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This Week's Citation Classic®

Powell J R. Protein variation in natural populations of animals.
Evolutionary Biology 8:79-119, 1975.
[Department of Biology, Yale University, New Haven, CT]

This paper was a summary of studies (through 1974) of genetic variation in natural populations of animals using the technique of protein electrophoresis. Examination of the data revealed certain patterns both within and among species. [The *SCI*® indicates that this paper has been cited in over 215 publications since 1975.]

Jeffrey R. Powell
Department of Biology
Osborn Memorial Laboratories
Yale University
New Haven, CT 06511-7444

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By 1974, the technique of protein electrophoresis was clearly established as an extraordinarily important tool in analyzing genetic variation in populations of virtually any organism. The late Theodosius Dobzhansky had been prevailing upon me to write a review of this work for *Evolutionary Biology*, of which he was senior editor. He was a rather persistent man and I caved in.

Two important events occurred in 1974 that helped shape the type of review I was to write. First was the publication of Richard Lewontin's excellent book,[1] which reviewed the history of the problem and discussed the theoretical implications of data from electrophoretic studies of populations. Second, earlier in the year I had written a paper[2] that summarized my own interpretation (at that time) of electrophoretic data from populations. In that paper, I pointed out that "the view that natural populations are highly polymorphic for adaptively significant variation is not necessarily incompatible with the view that most evolutionary changes on the nucleotide level are the result of random fixation of neutral mutations."

What was still lacking at that time was a compilation of all the electrophoretic studies of natural populations. Thus I decided rather than try to write a creative review, I would write a useful review. I summarized the results of studies on about 130 species of animals and then attempted to find patterns in this large data set. Probably the two most important conclusions were (1) invertebrates are significantly genetically more variable than are vertebrates and (2) some enzymes (e.g., esterases, peptidases, and phosphatases) are more variable than others (e.g., dehydrogenases) in all species studied.

The review is cited most in some variant of the following phrase: "Electrophoretic studies have revealed a high level of genetic variation in populations (Powell, 1975)." I hope, however, that the review was more than just a convenient way to cite a large body of literature. It was intended to be a place where any scientist could go to find out if a certain species had been studied and easily find the reference to the pertinent work. This should have been especially useful for anyone contemplating beginning work on a new species.

The review has been superseded several times in the last 10 years. The most recent of which I am aware is the extensive review[3] by Eviator Nevo and colleagues; they cite studies on over 700 species. The field has grown.

1 **Lewontin R C.** *The genetic basis of evolutionary change* New York Columbia University Press, 1974 346 p
2 **Powell J R.** Isozymes and non-Darwinian evolution a re-evaluation (Markert C, ed) *Isozymes IV Genetics and evolution* New York Academic Press, 1975 p 9-26
3 **Nevo E, Beiles A & Ben-Shlomo R.** The evolutionary significance of genetic diversity ecological, demographic and life history correlates *Lect Notes Biomath* 53 13-213 1984