BEYOND BORDERS

In its six decades, São Paulo's FAPESP has helped strengthen Brazil's broader science, technology, and innovation ecosystem

Fabrício Marques

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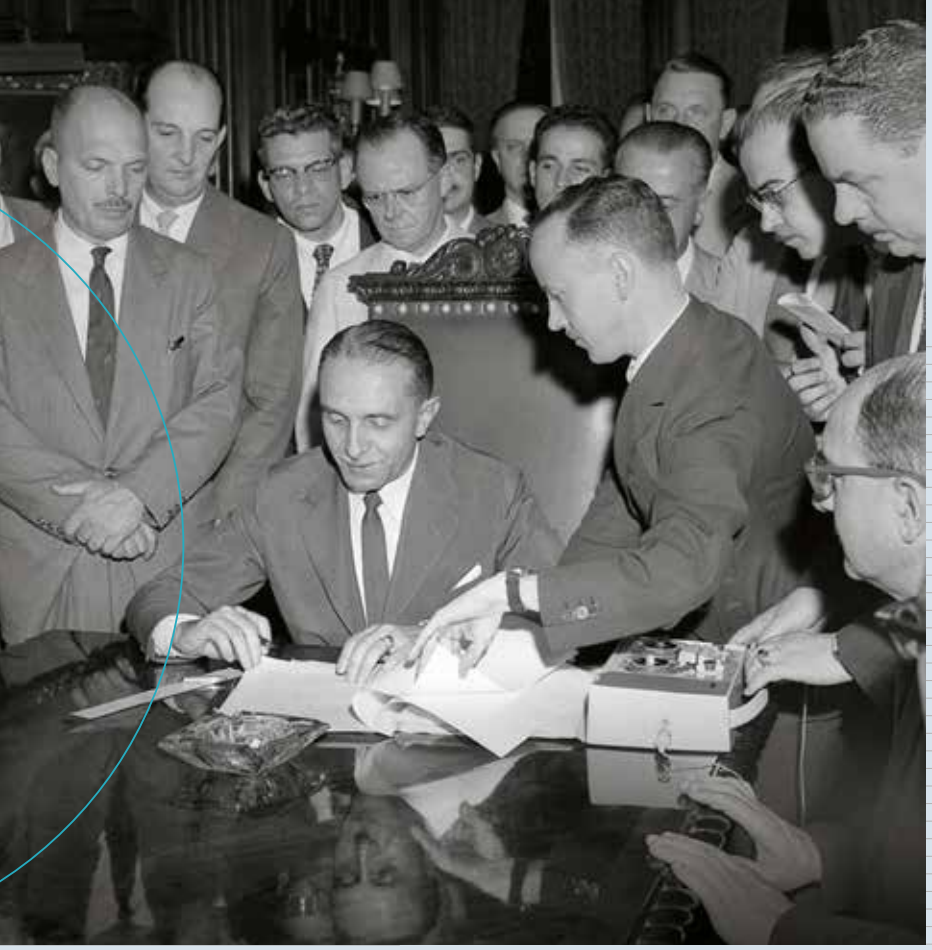
Since its founding 60 years ago this May, FAPESP has funded some 320,000 research projects at institutions in São Paulo across all fields, helping consolidate the state's nationally leading position in scientific output. However, the Foundation's influence on higher education and basic and applied research has extended beyond São Paulo's borders, imprinting a lasting mark on Brazil's wider science and technology landscape. On many occasions, programs developed at FAPESP have inspired other initiatives on a national scale.

In the late 1990s, the FAPESP Genoma program, which brought together 192 researchers in a virtual network of 60 laboratories to sequence the DNA of multiple organisms, led to several other similar initiatives around the country. In 2000, the year Nature published the results of the genome sequencing of the bacterium Xylella fastidiosa, the Brazilian National Council for Scientific and Technological Development (CNPq) established a nationwide network for the Brazilian Genome Program, comprising 240 scientists from 18 states, which was initially tasked with cracking the genome of Chromobacterium violaceum, a bacterium with important applications in biotechnology. "CNPq, not surprisingly, chose biochemist Andrew Simpson, the FAPESP program's DNA coordinator, to head the federal initiative," says physicist José Fernando Perez, who served as the scientific director of FAPESP from 1993 to 2005. He recalls a telephone call he received from Wanderley de Souza, then Rio's Science and Technology secretary: "He said that the governor of Rio de Janeiro was impressed by our program and was proposing a partnership." A collaboration was established with Jesus Ferro, a researcher at São Paulo State University (UNESP) in Jaboticabal and one of the scientists heading the FAPESP Genoma program, to develop a DNA library for his counterparts in Rio.

