ANNUAL
REPORT

FAPESP

2021

FAPESP 60
SCIENCE, CULTURE AND DEVELOPMENT | 1962 - 2022

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YEAR 2021

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SECRETARY OF ECONOMIC DEVELOPMENT
Patricia Ellen da Silva

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INTRODUCTION

Post-pandemic normality gradually took shape in 2021, as in-person activities resumed in most sectors of society including academia and business.

The onset of COVID-19 vaccination in January 2021 allowed universities and research institutions to restart their activities step by step, after suspension for the most part in the first year of the pandemic. This process was completed only in 2022, however.

FAPESP allocated $ PPP 400.5 million to the funding of 19,692 research projects in 2021, for growth of 3.5% compared with 2020. The main driver of this growth was investment in research grants, which rose 15.6%, while investment in scholarships was 23% lower than in 2019, still reflecting the fall in demand.

To speed up the reversal, FAPESP took several measures to stimulate research careers, creating new types of scholarship and grant and launching a mentoring program for postdocs in all knowledge areas. Even so, investment in the training of human resources in 2021 corresponded to 36.4% of annual disbursement to fund 11,469 scholarships.

Investment in Basic and Apllied Research increased in the same period: $ PPP 222,8 million – corresponding to 55.6% of total investment – to support 9,251 research projects. This funding strategy entails support for long-term research projects in the form of Thematic Projects, Young Investigator awards and the 17 Research, Innovation and Dissemination Centers (RIDC), among other programs.

To strengthen and renew this strategic line, FAPESP decided to promote the establishment of 18 new RIDCs in the years ahead. They will be selected in the program's third call for proposals, issued in 2021.

Investment in Research for Innovation amounted to $ PPP 34.2 million. This was 8.6% of total disbursement in the period and consisted of support for 1,644 collaborative projects involving universities, large and small businesses, and startups.

The Innovative Research in Small Business Program (PIPE), for example, invested more than $ PPP 25.1 million in support for 1,346 research projects conducted by 209 startups and small enterprises in 44 municipalities across São Paulo State. A new funding line was added to the program: known as PIPE for Knowledge Transfer (PIPE-KT), it stimulates the transformation of academic research results into new products, processes and services.

Two new Engineering Research Centers (ERCs) began operating in the same period, in partnership with Braskem and GSK, as well as an Applied Research Center (ARC) dedicated to studying early childhood. This ARC is a partnership with Maria Cecilia Souto Vidigal Foundation and hosted by INSPER. FAPESP disbursed $ PPP 7.2 million as its contribution to the funding of 13 ERCs and ARCs in 2021, making the ERC/ARC Program Brazil's largest program of collaborative research between academia and business involving long-term projects.

Partnerships were also important in 2021 in the area of innovation. FAPESP signed an agreement with SEBRAE-SP to invest $ PPP 59.4 million in funding for 150 companies to facilitate market access under the aegis of PIPE and issued two calls under the FINEP – Tecnova II Program for proposals to develop innovative products and processes.

FAPESP also took an important step to consolidate its sustainability agenda by launching an initiative known as Amazonia +10, a program to develop science, technology and innovation for the Amazon, in partnership with the National Council of State Departments for ST&I Affairs (CONSECTI), the National Council of Research Foundations (CONFAP) and nine state research foundations. The aim is to bring together researchers in at least three states in collaborative research projects oriented to biodiversity conservation, adaptation to climate change, protection of traditional peoples and communities, urban challenges and the bioeconomy as contributions to economic development policy for the Amazon.

Pursuing the same agenda but in the state sphere, FAPESP issued a call under its BIOEN program, in collaboration with the São Paulo State Department of Infrastructure and Environment, to select projects relating to the use of urban and agroindustrial waste to produce bioenergy.

FAPESP also reiterated its commitment to supporting research conducted with the aim of removing development bottlenecks in São Paulo State by issuing the second call for proposals to establish Science for Development Centers (SDCs) staffed by researchers affiliated with universities and research institutions in the public sector and private enterprise. The results will be announced in 2022. The first call, completed in 2020, led to the selection of 12 proposals and the SDCs in question are already up and running.

The COVID-19 pandemic and mitigation of its economic and social impacts continued to occupy the attention of FAPESP, which participated in two international calls – with the Trans-Atlantic Platform (T-AP) for Social Sciences & Humanities and the United Nations Research Roadmap for the COVID-19 Recovery – for projects to mitigate the social effects of the pandemic and contribute to public policies oriented to the recovery from the resulting economic crisis. FAPESP also supported the fifth and last phase of EPICOVID-19 BR, an epidemiological survey that analyzed the prevalence of infection by SARS-CoV-2 throughout Brazil, and Project S, a study conducted by Butantan Institute in Serrana, São Paulo State, to assess the impact of vaccination on the fight against COVID-19.

In May 2021, FAPESP began commemorating its sixtieth anniversary, which will be on May 23, 2022. The first initiative was the launch of a website entitled "FAPESP and the Sustainable Development Goals" indexing the portfolio of programs and projects it supports to each of the 17 SDGs.

The following month saw the launch of a series of events called FAPESP 60 Years Conferences, featuring experts from Brazil and abroad in discussions of strategic topics and well-founded reflection on the future. Seven were held in 2021 and ten are planned for 2022.

In July, the introduction to FAPESP 60 anos – Ciência, Cultura e Desenvolvimento was published, together with the first of ten digital installments of this book. Edited by Carlos Vogt, a former President of FAPESP, the book recounts the Foundation's activities in the six decades since its inception and highlights its main initiatives and projects. Six more installments were posted to **https://60anos.fapesp.br/livro** between July and December 2021. The rest will be issued in the first four months of 2022. The complete book will be published in print on the date of FAPESP's anniversary.

Also as part of the anniversary celebrations, in December the São Paulo State Academy of Sciences (ACIESP) held the first of a series of meetings with researchers from across the state for a critical analysis of the state of the art in science in São Paulo and a look ahead to the coming decades. The discussion and conclusions will be summarized in a book to be published in 2022.

COVID-19 put science in the headlines in 2020, the first year of the pandemic. In 2021, interest in research on the part of the general public remained high: 38,000 news stories about research projects supported by FAPESP appeared in the media in Brazil and abroad, for an increase of 20% on 2020. Most of these articles were published by Agência FAPESP and Pesquisa FAPESP magazine.

The most-read news stories were about research relating to COVID-19, but coverage of other research lines increased as a share of the total.

The visibility achieved by FAPESP's diffusion outlets was enhanced by recognition: in 2021, Agência FAPESP was elected best news agency in a contest for prizes known as Prêmio Einstein +Admirados da Imprensa de Saúde e Bem-estar ("Most Admired in the Media on Health and Wellbeing") and awarded by Jornalistas&Cia and the Albert Einstein Jewish-Brazilian Charitable Society (SBIBAE).

In sum, 2021 was a year of transition in which society, academia and the business community slowly but steadily resumed their activities after the great catastrophe of the pandemic.

FAPESP strove to stimulate the growth of research by means of its traditional funding strategies as well as innovative initiatives. Thus, it reinforced its traditional support for research, education and training, individual and thematic projects, strategic programs and research at the knowledge frontier, and stepped up its support for innovation and mission-oriented research projects whose results have a direct application to society and an impact on public policy.

Marco Antonio Zago
President, FAPESP

ABOUT THIS REPORT

This Annual Report on FAPESP's activities in 2020 details the results of its investment in scientific and technological research using funds transferred by constitutional mandate from the São Paulo State Treasury, and from other sources. It highlights FAPESP's contribution to the advancement of science and innovation in São Paulo, and to the solutions to many economic and social challenges.

The framework for the Report comprises two funding instruments – research scholarships/fellowships and research grants – awarded by FAPESP to further six funding strategies: (1) Training of Human Resources for S&T; (2) Basic and Apllied Research; 3) Research for Innovation; (4) Research on Strategic Themes; (5) Support for Research Infrastructure; and (6) Communicating Science to the Public.

These six strategies translate respectively into (1) scholarships/fellowships in Brazil and abroad to support the training of human resources for academic and technological research; (2) support for long-term research, and regular research grants; (3) research conducted in partnership with companies; (4) strategic projects in areas such as biodiversity, bioenergy, climate change, and public policy; (5) support for modernization and conservation of research facilities; and (6) dissemination of scientific and technological research findings.

The indicators of the results of funding instruments are amounts disbursed, numbers of active projects, and numbers of projects contracted for between January and December. These results are presented in the report in connection with the funding strategies.

The classification of funding instruments (scholarships/fellowships and research grants) by funding strategy provides insight into the objectives of FAPESP's investment in research by accounting for all types of funding linked to approved projects, and distinguishing among support for long- and short-term research projects, projects selected in calls for proposals and projects submitted spontaneously, support for human resource training, and support for scientific exchange and research infrastructure, among others.

HOW THIS REPORT IS STRUCTURED

SÃO PAULO ST&I SYSTEM: Indicators for São Paulo State's Science, Technology & Innovation (ST&I) System, giving the reader an overview of the state's importance to scientific and technological development in Brazil.

FAPESP HIGHLIGHTS 2021: A summary of FAPESP's key indicators for the year, as detailed in the rest of the report, and examples of scientific research projects that were conducted in the period and stand out for their quality and relevance.

CHAPTER 1 – THE INSTITUTION: A description of FAPESP's governance, how it assesses and selects research proposals, the number of projects funded since 1962, and the numbers of reviewers and expert opinions issued.

CHAPTER 2 – GENERAL INDICATORS: The composition of FAPESP's income, the annual change in total disbursement since 2014, and indicators of disbursement, active projects and projects contracted for during the year, organized by funding strategy, major knowledge area, institution, and scholarships/fellowships or research grants pertaining to each strategy. The tables include time series for the years **2015-2021** showing total disbursement for each funding strategy, total projects contracted for, and disbursement for scholarships/fellowships and research grants.

COVID-19 SPECIAL: An outline of the measures taken by FAPESP to fast-track funding for research on ways of combating the COVID-19 pandemic, distributed along a timeline highlighting some of the scientific discoveries made in the period, and noting media coverage of the research in Brazil and abroad.

CHAPTER 3 – FUNDING STRATEGIES: Information on the programs covered by the six research strategies, detailing disbursement, active projects, projects contracted for during the year, and examples of outstanding achievements and research results.

CHAPTER 4 – FAPESP 60 YEARS: main initiatives in 2021.

CHAPTER 5 – CONSOLIDATED STATUS OF SCHOLARSHIPS/FELLOWSHIPS AND GRANTS: Amount disbursed and total numbers of awards contracted for in all funding lines.

CHAPTER 6 – RESEARCH COLLABORATION AND CO-FUNDING: Promotion of collaborative research in Brazil and abroad; co-funding initiatives; investment and partnerships with funding agencies, academic institutions and companies during the year.

FAPESP'S TOTAL INCOME AND EXPENDITURE IN 2021

APPENDIX: Lists of the tables and figures in the Report.

SUMMARY

SÃO PAULO STATE SCIENCE, TECHNOLOGY & INNOVATION SYSTEM

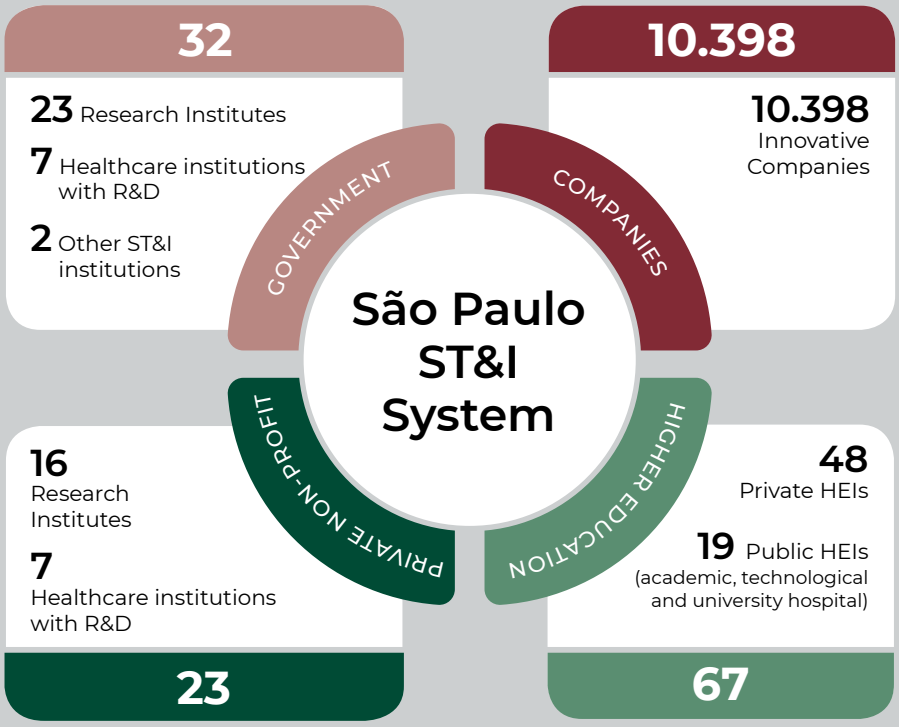
Institutions

Researchers

R&D Personnel

R&D Expenditure

Scientific Publications



Source: FAPESP – survey of information on the São Paulo State ST&I System, 2020; IBGE: Industrial Survey of Technological Innovation (PINTEC), 2017.

R&D PERSONNEL

DEGREES AWARDED IN SÃO PAULO STATE, 2020

5,876 PhDs – **29.4%** of national total

9,880 mestres – **21.5%** of national total

DEGREES AWARDED BY TYPE OF HIGHER EDUCATION INSTITUTION (HEI)

São Paulo State, 2020

Type of HEI	Master	Doctorate
Public HEI	7,350	4,790
State HEI	5,603	3,998
Federal HEI	1,662	771
Municipal HEI	85	21
Private HEI	2,530	1,086
TOTAL	**9,880**	**5,876**

RESEARCHERS IN THE STATE OF SÃO PAULO, 2020 (full-time equivalent – FTE)

BY TYPE OF EXECUTION

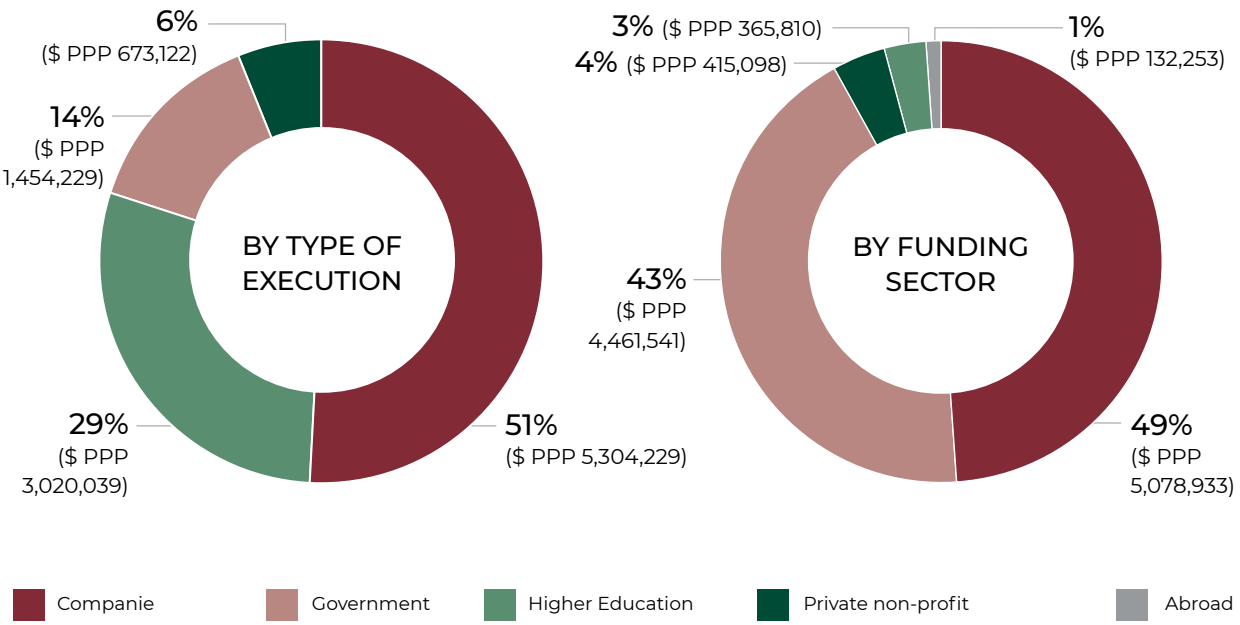
Type of Execution	Number of Researchers	
	2018	2020
Research Institute (RI)	3,594	3,288
Higher Education Institution (HEI)	20,746	19,278
Healthcare institutions with R&D	515	564
Others	17	40
Companies	28,891	25,756
TOTAL	**53,763**	**48,926**

Source: FAPESP – survey of information on the São Paulo State ST&I System, 2020; IBGE: Industrial Survey of Technological Innovation (PINTEC), 2017; administrative records of FAPESP, CNPq and CAPES regarding PhD scholarships and postdoctoral fellowships.

R&D EXPENDITURE IN SÃO PAULO STATE

RELATIVE DISTRIBUTION OF R&D EXPENDITURE

São Paulo, 2020 ($ PPP*)



Source: FAPESP – survey of information on the São Paulo State ST&I System, 2020; IBGE: Industrial Survey of Technological Innovation (PINTEC), 2017; administrative records of FAPESP, CNPq and CAPES regarding PhD scholarships and postdoctoral fellowships, and of state and federal research funders; records of support for companies not considered by PINTEC.

BY TYPE OF EXECUTION – 2018 and 2020

Type of institution	2018		2020	
	$ PPP*	Participation (%)	$ PPP*	Participation (%)
Research Institution (RI)	3.544,1	13,4%	3.249,1	12,3%
Higher Education Institution (HEI)	7.769,4	29,4%	7.520,3	28,4%
Healthcare institutions with R&D	1.540,5	5,8%	2.233,8	8,4%
Companies	12.710,1	48,1%	13.419,7	50,8%
Others	24,6	0,1%	19,7	0,1%
Total R&D - São Paulo	25.588,68	96,8%	26.442,63	100,0%

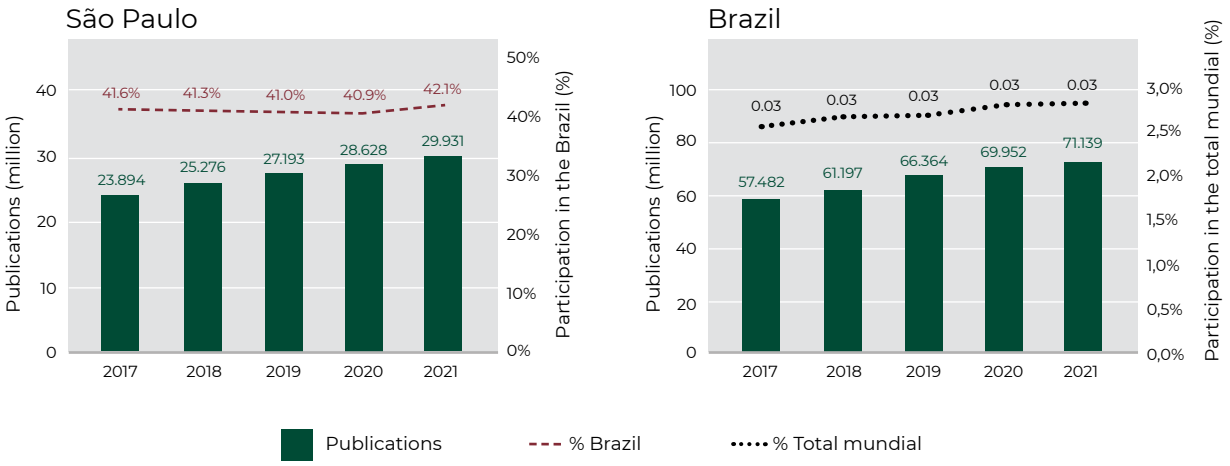
Source: FAPESP - survey of information on the São Paulo State ST&I System, 2018 and 2020; IBGE: Industrial Survey of Technological Innovation (PINTEC); administrative records of FAPESP and federal funding agencies.

Note: R&D expenditure by execution sector considers institutions located in São Paulo State. Data for research institutions, higher education institutions and healthcare institutions was collected directly by FAPESP. Expenditure by companies was estimated from PINTEC and adjusted for information from funding agencies. The category "Other" refers to scientific associations or institutions that do not execute R&D activities but operate in São Paulo State and receive funding from funding agencies. They are not part of the primary survey universe but are included in total expenditure.

* $ PPP = Purchasing Power Parity. Source: https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm

SCIENTIFIC PUBLICATIONS

NUMBER OF PUBLICATIONS – TOTAL (MILLION) AND PARTICIPATIONS (%) OF SÃO PAULO/BRAZIL AND BRAZIL/TOTAL MUNDIAL (2017-2021)

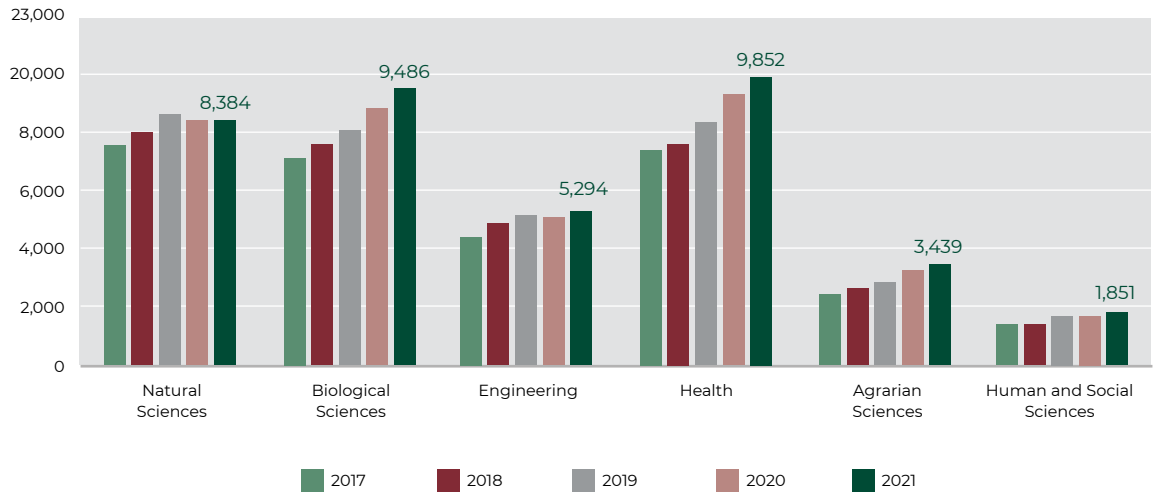


Source: Incites, WoS. Clarivate.

Notes: (1) Publication types are Articles, Proceedings Papers and Reviews as per Web of Science/Clarivate, grouped in accordance with FAPESP's classification of areas. Downloaded on June 3, 2022, via Incites/Clarivate. A publication is assigned to a region if at least one of the authors' addresses is in the region.

PUBLICATIONS BY FAPESP KNOWLEDGE AREAS

São Paulo, 2017-2021



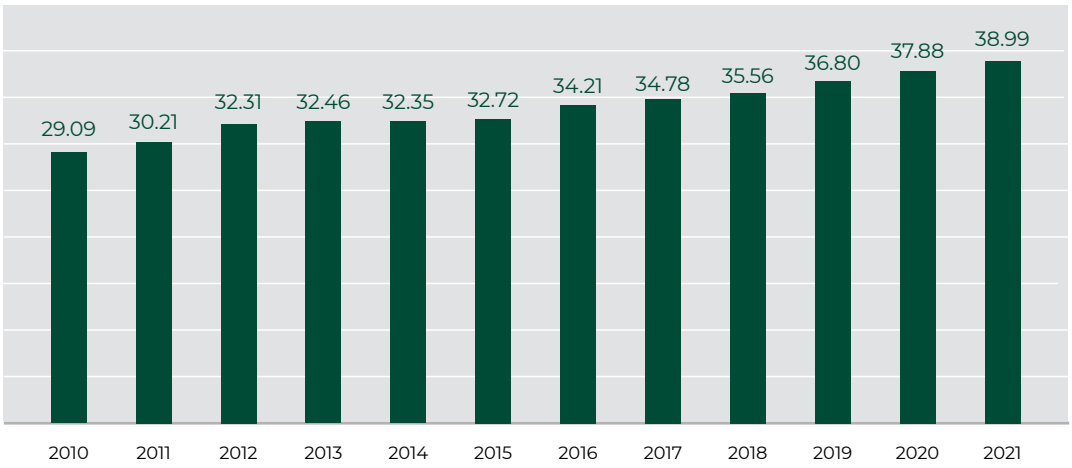
Source: Incites, WoS. Clarivate.

Notes: Publication types are Articles, Proceedings Papers and Reviews as per Web of Science/Clarivate, grouped in accordance with FAPESP's classification of areas. Downloaded on June 3, 2022, via Incites/Clarivate. A publication is assigned to a region if at least one of the authors' addresses is in the region. FAPESP areas Applied Social Sciences, Human Sciences, Linguistics, Letters & Arts and Interdisciplinary have been aggregated for legibility.

SCIENTIFIC PUBLICATIONS

PUBLICATIONS OF SÃO PAULO IN COLLABORATION WITH OTHER FEDERATIVE UNITS (UF) OF BRAZIL

% total for São Paulo, 2010-2021



	UF	PUBLICATIONS
1st	MG	3,023
2nd	RJ	2,332
3rd	PR	1,868
4th	RS	1,590
5th	DF	832
6th	BA	828
7th	SC	790
8th	GO	725
9th	PE	616
10th	MS	583
11th	PA	545
12th	CE	533
13th	AM	479

	UF	PUBLICATIONS
14th	RN	430
15th	ES	414
16th	PB	399
17th	MT	346
18th	MA	276
19th	SE	232
20th	PI	222
21th	AL	190
22th	RO	99
23th	TO	92
24th	AC	83
25th	AP	68
26th	RR	15

Source: Incites, WoS. Clarivate.

Notes: A publication with at least one author from São Paulo is considered a collaboration with one or more states if the address of at least one co-author is in the state(s) concerned. A publication may be assigned to more than one state if its authors are from more than one state.

FAPESP HIGHLIGHTS 2021

RESEARCH FUNDING STRATEGIES

FAPESP's support for scientific and technological development in São Paulo State is oriented by six funding strategies, described below:

TRAINING OF HUMAN RESOURCES FOR RESEARCH

Regular scholarships/fellowships for undergraduate and graduate students in Brazil and abroad, not associated with other research grants. **In Brazil:** Scientific Initiation, Master's, PhD, Direct Doctorate, Postdoc.
Abroad: Research Fellowship Abroad (RFA), postdoc level; Research Internship Abroad (RIA), funding research conducted abroad while a scholarship/fellowship is in progress in Brazil.

BASIC AND APPLIED RESEARCH

Long term: Support for basic and applied research via Thematic Projects, Research, Innovation and Dissemination Centers (RIDCs), Young Investigator awards, São Paulo Excellence Chair (SPEC), Special Projects, and associated scholarships/fellowships and grants.
Short term: Support for basic and applied research via Regular Research Grants and associated scholarships/fellowships, regular grants for visiting researchers from abroad, scientific publications, and participation in and organization of scientific or technological meetings.

