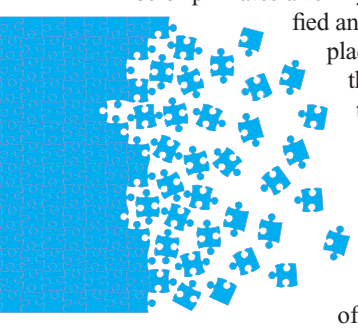
LETTERS

edited by Jennifer Sills

Prions: A Piece of the Puzzle?

IN HIS PERSPECTIVE "A UNIFYING ROLE FOR PRIONS IN NEURODEGENERATIVE DISEASES" (22 June, p. 1511), S. B. Prusiner proposes that Alzheimer's disease (AD) is a prion disorder (*1*). News publications have speculated that AD may be transmitted by blood transfusion (*2*), and caution has been thrown to the wind in Internet outlets. Prusiner's model comes from experiments in which Aβ peptide (the immediate precursor of AD amyloid plaques) induced aggregation in transgenic mice or primates after injection of AD brain extracts (*3*, *4*) or purified and synthetic Aβ peptides (*4*, *5*). However, no plaque appeared in monkeys injected with synthetic Aβ, raising questions about the direct translation of animal results to humans.



This technical critique ignores fundamental questions of AD etiology. Extracellular Aβ accumulation always accompanies the disease, but is it a cause or a result? How can we explain memory deficits that familial AD model mice exhibit before evidence of plaque deposition (*6*)? Given that direct neuron-to-neuron transmission of nonfibril Aβ exists (*7*), could AD pathogenesis depend on intracellular, nonplaque Aβ?

Multiple environmental risks for AD have been identified; where would they fit into a prion model? In addition to dietary cholesterol, factors such as mid-life exercise, nutrition, education, and early-life exposure to environmental hazards may modify amylodogenesis and AD (*8*). Late-onset neurodegenerative disorders, such as AD, can be explained by the latent early-life associated regulation (LEARn) pathway, in which environmental factors act epigenetically, long before the onset (*8*).

Other evidence suggests that AD has some genetic basis, in seeming contradiction to a prion model. For example, apolipoprotein E is a genetic risk factor. Genetic evidence for the role of the Aβ precursor protein (APP) in age-related cognitive decline and AD suggests that APP protective mutation carriers have lower Aβ peptide levels for their entire lives (*9*).

There is no denying that Aβ subunits play a role in nucleation of Aβ aggregates, but to call them prions, in the sense of the naturally infectious particles that catalyze disease based entirely on their own refolding and aggregation, ignores a great deal of evidence in the field and stirs up public fear prematurely.

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Sustaining Metal-Loving Plants in Mining Regions

THE RECENT UNITED NATIONS RIO+20 Conference on Sustainable Development highlighted the rapid increase in industrial mineral exploration and extraction over the past two decades (*1*). Endemic metallophyte plants, which have evolved where metal accumulations extend to the Earth's surface, have inevitably become extinct as a result of these mining activities. Remaining metallophyte refugia are now under acute threat as previously uneconomic deposits of metals, particularly in biodiverse tropical areas, are targeted for extraction (*2*).

Academic awareness of metallophytes has not protected these species, and miners and government regulators appear almost universally ignorant of their presence and/or potential. A revival of mining in the Katanga copper region of the Democratic Republic of the Congo means that hundreds of endemic copper metallophyte species are now some of the most critically endangered plants in the world (*3*). Soaring extinction rates of metallophytes in Brazil have led to calls for authorities to protect metalliferous (metal-containing) ecosystems from mining, but these appear unlikely to succeed given the high cost of compensating mineral rights holders (*4*). Even in Australia's highly regulated mining environment, metallophyte extinction risk remains. The Dugald River

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the past 3 months or matters of general interest. Letters are not acknowledged upon receipt. Whether published in full or in part, Letters are subject to editing for clarity and space. Letters submitted, published, or posted elsewhere, in print or online, will be disqualified. To submit a Letter, go to www.submit2science.org.

