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astonishingly, is never mentioned in Mueller's book)? The ABM Treaty was widely seen by arms-control advocates as having headed off an expensive and destabilizing race between offensive and defensive weapons during the Cold War.

The strengths and weaknesses of Mueller's argument collide most jarringly in his discussion of nuclear proliferation. He is entertaining when he catalogs decades of dire predictions from experts about a coming cascade of countries crossing the nuclear threshold—predictions that have failed to come true, although this has not deterred contemporary pundits from re-sounding the alarm. And we need to think seriously about his argument that sanctions intended to deter nuclear proliferation killed hundreds of thousands of civilians in Iraq and North Korea while increasing the attractiveness of nuclear weapons to the paranoid leaders of those countries; the remedy may be worse than the disease.

But surely Mueller goes too far, and his polemical casuistry becomes dangerous, when he argues that sanctions and treaties are largely unnecessary because most countries have freely eschewed proliferation, recognizing that nuclear weapons are "militarily useless, and a spectacular waste of money and scientific talent." Although he is surely right that nuclear weapons are overrated and often fail to bring the bargaining power and military strength their owners seek, some countries (whether because they are in a bad neighborhood or have a bad regime) have spared no expense to seek them. And when a country acquires them, this puts pressure on rivals and neighbors to seek them too (as Pakistan did in response to India, for example). There can be a collective logic that forces individual countries to make choices they would rather not. The importance of the Treaty on the Non-Proliferation of Nuclear Weapons, for which Mueller shows so little respect, is that it releases countries from the prisoner's dilemma here: The treaty and its inspection provisions give confidence to countries who want to eschew nuclear weapons as long as they can be sure that their rivals do so too. This is why Brazil and Argentina both joined the treaty regime in the 1990s, for instance.

In short, Mueller has a gimlet eye for hype about nuclear weapons but is blind to their very real dangers. His book, which should sport a "don't-worry-be-happy" smiley face rather than a scrawled atom on the cover,

counsels us in its final sentence that we are not in danger and should "sleep well." Mueller seems to assume that, because there has not yet been an accidental nuclear war, because terrorists have not yet exploded a nuclear weapon, and because no country has used nuclear weapons since the United States bombed Nagasaki, we are safe. Presumably BP executives talked the same way about the safety of deep-water drilling before April 20, 2010; Soviet engineers talked the same way about the safety of their nuclear reactors before April 26, 1986; and NASA engineers talked the same way about the safety of shuttle launches at low temperatures before January 28, 1986. In regard to nuclear weapons, we have arguably been lucky. There have been several incidents in which U.S. planes carrying nuclear weapons have crashed or burned. In 1995 the Soviets mistook a Norwegian weather rocket for a U.S.

nuclear attack, and Boris Yeltsin found himself staring into the nuclear briefcase as his aides told him he might only have a few minutes to launch Russian nuclear weapons. And we now know that in the early years of the Cold War, there were senior U.S. military officers who wanted to preemptively attack the Soviet Union.

Mueller mocks those who warn of events that are possible but have not happened. "There is a 'genuine possibility,'" he says, "that Osama bin Laden could convert to Judaism, declare himself to be the Messiah, and fly in a gaggle of Mafioso hit men from Rome to have himself publicly crucified."

If only nuclear disaster were that unlikely.

Hugh Gusterson is professor of anthropology and sociology at George Mason University. He is the author of People of the Bomb: Portraits of America's Nuclear Complex (University of Minnesota Press, 2004).

ANTHROPOLOGY

At the Cutting Edge of Human Adaptation

Melvin Konner

THE HADZA: Hunter-Gatherers of Tanzania. Frank W. Marlowe. x + 325 pp. University of California Press, 2010. \$65 cloth, \$27.50 paper.

LIFE HISTORIES OF THE DOBE !KUNG: Food, Fatness, and Well-Being Over the Life-Span. Nancy Howell. xii + 234 pp. University of California Press, 2010. \$60 cloth, \$24.95 paper.