RESEARCH FOR INNOVATION

A set of research programs that prioritize collaboration between business organizations and universities or research institutions and stimulate technological innovation in São Paulo State.
Programs: Research Partnership for Technological Innovation (PITE); Engineering Research Centers/Applied Research Centers (ERCs/ARCs); Innovative Research in Small Business (PIPE); Support for Intellectual Property (PAPI); associated research grants and scholarships/fellowships.

RESEARCH ON STRATEGIC THEMES

A set of programs whereby FAPESP stimulates the formation of research groups to focus on topics considered strategic to the development of São Paulo State and Brazil, including support for the modernization of research institutions in the state.
Programs: BIOTA-FAPESP (biodiversity), BIOEN (bioenergy), Global Climate Change (RPGCC), eScience and Data Science, Public Policy, Public Education, Modernization of State Research Institutions, and associated grants and scholarships/fellowships.

SUPPORT FOR RESEARCH INFRASTRUCTURE

A set of programs whereby FAPESP assures the infrastructure required for the continuity of research.
Programs: Multi-User Equipment, FAP-Livros, Equipment Repair, Institutional Overhead, Access to REDNESP, Support for Infrastructure (collections, laboratories etc).

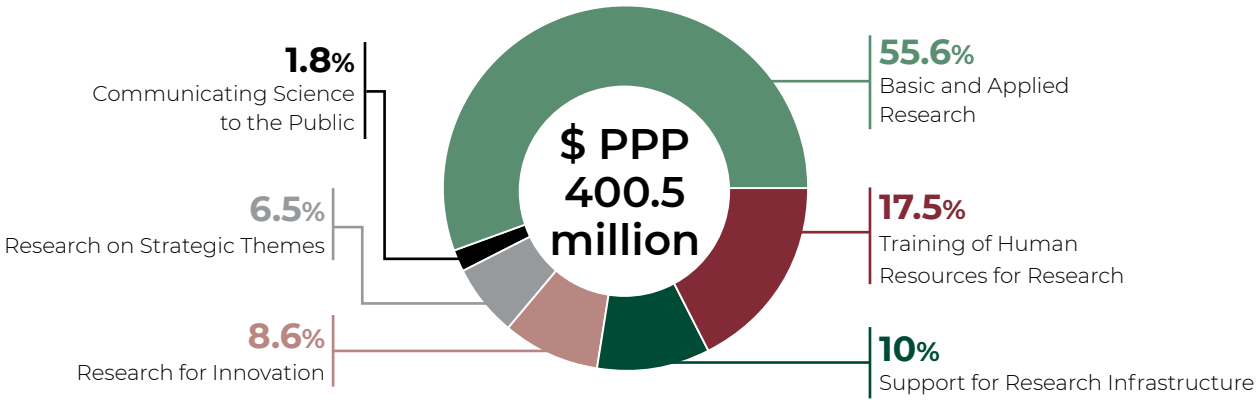
COMMUNICATING SCIENCE TO THE PUBLIC

Initiatives to inform FAPESP's stakeholders about its science policy guidelines, the results and societal and economic impact of the scientific knowledge produced in São Paulo State with FAPESP's support; and actions to measure the results of its activities, map research institutions and evaluate the overall status of research in the state.

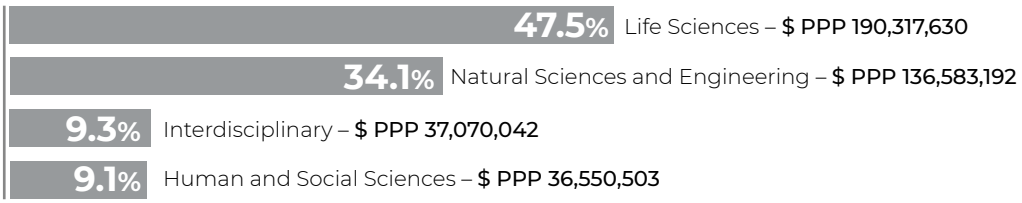
DISBURSEMENT FOR FUNDING STRATEGY AND MAJOR KNOWLEDGE AREA

FAPESP disbursed **$ PPP* 400,521,367** to fund **19,692** active research projects.

BY FUNDING STRATEGIES



BY MAJOR KNOWLEDGE AREA



* $ PPP = Purchasing Power Parity. Source: https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm

PROJECTS SUBMITTED, PROJECT APPROVED, PROPOSAL SELECTION

In 2021, the number of projects submitted to FAPESP totaled **20,072** and **6,823** were selected. The number of active projects plus new projects selected during the year amounted to **19,692**.

Advisors to the Science Directorate and **9,021** ad hoc reviewers issued **22,316** expert opinions. The average time taken to analyze each of **14,401** initial evaluation was **95** days.

SPECIAL ACTIONS IN 2021

New type of scholarship: FAPESP launched the Direct Doctorate Scholarship in Medical Research for medical students in MD/PhD dual degree programs (doctorate in medicine and research). The aim is to train professionals motivated for a career that involves working both as a physician and as a scientific researcher (*p. 74*).

Research Careers: FAPESP launched a Mentoring Initiative to Build Research Careers, a series of online events organized to help researchers build careers in academia, industry and government (*p. 74*).

New type of grant: FAPESP created the Initial π (Pi) Project Research Grant to support projects in all knowledge areas for up to five years (*p. 93*).

FAPESP 60 Years logo used in the commemorative activities that began in May 2021

PIPE-TC: FAPESP created the Innovative Research in Small Business Program (PIPE) for Knowledge Transfer (TC) to support scientific or technological research projects implemented by small enterprises in partnership with researchers at universities and research institutions (*p. 106*).

New intellectual property policy: new guidelines governing the assignment of IP rights and sharing in the economic benefits of creations originating in FAPESP's funding programs are described at https://fapesp.br/pi (*p. 112*).

FAPESP 60 years: starting in 2021, FAPESP launched a calendar of commemorative activities scheduled to continue until May 2022 (*pp. 142-147*)

Mitigating the social effects of the COVID-19 pandemic: FAPESP participated in two international calls for collaborative research proposals to develop solutions to mitigate the social effects of the COVID-19 pandemic and contribute to public policy for recovery from the economic crisis caused by the pandemic: (1) Recovery, Renewal and Resilience in a Post-Pandemic World (RRR), issued by the Trans-Atlantic Platform (T-AP) for Social Sciences and Humanities; and (2) the United Nations Research Roadmap for the COVID-19 Recovery (*p. 48*).

Admired by journalists: *Agência FAPESP* was elected best news agency in a contest for prizes awarded by Jornalistas&Cia and the Albert Einstein Jewish-Brazilian Charitable Society (SBIBAE), known as Prêmio Einstein +Admirados da Imprensa de Saúde e Bem-Estar (*p. 62*).

***#VacinaSim* campaign:** on January 18, 2021, one day after COVID-19 vaccination began in São Paulo State, FAPESP launched the #VacinaSim campaign to combat anti-vax rumors in videos posted to *Agência FAPESP*'s social media channels (*pp. 63-65*).

RIDC call: FAPESP issued a call for proposals to set up new Research, Innovation and Dissemination Centers (RIDCs). This was the third call since the program's inception in 1998. The aim is to establish 18 new RIDCs between 2021 and 2026 in six proposal pitching cycles divided by knowledge area (*p. 84*).

Public education: FAPESP updated the rules of the Public Education Program. The changes included the possibility of conducting research in partnership with public nursery schools (*p. 120*).

Artificial intelligence: six Applied Research Centers (APCs) in Artificial Intelligence were selected in 2021 under a 2020 joint call with the Ministry of Science, Technology and Innovation (MCTI) and the Brazilian Internet Steering Committee (CGI.br). The new APCs will operate in several states of Brazil (*p. 101*).

Modernization of the sanitation sector: 13 projects were selected in the third joint call by FAPESP and SABESP, the São Paulo State Basic Sanitation Corporation. The total amount invested will exceed $ PPP 4.3 million, shared by the two partners over a period of 20 years (*p. 105*).

Strategic research about the internet: 25 projects were selected under a call for projects involving strategic research on the internet issued jointly by FAPESP, MCTI, the Ministry of Communications (MCom) and CGI.br. The funds will come from sources established when FAPESP ran Brazil's domain registration and IP allocation activities (*p. 105*).

$ PPP 59.3 million for startups: FAPESP and SEBRAE-SP signed an agreement to invest $ PPP 59.3 million in six-year grants to fund some 150 startups under the aegis of the PIPE Program and use funds allocated by SEBRAE-SP to facilitate market access and development of proofs of concept (*p.108*).

FINEP TECNOVA II: FAPESP issued two calls for proposals under the FINEP-TECNOVA II Program in 2021. The first was in March, and the eight selected projects were announced in July. The second was in September and is still in progress. The program supports the development of innovative products and processes that strengthen economic sectors considered strategic by federal government policies and that comply with innovation policy in São Paulo State (*p. 108*).

Amazon+10 Fund: announced in November 2021 at the COP26 UN Climate Change Conference in Glasgow, Scotland, Amazon +10 is an initiative to develop science, technology and innovation (ST&I) in Amazonia established by FAPESP in partnership with CONSECTI, the national council for state departments of STI, and CONFAP, the national council of state research funding agencies (https://fapesp.br/37504).

Urban waste: in 2021, FAPESP's BIOEN Program and the São Paulo State Department of Infrastructure and Environment issued a call for scientific research projects relating to the use of urban and agroindustrial waste to produce bioenergy (*p. 115*).

Science for Development Centers (SDCs): in 2021, FAPESP issued a new call for proposals to set up Problem-Oriented Research Centers in São Paulo (NPOP-SP) under the SDC Program. Twelve new SDCs were selected in the first call, completed in 2020 (*p. 122*).

Spark Program: FAPESP joined the second edition of Centelha (Spark), the national program to support innovative entrepreneurs and disseminate entrepreneurial culture among young people. The program is an initiative of MCTI and the Brazilian Innovation Agency (FINEP), implemented

SPECIAL ACTIONS IN 2021 (cont.)

in 26 states in partnership with the National Council for Scientific and Technological Development (CNPq), the National Council of State Research Support Foundations (CONFAP), and CERTI Foundation (*pág. 108*).

YI Phase 2 call: FAPESP selected 51 projects in Phase 2 of its Young Investigator Program, which aims to strengthen the independence of YIs and the excellence of the research groups created to conduct projects (*p. 89*).

Strengthening of the SUS: eight projects were selected in a call for proposals under the SUS Research Program (PPSUS). The SUS is Brazil's unified health system. The projects will develop science, technology and innovation for the SUS in São Paulo State in the context of the COVID-19 pandemic (*p. 48*).

Publicity for the event to launch the Centelha (Spark) Program in São Paulo

INTERNATIONAL COOPERATION

In 2021, FAPESP held **34 joint calls** for proposals with **21** foreign organizations and **11** domestic organizations (funding agencies, universities and companies).

FAPESP signed **7** new research partnerships agreements with foreing organizations: **249 active partnerships** with **190** foreing organizations and **59** local organizations.

SCIENCE DIFFUSION

51,457 references to research projects funded by FAPESP in the media	**9,710** news stories carried by **3,498** media outlets in **109** countries	**41,474** news stories carried by **5,787** Brazilian media outlets	**21%** growth in the number of mentions of FAPESP

Much of this performance should be credited to the broad coverage given by *Agência FAPESP* to research projects relating to COVID-19 and SARS-CoV-2, and to Brazilian and foreign media coverage of their results (*p. 70*).

EXAMPLES OF RESEARCH PROJECTS FUNDED IN 2021

BACTERIA THAT CAUSE PERIODONTITIS ARE TRANSMITTED FROM PARENTS TO CHILDREN

PhD Scholarship in Brazil and Scholarship for Research Internship Abroad (RIA) – FAPESP Process 2016/23218-0
Principal Investigators: Renato Corrêa Viana Casarin (no país) and Purnima Kumar (abroad)
Grantee: Mabelle de Freitas Monteiro
Institutions: Piracicaba Dental School, State University of Campinas (FOP-UNICAMP); Ohio State University, USA)

A study by researchers at UNICAMP found that adults with periodontitis transmit bacteria that can cause the disease in their children. Periodontitis is an inflammation of the tissue that supports the teeth and maintains them in the maxillary and mandibular bones. Symptoms include bleeding of the gums and halitosis. In severe cases, it leads to bone and tooth loss. The bacteria remain in the oral cavity even when the children undergo treatment, reinforcing the need for preventive care in the first year of a baby's life. An article on the study was published in the journal *Scientific Reports*: www.nature.com/articles/s41598-020-80372-4#Abs1.

Photo: Jenny Friedrichs/Pixabay

ELECTRIC EELS IN AMAZONIA HUNT IN PACKS

Research Grant – Thematic Project – FAPESP Process 2016/19075-9
Principal Investigator and Collaborators: Naércio Aquino Menezes and Carlos David de Santana (Smithsonian) and Douglas Bastos (Inpa)
Institutions: Museum of Zoology, University of São Paulo (MZ-USP); National Museum of Natural History, Smithsonian Institution, Washington; National Institute for Research on Amazonia (INPA)

Rare behavior in fish, albeit more well-known in whales, wolves, dolphins and a few other mammals, was detected for the first time in a species of electric eel endemic to the Amazon. They hunt in packs (social predation) and can paralyze prey at a distance with strong electric discharges of up to 650 volts. Researchers at INPA in Manaus and the Smithsonian Institution's NMNH discovered the behavior in a lake at the Terra do Meio Ecological Station in Pará. An article on the study was published in *Ecology and Evolution*: https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.7121.

Photo: Douglas Bastos (Inpa)

NOVEL FLOOR COATING CAN REDUCE EXPENDITURE ON CLEANING PRODUCTS

Research Grant – SPEC and PFPMCG – FAPESP Processes 2015/22828-6 and 2018/19785-1
Principal Investigators: Younes Messaddeq and Ubirajara Pereira Rodrigues Filho
Institutions: Institute of Chemistry, São Paulo State University (IQ-UNESP) in Araraquara; Laval University, Canada; São Carlos Institute of Chemistry, University of São Paulo (IQSC-USP)

Researchers at the University of São Paulo's São Carlos Institute of Chemistry (IQSC-USP) and São Paulo State University's Institute of Chemistry (IQ-UNESP) in Araraquara created a coating with self-cleaning properties for floor and wall tiles in homes, hospitals, shops and offices. When light shines on ceramic material coated with the product, it chemically degrades any dust, grease, vestiges of medical drugs and even atmospheric pollutants that have settled on its surface. The results were published in *Materials Advances*, a journal of the Royal Society of Chemistry: https://pubs.rsc.org/en/content/articlelanding/2021/MA/D0MA00785D.

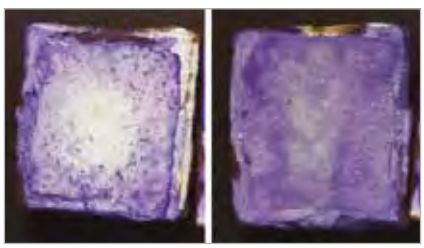


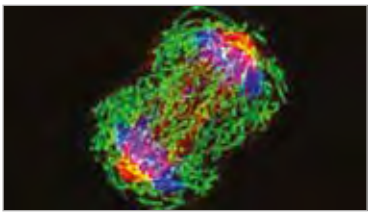
Photo: Elias Paiva Neto/Divulgação

EXAMPLES OF RESEARCH PROJECTS FUNDED IN 2021

DRUG FOR PULMONARY HYPERTENSION MAY BECOME AN OPTION AGAINST CANCER

Young Investigator Grant – Processes FAPESP 2018/18886-9 and 2020/01688-0
Principal Investigator: Otávio Cabral Marques
Institutions: Institute of Biomedical Sciences, University of São Paulo (ICB-USP); United Arab Emirates University, UAE; University of Lübeck, Germany

A drug used to treat pulmonary hypertension significantly reduced the capacity of tumor cells to migrate and invade other tissues in trials involving pancreatic, ovarian, breast cancer, and leukemia cell lines. Furthermore, in mice with an aggressive form of breast cancer, the drug reduced the incidence of metastasis in the liver and lungs by 47% and lengthened survival compared with untreated animals. The principal investigator is now preparing to perform clinical trials with other researchers at ICB-USP. The drug will be tested on a group of cancer patients undergoing chemotherapy to see if they recover better than the control group that will not be given the drug. An article on the study was published in *Scientific Reports*: www.nature.com/articles/s41598-020-72960-1.



Breast cancer cell undergoing division. Image: NCI/NHI

DROUGHT AND FIRE INCREASE AMAZON TREE DEATHS AND CO_2 EMISSIONS

Research Grant – Thematic/BIOTA – FAPESP Process 2012/51872-5
Cooperation agreement with Natural Environment Research Council (NERC UK)
Principal Investigators: Carlos Alfredo Joly (in Brazil) and Jos Barlow (in United Kingdom)
Institutions: Institute of Biology, State University of Campinas (IB-UNICAMP); Lancaster University (UK)

Extreme droughts are becoming more and more frequent and intense owing to climate change, and this could have significant effects on the Amazon Rainforest. In the summer season between late 2015 and early 2016, severe drought and forest fires associated with El Niño ravaged parts of the region. The effects of this climate-driven event lasted at least three years, resulting in the death of 3 billion trees by 2018, and in the emission of 495 million metric tons of carbon dioxide (CO2), more than the annual average for the entire Brazilian Amazon. The findings were published in *Proceedings of the National Academy of Sciences (PNAS)*: https://www.pnas.org/content/118/30/e2019377118.

Figure: Julio Larrea/IF-USP

QUANTUM PHASE TRANSITION DISCOVERED IN A QUASI-2D SYSTEM CONSISTING PURELY OF SPINS

Research Grant – Young Investigator – FAPESP Process 2018/08845-3
Principal Investigator: Julio Antonio Larrea Jimenez
Institution: Institute of Physics, University of São Paulo (IF-USP)

Pure quantum systems can undergo phase transitions analogous to the classical phase transition between the liquid and gaseous states of water. At the quantum level, however, the particle spins in states that emerge from phase transitions display collective entangled behavior. This unexpected observation, made in a study conducted by a broad international collaboration, offers a new avenue for the production of materials with topological properties that are useful in spintronics and quantum computing applications. The findings were published in *Nature*: www.nature.com/articles/s41586-021-03411-8.

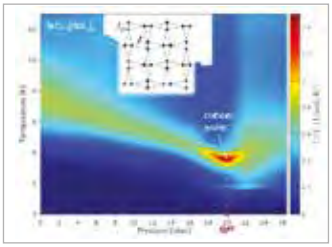


Figure: Julio Larrea/IF-USP

EXAMPLES OF RESEARCH PROJECTS FUNDED IN 2021

ENZYME FROM AMAZON FUNGUS COULD ENHANCE EFFICIENCY OF SECOND-GENERATION ETHANOL PRODUCTION

Research Grant – Regular – FAPESP Process 2018/19660-4
Principal Investigator: Anete Pereira de Souza
Institution: Center for Molecular Biology and Genetic Engineering, State University of Campinas (CBMEG-UNICAMP)

Researchers at UNICAMP found an enzyme from the Amazon fungus *Trichoderma harzianum* to be capable of breaking down biomass. They characterized the enzyme and used genetic engineering techniques to mass produce it at low cost and make its industrial use viable. The discovery will contribute to wider use of sugarcane waste to produce biofuels, as the development of a low-cost enzyme cocktail is one of the main challenges in the production of second-generation ethanol. An article about the research was published in *Scientific Reports*: www.sciencedirect.com/science/article/pii/S0168165621001243.

Fungus of the species *Trichoderma harzianum*. Photo: Maria Augusta C. Horta/UNICAMP.

MICROORGANISMS ON THE RIO GRANDE RISE ARE A BASIS FOR DEEP-SEA LIFE AND A POSSIBLE ORIGIN OF METALS

Research Grant – Thematic Project – FAPESP Process 2014/50820-7
Cooperation agreement with NERC (UK)
Principal Investigators: Frederico Pereira Brandini (no Brasil) e Bramley Murton (na Inglaterra)
Institutions: Oceanographic Institute, University of São Paulo (IO-USP); University of Southampton (UK)

The abundant biological and mineral diversity of the Rio Grande Rise, a seamount in the depths of the Atlantic Ocean about 1,500 km from the coast of Brazil, is probably due to a great extent to little-known microscopic creatures. Researchers at IO-USP, collaborating with colleagues at the UK's National Oceanography Center, investigated the microorganisms inhabiting the seamount's ferromanganese crusts, and concluded that bacteria and archaea are probably responsible for maintaining the abundant local life, besides being involved in the process of biomineralization that forms the metals present in the crusts. Their findings were published in *Microbial Ecology*: https://link.springer.com/article/10.1007/s00248-020-01670-y.

Calcarenite rocks, Rio Grande Rise. Photo: National Oceanography Center

RESEARCHERS AT UNIVERSITY OF SÃO PAULO FIND CORONAVIRUS IN GUM TISSUE OF COVID-19 PATIENTS

Research Grant – Thematic Project – FAPESP Process 2013/21728-2
Principal Investigator: Paulo Hilário Nascimento Saldiva
Institution: Institute of Advanced Studies, University of São Paulo (IEA-USP)

Researchers at the University of São Paulo's Medical School (FM-USP) detected for the first time the presence of SARS-CoV-2 in the periodontal tissue of patients who died from COVID-19. Their findings indicated one of the possible sources of the novel coronavirus in the saliva of COVID-19 patients. An article on the research was published in the *Journal of Oral Microbiology*: www.tandfonline.com/doi/full/10.1080/20002297.2020.1848135.

Image: Pixabay

RESEARCH AND ENTREPRENEURSHIP

Research projects supported by FAPESP associated with patent filings at Brazil's National Industrial Property Institute (INPI)

NOVEL RAPID TEST DETECTS SARS-COV-2 IN SALIVA AND INDICATES VIRAL LOAD

Researchers at the Federal University of São Carlos (UFSCar) patented a novel test to detect SARS-CoV-2 in saliva. The device combines accuracy equivalent to RT-PCR, low cost, and the ability to analyze several samples at the same time. In addition to detecting the presence of the virus, it also indicates an infected individual's viral load. Commercialization now depends on companies interested in licensing the platform and using it to mass-produce the device (https://agencia.fapesp.br/37087).

BRAZILIANS CREATE ANTO-INFLAMMATORY CREAM AND SUNSCREEN FROM SOUARI NUT WASTE

Researchers at UNESP developed an anti-inflammatory cream and sunscreen based on waste from the process of extracting oil from the souari nut (*pequi*), a popular food in Goiás and northern Minas Gerais. The production process is low-cost. The product has no adverse effects on health and meets strong demand for more natural medications and cosmetics. UNESP has filed for a patent. Sales will begin as soon as approval has been obtained from ANVISA, the national health surveillance agency. (https://agencia.fapesp.br/37354).

WOUND DRESSING WITH BIOACTIVE COMPOUND EXTRACTED FROM CURCUMIN

Using nanotechnology and biotechnology, researchers at UFSCar and the Brazilian Agricultural Research Corporation (EMBRAPA) developed a multifunctional membrane for use as a skin wound dressing. Biodegradable materials assure slow release of curcumin, a medicinal substance extracted from turmeric. The results of the project supported by FAPESP were published in the journal *Reactive & Functional Polymers*. A patent application was filed with INPI. The next step is to find partners interested in developing the product further and conducting large-scale trials before bringing it to market (https://agencia.fapesp.br/36817).

Photo: Researcher's archive

BRAZILIAN RESEARCHERS DEVELOP NANOCOMPOUND FOR TARGETED TREATMENT OF TUMORS

Researchers at the Federal University of the ABC (UFABC) in São Paulo State developed a nanotechnology platform for targeted treatment of tumors without affecting healthy tissue and with less risk of side-effects. To do so, they used a property called superparamagnetism to ensure that the nanoparticles deliver the compound of interest only to cancer cells. The proposition is to use nanoparticles that can be guided by applying an external magnetic field to attack solid tumors resistant to conventional treatment. The research was conducted in partnership with the State University of Londrina (UEL) and the University of Lorraine in France. A patent application was filed with INPI (https://agencia.fapesp.br/37563).

SUSTAINABLE RECYCLING OF SMARTPHONE BATTERIES

Researchers at UNESP's Center for Advanced Sustainable Technology (CAST) in São José da Boa Vista developed a hydrometallurgical methodology for recycling components of discarded lithium-ion batteries used in smartphones and

other common devices, with optimal usage and purity of the metals, which can be reused in new batteries. It has low environmental impact and costs. The methodology recovers the copper, graphite and aluminum rolled up inside the cells, using reagents to separate individual layers so that the internal elements can be recovered independently. The technique solves the problem of how to recycle lithium-ion batteries efficiently. The conventional approach is shredding to a powder and then melting, which is costly and generates toxic waste. UNESP has patented the invention (https://auin.unesp.br/noticias//584/projeto-patenteado-pela-auin-desenvolve-metodologia-de-reciclagem-sustentavel-e-facilitada-para-elementos-de-baterias-de-smartphones).

DRUG DEVELOPED AT UNIVERSITY OF CAMPINAS ACHIEVES POSITIVE RESULTS IN TREATING BLADDER CANCER

Photo: Researcher's archive

A drug developed at UNICAMP and recently patented in the United States has performed promisingly in the treatment of bladder cancer. The experimental treatment eliminated the tumor in 77.3% of the participants, and the disease returned less intensely in the other cases. To complete the final stages of drug development, the researchers founded a startup called Nanoimmunotherapy Pharma Ltda. (NIMM-Pharma). They expect to patent OncoTherad in Europe as well, with the support of INOVA, the university's innovation agency. (https://agencia.fapesp.br/37840).

RESEARCHERS CREATE MATERIALS THAT CAN MAKE DENTAL CAVITY FILLING AND TREATMENT CHEAPER

Researchers at UNESP developed two novel materials capable of optimizing dental procedures such as filling and treating cavities. The materials consist of a powder based on sodium cyclophosphate and a solution containing chitosan or titanium oxide nanoparticles. The innovations are compatible with the human body. They have the appearance of a paste and are easy for dentists to handle. They can be applied to treated areas of the mouth as a protection against contaminants such as bacteria and to help tooth pulp heal. They can help make dental treatment more affordable and hence improve the quality of life for many people. They have been patented by UNESP's innovation agency (AUIN). Studies continue, and the inventors are looking for partners in the pharmaceutical industry to bring the product to market (https://auin.unesp.br/noticias/592/pesquisadores-criam-materiais-que-podem-baratear-obturacoes-e-tratamento-de-caries).

PEN-LIKE SENSOR DETECTS BISPHENOL-A IN WATER QUICKLY AND INEXPENSIVELY

Researchers affiliated with the University of São Paulo's São Carlos Physics Institute (IFSC-USP) and São Carlos Chemistry Institute (IQSC-USP) developed a sensor with an elongated cylindrical shape similar to a pen for use in analyzing chemical pollutants in tap and river water. Made of graphite, silver nanoparticles and polyurethane, the sensor detects bisphenol-A (BPA), a chemical compound considered to be a molecular marker of the presence of emerging contaminants such as pharmaceuticals, hormones and pesticides, among others. They recently applied for a patent via the university's innovation agency, AUSPIN (https://agencia.fapesp.br/38245).

