

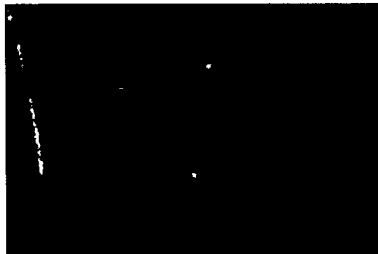


**In response to an earlier letter, a physiologist says that the name "Henneman's Size Principle" is "rightfully referred to." On the topic of "UFO research," a scholar says that "science is legitimized by its methodology, not the subject matter it investigates." And whether a "racial divide on the Internet" exists is debated.**

### UFOs and the Scientific Method

The article "Panel says some UFO reports worthy of study" by David Kestenbaum (News of the Week, 3 July, p. 21) describes one critic who "worries that the report will unjustly legitimize UFO research" and notes that some scientists "have a record of enthusiasm for these exotic topics." Is it the topic under investigation that determines whether or not research is legitimate? Does a re-

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searcher's passion for his subject makes its legitimacy suspect?

At a time when media attention and public interest in anomalous phenomena seem to be at a peak, should we not demonstrate that science is legitimized by its methodology, not the subject matter it investigates? And do we really expect to attract potential scientists to the calling with the message that they must be dispassionate? If lack of passion is the criterion by which a researcher's work is to be validated, how much research qualifies?

It is, of course, appropriate to make personal judgments about how fruitful UFO research is likely to be, or to decide (as a physicist cited in the article concludes) that UFO research may be "just a total waste of time." But such conclusions should be based on an examination of the evidence itself.

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### Henneman's Size Principle: The Right Name

In their letter "Renaming the 'Henneman Size Principle'" (26 June, p. 2031), J. A. Vilensky and S. Gilman correctly point out that Denny-Brown and Pennebacker (1)

made a landmark observation in the 1930s when they showed that mammalian motor units tend to be activated in a fixed sequence from the weakest to the strongest units. This finding, however, does not represent the "size principle" as Vilensky and Gilman suggest; rather, it describes the phenomenon of orderly recruitment. It was not until the seminal work of Elwood Henneman in *Science* (Reports, 27 Dec. 1957, p. 1345) that the neural mechanisms underlying orderly recruitment began to be revealed.

On the basis of innovative experiments and biophysical reasoning, Henneman and his colleagues proposed that the amount of excitatory input required to activate a motoneuron is directly related to its size (surface area of soma and dendrites). It was argued, therefore, that activation of motoneurons should proceed from smallest to largest as the broadly distributed excitatory input to a pool of motoneurons (2) increases. Moreover, smaller (and more excitable) motor neurons have thinner axons that give rise to proportionately fewer terminal branches, which in turn innervate smaller numbers of muscle fibers. Consequently, recruitment progresses "automatically" from weak to strong muscle units.

These ideas, rightfully referred to as "Henneman's size principle," not only explain the phenomenon of orderly recruitment originally observed by Denny-Brown and Pennybacker, but also represent one of the few parsimonious and testable hypotheses describing the functional organization of any population of neurons.

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1. D. Denny-Brown and J. B. Pennybacker, *Brain* **61**, 311 (1938).
2. L. M. Mendell and E. Henneman, *J. Neurophysiol.* **34**, 171 (1971).

The seminal importance of the Denny-Brown and Pennybacker paper (1) was discussed in several reviews of the historical development of the "size principle" (2). Moreover, Henneman and his co-workers were aware of the Denny-Brown and Pennebacker observations as evidenced by this paragraph from a 1968 paper (3):

Denny-Brown and Pennebacker [4] and Norris and Gasteiger [5] also observed orderly recruitment, although they did not carry out a statistical analysis of their data. They attributed this recruitment to properties of the motor neurons and suggested that the larger motor neurons may have higher thresholds and innervate larger motor units. Although the evidence to support these suggestions was not available, their observations are in harmony with ours and their suggested interpretation, in view of later developments, is remarkably prescient.

Henneman, of course, did not give the "size principle" its commemorative moniker. Nonetheless, he was reproved more than once for not giving Denny-Brown more credit in the development of his ideas. I know from conversations with Henneman that he regretted having done so.

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### Division on the Internet?

In their Policy Forum "Bridging the racial divide on the Internet" (17 Apr., p. 390), Donna L. Hoffman and Thomas P. Novak present data on computer access and use as well as purchase intentions among white and black Americans. They find that overall, blacks are less likely to own computers or to have used them recently for Internet access, and that they are more likely to want to buy one. Hoffman and Novak call for improvements of "educational opportunities for African Americans." This suggestion is good, but unrelated to the data. As they are presented and analyzed, the data cast more shadow than light on this important topic.

