Twenty-Five Years Ago in Genetics: Electrophoresis in the Development of Evolutionary Genetics: Milestone or Mill Stone

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In the Olden’ Days:
The “Problematic:”

http://en.wikipedia.org/wiki/Mendelian_inheritance
Rise of opposing views

Their Shining Knight

- Gel Electrophoresis
  - Able to visualize extracts from single individuals
  - High Resolution: Single Nucleotide Substitution
Opening of Flood Gates

- 18 Year’s compiled
- Most species polymorphic for 1/3 loci
  - Coded for by multiple alleles
  - Average Heterozygosity of 10%
- Balance School appeared victorious
- Important Note:
  - Natural variations existed between phyla and species.
Why so much variation?

- 2 New Schools ~ “Krikey!”
  - Preserving Natural Selection
    - Over dominance, or frequency dependent selection
  - Purifying Variation (removing)
    - Accumulation of Selectively Neutral Mutations
Would Electrophoresis answer purification of preservation?

- Two types of data were produced:
  - Static data: electromorphic variants within and between populations
  - Ambiguous in regards to heterozygosity
  - Functional data: electromorphic variants relevant to fitness and physiology
Nucleotide substitutions do not always cause amino acid substitutions!

Genetic variation may not show up in Proteins

“Only about 1/4 of all random code changes that lead to amino acid results in a change from one charge class to another”
Why Sequential Electrophoresis?

Attempt to resolve “hidden” amino acid changes because of the charge class problem

RESULT: Polymorphic loci previously shown to be polymorphic
Only appeared “more” polymorphic

Monomorphic loci primarily remained monomorphic

Overall, the estimate of average polymorphism did not change
Mile Stone

- Mile Stone
  - Allowed molecular study of variation within and between populations
  - Natural Variation could be studied in any organism
Millstone

- Completely vaporized diversity of empirical work in evolutionary genetics
  - Fitness variation, selection experiments, developmental regulation and flexibility vanished
- Never answered the question these studies sought to answer
- Created new more tantalizing impasse
Current Directions

- DNA sequencing is rapidly replacing electrophoreteric studies.
  - A replication of the revolution brought on by electrophoresis