CHAPTER

1

THE INSTITUTION

- About FAPESP
- Governance
- Proposal selection
- Evaluation of FAPESP's Programs

ABOUT FAPESP

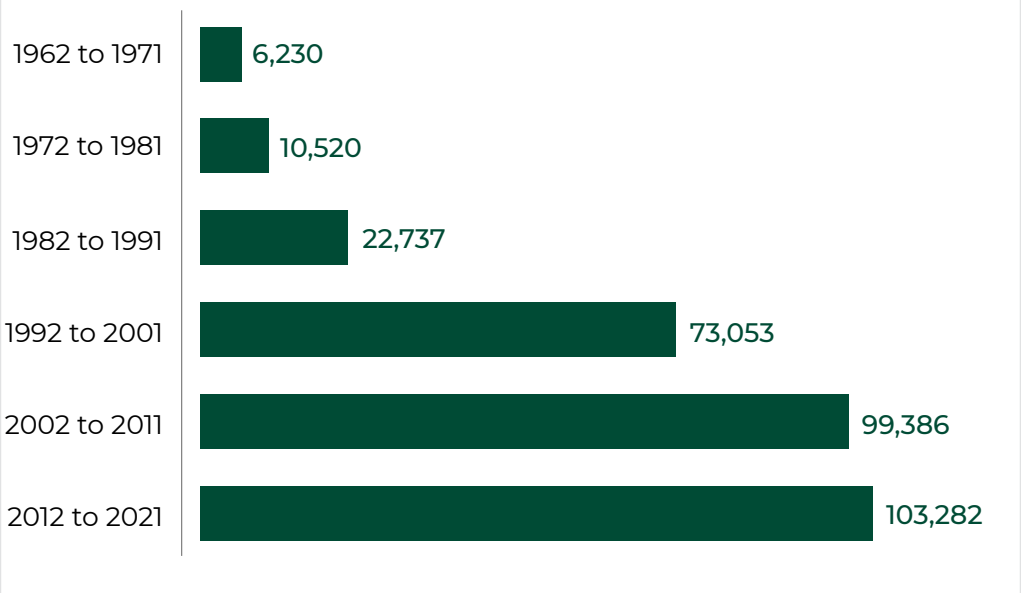
The São Paulo Research Foundation (FAPESP) is one of Brazil's leading public agencies for the funding of research. FAPESP was formally created by State Law 5918 (dated October 18, 1960), which established that its remit was to support scientific research and science dissemination in São Paulo State. It began operating in 1962 in accordance with Decree 40132 (dated May 23, 1962).

Called for by São Paulo State's 1947 Constitution and ratified by its 1989 Constitution, FAPESP receives 1% of the state's annual tax revenue to carry out its mission of investing in scientific and technological development.

This investment takes the form of scholarships, fellowships and grants to fund research projects in all knowledge areas led by researchers affiliated with public or private higher education and research institutions in São Paulo State, and by researchers employed by companies based in the state.

FAPESP's funding strategies support Research for Innovation, Research for Knowledge Advancement, Research on Strategic Themes, Training of Human Resources for Science and Technology, Support for Research Infrastructure, and Knowledge Diffusion initiatives.

CHART 1 NUMBER OF PROJECTS SUPPORTED – 1962 TO 2021



GOVERNANCE

FAPESP is governed by a Board of Trustees and an Executive Board. The São Paulo State Constitution guarantees its administrative autonomy.

The Board of Trustees sets general guidelines and makes key decisions regarding scientific policy, administrative affairs and asset management. The Board has 12 members, who each serve a six-year term renewable once. Six trustees are appointed directly by the state governor, and the others are chosen by the governor from three-name shortlists submitted by public and private higher education and research institutions in São Paulo State. FAPESP's president and vice president are appointed by the governor from a three-name shortlist drawn up by the Board of Trustees from among its own members.

The Executive Board (CTA) is responsible for the day-to-day running of FAPESP. It has three members: the Executive Director, the Scientific Director, and the Administrative Director. They are chosen by the governor from three-name shortlists drawn up by the Board of Trustees and are retained by FAPESP for up to three years, renewable for two further terms.

DECEMBER 2021

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VICE PRESIDENT
Ronaldo Aloise Pilli

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PROPOSAL SELECTION

Research proposals submitted to FAPESP for support from its various funding lines are evaluated by peer review. Committees of experts called Area Panels coordinate the proposal assessment process in major knowledge areas under the aegis of FAPESP's Scientific Directorate.

The relevant Area Panel selects ad hoc reviewers to analyze each proposal and issue a merit assessment. The proposal then returns to the Area Panel, which issues an approval or denial recommendation to the Scientific Directorate. The Scientific Directorate makes the final decision, with the assistance of a supervisory panel comprising 20 associate coordinators. Decisions must be ratified by the Executive Board, and may also have to be endorsed by the Board of Trustees.

TABLE 1 AD HOC REVIEWERS AND ASSESSMENTS

Evolution – 2016 to 2021

Nº of assessments by reviewers	Nº of reviewers by year					
	2016	2017	2018	2019	2020	2021
1 to 4	7,834	7,797	7,821	8,016	8,272	7,797
5 to 9	1,128	1,051	1,103	1,184	1,194	1,087
10 to 14	78	64	75	71	120	126
15 or +	6	8	4	8	13	11
Total of reviewers	9,046	8,920	9.003	9,279	9,599	9,021

Until the 2020 annual report, the numbers presented in Table 1 and Chart 2 considered the dates on which reviewers' assessments were requested, not completed. Instead, assessment delivery is the criterion used for statistical purposes in the 2021 report, which retroactively applies the same rule to the entire series. There may therefore be minor differences in comparison with previous annual reports.

CHART 2 NUMBER OF ASSESSMENTS BY REVIEWERS' REGIONS OF ORIGIN – 2016 TO 2021

NORTH

2016	2017	2018	2019	2020	2021
22	34	12	15	22	19

NORTHEAST

2016	2017	2018	2019	2020	2021
304	325	304	293	315	275

CENTER-WEST

2016	2017	2018	2019	2020	2021
234	255	221	228	244	228

SOUTHEAST

	2016	2017	2018	2019	2020	2021
São Paulo	20,305	19,570	19,724	20,762	21,719	19,433
Other states	1,253	1,276	1,141	1,125	1,172	1,034

SOUTH

2016	2017	2018	2019	2020	2021
636	617	592	598	618	508

NOT IDENTIFIED

2016	2017	2018	2019	2020	2021
227	180	149	149	132	819

THE STEPS IN THIS PROCESS ARE SUMMARIZED BELOW:

FOR MORE DETAILS OF FAPESP'S PROJECT SELECTION PROCESS, SEE http://fapesp.br/pdf/peer_review.pdf

1

Area Panels receive applications

Each application received by FAPESP goes to the Area Panel corresponding to the knowledge area for the project. The Area Panel analyzes the abstract and the principal investigator's institutional affiliation.

2

Selection of ad hoc reviewers and issuance of assessment reports

The Area Panels select specialists with specific competencies in each project's subject matter to act as ad hoc reviewers, asking them to analyze proposals and issue expert opinions on their merit. The choice of ad hoc reviewers avoids potential conflicts of interest. The FAPESP recently implemented a program based on algorithms and integrated into the Management Support System (SAGE) to analyze data from FAPESP's processes (reviewer history, project research area, keywords, conflicts) and suggest lists of possible reviewers for each new proposal. These lists are presented to the Area Panels, which make the final selection based on the recommendations.

9,021 ad hoc reviewers produced 22,316 assessments in 2021

3

Analysis by Area Panel

The proposal returns to the Area Panel, which analyzes the reviewers' assessments and recommends approval or denial by the Scientific Directorate.

KNOWLEDGE AREAS OF PROPOSALS ANALYZED IN 2021:

- 47.4% Life Sciences
- 24.0% Human and Social Sciences
- 27.4% Natural Sciences and Engineering
- 1.2% Interdisciplinary

4

Analysis by Supervisory Panel

The Scientific Directorate also works with a Supervisory Panel comprising 20 researchers who are Area Panel members and recognized leaders in their respective fields. They review the recommendations made by the Area Panels to assure compatibility with the available merit assessments. They may endorse recommendations, or question them and suggest further analysis, among other measures.

5

Decision by Scientific Directorate

The Scientific Directorate's decisions are based on the recommendations of the Supervisory Panel and Area Panels.

95 days was the average time taken to analyse each of the 12,793 initial assessments

6

Approval by Executive Board

The Executive Board (CTA) **deliberates** on the applications for research funding, subject to ratification by the Board of Trustees.

7

Board of Trustees

The Board of Trustees **examines** the Executive Board's approvals, **ratifying** them if appropriate.

EVALUATION OF FAPESP'S PROGRAMS

FAPESP's programs are regularly evaluated in terms of their scientific, societal and economic impact. Executive summaries and full reports on the evaluations completed so far are available on its portal in Portuguese (**www.fapesp.br/avaliacao**) and since 2021 in English (**https://fapesp.br/en/evaluation**). Links to articles deriving from these initiatives and published in special-interest journals can be found on the same page.

The evaluations completed to date cover FAPESP's key activities: cross-border cooperation agreements, scientific initiation, master's and PhD scholarships, the Innovative Research in Small Business Program (PIPE), the BIOTA-FAPESP Program, the Multi-User Equipment Program, the Young Investigator Program, the Research Partnership for Technological Innovation Program (PITE), and the Public Policy Program.

FAPESP makes changes to its initiatives in response to these evaluations with the aim of increasing their effectiveness. New activities are also influenced by the evaluations. The process has been enhanced over the years, not least by an exchange of experiences with funding agencies in other countries. The evaluations now involve detailed questionnaires for completion by the researchers and institutions awarded funding, as well as control groups with proponents whose applications for funding are turned down.

CHAPTER

2

GENERAL INDICATORS

- Income in 2021
- Total disbursement for research funding
- Disbursement, active projects and projects contracted – 2021

  By Funding Strategies

  By Major Knowledge Areas

  By Institution

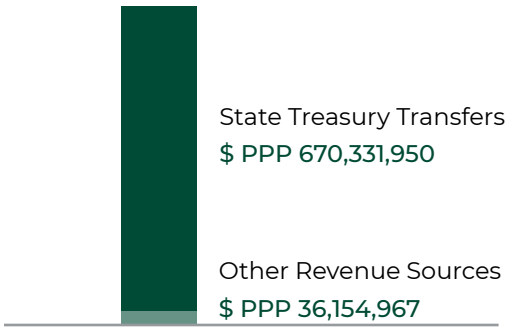
  By Scholarship/fellowship and grant per funding strategies
- Annual evolution of disbursement – 2015 to 2021
- Annual evolution in projects contracted – 2015 to 2021

INCOME IN 2021

FAPESP's income totaled, in 2021,
$ PPP 1.784.585.951.

FAPESP's income consists of 1% of São Paulo State's annual tax revenue, transferred by the state treasury in compliance with the state constitution, and receipts from other sources, such as joint research funding agreements with other institutions and companies. For details of transfers of funds from partners, see Tables 53 and 53a at **www.fapesp.br/relatorio2021.**

CHART 3 COMPOSITION OF FAPESP'S INCOME 2021

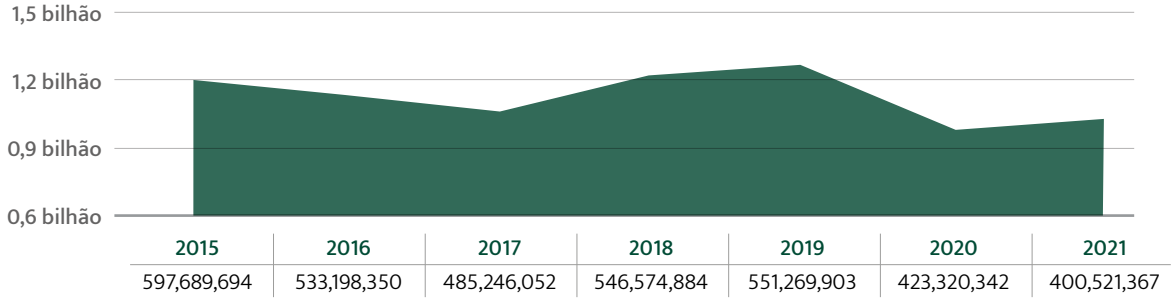


DISBURSEMENT

In 2021, FAPESP disbursed **$ PPP 400,521,367** to support **19,692** active scientific and technological research projects. .

On December 31, 2021, FAPESP had a contractual portfolio (projects and scholarships approved and in progress) with a value of $ PPP 706,496,917, reflecting its efforts to foster a return to normal in São Paulo's research activities, which were hard hit by the COVID-19 pandemic, with many laboratories and graduate programs both in Brazil and elsewhere only able to operate partially.

CHART 4 ANNUAL EVOLUTION OF DISBURSEMENT FOR RESEARCH FUNDING ($ PPP) – 2015 TO 2021



2015	2016	2017	2018	2019	2020	2021
597,689,694	533,198,350	485,246,052	546,574,884	551,269,903	423,320,342	400,521,367

$ PPP = Purchasing Power Parity. Source: https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm

DISBURSEMENT, NUMBER OF ACTIVE PROJECTS AND NEW PROJECTS CONTRACTED IN 2021

TABLE 2 BY FUNDING STRATEGIES

Funding Strategies	Disbursement		Active projects		New Projects contracted	
	$ PPP	%	Nº	%	Nº	%
Training of Human Resources for ST&I	69,907,938	17.5	6,958	35.3	2,496	36.5
Basic and Applied Research	222,777,579	55.6	9,251	47.0	2,979	43.5
Research for Innovation	34,245,414	8.6	1,644	8.4	756	11.0
Research on Strategic Themes	26,054,915	6.5	1,024	5.2	317	5.0
Support for Research Infrastructure	40,459,367	10.0	809	4.1	273	4.0
Communicating Science to the public	7,076,154	1.8	6	0.0	2	0.0
Total	**400,521,367**	**100.0**	**19,692**	**100.0**	**6,823**	**100.0**

TABLE 3 BY MAJOR KNOWLEDGE AREAS

Major knowledge areas	Disbursement		Active projects		New Projects contracted	
	$ PPP	%	Nº	%	Nº	%
Life Sciences	190,317,630	47.5	10,116	51.3	3,470	50.9
Natural Sciences and Engineering	136,583,192	34.1	6,075	30.9	2,067	30.3
Human and Social Sciences	36,550,503	9.1	2,991	15.2	1,064	15.6
Interdisciplinary	37,070,042	9.3	510	2.6	222	3.2
Total	**400,521,367**	**100.0%**	**19,692**	**100.0%**	**6,823**	**100.0**

TABLE 4 BY INSTITUTION

Institution	Disbursement		Active projects		New Projects contracted	
	$ PPP	%	Nº	%	Nº	%
University of São Paulo (USP)	184,908,368	46.2	7,325	37.2	2,430	35.6
Federal Research Institutions	55,668,940	13.9	3,084	15.7	1,076	15.9
University of Campinas (UNICAMP)	52,517,902	13.1	2,595	13.2	806	11.8
São Paulo State University (UNESP)	34,571,496	8.6	3,257	16.5	1,126	16.5
State Research Institutions	30,412,640	7.6	930	4.7	274	4.0
Companies	25,381,331	6.3	1,381	7.0	657	9.6
Private Higher Education and Research Institutions	15,737,294	3.9	1,040	5.3	419	6.1
Scientific Associations and Societies	629,638	0.2	25	0.1	16	0.2
Municipal Institutions	401,167	0.1	40	0.2	11	0.2
Others	292,591	0.1	15	0.1	8	0.1
Total	**400,521,367**	**100.0**	**19,692**	**100.0**	**6,823**	**100.0**

DISBURSEMENT, NUMBER OF ACTIVE PROJECTS AND NEW PROJECTS CONTRACTED IN 2021

TABLE 5 SCHOLARSHIPS/FELLOWSHIPS AND GRANTS BY FUNDING STRATEGIES – 2021

Funding Strategies		Disbursement $ PPP	Active projects	New projects contracted
Total		**400,521,367**	**19,692**	**6,823**
TRAINING OF HUMAN RESOURCES FOR RESEARCH		69,907,938	6,958	2,496
Scholarships and Fellowships not associated with research grants	In Brazil	61,813,197	6,642	2,219
	Abroad	8,094,741	316	277
BASIC AND APPLIED RESEARCH		222,777,579	9,251	2,979
Long-term Research	Thematic Project Grant and associated scholarships/ fellowships and grants	97,491,407	3,310	983
	Research, Innovation and Dissemination Centers (RIDC) and associated scholarships/fellowships and grants	25,600,629	694	232
	Young Investigator grants and associated scholarships, fellowships and grants	26,360,556	1,256	398
	Special Project grants and associated scholarships, fellowships and grants	22,784,285	14	1
	São Paulo Excellence Chair (SPEC) and associated scholarships, fellowships and grants	1,724,809	64	27
Subtotal		**173,961,686**	**5,338**	**1,641**
Regular Research Grants not associated with other grants	Regular Research Grants not associated to other grants and associated scholarships/fellowships	46,782,814	1,114	678
	Regular Grants (meetings, organization, publications, visiting researchers) not associated to other grants	2,033,079	2,799	660
Subtotal		**48,815,893**	**3,913**	**1,338**
RESEARCH FOR INNOVATION		34,245,414	1,644	756
	Research Partnership for Technological Innovation Program (PITE) and associated scholarships/fellowships and grants	1,746,905	71	34
	Engineering Research Centers/Applied Research Centers (ERC/ARC) and associated scholarships/fellowships and grants	7,244,674	203	75
	Innovative Research in Small Business Program (PIPE), Fellowship PE and associated scholarships/fellowships and grants	25,074,781	1,346	642
	Intellectual Property Support Program (PAPI-Nuplitec) and associated scholarships/fellowships and grants	119,766	24	5
	Innovation Distritcts	59,288	0	0
RESEARCH ON STRATEGIC THEMES		26,054,915	1,024	317
	FAPESP Research Program on Biodiversity Characterization, Conservation, Restoration and Sustainable Use (BIOTA) and associated scholarships/fellowships and grants	4,324,566	234	86
	FAPESP Bioenergy Research Program (BIOEN) and associated scholarships/fellowships and grants	3,501,117	176	51

DISBURSEMENT, NUMBER OF ACTIVE PROJECTS AND NEW PROJECTS CONTRACTED IN 2021

Funding Strategies		Disbursement $ PPP	Active projects	New projects contracted
	FAPESP Research Program on Global Climate Change (RPGCC) and associated scholarships/fellowships and grants	5,334,396	248	81
	FAPESP Research Program on eScience and DataScience and associated scholarships/fellowships and grants	565,264	28	8
	Institutional Development Plan for State Research Institutions (RIs)	5,093,298	135	28
	Research in Public Policies Program (PPP) and associated scholarships/fellowships and grants	6,848,176	100	29
	Public Education Research Program (EP)	170,596	89	24
	Science Journalism (MídiaCiência) fellowships not associated to other grants	36,726	8	3
	Science for Development Centers (SDC-SP)	180,776	6	7
SUPPORT FOR RESEARCH INFRASTRUCTURE		**40,459,367**	**809**	**273**
	Multi-User Equipment Program	11,160,531	360	59
	Equipment Repair Program	1,600,608	167	89
	REDNESP	6,669,783	2	1
	Overhead for REDNESP Connectivity	3,825,571	14	3
	Overhead for Research Institution Infrastructure	16,910,298	252	116
	Overhead for Program Coordination	292,576	14	5
COMMUNICATING SCIENCE TO THE PUBLIC		**7,076,154**	**6**	**2**
	Pesquisa FAPESP magazine	3,651,385	1	0
	Dissemination of scientific knowledge in São Paulo State	1,748,022	2	1
	Mapping of research units in São Paulo State (BV)	1,062,687	2	1
	ST&I Indicators for São Paulo State	465,115	1	0
	Others (contrats)	148,945	0	0

ANNUAL EVOLUTION OF DISBURSEMENT ($PPP) – 2015 TO 2021

TABLE 6 BY FUNDING STRATEGIES ($PPP)

Funding Strategies		2021	2020	2019	2018	2017	2016	2015
Training of Human Resources for Research		69,907,938	98,061,692	130,559,806	131,522,911	135,402,194	156,512,055	188,670,898
Basic and Applied	Long-term research	173,961,686	152,179,415	188,499,668	190,850,872	160,832,022	158,208,236	168,868,243
	Regular Grants not associated to other grants	48,815,893	44,259,418	87,936,995	89,869,416	85,922,183	99,878,205	127,212,158
Research for Innovation		34,245,414	42,568,890	50,034,027	51,022,082	39,542,186	35,156,333	21,966,359
Research on Strategic Themes		26,054,915	22,992,180	33,066,684	24,536,592	17,606,051	18,490,279	23,170,518
Support for Research Infrastructure		40,459,367	56,474,563	53,246,198	51,216,717	39,344,201	58,610,665	60,069,799
Communicating Science to the Public		7,076,154	6,784,184	7,926,525	7,556,294	6,597,215	6,342,577	7,731,719
Total		400,521,367	423,320,342	551,269,903	546,574,884	485,246,052	533,198,350	597,689,694

TABLE 7 BY TYPES OF SCHOLARSHIPS/FELLOWSHIPS AND GRANTS ($PPP)

Types	2021	2020	2019	2018	2017	2016	2015
Scholarships/Fellowships[1]	163,489,765	198,924,248	236,799,075	225,612,672	212,596,872	223,406,194	250,730,801
Grants[2]	237,031,602	224,396,094	314,470,828	320,962,212	272,649,180	309,792,156	346,958,893
Total	400,521,367	423,320,342	551,269,903	546,574,884	485,246,052	533,198,350	597,689,694

For a detailed breakdown of disbursements for all types of scholarships and grants in 2021, see pages 146 and 148.

(1) Scholarships = Regular scholarships (IC, MS, DR, DD, PD) in Brazil and abroad, and scholarships for technical training (CT), science journalism (JC), academic training (PC), Young Investigators (JP), research in small enterprises (PE) and public education (EP), which may or may not be linked to grants.

(2) Grants = all research grants.

ANNUAL EVOLUTION OF THE NUMBER OF PROJECTS CONTRACTED – 2015 TO 2021

TABLE 8 BY FUNDING STRATEGIES

Funding Strategies		2021	2020	2019	2018	2017	2016	2015
Training of Human Resources for Research		2,496	2,557	3,921	4,386	4,021	4,389	4,427
Basic and Applied	Long-term research	1,641	1,612	2,330	2,048	1,881	1,594	1,384
	Regular Grants not associated to other grants	1,338	1,503	2,657	2,960	2,924	3,249	3,319
Research for Innovation		756	756	733	836	731	650	365
Research on Strategic Themes		317	360	454	344	314	268	234
Support for Research Infrastructure		273	237	337	359	310	327	339
Communicating Science to the Public		2	2	11	13	5	3	2
Total		6,823	7,027	10,443	10,946	10,186	10,480	10,070

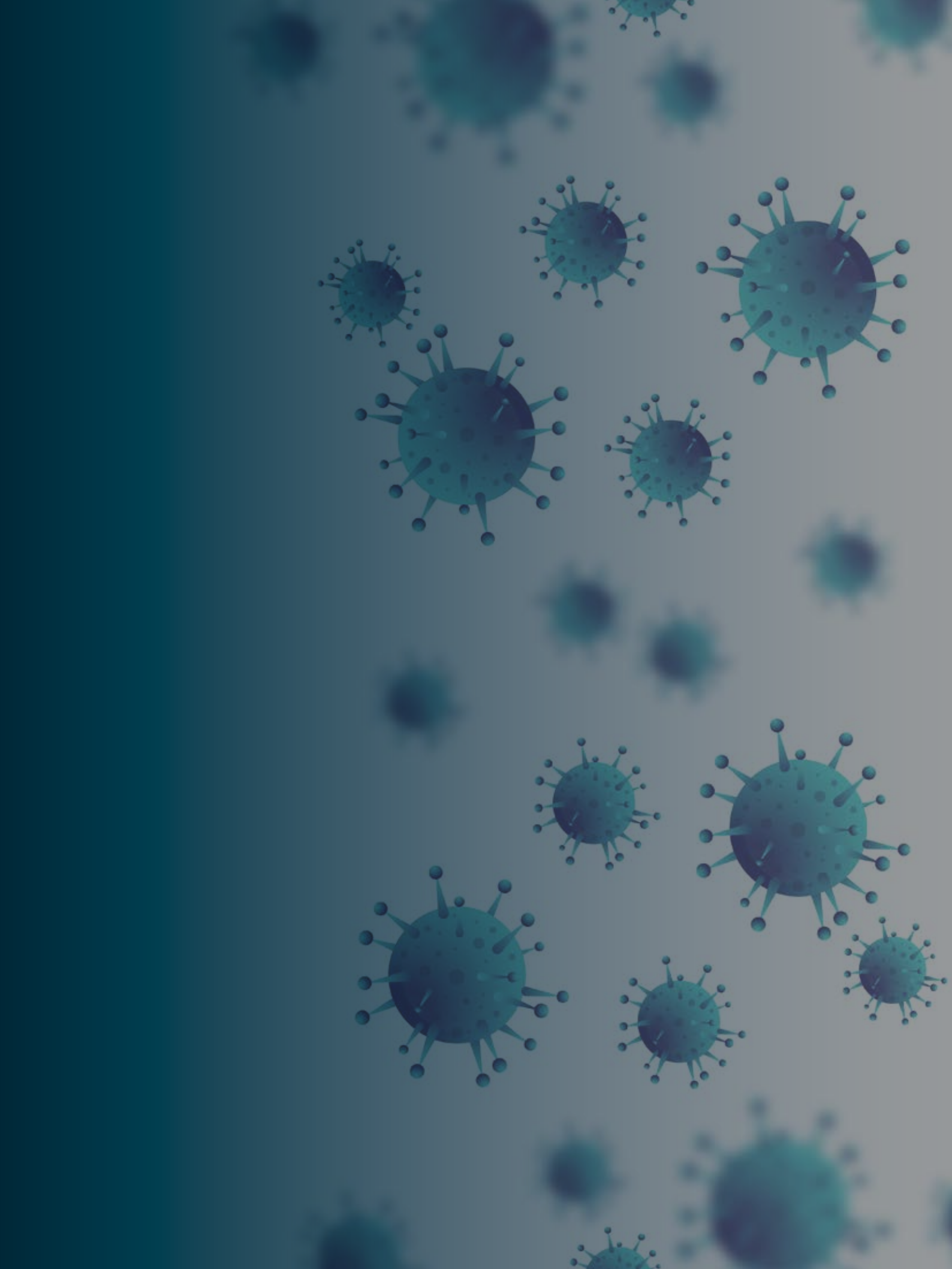
TABLE 9 BY TYPES OF SCHOLARSHIPS/FELLOWSHIPS AND GRANTS

Types	2021	2020	2019	2018	2017	2016	2015
Scholarships/Fellowships[1]	5,067	5,035	7,107	7,276	6,584	6,653	6,247
Grants[2]	1,756	1,992	3,336	3,670	3,602	3,827	3,823
Total	6,823	7,027	10,443	10,946	10,186	10,480	10,070

For a detailed breakdown of contracts for all types of scholarships and grants in 2021, see pages 147 and 149.

(1) Scholarships = Regular scholarships and fellowships (Scientific Initiation, IC; Master's, MS; Doctorate, DR; Direct Doctorate, DD; Postdoctorate, PD) in Brazil and abroad, and scholarships for technical training (CT), science journalism (JC), academic training (PC), Young Investigators (JP), research in small enterprises (PE) and public education (EP), which may or may not be linked to grants.

(2) Grants = all research grants.