The few societies that still live by foraging for wild food are of great interest to researchers curious about how our ancestors might have lived before the introduction of agriculture thousands of years ago. Two groups that have been intensively studied are the Hadza people of Tanzania and the !Kung San (also known as the Jun/twasi) of the Kalahari Desert. The Hadza continue to hunt and gather today—two attempts at settling them ended in disastrous epidemics and a return to the hard but viable life they are so good at. The !Kung way of life has changed in recent years, but much information was obtained about them in the 1960s and 1970s, when they were still living as hunter-gatherers. Two recent books—Frank W. Marlowe's *The Hadza: Hunter-Gatherers of Tanzania* and Nancy Howell's *Life Histories of the Dobe !Kung: Food, Fatness, and Well-Being over the Life-Span*—show how much

the Hadza and the !Kung have in common. As someone who spent two years studying the !Kung San as a member of Harvard Kalahari Research Group expeditions in 1969–1971 and 1975, I found both volumes riveting.

Modern work on the Hadza was pioneered by James Woodburn in 1958. Later, Nicholas G. Blurton Jones, joined by Kristen Hawkes, James O'Connell, Frank Marlowe and others, led decades of studies motivated by neo-Darwinian theory. Marlowe's book is based on 15 field trips he made to Tanzania, during which he spent a total of four years with the Hadza, and on dozens of published papers, including his own. It is the most important single source of information about the Hadza, and it is superb, combining many of the virtues of classical ethnography with rigorous quantitative description and experimental hypothesis testing. The book is dedicated "to the Hadza, the fantastic, wonderful



The digging stick, which may have been one of the first tools used by hominins, is still quite important to tropical foragers today. It is the main tool of Hadza women, who begin using the wooden sticks at age 2. The sticks vary in length because they become blunted and have to be repeatedly sharpened with knives. Here, Hadza women accompanied by young girls dig tubers. The digging requires strength and stamina; some of the species of tubers that the Hadza eat grow in rocky spots, and boulders sometimes have to be moved to get at them. From *The Hadza: Hunter-Gatherers of Tanzania*.

Hadza,” and to Blurton Jones, “simply the greatest adviser one could ever have.” It was Blurton Jones whose vision made study of the Hadza a proving ground for evolutionary theory.

The Hadza occupy an area of about 4,000 square kilometers around Lake Eyasi, a large body of salt water in northern Tanzania. It is remarkable how much they resemble the desert-dwelling traditional !Kung, given the differences in their environments. It is also striking how well both societies fit the generalizations made by Richard Lee and Irven DeVore in *Man the Hunter* in 1968. Marlowe’s excellent comparative chapter, in which he puts the Hadza in the context of all other hunter-gatherers for whom data are available, further confirms most of these generalizations.

Both the Hadza and the !Kung live in small groups with a mean size of about 30 people. These groups move camp several times a year for various reasons, including the availability of food and water. Groups are larger in the dry season and smaller in the rainy season. They are basically egalitarian—any attempts at domination fail, because people gain others’ support or simply leave the group if someone tries to boss them around. There is no role specialization

except the division of labor by sex, and male domination is minimal. There are no clans or rules of inheritance passing through one sex, but groups are made up mainly of various kinds of kin. Violence can erupt between two men over a woman, and this is a main cause (among the Hadza, the main cause) of homicide. Meat supplies about 25 to 30 percent of the calories in both diets, and most aspects of child care are very similar between the two cultures. To a former !Kung researcher, it is reassuring to see these and many other commonalities, since the Hadza live in an environment that is more like the one in which we evolved than is that of the !Kung, and the Hadza have been studied with methods and theories that were unavailable when the !Kung were hunting and gathering.

