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Surplusage

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The forgotten dilemma of surplusage, why an animal should display potentials of learning ability far in excess of those required during evolution, is recalled in its century-old form and then reinstated as a guide to insights about contemporary but nontraditional views of animal intelligence.

Surplusage is a forgotten idea from an era of serious thinking about the evolutionary origins of animal intelligence.[1] Simply stated, it is the question as to why an organism should have a surplusage of mental power beyond the evolutionary needs of its possessor (Murphy, 1879). Unresolved and dormant for nearly a century, the issue of surplusage can now provide an insightful view of unconventional thinking on animal intelligence in our own era.

The idea of surplusage seems most directly traceable to Alfred Russell Wallace (1870). His belief that savages possessed brains far in excess of their requirements was the germinal idea of surplusage; consider, he would argue, that civilized humans use the same brain as that of savages to accomplish higher mental feats such as mathematical reasoning, a kind of reasoning never required of our primitive ancestors.[2] If the potential for higher mental processes appeared before it was evolutionarily adaptive, what caused its presence? This is the dilemma posed by the notion of surplusage. As naive as the arguments about savages might seem today, surplusage remains an interesting consideration for psychologists studying animal intelligence in the laboratory.

Wallace's surplusage was taken kindly by Darwin (Marchant, 1916) but it got strong opposition from Darwinists such as Romanes (1892). Why, they asked, would something so important as learning ability have developed if without direct use in nature (Carter, 1899)?

Early support for surplusage came in supposing evolution and intelligence to be antithetical. Morgan (1908) seemed certain that evolution would favor fixed definite styles of responding and not plastic accommodation through intelligence. Similarly, Hobhouse (1915) reasoned that natural selection rests on the destruction of a majority of individuals; thus, intelligence works at odds with evolution because it allows individuals to survive by cleverly adapting to novel circumstances.

If intelligence is not strictly a product of natural selection, how then did it materialize? Morgan's (1895) struggle to explain surplusage was typical of his time. He assumed that organic evolution and natural selection operate only to the point where conscious choice appears. This, of course, left the question as to why conscious choice suddenly appears. The attempts at answers may have led to the end of thinking about surplusage in that era. Vague notions of consciousness being an emergent (e.g., McDougall, 1929) were of little help, whereas the most direct answers posited some kind of Divine intervention (Wallace, 1890) and the kind of thinking so abhorrent to Darwinists. Considering that the real contribution of Darwinism was to establish a view of mentality without supernatural aspects (Ghiselin, 1972), it is no surprise that the notion of surplusage dropped from view. It seemed better forgotten, along with other unproductive ideas such as "lapsed intelligence" (Holmes, 1911).

Surplusage has reappeared on occasion, quickly disappearing when no good answer to its quandary appeared. Harlow (1958), for instance, wondered why animals develop potentials which are never used in nature but are so readily elicited in laboratory tests. Why, he asked, should a potential which was never used give its bearer a selective advantage over another animal lacking it?[3]

Now it seems that the zeitgeist might be favorable for closure on surplusage. In breaking with traditional thought on animal intelligence, several contemporary writers approach coming to terms with the old problem. Hailman (1969) was one of the first to suggest an observable explanation. His research is an innovative combination of field and laboratory studies for watching the development of the gull chick's pecking response. He noticed that a simple process (perceptual sharpening) occurring in nature can be expanded into more and more complex learning processes (classical conditioning) in the laboratory. With the control procedures of the laboratory, the simple perceptual process can be artifactually elaborated into a more gradually developing intelligence.

Surplusage, then, can be explained as an artifact of captivity and manipulation (Boice, 1973). It might also be the accidental by-product of perceptual processes and their combinations of integrative centers in the brain (Jerison, 1973). In this sort of perspective, surplusage is the extent to which perceptual abilities can be artifactually elaborated into complex learning ability. Similar ideas of complex learning as artifact are as old as Mill's (1899) complaints about laboratory constraints and as unappreciated as Thorpe's (1963) insights on the roles of captivity, boredom, and domestication in

producing complex learning abilities. It should be no surprise for Mill or Thorpe that chimpanzees, who have never done so in nature, learn a sign language under the control of skilled human technicians. The surprise might come in appreciating that many researchers commonly ignore animal behavior beyond the bounds of their laboratories while steadfastly assuming that the behaviors they study can be explained in evolutionary terms (Skinner, 1971).