Another case in point is the FAPESP Technological Innovation in Small Businesses (RISB, or PIPE in Portuguese) program, launched in 1997. Like the FAPESP Genoma program, RISB was modeled on a US initiative. It mirrored the format of the Small Business Innovation Research (SBIR) Program, created in 1982 to funnel funding from US research agencies to support innovative small businesses. RISB was in its fifth year when the Brazilian Funding Authority for Studies and Projects (FINEP), a federal agency, launched a similar initiative: the Research Support for Businesses Program (PAPPE). However, in São Paulo, the federal program took a different format. Under an agreement between



São Paulo Governor Carlos Alberto Alves de Carvalho Pinto (*seated*), signing FAPESP's articles of association on May 23, 1962

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FAPESP's Science Board and the then chairman of FINEP, Sergio Machado Rezende, PAPPE funded only Phase 3 RISB projects—those that had already received FAPESP funding, were at an advanced stage and were close to commercial application. In other states, FINEP also funded earlier-stage projects.

While the Foundation does not have a mandate to directly fund researchers and institutions in other states, the impacts of its programs have reached across borders. In 2008, FAPESP performed a survey to profile its scientific initiation, master's, doctoral, and postdoctoral grant beneficiaries from 1992 to 2002. A map showing the subsequent professional careers of former grant beneficiaries in 12 different fields revealed that while most—between 70.3% and 83.8%, depending on the field—were still in São Paulo, a significant number of them were employed in other states and even other countries. In the fields of health care, crop science, and veterinary science, former grant beneficiaries were found in 24 states. "For many years, FAPESP-funded researchers and higher education institutions in São Paulo accounted for 70% of PhD researchers in Brazil," writes FAPESP Chairman Marco Antonio Zago in an article published this year in the journal Estudos Avançados: "As of 1996, 67% of PhDs were completed in São Paulo, and from 1996 to 2017 the state accounted for 44.3% of the total. So, you could say that FAPESP has indirectly supported the development of federal universities in all the states of Brazil."

FAPESP has also grant-funded São Paulo-based researchers with research interests outside the state, as well as collaborations with scientists in other states and internationally. For example, FAPESP has been the single largest funder of Amazon research, provisioning 895 projects and 1,612 grants, many linked to the Foundation's special programs. "The Amazon has always been a key research interest for us, given the importance of the region for Brazil and for the world," says physicist Carlos Henrique de Brito Cruz, who served as chairman of the FAPESP Board of Trustees from 1996 to 2002 and scientific director from 2005 to 2020. In 2014, he attended a symposium in Washington where he presented the results of research projects on the Amazon's tropical forests. "The Amazon is part of the scope of two of FAPESP's flagship programs," he explains, referring to the Research Program on Biodiversity Characterization, Conservation, Restoration, and Sustainable Use (BIOTA) and the Global Climate Change Research program.

However, perhaps FAPESP's biggest contribution to Brazil's science and technology ecosystem is the way it has served as a blueprint that research-funding agencies in other states have replicated. Granted, it took several years for FAPESP's pioneering model to find its way to other states. Rio Grande do Sul became the first state to institute a counterpart funding agency (FAPERGS) in 1964, while the states of Minas Gerais and Rio de Janeiro would not follow suit until the 1980s. Although Brazil now has similar foundations in 26 of its 27 states (all but Roraima), it was only in the 2000s that most of them were created, often under the provisions of their state constitutions. "FAPESP helped structure many of these foundations," says Brito Cruz.

In addition to assisting with more formal matters, FAPESP was active in discussions regarding the approaches to research funding in these states. Flávio Fava de Moraes, FAPESP's scientific director between 1985 and 1993, recalls a landmark battle that the Foundation championed in the state legislature, which sent waves across country when it lobbied to raise FAPESP's allocation of state tax from 0.5% to 1% under São Paulo's 1989 Constitution. "São Paulo's science community, led by the Foundation, decided to ask for a larger slice of funding," explains Fava, who, accompanied by the then chairman of the FAPESP Executive Board, Alberto Carvalho da Silva (1916–2002), went from office to office in the State Assembly and visited Palácio dos Bandeirantes, the seat of the São Paulo state government, to advocate for the change.