There are also differences between the two societies. The !Kung have dogs, so they hunt in groups when in pursuit of game animals that stand and fight the dogs—gemsbok (large antelope), for example. Otherwise the !Kung hunt alone, as the Hadza almost always do. Both use poisoned arrows, but the Hadza have much larger bows with heavy pull weights. Hadza children are weaned at least six months earlier than are !Kung

children, and interbirth intervals are thus shorter. Hadza children forage for themselves much more. Hadza girls are subjected to partial clitoridectomy at puberty.

Marlowe says that the Hadza divorce rate is “close to the same as that of the !Kung,” but this is misleading. As Howell shows, almost all !Kung divorces occur in the first few years of marriage, mainly the first; these are, in effect, trial marriages and are typically childless. Nothing in !Kung culture really matches the common Hadza pattern of men leaving older wives for younger ones, with stepfatherhood resulting if and when the first wife remarries. Cowives exist in both cultures (in about 5 percent of marriages), but among the Hadza the instability of such unions is usually resolved by the abandonment of the older wife, whereas among the !Kung the younger wife departs.

Marlowe tests many evolutionary models. He decisively shows that fathers’ provisioning of their wives and genetic children increases the men’s reproductive success by shortening interbirth intervals. Men whose wives are breast-feeding bring home more food. Megan Biesele’s book about !Kung folklore is called *Women Like Meat*, and Marlowe’s data show that this is true of the Hadza as well, although Hadza men also bring home honey and baobab pods. Grandmothers’ contributions also matter—women are most productive at acquiring food when they are in that age range. Despite the fact that husbands and wives forage separately, proximity of husbands to wives is highly correlated with women’s fecundity (as predicted from their ages), which suggests that mate-guarding as well as provisioning figured in the evolution of pair-bonding.

Discussing the reasons for sharing, Marlowe considers nepotism (kin selection), mate provisioning (courtship investment), not-in-kind exchange (meat for honey, say), in-kind delayed reciprocity, costly signaling (to demonstrate foraging ability), and tolerated scrounging. Even with his excellent data, he can’t rule out any of them. Clearly, the impulse of pure generosity explains little; in anonymous games such as the prisoner’s dilemma, the ultimatum game, and the dictator game, the Hadza were among the least generous people ever tested, despite being among the most generous in their culturally sanctioned everyday life.

Evolutionary theory is second nature for Marlowe, so much so that his transi-

tions back and forth between Hadza, chimpanzees and foraging squirrels may seem abrupt to some. But his respect and affection for these brave people is always palpable, and the ease of his nonhuman comparisons simply reflects the depth and breadth of his training under Blurton Jones, as well as the theoretical awareness that now pervades hunter-gatherer studies.

Such applications of evolutionary theory and human behavioral ecology by Blurton Jones and others were part of the inspiration for Howell's book, in which she returns to data she gathered four decades ago, on Harvard Kalahari Research Group expeditions with Lee and DeVore from 1967 to 1969. *Life Histories of the Dobe !Kung* is an enormous achievement, confirming what can be done with unique archival data in the right hands. It is the newest on a shelf of books that includes Lorna Marshall's two fine traditional ethnographies of the !Kung; Richard Lee's classic on their subsistence ecology; Marjorie's Shostak's *Nisa: The Life and Words of a !Kung Woman*; Howell's earlier book, *Demography of the Dobe !Kung* (which set the standard for hunter-gatherer demography); and others.

So why another book now? Howell writes, "When research methods and theoretical models that were developed in [recent hunter-gatherer] studies are applied to the !Kung, . . . I am impressed by how much we gain in explanatory power." I am too. Using current life-history theory and analytical methods, Howell places adaptation at the center of her account, but on the sound premise that an organism *is* its life history. She interprets that lifelong adaptive process by mining her demographic data in combination with height, weight and growth data from the same period (1967–1969), some of it analyzed in later collaborations with Patricia Draper.

