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sexual assault and humiliation. Many of the women forced to labor on so-called “poor relief” projects on the reserves died of exhaustion and disease. Others found their babies had died while strapped to their backs during work brigades. Both British officers and loyalist African guards raped women with impunity.

Elkins spends much of her book trying to account for how a brief British military operation turned into a systematic assault on an entire people. By the early 1950s, Kenya was Britain’s remaining prize colony. The Indian subcontinent had gained independence, and the British looked to Africa to help finance the homeland’s postwar reconstruction. As Conservative Party governments funneled investment into white settlers’ estates, the Kikuyu saw their already diminished landholdings and economic opportunities shrink further. The Mau Mau rebellion, like so many anticolonial uprisings, sprang from a reservoir of popular suffering and anger that the authorities had long managed to ignore.

But the Mau Mau were also qualitatively different from any insurgents the British had faced. Although only 32 whites in total were killed, the rebellion’s “primitive” symbolism shocked colonial society. Mau Mau leaders relied on elaborate “oathing” rituals, involving the blood and body parts of sacrificial goats, to bind new recruits to the struggle. Government authorities viewed these ceremonies as evidence of backwardness. They called in J. C. Carothers, a famous ethnopsychiatrist, who diagnosed the Kikuyu with a form of “mass psychosis” arising from “a crisis of transition between primitive and modern worlds.” Confession was eventually determined to be the only path to recovery: once the Kikuyu had renounced their oaths they could begin their moral reeducation under British tutelage. Many detainees resisted, and forced confession became an end in itself.



**British soldiers guard Mau Mau suspects on their way to a detention camp.**

by Barbara Castle began to press for an independent investigation into the detention system. But not until 1959, after the fatal beating of 11 detainees in Hola prison, were the detention camps finally closed, heralding the end of British rule in Kenya. Still, the full story never came out. The political focus in England shifted quickly enough to allow the perpetrators time to cover their tracks. Kenyans recall seeing bonfires around

Most British citizens saw little reason to question their government’s line on the internment camps. The newspapers had helped stir up racist fears during the rebellion by printing gory photographs of murdered settlers and detailing the “bestial” and “degraded” practices of the insurgents. The sensational coverage made *Mau Mau* a household word, synonymous with savagery. “There was a sense,” Elkins points out, “that [the Mau Mau] got what they deserved.” The colonial secretary, Alan Lennox-Boyd, and his party’s prime ministers, including Winston Churchill, continued to tout the system’s successes despite mounting evidence of abuses. “It was,” Elkins writes, “as if by insisting loudly enough and long enough, [the authorities] could somehow revise the reality of their campaign of terror, dehumanizing torture, and genocide.”

As disturbing reports trickled out of Kenya, a handful of Labour Party MPs led

Nairobi in the final days before the British departure in 1963; former colonial officers have acknowledged receiving orders to destroy hundreds of thousands of documents relating to the Pipeline’s victims.

When the Abu Ghraib prison scandal broke last summer, Elkins was completing the final chapter of her book. She found the parallels unnerving. The excuses for torture given by American officials closely resembled those that British prime minister Harold Macmillan and his colonial secretary gave in 1959 when they were confronted with the 11 beating deaths. “Whether it’s Britain’s ‘civilizing mission’ or America’s ‘freedom and democracy,’” she says, “the dark side of Western imperialism and the official wisdom behind it have not changed much in the last 50 years.” ~ASHLEY PETTUS

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## HYDROCARBON HERESY

# Rocks into Gas

**G**EOLOGISTS have long believed that the world’s supply of oil and natural gas came from the decay of primordial plant and animal matter, which, over the course of millions of years, turned into petroleum.

But new research coauthored by Dud-

ley Herschbach, Baird research professor of science and recipient of the 1986 Nobel Prize in chemistry, questions that thinking. Published last fall in the *Proceedings of the National Academy of Sciences*, the study describes how investigators combined three abiotic (non-living) materials—

water (H<sub>2</sub>O), limestone (CaCO<sub>3</sub>), and iron oxide (FeO)—and crushed the mixture together with the same intense pressure found deep below the earth's surface. This process created methane (CH<sub>4</sub>), the major component of natural gas. Herschbach says this offers evidence, although as yet far from proof, for a maverick theory that much of the world's supply of so-called fossil fuels may not derive from the decay of dinosaur-era organisms after all.

