

Response: The letters by Varmus and Paul and by Gallo reflect behind-the-scenes competition and conflicts well known to most U.S.-based researchers. I believe that in both cases my description of events does not require correction. —**Michael Balter**

Characterizing Scientific Knowledge

David Edge (Letters, 8 Nov., p. 904) agrees with me (for which I thank him) about the appropriate response of scientists to false statements by creationists. But he then intimates, citing as evidence a review by M. N. Wise, in *Isis* (1), of *Higher Superstition* (2), that Norman Levitt and I commit there high crimes of scholarship—ad hominem argument, failure to engage in “open, fair, honest, and well-informed disputation”—and asserts that we “demean” and “will eventually destroy . . . science and reason.”

Since we and Edge live on opposite sides of the Atlantic, I doubt that he has observed us in disputation; I suspect that he cannot have read the book to which he refers with such charm, since his accusations refer only to a tendentious and defensive review of it.

Neither Wise nor anyone else has shown that the arguments of *Higher Superstition* are ill-informed or dishonest, and it is not for lack of trying. Edge (and anyone else) has been free since 1994 to respond by showing how we are wrong, which they have not done. To date, among the scores of published reviews, including a few by persons who disliked the book, not one has identified an outright error or instance of dishonesty. The criticisms are about “tone” and “danger” to science and reason, meaning, in this case, danger to the brand of “science studies” we addressed. Ad hominem arguments come not from us, but from our science study critics.

One wonders how scientists, and honest scholars generally, are supposed to respond after more than a decade of “scholarship” that characterizes scientific knowledge as a mere cultural construct, an oppressive, masculinist, hegemonic tool of capitalism and the military, remote from the needs and wisdom of indigenous peoples. Are they supposed to dissect creationist slanders but remain decorously silent about all else?

Who is “demonizing” whom?

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References

1. M. N. Wise, *Isis* **87**, 323 (June 1996).
2. P. R. Gross and N. Levitt, *Higher Superstition* (Johns Hopkins Univ. Press, Baltimore, MD, 1994).

W. Penn Handwerker says (Letters, 22 Nov., p. 1286) that Norman Levitt made a logical error in his dismissal of postmodernism as just so much whimsy and classroom fluff. The same charge could be made against Handwerker's critique. Assuming it's true that everything culturally determined is founded on human understanding, it does not follow that everything found on human understanding is culturally determined. A parallel situation would be to say that because all mothers are women, it must be the case that all women are mothers. Why don't we be reasonable and compromise by saying that some things are culturally determined and some are not?

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Neurons and Reaction Times

As noted in Marcia Barinaga's Research News article of 18 October (p. 344), the

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report by Doug P. Hanes and Jeffrey D. Schall (p. 427) represents an exciting development in the application of neurally based measures to the study of cognitive function. Their research complements the seminal work of the late Jean Requin and his colleagues at the Centre National de la Recherche Scientifique (CNRS) in Marseilles, France, who pioneered the study of neuronal responses in monkey cortex in complex reaction time tasks (for example, 1, 2).

Among other things, the Marseilles group analyzed the behavior of units in motor regions, whose peak firing rate is time-locked to the execution of unimanual responses to externally presented stimuli. They showed that variability in reaction time (the interval between stimulus and response) was related to the variability in the firing rate of the units in the period immediately preceding the presentation of the stimulus. Conceptually, this result suggests a relation between the speed of motor response execution and the degree to which the response has been prepared in advance of stimulus presentation.

This result also paralleled a finding obtained by our group at Illinois, namely, that variability in human reaction time is related to variability in the prestimulus

size of the lateralized readiness potential (LRP), an unobtrusive measure of brain-electrical activity derived from scalp electrodes placed over the motor cortex (3). As noted by Hanes and Schall, their finding of a response threshold for unit firing rate is consistent with another finding from our laboratory: response initiation is associated with a fixed size of the LRP regardless of reaction time. However, in contrast to Hanes and Schall, we find that overt responses can sometimes be stopped even after the normal LRP threshold for a response has been crossed (4). This appears to occur when subjects can use a general inhibitory mechanism to stop their responses. When selective inhibitory mechanisms are involved, the LRP threshold is not exceeded (5). This inconsistency between LRP and unit data may be the result of a difference in the way saccadic eye movements (as evaluated by Hanes and Schall) and hand movements (as evaluated by the Illinois group) are controlled.

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References

1. J. Requin, in *Attention and Performance XI*, M. Posner and O. Marin, Eds. (Erlbaum, Hillsdale, NJ, 1985), pp. 147-167.
2. A. Riehle and J. Requin, *Behav. Brain Res.* **53**, 35 (1993).
3. M. G. H. Coles, *Psychophysiology* **26**, 251 (1989).
4. R. De Jong, M. G. H. Coles, G. Gratton, G. D. Logan, *J. Exp. Psychol. Human Percept. Perform.* **16**, 164 (1990).
5. R. De Jong, M. G. H. Coles, G. D. Logan, *ibid.* **21**, 498 (1995).

