Fromm Institute – Winter, 2009

Charles Darwin and 19th Century Victorian England

David Bisno, M.D.

The Logic of the Theory of Natural Selection

Ernst Mayr

Darwin's theory consisted of 3 inferences based on 5 facts derived in part from population ecology and in part from phenomena of inheritance:

Fact 1: All species have such great potential fertility that their population size would increase exponentially (Malthus called it geometrically) if all individuals that are born would again reproduce successfully.

Fact 2: Except for minor annual fluctuations and occasional major fluctuations, populations normally display stability.

Fact 3: Food is limited. In stable environments the amount remains relatively constant.

Inference 1: Since more individuals are produced than can be supported by the available resources a fierce struggle for existence will ensue. Only some of the progeny of each generation will survive.

Fact 4: No two individuals are exactly the same. Every population displays enormous variability.

Fact 5: Much of this spontaneous, random variation is inherited.

Inference 2: Survival in the struggle for existence is not random but depends in part on the hereditary constitution of the individual. This unequal survival is a process of natural selection.

Inference 3: Over generations this process of natural selection leads to a continuing, gradual change of populations, to evolution and to the production of new species.

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...putting it another way

The Modern Synthesis

Julian Huxley

Darwin based his theory of natural selection on 3 observable facts of nature and 2 deductions from them:

Fact 1: The tendency of all organisms to increase in a geometrical ratio. Offspring are almost always more numerous than their parents, whether reproduction is sexual, asexual, by fission or budding or by means of seeds, spores or eggs.

Fact 2: The numbers of a given species which survive into adulthood appears to remain approximately constant.

Deduction 1: From the two facts above there must be a struggle for existence since more young are produced than we find surviving.

Fact 3: All organisms are seen to vary appreciably. No two organisms are exactly the same.

Deduction 2: Since there is a struggle for existence among individuals, and since these individuals are all different, some of the variations will be advantageous in the struggle for survival, others unfavorable. Consequently a higher proportion of individuals with favorable variations will on the average survive. Since a great deal of variation is transmitted by heredity, these effects of differential survival will in large measure accumulate from generation to generation. Thus natural selection will act constantly to improve and to maintain the adjustment of animals and plants to their surroundings and their way of life.