COVID-19 SPECIAL

FAPESP's main actions to deal
with the pandemic caused
by the novel coronavirus

FAPESP COVID-19

ANNUAL REPORT
FAPESP

2021

TABLE OF CONTENTS

SUPPORT FOR RESEARCH ON COVID-19

ONGOING RESEARCH PROJECTS

FAPESP continued to fund 66 research projects on SARS-CoV-2 and COVID-19, selected in two calls for proposals conducted in 2020, and continued to support the development of technologies for diagnosis and treatment of the disease. Full coverage of the projects and results is at https://covid19.fapesp.br.

VACCINES

http://agencia.fapesp.br/36222

In 2021, FAPESP and Todos pela Saúde (Itaú Unibanco) continued the partnership with Butantan Institute established in 2020 whereby they undertook to invest BRL 82.5 million – with FAPESP contributing BRL 32.5 million – in Phase 3 clinical trials of CoronaVac, the COVID-19 vaccine developed by China's Sinovac Biotech, and to retrofit a factory for production of the vaccine and final processing of immunobiologicals. In the same period, FAPESP also funded eight other research projects involving the development of COVID-19 vaccines: four at the University of São Paulo (USP), two at Butantan Institute, and two at startups supported by the FAPESP Innovative Research in Small Business Program (PIPE).

Image: Pixabay

PPSUS-SP CALL

In 2021, eight projects led by researchers affiliated with institutions in São Paulo State were selected in the 2020 Research Program on Public Policies for the SUS (PPSUS) call for proposals issued by FAPESP jointly with the Ministry of Health and the National Council for Scientific and Technological Development (CNPq). The call was designed to support research projects that promote scientific and technological development or innovation to strengthen the SUS, Brazil's national health service, in São Paulo State in the context of the COVID-19 pandemic.

POST-PANDEMIC RECOVERY PROJECTS

FAPESP took part in two international calls for the selection of collaborative research projects aimed at mitigating the social effects of the COVID-19 pandemic and providing inputs for public policies to assist recovery from the resulting economic crisis.

■ With the Trans-Atlantic Platform (T-AP) for Social Sciences and Humanities, in May 2021 FAPESP issued a call for collaborative research proposals in social sciences and the humanities to be conducted on both sides of the Atlantic. The results of T-AP's Recovery, Renewal and Resilience in a Post-Pandemic World (RRR) were announced in March 2022.

■ The United Nations Research Roadmap for the COVID-19 Recovery, announced in November 2020, listed research priorities in strategic areas to build a more equitable, resilient and sustainable future, in line with the Sustainable Development Goals (SDGs). FAPESP helped produce the document alongside the heads of research funding agencies from 25 countries, and was one of the first to issue a call aligned with this international research roadmap. The projects selected were announced in February 2022.

COVID-19 DATA SHARING/BR

In June 2020, in partnership with the University of São Paulo (USP), FAPESP launched the first open-access repository in Brazil with demographic information and anonymized clinical and laboratory data from patients tested for COVID-19 to facilitate data sharing in support of scientific research on the disease. The data is uploaded by Fleury Group, Syrian-Lebanese Hospital (HSL), Albert Einstein Jewish Hospital (HIAE), Hospital das Clínicas (HC-FMUSP), the hospital complex run by USP's Medical School), and Beneficência Portuguesa de São Paulo (BP, the largest private hospital in Latin America). By end-2021, the platform held more than 50 million records, relating mainly to clinical examinations of some 800,000 patients, as well as more than 300,000 outcome records. Researchers from 36 countries had performed more than 5,000 downloads. Besides scientific uses, the data is used by companies to develop technologies to combat COVID-19, such as an artificial intelligence system to help diagnose diseases and predict outcomes created by the startup DiagoNow.

SUPPORT FOR RESEARCH ON COVID-19

EPICOVID-19 BR

http://agencia.fapesp.br/36065

FAPESP supported the fifth and last phase of the survey of SARS-CoV-2 prevalence in Brazil. It was initially led by the Federal University of Pelotas (UFPEL) in Rio Grande do Sul, with four phases called EPICOVID BR1. The fifth phase, led by a researcher at the Federal University of São Paulo (UNIFESP), was called EPICOVID-19 BR2 and tested 120,000 people in 133 cities between January 25 and April 24, 2021. Seroprevalence was highest in Amazonas State, with positive results accounting for 31.4%. The nationwide average was 15%.

PROJECT S, IN SERRANA (SÃO PAULO)

http://agencia.fapesp.br/36003

FAPESP supported a study called Project S, conducted by Butantan Institute in Serrana, a town with 48,000 inhabitants in São Paulo State, to assess the impact of vaccination on the fight against COVID-19. Researchers from Butantan vaccinated more than 27,000 people with CoronaVac and measured the impact of vaccination on transmission of the virus and overcrowding of the health system, as well as its indirect effects (on the economy, mobility, and emergence of novel variants of SARS-CoV-2). The results, announced on May 31, 2021, showed deaths from the disease down 95% and hospitalizations down 86%. Moreover, the number of symptomatic cases fell 80% in the period. Thus the unvaccinated, such as children and adolescents, also benefited from the protection afforded by the vaccine. This suggests that the pandemic would be controlled throughout the country if 75% of the population were vaccinated. Only 10% of Brazilians had completed the immunization protocol at the time. Serrana State Hospital and the municipal administration collaborated with Butantan in the study.

FAPESP'S COMMUNIQUÉS AND REGULATIONS REGARDING COVID-19

FAPESP issued six communiqués in 2021 in response to resurgence of the pandemic, interruption of in-person activities at research institutions in Brazil and abroad, and the need for precautionary measures to assure the safety of grantees.

- **FAPESP COMMUNIQUÉ Nº 9 ON COVID-19 – APPLICATIONS FOR SCHOLARSHIPS FOR RESEARCH INTERNSHIPS AND RESEARCH FELLOWSHIPS ABROAD** – FAPESP cancelled ongoing applications for Research Fellowships Abroad (RFA) and Research Internships Abroad (RIA) and suspended all new applications for these scholarships, initially for 90 days. . (www.fapesp.br/14701)

- **FAPESP COMMUNIQUE Nº 10 ON COVID-19** – FAPESP again extended the time allowed for presentation of accounts. (www.fapesp.br/14809)

- **FAPESP COMMUNIQUÉ Nº 11 ON COVID-19** – FAPESP extended for three more months the lifetime of scholarships in Brazil due to expire on December 31, 2021. (www.fapesp.br/14938)

- **FAPESP COMMUNIQUÉ Nº 12 ON COVID-19 – RESEARCH INTERNSHIPS AND RESEARCH FELLOWSHIPS ABROAD** – FAPESP resumed processing of applications for Research Fellowships Abroad (RFA) and Research Internships Abroad (RIA), as well as reception of new applications, suspended for the reasons stated in Communiqué Nº 9. (www.fapesp.br/14972)

- **FAPESP COMMUNIQUÉ Nº 13 ON COVID-19: RESUMPTION OF ANALYSIS OF APPLICATIONS FOR VISITING RESEARCHER GRANTS** – FAPESP resumed reception and analysis of applications for Visiting Researcher grants. (www.fapesp.br/14992)

- **FAPESP COMMUNIQUÉ Nº 14 ON COVID-19 – RIA (COMPLEMENTATION OF COMMUNIQUÉNº 12)** – FAPESP announced that it would exceptionally analyze on a case-by-case basis proposals in which the minimum time remaining until expiration of scholarships in Brazil after the awardee's return was shorter than that defined in items 4 and 5 of the rules governing this funding modality. (www.fapesp.br/15024)

SMALL ENTERPRISES IN THE FIGHT AGAINST COVID-19

STARTUP DEVELOPS REMOTELY OPERATED ROOM STERILIZATION DEVICE (30 NEWS ITEMS)

https://pesquisaparainovacao.fapesp.br/1746
https://agencia.fapesp.br/35470

The startup BioLambda, in partnership with Albert Einstein Jewish-Brazilian Hospital (HIAE), developed a remotely operated mobile device that sterilizes a large indoor space in three to six minutes using ultraviolet-C radiation (UVC). In addition to killing germs, the UVC device also inactivates the novel coronavirus.

Originally designed for use in hospitals, clinical laboratories and ambulances, it can also be used to decontaminate offices, food processing plants and even containers for fresh or processed food exports before they are loaded on to ships.

COMPANY DEVELOPS PAPER THAT INACTIVATES NOVEL CORONAVIRUS (102 NEWS ITEMS)

https://agencia.fapesp.br/36225
https://pesquisaparainovacao.fapesp.br/1856

Material for packaging paper and corrugated cardboard eliminates 99.99% of viral particles in up ten 10 minutes of contact (photo: Irani)

Packaging paper and corrugated cardboard can inactivate SARS-CoV-2 by contact. Launched by Brazilian papermaker Irani, the material contains silver-silica nanoparticles developed by Nanox, a São Paulo-based company supported by the FAPESP Innovative Research in Small Business Program (PIPE). In tests performed at the biosafety level 3 (BSL3) laboratory belonging to the University of São Paulo's Institute of Biomedical Sciences (ICB-USP), the material was found to eliminate 99.9% of SARS-CoV-2 particles in five minutes of contact and 99.99% in up to ten minutes.

SÃO PAULO-BASED FIRM CREATES "ARTIFICIAL LUNG" TO TREAT COVID-19 (44 NEWS ITEMS)

https://agencia.fapesp.br/35524

https://revistapesquisa.fapesp.br/empresa-paulista-cria-pulmao-artificial-para-tratar-covid-19

The Solis system acts as an artificial lung and heart in critical patients (image: Braile Biomédica)

Braile Biomédica, a Brazilian company that makes medical equipment for cardiology, has brought to market a device that can help treat critical COVID-19 patients. Known as Solis, it is an extracorporeal membrane oxygenation (ECMO) system in which blood is pumped through a heart-lung machine that removes carbon dioxide, and is returned full of oxygen to keep the patient's cardiopulmonary system going when a mechanical ventilator can no longer provide adequate gas exchange or perfusion to sustain life. ECMO is indicated in cases involving heart transplants and for patients who have had a heart attack or cardiac arrest. It can also be used to assist severe COVID-19 patients with severe acute respiratory failure. The device was developed with technical support from the Eldorado Research Institute in Campinas, São Paulo, a unit of EMBRAPII, the Brazilian Research and Industrial Innovation Corporation, a federal agency. It invested BRL 2.3 million in the project. Braile invested a matching amount. The São Paulo State Development Agency (Desenvolve SP) provided BRL 2.5 million, and the National Development Bank (BNDES) supplied BRL 3 million. Founded by cardiovascular surgeon Domingo Marcolino Braile (1938-2020) in 1977, the firm is currently supported by FAPESP's Innovative Research in Small Business Program (PIPE) to develop a peripheral stent (a scaffold inserted into peripheral blood vessels to treat blockage), and already had the know-how to manufacture similar equipment.

FAPESP-FUNDED STARTUPS ARE DEVELOPING COVID-19 VACCINES

(2 NEWS ITEMS)

https://pesquisaparainovacao.fapesp.br/1901

https://pesquisaparainovacao.fapesp.br/1794

https://pesquisaparainovacao.fapesp.br/1884

Farmacore Biotecnologia and Invent Biotecnologia, startups based in Ribeirão Preto, supported by PIPE and linked to the Supera Innovation and Technology Park, joined the race to produce COVID-19 vaccines. Farmacore specializes in biotechnological and immunobiological products, and is partnering with PDS Biotechnology (USA) and the University of São Paulo (USP) to develop a vaccine called Versamune®-CoV-2FC. Invent is in the early stages of developing an oral/nasal vaccine in a stable formulation that can be stored at room temperature.

SMALL ENTERPRISES IN THE FIGHT AGAINST COVID-19

MOLECULE DERIVED FROM COLORANT INACTIVATES SARS-COV-2 AND CAN BE USED IN ORAL HYGIENE PRODUCTS (146 NEWS ITEMS)

https://pesquisaparainovacao.fapesp.br/2038
https://agencia.fapesp.br/37322

Photo: Pixabay

Researchers at the University of São Paulo's Institute of Chemistry (IQ-USP), working with chemicals manufacturer Golden Technology, discovered that a molecule derived from the textile dye phthalocyanine inactivates SARS-CoV-2 and developed a process to produce it to scale for inclusion in a mouthwash.

In laboratory tests performed at the Institute of Biomedical Sciences (ICB-USP) and reported in the journal *Scientific Reports*, the compound reduced viral load in cell cultures by 99.96% without cytotoxic effects (cell damage or death).

Golden Technology's researchers decided to see if the mouthwash containing the compound could reduce viral load in the saliva of infected patients. One of the first in vitro studies, conducted by researchers at the Bauru Dental School (FOB-USP) in partnership with colleagues at São Paulo State University (UNESP) in Botucatu, showed that an antiseptic mouthwash with phthalocyanine reduced viral load in saliva samples by 90%.

MAIN DISCOVERIES RELATING TO COVID-19 SUPPORTED AND PUBLICIZED BY FAPESP – TIMELINE

2021

JAN 6

A study by researchers at the University of São Paulo (USP) in Ribeirão Preto identifies one of the factors that make the alpha variant of SARS-CoV-2 (B.1.1.7), first detected in the UK, more contagious.

315 news items (https://agencia.fapesp.br/34932)

JAN 11

A study by USP shows that melatonin produced in the lungs acts as a barrier against SARS-CoV-2, preventing expression of genes that encode proteins used by cells that are entry points for the virus.

233 news items (https://agencia.fapesp.br/34959)

JAN 14 AND 15

Health services in Manaus are overwhelmed and oxygen supplies run out owing to surge in COVID-19 case and hospitalization numbers since December 2020.

JAN 17

First vaccinations in Brazil – vaccination begins in São Paulo after emergency use of the CoronaVac and AstraZeneca vaccines is authorized by ANVISA, the national health surveillance agency.

JAN 21

Affordable COVID-19 test – a test that detects antibodies to the novel coronavirus in 10 minutes and costs only a fifth of the market average is developed by researchers at the São Carlos Chemistry Institute (IQSC-USP) and Brazilian startup Biolinker.

199 news items (https://agencia.fapesp.br/35036)

JAN 26

Exercising regularly does not affect severe COVID-19 outcomes – a study involving 209 severe COVID-19 patients admitted to Hospital das Clínicas (HC), the hospital complex run by the University of São Paulo's Medical School (FM-USP), and the field hospital set up at the Ibirapuera Sport Center shows that exercising regularly before hospitalization was not a decisive factor in combating the disease for these patients.

62 news items (https://agencia.fapesp.br/35048)

JAN 27

FAPESP Communiqué nº 9 on COVID-19 – Research Internships and Research Fellowships Abroad: FAPESP cancels ongoing applications for Research Fellowships Abroad (RFA) and Research Internships Abroad (RIA) and suspends all new applications for these scholarships for 90 days.

(https://fapesp.br/14701)

JAN 28

Preliminary results of a study conducted at the State University of Campinas (UNICAMP) suggest that COVID-19, even in mild cases, can alter the brain's functional connectivity, causing a synaptic "short circuit".

66 news items (https://agencia.fapesp.br/35081)

2021

FEB 9

Start of the fifth and last phase of EPICOVID-19 BR – the largest epidemiological survey of COVID-19 under way in Brazil – with FAPESP's support.

8 news items (https://agencia.fapesp.br/35145)

FEB 17

Butantan Institute begins a trial of the collective effectiveness of vaccination in Serrana.

64 ews items (https://agencia.fapesp.br/35203)

MAR

Eight research projects that will strengthen the capacity of the SUS, Brazil's national health service, to address the challenges posed by COVID-19 are selected in a call issued jointly by FAPESP, the Ministry of Health and the National Council for Scientific and Technological Development (CNPq).

MAR 2

A study suggests that the gamma variant (P.1) is more transmissible, can cause re-infection and probably emerged in Manaus in November 2020, about a month before the number of hospitalizations for severe acute respiratory syndrome surged in the city.

455 news items (https://agencia.fapesp.br/35290)

MAR 7

Effects of vaccination – a month after vaccination began, preliminary data from the São Paulo City Department of Health show a 70% drop in the number of over-nineties dying in the city between January and February 2021.

MAR 8

Butantan Institute asks ANVISA to authorize a clinical trial to test an anti-COVID serum.

385 news items (https://agencia.fapesp.br/35335)

MAR 15

The president appoints his fourth health minister – Health Minister Eduardo Pazuello, an army general, is replaced by Marcelo Queiroga, a cardiologist.

MAR 17

The Brazilian health system is overwhelmed – according to Oswaldo Cruz Foundation (Fiocruz), 80% or more of the intensive care beds paid for by the SUS are occupied by COVID-19 patients in 25 of the country's 27 federative units.

MAR 26

For the first time, researchers at USP detect SARS-CoV-2 in the periodontal tissue of patients who died from COVID-19 – the discovery points to a possible source of the virus in the saliva of patients with the disease.

340 news items (https://agencia.fapesp.br/35512)

MAR 26

Butantan Institute asks ANVISA to authorize clinical trials to test ButanVAC, its new COVID-19 vaccine.

7 news items (https://agencia.fapesp.br/35513)

2021

MAR 30

FAPESP Communiqué nº 10 on COVID-19 – the time allowed for presentation of accounts is extended.

(https://fapesp.br/14809)

APR 22

Researchers at USP and Butantan, collaborating with colleagues at the Federal University of Rio de Janeiro (UFRJ), find that Alzheimer's patients are three times more likely to die from COVID-19 and six times more if over 80.

108 news items (https://agencia.fapesp.br/35679)

APR 29

In autopsies of children who died from COVID-19, researchers at USP and Adolfo Lutz Institute find that acute infection of several organs at once by SARS-CoV-2 can make children's immune system overreact, leading to multisystem inflammatory syndrome.

724 news items (https://agencia.fapesp.br/35743)

APR 30

USP's Human Genome and Stem Cell Research Center (HUG-CELL) analyzes genetic material from 86 discordant couples (both were exposed to SARS-CoV-2 but only one was infected) to map immune system genes involved in resistance to the virus.

532 news items (https://agencia.fapesp.br/35752)

MAY 4

A study conducted at USP's Physics Institute measures the filtration efficacy of 227 face masks sold in Brazil.

375 news items (https://agencia.fapesp.br/35773)

MAY 5

FAPESP issues two calls for research proposals: the COVID-19 UN Research Roadmap Fast-Track Call, with a July 10 deadline; and the T-AP Recovery, Renewal and Resilience in a Post-Pandemic World Call.

(https://agencia.fapesp.br/36057)

MAY 20

The delta variant is detected in Brazil.

MAY 27

EPICOVID-19 BR 2 – the survey, supported by FAPESP and led by a researcher at UNIFESP, tests 120,000 people in 133 cities between January 25 and April 24, 2021. Seroprevalence is highest in Amazonas State, with positive results accounting for 31.4%. The nationwide average is 15%.

277 news items (https://agencia.fapesp.br/35967)

MAY 31

FAPESP Communiqué nº 11 on COVID-19 – the lifetime of scholarships in Brazil due to expire on December 31, 2021, is extended for three months.

(https://fapesp.br/14938)

2021

JUN 17

Long COVID-19 – studies show that most patients who survive severe COVID-19 have long-term symptoms of the disease. In an online seminar organized by FAPESP, researchers from Brazil and the United States discuss preliminary results of studies on mental health and quality of life among survivors of the disease six months after leaving hospital.

31 news items (https://agencia.fapesp.br/36134)

JUN 22

COVID-19 tests – researchers at the Federal University of São Carlos (UFSCar) patent two new tests to detect the virus in saliva. Both achieve high sensitivity and, if produced on a large scale by partner companies, could be used in mass testing of the Brazilian population.

567 news items (https://agencia.fapesp.br/36162)

JUN 23

In the first FAPESP 60 Years event, Ambassador Celso Lafer, a former President of FAPESP, speaks about science diplomacy, which has been at the forefront of multilateral negotiations on climate and COVID-19 vaccines.

JUN 25

FAPESP Communiqué nº 12 on COVID-19 – Research Internships and Research Fellowships Abroad – FAPESP resumes processing of applications for Research Fellowships Abroad (RFA) and Research Internships Abroad (RIA), as well as reception of new applications, suspended for the reasons stated in Communiqué nº 9.

JUN 29

The government suspends a contract to buy 20 million doses of the Indian vaccine Covaxin while allegations of irregularities are investigated.

JUN 29

SARS-CoV-2 infects and replicates in salivary glands – discoveries by researchers at USP help explain why the virus is found in large amounts in saliva, serving as a basis for the development of saliva tests to diagnose COVID-19.

986 news items (https://agencia.fapesp.br/36213)

JUL 2

Physical exercise in the pandemic – researchers at USP use data for 344 volunteers to compare the physical and mental health benefits of workouts led in person by a fitness instructor, unsupervised online sessions, and classes supervised remotely via video call. Gradually increasing intensity is associated with improvements in mental health.

465 news items (https://agencia.fapesp.br/36251)

JUL 12

FAPESP postpones to August 2, 2021, the deadline for submission of proposals under the COVID-19 UN Research Roadmap Fast-Track Call.

2021

JUL 14

FAPESP Communiqué nº 13 on COVID – FAPESP resumes reception and analysis of applications for Visiting Researcher grants.

(https://fapesp.br/14992)

JUL 19

The impact of SARS-CoV-2 on the brain – in an online seminar organized by FAPESP, researchers from Brazil and Germany discuss the results of studies showing how the virus invades the central nervous system and which cells are most affected.

137 news items (https://agencia.fapesp.br/36360)

JUL 26

A study by UNICAMP concludes that vaccinated people can be infected by and transmit the alpha variant of SARS-CoV-2 – outbreaks at two care homes in Campinas show that even people who have been vaccinated with one dose of the AstraZeneca vaccine or two doses of CoronaVac can still be infected by and transmit the virus. The cases analyzed were asymptomatic or mild and did not require hospitalization, but the findings highlight the importance of rapidly vaccinating the entire population while continuing to require face coverings and social distancing even for those who have been vaccinated.

212 news items (https://agencia.fapesp.br/36415)

JUL 29

FAPESP Communiqué nº 14 on COVID – FAPESP announces it will exceptionally analyze on a case-by-case basis proposals in which the minimum time remaining until expiration of scholarships in Brazil after the awardee's return is shorter than that defined in items 4 and 5 of the rules governing this funding modality.

(https://fapesp.br/15024)

AUG 9

Gamma variant (P.1) is more aggressive but can be contained with vaccine and lockdown – correlating whole-genome sequencing with epidemiological data for São José do Rio Preto, researchers at FAMERP, the city's medical school, show that severe COVID-19 and deaths from the disease rose sharply when the variant became prevalent in the region. A two-week lockdown and vaccination of the elderly averted a collapse of the health system.

353 news items (https://agencia.fapesp.br/36531)

AUG 11

Physically active people respond better to COVID-19 vaccine – more than 1,000 volunteers immunized with the CoronaVac vaccine are assessed by researchers at USP. Those who are active for at least 150 minutes per week without long sedentary periods produce more antibodies against SARS-CoV-2.

127 news items (https://agencia.fapesp.br/36542)

AUG 13

Physicists at UNICAMP create model to predict mutations in SARS-CoV-2 – equations suggest viral population variability can be estimated on the basis of epidemiological data.

382 news items (https://agencia.fapesp.br/36571)

AUG 12

A study by UNIFESP shows that pregnant women with COVID-19 face a higher risk of pre-eclampsia.

365 news items (https://agencia.fapesp.br/36563)

2021

AUG 26

Men are the main transmitters of SARS-CoV-2 – this is one of the findings of an epidemiological survey by scientists at USP involving 1,744 Brazilian couples where at least one partner contracted COVID-19.

567 news items (https://agencia.fapesp.br/36683)

SEP 1°

Technique used at UNIFESP permits genome sequencing of novel coronavirus with 25-fold increase in resolution.

104 news items (https://agencia.fapesp.br/36729)

SEP 3

Researchers seek a vaccine capable of neutralizing the coronavirus while still in the nose – groups at USP, UNIFESP and Fiocruz join forces to create a vaccine in an affordable nasal spray that assures lasting protection against variants.

394 news items (https://agencia.fapesp.br/36754)

SEP 8

Research conducted at USP shows that SARS-CoV-2 can affect the testicles, reducing hormones and sperm quality.

385 news items (https://agencia.fapesp.br/36763)

SEP 22

The fourth FAPESP 60 Years event focuses on Global Health Challenges, with a discussion on how combating COVID-19 can help the search for solutions to other problems that threaten humanity, such as viral, fungal and bacterial diseases, affecting health, ecosystems and social inequality.

SEP 27

A study by USP identifies two different types of lung damage in victims of COVID-19.

147 news items (https://agencia.fapesp.br/36920)

OCT 6

Entitled "Artificial Intelligence in COVID-19", an online seminar in the series FAPESP COVID-19 Research Webinars, held in partnership with the Global Research Council (GRC), presents AI approaches and use of COVID-19 data to control the pandemic.

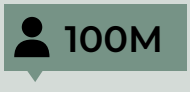
OCT 6

Researchers at UFSCar patent a new test to detect SARS-CoV-2 in saliva. The portable device has similar accuracy to RT-PCR, considered the gold standard for diagnosing COVID-19, but is faster and cheaper, and can analyze up to 20 samples simultaneously. In addition to detecting the presence of the virus, the test also measures viral load.

171 news items (https://agencia.fapesp.br/37003)

OCT 14

The number of fully vaccinated Brazilians reaches **100 million**.



2021

NOV 3

Researchers at USP's Institute of Chemistry, in partnership with Brazilian company Golden Technology, produce to scale a molecule derived from the textile dye phthalocyanine that inactivates SARS-CoV-2 and can be included in oral hygiene products. .

146 news items (https://agencia.fapesp.br/37202)

NOV 25

South Africa identifies a novel variant, which is soon named omicron.

DEC

Brazil is one of the ten countries most frequently referenced in scientific publications about COVID-19 around the world – up until mid-November, there were 2,221 mentions in papers authored by domestic and foreign groups. The papers address topics relating to the mechanisms and dynamics of transmission of SARS-CoV-2, as well as prevention, diagnosis, and treatment strategies, among others. The statistics are from LitCovid, a repository created by engineers and data scientists at the US National Library of Medicine (NLM), holding more than 190,000 papers on the pandemic.

(https://revistapesquisa.fapesp.br/sob-holofotes)

DEC 7

FAPESP hosts an online seminar to discuss some of the results of the 2020 First COVID-19 Fast-Track Call, as part of the FAPESP COVID-19 Research Webinar series.

DEC 14

Researchers at USP isolate omicron – a study is conducted to monitor the spread of this variant of SARS-CoV-2 and assess the effectiveness of the COVID-19 vaccines currently used in Brazil.

172 news items (https://agencia.fapesp.br/37552)

DEC 16

ANVISA authorizes vaccination of children with Pfizer's vaccine.

SCIENTIFIC DISSEMINATION IN THE PANDEMIC

COVID-19 WEBSITE

https://covid19.fapesp.br

FAPESP launched this website in July 2020 to centralize information about research and development projects in new technologies to combat the disease, news articles and videos on the results of these investigations, and access to the schedule and archive of its COVID-19 webinars, communiqués, ordinances and calls for proposals, among other initiatives relating to the disease and SARS-CoV-2. Since its creation, the website has recorded 49,255 hits and 94,400 page views. The numbers for 2021 were 39,474 hits and 68,175 page views.

