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FALSIFICATION AND CERTAINTY

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Falsification of a universal statement such as "all swans are white" requires verification of a particular statement such as "this swan is black." Verification is an inductive process because it consists in examining one feature of the bird after another. The color of the feathers is not sufficient (the bird with black feathers could be a crow); many other features have to be compared. The identification of the bird as a whole is induced from considering its parts. Karl Popper's struggle with verification and induction is defeated by the very method (falsification) he advocates. This pretty obvious point is well-known: "there can, in fact, be no falsification without a background of accepted truth" (O'Hear 1995, p.4).

Popper failed to perceive another consequence of his philosophy: if it is impossible to verify a given statement, then it is equally impossible to falsify it. If the statement "this swan is black" is always conjectural, falsification of "all swans are white" remains in doubt. We'll end up with an infinite chain of opposing conjectures and no answer for or against any claim. Popper compares the scope of falsification with the overwhelming importance of natural selection in biology. Actually, natural selection is not sufficient to explain life and its evolution, which requires something positive – reproduction with modification.

Professor Rennolls (2010) believes that Popper's philosophy of falsification is most certainly adopted by scientists is an overstatement. This belief does not agrees with recent titles of the literature dealing with Popper's inheritance: "Is Popper's philosophy alive or dead?" (http://philpapers.org/rec/GODPPO) and "Debunking Popper: A Critique of Karl Popper's Critical Rationalism" (http://www.libertarian.co.uk/lapubs/philn/philn065.htm). Along with a desire to falsify a truth of yesterday, scientists are driven by the admiration of a new idea, which we are ready to defend against all odds. It is perverse to destroy what we have created and Popper's advice to seek refutation of our ideas is as natural as infanticide. That is why scientists are reluctant to follow Popper's philosophy. Mahoney and DeMonbreun (1978) compared critical thinking of 15 scientists (all with PhD's) with that of the same number of ministers of various Protestant denominations (including Assembly of God, Baptist, and Pentacostal). Three of the ministers had master's degrees; the education of the others was at the bachelor and high school levels. Trained to trust the authority of sacred books, ministers are believed to be more dogmatic and less critical than scientists. Both groups showed marked tendencies to confirm rather than refute their hypotheses. In fact, the scientists appeared to be strongly inclined to jump to conclusions with relatively little experimentation. They also

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tended to be more committed to their hypotheses, even those rejected by the task administrator, than the ministers.

Equally questionable is Popper's belief that every theory remains inherently provisional because we can never exclude the possibility of a future observation that might contradict it. This particular theory itself is not so much provisional as unduly general. Empirical confirmation is not the only source of our trust of science. Some theories are inherently provisional and some are inherently final and necessary because they are based on reasoning rather than on repetitive observations. Scientists do not doubt that nothing can be and not to be at the same time and in the same respect, that nothing can be created from nothing, that the doubter's existence cannot be doubted, that the Earth is round and not flat, that any body is subject to gravity, that blood circulates rather than is generated anew at each cycle, that eukaryotes originated after prokaryotes and many other things. Critical thinking that suspects these certainties would champion superstitions, miracles, and intelligent design rather than science.

For complex systems, there is another kind of certainty, the certainty of the extremes bounding the field of all possible solutions. For example, competition and random events are two extreme explanations of individual survival of trees in a pure even-aged stand of certain species. A model that explains tree survival by the mixture of the predicable order imposed by competition and the total disorder of randomness is likely to be more meaningful and accurate than that based on either density-dependence or density-independence. Because it spans all possible solutions between the extremes, such a model is non-falsifiable. The relationship between tree size and survival is contingent upon specific stand conditions reflected by the value of a parameter controlling the position between the extremes. In contrast, these extreme boundaries are necessary and general because they are established by reasoning alone. Further dualities can be perceived within each extreme. Certainty provided by such nested pairs of opposites can be used to transform sundry observations, empirical trials, and unconvincing generalizations accumulated in silviculture, mensuration, and ecology into the science of forestry (Zeide 2008).

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