont Company. At that time polymer science had just come into being, following the efforts of Hermann Staudinger to prove the existence of large molecules to a reluctant chemical establishment. With uncanny intuition Flory enunciated the rules governing the generation of high polymers and those describing their behaviour in solution and in the solid state. It is thanks to his insights and those of his illustrious contemporaries, in particular Werner Kuhn, Peter Debye and John Kirkwood, that we have come to a quantitative understanding of macromolecular behaviour. Flory's work and achievements cover such diverse aspects as solution thermodynamics of polymers and mixtures, hydrodynamics, the rules governing melt viscosities and the transition to the glassy state, crystallization of polymers from melts, chain configuration and conformational analysis, rubberlike elasticity, semicrystalline rigid polymers and liquid crystals. To Paul Flory we owe an understanding of the excluded volume in solutions of macromolecules and the concept of the theta, or Flory, temperature, at which the excluded volume vanishes and nonidealities in polymer solutions are internally compensated. At the Flory temperature, macromolecular chain configurations are unperturbed in solution. Many years before neutron scattering from deuterated macromolecules made it possible to verify his prediction, Flory had postulated that macromolecules in the amorphous bulk state would also assume unperturbed configurations. Flory's book *Principles of Polymer Chemistry* published in 1953, remains the classical reference in polymer science; to it was added in 1969 *Statistical Mechanics of Chain Molecules*.

Paul Flory's creative activities continued up to the time of his death. He was a "severe" teacher, an outstanding personality and a man of high principles. He had strong convictions concerning the responsibilities of scientists in the service of society and his extramural activities were manifold. I would like in particular to stress his efforts on behalf of dissident scientists in Eastern Europe, efforts which he pursued with great vigour and devotion. Personalities of his intellectual and moral calibre are indeed few. Henryk Eisenberg