

# CORRESPONDENCE

## Imprinting

SIR,—The earliest reported historical references to imprinting frequently cited in reviews of the subject<sup>1-3</sup> are the systematic observations of Spalding<sup>4</sup>. Spalding observed that "chickens as soon as they are able to walk will follow any moving object. And, when guided by sight alone, they seem to have no more disposition to follow a hen than to follow a duck, or a human being".

The following response and the formation of attachments of young nidifugous birds were noted, however, more than 350 years earlier by Sir Thomas More. In his classic treatise *Utopia*, first published in Latin in 1516, appeared the following account of a practice in Utopia:

"They breed vast numbers of chickens by a most extraordinary method. Instead of leaving the hens to sit on the eggs, they hatch out dozens at a time applying a steady heat to them—with the result that when the chicks come out of the shells, they regard the poultryman as their mother, and follow him everywhere!"<sup>5</sup>.

One wonders whether More's allusion to imprinting was derived from then-existing knowledge applied perhaps in some foreign land, or was the product of his own observations and imagination. In either case it appears doubtful that remarks presented in a treatise on a utopian state would be addressed to knowledge common to Britain at the time. It would be difficult to assess the heuristic value of More's statements on imprinting for subsequent thinkers, but one is reminded of Chaucer's words (lines 24-25, *The Parlement of Foules*): "And out of olde books, in good feith cometh al this new science that men lere".

Yours faithfully,

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- <sup>1</sup> Gray, P. H., *J. Gen. Psychol.*, **68**, 333 (1963).
- <sup>2</sup> Sluckin, W., *Imprinting and Early Learning* (Aldine, Chicago, 1965).
- <sup>3</sup> Bateson, P. P. G., *Biol. Rev.*, **41**, 177 (1966).
- <sup>4</sup> Spalding, D. A., *Macmillan's Mag.*, **27**, 282 (1873); reprinted in *Brit. J. Anim. Behav.*, **2**, 2 (1954).
- <sup>5</sup> More, T., *Utopia*, 71 (Penguin Books, Baltimore, 1965).

## Porphyria

SIR,—In a recent letter (*Nature*, **235**, 388; 1972), Dalton, McAuliffe and Slater presented additional evidence for the well-established observation that protoporphyrin-IX is a singlet oxygen ( $^1\Delta_g$ ) sensitizer<sup>1,2</sup> and suggested that  $\beta$ -carotene (a singlet oxygen quencher) might be effective in the treatment of some types of porphyria. I wish to point out that the therapeutic use of  $\beta$ -carotene as a photoprotective agent was proposed by Mathews in 1964 on the basis of studies on porphyric mice<sup>3</sup>, and that the effectiveness of  $\beta$ -carotene therapy in humans with erythropoietic protoporphyria has already been demonstrated<sup>4,5</sup>.

Yours faithfully,

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- <sup>1</sup> Rawls, H. R., and van Santen, R. J., *J. Amer. Oil Chem. Soc.*, **47**, 121 (1970).
- <sup>2</sup> Politzer, R. I., Griffin, G. W., and Laseter, J. L., *Chem. Biol. Interactions*, **3**, 63 (1971).
- <sup>3</sup> Mathews, M. M., *Nature*, **203**, 1092 (1964).
- <sup>4</sup> Mathews-Roth, M. M., Pathak, M. A., Fitzpatrick, T. B., Harber, L. C., and Kass, E. H., *New Engl. J. Med.*, **282**, 1231 (1970).
- <sup>5</sup> Mathews-Roth, M. M., Pathak, M. A., Fitzpatrick, T. B., Harber, L. C., and Kass, E. H., *Trans. Assoc. Amer. Phys.*, **83**, 176 (1970).

## Population Growth

SIR,—Your editorial of March 17<sup>1</sup> includes the possibility, which is already occurring to many people, that the work of Professor Ehrlich and others may conceivably have already "overkilled" the growth of US population, in certain social groups at least. The effects of this trend of opinion are by no means exhausted—an academic friend of mine received hostile correspondence on giving birth to a fourth child. You do not cover another demographic imponderable, the possibility within a reasonable time of fundamental interference with the rate of ageing. This is now a contingency only, but its most likely date of emergence as an option has been put between 1993<sup>2</sup> and 2023<sup>3</sup>. Neither of these Delphic predictions appears to allow for the time taken for an experimental method to validate itself actuarially—however, with the development

of short-term measurement of the ageing rate<sup>4</sup> it might be realized experimentally.

Taking experimental gerontology at its present rate of funding and progress, rather than any science-fiction level, it is still a factor to consider before we become alarmed at the dependency ratio in a naturally-ageing population which is following a policy of replacement only. Although on a plausible scenario the maximum likely gain in world population from artificial slowing of ageing is unlikely to exceed 7% by 2050<sup>5</sup>, gerontologists are often attacked on the ground that their researches are demographically inopportune. I have been accustomed to argue that if we need "zero population growth" they are the reverse, at least in the overconsuming developed countries most likely to apply any new knowledge, on the grounds that delay in ageing would increase the productive portion of the lifespan, and that, as in the case of the elephant compared with the mouse, low reproductive rate is equilibrated with longer life: "zero population growth requires longterm people". None of these possibilities are so far from clinical trial that a 50-year view can afford entirely to overlook them.