The study apparently has no hypotheses. blacks and whites are grouped eight different ways and their responses to 13 items (for example, "own home computer") are compared by tests of statistical significance. Of the 104 tests, 42 are significant, and 33 of those indicate greater "digitality" among whites. It is difficult to say whether this is a large number of significant results because few of the comparisons are independent. If one looks only at the primary variables for ownership, purchase intentions, and Web use, for example, only 6 of the 11 significant differences favor whites.

## SCIENCE'S COMPASS

Some "surprising" results have been picked up by the popular press. For example, among low-income respondents, "whites were almost six times more likely than their African American counterparts to have used the Web in the past week." This ratio is based on 5.9% and 1.1% for whites and blacks usage, respectively. Such ratios are deceptive because they increase as the overall base rates of the response decreases. It seems more newsworthy that 23% of low-income blacks plan to buy a computer as compared with 14% of such whites, although this ratio is less extreme.

The median split of the sample by household income obscures important information. If it is correct that "increasing levels of income correspond to an increased likelihood of owning a home computer, regardless of race," this relationship may also hold among low-income respondents. If the average income of low-income blacks is lower than the average income of low-income whites, the "digital divide" result is confounded by other variables, money and race.

Hoffman and Novak state that whites are more likely than blacks to own computers regardless of education. Education is related to racial differences in computer access at work, but among the respondents with a college education, blacks are more likely to report access (63.9%) than whites (55%). The face validity of the conclusion notwithstanding, it is unclear how these data suggest that "increasing levels of education are needed to promote computer access and Web use."

What are the means and ends in the computer age? The traditional idea is that computers facilitate learning. To call for more education to boost computer sales is to put the cart before the horse. And what proportion of computer use is beneficial? Chat rooms, pornographic sites, and on-line advertisement are popular, but their contributions to public education are likely negative.

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Hoffman and Novak present some interesting and potentially revealing data concerning the use of the Internet by different sectors of U.S. society. Their presentation is marred, however, by their use and description and use of the term "race."

Biologically, it is generally agreed that no "races" can be meaningfully defined in the human species. Yet the use of the term in scholarly literature persists, particularly in disciplines like sociology (where race and ethnicity are often interchangeable). The confusion is even greater in the general public.

Scientists, at least, should at least be consistent in their use of these terms. Hoffman and Novak are not. Why are "whites," a reputed physical description, compared with "African Americans," a partial description of ancestry? Who are the "whites" in this study, anyone who is not of African American ancestry? Are Arab Americans included in the "white" pool? Do "African Americans" only include those whose ancestors came to the United States as slaves, or also recently immigrated Africans (Nigerians, for example, who are amongst some of the most educated people in the world) and Caribbean émigrés? How were students with one Euro-American or Asian-American parent classified? And will we soon see research about the "Internet avoidance gene" and its distribution among the "races?"

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Although partisans like to refer to computers as fostering democracy, the technology seems more likely to exacerbate social stratification. The real inequities are probably worse than the data in the study indicate because the information was collected by a telephone survey. Yet 18% of black households lack phones (the same for Hispanic homes; 80% on some Native American reservations), while over 95% of white homes have them. So the survey contains a sampling bias.

"Universal access" to the Internet is unlikely to be realized. Over 60 years of federal public policy devoted to achieving universal phone service has not prevented the maldistribution of this older technology. In a country that now appears to have a declining interest in equity considerations, it would take a political revolution to lead to a different result for computers and the Internet.

### Philip L. Bereano

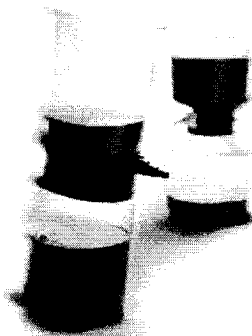
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Hoffman's and Novak's work was based on data that are over a year old. This is a fast-changing medium. Another study (*J*) based on 1998 data finds that the racial composition of Web users in the United States was "statistically indistinguishable from U.S. Census data for the general public." The major difference between Web users and others are in education and age: College graduates were online in a higher fraction (38%) than their presence in the general population (22%) would suggest. And the Net is still "skewing young."

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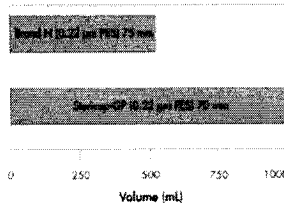
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