# Mammal furnace: Two-step evolution

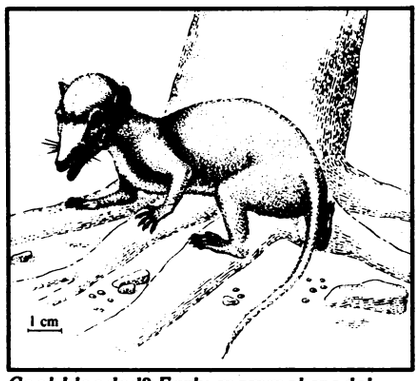
A vacant nocturnal niche spurred evolution of constant temperature regulation among early mammals. The high temperatures characteristic of most modern mammals appeared somewhat later. This two-step hypothesis for development of temperature control was proposed in the March 23 NATURE by biologists at the Harvard University Museum of Comparative Zoology. They disagree with those scientists who argue that dinosaurs and mammal-like reptiles were warm-blooded (SN: 4/8/78, p. 218). A.W. Crompton, C. Richard Taylor and James A. Jagger instead place the origins of mammalian temperature control among small nocturnal insect-eaters.

For such animals the thermostat setting could be relatively low. The optimal body temperature for a heat-producing animal is a few degrees above the highest temperature it is likely to encounter in nature. If ambient temperature exceeds body temperature, cooling can be an acute problem. Small animals have to drink almost continuously to sustain the evaporation required to keep their bodies a few degrees below air temperature.

"If the first mammals were nocturnal they could have maintained a constant body temperature of 30° [C] without the three- to fivefold jump in resting metabolic rate (after normalisation for temperature and size) which is generally assumed to be a prerequisite for homeothermy," Crompton and colleagues suggest. In comparison, a diurnal animal that encounters the sun's heat would need its temperature closer to 40° C.

The investigators support their two-step hypothesis with evidence from fossils and data on living mammals. The fossil record, they report, indicates that for about 120 million years most mammals remained in a nocturnal, insectivorous niche. Among living mammals, some insectivores have primitive characteristics, and they maintain body temperatures of 26° to 30° C.

Researchers have found a constant difference in the energetics of reptiles and mammals exercising at a given intensity. Where do the primitive mammals fit in? Crompton and co-workers trained a variety of animals to run on treadmills, while oxygen consumption and temperature were measured. The three species of insectivores (tenrecs, setifers and hedgehogs) seem to have reptilian-type energetics, the researchers report. They suggest these insectivores resemble the first mammals, one step into internal heat production. On the other hand, the marsupial (opossum) and monotreme (spiny anteater) seem to have mammalian-type energetics. Although the anteater and



*Cool-blooded? Early mammal model.*

opossum are nocturnal (and maintain their body temperatures at 30° to 35° C), their ancestors were at one time diurnal. The researchers suggest those nocturnal animals were unable to reacquire reptilian-type energetics.

Regarding the controversy of earlier prehistoric animals, Crompton and colleagues do not dispute that mammal-like reptiles probably had high activity rates sustained by voracious appetites and well-vascularized bones. However, they do not accept a high metabolic rate as conclusive evidence of constant temperature control. They say, "It might well have been possible to develop high rates of activity without homeothermy, just as we have shown that it is possible to be a homeotherm with a low resting metabolic rate." □

# The pill as an arthritis preventive

Birth control pills have been attacked a lot lately for their dangerous side effects, notably stroke, heart attacks, uterine cancer and gallbladder disease. Now, at last, here's some good news: Oral contraceptives may possibly help protect users against rheumatoid arthritis, the most serious, painful and crippling of all forms of arthritis. Approximately five million Americans — three-fourths of them women — are victims of this disease.

Back in 1968, Britain's Royal College of General Practitioners began a large-scale prospective survey of oral contraceptives. During the next 14 months, 23,000 pill-users and 23,000 women who had never used birth control pills were recruited for observation by 1,400 general practitioners throughout the United Kingdom. After each subject was enrolled in the study, detailed information about her health was collected by the participating doctors and stored on computer. By 1974, all the data available at that time were published by the college, and that report suggested, among various things, that oral contraceptives might protect users against rheumatoid arthritis. However, the data were too few for the relationship to be confirmed. And as the prospective study of oral contraceptives was still underway, college researchers decided to wait until they had more data collected to see whether they could truly establish birth control pills' protection against rheumatoid arthritis.

The link has now been made with substantial data, according to a report in the March 18 LANCET by the college study group, headed by Sally J. Wingrave. The rate of rheumatoid arthritis in oral contraceptive users is half the rate in nonusers, and this difference cannot be explained by cigarette consumption, social class or other seemingly influential factors. The college researchers thus conclude that "oral contraceptives protect against the development of rheumatoid arthritis."

This finding is also buttressed by physiological data obtained from other sources. Specifically, birth control pills contain the sex hormones estrogens and progestagens, and women with rheumatoid arthritis have long been observed to experience remission of their disease during pregnancy, when elevated levels of estrogens and progestagens are circulating in their bodies. High levels of these sex hormones have also been shown to suppress the body's immune system, and there is strong evidence that rheumatoid arthritis may be an autoimmune disease. Thus it is quite likely that the sex hormones in birth control pills might somehow prevent rheumatoid arthritis by dampening autoimmune reactions in the body.

There are several reasons to be cautious about these findings, however. For one, the Royal College of General Practitioners study has found that birth control protection against rheumatoid arthritis is small in absolute terms—only one in 3,000 users per year. So, the college scientists conclude, "It is unlikely that any woman will be influenced to use the pill for this reason." For another, two studies, one reported in 1969 and one in 1974, could not find any benefits of oral contraceptive treatment on persons who already had rheumatoid arthritis. And while another investigation noted a lower prevalence of rheumatoid factor—a complex protein in the bloodstream often indicating rheumatoid arthritis is present in the body — among pill users, still another study found a higher prevalence of the factor among pill users.

Finally, another reason to weigh these results carefully is that the study was partially funded by companies that make birth control pills. While the data may not be biased as a result of this funding, there is always an outside chance that study funders might influence study design and data interpretation. Or as an editor of a leading U.S. medical journal explains, "Drug companies can put out good studies. Science is still science. However, if the research concerns one of their own products, I would be more critical of it than usual." □