

and the Laboratory for Laser Energetics at the University of Rochester, respectively—think they will be able, with the aid of a \$1.1 billion National Ignition Facility that is in the works, to prove the skeptics wrong.

For fusion researchers, they write, “this is a time of high drama,” and morale is high. “The traditional reasons for optimism are as compelling as ever. For one thing, fusion works. An operational fusion reactor, the sun, illuminates the sky every day.” A fusion reactor scaled down for earthly use would provide a source of energy that, in contrast with nuclear fission, would be safe (no possibility of a sustained chain reaction), clean (no eternally radioactive by-products), and virtually inexhaustible. But the physics involved in confining and heating two rarified gases (deuterium and tritium, both hydrogen isotopes) to the temperature of the sun is a daunting obstacle to scientists.

There are two main approaches. One is magnetic fusion, in which the challenge is to use magnetic fields to keep the fuel confined. International teams in Europe, Japan, the United States, and Russia are currently designing the International Thermonuclear Experimental Reactor, which will be the largest facility of its kind. Hogan and his col-

leagues are working on inertial confinement fusion, in which a laser or particle beam is used to heat and compress a fuel capsule until it detonates, with the fuel’s own inertia keeping it confined long enough for the reaction to take place. “The long-standing hurdle has been ignition,” the authors say.

Just a few decades ago, estimates of the energy needed to achieve ignition varied widely—from 10 kilojoules to 10 megajoules. Now it appears that between one and two megajoules will be needed. This refinement, say the authors, “has made it possible, for the first time, to design equipment and set realistic budgets for achieving fusion ignition.”

Major programs are under way in the United States and eight other countries. A French inertial confinement research facility, Mégajoule, is scheduled to be completed between 2005 and 2010 in Bordeaux. Construction of the U.S. National Ignition Facility, at a site not yet selected, could begin this spring, with late 2002 the target for completion. If that schedule is kept, the authors are confident that “experiments would then lead to ignition by 2005.” Two decades after that, they say, commercial fusion power could become a reality.

Alternative Medicine Arrives

“Europe’s Strong Herbal Brew” by Rebecca Rawls, in *Chemical & Engineering News* (Sept. 23, 1996), 1155 16th St. N.W., Washington, D.C. 20036; “Trends in the Education and Practice of Alternative Medicine Clinicians” by Richard A. Cooper and Sandi J. Stoflet, in *Health Affairs* (Fall 1996), Ste. 600, 7600 Old Georgetown Road, Bethesda, Md. 20814–6133.

Herbal medicines have long seemed a fringe interest. No more. In the eyes of both middle-class consumers and physicians, reports Rawls, a senior correspondent for *Chemical & Engineering News*, such medicines have become increasingly respectable, and may now be on the verge of widespread acceptance and use.

Europe some time ago embraced herbal remedies, such as extract from *Ginkgo biloba*, used to improve the flow of blood in capillaries and arteries. In Germany and France, many herbs and herbal extracts are sold as prescription drugs, and their use is covered by national health insurance. Regularly prescribed by 80 percent of German physicians, herbal medicines are always among the best-selling prescription drugs in the country.



Echinacea purpurea

Most of the research on herbal medicines has been done by companies in Europe (particularly Germany). The reason, Rawls explains, is that it is far less costly to get a drug approved for use there than in the United States. "Because herbal medicines are usually not patentable, the profit margin on them is often much lower than for synthetic drugs," she notes.

In the United States, herbal remedies are generally sold in so-called natural food stores rather than drugstores. Extracts from the echinacea plant, used to prevent or treat colds and influenza by stimulating the immune system, are the best-selling herbal medicines here. Garlic is also widely used for medical purposes, such as the reduction of cholesterol levels and blood pressure. Many clinical studies indicate that garlic does cut cholesterol, Rawls notes, though just how it works is unclear.

Many other "alternative" therapies, from folk remedies to bioelectromagnetics, have

been getting increased attention in recent years. Cooper, director of the Health Policy Institute at the Medical College of Wisconsin in Milwaukee, and Stoflet, a research assistant, report that in 1990 Americans spent \$13.5 billion on alternative therapies—equivalent to about half the out-of-pocket sum spent on physician services. Interest in such therapies is growing rapidly. The authors project that the number of chiropractors, now about 50,000, will double by 2010. Also on the horizon: a tripling in the ranks of today's 1,800 naturopaths and 7,200 practitioners of acupuncture and "oriental" medicine.

There are still plenty of skeptics, but Cooper and Stoflet say that "many physicians" now use acupuncture, herbal medicine, and other alternative measures. It no longer makes sense, the authors conclude, to discuss the future of America's health care system without giving consideration to medicine beyond the mainstream.

Sperm Shortage?

"Toxic Shock," in *The Economist* (Aug. 3, 1996), 27 St. James's St., London SW1A 1HG.

In the Great Lakes, female gulls have been found nesting with other females, having apparently given up on the males. In a Florida lake contaminated by pesticides, alligators have abnormally small penises. These and other strange incidents—along with studies claiming to show dramatic declines in human sperm counts and increases in testicular cancer—have given rise, the *Economist* reports, to a new scare: the fear that artificial chemicals are wreaking havoc with the reproductive systems of man and other animals.

"Many studies do indeed show sperm counts to be falling," the British news-magazine says. A 1992 review in the *British Medical Journal* of 61 such studies, involving a total of 15,000 men from around the world, concluded that the average sperm count had dropped by 42 percent since 1940—from 113 million sperm per milliliter of semen to 66 million. Suspicion has been cast on a number of synthetic chemicals—including the insecticide DDT (which is now banned in many developed countries) and phthalates (widely used to make plastics softer)—that are believed to mimic estrogens, the female hormones.

"But the evidence looks messier on closer inspection," the *Economist* observes. One recent study showed slight rises in the sperm counts of men in various American cities since 1970. The fact that sperm counts, for reasons unknown, often vary hugely from region to region may explain the decline found in the *British Medical Journal* survey, since a large proportion of its early samples were taken from New York City, where men in the recent study had by far the highest sperm counts, while later samples were from outside the United States.

Even if "gender-bending" is going on, man-made chemicals may not be responsible. Many naturally occurring chemicals also can act as hormone mimics. In a study published this year, the skeptical scientists of the European Science and Environment Forum say the estrogenic effects in the human diet from naturally occurring chemicals far outweigh those of artificial chemicals, and no solid evidence exists that either sort poses any risk to human health. Other than chemicals, some possible "gender-bending" suspects are stress, global warming, and even, according to one recent study, tight underwear.