Hanes and Schall demonstrate a correlation between the neural activity in the frontal eye field (FEF) of monkeys and the commonly observed variability in the reaction times of visually evoked saccadic eye movements. However, the question remains as to whether this correlation represents a causal relationship, or whether it is only an epiphenomenon reflecting changes in neural activity in a number of related cortical eye fields. The authors appear to overemphasize the role of the FEF in initiating saccades. The FEF is one of at least five well-defined, highly interconnected areas in the cerebral cortex that each have credentials similar to those cited for the FEF. The down-played question is, What happens to the execution of saccadic eye movements when the FEF is completely destroyed? This experiment has been performed (1). After complete bilat-

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The p53 gene from 316 breast cancer patients was sequenced using ALF automated sequencing technology. (Bergh J., Norberg, T., Sjögren, S., Lindgren A., Holmberg, L. "Complete Sequencing of the p53 Gene ..." *Nature Medicine* 1995; 10:1029-1034.)



eral surgical removal of the FEF, monkeys were able to make accurate saccades with normal reaction times to visual targets as soon after surgery as they were able to be tested (4 days). Only when FEF lesions were combined with parietal eye field lesions were saccade deficits serious and long-lasting. This result demonstrates that the remainder of the cortical eye movement system is able to generate normal vision-guided saccades in the absence of the FEF. The neural activity within the FEF is therefore not the only neural activity in the cerebral cortex that can cause the execution of an accurate saccadic eye movement.

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Reference

1. J. C. Lynch, *J. Neurophysiol.* **68**, 1913 (1992).

Hanes and Schall address response time variance much more than its mean. This variance is called irreducible, and tentative explanations offered include unpreventable noise and desirable adaptation. Barinaga's Research News article refers to dice-throwing in the

brain. However, the variability of response time can decrease with practice and other factors. A significant portion of the variance may be accounted for by considering that the cell examined has multiple inputs and that the circuits subserving these inputs have spontaneous activity that can leave them in different states on different trials. The brain can be involved in activities other than that specified by the researcher. One clue to the effect of the initial state on the rate of growth of neural activation is in the comparison of activation levels in panels C and D of figure 3 of Hanes's and Schall's report. The neural activations in slow and fast trials illustrated in the two graphs not only have different growth rates, they also appear to differ in prestimulus baseline firing rates. This does not alter the value of the data and conclusions, but points to network-related sources of variance as a major element in interpreting the results.

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Response: The work of the late Jean Requin should receive the appropriate recognition

for bridging psychology and neuroscience. We were influenced by his approach. Experimental psychology and modern neuroscience research began together, but historical developments resulted in something of a divorce until fairly recently. Requin's work was one of the earliest manifestations of the new reunion of neuroscience and psychology that has become cognitive neuroscience.

In our report, we found that when monkeys inhibited eye movements, the activity of the cortical neurons did not reach the critical threshold that would have generated a movement. In contrast, Coles and his colleagues found that in some of their subjects, the magnitude of the movement-related scalp potential recorded when grasping movements were withheld exceeded the threshold observed before movements were executed. Thus, note 16 in our report misconstrues this element of their data, and a correction is in order. We agree that the basis for the difference between the brain systems responsible for eye movements and those responsible for hand movements deserves further attention.

Lynch contrasts our observation of a correlation between neural activity in the frontal eye field and eye movement initiation with the well-known fact that eye movements are produced by a distributed network

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of multiple cortical areas and subcortical structures. Our data and conclusions do not contradict this fact. Work in the oculomotor system, as well as in the skeletal motor system, shows clearly that many neurons contribute to the motor command. However, the precision of the relationship we observed suggests that the growth of activation of eye movement-related neural activity throughout the brain is coordinated in such a fashion that the instant that a movement is triggered is agreed on by the various brain regions. Consensus, rather than independence or competition, may be the rule of response preparation. Whether there is a coordinated rise of activation to a movement-triggering threshold, which may represent a motor system complement to the perceptual binding problem, can be evaluated experimentally by recording simultaneously from many movement-related neurons within and across saccade-related structures.

Richer and Achim make the astute observation that in figure 3 of our report, the level of activity preceding target presentation was higher in trials with shorter saccade latencies than it was in trials with longer latencies. However, in an analysis of all of our data, we found no evidence that the level of activity preceding target presentation accounted for a significant fraction of the variance of reaction time.

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Corrections and Clarifications

In the Research News article "Linker histones, DNA's protein custodians, gain new respect" by Elizabeth Pennisi (25 Oct., p. 503), the upper illustration was mistakenly inverted to show right-handed, rather than left-handed, DNA coils. The source of the illustration of the new model of linker histones and coiled DNA should have been given as Pruss *et al.*

Letters to the Editor

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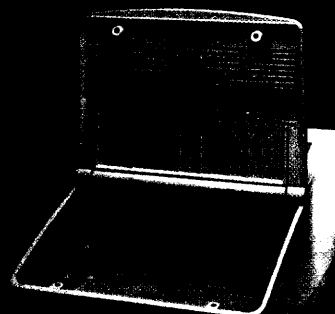


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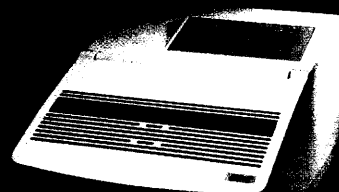


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