Jason: Can a Cold Warrior Find Work?

For more than 30 years, a secretive band of top-flight academics has been proposing, analyzing, and critiquing some of the most innovative ideas in national defense

ASTRONOMERS HAVE LONG DREAMED OF steadying images of the stars with a technology called adaptive optics—a scheme for freeing earthbound telescopes from the effects of atmospheric turbulence. Last May that goal moved closer, when the Department of Defense (DOD) declassified an adaptive optics system from the Strategic Defense Initiative (SDI) (see *Science*, 28 June, p. 1786). The Star Wars system, meant to see incoming missiles, had a feature civilian astronomers had never had their hands on before: It supplies its own reference point by firing a laser into the upper atmosphere, creating a spot of brilliance—an artificial star—right next to the target object. But though astronomers acclaimed the technology, few guessed that the notion of a star-making laser had originated not with some defense laboratory or aerospace contractor but among a group of civilian sages who constitute one of the most influential yet little known science clubs in the world: Jason.

John Wheeler

Named after the inventive Greek hero, this exclusive cadre of about 45 academic scientists, mostly physicists, has been meeting every summer for more than 30 years. Its members—a veritable star map of physics—gather in secrecy to solve practical problems for the government, usually the DOD. Over the decades, the group has developed ideas that are far better known than the group itself. Among them: a system for communicating with submarines using radio wavelengths thousands of kilometers long, techniques for distinguishing incoming missiles from decoys, an efficient way to build a laser using free electrons.

In exchange for creativity, Jason's government sponsors have to accept the group's uncompromising independence. Unlike the national laboratories and defense think tanks, which have institutional commitments to the projects they do for the government, the members of Jason choose their own projects, have no financial or political stake in a project's success, and, most important, feel free to say a proposed project is dumb. "Jason is independent and not beholden to the Pentagon," says Val Fitch of Princeton University, one of Jason's founders. "Jason doesn't suffer fools." And sometimes, at least, the DOD values that bracing approach. "The Jasons are just as smart as you want them to be," says William H. Perry, the Carter Administration's undersecretary of defense for research and engineering. "Even when I disagreed with their conclusions, it would have been an enormous mistake not to listen to them."

Science set out to do just that, partly to bring this little publicized group out of the shadows and partly to find out how Jason is adapting to an era that appears to have marked the end of the superpower arms race. Indeed, even Jason members themselves are increasingly wondering how relevant their unique brand of advice will be. "For the past few years," says Marvin Goldberger, a University of California, Los Angeles (UCLA), physicist who was Jason's first chairman, "Jasons have been asking, 'Whither Jason?'"

It wasn't easy to find out. After a score of interviews with current and former members, the strongest impression was how little the Jasons like to talk about the specifics of their summer sessions. Still, several intriguing themes emerged. For one, more and more of Jason's problems—the flow of illegal drugs across U.S. borders, global warming, and air-traffic control—are unrelated to defense. For another, the decline of the Soviet Union has also raised new defense-related issues—nuclear proliferation, for example. Might the Jasons have some ideas on better ways to detect illegal arms programs? They do indeed.

Indeed, one thing Jason has never been short of in its 33 years of existence is ideas. Its founding in 1958 was a direct response to the Soviet launch of Sputnik. Most Americans saw Sputnik as evidence of our weakness in teaching and funding science. Scientists saw Sputnik as an omen of military vulnerability, as "a device for throwing [bombs] at you," says Fitch, "without your being able to defend yourself." According to John Wheeler, another founder at Princeton, "It's hard to reconstruct now the sense of doom when we were on the ground and Sputnik was up in the sky." So several ex-Manhattan Project scientists proposed forming a group that could, according to Wheeler, "inject new ideas into national defense."

Wheeler took the initiative and wrote a letter suggesting what in July 1958 became DOD's Project 137: "Twenty-two scientists spent 2 weeks in D.C.," recalls Wheeler, "and the [defense services] told us in top secret about their hottest problems. We came up with 22 ideas per problem." One idea discussed at that founding session: a way to jury-rig radiation detectors for the nuclear battlefield out of radios and Geiger counters. Another project from those first 2 weeks: advice on how to build a nuclear-powered torpedo that could roam the seas almost indefinitely.

The military was pleased with the results—so much so that they decided to turn the summer brainstorming session into an ongoing project. The next summer Project 137 was awarded regular funding through DOD's Advanced Research Projects Agency (DARPA) and was renamed Jason. Mildred Goldberger, Marvin's wife, suggested the name, she told *Science*, because like the eponymous hero, the group solved problems "by analyzing and thinking, not by going out and chopping things up."