The !Kung, like the Hadza, are small in stature as adults, which lessens the burden of the food quest. On normal Western growth curves, most !Kung infants older than one year fall below the third percentile in height and weight. Howell interprets this (as would most pediatricians) to mean that inadequate caloric intake is pulling down their weight, and in turn their height. However, as she recognizes, teaching children to restrict their food intake may be an adaptation for achieving small adult stature. The body mass index (BMI) of most adults is above 18 (the lower end of the desirable range by Western



This 18-year-old young man and 17-year-old young woman are in the adolescent stage of life. In !Kung society, adolescence for young women begins with menarche at about age 16 and ends with the birth of the first child at about age 21. Most young women marry shortly after menarche, but conception is usually delayed for several years. Young men marry much later, at a mean age of about 26, so their adolescence is more protracted, giving them the freedom to travel widely. From *Life Histories of the Dobe !Kung*.

standards), and almost no one has a BMI greater than 25 (the top end of the desirable range). Howell creates a variable she calls BMIDiff—the actual BMI subtracted from the expected (!Kung) BMI for age and sex—a key dependent variable in her analyses.

After carefully estimating caloric demands using quantitative data about activities involved in gathering, hunting, leisure, pregnancy and lactation, Howell goes on to assess the caloric productivity of males and females throughout the life cycle. The age curves for adult productivity resemble Marlowe's for the Hadza, with maximum productivity at roughly 40 to 50 years of age. (The productivity of children is much lower among the !Kung.)

The difference between production and consumption of calories among the !Kung is most negative in adolescence and most positive in middle age. The !Kung clearly have a pubertal growth spurt, whereas Marlowe says the adolescent growth spurt in the Hadza is "very minor." He views this in something like the light in which Howell sees slowed !Kung growth after infancy, regarding it as a way of achieving smaller adult size and lower caloric needs.

This brings us to the crux of Howell's argument about children's needs. After the second child, *household* caloric bal-

ance becomes negative, so food must come from somewhere else. Without a partner, neither a mother nor a father could meet the needs of even two children, so Howell, like Marlowe, sees the pair bond as necessary. Howell also sees value in the "grandmother hypothesis"—the theory that menopause is an adaptation allowing women to increase their reproductive fitness by focusing on existing children and grandchildren. Her data, however, don't strongly support the hypothesis. But just how are the households with more than two children provided for? Here is where BMIDiff, or relative fatness, comes in, as an indicator of investment in offspring. Households do differ significantly in this measure, and we might expect that household caloric balance would predict relative fatness, but there is no significant correlation. As for proximity to kin, multiple regression analysis shows that having a mother, a father, a mother's mother or a father's father around predicts relative fatness—but, oddly, having a mother's father or a father's mother around predicts thinness.

So there is no simple kin-selection explanation of relative fatness. Using different measures than Marlowe, Howell concludes, like him, that genetic relatedness, reciprocity, tolerated scrounging and costly signaling all contribute to pro-

visioning of children. But ultimately, for her, a rule like “feed the thinnest child” affects almost everyone. The fitness benefit to the recipient is an important predictor of altruism under Hamilton’s rule (which states that an altruistic act should be performed when the cost to the actor is less than the benefit to the recipient multiplied by the degree of relatedness between the two individuals). So, given all the factors affecting sharing in !Kung culture, it may be that Howell’s feed-the-thinnest-child rule is the most refined that natural selection could come up with.

Nevertheless, Marlowe shows that Hadza men do more for their genetic offspring than for their stepchildren. Howell does not resolve this question for the !Kung, but here is the good news: She has put her entire data archive on the Web, with instructions for accessing it, so that any scientist can use the data. If others follow her example, then future cross-cultural comparisons will be more precise. I would be surprised if it turned out that relatedness doesn’t matter, although I expect that it will be shown to

be just one factor predicting sharing in hunter-gatherers.

The !Kung today are settled, some successfully, some not. They have made a transition the Hadza have resisted, from living a rough but independent, very ancient lifestyle to being among the poorest people in a poor developing country. It is fortunate that Howell and others were able to study them while they could still teach us so much about human adaptation, and that she has continued the quest in the data archive.

