contends. Parental influences can weaken parent-child correlations on all sorts of personality measures, she points out. For instance, domineering, powerful parents may produce an anxious child, and an extremely self-assured, professionally successful parent may make a child feel inadequate.

Behavioral genetics comes under additional fire for its reliance on statistics that treat genetic and environmental influences on personality separately. This approach simply lacks the statistical power to pick up the interactions between genes and environment that primarily direct physical and psychological development, rendering current research in human behavioral genetics meaningless, argues Canadian psychologist Douglas Wahlsten of the University of Alberta in Edmonton. Much larger samples might begin to pick up such interactions, he adds.

Behavioral geneticists rely on statistics derived from a technique known as analysis of variance (ANOVA). This method is used throughout psychology to calculate whether a significant relationship, or correlation, exists between experimental variables by comparing variations in individual scores from a group's average value. Statisticians developed ANOVA in the 1920s as a way to estimate whether different types and amounts of fertilizer substantially increased the yield of various agricultural crops.

When applied to human personality and behavior, an ANOVA-based approach treats heredity and environment as mutually exclusive influences on personality, Wahlsten argues. Psychologists possess no conclusive test of interactions between genes and environments. But evidence of their interplay – as in the widely accepted theory that specific genes combine with particular family experiences to produce a psychotic disorder – may begin to emerge in behavioral genetics studies employing samples of 600 or more individuals, Wahlsten maintains. Mathematical formulas used in conjunction with ANOVA stand a better chance of ferreting out gene-environment interactions in extremely large samples, Wahlsten concludes in the March 1990 BEHAVIORAL AND BRAIN SCIENCES.

Psychologist Daniel Bullock of Boston University takes a bleaker view of ANOVA, citing its neglect of the intertwined forces guiding personality development. "The special status of ANOVA in psychology is an utter anachronism," he contends. "Many past claims by behavioral geneticists are unreliable."

Plomin rejects such charges. "To say that genetic and environmental effects interact and therefore cannot be disentangled is wrong," he states.

Twin and adoption studies consistently find strong separate effects of genes and non-shared environments on personality and other developmental measures, even when researchers painstakingly seek out possible interactions of nature and nurture, Plomin points out. Investigators may devise more sensitive statistical tests to illuminate cooperative ventures between genes and family experiences, but that will not invalidate the insights of behavioral genetics, he maintains.

That includes the discovery that what parents do similarly to two children does not importantly influence personality or problem behavior in the long run; rather, each child's perceptions of what goes on in the family prove critical. Appreciating the differences of offspring based on their individual qualities, with minimal preferential treatment of one child over another, seems a good general rule for concerned parents, Plomin says. Parents should recognize that siblings as well as "only children" harbor a keen sensitivity to their standing within the family, he adds.

"If we are reasonable, loving, but not perfect parents, the children will grow up to be themselves – all different but okay," says psychologist Sandra Scarr of the University of Virginia, a behavioral genetics researcher. "Children experience us as different parents, depending on their own characteristics, and we simply cannot make them alike or easily spoil their chances to be normal adults." □

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No pain, no game

I was pleased to read "Mass hysteria mars the music" (SN: 9/21/91, p.187), about the 600 junior and senior high school students who fell prey to "mass hysteria" before a concert they were to give. When I was a cheerleader in high school, many times before a game (especially before important games such as championships) six or seven of us would complain of the same muscle aching or the same limb in pain. At first we didn't think much of it, since we always got over the "pains." However, these complaints became so common and occurred so regularly that they were difficult to ignore. I now suspect that they were brought on by nervousness and excitement – what you call "mass hysteria" – because the pains were quickly forgotten with the start of the game.

Jodi Weikel
Sierra Vista, Ariz.

If only they'd asked

I wish to add a personal response to "Clues emerge from vowels of the brain" (SN: 9/21/91, p.180).

I experienced a medium-strength stroke in October 1982. Much of the damage is no longer visible to others; in most regards I no longer consider myself handicapped. One small hangover remains, however: When I spell words on paper, at the computer, on a blackboard or even aloud, I frequently omit final, silent vowels. A discipline I have learned over these past nine years has been to proofread my written work before submitting it to public view.

During the past nine years or so, SCIENCE NEWS has published a number of good articles on brain function in general and stroke damage in particular. But it always surprises me how few of the researchers you quote take the stroke victims' perceptions into consideration. Many of us have experienced very specific spelling/writing difficulties after the big bang; all the investigators needed to do was ask (or even listen). At any stroke victims' support-group meeting, your "Clues emerge" article would rate a review of "What's new?"

Raymond S. Sweeney
Tehachapi, Calif.

Tree-ring correlations

Atmospheric carbon dioxide is another factor that will probably correlate with the recent tree-ring data ("Tasmanian trees track recent warming," SN: 9/28/91, p.207), since plant growth often increases with increased carbon dioxide levels. Because accumulation of greenhouse gases, particularly carbon dioxide, correlates with global warming, are tree-ring increases due to temperature increases, or to carbon dioxide increases, or to a combination of both?

David R. Hershey
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Ubiquitous memories

Although Dr. Demetrios Christodoulou's discovery of a fascinating new mechanism by which a gravitational wave's permanent memory can be generated ("Found: Memories of gravitational waves," SN: 9/28/91, p.198) is of great importance for the theory of gravitational waves, there is no reason to expect it to have any impact on the design of gravitational wave detectors. The fact that gravitational waves can possess memories has been known for 20 years and has already been taken into account in the design of the Laser Interferometer Gravitational Wave Observatory (LIGO). From an experimenter's point of view, Christodoulou's discovery is important because it reveals that memories will be more ubiquitous than had been thought.

Any gravitational wave detector will have an unavoidable low-frequency cutoff in its sensitivity. For ground-based detectors, a fundamental lower-frequency limit lies around 1 hertz and is caused by fluctuating gravitational fields near the detector, due to atmospheric density variations. These gravitational fields cannot be screened out without simultaneously screening out the gravitational wave signal. This obstacle will prevent the detector from integrating up a wave's memory signal longer than a fraction of a second.

The best strategy for detecting a wave's memory is to push the detector's regime of operation to the lowest frequency and the highest sensitivity possible. This has been a LIGO project goal since its inception.

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