Surplusage might gain in explanation value as we establish more realistic views of animal intelligence and evolution. *Suppose*, first of all, that we appreciate the relative unimportance of animal learning in nature: "One reason animal learning abilities appear limited is that individuals generally do not learn things that make no contribution to their fitness" (Alcock, 1975, p. 256). And then *suppose* that much of laboratory learning must be forced because it only remotely resembles what gets learned in nature (Seligman, 1970). Suppositions such as these are compatible with surplusage because they portray laboratory learning as something more than would happen outside the laboratory.[4] In doing so, they leave an opening for an explanation of surplusage in terms of manipulative and perceptual artifacts.

Another possibility could be that surplusage is an artifact of sloppy thinking. Perhaps innovative thinking and research will suggest a means whereby natural selection has directly provided for complex intelligence without necessity of its use during evolution. Rozin (1976) offers just such an approach: "As is the case with virtually all complex biological systems, intelligence should be organized in a hierarchical manner, out of component 'subprograms.' Within an evolutionary framework, these subprograms, which can be called *adaptive specializations*, usually originate as specific solutions to specific problems in survival, such as prey detection. These specializations, functionally defined, may be simple programs or circuits, or clusters of these, and may contain both plastic and prewired elements. They form the building blocks for high level intelligence" (pp. 245-246).

In the course of evolution, Rozin argues, these subprograms, by changes in genetic blueprint or by physical connection, become more accessible to each other. Thus, laboratory training alone could increase the accessibility of previously unconnected programs, the potential for which we are only beginning to fathom.

If Rozin is correct, and complex animal intelligence is nothing but accessing more specific, prewired programs, then surplusage can be put to rest. No reason then to look beyond the usual bounds of Darwinian evolution to account for complex intelligence in animals. To finally do that, however, will require a confrontation with the problem that has allowed surplusage to remain unresolved for so long; in determining the evolutionary roots of learning, we may need to make systematic observations in contexts where natural selection is operating.

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NOTES

1. This paper is a brief introduction to a more comprehensive paper on the evolution of intelligence which has been in progress since 1969. Its only other public appearance was the paper, "Is learning unnatural?", presented at the 1971 Psychonomic Society meetings in St. Louis. In the interim I have discovered surprising inhibitions against publishing views which suggest an alternative to the Darwinian evolution of learning ability. Even this brief, tame version of what I have to say, presented as an inquiry, has drawn strong rejections from reviewers; for example, a reviewer for *Animal Behaviour* said, "My dictionary lists as the second definition of surplusage 'non-essential words.' I think this definition is well applied both to the title of the paper and most of its contents." The other reviewer's opinion was "that it would only muddy water that was previously clear." A reviewer for *Animal Learning & Behavior* rejected this brief manuscript for lack of "more solid scholarship." Because this paper has the potential to elicit overreaction, I am responding to some specific criticisms in the notes that follow. It may help

if readers can join me in the attitude that this is only a question, stated here in preliminary form.

2. These are Wallace's views, not mine. It may be that, as one reviewer said, they are "totally wrong-headed," but this was the early version of surplusage, an idea which could be of value if reinterpreted today.

3. One reviewer felt that Harlow's musings were "the height of arrogance," since Harry has never observed monkeys in the wild. Because the ethologists who do field research rarely report on learning (or even include a category called learning in their ethograms), I believe this point is worth considering.

4. This kind of statement has drawn the most vigorous reactions from animal psychologists; for example, "I am quite certain that a rat living in the wild 'learns' much more than in the lab." Unlike that reviewer, I suspect that without evidence we should keep the question open. One of my motives in all this is to encourage field research in animal psychology.

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