

Talk of cannibalism

Jared M. Diamond

Incontrovertible evidence of cannibalism has been found at a 900-year-old site in the southwestern United States. Why do horrified critics deny that many societies have found cannibalism acceptable?

The difficulties of proving the occurrence of cannibalism are illustrated by an experience of mine in New Guinea. On 18 August 1965, while a dozen New Guinea men and I were collecting birds at a remote camp, a man unfamiliar to me arrived and began talking in the Tudawhe language to one of my workers, named Hinobe. The next morning Hinobe departed, claiming that the visitor brought news that his daughter was sick. My other New Guinea friends who heard the conversation later told me the real reason: Hinobe's prospective son-in-law had just died, and Hinobe was expected to join in eating the body.

My friends' detailed account of the eating ceremony matched accounts by Australian patrol officers who arrived unexpectedly in villages when a body was being prepared for consumption. I was not invited to the ceremony, so my experience does not provide first-hand evidence for cannibalism. But archaeologists working in the southwestern United States have now provided compelling evidence. Marlar *et al.*¹, writing on page 74 of this issue, report one episode, and a recent book² offers dozens of examples. Because cannibalism is such a controversial topic, I

report the evidence as an imaginary conversation between claimants and sceptics.

PRO: There are thousands of detailed, independent, mutually consistent accounts in recent times, from some societies but not others, of 'customary cannibalism'. This means the consumption of human flesh (from either deceased relatives or slain enemies) as a non-emergency custom, not just as something that cannibalism-abhorring societies may resort to in an emergency — for example, in 1846 when American pioneers trapped for the winter without food ate each other (the Donner Party).

CON: We consider all of the second-hand accounts to be by gullible or biased observers, and all of the first-hand accounts (none of which is by an anthropologist) to be fabricated. To quote W. Arens³, "There is no satisfactory first-hand account of this act [cannibalism] as a socially approved custom in any part of the world."

PRO: You would consider many accounts convincing if they did not involve a phenomenon that you abhor, or if the observer had been an anthropologist. But there is also abundant archaeological evidence. For example, at many AD 900–1300 Anasazi or

Puebloan archaeological sites in the southwestern United States there are disarticulated bones of dozens of individuals, bearing marks showing that they had been cut up and roasted or boiled² (Fig. 1).

CON: That bone evidence can be interpreted in other ways, such as the slaughter of enemies, scattering of bones by carnivores or scavengers, reburials of people who had died some time ago, or execution of witches.

PRO: Each of these events leaves distinctive macroscopic and microscopic marks on human bones, different from each other and from a characteristic set of six marks on the bones at the putative cannibalism sites². These six marks instead resemble those on the bones of animals eaten at the sites.

CON: But human bodies could have been cut up like animal bodies for reasons other than for eating.

PRO: A hastily abandoned Puebloan site, from AD 1150, has now been studied by Marlar and colleagues¹; at this site, disarticulated, defleshed, cooked bones of seven people were found in a pile or scattered over the floor. A pot at the site contained residues of human myoglobin, a protein confined to human heart and skeletal muscle, as detected by a specific antibody assay. Pots from the same site that were not used for cooking, and cooking pots from other nearby sites, lacked human myoglobin. So someone was cooking human flesh just before the site was abandoned¹.

CON: That supports the cooking of human flesh, but it doesn't prove that the cooks ate the flesh.

PRO: Ash in the fireplace contained dry, unburned human faeces, apparently deposited after the last fire in the fireplace¹. The faeces lacked plant remains, but contained human myoglobin, so the person who deposited them had recently eaten only meat, including human flesh.

CON: But perhaps the myoglobin-specific antibody was not species-specific, and the myoglobin came from an animal.

PRO: The antibody was species-specific, because antibodies that recognize myoglobin of all of the major animal species in Puebloan diets — including deer, antelope, elk, bison, rabbit, rat, turkey, canids and felids — had been removed¹.

CON: But even normal human faeces contain human proteins from shed intestinal



Figure 1 Evidence for the occurrence of cannibalism: the complete collection of human bones from Room 2 of the AD 1150–1200 Anasazi pueblo Houck K, in Arizona. Bones from at least four adults, two teenagers and one child were found. As at many other sites where cannibalism is thought to have occurred, vertebrae are largely missing (because they were crushed to extract marrow), and ends of bone fragments have a rubbed appearance (as a result of having been boiled in pots). Marlar *et al.*¹ have now found further evidence for cannibalism — the presence of human myoglobin protein in cooking pots and in human faeces from an AD 1150 Puebloan site in the southwestern United States. (Photograph reproduced from ref. 2.)

cells. Perhaps the faeces came from an Indian with a bleeding intestine.

PRO: Because myoglobin comes only from heart and skeletal muscle, myoglobin was not detected in 20 'control' faeces from other Puebloan archaeological sites, nor in modern faeces from 29 healthy individuals and 10 patients with blood in their faeces. The myoglobin-specific antibody used does not detect the related blood protein haemoglobin¹.

CON: Okay, you've proved one case of cannibalism, but it's still a rare aberration. Instead of denigrating Indians by looking for proof of bad behaviour, why don't you look for proof of good behaviour²?

I ask instead, why is the evidence for cannibalism — which suggests that this practice was once widespread — now so desperately denied? I can think of at least four reasons. First, because Westerners abhor cannibalism, some of us cannot believe that other societies practised (or still practise) it. But many behaviours accepted by one society are abhorred by another. The horror of my New Guinea friends when I described circumcision, US treatment of the elderly, and US funeral customs matched Westerners' horror at cannibalism. Some widespread Western practices are far more destructive than cannibalism. There are good reasons why cannibalism might have been customary in some societies but abhorrent in others³.

