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McNab B K. The metabolism of fossorial rodents: a study of convergence. *Ecology* 47:712-33, 1966.
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The energetics of five species of fossorial rodents were compared. All species had low basal rates of metabolism and high minimal thermal conductances compared with standard scaling relationships. These modifications were greatest in species living at high burrow temperatures. Adaptation to climate involves the interaction of several physiological characteristics. [The *SCI*® indicates that this paper has been cited in over 130 publications since 1966.]

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"In 1962, shortly after my appointment at the University of Florida, I worked on the physiology of the local pocket gopher (*Geomys pinetis*). The results led me to work on other species of burrowing rodents, one of which was the East African naked mole-rat (*Heterocephalus glaber*). I applied to the American Philosophical Society for a grant to collect mole-rats. At that time, I was unknown, so it was a surprise to me that they awarded the funds. They did want to know whether my entrance into Kenya one month after independence was safe (remembering the earlier problems in the Congo)—they didn't want my blood on their hands!

"This paper was the first to use fossorial mammals for experimental studies. Since then, many others have examined energy expenditure, temperature regulation, gas exchange, and cost of digging in these species. It was also one of the earliest papers to show that Scholander *et al.*[1] were wrong in concluding that climatic adaptation did not affect rate of metabolism in endotherms. In my view, one of the most important contributions of the paper was the recognition that the modification of various individual physiological characteristics cannot be examined effectively as isolated phenomena. Each modification must be viewed in context with the changes found simultaneously in other characteristics. Thus, a reduction in rate of metabolism coincident with an increase in thermal conductance will lead to a reduction in body temperature and in the capacity for temperature regulation, whereas a decrease in conductance may compensate for a reduction in rate of metabolism so that there is no appreciable effect on body temperature and temperature regulation. Before this paper, most comparative physiologists tended to view each characteristic independently. The holistic view has recently gained currency with the writings of Gould,[2] but I am not sure that it has been fully assimilated.

"Subsequent work has shown that the results reported in the 1966 paper are part of a larger story. I had thought that the influence of body mass was eliminated by comparing rate of metabolism and thermal conductance with the appropriate scaling functions, but recent information has shown that the physiological adjustments to a burrowing habit are accentuated at a large mass and diminished at a small mass. This was not perceived in 1966 because of the restricted range in body mass of the species that were used. The new data were published in 1979,[3] which will likely reduce further citations to the 1966 paper.

"In conclusion, the 1966 paper has been cited so frequently because it helped to open new ground on the ecological flexibility of physiological characteristics and because it was one of the first papers to place this flexibility in an evolutionary context."

1. **Scholander P F, Hock R, Walters V & Irving L.** Adaptation to cold in arctic and tropical mammals and birds in relation to body temperature, insulation, and basal metabolic rate. *Biol. Bull.* 99:259-71, 1950. (Cited 155 times since 1955.)
2. **Gould S J & Lewontin R C.** The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. *Proc. Roy. Soc. London Ser. B* 205:581-98, 1979. (Cited 160 times.)
3. **McNab B K.** The influence of body size on the energetics and distribution of fossorial and burrowing mammals. *Ecology* 60:1010-21, 1979. (Cited 20 times.)

 