AGÊNCIA FAPESP

BULLETIN AND NEWS WEBSITE

Since the start of the pandemic, Agência FAPESP has published 359 news articles about advances in and results of research supported by FAPESP relating to SARS-CoV-2 and COVID-19, 131 of them in 2021. Many of these stories were published in real time on its website, even before they circulated in the daily bulletin, and distributed to the media. The website recorded over 5.5 million page views by 2.9 million users. Its specific content on COVID-19 was reproduced in 27,160 news items published by media outlets in Brazil and other countries. This corresponded to 53% of all the news stories inspired by FAPESP in 2021 on all subjects

PRÊMIO EINSTEIN + ADMIRADOS DA IMPRENSA DE SAÚDE E BEM-ESTAR

Agência FAPESP was elected best news agency in a contest for prizes awarded by Jornalistas&Cia and the Albert Einstein Jewish-Brazilian Charitable Society (SBIBAE), known as Prêmio Einstein +Admirados da Imprensa de Saúde e Bem-Estar. Thousands of journalists and media professionals took part in two rounds of voting.

VIDEO REPORTAGE

The reportage video "Study reveals one of the factors that make the novel coronavirus more contagious" received 12,349 views on YouTube.

CIÊNCIA SP

This Agência FAPESP channel produced six videos on COVID-19, which received 9,395 views on YouTube, 4,242 on Facebook and 7,127 on Instagram. The most viewed were "Novel coronavirus variant" (6,893 views), "Mask filtration efficiency" (3,957), and "Effectiveness of CoronaVac" (3,755).

COVID-19 – SOCIAL MEDIA IN 2021

AGÊNCIA FAPESP

COVID-19 was the most frequent focus for Agência FAPESP's top-performing posts on social media in 2021, repeating the 2020 performance. On Facebook, although the disease shared the top rankings with other subjects, it maintained a significant presence among the most-viewed posts and the posts with the most follower engagements.

On Facebook (@agfapesp), the report "Melatonin produced in lungs prevents infection by novel coronavirus" ranked third in total engagements (9,128), while "Vaccinated people can be infected and transmit alpha variant" reached 38,602 people and ranked tenth in the year in terms of reach.

On Twitter (@AgenciaFAPESP), seven of the top ten posts in total engagements had to do with COVID-19, led by a tweet launching the campaign to combat anti-vax rumors (#VacinaSim – see details below). In this campaign, a video featuring FAPESP President Marco Antonio Zago notched up 873 engagements and was the top-performing post in the year on this criterion.

Other tweets about the disease that stand out in terms of total engagements referred to the news story "Melatonin produced in lungs prevents infection by novel coronavirus" (649 engagements) and a talk by journalist Luiza Caires (637) for the #VacinaSim campaign, ranked third and fourth respectively in terms of total engagements during the year.

On Instagram (@agenciafapesp), the standouts were two posts about coronavirus: "Antibodies against SARS-CoV-2 produced during prior infection are six times more effective against P.1 variant" (top performer, with 4,489 engagements and 19,400 accounts reached) and "Melatonin produced in lungs prevents infection by novel coronavirus" (2,712 engagements and 16,000 accounts reached).

#VacinaSim

On January 18, 2021, one day after COVID-19 vaccination began in São Paulo State, FAPESP launched the #VacinaSim campaign in videos posted to Agência FAPESP's social media channels. In each post, researchers and opinion makers emphasized the importance of vaccination to the control the pandemic and called on the public to trust science and vaccines. Altogether, 66 people took part in the 264 videos posted to Facebook, Twitter and Instagram.

Institutional profiles that engaged with the campaign included those of São Paulo's three state universities and several research institutions linked to them, as well as the Brazilian Academy of Science (ABC), the São Paulo State Academy of Sciences (ACIESP), SciElo, the Brazilian Chemistry Society (SBQ), Canal Futura, Nexo Jornal, Nexo Políticas Públicas and TV Cultura, among others. Researchers and opinion makers also engaged with the campaign on social media.

#VacinaSim was reproduced in full by Canal Futura. TV Cultura broadcast six videos on the campaign. It was also supported by the research funding agencies for the Federal District, Alagoas, Mato Grosso and Paraná, which used the same hashtag (#) but produced their own content.

In statistical terms, the Twitter standouts, as already mentioned, were the videos featuring Zago and Caires (see numbers above). The video by FAPESP's president was also popular on Facebook, with 2,381 total engagements and 28,951 people reached. On Instagram, a post by researcher Ester Sabino achieved 330 engagements with a feed post and reached some 600 accounts in the story format.

FAPESP INOVAÇÃO

The FAPESP Inovação profile premiered on LinkedIn on November 18, 2021. In science diffusion regarding COVID-19, the standout between then and the end of the year was the news story "Molecule derived from colorant inactivates SARS-CoV-2 and can be used in oral hygiene products", with 364 total engagements and 12,771 views.

PESQUISA FAPESP MAGAZINE

COVERAGE OF COVID-19 ON THE WEBSITE

https://revistapesquisa.fapesp.br/keywords/coronavirus
https://revistapesquisa.fapesp.br/keywords/coronavirus-en-2

In 2021, the magazine's website published 156 articles directly about COVID-19. Altogether, it published 56 news items, three ping-pong interviews, 32 notes and 33 researcher testimonials in the section "Research during Lockdown" created specially for the pandemic. It also featured 49 interviews in the Pesquisa Brasil podcast, as well as five videos and two picture galleries.

The keyword that aggregates content relating to COVID-19, comprising news stories, notes, testimonials, videos, podcasts and galleries (with some repetition, such as interviews extracted from radio programs), linked to 708 items at the end of 2021.

GUIDE TO COVID-19

https://revistapesquisa.fapesp.br/um-guia-do-novo-coronavirus

Created in March 2020 and constantly updated, this section was viewed 34,155 times in 2021 (-11.4% compared with 2020), and was the second most viewed COVID-related content on the website during the year.

NEWS HIGHLIGHTS

Vaccines were the most frequent topic during the year, in over 20 stories on their development, logistics, patenting and effectiveness, as well as on resistance to vaccination. Stories on these aspects were produced practically every month. Patient treatment equipment and drug development were also covered, with less emphasis.

The second most covered topic was the social consequences of the pandemic, such as the blow to education, aggravation of its impact by social and racial inequality, and the appearance of a legion of orphans.

The magazine also covered the emergence of viral variants, explaining how this occurred in terms of virology and evolution, and their bearing on the future of the pandemic.

Most read items on COVID-19 in 2021

News stories	Views
Similarities between Spanish flu and COVID-19 (Mar 26, 2020)	50,892
São Paulo-based firm creates "artificial lung" to treat COVID-19 (Feb 11, 2021)	19,960 (up in April)
Butantan develops serum against novel coronavirus (Dec 14, 2020)	17,179
Eurico Arruda: an admirer of viruses (Mar, 2021)	15,797
The effects of COVID-19 (Sep, 2020)	12,869
"I hope the pandemic makes teachers more highly valued" (Jan 10, 2021)	12,179
Video on the importance of COVID-19 vaccines (Feb 16, 2021)	10,557
New test can improve detection of SARS-CoV-2 (Aug 14, 2020)	9,911
The challenge of calculating R (Jul, 2020)	9,907
Challenges of isolating (Apr 6, 2020)	8,052

RESEARCH DURING LOCKDOWN

The series of testimonials continued in 2021, documenting how day-to-day science was affected by COVID-19 in several areas. In its second year, it reflected changes in the dynamics of science. Some researchers returned to the laboratory and the field, while others continued to work remotely. The discovery that it is possible to do more when less time is spent on travel made way, in many cases, for the realization that in-person meetings are important to trigger new ideas.

The scope of the testimonials narrowed, partly owing to Google's indexation system: their titles typically consist of a striking sentence chosen from what the interviewee said and rarely contain keywords that assist searches. Changes to social media algorithms may also have had an effect.

Number of views		
Education	Circe Bittencourt (Jan 10, 2021)	12,179
Music	Thiago de Souza (Feb 14, 2021)	4,815
Pathology	Paulo Saldiva (May 9, 2021)	4,391
Biology	Patricia Pereira Coltri & Paulo Roberto Guimarães Junior	3,202
Zoonoses	Luiz Gustavo Bentim Góes & Angélica Cristine de Almeida Campos	2,753
Science Difusion	Ana Arnt	2,491
Biomedicine	Isis Souza	2,476
Ecophysiology	Vera Val	2,296
Anthropology	Caio Monticelli	2,261
Geography	Larissa Bombardi	1,770

VIDEOS

Videos reach large numbers of people in addition to users of the website. Many teachers use them, and this was particularly the case for remote learning during periods of lockdown or confinement. The following videos on COVID-19 were published in 2021:

Videos	Views on YouTube in 2021
The importance of COVID-19 vaccines (Feb 16, 2021)	18,494
The role of the SUS in the fight against the pandemic (Mar 29, 2021)	5,591
Nine questions about variants of the novel coronavirus, answered by virologist Eurico Arruda (Apr 12, 2021)	4,743
The difficulty of post-COVID rehabilitation (Jul 19, 2021)	2,591
How science went to the media to explain COVID-19 (Feb 1st, 2021)	1,964

IMAGE GALLERY

Two selections of photos about the pandemic were published in 2021:

- "Far from school" (*Longe da escola*, January 30, 2021), showing shuttered schools, or partly open schools with few children and many protocols.
- "A system that saves lives" (*Um sistema que salva vidas*, March 18, 2021), showing how Brazil's national health service, the SUS, is fighting the pandemic.

COVERAGE OF COVID-19 IN THE PRINT MAGAZINE

Part of the content originally produced for the website was published later in the print magazine. All texts produced for the print magazine were posted to the website. All 12 issues of the print magazine published in 2021 contained news stories and a section of notes on the pandemic. COVID-19 featured on the covers of the issues for March ("The value of the SUS"), April ("The virus in motion") and May ("Future threatened", on the educational lag caused by school closures and unequal access to remote learning).

EVENTS

COVID-19 RESEARCH WEBINARS

https://covid19.fapesp.br/en

FAPESP organized a series of webinars in which researchers from Brazil and other countries discussed discoveries and results of studies relating to the advancement of knowledge about COVID-19. Ten such webinars were held between February and December 2021, with 2,158 live participants and recordings watched by 16,448 people. Posts on these events to Agência FAPESP's social media channels reached 20,912 people and received 24,700 views on Twitter.

The following topics were discussed in the webinars: Designing and interpreting clinical trials to assess the effectiveness of COVID-19 vaccines (February 3); Education: COVID-19 and social inequality (March 3); Scientific entrepreneurship and innovation in response to COVID-19 (April 7); A research agenda for post-COVID recovery (May 5); Long and sub-acute COVID-19 (June 2); What does COVID-19 have to do with the brain? (July 7); Challenges of drug and biopharmaceutical development in Brazil (September 1); Artificial intelligence and COVID-19 (October 6); The role of implementation science (November 3); Results of the 1st COVID-19 Fast-Track Call (December 7).

In August, the FAPESP COVID-19 Research Webinars series was replaced by four events organized by the São Paulo Excellence Chair (SPEC) program. Entitled "Health and Environment in the Amazon in the Context of COVID-19", they were watched live online by 289 people. Recordings were watched by 2,281 people.

The ILP-FAPESP cycle is a partnership between the São Paulo Legislative Assembly Institute (ILP) and FAPESP to disseminate scientific and technological research to society, lawmakers, public administrators and other interested parties. In 2021, three editions discussed topics relating to COVID-19: "The race for vaccines", "Post-pandemic cities", and "COVID-19: variants, monitoring and control". They were held as in-person events and also broadcast online, with a live audience of 745 people and 3,761 views for the recordings.

Another event, called "COVID-19 Data Sharing/BR Repository– Open Data in the Fight against the Pandemic", discussed research projects that use the database created by FAPESP and the University of São Paulo, and how open data can help fight pandemics. The event was watched live by 299 people, and the recording received 1,543 views.

FAPESP IN THE MEDIA

Dissemination of research and technological innovations developed with FAPESP's support and focusing on SARS CoV-2 and COVID-19 resulted in the publication of 27,160 news items in Brazilian media (22,257) and media abroad (4,903). The most widely read items are listed below.

Research on COVID-19 publicized by FAPESP and with the highest visibility in Brazilian media

Topic discussed	Nº of news
People who have had dengue are twice as likely to develop symptomatic COVID-19	844
Novel coronavirus infects and replicates in salivary gland cells	790
Direct action of SARS-CoV-2 on several organs may cause exaggerated immune reaction in children	711
Two new COVID-19 tests developed in Brazil are patented	560
Men are the main transmitters of the novel coronavirus, study suggests	543
The incidence of COVID-19 in a Brazilian regional soccer league is one of the world's highest	424
Study maps immune system genes involved in resistance to SARS-CoV-2	396
Butantan Institute asks ANVISA to authorize clinical trials of anti-COVID serum	382
Brazilian physicists create model to predict mutation in SARS-CoV-2	373
A study conducted in Brazil evaluated the filtration efficacy of 227 commercially available face masks	364

Pesquisas sobre COVID-19 divulgadas pela FAPESP com maior visibilidade na mídia internacional

Top discussed	Nº of news
SARS-CoV-2 continued to replicate and mutate in a patient for 218 days	474
People who have had dengue are twice as likely to develop symptomatic COVID-19	225
Study suggests the Brazilian variant emerged in November, is more transmissible and can cause reinfection	210
Study identifies a factor that makes the novel coronavirus variant B.1.1.7 more contagious	194
Novel coronavirus infects and replicates in salivary gland cells	172
Researchers at the University of São Paulo find coronavirus in gum tissue of COVID-19 patients	143
Study reveals how saline solution can inhibit replication of SARS-CoV-2	130
Study maps immune system genes involved in resistance to SARS-CoV-2	126
Nationwide survey shows that several COVID-19 epidemics are under way in Brazil	114
High dose of vitamin D fails to improve condition of moderate to severe COVID-19 patients	109

CHAPTER

3

FUNDING STRATEGIES

- Training of Human Resources for Research
- Basic and Applied:

  – Long-term research and
  – Regular Grants not associated to other grants
- Research for Innovation
- Research on Strategic Themes
- Support for Research Infrastructure
- Communicating Science to the Public

FUNDING STRATEGIES

TRAINING OF HUMAN RESOURCES FOR RESEARCH

FAPESP awards several types of regular scholarships and fellowships for undergraduates and graduates who reside in São Paulo State to train in Brazil and abroad. Regular scholarships and fellowships in Brazil support academic education and training at different levels: Scientific Initiation (IC), Master's (MS, Doctorate (DR), Direct Doctorate (DD), and Postdoctorate (PD).

FAPESP has an agreement with the Ministry of Education's Higher Research Council (CAPES) to fund MS, DR and DD scholarships, as well as PD fellowships. Transfers of funds from CAPES to FAPESP in 2021 are detailed in Tables 53 and 53a at **www.fapesp.br/relatorio2021.**

FAPESP awards two types of funding for education and training abroad: Research Fellowships Abroad (BPE) for postdoctoral research; and Research Internships Abroad (BEPE) for use while scholarships in Brazil are in progress. It considers the experience of research abroad a key component of the training of new researchers.

In 2021, FAPESP launched a new type of DD scholarship in medical research for students enrolled in double degree programs (MD-PhD, medical degree and research doctorate) maintained by universities and research institutions in São Paulo State, with the aim of training professionals for a career in medicine combined with research.

Another innovation was the Research Career Consolidation Mentoring Initiative, a series of online events held periodically to help researchers in academia, industry and government consolidate their careers. The various activities involved include videos to complement the scholarship awardees' scientific training.

For other education and training scholarships awarded under the budgets for the grants with which they are associated, see Tables 36 and 37 (*pp. 148-149*). FAPESP contracted for 1,466 new research grants and disbursed $ PPP 75.8 million for 4,511 active research grant: $ PPP 69.4 million for regular scholarships in Brazil and $ PPP 6.4 million for regular scholarships abroad.

In 2021, FAPESP disbursed $ PPP 69.9 million in 6,958 human-resource training scholarships/fellwships in Brazil and abroad, and contracted for 2,496 new in 2021.

TYPES

REGULARES SCHOLARSHIPS/ FELLOWSHIPS NOT ASSOCIATED WITH GRANTS

IN BRAZIL

Scientific Initiation (SI)
Master's (MS)
Doctorate (DR)
Direct Doctorate (DD)
Doutorado Direto MD-PhD
Postdoctorate (PD)
www.fapesp.br/en/postdoc

ABROAD

Research Internships Abroad (RIA)
www.fapesp.br/en/bpe
Research Fellowships Abroad (RFA)

Table 10 shows the amounts disbursed for training scholarships not associated with other grants, as well as the numbers of active scholarships and new scholarships contracted for in the year. Table 11 shows the amounts disbursed and the number of scholarships contracted for by major knowledge area.

TABLE 10 TRAINING OF HUMAN RESOURCES FOR RESEARCH

Types of scholarships/fellowships, disbursement, number of actives projects and new projects contracted for in 2021

Regular Scholarships/Fellowships not associated to grants	Disbursement $ PPP	Active projects	New projects contracted
In Brazil	**61,813,197**	**6,642**	**2,219**
Scientific Initiation (SI)	6,073,195	3,042	1,419
Master's (MS)	5,641,578	901	286
Doctorate (DR)	24,243,386	1.583	275
Direct Doctorate (DD)	4,645,000	354	58
Postdoctorate(PD)	21,210,038	762	181
Abroad	**8,094,741**	**316**	**277**
Research Internships Abroad (RIA)	6,463,985	255	225
RIA – IC	87,073	3	10
RIA – MS	401,664	24	32
RIA – DR	2,877,886	132	119
RIA – DD	653,236	28	23
RIA – PD	2,444,126	68	41
Research Fellowships Abroad (RFA) – PD	1,630,757	61	52
Total	**69,907,938**	**6,958**	**2,496**

TABLE 11 TRAINING OF HUMAN RESOURCES FOR RESEARCH

Types of scholarships/fellowships, disbursement, number of actives projects and new projects contracted by knowledge areas

Scholarships/ Fellowships	Life Sciences		Natural Sciences and Engineering		Human and Social Sciences		Interdisciplinary	
	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted
In Brazil	**32,744,374**	**1,214**	**12,310,885**	**449**	**16,603,284**	**556**	**154,655**	**0**
Abroad	**3,846,790**	**124**	**2,249,507**	**67**	**1,998,444**	**86**	**0**	**0**
RIA	3,319,788	102	1,467,273	54	1,676,924	69	0	0
RFA	527,002	22	782.234	13	321,520	17	0	0
Total	**36,591,164**	**1,338**	**14,560,392**	**516**	**18,601,728**	**642**	**154,655**	**0**

MEDIA COVERAGE OF RESEARCH RESULTS: SCHOLARSHIPS/FELLOWSHIPS

Combination of muscle strengthening and aerobic exercises can reduce cancer mortality by 28%

In a systematic review of epidemiological studies focusing on the link between physical activity and a reduced risk of cancer, researchers at the Federal University of São Paulo (UNIFESP) concluded that workouts with squats, rowing, planks, weight training and so on can reduce the probability of dying from cancer by 14%. When these exercises are combined with aerobic activities, the benefit is even greater, potentially reducing mortality by 28%.

An article on the study was published in the *International Journal of Behavioral Nutrition and Physical Activity* News stories about it were carried by **102** media outlets.

Collective Health

IC and DR scholarships and PD fellowship in Brazil – FAPESP
Processes 2019/26326-6, 2014/25614-4 and 2018/23941-9

INSTITUTION:
Medical School, Federal University of São Paulo (EPM-UNIFESP)

PRINCIPAL INVESTIGATOR:
Leandro Fórnias Machado de Rezende

GRANTEE:
Wilson Guilherme Aparecido Nascimento

https://agencia.fapesp.br/36480

Vegan and omnivorous diets promote equivalent muscle mass gain, study shows

Trials performed by researchers at the University of São Paulo (USP) with healthy young adults showed that the right level of protein intake is the key to muscle health, regardless of protein source. The study compared the effects of strength training in 38 volunteers, half of whom were vegans and half omnivores. Monitored for 12 weeks, the volunteers followed either a mixed diet with both animal and plant protein, or an entirely plant-based diet. Both diets had the recommended protein content. After three months, there was no difference between vegans and omnivores in terms of muscle strength and muscle mass increase.

An article on the study was published in *Sports Medicine* . News stories about it were carried by **222** media outlets.

Physical Education

MS scholarship in Brazil – FAPESP
Process 2016/22083-3

INSTITUTION:
School of Physical Education and Sports, University of São Paulo (EEFE-USP)

PRINCIPAL INVESTIGATOR:
Hamilton Augusto Roschel da Silva

GRANTEE:
Victoria Hevia-Larraín

https://agencia.fapesp.br/35898

MEDIA COVERAGE OF RESEARCH RESULTS: SCHOLARSHIPS/FELLOWSHIPS

Experiment proves that immune system can be stimulated to combat HIV in newborns

A study conducted at the University of São Paulo's Medical School (FM-USP) demonstrated that it is possible to boost the immune response against HIV in newborns. Umbilical cord cells treated with a compound that activated the organism's first line of defense became more capable of combating the AIDS virus. This result promises to contribute to novel therapeutic interventions to protect babies against infectious diseases.

An article on the study was published in the *Journal of Infectious Diseases*. News stories about it were carried by **99** media outlets.

Immunology

MS scholarship in Brazil – FAPESP
Process 2016/01269-1

INSTITUTION:
Medical School, University of São Paulo (FM-USP)

PRINCIPAL INVESTIGATOR:
Maria Notomi Sato

GRANTEE:
Anna Julia Pietrobon

https://agencia.fapesp.br/37435

Study reveals decline in predatory fish catch at Arraial do Cabo

Researchers at UNIFESP discovered that one of the effects of overfishing of valuable large species at Arraial do Cabo in Rio de Janeiro State is a decline in stocks of *Pomatomus saltatrix* (bluefish), *Epinephelus marginatus* (dusky grouper), *Caranx hippos* (crevalle jack) and *Seriola fasciata* (lesser amberjack), followed by an increase in the capture of less commercially valuable but more abundant species. As a result, fishers spend longer at sea to obtain the same yields as in the past, the youngest are switching to other sources of income such as tourism and are often encouraged by their families to quit fishing.

The study was published in the journal *PLOS ONE*. News stories about it were carried by **17** media outlets.

Ecology

PD fellowship in Brazil – FAPESP
Process 2017/22273-0

INSTITUTION:
Institute of Health and Society, Federal University of São Paulo (UNIFESP) in Santos

PRINCIPAL INVESTIGATOR:
Guilherme Henrique Pereira Filho

GRANTEE:
Vinícius Jose Giglio Fernandes

https://agencia.fapesp.br/36666

Bacteria that cause periodontitis are transmitted from parents to children

A study led by researchers at the State University of Campinas (UNICAMP) found that adults with periodontitis transmit bacteria that can cause the disease in their children. Periodontitis is an inflammation of the tissue that supports the teeth and maintains them in the maxillary and mandibular bones. The disease is triggered by bacterial infection. Symptoms include bleeding of the gums and halitosis. In severe cases, it leads to bone and tooth loss. The bacteria remain in the oral cavity even when the children undergo treatment, reinforcing the need for preventive care in the first year of life.

An article on the study was published in the journal *Scientific Reports*. News stories about it were carried by **62** media outlets.

Dentistry

DR scholarship in Brazil and BEPE-DR – FAPESP Processes 2016/03704-7 and 2016/19970-8

INSTITUTIONS:
Piracicaba Dental School, State University of Campinas (FOP-UNICAMP); Ohio State University (USA)

PRINCIPAL INVESTIGATOR:
Renato Corrêa Viana Casarin

SUPERVISOR ABROAD:
Purnima Kumar

GRANTEE:
Mabelle de Freitas Monteiro

https://agencia.fapesp.br/35622

New description increases number of known species in jellyfish genus *Aurelia* from seven to 28

With diameters varying from 10 cm to 46 cm, the moon jellyfish *Aurelia spp.* is almost entirely translucent, with a bluish or pinkish tinge, and is found in coastal environments worldwide. Seven species were recognized until recently, but a study by researchers in Brazil, Argentina and the United States raised the number of species in the genus to 28. The descriptions are essential to new research on Aurelia, one of the most studied jellyfish genera. Delimitation of species also contributes to conservation strategies amid the environmental changes caused by the climate crisis.

An article on the study was published in the journal *PeerJ*. News stories about it were carried by **12** media outlets.

Biological sciences

MS scholarship in Brazil and BEPE-MS – FAPESP Processes 2016/12163-0 and 2017/07317-0

INSTITUTIONS:
Institute of Biosciences of the University of São Paulo (IB-USP) and Smithsonian National Museum of Natural History (USA)

PRINCIPAL INVESTIGATOR:
André Carrara Morandini

SUPERVISOR ABROAD:
Allen Gilbert Collins

GRANTEE:
Jonathan Wanderley Lawley

https://agencia.fapesp.br/37491

MEDIA COVERAGE OF RESEARCH RESULTS: SCHOLARSHIPS/FELLOWSHIPS

Older people with abdominal fat and weak muscles are more likely to develop mobility problems

A study conducted by researchers at the Federal University of São Carlos (UFSCar) in São Paulo State, in partnership with colleagues at University College London (UCL) in the UK, points to a significant loss of gait speed in older people with weak muscles and abdominal fat. The researchers analyzed data for 2,294 individuals aged 60 or more for eight years. A slower gait is a natural outcome of the aging process, but mobility problems can result if walking speed falls sharply. Everyday activities become increasingly difficult, and there may be a heightened risk of falling as well as a gradual loss of independence if the condition worsens.

An article on the study was published in the journal *Age and Aging*. News stories about it were carried by **153** media outlets.

Physical therapy and occupational therapy

BEPE-PD fellowship and JP grant – FAPESP Processes 2019/22074-2 and 2018/13917-3

INSTITUTIONS:
Center for Biological and Health Sciences, Federal University of São Carlos (CCBS-UFSCar); University College London (UCL), UK

PRINCIPAL INVESTIGATOR:
Tiago da Silva Alexandre

SUPERVISOR ABROAD:
Cesar Messias de Oliveira

GRANTEE:
Roberta de Oliveira Máximo

https://agencia.fapesp.br/36724

Chip mimicking bovine endometrium used in study of factors that can jeopardize pregnancy

To investigate factors that can jeopardize pregnancy success in cattle, researchers at the University of São Paulo (USP) used a kind of chip to mimic the environment of the endometrium, the tissue that lines the inside of the uterus. Used for the first time for this purpose, the device enabled the scientists to culture two endometrial cell types, revealing the effects of alterations in glucose and insulin levels in the uterine environment. It can also be converted into a model for study of pregnancy in humans and endometriosis.

An article on the experiment was published in the journal *Endocrinology*. News stories about it were carried by **50** media outlets.

Veterinary Medicine

PD fellowship in Brazil and BEPE-PD fellowship – FAPESP Processes 2016/22790-1 and 2018/14137-1

INSTITUTIONS:
School of Animal Science and Food Engineering, University of São Paulo (FZEA-USP) in Pirassununga; University of Leeds (UK)

PRINCIPAL INVESTIGATOR:
Flávio Vieira Meirelles

SUPERVISOR ABROAD:
Niamh Mary Forde

GRANTEE:
Thiago Henrique Camara de Bem

https://agencia.fapesp.br/36056

FUNDING STRATEGIES

BASIC AND APPLIED RESEARCH

Almost half of all the funding disbursed by FAPESP goes to ambitious research projects that set out to advance knowledge and solve problems. Research of this kind requires long-term support and is conducted under the aegis of Thematic Projects, the Young Investigator (JP) and São Paulo Excellence Chair (SPEC) programs, Special Projects, and Research, Innovation and Dissemination Centers (RDICs). It is also supported by Regular Research Grants for fast-track projects.