Since those early days, Jason's modus operandi has changed little. It is now run through a defense think tank called Mitre Corp. for a variety of government sponsors, including DARPA, the Army, Navy, Air Force, and the Department of Energy (DOE). Over the years, Jason has perpetuated itself as an exclusive public-service club: Old Jasons pick new Jasons "for their lively imaginations and specific lines of interest," says Wheeler. Impeccable credentials are also required: Eight current or ex-Jasons—Charles Townes, Murray Gell-Mann, Henry Kendall, Hans Bethe, Joshua Lederberg, Val Fitch, Steven Weinberg, and Burton Richter—have won Nobel Prizes.

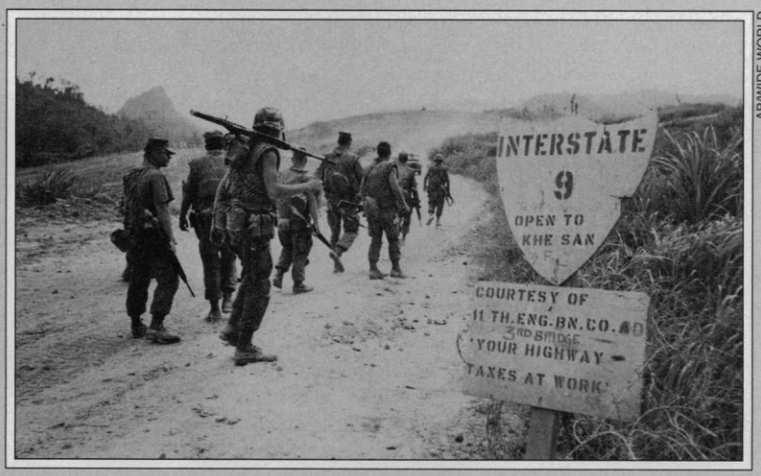
Each spring over a long weekend, Jason members old and new leave academia and

meet their sponsors to decide the upcoming summer's projects. The decision process is a little loose. Most Jasons, who have been members for years, already know the sponsors' concerns. "They or we suggest things" based on pressing defense problems or new developments in science, says Curtis Callan, a Princeton physicist who is Jason's current chairman, "and we all circle around several times, and pick a few topics we think are promising. It's an iterative process." The process does have ground rules. Jason won't take on projects that a clutch of theorists can't solve in a summer session. An example: Sponsors often bring up the problem of turbulence—a critical issue for, say, the design of submarine hulls—but Jason always demurs, Callan says. "We have to say the human race has been working on that problem for the last 150 years and we're not going to do anything terribly dramatic in 7 weeks."

Once projects are chosen, "several people will say, 'Ah yes, I want to work on that one,'" Callan says, "and by the time the summer session rolls around, [we've] organized briefings and know where the documents are." At the 7-week session, held at GA Technologies, a nuclear technology company in La Jolla, Jasons work in groups of varying sizes on half a dozen projects at once. They

Vietnam: An Awkward Time to Be a Jason

Defense work may bother many researchers, but not members of Jason, an exclusive club of academics that has willingly given the government top-secret advice about military technology for more than three decades (see main text). But Jasons are not all right-wingers or avid cold warriors. Far from it: Many, including physicists Hans Bethe of Cornell University, Henry Kendall of the Massachusetts Institute of Technology, and Richard Garwin of IBM, have taken unabashedly dovish stands on issues such as defense spending and research. So how do they justify their efforts on behalf of the Department of Defense (DOD)? Most would agree with the current Jason chairman, Princeton physicist Curtis Callan, who responds, "Do all right-thinking people have to be pacifists? In the right world they would be. But this isn't the right world."



AP/WIDE WORLD

Did Jason help them get out? *Marines on their way to Khe Sanh.*

Even so, one Jason project still haunts older members of the club. For most of the United States, the world was as wrong as it has ever been in the late 1960s, as the Vietnam war escalated. The Jasons found themselves advising the government to throw an electronic barrier across the Ho Chi Minh trail in Vietnam. Like much of the advice they had given the DOD, this figured to be unnoticed by the world at large. But in 1971 the Pentagon Papers exposed the group's involvement in the barrier project, and suddenly Jason's name was indelibly linked to an unpopular war.

Even before then, the war was a sore point with many Jasons. "Vietnam was agonizing and most of us were opposed to it," says Marvin Goldberger, now at the University of California, Los Angeles (UCLA). "But if, like Lysistrata, we had withheld our favors, it wouldn't have made a damn bit of difference." Other Jasons disagreed—in fact so strongly that several, including Gordon MacDonald of the University of California, San Diego (UCSD), left the group.