Second, because Westerners abhor cannibalism, Western missionaries and government officers who encounter a society practising cannibalism immediately forbid it. So it is no surprise that there are few first-hand accounts of cannibalism by twentieth-century Westerners: would you invite someone to watch you doing something if it would get you arrested? Once Western control is established, cannibalism quickly dies out.

Third, those Westerners who obtain evidence of cannibalism are condemned as slandering the non-Western society reported as having practised it — condemned not only by anthropologists offended at perceived insults to 'their' people whom they study, but also by the cannibals' descendants who have absorbed Western values.

Finally, any society has practices considered acceptable in private but inappropriate to practise in public, in the presence either of anyone else (for example, sex or defecation) or of non-clan members (for example, initiation rites or cannibalism). The abundance of New Guinea babies, my knowledge that babies are conceived by sexual intercourse, and second-hand accounts persuade me that New Guineans practise sex, but I have no first-hand observations of it even after many years there. When I read how vigorously cannibalism's critics deny its existence in the absence of first-hand observations by anthropologists, I find myself imagining a conversation among asexually reproducing extraterrestrials who have conquered the Earth.

PRO: Abundant second-hand evidence convinces me that humans engage in a ritual, too horrible to describe, involving misuse of the urine-producing organs. Our leaders execute humans suspected of performing the ritual.

CON: Have you observed this awful practice yourself?

PRO: No, never. But I have incontrovertible evidence: immunologically detected seminal protein recovered from the vagina of a female human mummy.

CON: This is just one possible interpretation of one aberrant finding. There are other possible interpretations. Why must

you denigrate humans by seeking evidence for bad behaviour, instead of studying good behaviour? ■

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2. Turner, C. G. II & Turner, J. A. *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest* (Univ. Utah Press, Salt Lake City, 1999).
3. Arens, W. *The Man-eating Myth* (Oxford Univ. Press, 1979).
4. Turner, C. G. II & Turner, J. A. *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest* p. 8 (Univ. Utah Press, Salt Lake City, 1999).
5. Harris, M. *Good to Eat: Riddles of Food and Culture* (Simon and Schuster, New York, 1985).

Chemistry

The smallest fullerene

Martin F. Jarrold

A flat graphite sheet can be made from carbon atoms arranged in hexagons. Inserting pentagons into the sheet will cause it to pucker and curve; adding just twelve pentagons creates enough curvature, in principle, to make the sheet wrap up and link together to form a spherical shell (a fullerene) or even a closed tube. The deciding factor is how the pentagons and hexagons are arranged. The archetypical fullerene, C₆₀, is a sphere with all 12 pentagons evenly distributed over its surface, each one completely surrounded by a ring of

hexagons. This highly symmetric geometry is possible only with precisely 60 atoms. Some other fullerenes have icosahedral (12-fold) symmetry, but it is quite rare¹. C₁₈₀, with two rings of hexagons around its 12 pentagons, can adopt icosahedral symmetry. So, in principle, could C₂₀. A C₂₀ fullerene has no hexagons, just twelve pentagons. This is the smallest fullerene that can exist, although it had never been seen until now. On page 60 of this issue, Prinzbach *et al.*² claim to have prepared not only the C₂₀ fullerene, but also the equally elusive 'bowl' isomer of C₂₀ (Fig.

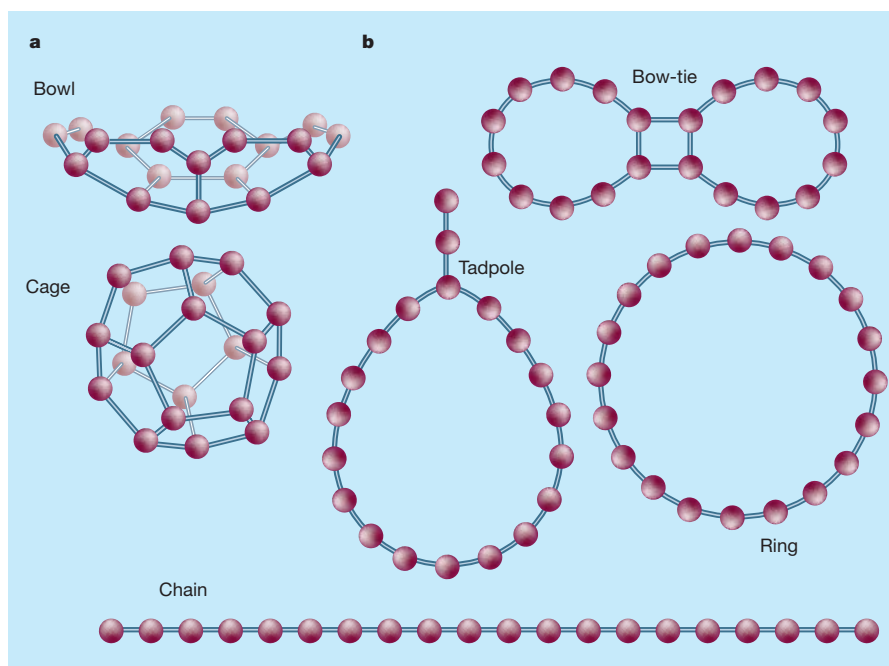


Figure 1 Isomers of C₂₀. a, The fullerene cage and bowl isomers. Prinzbach *et al.*² have created these structures for the first time in minute quantities. Note that the fullerene is expected to be distorted from ideal icosahedral (twelve-fold) symmetry. b, The ring and chain isomers, all of which have been observed previously. Several different forms of the 'tadpole' (a chain attached to a ring) and the 'bow-tie' isomers exist.