FAPESP disbursed
$ PPP 222.8 million
to support 9,251 short- and long-term research projects and contracted for 2,979 new projects in 2021.

RELATED PROGRAMS

- **Long-term research**

  Thematic Project Grant – www.fapesp.br/thematic

  São Paulo Excellence Chair (SPEC)

  Research, Innovation and Dissemination Centers (RIDC) – http://cepid.fapesp.br/en/home

  Young Investigators Grants (YIG) – www.fapesp.br/jp

  Special Projects

  Initial ΠI (PI) Project Research Grants
  www.fapesp.br/projetoinicialpi

- **Regular Grants not associated to other grants**

  Research Grants – Regular

  Visiting Researcher Award – www.fapesp.br/en/visiting

  Publications Award

  Participation in Scientific Meeting Award

  Organization of Scientific Meeting Award

  - São Paulo School of Advanced Science (SPSAS) http://espca.fapesp.br/home

TABLE 12 BASIC AND APPLIED RESEARCH

Disbursement and new projects contracted in 2021 by major knowledge area

Programs	Life Sciences		Natural Sciences and Engineering		Human and Social Sciences		Interdisciplinary	
	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted
Thematic and associated	61,254,636	467	31,817,505	406	4,035,121	95	384,145	15
Special projects and associated	0	0	22,784,286	1	0	0	0	0
RIDC and associated	5,640,416	99	6,079,014	100	1,283,103	31	12,598,095	2
YIG and associated	18,419,444	241	6,436,049	116	1,370,274	39	134,789	2
SPEC and associated	769,171	10	790,921	10	118,029	5	46,688	2
Regular Grants not associated to other grants	30,279,722	824	12,529,808	341	2,328,894	156	3,677,469	17
Total	116,363,389	1,641	80,437,583	974	9,135,421	326	16,841,186	38

THEMATIC PROJECTS

Goals: support for research projects with ambitious aims conducted by multidisciplinary teams for up to five years. Includes National Institutes of Science and Technology (NISTs), in partnership with the Ministry for Science, Technology and Innovation via the National Council for Scientific and Technological Development (CNPq).

In 2021, researchers and students at the State University of Campinas's Gleb Wataghin Institute of Physics (IFGW-UNICAMP) launched a short animated movie entitled Raios cósmicos ("Cosmic rays"), the second such feature in AnimaFísica (http://animafisica.com.br), a science diffusion venture that is part of the Thematic Project "Challenges for the Twenty-First Century in Physics and Neutrino Astrophysics".

TABLE 13 THEMATIC

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grants – Thematic Project	51,439,260	60	472
Research Grants – Regular	826,327	6	87
Research Grants – Participation in Scientific Meetings	18,765	2	2
Research Grants – Visiting Researcher	152,061	1	5
Research Grants – Visiting Researcher abroad	76,139	4	2
Research Grants – Publications	15,987	5	7
Regular Scholarships/Fellowships	39,667,232	663	2,326
Research Internships and Fellowships Abroad (RIA, RFA)	3,827,656	97	118
Fellowships – Technical Training	1,396,904	138	276
Fellowships – Science Jornalism	58,583	3	6
Fellowships – Public Education	12,493	4	9
Total	97,491,407	983	3,310

SPECIAL PROJECTS

Objetivo: support for projects with significant scientific impact via participation in international consortia to assure access to high-cost next-generation equipment and technology for researchers in São Paulo State, such as participation in the Giant Magellan Telescope (GMT).

In 2021, the GMT announced fabrication of the sixth of its seven monolithic mirrors, the largest of their kind in the world. With a diameter of 8.4 m and a height roughly equivalent to a two-story building (when placed vertically), the mirror will join the other five segments of the GMT's primary mirror already built. When ready, the GMT will produce images ten times sharper than those generated by the Hubble Space Telescope.

TABLE 14 SPECIAL PROJECTS

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grants – Special Projects	22,464,199	0	2
Regular Scholarships/Fellowships	220,954	0	7
Research Internships and Fellowships Abroad (RIA, RFA)	18,168	1	0
Fellowships – Technical Training	80,964	0	5
Total	22,784,285	1	14

Bingo radio telescope in Paraíba will seek echos of first sounds in the Universe

In June 2021, the first component of one of the most ambitious astronomic instruments ever designed by Brazilian scientists began operating in Campina Grande, Paraíba State. This first observatory is a prototype of a more complex version to be installed at Aguiar in the semi-arid interior of the state, where the Bingo radio telescope will capture radiation emitted 6 billion years ago and scientists will use it to study the primordial Universe. Led by physicist Elcio Abdalla, a professor at the University of São Paulo (USP), the new observatory's team includes scientists from other Brazilian institutions and five other countries (China, France, South Africa, South Korea and the UK).

News stories on the start of operations were carried by **110** media outlets.


FOLHA DE S.PAULO

MENSAGEIRO SIDERAL

Astronomy

Research Grant – Thematic Project – FAPESP Process 2014/07885-0

INSTITUTION:
Institute of Physics, University of São Paulo (IF-USP)

PRINCIPAL INVESTIGATOR:
Elcio Abdalla

https://agencia.fapesp.br/29064

Survey points to heavy drinking by older people

A study conducted at the Federal University of São Paulo (UNIFESP) showed that nearly one in four Brazilians aged 60 and over (23.7%) regularly drink alcoholic beverages. Moreover, 6,7% (about 2 million) reported having indulged in binge drinking in the previous month and 3.8% (over 1 million) said they drank heavily enough to put their health at risk in a typical week.

Articles on the study and its implications were published in the journals *Substance Use & Misuse* and *BMJ Open*. News stories about it were carried by **113** media outlets.


Um em cada dez idosos do Brasil faz consumo abusivo de álcool, aponta estudo


Estudo revela que um em cada dez idosos faz uso abusivo de álcool

Psychology

Research Grant – Thematic Project – FAPESP Process 2015/19472-5

INSTITUTION:
Medical School, Federal University of São Paulo (EPM-UNIFESP)

PRINCIPAL INVESTIGATOR:
Ana Regina Noto

https://agencia.fapesp.br/37060

MEDIA COVERAGE OF RESEARCH RESULTS: THEMATIC PROJECTS

Electric eels in Amazon hunt in packs

Rare behavior in fish, albeit more well-known in whales, wolves, dolphins and a few other mammals, was detected for the first time in a species of electric eel endemic to the Amazon. They hunt in packs (social predation) and can paralyze prey at a distance with strong electric discharges of up to 650 volts. Researchers at INPA in Manaus and the Smithsonian Institution in the US discovered the behavior in a lake at the Terra do Meio Ecological Station in Pará and are now investigating whether members of these packs are related, respect hierarchy and communicate to coordinate the hunt. The study is part of a project entitled "Diversity and evolution in Gymnotiformes".

An article on the study was published in *Ecology and Evolution*. News stories about it were carried by **237** media outlets.

Zoology

Research Grant – Thematic Project – FAPESP Process 2016/19075-9

INSTITUTIONS:
Museum of Zoology, University of São Paulo (MZ-USP); National Museum of Natural History, Smithsonian Institution, Washington; National Institute for Research on Amazonia (INPA)

PRINCIPAL INVESTIGATOR:
Naércio Aquino Menezes

COLLABORATORS:
Carlos David de Santana (Smithsonian) e Douglas Bastos (Inpa)

https://agencia.fapesp.br/34996

Droughts may increase in South America by the end of the century, study suggests

If greenhouse gas emissions remain at current levels, the average temperature in South America could rise by as much as 4 °C between now and the end of the century under a worst-case scenario, making extreme weather events such as droughts, floods and wildfires more frequent and intense in the region. The prediction comes from a study by an international group of scientists, including Brazilian researchers.

An article on the study was published in *Earth Systems and Environment*. News stories about it were carried by **66** media outlets.

Eletric Engineering and Geosciences

Research Grant – Thematic Project – FAPESP Process 2015/50122-0. Cooperation Agreement with the German Research Foundation (DFG)

INSTITUTION: Instituto Nacional de Pesquisas Espaciais (Inpe)

INSTITUTION ABROAD: Humboldt University, Alemanha

PRINCIPAL INVESTIGATOR IN BRAZIL: Elbert Einstein Nehrer Macau

PRINCIPAL INVESTIGATOR ABROAD: Jurgen Kurths

INCT for Climate Change – FAPESP Process 2014/50848-9

INSTITUTION: Centro Nacional de Monitoramento e Alertas de Desastres Naturais (Cemaden)

PRINCIPAL INVESTIGATOR: José Antonio Marengo Orsini

https://agencia.fapesp.br/36305

BASIC AND APPLIED RESEARCH

RESEARCH, INNOVATION AND DISSEMINATION CENTERS (RIDC)

Goals: support lasting up to 11 years for centers of excellence that conduct basic or applied research focusing on specific issues; active contributions to innovation via technology transfer; production of public policy input; extension activities for primary and secondary schools and the general public.
In 2021, FAPESP began selecting proposals for new RIDCs under the third call in the program since its inception in 1998. Ten centers were selected under the first call. The second, issued in 2011 and completed in 2013, entailed the selection of 17 projects for a period ending in 2024. Eighteen centers will be chosen between 2021 and 2026 under the current call, in six proposal submission cycles divided by knowledge area (https://agencia.fapesp.br/36091).

The following RIDCs were up and running in 2021:

- Center for Research and Innovation in Biodiversity and Drug Discovery (CIBFar): USP – São Carlos
- Center for Research on Toxins, Immune Response and Cell Signaling (CeTICS): Butantan Institute – São Paulo
- Center for Cell-Based Therapy (CTC): USP – Ribeirão Preto
- Center for Research in Optics and Photonics (CEPOF): USP – São Carlos
- Center for Metropolitan Studies (CEM): USP – São Paulo
- Food Research Center (FoRC): USP – São Paulo
- Center for Research, Education and Innovation in Vitreous Materials (CeRTEV): UFSCar – São Carlos
- Center for Mathematical Sciences Applied to Industry (CeMEAI): USP – São Paulo
- Human Genome and Stem Cell Research Center (HUG-CEL): USP – São Paulo
- Brazilian Institute of Neuroscience and Neurotechnology (BRAINN): UNICAMP – Campinas
- Center for the Study of Violence (NEV): USP – São Paulo
- Obesity and Comorbidities Research Center (OCRC): UNICAMP – Campinas
- Center for Research on Inflammatory Diseases (CRID): USP – Ribeirão Preto
- Center for Computing in Engineering and Science (CCES): UNICAMP – Campinas
- Research, Innovation and Dissemination Center for Neuromathematics (NeuroMat): USP – São Paulo
- Functional Materials Development Center (CDMF): UFSCar – São Carlos

DISSEMINATION ACTIVITIES – 2021

TABLE 15 RIDC

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grants – CEPID	13,938,000	0	17
Research Grants – Regular	222,126	0	16
Research Grants – Visiting Researcher	40,791	1	1
Research Grants – Visiting Researcher Abroad	44,098	0	1
Regular Scholarships/Fellowships	9,469,022	157	546
Research Internships and Fellowships Abroad	1,309,577	37	42
Fellowships – Technical Training	520,417	32	63
Fellowships – Science Jornalism	56,598	5	8
Total	25,600,629	232	694

***Family Secrets* Podcast**

The FAPESP-funded RIDC Human Genome and Stem Cell Research Center (HUG-CELL) launched a podcast entitled Family Secrets with six episodes on information passed from parents to children in genes. Each episode (www.youtube.com/user/ceghusp)) focuses on a case brought up in genetic counseling sessions, discussing how the geneticists were surprised and had to make complicated decisions relating to "family secrets" that not even genes should reveal. .

Glass strips

The Center for Research, Education and Innovation in Vitreous Materials (CeRTEV), another RIDC funded by FAPESP, created a project called Glass Strips consisting of comic strips drawn to disseminate knowledge and curiosities about the world of glass. The characters are Nick and Bia, undergraduates involved in scientific initiation research. The strips can be found at https://tirinhasdevidro.wordpress.com, and @tirinhasdevidro on Facebook and Instagram.

Young Ideas (Jovens Ideias) on Instagram

A research group affiliated with the Brazilian Institute of Neuroscience and Neurotechnology (RIDC BRAINN) and calling itself the Neuroeducation Research Group (NGR) created the profile Young Ideas on Instagram (www.instagram.com/jovensideias)) to collaborate in acquiring knowledge about healthy habits for young people.

Sapiência BR videos

The Open Interactivity Laboratory for Knowledge Dissemination (LAbI) at the Federal University of São Carlos (UFSCar), also linked to CDMF, a FAPESP-funded RIDC, launched a second season of Sapiência BR videos on the careers of scientists and other ST&I professionals from Brazil at institutions in nine countries (Austria, China, Finland, France, Germany, Poland, Portugal, Slovakia and Slovenia), emphasizing cross-border cooperation. The project is a partnership between LAbI-UFSCar and Brazilian embassies and consulates in the countries concerned. The 37 episodes of the second season of Sapiência BR, which can be watched on the Click Ciência channel (www.youtube.com/clickciencia), set out to share the experience of professionals at different stages of their careers and in different knowledge areas.

Brain Mathematics Podcast

The RIDC in Neuromathematics (NeuroMat) launched a new episode in the Brain Mathematics podcast series. In this episode, NeuroMat researchers Jorge Stolfi and Arthur Valencio talk about the brain and computers, pointing out similarities and differences between the two and the human-machine interface, explain how computing helps neuroscience studies and describe research projects in these two areas, including the work being done on Parkinson's disease at Hospital das Clínicas. The podcast is available at: https://podcast.numec.prp.usp.br/cérebro-e-computador.

Research at USP shows how lack of cleanliness in the kitchen is a health hazard for Brazilians

Researchers at the Food Research Center (FoRC) analyzed the measures taken by 5,000 people in all Brazilian states to keep their kitchens and food clean, detecting mistakes that put the population's health in danger. The findings served as a basis for a guidebook on the right way to store food in the fridge.

News stories on the study were carried by **322** media outlets.


FOLHA DE S.PAULO

Veja erros de higiene na cozinha que põem em risco a saúde dos brasileiros


CUIDADO COM A HIGIENE DOS ALIMENTOS

Pesquisa da USP alerta sobre higiene na cozinha

Food science and technology

Research Grant – RIDC FoRC – FAPESP Process 2013/07914-8

INSTITUTION:
School of Pharmaceutical Sciences, University of São Paulo (FCF-USP)

PRINCIPAL INVESTIGATOR:
Bernadette Dora Gombossy de Melo Franco

https://agencia.fapesp.br/37568

São Paulo City has more homes and businesses in vertical than horizontal buildings

The Center for Metropolitan Studies (CEM) found that São Paulo City had more homes and businesses in vertical than horizontal buildings for the first time. The researchers analyzed changes in the urban structure over the past 20 years using property tax (IPTU) data for more than 62.7 million properties registered with the municipal department of finance.

News stories about the study were carried by **386** media outlets.


globoplay

SÃO PAULO TEM MAIS APARTAMENTOS DO QUE CASAS

São Paulo tem mais apartamentos do que casas pela primeira vez


CBN

'É surpreendente pensar que metade dos imóveis de SP ainda é de casas'

Interdisciplinary

Research Grant – RIDC CEM – FAPESP Process 2013/07616-7

INSTITUTION:
Brazilian Center for Analysis and Planning (CEBRAP)

PRINCIPAL INVESTIGATOR:
Eduardo Cesar Leão Marques

https://centrodametropole.fflch.usp.br/pt-br/noticia/sao-paulo-tem-mais-empreendimentos-comerciais-em-imoveis-verticais-do-que-horizontais

MEDIA COVERAGE OF RESEARCH RESULTS: RIDC

Study shows how protein-poor diet during pregnancy can cause kidney problems in offspring

Babies born to women with a protein-poor diet during pregnancy are not only low-weight but also tend to have kidney problems arising from alterations that occur while the organs are forming in the womb. Researchers affiliated with the Obesity and Comorbidities Research Center (OCRC) at the State University of Campinas (UNICAMP) discovered the cause of the problem at the molecular level and also found it to be due to underlying epigenetic factors (gene expression alterations caused by environmental variables such as stress, exposure to toxins and undernourishment). The group described the impact of protein deprivation on the expression of microRNAs associated with kidney formation in rat embryos.

An article on the study was published in *PLOS One*. News stories about it were carried by **14** media outlets.

Medicine

Research Grant – RIDC OCRC – FAPESP Process 2013/07914-8

INSTITUTION: School of Medical Sciences, State University of Campinas (FCM-UNICAMP)

PRINCIPAL INVESTIGATOR: Licio Augusto Velloso

DR Scholarship in Brazil – FAPESP Process 2012/18492-4

INSTITUTION: Institute of Biosciences, São Paulo State University (IBB-UNESP), Botucatu

PRINCIPAL INVESTIGATOR: Patrícia Aline Boer

GRANTEE: Letícia de Barros Sene

https://agencia.fapesp.br/35473

Researchers identify a novel cell type that makes survivors of sepsis more susceptible to infections

Sepsis is the leading cause of death in Brazil's intensive care units (ICUs). Among patients who progress to the severe form of the disease, 40% die, and the survivors often suffer from cardiovascular and neurological complications, as well as a significant decline in immunity lasting for years after they are discharged from hospital. Researchers at the Center for Research on Inflammatory Diseases (CRID) showed why this happens.

An article on the study was published in the journal Immunity. News stories about it were carried by **55** media outlets.

Pharmacology and Immunology

Research Grant – RIDC CRID –FAPESP Process 2012/10100-0

INSTITUTION: Ribeirão Preto Medical School, University of São Paulo (FMRP-USP)

PRINCIPAL INVESTIGATOR: Fernando de Queiroz Cunha

DR Scholarship in Brazil – FAPESP Process 2013/08216-2

PRINCIPAL INVESTIGATOR: José Carlos Farias Alves Filho

GRANTEE: Daniele Carvalho Bernardo Nascimento

https://agencia.fapesp.br/36723

MEDIA COVERAGE OF RESEARCH RESULTS: RIDC

First genetic sequencing of Brazilian pit viper is completed

A group led by researchers at Butantan Institute and the Center for Research on Toxins, Immune Response and Cell Signaling (CeTICS) completed the first sequencing of a Brazilian snake's genome. The study suggested that the nine genes that encode toxins produced by the jararaca pit viper *Bothrops jararaca* probably originated in genes that had different functions in the ancestral species. The group began sequencing the snake's genome in 2013. *B. jararaca* is responsible for a large proportion of snake-bite accidents in Brazil and is one of the most studied snakes for this reason. The sequencing produced the fundamental information on the origins of its venom they had lacked hitherto.

An article on the study was published in the journal PNAS. News stories about it were carried by **68** media outlets.

Biochemistry

Research Grant – RIDC CeTICS – FAPESP Process 2013/07467-1

INSTITUTION:
Butantan Institute

PRINCIPAL INVESTIGATOR:
Hugo Aguirre Armelin

Research Grant – Regular and Thematic/BIOTA, DR Scholarship and PD Fellowship in Brazil – FAPESP Process 2012/00177-5, 2016/50127-5, 2013/07974-0 and 2015/03509-7

PRINCIPAL INVESTIGATOR:
Inácio de Loiola Meirelles Junqueira de Azevedo

GRANTEES:
Diego Dantas Almeida e Vincent Louis Viala

https://agencia.fapesp.br/36548

Researchers develop a technique to produce transplantable livers in the laboratory

At the Human Genome and Stem Cell Research Center (HUG-CELL), researchers led by Silvano Raia, who pioneered liver transplants in Latin America, developed a technique to reconstruct and produce livers in the laboratory. The proof-of-concept study was conducted with rat livers. In the next stage of their research, the scientists will adapt the technique for the production of human livers in order to increase the supply of these organs for transplantation in future. The center expects to conduct the first trials involving humans in Brazil within two years.

An article on the study was published in the journal Materials Science and Engineering: C. News stories about it were carried by **68** media outlets.

Genetics and Biology

Research Grant – RIDC CEGH-CEL – FAPESP Process 2013/08028-1

INSTITUTION: Institute of Biosciences, University of São Paulo (IB-USP)

PRINCIPAL INVESTIGATOR: Mayana Zatz

Research Grant – PITE – FAPESP Process 2018/14275-5

COMPANY: EMS S/A

INSTITUTION: Medical School, University of São Paulo (FM-USP)

PD Fellowship in Brazil – FAPESP Process 2017/16283-2

PRINCIPAL INVESTIGATOR: Silvano Mario Atillio Raia

GRANTEE: Luiz Carlos de Caires Júnior

https://agencia.fapesp.br/35565

BASIC AND APPLIED RESEARCH

YOUNG INVESTIGATORS GRANT (YIG)

Goals: attracting young PhDs from Brazil and other countries to create new research groups, and training new science leaders with the aim of building a scientific community of excellence in São Paulo State. Phase 2 of the program aims to consolidate research lines initiated by researchers who previously received support from the program and achieved excellence in their performance during the development of their projects.
In 2021, 51 projects were selected for Phase 2 of the program in a call issued in March for a total of $ PPP 32.8 million, to strengthen the independence of Young Investigators and the excellence of the research groups created.

TABLE 16 YOUNG INVESTIGATORS

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Young Investigator Grant – Phase 1	11,580,797	35	245
Young Investigator Grant – Phase 1	2,375,716	19	33
Research Grants – Regular	489,487	1	35
Research Grants – Visiting Researcher	74,540	0	1
Research Grants – Visiting Researcher abroad	0	0	1
Research Grants – Publications	11,657	3	3
Young Investigators Fellowships	3,010,481	23	87
Regular Scholarships/Fellowships	8,132,921	253	755
Research Internships and Fellowships Abroad (RIA, RFA)	424,577	20	15
Fellowships – Technical Training	254,726	43	80
Fellowships – Science Jornalism	5,654	1	1
Total	26,360,556	398	1.256

SÃO PAULO EXCELLENCE CHAIR (SPEC)

Goals: support for high-level researchers based abroad to come to Brazil to set up research centers at universities in São Paulo State. They remain affiliated with their home institutions but undertake to stay in Brazil for 12 weeks per year for the duration of the project, which must last at least five years. They each coordinate a group of FAPESP grantees comprising postdoctoral researchers, PhDs, and scientific initiation students.

TABLE 17 SPEC

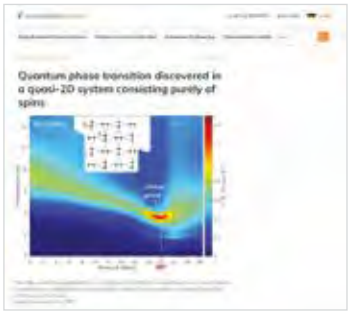
Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grants – SPEC	783,145	0	12
Research Grants – Regular	0	0	1
Research Grants – Visiting Researcher	35,692	0	1
Regular Scholarships/Fellowships	810,923	24	45
Research Internships and Fellowships Abroad (RIA, RFA)	79,703	2	3
Fellowships – Technical Training	5,826	1	1
Fellowships – Science Jornalism	9,520	0	1
Total	1,724,809	27	64

Quantum phase transition discovered in a quasi-2D system consisting purely of spins

Pure quantum systems can undergo phase transitions analogous to the classical phase transition between the liquid and gaseous states of water. At the quantum level, however, the particle spins in states that emerge from phase transitions display collective entangled behavior. This unexpected observation, made in a study conducted by a broad cross-border collaboration, offers a new avenue for the production of materials with topological properties that are useful in spintronics applications and quantum computing. An article on the study was published in the journal Nature, with a researcher at the University of São Paulo's Physics Institute (IF-USP) as its first author.

News stories about the discovery were carried by **132** media outlets.



Physics

Research Grant – YIG – Processo FAPESP 2018/08845-3

INSTITUTION:
Physics Institute, University of São Paulo (IF-USP)

PRINCIPAL INVESTIGATOR:
Julio Antonio Larrea Jimenez

https://agencia.fapesp.br/36323

Researchers innovate in gluten-free bread formulations, creating more palatable and nutritious product

Researchers at the Federal University of São Paulo (UNIFESP) in Santos developed a research line to enhance gluten-free bread, which is often deficient in sensory quality and nutritionally poor. The project pursued three goals: improving the overall nutritional value of gluten-free products, increasing their acceptability to consumers and seeking technologically feasible solutions.

The research resulted in 14 articles published in specialized journals, most recently in Foods. News stories about it were carried by **426** media outlets.

Food Technology

Research Grant – YIG and Multiuser Equipment – FAPESP Processes 2012/17838-4 and 2017/10843-6

INSTITUTION:
Institute of Health and Society, Federal University of São Paulo (UNIFESP), Santos

PRINCIPAL INVESTIGATOR:
Vanessa Dias Capriles

https://agencia.fapesp.br/36371

MEDIA COVERAGE OF RESEARCH RESULTS: YOUNG INVESTIGATORS GRANT

Drug for pulmonary hypertension may become an option against cancer

A drug used to treat pulmonary hypertension significantly reduced the capacity of tumor cells to migrate and invade other tissues in trials involving pancreatic, ovarian, breast cancer, and leukemia cell lines. Furthermore, in mice with an aggressive form of breast cancer, the drug reduced the incidence of metastasis in the liver and lungs by 47% and lengthened survival compared with untreated animals. The principal investigator plans to perform clinical trials with colleagues at the Institute of Biomedical Sciences (ICB-USP). The drug will be tested on a group of cancer patients undergoing chemotherapy to see if they recover better than the control group, which will not be given the drug.

An article on the study was published in Scientific Reports. News stories about it were carried by **143** media outlets.

Medicine and Immunology

Research Grant and Fellowship – YIG – FAPESP Processes 2018/18886-9 and 2020/01688-0

INSTITUTION:
Institute of Biomedical Sciences, University of São Paulo (ICB-USP)

PRINCIPAL INVESTIGATOR:
Otávio Cabral Marques

https://agencia.fapesp.br/34837

Study reveals factors in metabolism that can enhance efficiency of treatment for gynecologic tumors

Researchers at the Federal University of São Paulo's Medical School (EPM-UNIFESP) in Brazil, in partnership with specialists at the University of California Irvine (UCI) in the United States discovered that blood plasma from women with ovarian and uterine cancer can contain molecules that suggest whether they will respond well to chemotherapy or suffer a relapse. They analyzed samples from 50 women with ovarian and endometrial tumors who were submitted to surgery and first-line chemotherapy. The results point to a future in which oncologists will use a blood test performed in the clinic to discover the patient's metabolic signature and use it to help decide on the best way to manage the case.

An article on the study was published in the journal Gynecologic Oncology. News stories about it were carried by **101** media outlets.