For those who stayed, 1966 was a critical year. The war was going badly; massive bombing had not cut the flow of supplies and soldiers down the Ho Chi Minh trail from North Vietnam. Jason got wind of a proposal by Roger Fisher, a Harvard Law School professor interested in arms control: block the trail with a high-tech barrier. Eager to do something constructive about the war, Jason developed the idea under the leadership of William Nierenberg, past director of the Scripps Institution of Oceanography. Jason's version of the barrier was no Great Wall, but rather an acoustic curtain that would betray passing troops and trucks.

The plan was to seed a 100-kilometer strip across Vietnam with bomblets—little more than cherry bombs—and acoustic sensors. When a soldier's boot or a truck tire triggered a bomblet, the sensors would pick up the report and send a signal to a central computer, which would pinpoint its source. Air strikes would then be dispatched to cut off the infiltration.

The Pentagon adopted the idea and actually constructed such a barrier, though just where it was installed and for how long remains unclear. Several Jasons testify to its effectiveness—at least in certain limited situations. Physicist Kenneth Case, a Jason at UCSD, recalls with some pride: "The detectors could hear soldiers peeing." Lest this trivialize the barrier, Case points to one clear success—at the notorious siege of the Marines at Khe Sanh in 1967.

"The Vietnamese were 'sapping': digging under the lines at Khe Sanh, bringing the siege in tighter, and cutting off more and more supplies," recalls Nierenberg. "It was the same tactic they used to starve out the French at Dien Bien Phu." Thanks to the barrier, though, would-be rescuers could tell where the enemy troops were massing, allowing them to target bombs and artillery fire. "It's how the Marines got out of Khe Sanh," Case adds.

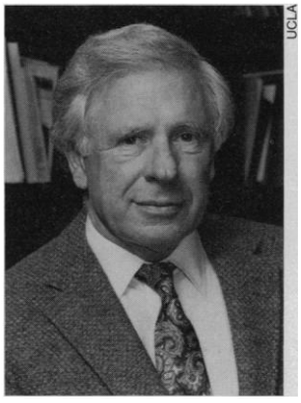
Was the barrier this successful on a grand scale? Robert McNamara, then secretary of defense, told *Science*: "The barrier was more effective than most people give it credit for. To some extent it worked, no question."

But whatever the barrier's success, a public outcry erupted when the Pentagon Papers revealed Jason's link to the war. Radical students and faculty demonstrated on the Jasons' home campuses; Jasons met angry confrontations at international conferences; Jasons' houses were vandalized. And Jasons' own doubts about the war sharpened. "Thinking in retrospect about science advising [in that era], we should have told McNamara to go to hell," says Goldberger. "But at the time, nothing is ever obvious." ■ A.F.

talk across groups: "It's a chatty bunch," says physicist Sam Treiman, a Jason at Princeton. The atmosphere, Treiman adds, is like that of a good scientific workshop. "Jasons have a team feeling," says founding chairman Goldberger, who has also been director of the Institute for Advanced Study and president of Caltech, "a common language, a common style, and the confidence acquired from a career of successful problem-solving."

Indeed, much like participants in the original Manhattan Project, Jasons savor their work. Says Freeman Dyson of the Institute for Advanced Study, a current Jason, "Doing real, honest, detailed technical work, that's fun. And working in a noncompetitive atmosphere—it's not important who does it, only that it gets done—is fun." Jason appeals to physicists, says Fitch, because "inventing and advising is what physicists love to do."

In general Jason sticks to science; it does not, says Goldberger, "sit around pontificating about policy issues." That's not to say that Jasons—many of whom are known outside Jason as liberals and frequent critics of the Pentagon—monolithically support all defense projects. But they seem able to separate scientific assessment of a technology from any philosophical distaste for it. Hans Bethe, the Cornell University physicist who is a longtime advocate of arms control, calls Jason's work "more a scientific inquiry than a taking of sides." In his own case, he says, his experience on Jason gave him background for his advocacy. "One has to know what a given armament can do," he says. "That's as useful for people who oppose the armament as for those who support it." Goldberger agrees. "To contribute seriously to arms control you have to study it."


