

CORRESPONDENCE

Imprinting

SIR,—The earliest reported historical references to imprinting frequently cited in reviews of the subject¹⁻³ are the systematic observations of Spalding⁴. 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!”⁵.

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 here”.

Yours faithfully,

MICHAEL D. SHALTER

Department of Zoology,
University of Maryland,
College Park, Maryland

- ¹ Gray, P. H., *J. Gen. Psychol.*, **68**, 333 (1963).
- ² Sluckin, W., *Imprinting and Early Learning* (Aldine, Chicago, 1965).
- ³ Bateson, P. P. G., *Biol. Rev.*, **41**, 177 (1966).
- ⁴ Spalding, D. A., *Macmillan's Mag.*, **27**, 282 (1873); reprinted in *Brit. J. Anim. Behav.*, **2**, 2 (1954).
- ⁵ 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 (¹Δg) sensitizer^{1,2} and suggested that β-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 β-carotene as a photoprotective agent was proposed by Mathews in 1964 on the basis of studies on porphyric mice³, and that the effectiveness of β-carotene therapy in humans with erythropoietic protoporphyria has already been demonstrated^{4,5}.

Yours faithfully,

ANTONY F. McDONAGH

Department of Medicine,
University of California

- ¹ Rawls, H. R., and van Santen, R. J., *J. Amer. Oil Chem. Soc.*, **47**, 121 (1970).
- ² Politzer, R. I., Griffin, G. W., and Laseter, J. L., *Chem. Biol. Interactions*, **3**, 63 (1971).
- ³ Mathews, M. M., *Nature*, **203**, 1092 (1964).
- ⁴ Mathews-Roth, M. M., Pathak, M. A., Fitzpatrick, T. B., Harber, L. C., and Kass, E. H., *New Engl. J. Med.*, **282**, 1231 (1970).
- ⁵ 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 17¹ 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 1993² and 2023³. 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 rate⁴ 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 2050⁵, 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,

ALEX COMFORT

Department of Zoology,
University College London,
Gower Street,
London WC1E 6BT

- ¹ *Nature*, **236**, 87 (1972).
- ² 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).
- ³ Gordon, T. J., and Helmer, O., *RAND Corp. Rep.*, P-2982 (September 1964).
- ⁴ Comfort, A., *Lancet*, **ii**, 1411 (1969).
- ⁵ 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