would operate outside the usual political system. They included in the state constitution a clause stipulating that 1% of all state revenues be set aside each year for research grants. According to FAPESP's present scientific director, José Fernando Perez, the foundation is now receiving about $50 million a year and—using accumulated reserves—plans to spend $70 million to $90 million a year on grants. The money is available only to residents of São Paulo, but often they team up with collaborators in other states.

By law, says Perez, FAPESP cannot spend more than 5% of its budget on administration. The rest goes out to grantees—a striking contrast to the federal agencies, which absorb most of their own budgets administering intramural projects. Unlike some other agencies, FAPESP tries to ban at least the appearance of a conflict of interest, and applications are thoroughly peer-reviewed. Space researcher Umberto Sobral of São José dos Campos, for example, said he was thrilled at how FAPESP handled his application: It read, accepted, and funded new plans to study Earth's magnetosphere, while he had been kept dangling by a federal agency. And a biologist from Rio said he held FAPESP in high regard because even its critical responses show that reviewers read the proposals carefully.

FAPESP is able to put science first because of its independence. At least half of its governing council members, appointed by the governor of São Paulo, have a technical background. As a result, says Perez, "we don't have to align our policies with the government's." However, this could change, because FAPESP's technical orientation has been protected by tradition rather than by law.

But while the going is good, FAPESP wants to expand. According to Perez, the agency hopes to offer a new series of grants aimed at improving scientific infrastructure. Already FAPESP has started the ball rolling by paying to bring the Internet to all Brazilian scientists, including those outside São Paulo. Now, Perez says, FAPESP is planning to invite applications for funding to address equipment needs ranging from air conditioning to lab renovations. In conjunction with the World Bank, which is contributing roughly $100 million, FAPESP is planning to spend $250 million on laboratory equipment over the next 3 years. The word has already gone out, and, based on expressions of interest, Perez says, "the demand appears to be double what we anticipated."

Other Brazilian states are not likely to fill the breach. Their governments have tried to copy FAPESP, writing R&D taxes into their state constitutions. But scientists report that these laws have been ignored: Politicians in other states have not yet been able to stomach anything so weird as an independent, apolitical science agency.

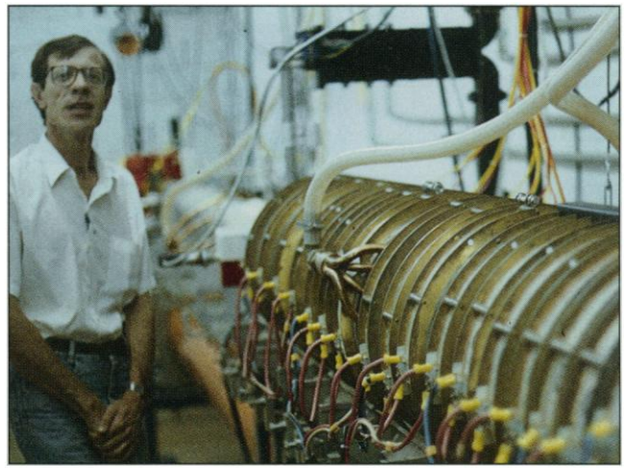
–Eliot Marshall

BRAZIL

Physicists Hand-Build a Synchrotron

CAMPINAS, BRAZIL—On a hilltop on the outskirts of this university town in southeastern Brazil, physicists and artisans have been engaged for the past 10 years in a unique and, many would say, wildly ambitious project. They are building an electron storage ring: a 29-meter-diameter accelerator for electrons. Within a year, if all goes as planned, the ring will spring to life as the heart of the first and only synchrotron light source in the Southern Hemisphere.

The goal is to build a facility comparable to medium-power machines like the one at the Louisiana State University (LSU) in Baton Rouge. The penetrating light thrown off by the billion-electron-volt beam, just shy of hard x-ray power, should enable South Americans to compete with Europeans and North Americans in dissecting new materials and doing exotic biology, such as protein crystallography. And in an extra dose of chutzpah, the Brazilians are building this machine largely by hand. Most of the components are being assembled in special workshops in Campinas because Brazil's economic problems during much of the project ruled out big purchases from overseas.



E. MARSHALL

Ready and waiting. The linear accelerator for the Campinas synchrotron, shown with deputy director Ricardo Rodrigues, awaits the completion of the project, which is scheduled for early 1996.

"Assuming it all works," says Peter Siddons, a physicist at Brookhaven National Laboratory who visited Campinas recently and reviewed parts of the design at the request of the Brazilian team, the machine should be producing "lots of good materials science" in a few years. John Scott, a researcher at the LSU synchrotron, knows the Brazilian effort firsthand because the Campinas center has assembled the experimental equipment for two of the synchrotron's beam lines at LSU for testing. "The craftsmanship is outstanding," Scott says.

Physicist Cylon da Silva, director of the Laboratorio Nacional de Luz Sincrotron (LNLS) argues that besides producing good science, this homegrown effort will generate expertise that should diffuse through the local community, making Brazilian industry more competitive in the world economy. That was the justification for the LNLS when planning began in the early 1980s, da Silva says. And in 1984, this rationale helped win it the status of an official project, backed with funds from the national science council, known as the CNPq. The state of São Paulo also made a donation, kicking in the 90 acres of land adjacent to the university at Campinas where the storage ring is now being built.

But construction has been slower than planned because of budget constraints. In the first years, according to da Silva and his deputy, Ricardo Rodrigues, a few local industrialists were enthusiastic enough to join the board, but no financial support from them materialized. Federal funding has also been less than planned, and the total budget has actually shrunk, dropping from $70 million to $50 million today.

Da Silva thinks the project has now turned a corner. Last year, funds finally came through for construction of the main building. The foundations and roof were in place last fall, and the lovingly crafted magnets and vacuum lines—now housed in a large warehouse on the hilltop—will move into place this year. LNLS is also at work designing research projects, which will use the emitted light for molecular spectroscopy and studies of the fine structure of various solids and liquids, among other things. Sometime in early 1996, da Silva predicts, the whole system will be up and running.

The LNLS staff still faces a challenge in trying to finish the project on this schedule. But if you ask da Silva to name the biggest obstacle he has confronted in getting to this point, he doesn't mention a shortage of money, materials, or personnel. Instead, he says his biggest problem was persuading Brazilian leaders that Brazil could actually build such a complex machine and make it work. In less than a year, his judgment on this point will be put to the test.

–Eliot Marshall