SOME STARTLING NEW DISCOVERIES IN RECENT YEARS

From Adaptationist and Other Evolutionary Approaches

The purpose of this effort is to place into context and then defeat Julian Adams's peculiar assertion that all startlingly new discoveries in biology in recent years have come from cellular, molecular, and developmental biology.

A lengthy comparison is necessary at the outset:

The particular kind of reductionism practiced by CMBD biology (dissecting toward the structurally smallest components for the start toward a functional understanding of the whole) can be illustrated by a craftsman who takes apart a violin. The violin will serve the role of "organism" in this discussion. Violins are products of conscious design, which in turn are products of differential survival or selection. Selection is the process ultimately responsible for all complexity in the universe, including conscious design in living creatures like ourselves; it is therefore the central subject of the functional reductionism of another kind of craftsman.

In the first craftsman's particular kind of work, he might discover, for the first time, that every violin has within it, located precisely at the foot of the bass side of the bridge, a small straight wooden peg extending from the back of the violin to its front. That would be a "startlingly new discovery" if violins were in fact products of selection more directly than they are products of conscious design -- meaning that, as with molecules and other suborganismic phenomena, humans did not know beforehand how violins were constructed. The discovery would probably be viewed as increasingly worthy of the label "startling" as the function of the peg in relation to the whole violin became increasingly clear. Of course one would have to understand something about the function of the whole violin, and appreciate it as important, before this view of worth could become standard.

Another kind of reductionism practiced by evolutionary biologists, behaviorists, ecologists, and other biologists seeking to understand the organism itself (that is, focused on identifying the organism's function and the contribution of each of its traits to this function) can be illustrated by a musician who discovers how to play beautiful melodies on the violin. He might regard his discovery as "startlingly new," although it clearly would not be so viewed by anyone whose nose was so deeply buried in the interior of the violin as not to be able to hear the melody or be affected by it. The musician, on the other hand, would be glad that the structural reductionist was dissecting the violin because the dissection would carry promise of enhancing the glory of the melody. Those of us who think of ourselves (as organisms) as comparable to the violin and our lives as the beautiful melody are expectantly thankful for structural reductionists such as molecular biologists. The structural reductionists would be expected to know this and to exaggerate the potential significance of their findings whenever it seemed likely to have the desired effect. Similarly, the functional reductionists gain by parading the virtues of their brand of analysis to those who wish to understand themselves. The structural reductionists, however, can properly argue that when they do eventually get to putting the parts beack together with functional knowledge they will just about know it all; the functional reductionists have no such

aim; theirs is an effort to shortcut to significantly new understanding that will still fall short of the goal of the structural reductionists.

Although the two kinds of reductionists may have the same goal, they move toward it from different starting points and using different routes. The structural reductionists set out to describe and understand each part of the violin (organism) piece by piece, integrating components and working out their interactions as they go. This procedure is their virtue because when they are finished their understanding of the structure and internal functioning of the violin will be complete. It is as well their greatest limitation for two reasons: First, they are unlikely to complete the job (especially on the organism) for a very long time. Second, there is no evidence at all that understanding every last part of the violin, and how the parts interact, would ever result in the understanding individual being able to play a complex melody beautifully. But it may enable others to do that. Similarly, the functional reductionists could never construct a new violin, and are unlikely ever to understand why such beautiful sounds can be elicited from a violin. But, especially when the subject is an organism rather than the immensely simpler violin, the functional reductionist will understand huge realms long before the structural reductionist. All of us know a good deal about playing the melodies of which we are capable or we could not persist. The travails of the human species nevertheless show that our musical (life) repertoire is still wretchedly inadequate, and thus will continue to benefit from every rise in comprehension deriving from functional reductionism.

Both kinds of investigation, and discovery, then, are important. One of them concerns the overall functioning of the violin and that requires the musician's effort; the other concerns how that function can be maximized, here by modifying or moving the sound peg. Each can lead to more beautiful uses, or functioning, of the violin (or the organism). Each has consequences for the other.

A List of Examples from Evolutionary Biology

1. Richard Connor's 1992 discovery (Michigan: UMMZ) that bottlenosed dolphins, unlike any species other than humans, sometimes sometimes participate in two levels of social alliances (PNAS . . .). This finding affects our efforts to understand how brains can evolve as social tools -- in particular the human brain, which has increasingly been viewed in this fashion.

2. David Haig's 19?? discovery (Harvard) that startling . . .many of the features of mother-embryo interaction in human females are competitive rather than cooperative, some of them leaving residual effects that can last across the mother's lifetime (citation). Among other startlingly new consequences, his finding provides the first credible hypothesis for the so-called "genomic imprinting" of gametes coming, respectively, from the male and female parents.

3. The prediction (RDA: Michigan) and subsequent discovery (Jennifer Jarvis) that eusociality (queen-worker sociality) exists in mammals (described by the Austrian mathematical ecologist, Karl Sigmund, as follows: "". . . this splendid feat of theoretical biology ranks with the prediction of the planet Neptune by astronomers." (*Games of Life*, 1993, p. 118)

4. The elaboration of the hypothesis (generated by Williams 1957: Stony Brook, NY) that menopause in the human female is likely not simply a consequence of senescence but increases reproduction through non-child-bearing activities: namely, the social and political efforts of older women on behalf of their entire collection of relatives, especially adult children and grandchildren (Alexander 1991: Michigan; Hawkes 1997: Utah) . This discovery promises to alter the entire medical view and threrefore "treatment" of menopause.

5. The demonstration by (author: Oxford: 19??) that pea hens mated with peacocks having more eyes in their tails produce more and healthier ?) young, demonstrating that the tail is in fact honest advertisement of "better genes" and not, as we have interpreted it for centuries, an inconsequential frill. This finding affects our approach to the analysis of all sexually and socially selected traits in all organisms, which for humans includes all the ways humans strive sexually and socially, including the humanities and the arts.

6. Discovery of evidence that the best model of how speciation usually occurs in sexual organisms almost certainly involves both divergent selection and restrictions of gene flow. This changing view affects our understanding of the entire history of the hominid line that gave rise to the diversity of humans occupying the planet today.

7. Discovery of the oldest tool in the hominid line . . .

8. Discoveries that kin are recognized, in all organisms, through social learning, as with development of incest avoidance mechanisms. This discovery, from adaptationist approaches, highlights the importance of vast bodies of unconscious learning that are too poorly understood to be replicated if they do not occur "normally" and often cannot be replaced by conscious learning or teaching later in the organism's life . . .