Severe funding cuts threaten the future of research in Brazil

Despite a diverse and expanding research portfolio, a federal funding crisis is threatening the future of scientific research in Brazil. Materials research in Brazil has been expanding in recent years. A new advanced synchrotron light source, Sirius, is under construction. Major research centers on functional materials, glass, and graphene were recently approved. The number of materials science articles published in international journals with authors in Brazil nearly doubled between 2006 and 2015. Materials researchers in Brazil should have much to look forward to, but the climate is one of apprehension as increasingly severe funding cuts take hold.

Scientific research in Brazil occurs at universities and research institutions. Most funding comes from federal agencies that support research programs at federal universities and institutes. Each state also has its own research funding agency that supports programs at its state universities and institutions. Collaborations among federal and state universities and institutions are common. With the exception of the state of São Paulo, the strongest research programs are associated with federal universities.

This system works well when the economy is booming, but when money is tight, science often pays the price. "Science in Brazil remains subject to governmental policies, which means that every new government decides on its own science and technology policy," says Helena Nader, president of the Brazilian Society for the Advancement of Science. Resources are set aside for science and technology in the annual budget, but getting the full allocation requires the support of finance ministers or the president. That support is lacking.

Brazil is currently in the midst of its worst economic recession in decades, which many blame on the previous administration's mismanagement of public funds. Severe austerity measures are now in place. Science funding for federal agencies has decreased consistently since 2015, and in some cases almost disappeared. This is also true for most state funding agencies.

Science has been hit particularly hard. "The cuts in funding have been much larger than the actual drop in the Brazilian gross domestic product. That is to say, the share of sacrifices taken by the scientific system has been much larger than the downturn in the economy," says Osvaldo Novais de Oliveira Jr., president of Sociedade Brasileira de Pesquisa em Materiais (SBPMat), the Brazilian Materials Research Society.

The impact of these cuts varies by state. Some, like Rio de Janeiro and Rio Grande do Sul, have virtually no money for universities or research. States that rely less on federal research funding or whose local economies have fared better during the recession are more stable, but the strain is widespread. Not only is the lack of funding troubling, says Oliveira, but the present federal government has not presented a detailed plan for its strategy in science, technology, and innovation. "We do not know whether the government values science and technology as an asset for the country," he says.

In May of 2016, then-interim Brazilian President Michael Temer merged the science ministry with the communications ministry, requiring the already dramatically reduced budget to be shared. An important federal funding agency within the ministry, the National Council for Scientific and Technological Development, was moved beneath more layers of bureaucracy in this transition. A recently passed constitutional amendment includes severe restrictions on science and technology funding for at least the next 10 years.

The result of all of this is an atmosphere of insecurity and anxiety among Brazilian scientists. There is looming fear that young scientists will leave the field or even leave Brazil altogether, and anecdotally, this is already happening. Not only could Brazil's growing materials community lose ground in research areas like metallurgy, conducting polymers, and bioactive materials from such an exodus,

The construction site of Sirius, Brazil's new fourth-generation synchrotron light source. Sirius could greatly increase the capacity of Brazil's research infrastructure, but scientists are already struggling to maintain adequate support for existing research. Credit: LNLS/CNPEM.

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the country could miss out on an opportunity for a more stable financial future.

"For the country to develop in a sustainable manner, we need to improve our innovation system," Oliveira says. "Brazil has managed to build a reasonable scientific basis, but this has not been sufficient to transform knowledge into technology and wealth. If the funding crisis persists, we shall not be able to innovate further, as we will not have the human resources qualified for that."

The crisis could severely impact Brazil's capacity for research in other ways. Edgar Dutra Zanotto, a materials scientist and member of the Brazilian Academy of Sciences, cites concerns about the community's ability to maintain electron microscopes, spectrometers, laser devices, and other tools that require costly parts or maintenance by non-Brazilian technicians and engineers. A very restrictive funding situation could also jeopardize national projects like Sirius and a planned multipurpose nuclear reactor.

In response to these concerns, scientists, funding agencies, and scientific organizations from across the country are meeting with politicians and ministers, organizing seminars, writing letters to the press, and holding protests. "I would risk saying that, in addition to organizing their annual meetings, this has been the most important activity of all these societies in the past year and still is currently," Zanotto says.

There is cautious optimism that these efforts will create change, and a few faint positive signs are emerging. The first private foundation for funding science research and outreach in Brazil is expected to open its doors in 2017. Many efforts are under way to find new partnerships and international funding for research programs. There are glimmers of hope that the worst of the crisis is over, but the situation remains very much in flux.

"It is hard to be optimistic in Brazil at the present situation, but we cannot abdicate hope. Our country has enormous [potential], that we are slowly, step by step, learning to identify and make good use of," Nader says. "Science will help Brazil to overcome the present crisis and be ready for a new period of sustainable growth that will certainly come."

Kendra Redmond

Connecting the EU research dots

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The first step toward open access to research findings is an open discussion on what this involves and how it can be achieved. The EU-funded project called PASTEUR4OA (Open Access Policy Alignment Strategies for European Union Research)—which ran from February 2014 to July 2016—brought together experts to develop and reinforce open access strategies and policies across Member States in a coordinated and collaborative approach. The premise of this project was that it is essential that a scientist working in one country has access to relevant research happening in another. Funders across the globe, including the European Commission, acknowledge the numerous benefits of open access to publicly funded research.

The European Commission has a mandatory open access policy for research publications and a pilot for open access to research data in the context of Horizon 2020. Furthermore, in its 2012 Recommendation on access to and preservation of scientific information, the Commission has recommended that Member States develop policies to allow for open access to publicly funded research.

Member States, funders, and research institutions are gradually developing open access policies. The PASTEUR4OA project supported the development of policies that are aligned with the 2012 Recommendation and Horizon 2020 rules.

"Our goal was to record and analyze the policy situation regarding open access to research findings, as in general the whole policy picture was rather murky," says Project Co-director Alma Swan. "There was some understanding of what policies were out there, and we knew that while some were very effective, others were not—so this project was an opportunity to have a go at settling the mud."

The project began by searching for open access policies around the world and recording them in detail. "Once we had all the policies and all their characteristics recorded, we used this information to analyze the anatomy of a good policy," Swan says.

What they concluded was that a policy must be mandatory and firmly established as a rule and not an option for research results to become available in open access. The project showed that for this to happen, especially in research institutions, it is most efficient that a policy for open access be connected to performance evaluation procedures.

In addition to this research work, the project put considerable effort into building a European-wide network of expert organizations to promote open access, encourage policy development and alignment, and support one another in these aims. The outcome of this work is the Knowledge Net, a network of expert organizations, known as "Key Nodes," from each country that has the authority and expertise to engage with policymakers.

These Key Nodes provide policymakers with information, share best practices, and offer guidance and advice where appropriate.

"We have 33 organizations in Knowledge Net and, because the network has been embraced by OpenAIRE, the Commission's open access infrastructure organization, it has been able to continue this work even after the end of the PASTEUR4OA funding period," Swan says.

In the context of the work of the Knowledge Net, and to support aligned policy development, the project prepared a large set of short but authoritative research and advocacy materials for national policymakers. For more information, see the PASTEUR4OA website: www.pasteur4oa.eu. □

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