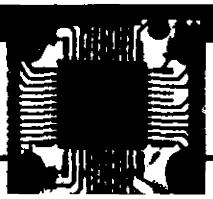

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Endangered bill takes flight

THE GULF WAR'S AFTERMATH

Kuwait Unveils Plan to Treat Festering Desert Wound

LONDON—Ten years after the Gulf War ended, Kuwait's deserts are still drenched in crude oil, most of it spilled as Iraqi invaders beat a hasty retreat. Now the country is about to embark on a belated $1 billion effort to tackle the ecological calamity in one of the biggest environmental remediation projects ever attempted. "It's a living laboratory of a type mankind has never seen before," says Paul Kostecki of the University of Massachusetts, Amherst.

Despite its considerable wealth, Kuwait has made little headway in cleaning up its oil-contaminated deserts. An estimated 250 million gallons of oil—more than 20 times the amount spilled by the *Exxon Valdez* oil tanker off Alaska in 1989—despoiled one-third of the land. Kuwaiti scientists claim that wildlife took a heavy hit, particularly in the National Park of Kuwait, where the national flower, the arfaj (*Rhanterum epapposum*), was wiped out; it's now being replanted. Speaking here last week at the International Congress on Petroleum Contaminated Soils, Sediments and Water, Kuwait's oil minister, Adel Al-Sabeeh, asserted that his nation's oil industry has committed more than $630 million on projects related to health, safety, and the environment. However, Kuwaiti researchers counter that cleanup efforts have so far dealt only with contamination that impedes oil extraction. All told, they insist, only $13 million has been spent in the past decade to examine the true scope of the oil's harm.

Ecological conflagration. Kuwait's deserts, drenched in oil since the Gulf War, are finally getting some serious attention.

A delay in sopping up the crude was inevitable: Kuwait spent the first 6 months just putting out oil fires set by retreating Iraqi forces. Some also see the psychological factors of an aggrieved nation at play. "If somebody breaks into your car, you wait for them to pay," says Andy Kwarteng of the Kuwait Institute for Scientific Research (KISR) in Kuwait City, which will oversee the environmental reparations budget.

But the wait is over. In June, the United Nations Compensation Committee awarded Kuwait $108.9 million in reparations from U.N.-controlled Iraqi oil sales to be spent on addressing the environmental fallout from the Gulf War (*Science*, 29 June, p. 2411). First up is a 5-year project to catalog the environmental ills, followed by a remediation estimated to cost more than $1 billion.

Any remediation efforts must be tailored to Kuwait's desert environment and the unprecedented extent of the contamination. Although the *Valdez* spill was a disaster in its own right, waves helped break up the slick to allow petroleum-eating bacteria to consume tons of oil, thus partly mitigating the harm to Alaska's coastal ecosystem. In soil, by contrast, adhesion and weathering make crude oil more stubborn, while a desert's dryness tends to deter natural degradation.

Short on funds, the KISR so far has carried out only two pilot remediation projects. In one, Nader Al-Awadi's team from KISR, working with Japan's Petroleum Energy Center, showed how to remove 94% of hydrocarbons from soil underneath lakes of oil now covering 49 km^2 of Kuwait. It is not a delicate process: The soil is excavated and washed with kerosene, piled up, and then pumped with air and water to nourish oil-eating microbes. If this process were used to treat all 70 million cubic meters of soil affected by oil lakes, it would cost $1.3 billion, says Al-Awadi. And that's leaving out contaminants such as soot and hardened tar mats, which cover a wider area but are deemed less serious ecological threats.

One novel project stems from the high concentration of petroleum in some of the spills. Researchers have proposed using the oily sand to pave roughly 5000 kilometers' worth of roads. In other words, when life gives you asphalt, make a highway.

Kuwait's bioremediation windfall "could provide an incredible amount of research," says Kostecki, executive director of the U.S.-based Association for Environmental Health and Sciences, which sponsored the London conference. And although Kuwait has skimped so far, outside experts say the country's leadership has experienced a change of heart. "They don't really care about the cost," insists Farouk El-Baz, director of the Center for Remote Sensing at Boston University. "If they can find a way, they will clean it up." **–BEN SHOUSE**

Ben Shouse is an intern in *Science*'s Cambridge, U.K., office.

COSMOLOGY

Changing Constants Cause Controversy

The times, they are a-changin', and so are the fundamental constants of physics, an international group of physicists reports. After analyzing light from distant quasars, the team has concluded that the fine-structure constant, which is related to the speed of light, has shifted over time. The claim is extremely controversial, but scientists are taking it seriously—if skeptically.

The fine-structure constant is an amalgamation of the speed of light, the charge of the electron, and the quantum-mechanical number known as Planck's constant. Combined, these values give a measure of the inherent strength of electromagnetic interactions, such as those that bind an electron to an atom. Like the speed of light, it is thought to be immutable: approximately 1/137. But in the 27 August edition of *Physical Review Letters*, a team of astronomers and physicists presents evidence that the fine-structure constant was different in the early universe. "One thing is clear. If it's correct, it's fantastically important," says John Bahcall, an

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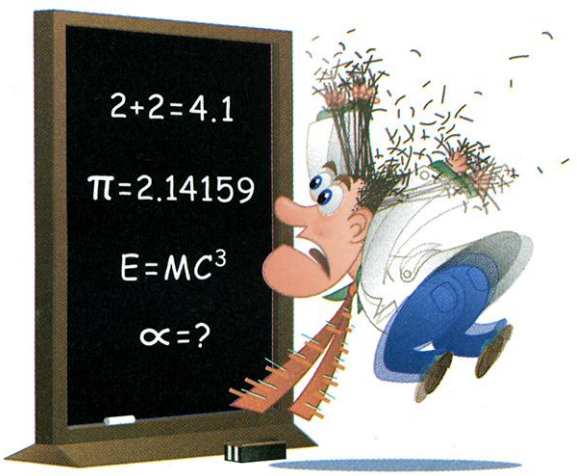

Alarming. The thought that the fine-structure constant is changing gives some physicists fits.