Medicine

Research Grant – YIG – FAPESP Process 2014/19171-2

INSTITUTION:
Medical school, Federal University of São Paulo (EPM-UNIFESP)

PRINCIPAL INVESTIGATOR:
Paulo D'Amora

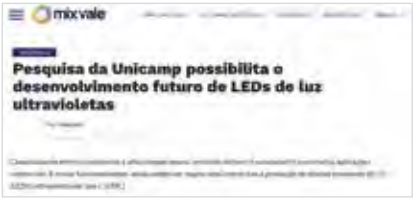
https://agencia.fapesp.br/37319

MEDIA COVERAGE OF RESEARCH RESULTS: YOUNG INVESTIGATORS GRANT

Research conducted at UNICAMP lays foundation for future development of ultraviolet LEDs

As an electrical insulator that withstands high temperatures, boron nitride is a material with many commercial applications. New functions that can be explored include production of ultraviolet C light-emitting diodes (UVC LEDs). This type of light can sterilize spaces, surfaces and water by disrupting the DNA of microorganisms and making them inactive. Fluorescent tubes are currently used as UVC sources, but LEDs can be much more efficient, as they have already proved when used to light offices and homes. A study was conducted at the State University of Campinas's Gleb Wataghin Institute of Physics (IFGW-UNICAMP) to enhance understanding and control of the electronic and optical properties of boron nitride so that these new applications can be developed.

An article on the study was published in the journal 2D Materials. New stories about it were carried by **64** media outlets.



Physics

Research Grant – YIG and Multiuser Equipment – FAPESP Processes 2014/23399-9 and 2016/01918-0

INSTITUTION:
Gleb Wataghin Institute of Physics, State University of Campinas (IFGW-UNICAMP)

DR scholarships in Brazil – FAPESP Process 2018/08543-7

PRINCIPAL INVESTIGATOR: Luiz Fernando Zagonel

GRANTEE: Ricardo Javier Peña Román

https://agencia.fapesp.br/37630

MEDIA COVERAGE OF RESEARCH RESULTS: SPEC

Novel coating for floor tiles can reduce expenditure on cleaning products

Researchers at the University of São Paulo's São Carlos Institute of Chemistry (IQSC-USP) and São Paulo State University's Chemistry Institute (IQ-UNESP) in Araraquara created a self-cleaning coating for application to flooring and floor and wall tiles in homes, hospitals, offices, shops and other buildings. Light interacts with the material to break down grease, dust, pharmaceuticals and atmospheric pollutants deposited on its surface.

An article on the invention was published in Materials Advances, a journal of the Royal Society of Chemistry. News stories about it were carried by **12** media outlets.

Chemistry

Research Grant – SPEC – FAPESP Process 2015/22828-6

HOST INSTITUTION:
Chemistry Institute, São Paulo State University (IQ-UNESP), Araraquara

VISITING RESEARCHER'S INSTITUTION:
Université Laval, Canadá

VISITING RESEARCHER AND PRINCIPAL INVESTIGATOR: Younes Messaddeq

Research Grant – RPGCC – FAPESP Process 2018/19785-1

INSTITUTION:
São Carlos Institute of Chemistry, University of São Paulo (IQSC-USP)

PRINCIPAL INVESTIGATOR:
Ubirajara Pereira Rodrigues Filho

https://agencia.fapesp.br/37179

BASIC AND APPLIED RESEARCH

REGULAR GRANTS NOT ASSOCIATED TO OTHER GRANTS

The funding strategy Research for Knowledge Advancement also encompasses fast-track research projects supported by Regular Research Grants awarded in response to applications submitted spontaneously by researchers with doctoral degrees. This type of support is extended to individual projects (Research Grants – Regular), expenditure on visits by researchers from other parts of Brazil or other countries (Visiting Researcher Grants), organization of scientific meetings (Science Meeting Organization Grants), participation in scientific meetings in Brazil or abroad (Science Meeting Participation Grants), and books, articles and other publications in scientific journals reporting original research results (Publication Grants).

In 2021, FAPESP created the Initial ΠΙ (Pi) Project Research Grant to support projects in all knowledge areas for up to five years, with a budget of up to $ PPP 395,300. Proposals must include a teaching plan associated with the research project, which may involve pre-approved master's and PhD scholarships as well as equipment and other required material resources.

São Paulo School of Advanced Science (SPSAS)

SPSAS awards are a type of Regular Grant for Science Meeting Organization to support short courses for graduate students and postdocs from Brazil and elsewhere delivered by leading Brazilian and foreign scientists.

No SPSAS courses were held in 2021 owing to the mobility restrictions imposed to combat the COVID-19 pandemic.

TABLE 18 REGULAR GRANTS

Disbursement, number of active projects and new projects contracted in 2021

Research Grants not associated and Fellowships and Grants associated to them	Disbursement $ PPP	New Projects contratados	Active projects
Research Grants – Regular	43,511,882	678	2,799
Research Grants – Participation in Scientific Meetings	3,052	3	3
Research Grants – Participation in Scientific Meetings Abroad	22,900	10	12
Research Grants – Organization of Scientific Meetings	134,301	0	61
Research Grants – Organization of Scientific Meetings Abroad	553,959	41	0
Research Grants – Publications in Brazil	1,107,504	294	428
Research Grants – Publications Abroad	32,513	4	8
Research Grants – Visiting Researcher	137,144	6	7
Research Grants – Visiting Researcher Abroad	41,704	3	2
Fellowships – Technical Training	1,512,422	287	539
Regular Scholarships/Fellowships	1,712,139	12	53
Research Internships and Fellowships Abroad (RIA, RFA)	46,372	0	1
Total	**48,815,893**	**1,338**	**3,913**

Life experience shapes dogs' interaction with humans

A study by researchers at the University of São Paulo (USP) analyzed how dogs living inside the home exchange looks with their owners to obtain food or other desired objects, comparing them with those who live outside the home and in shelters. This kind of communication between dogs and people involving an exchange of looks is very common. The study showed that different life experiences can change the way dogs direct their gaze to communicate with humans, finding that dogs that spent longer near people were more disposed to use this strategy to obtain a desired objective. The researchers concluded that the study refuted an old dichotomy between nature and nurture in the field of ethology, the science of animal behavior.

An article on the study was published in Behavioural Processes. News stories about it were carried by **472** media outlets.

Psychology

Research Grant – Regular – FAPESP Process 2018/25595-0

INSTITUTION:
Institute of Psychology, University of São Paulo (IP-USP)

PRINCIPAL INVESTIGATOR:
Briseida Dôgo de Resende

https://agencia.fapesp.br/37318

Study shows why crossing obstacles is difficult for patients with Parkinson's disease

A group of researchers at São Paulo State University (UNESP) in Bauru found that improving step length synergy can significantly improve the quality of life for Parkinson's patients, who tend to fall three times more often on average than healthy people of the same age and weight. Synergy refers in this case to the capacity of the locomotor (or musculoskeletal) system to adapt movement while crossing an obstacle, combining factors such as speed and foot position, for example. Step length is one of the main variables affected by the disease, according to the researchers.

An article on the study was published in Gait & Posture. News stories about it were carried by **117** media outlets.

Physical Education

Research Grant – Regular and Visiting Researcher – FAPESP Processes 2017/19516-8 and 2018/03448-6

INSTITUTION:
School of Sciences, São Paulo State University (FC-UNESP), Bauru

VISITING RESEARCHER'S INSTITUTION:
Newcastle University, UK

PRINCIPAL INVESTIGATOR:
Fabio Augusto Barbieri

VISITING RESEARCHER:
Lisa Alcock

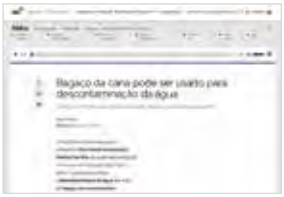
https://agencia.fapesp.br/35563

MEDIA COVERAGE OF RESEARCH RESULTS: GRANTS

Nanomodified sugarcane bagasse can purify water contaminated by copper or chromium

Sugarcane bagasse, one of the main residues of Brazilian agroindustry, has proved promising for use in decontaminating water with high levels of potentially toxic metallic ions. The study was part of a series conducted at the Polymeric and Biosorbent Materials Laboratory (Lab-MPB) belonging to the Federal University of São Carlos (UFSCar) in Araras, São Paulo State, where biomass is used as a biosorbent and has proved to be a viable and efficient alternative for decontamination of aquatic environments. For example, one of the projects, supported by FAPESP and with the collaboration of the Laboratory of Integrated Sciences (LabInSciences) at the Federal University of de São Paulo (UNIFESP) in Diadema, developed an adsorbent material made from yeast biomass (also a byproduct of the sugar and ethanol industry).

An article on the study was published in the journal *Environmental Science and Pollution Research*. News stories about it were carried by **58** media outlets.



Sanitary Engineering

Auxílio à Pesquisa – Regular – FAPESP Process 2016/06271-4

INSTITUTION:
Laboratory of Integrated Sciences (LabInSciences), Chemistry Department, Federal University of São Paulo (DQ-UNIFESP) in Diadema, in collaboration with Polymeric and Biosorbent Materials Laboratory (Lab-MPB), Federal University of São Carlos (UFSCar) in Araras.

PRINCIPAL INVESTIGATOR:
Geórgia Christina Labuto Araújo

https://agencia.fapesp.br/36014

Genetic mutation that causes severe acute leukemia is discovered

Researchers at Boldrini Child Center and João Lobo Antunes Institute of Molecular Medicine discovered that an aggressive type of acute lymphoblastic leukemia (LLA), the most common childhood cancer, is caused by a mutation in the gene that encodes a protein involved in immunity (IL-7R). The finding is important because a better understanding of the disease at the molecular level and knowledge of its genetic causes can lead to the development of novel therapies, especially for relapses or cases where conventional treatment does not work.

An article on the discovery was published in *Nature Communications*. News stories about it were carried by **87** media outlets.

Medicine

Research Grant – Regular – FAPESP Process 2014/20015-5. Cooperation agreement with the Foundation for Science and Technology (IFCT), Portugal

INSTITUTIONS:
Dr. Domingos A. Boldrini Center for Child Hematology, Campinas, São Paulo State, Brazil; João Lobo Antunes Institute of Molecular Medicine (iMM), University of Lisbon, Portugal

PRINCIPAL INVESTIGATOR IN BRAZIL:
José Andrés Yunes

PRINCIPAL INVESTIGATOR ABROAD:
João Pedro Taborda Barata

https://agencia.fapesp.br/37565

Cognitive-behavioral approach to treatment of obesity yields significant results

Quality of life relating to physical and mental health can be a key element in the treatment of obese adults. For this reason, interdisciplinary clinical measures including cognitive and behavioral therapy may produce more significant outcomes for these people, reducing not just weight but also symptoms of depression. This is the main conclusion of a study conducted by the Obesity Research Group (GEO) at the Federal University of São Paulo (UNIFESP) in Santos.

An article on the study was published in Frontiers in *Nutrition*. News stories about it were carried by **164** media outlets.

Nutrition and Interdisciplinary

Research Grant – Regular – FAPESP Process 2011/51723-7 and 2015/06630-1

INSTITUTION:
Federal University of São Paulo (UNIFESP), Santos

PRINCIPAL INVESTIGATORS:
Danielle Arisa Caranti and Ricardo José Gomes

https://agencia.fapesp.br/35895

New findings confirm that impact of extraterrestrial objects produced Colônia crater

A new study by the University of São Paulo (USP) yielded even more robust evidence that an extraterrestrial object produced the Colônia crater, a geological formation located in Parelheiros, a suburb in the south of São Paulo less than 40 km from the center of Brazil's most populous city. The crater has a diameter of 3.6 km, a depth of 300 m and an uplifted rim of 120 m. Over time, intense weathering and sedimentation filled the hole almost completely, and its rim became covered with vegetation, resulting in a flat area surrounded by hills that remained hidden until the early 1960s, when aerial photographs and satellite imagery revealed its almost perfectly circular shape. In 2013, it was recognized as an impact crater caused by an extraterrestrial body, through microscopic analysis of sediments collected at different depths. The new study found spherules inside the crater at depths of between 180 m and 224 m, with shapes that can be explained only by the impact of an extraterrestrial body that produced temperatures on the order of 5,000 degrees Celsius and pressure of 40 kilobars, equivalent to 40,000 times the standard atmospheric pressure, among other features.

An article on the study was published in *Solid Earth Sciences*. News stories about it were carried by **215** media outlets.

Geosciences

Research Grant – Regular – FAPESP Processes 2011/50987-0 and 2006/59046-6

INSTITUTION:
School of Arts, Sciences and Humanities, University of São Paulo (EACH-USP)

PRINCIPAL INVESTIGATOR:
Victor Velázquez Fernandez

https://agencia.fapesp.br/39360

FUNDING STRATEGIES

RESEARCH FOR INNOVATION

FAPESP runs a number of research programs that promote collaboration between companies and universities or research institutions to stimulate the development of technological innovation in São Paulo State. As part of this strategy, FAPESP is supporting a study to establish conceptual and operational parameters for the creation of Innovation and Creativity Districts in São Paulo and Campinas.

In 2021, FAPESP allocated $PPP 34.2 million to 1,644 collaborative research projects involving universities and companies, and to support innovation by small enterprises. It contracted for 756 new projects in the year.

RELATED PROGRAMS

Engineering Research Centers (ERCs)/Applied Research Centers (ARCs) – www.fapesp.br/cpe/home
Research Partnership for Technological Innovation Program (PITE) – www.fapesp.br/en/12050
Innovative Research in Small Business Program (PIPE)
Intellectual Property Support Program (PAPI-Nuplitec)
Innovation Districts

TABLE 19 RESEARCH FOR INNOVATION

Disbursement (in $ PPP) and number of new projects contracted for as research in partnership with companies in 2020, by major knowledge area

Programs	Life Sciences		Natural Sciences and Engineering		Interdisciplinary		Human and Social Sciences	
	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted
ERC/ARC and associated	3,027,918	10	2,773,429	58	1,281,454	5	161,872	2
PITE and associated	960,807	6	770,703	28	15,394	0	0	0
PIPE and associated	8,459,804	232	13,322,089	327	2,376,225	48	916,664	35
Intellectual Property and associated	0	0	988	1	78,180	0	40,598	4
Innovation Districts	0	0	0	0	59,289	0	0	0
Total	12,448,529	248	16,867,209	414	3,810,542	53	1,119,134	41

RESEARCH FOR INNOVATION

ENGINEERING RESEARCH CENTERS/APPLIED RESEARCH CENTERS (ERC/ARC)

ERCs and ARCs operate in accordance with an innovative collaborative research model: they enable companies' research teams to conduct effective collaboration for a long period (five to ten years) with a university or research institution, creating shared knowledge in areas of common interest with significant potential for application of results. Research projects are co-funded by FAPESP, partner companies, and host institutions responsible for operating costs and salaries.

In 2021, 14 ERCs/ARCs established with 11 organizations were operating. Three commenced work on scientific projects during the year:

– **Brazilian Center for Applied Research on Early Childhood (CPAPI):** a partnership with Maria Cecília Souto Vidigal Foundation, and INSPER, a private university and business school in São Paulo, as host institution. CPAPI will receive $ PPP 6.3 million in funding from the three partners for a period of up to ten years, using scientific evidence to support the formulation of public policies that foster the healthy development of children aged 0 to 6.

– **Plasticulture Research Center:** a partnership with Braskem hosted by the University of Campinas (UNICAMP). With annual funding of up to $ PPP 632,000 shared by the partners for a ten-year period, the center will conduct research on the use of plastics in agriculture (plasticulture), with the development of disruptive solutions to foster food security and combat climate change as a key goal.

– **Center for Research in Immuno-Oncology (CRIO):** the third ERC established in partnership with GSK. CRIO is hosted by the Albert Einstein Jewish Institute for Education and Research (IIEP) and will pursue novel targets for cancer immunotherapy drugs to treat tumors that do not respond well to existing therapies, as well as seeking markers to predict which patients will respond best to immunotherapy.

The inception of the Sugarcane Plant Health Research Center, a partnership with Grupo São Martinho hosted by São Paulo State University's School of Agricultural and Veterinary Sciences (FCAV-UNESP), was changed from 2019 to 2021.

In 2021, a call for proposals was issued to establish an Offshore Innovation Center with Shell, and the Applied Research Center on Wellbeing and Human Behavior, a partnership with Natura, was wound up.

FAPESP disbursed $ PPP 7.2 million in 2021 for 203 research projects under the auspices of 14 ERCs/ARCs established in partnership with 11 companies and academic institutions. It contracted for 75 new projects in the year.

TABLE 20 ERC/ARC

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement FAPESP ($ PPP)	New projects contracted	Active projects
Grants – ERC/ARC	4,757,415	4	20
Research Grants – Regular	25,557	0	6
Research Grants – Multiuser Equipment	0	4	15
Regular Scholarships/Fellowships	2,140,430	50	136
Research Internships and Fellowships Abroad	123,314	6	2
Fellowships – Technical Training	197,957	11	24
Total	7,244,674	75	203

14 Engineering Research Centers and Applied Research Centers in operation in 2021

1 Engineering Research Center developing combustion engines powered by biofuels, a partnership with Peugeot-Citroën hosted by the University of Campinas (UNICAMP).

2 Center of Excellence for Research on Sustainable Chemistry (CERSusChem), a partnership with GSK hosted by the Federal University of São Carlos (UFSCar).

3 Center of Excellence in New Target Discovery (CENTD), a partnership with GSK hosted by Butantan Institute.

4 Center for Research in Immuno-Oncology (CRIO), the third ERC established in partnership with GSK, hosted by the Albert Einstein Jewish Institute for Education and Research (IIEP).

5 Energy Production Innovation Center (EPIC), a partnership with Equinor (formerly Statoil) hosted by UNICAMP's School of Mechanical Engineering.

6 Research Center for Gas Innovation (RCGI, formerly ERC for Innovation in Natural Gas), a partnership with Shell hosted by the University of São Paulo's Engineering School (POLI-USP).

7 Center for Innovation in New Energies (CINE), a partnership with Shell with four research divisions – Advanced Energy Storage and Dense Energy Carriers (hosted by UNICAMP), Materials Science and Computational Chemistry (USP), and Sustainable Route for Conversion of Methane with Advanced Chemical Technologies (IPEN).

8 São Paulo Advanced Research Center for Biological Control (CBIO), a partnership with Koppert hosted by the University of São Paulo's Luiz de Queiroz College of Agriculture (ESALQ-USP).

9 Genomics for Climate Change Research Center (GCCRC), a partnership with EMBRAPA hosted by UNICAMP.

10 Engineering Research Center in Artificial Intelligence (C4AI), a partnership with IBM hosted by USP.

11 Brazilian Water Research Center (BWRC), a partnership with the Campinas Water and Sanitation Corporation (SANASA) hosted by UNICAMP.

12 Sugarcane Plant Health Research Center, a partnership with Grupo São Martinho hosted by São Paulo State University's School of Agricultural and Veterinary Sciences (FCAV-UNESP).

13 Brazilian Center for Applied Research on Early Childhood (CPAPI): a partnership with Maria Cecília Souto Vidigal Foundation hosted by INSPER in São Paulo

14 Plasticulture Research Center, a partnership with Braskem hosted by UNICAMP's Interdisciplinary Energy Planning Unit (NIPE).

RESEARCH FOR INNOVATION

ERC/ARC INITIATIVES IN 2021

ERC RCGI expands scope and changes name

In October 2021, FAPESP and Shell announced investment of $ PPP 24.9 million in the Research Center on Gas Innovation (RCGI), hosted by the University of São Paulo's Engineering School (POLI-USP). Shell will contribute $ PPP 20.2 million and FAPESP $ PPP 4.7 million. The investment will enable RCGI to expand its scope to include research on greenhouse gas emission mitigation strategies. Accordingly, its name has been changed to Research Center on Greenhouse Gas Innovation. It will conduct five new programs: Nature Based Solutions (NBS); Carbon Capture and Utilization (CCU); Bioenergy with Carbon Capture and Storage (BECCS); Greenhouse Gases (GHG); and Advocacy. The programs will comprise 19 research projects, several of which are potentially disruptive.

https://agencia.fapesp.br/37099

FAPESP, GSK and Butantan renew partnership to discover novel drug targets

FAPESP, GSK and Butantan Institute renewed for another five years the project to foster scientific research at the Center of Excellence in New Target Discovery (CENTD). The first phase of CENTD (2015-20) focused on identifying new therapeutic targets involved in immunoinflammatory diseases. The second phase, starting with renewal of the partnership (2021-26), will validate molecular targets identified in the first phase and search for more new targets for selection in forthcoming research phases. Investment in this new phase of the project will total $PPP 6 million, with GSK contributing $ PPP 3 million and FAPESP $ PPP 3 million. Butantan Institute will provide operational support and personnel.

https://agencia.fapesp.br/37401

Research on microbiomes should use multidisciplinary approach to different ecosystems

In a review article published in the journal Current Opinion in Biotechnology, a cross-border group of researchers advocated a systems approach to the study of microbiomes so as to take into account the impact of microorganisms across a range of different ecosystems. The group mapped some 80,000 papers on microbiomes published between 1990 and 2019, including 13,500 in 2019 alone, and concluded that most analyzed microorganisms in a single ecosystem or discipline. The authors of the article include Rafael Soares Correa de Souza, a Brazilian scientist affiliated with the Genomics for Climate Change Research Center (GCCRC).

https://agencia.fapesp.br/37040

APPLIED RESEARCH CENTERS IN ARTIFICIAL INTELLIGENCE (CPA-IA)

www.fapesp.br/15272

FAPESP, the Ministry of Science, Technology and Innovation (MCTI) and the Brazilian Internet Steering Committee (CGI.br) will invest **$ PPP 395.3 million**, per year for a ten-year period in six Applied Research Centers (ARCs) in Artificial Intelligence selected in a 2020 call. These centers will operate in various states of Brazil. Partner companies will invest a matching amount, taking the total per center to **$ PPP 7.9 million**.

The funds will come from sources established when FAPESP ran Brazil's domain registration and IP allocation activities, between 1998 and 2005. The Brazilian Network Information Center (NIC.br) took over these tasks in 2005.

The six new centers, which will operate along the same lines as FAPESP's ERCs/ARCs, will conduct problem-oriented scientific and technological research using artificial intelligence:

– **ARC Artificial Intelligence Recreating Environments (IARA)**, hosted by the University of São Paulo's Institute of Mathematical and Computer Sciences (ICMC-USP) in São Carlos.

– **Center for Innovation in Artificial Intelligence for Health (CIIA-Saúde),** hosted by the Institute of Exact Sciences at the Federal University of Minas Gerais (ICEx-UFMG).

– **Brazilian Institute of Data Science (BIOS)**, hosted by the School of Electrical and Computer Engineering at the State University of Campinas (FEEC-UNICAMP).

– **Center of Excellence in Applied Research in Artificial Intelligence for Industry**, hosted by SENAI at SENAI CIMATEC in Bahia.

– **ARC in Artificial Intelligence for the Evolution of Manufacturing to Industry 4.0**, hosted by the Technological Research Institute (IPT) in São Paulo.

– **Reference Center in Artificial Intelligence (CeReIA), hosted by the Federal University of Ceará (UFC), and partnering with three Institutes of Science and Technology (ICTs):** the Pontifical Catholic University of Rio de Janeiro (PUC-RJ), the Federal University of Piauí (UFPI) and the University of Fortaleza.

Scientific processes began in 2021 at two of these centers – CIIA-Saúde and BIOS. In the next ten years, they are expected to receive a total of $ PPP 34,732,686, which will be disbursed by FAPESP ($ PPP 11,412,135), partner companies ($ PPP 3,966,687) and other sources ($ PPP 1,657,479). The higher education and research institutions involved will contribute an estimated $ PPP 19,277,413 in salaries for researchers and support personnel, facilities, equipment and infrastructure.

The second call for proposals to establish new CPA-IA was issued in October 2021 (**www.fapesp.br/15116**).

MEDIA COVERAGE OF RESEARCH RESULTS: ERC/ARC

Researchers at RCGI produce biopolymers from CO_2

Researchers at the Research Center on Greenhouse Gas Innovation (RCGI) reported the discovery of a novel method for producing bioplastics using carbon dioxide (CO2), a cheap and abundant feedstock that does not compete with the food industry. Their study involved cyanobacteria, also known as blue-green algae – prokaryotic microorganisms capable of photosynthesis. When submitted to stress in a culture medium with excess light, they capture CO2 and produce granules of polyhydroxybutyrate (PHB), a type of bioplastic. The method contributes to the capture of a major greenhouse gas and its conversion into a value-added product.

An article on the study was published in *Bioresource Technology*. News stories about were carried by **24** media outlets.

Mechanical Engineering

ERC – Research Center for Greenhouse Gas Innovation (RCGI) – FAPESP Process 2014/50279-4

HOST INSTITUTION:
Engineering School, University of São Paulo (POLI-USP)

COMPANY:
Grupo Shell

PRINCIPAL INVESTIGATOR:
Julio Romano Meneghini

https://pesquisaparainovacao.fapesp.br/1785

Article maps advances toward creation of plants that are more resilient to climate crisis

Plants that are more resilient to the climate crisis and absorb nutrients efficiently are the latest trend in the development of genetically modified organisms (OGMs). Researchers at the Genomics Applied to Climate Change Research Center (GCCRC) published a review article surveying the different techniques used to develop novel agricultural varieties and transgenic crops, especially genetically edited plants. According to the authors, research institutions and companies are working on the development of crops with more complex characteristics designed to tolerate adverse conditions deriving from the climate crisis such as drought and high temperatures, for example, while also making efficient use of nutrients and assuring high yields.

The article was published in Frontiers in *Plant Science*. News stories about the study were carried by **25** media outlets.

Genetics

ERC – Genomics Applied to Climate Change Research Center (GCCRC) – FAPESP Process 2016/23218-0

HOST INSTITUTION:
Center for Molecular Biology and Genetic Engineering, State University of Campinas (CBMEG-UNICAMP)

COMPANY:
Brazilian Agricultural Research Corporation (EMBRAPA)

PRINCIPAL INVESTIGATOR:
Paulo Arruda

https://agencia.fapesp.br/37068

MEDIA COVERAGE OF RESEARCH RESULTS: ERC/ARC

Study advances in development of batteries with increased energy storage capacity

Researchers at the Center for Innovation in New Energies (CINE) took an important step in the development of the catalysts required to optimize the performance of lithium-oxygen (Li-O_2) batteries, which store more energy than existing lithium-ion batteries. However, it is crucial to improve their cyclability – the number of times they can be recharged before they begin to break down – so that they become worth commercializing. The results obtained to date reinforce the advantages of spinels as catalysts for lithium-oxygen battery cathodes and the importance of controlling the parameters for obtaining these materials.

An article on the study was published in *Catalysis Today*. News stories about it were carried by **12** media outlets.

Interdisciplinary

ERC – Center for Innovation in New Energies (CINE)/Advanced Energy Storage Division – FAPESP Process 2017/11958-1

HOST INSTITUTION:
School of Chemical Engineering, State University of Campinas (FEQ-UNICAMP)

COMPANY:
Grupo Shell

PRINCIPAL INVESTIGATOR:
Rubens Maciel Filho

https://agencia.fapesp.br//37286

Model developed in Brazil can predict conviction of lawmakers for corruption

A study conducted by researchers at the Center for Research in Artificial Intelligence (C4AI), hosted by the University of São Paulo, estimated the likelihood of politicians' future conviction for corruption and other financial crimes by analyzing networks pointing to similar voting histories. The study was published as a chapter of the book Corruption Networks. The researchers analyzed the voting history and philosophy of 2,455 politicians elected to the lower house of Brazil's National Congress between 1991 and 2019, in a total of 3,407 sessions involving votes on bills covering a wide array of subjects. Crime-related studies based on complex networks have aims that range from finding a correlation between social capital and the risk of corruption in local government contracts to identifying hidden links among members of mafia groups.

News stories about the study were carried by **13** media outlets.