"I remember receiving a late-night call from a professor at USP alerting me that the funding increase was being discussed at that very moment by the deputies and was at risk of being carved out. I got in my car and drove as fast as I could to the Assembly," recalls Fava. He was able to talk to the rapporteur of the new Constitution, deputy Barros Munhoz, who described the impasse as follows: one group of deputies argued that a fixed tax allocation for FAPESP would be unfair to other state agencies—either they should all have a constitutional allocation, or none of them should. This gridlock was only resolved, says Fava, when, in consultation with the then Governor Orestes Quércia, a proposition was made. FAPESP's funding should be applied not only to scientific but also to technological development—a change that expanded the agency's scope and challenges: "The 1% was unanimously approved. This was great for the Foundation, helping it to better fulfill its mission to support research across all fields of knowledge."

This funding increase in São Paulo soon began to be discussed in the legislatures of other states. Alberto Carvalho da Silva visited several other states to hold discussions with governors and deputies, advocating that they replicate FAPESP's funding model. "I remember the chairman of the state assembly in Rio Grande do Sul was enthusiastic about the idea of earmarking state taxes for FAPERGS. He had strong support from colleagues who were familiar with São's Paulo successful model," says Fava. Ultimately, that state's Constitution set aside an even larger percentage than in São Paulo—1.5%—for its funding agency.

This had a limited impact, however, with many states failing to meet their constitutional allocation or having to adjust during budgetary crises. São Paulo alone maintained an impeccable record: since the 1% tax transfer was written into the Constitution in 1989, the state has never been late on its payments to FAPESP. Created as a private foundation, FAPESP manages its budget independently. It can also invest its funding and use dividends as a long-term source of cash for research grants and projects.

Former foreign minister Celso Lafer, who served as the chairman of FAPESP between 2007 and 2015, explains that the Foundation's model was influenced by the landmark report, "Science, the endless frontier," published in July 1945 by American engineer Vannevar Bush (1890-1974), in which he asserted the interdependence of basic and applied science and called for a free and independent scientific community and greater participation by industry and private business in research efforts. "Since it was founded, FAPESP has never made a distinction between basic and applied science and has instead funded research across all fields. It began by providing over-the-counter grants but soon expanded its scope to

FAPESP HAS PROVIDED A MODEL FOR RESEARCH-FUNDING FOUNDATIONS IN OTHER STATES

On December 15, 1997, the then Governor Mario Covas announced the first companies selected for the RISB program in Bandeirantes Palace

include more ambitious and longer-term programs and projects," says Lafer, whose tenure at FAPESP was marked by efforts to internationalize the organization by creating a network of collaboration with research institutes and universities around the world.

The assurance of sufficient funding to meet the scientific community's research needs has allowed the Foundation to expand its focus on developing innovative initiatives over time. Flavio Fava de Moraes mentions the Biochemistry Development Program (Bioq-FAPESP), launched in 1971, as an example. This was the Foundation's first foray into funding research in an emerging field. "Bioq-FAPESP also encouraged different research groups to collaborate and served as a pilot, during my tenure, for the introduction of a category of projects operating as research networks, known at FAPESP as thematic projects," says Fava.

"FAPESP was able to implement aspirational programs that leveraged this potential," says José Fernando Perez. The Foundation, he continues, created a fertile environment not found in any other agency: "Subject-matter coordinators would meet on a weekly basis, and I, as scientific director, had the opportunity to interact with leading figures in the science community to discuss FAPESP's vision. This highly interactive environment is maybe one of the things that distinguishes FAPESP from other agencies." Moreover, he says. "The somewhat invisible interface that exists between FAPESP and the community is behind a number of its pioneering programs." Based on the recommendations of assistant and subject-matter coordinators, says Perez, several programs were launched during his tenure, including Genoma, SciELO, Biota, and RISB—many of them based on international experience.

Neuroscientist Luiz Eugênio Mello, FAPESP's current scientific director, recalls how, during his time as an assistant coordinator from 2003 to 2006, he was involved in discussions that would later result in important programs. "There's a Brazilian saying that goes, 'it's easy to engineer a finished building,' or to prophesy in hindsight," he says. Hence, "Many of FAPESP's most successful initiatives (thematic projects, Genoma, SciELO, to name a few) were initially met with opposition from the community. Maybe that's the way it always is with challenges and new terrain. Different forces pulling hither and thither helped to shape the development of FAPESP's new projects and programs. Indeed, science flourishes from scientific disagreement, provided it does not devolve into personal attacks." ■

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