ILLUSTRATION: (TOP) TERRY SMITH

astrophysicist at the Institute for Advanced Study in Princeton, New Jersey.

The claim is based on observations of light from 72 distant quasars that has passed through light-absorbing clouds en route to Earth. Ions in those clouds, such as different valences of magnesium, iron, nickel, and zinc, each absorb certain narrow wavelengths of light, etching dark lines in the quasar's spectrum. Like a cosmic fingerprint, the pattern of the absorption bars tells scientists which ions reside in the clouds. And because an atom absorbs light due to the electromagnetic interaction between its nucleus and its electrons, the fine-structure constant affects where the bars appear. "The physics is pretty straightforward," says team member Jason Prochaska, an astronomer at the Observatories of the Carnegie Institution of Washington in Pasadena, California.

When Prochaska and other physicists from Australia, the United States, and England collected data from the distant quasars and analyzed the patterns of bars, they noticed that the spacing of the bars wasn't quite right. The pattern seemed to indicate that the fine-structure constant was about 0.001% smaller when the light was absorbed billions of years ago than it is now. In other words, the fine-structure constant has been increasing over time.

But other physicists are skeptical. "There's more ways to go wrong than to go right," says Bahcall. "This measurement is so sensitive to systematic uncertainties that I'm worried that one of them got them."

Lennox Cowie of the University of Hawaii, Manoa, has an alternative explanation for the strange spacing of the absorption lines. "Generally, it's likely to be things like different ions having slightly different velocities, as they reside at different points in space," he says. Because of the Doppler effect, the ions' different velocities shift the relative positions of the absorption lines. "In my own mind, that's the probable explanation," says Cowie.

But the team says it has already accounted for that effect. "I will be very surprised if this is the explanation," says team member John Webb, an astrophysicist at the University of New South Wales in Sydney, Australia.

Prochaska says he has unpublished data that strengthen the case for an inconstant constant, although he suspects they won't sway all critics. "Someone else needs to do it with a different telescope and a different instrument. That would be the proof of the pudding," he says. Until then, he agrees that cosmic change remains in doubt: "I wouldn't bet my life on it right today." –CHARLES SEIFE

SCIENTIFIC MISCONDUCT

Wellcome Rules Widen the Net

The U.K.'s biggest biomedical charity has filled a void by proposing its own guidelines and procedures for handling allegations of scientific misconduct. While generally winning high marks, the draft rules from the Wellcome Trust are likely to spark controversy by broadening the definition of misconduct beyond the U.S. government's standard and by offering relatively little protection to whistleblowers.

The draft guidelines, circulated late last month, would apply only to institutions receiving Wellcome funds. Even so, they could be a tonic for a scientific community that has been left to police itself without widely accepted definitions of both misconduct and good scientific practices. "Everyone in the U.K. seems to agree that something needs to be done, but no one seemed to be willing to take action," says Wellcome's Robert Terry.

"This is an extraordinarily positive development," says ethics expert C. Kristina Gunsalus, associate provost of the University of Illinois, Urbana-Champaign. "The most important thing is that someone in the U.K. has finally taken the initiative."

The Wellcome document gives a fuller—and perhaps more contentious—definition of misconduct than parallel regulations governing U.S. federal funding developed by the Office of Science and Technology Policy (OSTP) (see table). While approving Wellcome's overall approach, some experts quibble with the details. Although both the trust's and OSTP's definitions include plagiarism, fabrication, and falsification of data, the Wellcome language "moves away from the clarity of the U.S. definition by reintroducing deviation from accepted practices as misconduct rather than as the basis for finding misconduct," argues Fred Grinnell, director of the Ethics in Science and Medicine program at the University of Texas Southwestern Medical Center in Dallas. Adds ethics expert Howard K. Schachman, a biochemist at the University of California, Berkeley, "The definition of scientific misconduct presented in the Wellcome Trust document contains words and ideas that I think should be eliminated."

According to Chris B. Pascal, director of the U.S. Office of Research Integrity, Wellcome's definition of what constitutes misconduct—including "deliberate, dangerous or negligent deviations from accepted practices"—"is considerably broader" than the OSTP's definition. "In theory, it would be easier to show misconduct under Wellcome's definition" than under the U.S. definition, says Pascal, who notes that the OSTP rules are likely to go into effect

Scientific Misconduct: a Matter of Definition

The Wellcome Trust
"The fabrication, falsification, plagiarism or deception in proposing, carrying out or reporting results of research or deliberate, dangerous or negligent deviations from accepted practices in carrying out research. It includes failure to follow established protocols if this failure results in unreasonable risk or harm to humans, other vertebrates or the environment. ..."

U.S. government funding
"Fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. ... Research misconduct does not include honest error or honest differences of opinion."