

back to the rest of biology or I will put my dues to better use.

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Dear Editor:

Recently, *ABT* has published a useful and laudable series of articles concerning the evolution/creation controversy. The strength of the creationist argument—such as it is—would be considerably weakened by an observed and incontrovertible instance of speciation in a mammalian species or, in creationist language, by a transformation of kinds. To be maximally effective such speciation events should meet at least the following criteria:

1. It should be the production of a new mammalian species because (a) such speciation would be more dramatic and easier for a lay person to assess than the production of a species in some other taxon and (b) meet most easily and

clearly the notion of transformation of a “kind” since “kind” among mammals seems to be loosely synonymous with “species” rather than some ill-defined, higher taxonomic category.

2. The process should be observed and carefully documented from beginning to end.
3. The usual biological species concept, including non-interbreeding of the new with the old species or interbreeding without fertile offspring, should be the criterion for speciation since (a) it is the biologically most relevant in this case and (b) it is most widely accepted by creationists. A changed external phenotype would be helpful but not essential.
4. Only those forces generally said to operate in the course of evolution (random mutation, natural selection, sexual selection, genetic drift, etc.) or their simple laboratory substitutes (induced random mutation,

artificial selection, etc.) should be used so that the process resembles an evolutionary event as closely as possible.

All this may be a tall order. However, with our currently fairly good and increasing knowledge of mouse genetics, it should not be an impossible one. The successful completion of such a research enterprise would not only bear heavy fruit in the evolution/creation debate but also yield valuable insights into the evolution process at its most critical level.

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Teachers Should Clarify Terms

Dear Editor:

Drs. Dubowsky and Hartman Jr. made a fine argument in favor of “no universally accepted definition of terms.” (*ABT*, April 1999) It is an argument that teachers and sci-

SPECIAL NABT MEMBER BENEFIT INCLUDED WITH THIS ISSUE ...

The second edition of *Science & Creationism*,
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entists have discarded for many years.

Teachers and scientists have been trying for sixty years that I can remember to simplify the language in introductory science courses. Scientists have modified terms such as energy, atom, and species, for example.

Because a term is confusing and used with different meanings is no excuse for not making the term understandable with one meaning.

D. and H. cited one reference to support the multiple meanings of theory, hypothesis, law, etc. The misuse of these terms is not a sound reason for misusing them in freshmen classes. D. and H. should also have cited Gibbs, A. and A. Lawson, 1992 (*The American Biology Teacher*, 54, 137–152). On page 143 they define a list of general science terms for use in introductory courses. The list includes theory, hypothesis, and law.

Teachers should do what most scientists do—clarify the terms they use.

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Haeckel's Embryos in Question

Dear Editor:

In a recent article (Wells, *ABT*, May 1999) dealing with Haeckel's embryos and evolution, the author states:

"But human embryos do not really have gills or gill slits: like all vertebrate embryos at one stage in their development, they possess a series of "pharyngeal pouches," or tiny ridges in the neck region."

No. The ridges in the neck region are *not* the pharyngeal pouches! The latter are not visible externally. The ridges are the *branchial arches* containing the blood vessels (aortic arches) and skeletal primordia that develop

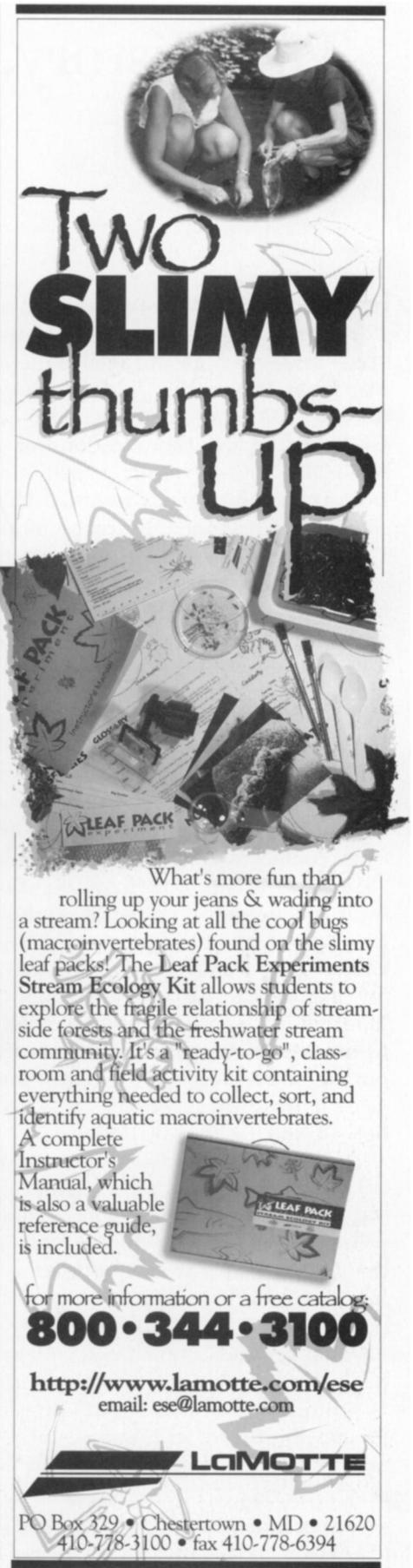
into the gill circulation and gill arch supports in the fishes and are partly coopted in terrestrial vertebrates for the aorta, pulmonary arteries, the hyoid apparatus and various cartilages in the throat region. These arches are separated from each other by inward growing *branchial grooves* which meet outward growing *pharyngeal pouches* from the inside. When these two structures meet and their epithelia perforate, a gill slit is formed. These persist in the fishes but eventually close in amphibians, reptiles and birds. In the mammals these epithelia normally do not perforate resulting in a "closed" gill slit. Occasionally, however, open slits do form and remain open resulting in a newborn infant with one or more cervical fistulae (holes in the neck) which have to be repaired surgically (Arey 1946, p. 179).

What I have said above is not based on any work of Haeckel. Any textbook of vertebrate developmental anatomy (example: Patten 1931, 1951) would have its own detailed drawings and photos of these structures. And any student taking a course in vertebrate embryology (at least in the first six decades of this century) would have spent a great deal of time studying the anatomy of the chick embryo and the fetal pig in detail and would have seen these structures first hand.

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References

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- Patten, B.M. (1931). *The Embryology of the Pig*, 2nd edition. Philadelphia: The Blakiston Company.
- Patten, B.M. (1951). *Early Embryology of the Chick*, 4th edition. Philadelphia: The Blakiston Company.



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