Yours faithfully,

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- <sup>1</sup> *Nature*, **236**, 87 (1972).
- <sup>2</sup> Bender, A. D., Strack, A. E., Ebright, G. W., and Von Haunalter, G., *A Delphic Study of the Future of Medicine* (Smith, Kline and French, Philadelphia, 1969).
- <sup>3</sup> Gordon, T. J., and Helmer, O., *RAND Corp. Rep.*, P-2982 (September 1964).
- <sup>4</sup> Comfort, A., *Lancet*, **ii**, 1411 (1969).
- <sup>5</sup> Prehoda, R. W., *Proc. Conf. Social Implications of Lifespan Change* (Center for the Study of Democratic Institutions, Santa Barbara, 1970).

## Knuckle Walking

SIR,—E. N. Tiratsoo (*Nature*, **236**, 472; 1972) notes the misleading word "linemen" in our communication on knuckle-walking. Our manuscript read "linemen", a designation for American football players who crouch in a line with hands on the ground prior to the attack. Unfortunately, on the proofs

we did not detect the "s" which removed them from the turf in Chicago to the sidelines in Buckinghamshire.

Yours faithfully,

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## Disaster Research

SIR,—The London Technical Group is in the process of compiling a list of people engaged in research which could be of value to workers in the disaster field.

We would be grateful to hear from anyone doing relevant research in such

fields as medicine, nutrition, engineering, sociology and so on.

Yours faithfully,

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# Obituary

## Professor J. J. Weiss



JOSEPH JOSHUA WEISS, Emeritus Professor of Radiation Chemistry at the University of Newcastle upon Tyne, died on April 9, 1972, at his home in Newcastle.

Born in Austria in 1905, Weiss studied at the Technische Hochschule in Vienna, where he obtained his doctorate. After spending two years (1928–30) at the Textile Institute in Sorau he moved to Germany to become assistant to Fritz Haber at the Kaiser-Wilhelm Institut für Physikalische Chemie und Elektrochemie, Berlin. The short period spent with Haber was a very important one; not only was Weiss's scientific career essentially moulded during this time, but it also provided an opportunity for him to establish personal contact with many of the great figures in the physical and mathematical sciences. A scientific product of this period is the well-known Haber-Weiss mechanism for the catalytic decomposition of hydrogen peroxide by ferrous ions; involving, as it does, the intermediate production of free radicals it is a milestone in the history of studies of free-radical reactions in solution.

The political atmosphere in Germany in the early thirties affected many of the scientific institutions so that in 1933 Haber, accompanied by Weiss (his last assistant), left Berlin to take up a post at the University of Cambridge. After Haber's death, which occurred soon afterwards, Weiss moved to University College, London, carrying out a research programme and obtaining a PhD degree. Ideas on the role of electron-transfer processes in the mechanisms of photochemical and thermal reactions laid the foundation for the research work during the following years. Such processes were postulated to occur in the quenching of fluorescence, in dye-sensitized reactions and in chemiluminescence. Weiss discovered the role of positive hydrocarbon ions in systems containing aromatic molecules and polycyclic hydrocarbons; this particular work led to research on the formation and structure of molecular complexes, which were postulated to be charge-transfer complexes. Weiss's long association with Newcastle upon Tyne began in 1937 with an appointment to a demonstratorship in King's College, University of Durham (now the University of Newcastle upon Tyne). In 1942, Weiss became interested in the theory of chromatography and published the first rather detailed mathematical theory for equilibrium conditions. It was at this stage, however, that he first began his researches into the chemical effects of ionizing radiations, particularly in solutions. As a consequence of the many significant contributions which then followed, Weiss may be rightly described as one of the fathers of the now extensive field of radiation chemistry. Thus, in 1944, he proposed that chemical effects in aqueous solutions can be accounted for by H atoms and OH radicals, this free-radical theory being elaborated in a large number of systems, including solutions of substances of biological interest. The implications of these ideas to radio-

biology were pointed out, allowing a new avenue of approach in this important area. The many productive years which followed led to Weiss's eventual promotion to a professorship and to the establishment of the Laboratory of Radiation Chemistry at Newcastle.

Professor Weiss was one of the pioneers in the field leading to the discovery of the hydrated electron as an entity in irradiated aqueous solutions. He was particularly interested in the exact physical state of trapped electrons and was recently working on this problem again.

On the occasion of his sixtieth birthday, and as a tribute to his many achievements, an International Conference on Radiation Chemistry and Photochemistry was held at the University of Newcastle upon Tyne. International recognition has led to the conferment of a honorary degree by the Technical University of Berlin (1968), the award of the Marie Curie Medal of the Institut du Radium (1970), and, recently, to the establishment of the Weiss Medal by the Association for Radiation Research. On retirement from his chair in Newcastle, an issue of the *International Journal for Radiation Physics and Chemistry* was dedicated to him "in appreciation of his exceptional contributions to radiation and photochemistry". Latterly, Professor Weiss was conducting research programmes at the Max-Planck Institut für Kohlenforschung, Mulheim, and at the Paterson Laboratories, Christie Hospital and Holt Radium Institute, Manchester; such activity in his official retirement was characteristic of his life-long dedication to science.

Professor Weiss will be remembered not only for his research work and his stimulating presence at scientific gatherings, but also, with gratitude, by the many pupils and colleagues who have benefited from his wide-ranging knowledge of science and of scientists.