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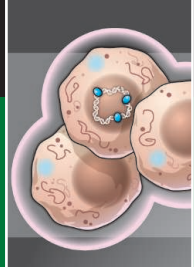

Navigating DNA

1179

Stable and superheavy

1183

ore deposit of lead, zinc, and silver was discovered in the 1880s with geobotanical maps describing specific ore-associated metallophyte vegetation (*5*). A recent environmental impact assessment and government vegetation mapping exercises failed to identify any metallophytes (*6*).

To prevent continued biodiversity loss and to benefit from their unique adaptive mechanisms that exclude, tolerate, or even hyperaccumulate toxic metals in mine site rehabilitation, metallophytes must be recognized as vital assets at the development stage of a mining operation (*7*). Where substrate metal concentrations exceed general toxicity thresholds at a site, the presence of metal-tolerant ecotypes should be assumed and addressed appropriately by performing the following steps: (i) Exclude metallic ore deposits with surface mineralization from mining operations; this is unlikely to occur for economic reasons. (ii) Modify mining operations so that areas of surface mineralization are retained intact with metallophyte vegetation. (iii) Move surface mineralization and associated seed banks before mining and reestablish them nearby. (iv) Collect and store metallophyte germplasm, and return it when the mine closes and the site is rehabilitated. (v) Select, breed, and improve metal-tolerant ecotypes and species adapted to a post-mine landscape.

Bioclimatic, geochemical, and physiological matching of metallophyte species to mine waste habitats should become an integral part of a profitable and sustainable global mine site rehabilitation strategy while also protecting highly evolved biodiversity.

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LIFE IN SCIENCE

Respect in a Pinch

Early in my career, I didn't know whether facial expressions of emotion were universal (Darwin's claim) or culture-specific (Margaret Mead's claim). In 1967, I traveled to a remote part of New Guinea to find out in an environment virtually untouched by Western culture. Among the secluded Fore people's traditions was cannibalism; the community ate people they respected after they died of natural causes. The Fore were still using stone tools and had never encountered a photograph or camera, and I was unfamiliar with their language and customs. One boy who knew Pidgin (which I had also learned before my trip) served as my translator. With his help, I asked the villagers to look at photographs of people displaying various emotions and invent stories about them. The study progressed slowly; my foreign ways were met with suspicion.

One day, about 2 weeks after my arrival, I was sitting outside eating my lunch of pit-pit (a vegetable similar to asparagus). An elder of the village approached me, and as I stood to greet him, I saw that he was followed by about 100 tribesman—more than half the village. The man stopped directly in front on me, reached down, and began pinching my thigh. To my horror, the villagers behind him began jumping and screaming with emotion. I searched the crowd for weapons and tried to hide my panic.

Suddenly, realization dawned. The people's expressions did not show anger. They were smiling and laughing. As I learned later, the village elder had declared that he planned to eat me when I died. From then on, I was a respected member of the tribe. My research proceeded with full cooperation from the villagers, and showed what I learned that day the hard way: Facial expressions do indeed transcend cultures. I left New Guinea before the elder tribesman could make good on his promise, but I hope at least he found my research palatable.

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EDITOR'S NOTE

This is an occasional feature highlighting some of the day-to-day humorous realities that face our readers. Can you top this? Submit your best stories at www.submit2science.org.

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TECHNICAL COMMENT ABSTRACTS

Comment on "Orthographic Processing in Baboons (Papio papio)"

William Bains

Grainger *et al*. (Reports, 13 April 2012, p. 245) suggest that baboons can discriminate words from nonwords on the basis of two-letter (bigram) frequencies. This ability can also be attributed to baboons being able to recognize specific letters (i.e., shapes) in specific positions in their four-letter words, without reference to letter or bigram frequencies.

Full text at www.sciencemag.org/cgi/content/full/337/6099/1173-b

Response to Comments on "Orthographic Processing in Baboons (Papio papio)"

Jonathan Grainger, Stéphane Dufau, Marie Montant, Johannes C. Ziegler, Joël Fagot

Bains pointed out that some of our nonwords were in fact real words and that an algorithm using only information about single letters and their positions achieves the same level of accuracy as baboons in discriminating words from nonwords. We clarify the operational definition of words and nonwords in our study and point out possible limits of the proposed algorithm.

Full text at www.sciencemag.org/cgi/content/full/337/6099/1173-c

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Editor's Summary

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