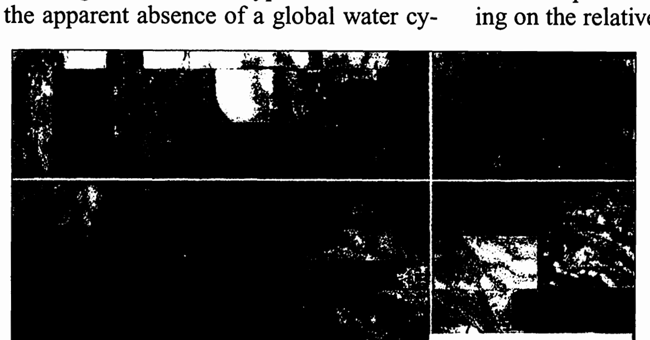
from near-subsurface icings in polar environments on Earth (*4*). The broad concavities of the alcoves resemble terrestrial features formed by discharge at the base of an "active layer" and subsequent accretion of ice. Further, we propose that the martian discharge is saline or hypersaline. Given the apparent absence of a global water cycle on Mars, any groundwater should have long subsurface residence times (perhaps more than a billion years), resulting in prolonged mineral contact and potentially very high salinity. Hypersaline water is also a common feature of the coldest and driest regions on Earth, such as the Antarctic dry valleys (*5*). Saline groundwater discharge would be more stable than fresh water near the martian surface, resulting in a more fluidized flow. As saline groundwater approached the surface, initial freezing and/or vaporization would occur, depending on the relative rates of temperature and pressure change near the surface. On the surface, water would have a salinity-dependant depression in vapor pressure, allowing some brine to flow downhill and further concentrate with evaporation (which will further depress the vapor pressure). Eventually surface flow would cease, leaving behind a channelized trail of evaporites, and possibly icings in the immediate region of the discharge points. Some flows may have taken place over near-surface icings from previous events, which could explain the discontinuous channels observed. The apparent lack of current ice or evaporitic deposits indicates that the channels may be relict forms.



An aerial view of fossil patterned ground preserved in plowed fields in central Illinois.

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Relation Between Diversity and Stability, in the Real World

Peter Taylor, commenting on a 25 August News Focus article by Jocelyn Kaiser, criticizes her for repeating "the conventional wisdom that Robert May's theoretical work in the 1970s showed that diversity works against stability" (*Science*'s Compass, Letters, 6 Oct., p. 51). Taylor then sets out his own sensible views, which differ from this. Although this may be the interpretation currently attributed to my 1973 book (*1*), it is not what I actually wrote.

In 1973, there was a widely cited belief that more complex or diverse ecosystems—more species, richer webs of interrelationship—were thereby better able to resist disturbance. I showed that there was no such arbitrarily general rule. Quite the contrary: randomly constructed complex ecosystems are more likely to lose species after disturbance than are simple ones. But, I emphasized, "the balance of evidence would seem to suggest that, in the real world, increased complexity is usually associated with greater stability. There is no paradox here....The real world is no general system. Nature represents a small and special part of parameter space [shaped ultimately by evolutionary forces acting on individuals]" (*1*, p. 75).

In short, the 1973 book expresses exactly Taylor's sensible argument that real ecosytems "develop" by adding, and losing, species over time, not by randomly sampling ecological possibilities.

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Outrageous Events: Don't Count Them Out

In his insightful News Focus article, "CERN's gamble shows perils, rewards of playing the odds" (29 Sept., p. 2260), Charles Seife discusses a paradox of "three-sigma" and "five-sigma" findings in the experiments of physicists and astronomers. Findings that are statistically significant to three standard deviations (that is, three sigma) theoretically occur less than one chance in 1000 if a hypothesis of no effect is true. Yet, Seife quotes particle physicist John Bahcall, "Half of all three-sigma results are wrong." Seife comments, "To a statistician, such vagaries may seem absurd." Actually, to statisticians the phenomenon is common. The problem usually is that the probability model under which the significance level is calculated is wrong. An example is the phenomenon Mosteller and Wallace referred to as the "outrageous event" (*1*, *2*).

An outrageous event is one that is unexpected and is not included in the probability model that yields a multi-sigma answer—like the "systematics" Seife mentions that tripped up astronomer Peter Van de Kamp and others (in the case of Van de Kamp, changes in a telescope lens assembly were the source of evidence for a wobbly star and hence an extrasolar planet). When Muhammed Ali was boxing, Mosteller liked to give the example of himself, Fred Mosteller, contending with Ali for the world heavyweight title. Although Ali would be heavily favored in the odds, he could trip over his shoelaces rushing from his corner and be out cold, with Fred the winner on a technicality! The serious point is that a small probability of a finding cannot in practical terms ever be smaller than the probability of the "outrageous events" that could produce the finding.

Another example pertinent to the paradox is this: The more data one searches through to find a "finding," the more opportunity there is to reach three sigmas (*3*).

William Bishop Fairley
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3. See articles and citations on "Multiple Comparisons" in S. Kotz, N. Johnson, C. Read, Eds., *Encyclopedia of the Statistical Sciences* (Wiley, New York, 1988).