Herschbach became interested in the origins of petroleum hydrocarbons while reading *A Well-Ordered Thing*, a book about the nineteenth-century Russian chemist Dmitri Mendeleev, who developed the periodic table. Written by Michael Gordin '96, Ph.D. '01, a current Junior Fellow, the book mentions a theory long held by Russian and Ukrainian geologists: that petroleum comes from reactions of water with other abiotic materials, and then bubbles up toward the earth's surface. Intrigued, Herschbach read further, including *The Deep, Hot Biosphere* by the late Cornell astrophysicist Thomas Gold. An iconoclast, Gold saw merit in the Russian and Ukrainian view that petroleum has nonliving origins. He theorized that organic materials found in oil—which most scientists took as a sign that petroleum comes from living things—may simply be waste matter from microbial organisms that feed on the hydrocarbons generated deep in the earth as these flow upward.

Another of Gold's assertions about methane and oil really caught Herschbach's attention. "He said there wasn't much chance that you could do a laboratory experiment to test this," Herschbach reports. "And I thought, 'Holy

**Two diamond anvils, each about one-eighth of an inch high, in a diamond anvil cell. They compress a small metal plate that holds the sample. The device can generate pressures greater than those in the center of the earth (3.6 million atmospheres). The methane generation experiments use pressures in the 50,000 to 100,000 atmosphere range, corresponding to the earth's upper mantle.**

smoke! We could do this with the diamond anvil cell.'" Long interested in how molecules behave under high-pressure conditions, he contacted Russell Hemley, Ph.D. '83, a former student now at the Geophysical Laboratory at the Carnegie Institution of Washington, to suggest the methane experiment. Together with Henry Scott of Indiana University and other researchers, Herschbach sought to create the same conditions found 140 miles below the earth's surface, where temperatures are scorching and pressures mount to more than 50,000 times those at sea level. "It's a great pressure cooker," he explains.

The diamond anvil cell, developed at the Carnegie Institution, can create the same pressures found as far as 4,000 miles beneath the earth's surface. The cell employs two diamonds, each about three millimeters (roughly one-eighth-inch) high, which sit with their tips facing each other in hardened precision frames that are forced together, creating intense pressure in the small space between the tips. Diamonds are an ideal material for such experiments, Herschbach explains. As one of the hardest substances on earth, they can withstand the tremendous force,

and because they're transparent, scientists can use beams of light and X-rays to identify what's inside the cell without pulling the diamonds apart. He notes that previous experiments by Russian scientists arrived at different conclusions because they used an old-fashioned press that had to be opened before any products inside could be analyzed, potentially changing the results.

"The experiment showed it's easy to make methane," Herschbach says. The new findings may serve to corroborate other evidence, cited by Gold, that some of the earth's reservoirs of oil appear to refill as they're pumped out, suggesting that petroleum may be continually generated. This could have broad implications for petroleum production and consumption, and for our planet's ecology and economy.

But before we begin to think of petroleum as a renewable resource, Herschbach urges caution. "We don't know if a globally significant or commercially significant portion of methane might be formed abiotically from this pressure-cooker business," he says. "Even if we did convince ourselves that a lot of hydrocarbons are formed that way, we don't yet know how long it takes for it to percolate up and refill the reservoirs."

For Herschbach, these exciting research questions have "given me a second scientific childhood." He and his colleagues are eager to return to the lab and find out if even higher pressures will create more complex hydrocarbons, such as butane or propane. The research raises fundamental questions about how scientists determine if a material has living or nonliving origins. It also validates the work of previous scientists. "The fair conclusion," Herschbach says, "is that the views of Thomas Gold and Russian scientists all the way back to Mendeleev need to be taken more seriously than they have been in the Western world." ~ERIN O'DONNELL

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