UCLA

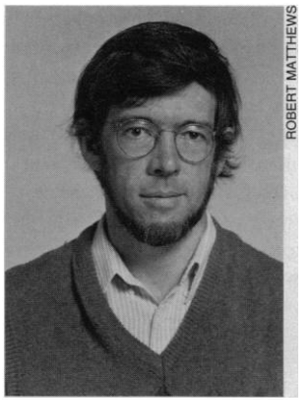
Marvin Goldberger

But if Jason skirts the political rationales for defense projects, by all accounts it is relentless at poking holes in misbegotten technologies. Perry recalls a notorious example: a Jason examination of the Carter administration's cruise missile program. Jason did a "measure/countermeasure" critique, in which the group first thinks up countermeasures that might defeat a weapon or defense and then tries to imagine ways of overcoming the countermeasures. In the case of the cruise missile, says Perry, the result was "a laundry list of problems, only some of which could be solved." Usually the DOD tries to avoid that sort of embarrassment if it has already committed itself to a project, says Perry. "Any time you invite a team as bright as Jason to be devil's advocates on a program you're committed to," he says, "you're asking for trouble."

That penchant for skepticism raises the question: What did Jason have to say about SDI? Speaking as individuals, Jasons are as sharply critical of the missile-defense program as any of their colleagues outside the national defense labs. Goldberger says SDI was "all baloney from the very beginning," and Treiman agrees: "Any sane person is against Star Wars." But Jason as a whole stuck to its habit of evaluating the technologies on their own merits. "Jason's certainly been critical," says John Cornwall of UCLA, "but there's been no blanket dismissal of ballistic missile defense." Indeed, Jason contributed substantially to several Star Wars technologies. One, of course, was the artificial "star," proposed in 1982 by two Jasons—Will Happer, now head of DOE's Office of Energy Research, and Gordon MacDonald at the University of California, San Diego (UCSD). And when Star Wars engineers were fretting over the low efficiency of their free-electron laser—a laser that generates radiation not in a crystal or a gas but in a sinuous beam of electrons—Jason suggested a design change that broke the impasse.

In those cases Jason members had the satisfaction of knowing that their advice was acted on. But most often, Jasons don't know the fate of their reports. If projects are classified, the outcomes are hard to track; and if projects are analyses or critiques rather than inventions, the outcomes are hard to quantify. "A score card is hard to do," Goldberger says. But individual Jasons are regretfully aware of advice that went nowhere. Kenneth Case of UCSD recalls that Jason recommendations for ways to update air traffic control systems with more efficient radars and better communications went unheeded. Indeed, some physicists who have declined the invitation to join Jason say that the group's role is a thankless one. "They say the government ignores technical advice [about politically favored projects] anyway, and Jason is naive in thinking it won't," explains Kurt Gottfried, a Cornell physicist who is not a Jason.

To Jason members, though, the risk of sometimes being ignored is outweighed by the appeal of contributing to the key issues of the day. At its founding Jason was infused


ROBERT MATTHEWS

Curtis Callan

with the spirit of the Manhattan Project. "You came out of [the Manhattan Project] with an accelerated maturity, a sense that you should work with your government on matters of national interest," says William Nierenberg, past director of the Scripps Institution of Oceanography and a longtime Jason. And that spirit was perpetuated in younger Jasons, who felt, Goldberger says, that they "were supposed to step up and take their responsibilities." Kenneth Case puts it this way: "I could contribute by running for public office, but I wouldn't get elected and wouldn't be any good if I were."

With the end of the cold war, will that sense of purpose dissipate? Goldberger worries about it: "Institutions often outlast the mission they were set up to do." Callan, however, downplays the danger. "The need for the military won't evaporate," he says. "DOD still regards technology as its source of effectiveness. That's precisely what we're all about, helping them [use] technology in the most intelligent way." And even though the concerns of the military may change now that the superpower arms race is over, Jason's access to and experience with defense issues will remain unparalleled. "Jason is uniquely situated," Callan says, "a foot in both worlds."

Even so, the group is casting about for nondefense problems as momentous as the military issues of the past. A current Jason project, for example, examines the role of clouds in climate change. Global warming will change the thickness, brightness, and water content of clouds, which in turn will feed back to change the climate. That much is certain, but climatologists can't say whether the feedback will speed up global warming or put the brakes on it. So DOE is designing an experiment to study how variations in cloud properties correlate with local climate variations—and it commissioned Jason to review the experimental designs.

So maybe the government will continue to find useful employment for this creature of the cold war as the nation stands down from nuclear alert. "The general feeling," Treiman says, "is that you don't want to move in any direction that isn't solid technology and where there's no room to do something useful." But those criteria should still leave Jason plenty of room to exercise its talents. ■ ANN FINKBEINER

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