careful engineering, he says, since the charged particles repel each other. When the dense proton beam, accelerated to nearly the speed of light, collides with a fixed target, it will produce a huge yield of kaons—enough to make the rarest types of decays likely.

These rare decays promise insight into a fundamental physical loophole: a violation in what is known as charge-parity (CP) symmetry. According to CP symmetry, changing every particle in the universe to its antiparticle and reversing each one's parity—a process physicists often compare to reflecting everything in a mirror—results in an indistinguishable universe. Though it all sounds pretty, CP symmetry would have tragic results if it were inviolate. With each type of particle matched by an equal quantity of the oppositely charged anti-particle, matter and antimatter would annihilate each other as fast as they came into existence. So some sort of fortuitous violation in the symmetry must have tilted the balance toward an excess of matter.

Such a violation was actually detected in 1964—well before physicists had focused on the cosmological importance of CP violation. In the products of one particular kaon decay, Princeton physicists Val Fitch and James Cronin found evidence that something was amiss. The parent particle and its decay products differed in their total CP—a quantity that takes into account both parity and the proportions of matter and antimatter. To the physicists, the implication was clear: a tiny violation of CP symmetry had occurred.

Current theory predicts some other CP violations, but it also says they should occur only extremely rarely. As University of Chicago theorist Yau Wah explains: "We've already seen the basic CP violating event—that's old. To learn more we want to look at rarer CP violating decays." The problem? "These happen a million times less frequently," he says.

Which is why many physicists are rooting for KAON. An investigation of these rare decays, besides helping clarify the nature of CP asymmetry and hence the existence of matter, might also open a wider window on fundamental physics, they say. For example, new forms of CP violation might point out a way to improve the particle physicists' "standard model"—the contemporary picture of particles and the forces that govern them. The CP violation observed by Fitch and Cronin can be explained within the standard model, but theorists have predicted possible CP violating decays that, if seen, would contradict it.

But why fund KAON, ask skeptics, when other accelerators, existing or planned, could do the same type of research? CP violation would also be the target of the "B factories"—special-purpose accelerators analogous to KAON but specializing in a related particle called the B-meson—that Stanford and Cornell are now eager to build (see *Science*, 22 March, p. 1416). And some U.S. physicists think existing accelerators, like Fermilab's Tevatron, could, with a little work, serve as productive kaon factories. "We could do better kaon physics here at Fermilab," says physicist Edward Kolb. Such sentiments make it clear that KAON will face tough scrutiny as the Canadians come south in search of the funds they still need.

Others disagree. Donald Lazarus of Brookhaven National Laboratory (BNL) argues that while existing machines can be retrofitted to make kaons, the Canadian project will do it better. "You can do that kind of thing here at BNL, but you will probably get more kaons from KAON." As for B-factories, most physicists interested in CP violation want both kinds of machines. "For the last 25 years we've been looking left and right and haven't found any new information," says Wah. "Any new evidence will be a great help." ■ FAYE FLAM

Some Would KO KAON

Canadian physicists hail it for the unique science it promises. World class physicists outside Canada—including U.S. presidential science adviser D. Allan Bromley (who is a Canadian by birth)—give it ringing endorsements. But KAON, the project to expand the Tri-University Meson Facility in Vancouver, British Columbia, into a high-intensity factory of the subatomic particles called kaons (see main story) is deeply upsetting to many Canadian scientists from other disciplines and some members of the federal government. Aghast at the $709-million price tag and annual operating costs of $100 million, which make it Canada's most expensive science project ever, they fear KAON will starve the rest of Canadian science. All reacted with dismay to the government's announcement last week that it would underwrite a third of the accelerator's costs.

"This is not a wise use of limited science and technology resources at this time," said Janet Halliwell, chairman of the Science Council of Canada, an arm's-length advisory body. Her reaction echoes statements made before the announcement by several scientific organizations, including the big science subcommittee of the prime minister's own National Advisory Board on Science and Technology, which had rejected KAON in favor of other science priorities.

Federal minister of science William Winegard denies that funding for KAON is bad news for the rest of Canadian science. "This is a fixed and capped offer," he insists, with no provisions for inflation or cost overruns. He also stresses that the federal offer represents new money; it will not drain existing science and technology budgets. "We didn't want people to get the impression, in making an offer on KAON, that suddenly subatomic physics becomes the number one priority for Canada," he told *Science*. "The cabinet recognizes that there are other science and technology priorities on the table, and that those will be looked at."

KAON opponents don't buy this, viewing the decision as a victory of politics over science. Much of the pressure for funding came from the government of British Columbia, which has been touting KAON as a tool for economic development and has even offered to pay part of its costs. Indeed, some critics have construed the timing of the announcement—hours before a provincial election was called in British Columbia—as political opportunism, a move on the part of federal Conservatives to boost the fortunes of the ideologically related British Columbia Social Credit party, which has been trailing in the polls. Winegard dismisses such charges, saying the announcement was made because "there was just too much speculation going around."

All this has emitted an odor of pork-barrel politics. And that, in turn, has led to questions about how future big science projects should be decided in Canada. Halliwell notes that while decisions about large projects such as KAON will always be political, the process "could be opened up more, as in the United States. If [the approval of KAON] represents a turning point for science and technology in this country, we should applaud, but it begs serious questions about the role of the national advisory board on science and technology." ■ DOUGLAS POWELL

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