



Creating the Nation's first BioPark

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Letter From the Desk of David Challinor
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I once gave a talk on the role of evolution as a way of accounting for the diversity of life. During the question period following the talk, I was asked by an earnest young man why evolution, being a theory, was a more solid explanation for diversity than the theory that God created all living organisms separately. I should have expected the question, but did not, and tried to explain that the two "theories" were not necessarily in conflict, even though both explained the variety of organisms from quite opposite perspectives.

The religious explication is consistent with the perceived "truth" of the teaching or edicts of a faith as accepted by its followers, some of whom take literally whatever symbolism is used to describe the creation of life. In their view, a seven-day creation means seven 24-hour days. Other followers may accept some tenets of the faith but reject others.

The scientific approach to such a complicated question is quite opposite: when trying to account for a seemingly inexplicable observed phenomenon, scientists will propose a hypothesis. Darwin did just this when he offered his explanation for the variation in the morphology of finches in the Galapagos. The hypothesis is then tested by controlled experiments described carefully and disseminated by articles so that it can be replicated by other scientists. Darwin's hypothesis has been tested repeatedly over the years using other animal species. It is important to understand that follow-up experiments are designed to test whether the proposed hypothesis is "not false." The testing may go on for years as it has in the case of Einstein's special and general theories of relativity, Wegener's theory of plate tectonics, and Darwin's theory of natural selection. Remember that the efforts expended by generations of scientists working on these and other theories is not to prove they are true, but rather to show whether they are not false -- an important distinction.

Faith allows the believer to accept as truth whatever is divinely promulgated. The scientific approach, in contrast, will never attain "truth" because the process is not designed to do so; a nicety difficult for lay people to grasp. In time a hypothesis can be tested successfully so often that the theory becomes increasingly, and indeed almost universally, accepted. It



remains, however, always a theory. For example, if astronomers were to discover in the universe an object moving faster than the speed of light, Einstein's relativity theory would be proven to be false. So far Einstein's theory remains intact; observations to date have refined his theories and basically supported them. Objects have been observed approaching what we believe is close to the speed of light, but none has been shown to exceed it.

One has to be fairly imaginative even to think of the speed of light as being too slow for some purposes, yet the velocity of light presents a problem if one is concerned with intergalactic communication initiated by humans. Space is vast and the human life span and human civilizations are comparatively short. Therefore, responses to our messages from other possible intelligent beings would arrive long after the sender was dead.

Imagination and curiosity are characteristics of many scientists who are often reluctant to accept explanations of natural phenomenon on faith alone. There are, nonetheless, countless millions of individuals who do, and this majority of scattered human populations provides the supportive followers of those who lead in the world of religious belief. I do not mean to imply that scientists, being human too, are exempt from being followers, but when they are, they are often the skeptical ones. The whole question of how populations of people, caterpillars, and other group-living (colonial) organisms develop hierarchies to control their lives is worthy of consideration and the balance of this letter will address this topic.

Leadership by its very nature is limited and our vocabulary is replete with expressions that start with "Too many cooks..." or "Too many chiefs..." to remind us of the result of too many people in charge. Evolution, I believe, tends to limit the number of "leaders" to tolerable ratios which, I contend, seldom exceed 5% to perhaps 8% in random human populations of 50 or more people. For example, let us imagine a lifeboat holding 50 people randomly assembled from a sinking ship. For those in the lifeboat to survive, I suggest that there must be not more than 3 or 4 people in charge. Were 10 or 12 to step forward and try to lead, chaos would soon result.

The dangers of multi-leadership explain why large universities are hard to administer. Their governing bodies seek to attract the brightest and most active faculty and student body they can find. Once assembled on campus, an army of generals may, and often does, exist.

Leaders are needed to focus the efforts of followers, but leadership often appears in the most unlikely people, its qualities elusive. Leadership arises through many channels: it can be earned by working up through the system; it can be inherited; it can be suddenly thrust upon a person; it can even be gained by default, or by a combination of the above avenues. It is generally maintained by authority that can be based on fear, trust, knowledge, experience, foresight, or a combination of these and many other qualities. Such a blend of qualities and circumstances exist in, or happen to, relatively few people, and I believe that aspects of the achievement of leadership may be in some way genetically controlled.

When we survey the scientific world, we learn that for biological systems to flourish, there must be far fewer leaders than followers, and species living in groups may have evolved so that only a few individuals lead. Evolution may maintain the ratio between the few leaders and the many followers. The problem is, of course, to determine what the optimal ratio might be. Reconsidering the lifeboat example, it could be 3 in 50 or even 8 in 50. A ratio of 10 to 50 (20%) is probably too high, and when we approach 30% or 40%, I assume all would agree that the limits are exceeded.

I doubt we will ever learn the precise ratio of leaders to followers in groups of humans because the measurement and characterization of leadership are too elusive. I am not bothered that such measurements are imprecise any more than I am bothered that a scientific hypothesis can never be "true," as we fall back on the double negative -- "not false" -- to describe the goal of science.

The search for scientific "truth" is endless and will never be concluded. Experimental testing of hypotheses will continue as long as humans exist and remain curious. We may achieve almost universal acceptance of a theory, but never what a scientist would consider "proof positive." For me it is comforting to realize that mankind will never gain universal knowledge even though we keep progressing towards that goal: humans are most human when they are learning, and I am confident we will continue to do so during our evolutionary existence. Full knowledge, however, must be left to God, and we may only gain it when we have a chance to speak to Him/Her.

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