Neither the !Kung nor the Hadza nor both societies together can be a sufficient basis for drawing conclusions about the environments of evolutionary adaptedness. Given that some of our ancestors dwelt in tropical forests, groups like the Aka, Efe and Ache are also key models. Before and during the human dispersal out of Africa, it is highly likely that adaptation to shorelines, including shellfish collecting, was important, and for this we turn to models in Australia. In some times and places, rich resources led to higher population densi-

ties and probably more complex social structures; here Native Americans of the Northwest Coast offer insight.

But the Hadza and the !Kung do tell us much about what it means to hunt and gather in warm climates on open plains, especially in Africa, the site of most of human evolution. That the Hadza can still be studied as hunter-gatherers and the !Kung data can still shed new light on this way of life should be cause for celebration. Hunter-gatherers are courageous, resilient, highly skilled, hardworking people who deserve both our admiration and the most thoughtful scientific description and analysis. Both of these excellent books meet that challenge.

Melvin Konner, who teaches anthropology and behavioral biology at Emory University, is the author of The Tangled Wing: Biological Constraints on the Human Spirit, second edition, revised and updated (Times Books, 2002), and The Evolution of Childhood: Relationships, Emotion, Mind (Harvard University Press, 2010), which is reviewed on page 68. Website: www.melvinkonner.com

ENVIRONMENT

Fenceline Patrol

Lauren Byrnes, Sarah Mele and Daniel Faber

SACRIFICE ZONES: The Front Lines of Toxic Chemical Exposure in the United States. Steve Lerner. xvi + 346 pp. The MIT Press, 2010. \$29.95.

Steve Lerner, the research director of Commonweal’s Fair Growth Project, always has an important environmental story to tell in his books. His latest, *Sacrifice Zones: The Front Lines of Toxic Chemical Exposure in the United States*, is a compelling and unnerving account of 12 communities fighting for their right to a clean and healthy environment. The book shows that in towns from Florida to Alaska, residents are discovering that the air they breathe, the water they drink and the homes they live in have been invaded by one or another of a host of dangerous toxins that are associated with a plague of environmentally induced diseases. The industries and U.S. military bases responsible for the pollution appear to be following a clear strategy of sacrificing entire communities as a matter of expediency or to protect bottom lines. To avoid the expense of installing highly effective pollution control systems or disposing of

toxic substances safely, they are dumping billions of pounds of pollutants in communities where residents have little political or economic power. It follows that those suffering the most are African Americans, Hispanics, working-class whites and indigenous peoples such as the Yupik Eskimos.

The “fenceline” communities that Lerner has chosen to investigate are adjacent to some of the most environmentally hazardous sites and facilities in the country. He believes that mixing residential and industrial zones is a dangerous practice and should be avoided. The book demonstrates that companies freely displace, or “externalize,” costs of production onto the public by polluting neighborhoods just outside the factory gates. Yet time after time these companies escape accountability for the damage they cause. The costs may then be absorbed by the state and the larger economy, through

government-funded cleanup operations, emergency-response programs, increased medical and disability costs, and lower commercial and residential property values. But sometimes the government doesn’t want to pay for the cleanup either. Lerner says that agencies and state officials often duck their regulatory responsibilities, sometimes because they find it politically expedient to protect the profits of the polluters.

The environmental regulatory system in the United States is proving to be grossly ineffective at addressing such “pollution hot spots” once they are created. Residents of these environmental “sacrifice zones” (a term originally used during the Cold War to designate areas that had been contaminated with radioactive materials from nuclear weapons production) are expected to forgo their fundamental right to a safe and healthy environment. But instead, as Lerner vividly describes, the ecological crises and social injustices they confront have led at least some of them to mobilize into a powerful new movement for environmental justice.

Part of what makes *Sacrifice Zones* such an interesting read is that Lerner gives names and faces to these local heroes. The book is based on hundreds of interviews with the people who are living, working and sometimes dy-