"The stability of BPA is at risk."

Ironically, these developments come on the heels of a decision in December that was intended to balance energy and environmental needs. Choosing not to back a plan to breach four dams on the Snake River to aid salmon recovery, President Clinton instead ordered several agencies to coordinate efforts to increase water releases from reservoirs in the spring and summer. The releases were meant to be part of an overall plan to speed and cool rivers to aid fish migration, restore damaged habitat, limit fishing, and prevent the overproduction of hatchery-reared fish, which can replace wild stocks.

It's now unlikely that those spring guidelines will be met. After declaring an energy emergency twice this winter, BPA has increased water flows at some dams by as much as 60%. Although the need for excess releases should end as winter ebbs, Mahar says that they may reduce springtime river flows by 1.5%.

BPA fisheries biologist Bill Maslen doesn't think that the small drop in flow will have much effect on juvenile salmon migration. But Chris Ross, a fisheries biologist with a National Marine Fisheries Service (NMFS) office in Portland, Oregon, says they make an already bad water year even worse for the salmon. "We're in the thick of trying to figure out what it means," says Lynn Krasnow, another fisheries biologist at NMFS.

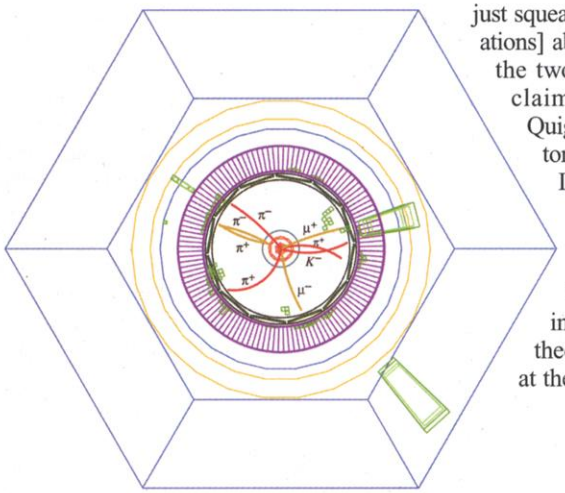
Even a season of good rains, however, is unlikely to make the problem evaporate. It will be years before power plants fueled by natural gas, now under construction in California, Oregon, and Washington, come on line. That leaves hydropower with the burden of filling the energy demand for a growing region—and of keeping its salmon population afloat. **–ROBERT F. SERVICE**

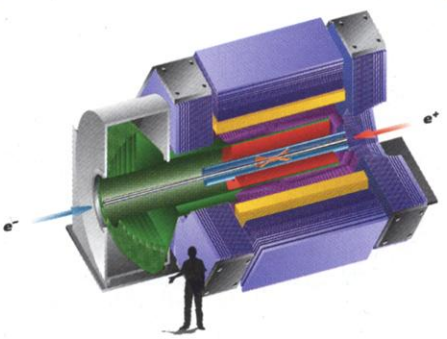
HIGH-ENERGY PHYSICS

B-Meson Factories Make A "Number From Hell"

SAN FRANCISCO—Humanity—and everything else in the universe—exists because matter and antimatter forged in equal amounts during the big bang may have decayed into slightly different sets of particles, giving matter a competitive edge. This tiny imbalance of one part per billion arose from a process called charge-parity (CP) violation, and there's a vigorous debate among particle physicists about its origin. New data reported here last week* at the annual meeting of the American Association for the Advancement of Science are at odds with the imbalance predicted by the reigning model of particle physics—but not by enough to settle the argument. "It's the number from hell," says Stewart Smith, a physicist at the Stanford Linear Accelerator Center (SLAC) in California, home to one of the two experiments.

Physicists discovered a simple form of CP violation in 1964 within the decays of K mesons, which are short-lived mixtures of matter and antimatter. For the last 2 years, teams at SLAC and the High Energy Accelerator Research Organization (KEK) in Tsukuba, Japan, have probed for a deeper signal of CP violation in B mesons, the heavy brothers of K mesons. Special machines dubbed "B factories" create tens of millions of B mesons by smashing electrons into their antimatter counterparts, positrons. However, only about one out of 10,000 collisions are "golden events"—pairs of B's and anti-B's that spawn an easily measurable spray of certain mesons and offer the clearest signature of CP violation. As of January, physicists had seen 630 such events at SLAC and 260 at KEK.





Hard to B sure. Particles (*above*) fly from an electron-positron smash inside the Stanford Linear Accelerator Center's B-meson detector (*right*). Analysis of 630 such "golden events" reveals a tantalizing but inconclusive difference in the properties of matter and antimatter.

CREDIT: BABAR COLLABORATION/STANFORD LINEAR ACCELERATOR CENTER

That's enough for a preliminary analysis, reported SLAC physicist Patricia Burchat. The Standard Model, which describes nature's basic particles and their interactions, predicts that the dimensionless value of CP violation should be 0.72 on a scale from –1 to 1, in which 0 represents symmetry between matter and antimatter. SLAC's value to date is 0.34, but the error range is large: ± 0.20. That means there's a 5% chance (twice the error bar, or two standard deviations) that the real value could match the prediction of the Standard Model, but it also could be 0. "It's not the most exciting of possible values," admits Burchat. KEK's preliminary number, 0.58, is closer to the Standard Model value, but with a bigger error bar of ± 0.33. Both teams presented their results in more detail this week at a conference in Ise-Shima, Japan.

However, a "meta-analysis" of all B-meson decays in the world to date offers some intriguing results. After combining data from SLAC, KEK, and other facilities and weighting them according to their errors, Burchat derives a value of 0.48 ± 0.16. "That just squeaks in at three sigma [standard deviations] above zero," she says. But neither of the two B-factory teams can make that claim by itself, says physicist Chris Quigg of the Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois. "The first people who do that will have a party," he observes.

Despite the uncertainties, other physicists applaud their colleagues' rapid progress. "It's starting to get interesting," says Fermilab theorist Joseph Lykken. "We're almost at the point of challenging the Standard Model and its explanation of CP violation." Theorist Michael Dine of the University of California, Santa Cruz, had hoped for something else: "It's depressing. I desperately wanted it to be 0." That result, far out of whack with the Standard Model, would have worked well with a sweeping but untested theory of particles and forces called supersymmetry, Dine says.

Burchat notes that imminent upgrades will lead to vastly improved statistics. For instance, SLAC's B factory has churned out 23 million pairs of B's and anti-B's so far, but physicists expect it to produce 80 million in 2002—far beyond the machine's initial goals. There is some urgency to do so: The new Tevatron accelerator at Fermilab may start spitting out billions of B pairs per year when it is turned on next month. However, the swarms of B's will be embedded within a complex tangle of other particles from the collisions of massive protons and antiprotons. That jumble will make the analysis far more complex than at SLAC and KEK—and in all likelihood add further fuel to the debate. **–ROBERT IRION**

* 2001 AAAS Annual Meeting & Science Innovation Exposition, San Francisco, 15–20 February.