Computer Science

ERC – Center for Research in Artificial Intelligence (C4AI) – FAPESP Process 2019/07665-4

HOST INSTITUTION:
Innovation Center, University of São Paulo (INOVA-USP)

COMPANY:
IBM Brasil

PRINCIPAL INVESTIGATOR:
Fabio Gagliardi Cozman

https://agencia.fapesp.br/37617

RESEARCH FOR INNOVATION

RESEARCH PARTNERSHIP FOR TECHNOLOGICAL INNOVATION PROGRAM (PITE)

PITE supports scientific and technological research projects conducted at universities or research institutions in São Paulo State in cooperation with researchers at companies in Brazil or abroad.

Research proposals can be submitted at any time (PITE Spontaneous Demand) or in response to calls issued under the aegis of cooperation agreements between FAPESP and partner companies interested in solutions to challenges facing the companies, an industry or an economic sector (PITE Agreements).

In 2021, FAPESP disbursed $ PPP 1.7 million to support 71 research projects conducted in partnership with companies and universities or research institutions. Thirty-four new projects were contracted for in the period.

IN 2021

- **PITE Agreements – Eight companies with 53 active projects and 27 newly contracted projects:**

  Agilent, Embraer (under the aegis of a cooperation agreement with the European Union – Horizon 2020), Empresa Brasileira de Pesquisa e Inovação (Embrapii), IBM Brazil, Intel, Kryptus Segurança da Informação Ltda. (via an agreement with MCTI/CGI.br), Microsoft and SABESP.

  Ten other companies with active agreements did not have ongoing projects in 2021: Andaraguá, AstraZeneca/MedImmune, BP Biocombustíveis, Braskem, Citrosuco, Copag, Biominas Brasil, Informática de Municípios Associados, Natura and Solvay.

- **PITE Spontaneous Demand – ten companies with 18 active projects and seven newly contracted projects:**

  bioMérieux Brasil S.A., Companhia Brasileira de Metalurgia e Mineração, EMS S.A., Infibra S.A., Laboratório BioVet S.A., Maiz Indústria e Comércio de Produtos Agropecuários Ltda., Medicines for Malaria Venture, Cetesb, Energy Source Indústria, Comércio, Importação e Exportação Ltda., e uma unidade não mapeada em parceria com a USP em Piracicaba.

TABLE 21 PITE

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement FAPESP ($ PPP)	New projects contracted	Active projects
Research Grants – PITE	1,317,971	15	36
Auxílio Equipamentos Multiusuários	0	0	2
Regular Scholarships/Fellowships	320,890	14	23
Research Internships and Fellowships Abroad (RIA, RFA)	3,870	1	0
Fellowships – Technical Training	104,175	4	10
Total	**1,746,905**	**34**	**71**

PITE INITIATIVES IN 2021

Call for proposals to modernize sanitation sector

In 2021, **13** projects were selected in the third joint call issued by FAPESP and the São Paulo State Basic Sanitation Corporation (SABESP) for research proposals linked to modernization of the sanitation sector. Funding for the projects will surpass **$ PPP 4.3 million**, with the two partners contributing equal amounts over 20 years. A total of **51** proposals were submitted and analyzed by FAPESP, SABESP and ad hoc reviewers.

Strategic research on the internet

In 2021, 25 projects were selected in a call for proposals to carry out strategic research on the internet issued jointly by FAPESP, the Ministry of Science, Technology and Innovation (MCTI), the Ministry of Communications (MCom) and the Brazilian Internet Steering Committee (CGI.br). The funds will come from sources established when FAPESP ran Brazil's domain registration and IP address allocation. The partnership enables startups based in other states to have projects supported by PIPE, while also letting research institutions outside São Paulo participate in projects supported by PITE. Examples include Vixsystem, a startup based in Espírito Santo that with PIPE's support is developing Lysa, a GPS-oriented robotic guide dog for visually impaired people, and Kryptus, which began a project supported by PITE in partnership with the Technology Center at the Federal University of Santa Catarina (UFSC) to enhance the security of gateways between machines or equipment and the internet or cloud.

MEDIA COVERAGE OF RESEARCH RESULTS: PITE

Drone-borne radar monitors sugarcane growth

Drones carrying a miniaturized radar system developed by startup Radaz with FAPESP's support via its PIPE program are being used in São Paulo State to monitor sugarcane growth in order to estimate the optimal time for harvesting the crop. In another project, supported by FAPESP's PITE program under a cooperation agreement with IBM Brazil, the researchers refined the algorithms that interpret the images acquired by the system so as to produce information according to the needs of users and the type of plantation analyzed.

The technology was described in article published in Remote Sensing. News stories about it were carried by **21** media outlets.

Eletric Engineering

PIPE and PITE Grants – FAPESP Processes 2018/00601-8 and 2017/19416-3

INSTITUTION:
School of Electrical and Computer Engineering, State University of Campinas (FEEC-UNICAMP)

COMPANIES:
Radaz Indústria e Comércio de Produtos Eletrônicos Ltda.; IBM Brasil

PRINCIPAL INVESTIGATORS:
Dieter Lubeck e Hugo Enrique Hernández Figueroa

https://agencia.fapesp.br/36118

RESEARCH FOR INNOVATION

INNOVATIVE RESEARCH IN SMALL BUSINESS PROGRAM (PIPE)

PIPE supports entrepreneurs who want to convert knowledge into novel products or services. Applications for funding can be submitted at any time. Proof-of-concept testing is Phase 1, project development proper is Phase 2, and PIPE Invest is a relatively recent addition to the program.

FAPESP gives entrepreneurs selected in Phase 1 an opportunity to enhance their business plans and align projects with market demand, increasing their chances of success, via the PIPE High Tech Entrepreneurship Training Program (PIPE Entrepreneur).

PIPE Invest allocates supplementary funds to startups and small and medium enterprises that have begun developing innovative processes or products with PIPE's support, have strong success potential and already have an interested investor. The aim is to enhance the technology and accelerate market insertion of the innovation. Through an agreement with FINEP, the Brazilian government's innovation agency (PIPE-PAPPE Grants), FAPESP also supports industrial and commercial development of innovative products (Phase 3). Transfers from FINEP to FAPESP are detailed in Tables 53 and 53a at: **www.fapesp.br/relatorio2021**.

In 2021, FAPESP created PIPE Knowledge Transfer (PIPE-TC) to support scientific or technological research in small enterprises via projects conducted in partnership with researchers at universities and research institutions.

Seven virtual meetings were held during the year as part of a Dialogue on Support for Innovative Research by Small Business, an opportunity for entrepreneurs to understand how FAPESP can support the various stages of innovative initiatives.

In 2021, PIPE invested $ PPP 25.1 million in 1,346 research projects by innovative small enterprises and contracted for 642 new projects. During the year, 209 companies in 44 cities in São Paulo State had 219 new PIPE projects approved, in addition to associated scholarships (131 of the companies were new). Since the program's inception in 1997, FAPESP has awarded 2,913 PIPE grants to 1,765 companies in 158 cities in São Paulo State.

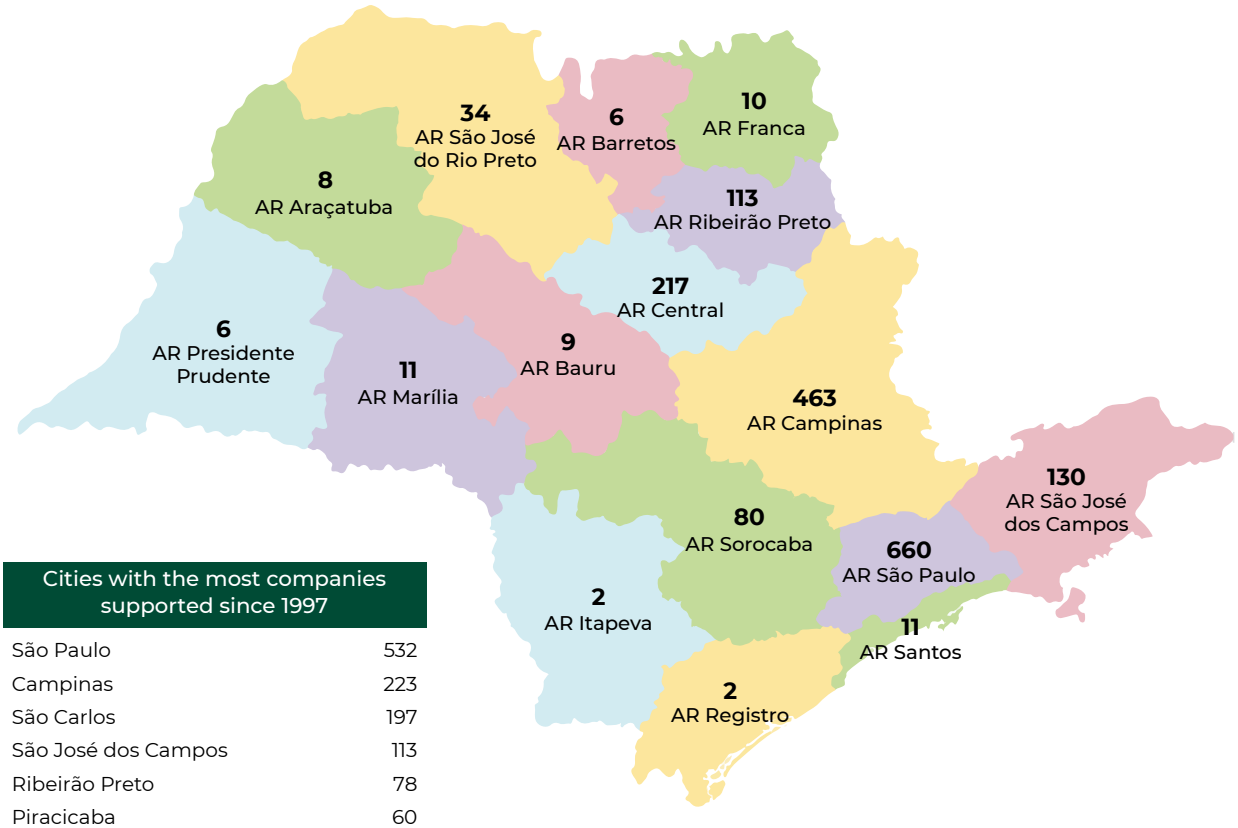
TABLE 22 PIPE

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants	Disbursement FAPESP ($ PPP)	New projects contracted	Active projects
Research Grants – PIPE	16,028,392	219	562
Fellowship – Research in Small Business (PE)	5,225,452	134	268
Fellowships – Technical Training	3,820,937	288	515
Fellowships – Technical Training (course abroad)	0	1	1
Total	**25,074,781**	**642**	**1,346**

CHART 5 GEOGRAPHY OF INNOVATION IN SÃO PAULO STATE – 2021

Companies supported by PIPE in Administrative Regions (AR) of São Paulo – since 1997*



Cities with the most companies supported since 1997	
São Paulo	532
Campinas	223
São Carlos	197
São José dos Campos	113
Ribeirão Preto	78
Piracicaba	60
Botucatu	28
Sorocaba	28
São José do Rio Preto	20
Araraquara	19
Indaiatuba	16
Jaboticabal	16
Santana de Parnaíba	16
Jundiaí	15
Limeira	13
Santo André	13
Cotia	12
São Bernardo do Campo	12
São Caetano do Sul	11
Valinhos	11

* Not city identified for three companies.

INNOVATIVE RESEARCH IN SMALL BUSINESS PROGRAM (PIPE)

PIPE INITIATIVES IN 2021

$ PPP 59.3 million for startups

FAPESP and SEBRAE-SP signed an agreement to invest $ PPP 59.3 million in support for the development of science- and technology-based startups throughout São Paulo State. Some 150 companies will be funded by PIPE for a six-year period, with funding from SEBRAE-SP aimed at facilitating market access and proof-of-concept projects with large technology companies, as well as consulting and advisory services. (**https://agencia.fapesp.br/36414**)

Programa Centelha (Spark Program)

FAPESP joined the second edition of Centelha (Spark), an initiative of the Ministry of Science, Technology and Innovation (MCTI) and the Brazilian Innovation Agency (FINEP), implemented in 26 states in partnership with the National Council for Scientific and Technological Development (CNPq), the National Council of State Research Support Foundations (CONFAP), and CERTI Foundation. The program supports innovative entrepreneurs and disseminates entrepreneurial culture among young people. (**https://agencia.fapesp.br/36806**)

FINEP – TECNOVA II Program

In March 2021, FAPESP issued a call for proposals under the FINEP-TECNOVA II Program. Eight selected projects were announced in July. A second call was issued in September. The program supports the development of innovative products and processes that strengthen economic sectors considered strategic by federal government policies and that comply with innovation policy in São Paulo State.

Out of sight

Drone developer XMobots, based on São Carlos (São Paulo State) and supported by PIPE, was awarded a license by the National Civil Aviation Agency (ANAC) for one of its unmanned aerial vehicles to carry out flights classified as BVLOS (Beyond Visual Line of Sight) at distances of up to 30 km and heights of up to 120 m (400 feet) above ground level. (**https://revistapesquisa.fapesp.br/en/out-of-sight**)

Bees for hire

Why is AgroBee nicknamed the "Uber for bees"? The startup based in Ribeirão Preto, in the interior of São Paulo State, offers a similar service to the ride sharing app but connects farmers and beekeepers so as to enable and encourage assisted pollination, a sustainable practice that takes bees to farms to increase crop yields. (**https://revistapesquisa.fapesp.br/en/bees-for-hire**)

Startup pitched bus fleet decarbonizing tool at COP26

Scipopulis, a startup based in São Paulo State, was one of five Brazilian firms selected to participate in the CivTech Alliance COP26 Global Scale-up Program, an initiative designed to help innovative fast-growth tech firms implement solutions that mitigate the adverse effects of climate change. The platform developed by Scipopulis, called Trancity, converts large mass transit operational databases into maps and graphs to assist urban mobility management. It can be used to assess the environmental impact of bus lanes, measure the travel time they save, and estimate the amount of battery power required to operate an electric fleet, for example. (**https://agencia.fapesp.br/37371**)

MEDIA COVERAGE OF RESEARCH RESULTS: PIPE

Brazilian company develops and exports DNA polymerases

Cellco Biotec, a company headquartered in São Carlos, São Paulo State, developed a novel process that enables high-quality DNA polymerases to be produced on a commercial scale for the first time in Brazil. Besides offering enzymes with comparable quality to imported products and at a more attractive price, the firm was able to sign its first export contract with a European client. DNA polymerases are enzymes that are widely used for in vitro manipulation of DNA, including DNA cloning, sequencing and mutagenesis, among other techniques. Their applications range from medical diagnosis to forensic analysis based on genetic material, to cite just two examples.

News stories about the project were carried by **13** media outlets.

Biochemistry

PIPE Grant – FAPESP Process 2017/12334-1

COMPANY:
Cellco Biotec do Brasil Ltda.

PRINCIPAL INVESTIGATOR:
Amanda Bernardes Muniz

https://agencia.fapesp.br/36490

Startup produces cholesterol-lowering molecule in tomatoes

Researchers at the startup Crop Biotecnologia in São Paulo State developed a platform to express peptides (short chains of amino acids, the building blocks of proteins) in tomatoes for use in treating chronic diseases such as dyslipidemia (high cholesterol). One such peptide can lower bad cholesterol (LDL) when taken by mouth, inhibiting the pro-protein convertase subtilisin/kexin type 9 (PCSK9) that breaks down LDL receptors in the liver. PCSK9 inhibitors allow the number of bad cholesterol receptors in the liver to increase by blocking the activity of the gene responsible for creating the pro-protein. The platform and peptide are being patented. Two pharmaceutical companies are interested in a licensing agreement, and a venture capital fund is thinking about investing in the startup.

News stories about the platform were carried by **17** media outlets.

Biochemistry

PIPE Grant– FAPESP Process 2020/00013-9

COMPANY:
Mastrangelo Ferreira e Ribeiro Pesquisa e Desenvolvimento Ltda.

PRINCIPAL INVESTIGATOR:
Aruã Mastrangelo Prudenciatti

https://agencia.fapesp.br/36728

Smart traps monitor caterpillar infestation of crops

A smart trap developed by startup Tarvos is effective against crop pests such as the Fall armyworm (*Spodoptera frugiperda*), the main cotton and corn pest in South America. One of the device's most distinctive features is that it operates independently of the telecommunications networks that cover rural properties.

News stories on the technology were carried by **11** media outlets.

Interdisciplinary

PIPE Grant– FAPESP Process 2019/19552-0

COMPANY:
AFH Soluções Tecnológicas Ltda.

PRINCIPAL INVESTIGATOR:
Bárbara Mirelli de Melo e Castro

https://agencia.fapesp.br/35197

Startup launches cosmetic made from passion fruit bagasse

Bagasse from passion fruit (Passiflora edulis), routinely thrown away by the juice industry, contains bioactive compounds whose properties have promising applications in the cosmetics market. This industrial waste is now a raw material for sustainably manufactured anti-aging skin products with tested and proven anti-oxidant action. Rubian Extratos, a startup located in Sumaré, São Paulo State, developed a mini-emulsion of passion fruit bagasse as the basis for an anti-oxidant complex called Rejuvenate. The project included a series of tests to validate the product's performance and safety. The innovation has other possible applications.

News stories about the project were carried by **47** media outlets.

Pharmacy

PIPE Grant– FAPESP Process 2016/15023-4

COMPANY:
Rubian Xtract Serviços Ltda.

PRINCIPAL INVESTIGATOR:
Philipe dos Santos

https://agencia.fapesp.br/37049

MEDIA COVERAGE OF RESEARCH RESULTS: PIPE

Biodressing made from stem cells permits smart treatment of wounds and burns

In Situ Terapia Celular, a startup based in São Paulo State, developed a biodressing for smart treatment of wounds and burns. Outwardly resembling a contact lens, it is produced by a 3D bioprinter using stem cells and a hydrogel. It can be applied directly to human skin. The firm has filed for approval of a clinical trial and registration of the product by ANVISA, Brazil's national health surveillance authority. The umbilical cord stem cells used in the biodressing have the potential to stimulate skin tissue regeneration.

News stories about the biodressing were carried by **102** media outlets.

Medicine

PIPE Grant– FAPESP Process 2016/16013-2

COMPANY:
In Situ Terapia Celular

PRINCIPAL INVESTIGATOR:
Carolina Caliári Oliveira

https://ods.fapesp.br/biodressing-made-from-stem-cells-permits-smart-treatment-of-wounds-and-burns/6979

https://pesquisaparainovacao.fapesp.br/1912

Nanoparticles extend shelf life of fruit and flowers

A startup based in Araraquara, São Paulo State, is developing nanoparticles that promise to extend the shelf life of fruit and flowers. The nanoparticles are based on a biodegradable natural polymer derived from the carapaces of shellfish such as shrimps, lobsters and crabs. It affords protection against fungi and other microorganisms.
The first phase of the project focused on applying the product to limes and obtained positive results. The researchers are looking for new market opportunities, starting with flowers because the legislation on conservation solutions for them is not as strict as for fruit.

News stories about the research were carried by **17** media outlets.

Chemistry

PIPE Grant– FAPESP Process 2019/16412-2

COMPANY:
Nazaré & Petrônio Pesquisa e Desenvolvimento Experimental em Ciências Físicas e Naturais Ltda.

PRINCIPAL INVESTIGATOR:
Ana Carolina Nazaré

https://pesquisaparainovacao.fapesp.br/1851

RESEARCH FOR INNOVATION

INTELLECTUAL PROPERTY SUPPORT PROGRAM (PAPI/NUPLITEC)

Two Ordinances (PRs) published in 2021 – PR 60, dated April 20 (https://fapesp.br/14857), and PR 65, dated June 8 (https://fapesp.br/14949) – discontinued the Intellectual Property Support Program (PAPI) and defined new functions for FAPESP's Center for Technology Patenting and Licensing (Nuplitec).

The new rules established by FAPESP's Intellectual Property Policy, altered by PR 77 on February 17, 2022, govern the assignment of IP rights and sharing in profits from creations that originate in FAPESP's research funding programs. FAPESP's Intellectual Property Policy is at: https://fapesp.br/pi.

In 2021, FAPESP allocated $ PPP 119,700 to projects contracted for in previous years and still active under the PAPI/Nuplitec program, which was established in May 2000 to support protection and licensing of IP rights to the results of research funded by FAPESP.

PATENT APPLICATIONS OF INTEREST TO FAPESP

Between 1982 and 2021, 1,699 patent applications of interest to FAPESP were filed with the National Industrial Property Institute (INPI), Brazil's patent office. In 2021, 294 of these applications had resulted in patents, 1,048 were still being processed, 118 were not licensed, and 177 had been denied.

TABLE 23

NUMBER OF PATENT APPLICATIONS FILED – 1982-2021

Top 10 institutions by n° of patent applications

Institution	Number of filings
UNICAMP	529
USP	492
UNESP	170
UFSCAR	99
Butantan Institute	93
UNIFESP	43
UFABC	22
IPT	20
UNIAN	15
UNIFRAN	15

TABLE 24

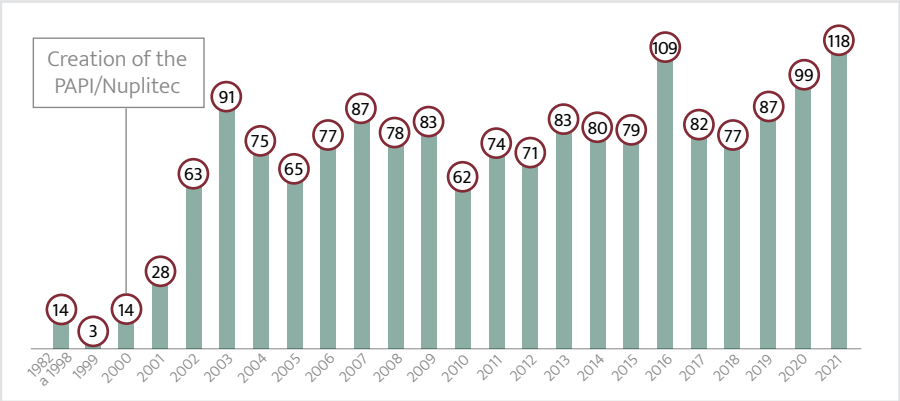
NUMBER OF PATENT APPLICATIONS FILED – 1982-2021

By knowledge area

Knowledge area	Number of filings
Life Sciences	756
Natural Sciences and Engineering	733
Human and Social Science	7
Interdisciplinary	5
Not identified	198
Total	1,699

CHART 6

PATENTS APPLICATIONS FILED – 1982-2021
PAPI/NUPLITEC PROGRAM ESTABLISHED



INNOVATION DISTRICTS

https://agencia.fapesp.br/36170

In 2021, researchers at FIPE, an economics think tank, completed the first stage of a technical study commissioned in 2018 by FAPESP on the creation of two innovation districts in São Paulo State. Innovation districts are planned areas designed to foster innovation, located near universities and research institutions, and containing high-tech companies, startup incubators and accelerators.

The study began by analyzing the current site of the CEAGESP wholesale market in the west of São Paulo City, to be connected to other areas along the Pinheiros River and near the University of São Paulo (USP), Butantan Institute, the Technological Research Institute (IPT) and the Nuclear and Energy Research Institute (IPEN).

The second innovation district will be located on Fazenda Argentina, a former farm occupying 1.4 million square meters near the University of Campinas (UNICAMP). The site was purchased by UNICAMP in 2014.

The two areas belong to metropolitan São Paulo and contain Brazil's most important universities, research institutions and science and technology centers, as well as large corporations in several sectors, accounting for about 25% of the nation's gross domestic product (GDP).

The results suggest that the proposed innovation districts have the potential to foster new regional dynamics in the production of knowledge and its application in manufacturing and services. They could also become drivers of a process of reorganization and densification of São Paulo's innovation ecosystem, as well as promoting socially inclusive development of the local and regional economy, with evident benefits in terms of sustainable urban renewal.

Other cities with the potential to develop innovation districts in São Paulo State, besides the capital and Campinas, include São Carlos, Ribeirão Preto and São José dos Campos, according to participants in an online seminar that discussed the second phase of the study, which began in December 2021.

FUNDING STRATEGIES

RESEARCH ON STRATEGIC THEMES

This funding line covers a group of programs through which FAPESP seeks to encourage research projects on topics considered strategic to the development of São Paulo State and Brazil, and includes support for the institutional development plan for research institutions in the state and support for the Science for Development Centers.

RELATED PROGRAMS

FAPESP Research Program on Biodiversity (BIOTA) – www.fapesp.br/en/biota
FAPESP Bioenergy Research Program (BIOEN) – www.fapesp.br/en/bioen
FAPESP Research Program on Global Climate Change – www.fapesp.br/pfpmcg
Research on Public Policies Program (PPP) – www.fapesp.br/politicaspublicas
Research on Public Policies for the SUS (PP-SUS) – www.fapesp.br/ppsus
Public Education Research Program – www.fapesp.br/46
Science Journalism (MídiaCiência) – www.fapesp.br/jornalismocientifico
FAPESP Research Program on eScience&Data Science – www.fapesp.br/en/escience
Institutional Development Plan for Research Institutions in São Paulo State (PDIp) – www.fapesp.br/11414
Science for Development Centers (SDC-SP) – agencia.fapesp.br/34906

$ PPP 26 million in 1,024 active projects under its ten programs for Research on Strategic Themes in 2021. The total included associated scholarships, fellowships and grants of various types. The number of new strategic projects contracted for in the year was 317.

TABLE 25 RESEARCH ON STRATEGIC THEMES

Disbursement and new projects contracted for in 2021, by major knowledge area

Programs	Life Sciences		Natural Sciences and Engineering		Human and Social Sciences		Interdisciplinary	
	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted	Disbursement $ PPP	New projects contracted
BIOTA and associated	3,312,581	69	504,602	5	200,774	12	306,608	0
BIOEN and associated	2,141,990	19	1,261,243	30	41,517	0	56,367	2
Global Climate Change and associated	2,104,994	27	2,708,887	37	394,600	12	125,916	5
Research on Public Policies and associated	6,228,768	21	361,280	26	358,884	3	69,840	3
eScience&Data Science and associated	349,617	4	212,335	4	0	0	3,311	0
Science Journalism not associated	4,845	1	8,743	0	4,845	1	18,293	1
PDIp and associated	3,063,343	16	2,022,757	11	2,913	1	4,286	0
SDC-SP and associated	180,776	6	0	1	0	0	0	0
Total	17,386,914	163	7,079,847	114	1,003,533	29	584,621	11

BIOTA-FAPESP

Goals: mapping, cataloguing and characterizing biodiversity in São Paulo State; defining mechanisms of conservation, restoration and assessment.
In 2021, BIOTA-FAPESP and the Center for Synthesis in Biodiversity and Ecosystem Services (SinBiose), a responsibility of the National Council for Scientific and Technological Development (CNPq), hosted a meeting of the heads of biodiversity synthesis centers in Canada, Germany, the United Kingdom and the United States for an exchange of views and to help implement synthesis science in Brazil.

TABLE 26 BIOTA

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grant BIOTA	521,779	14	49
Research Grant BIOTA – PIPE	18,825	1	1
Research Grant BIOTA – YIG	57,778	1	4
Research Grant BIOTA – Thematic	1,997,475	5	23
Research Grants – Regular	-939	1	4
Research Grants – Publications	3,813	1	2
Regular Scholarships/Fellowships	1,488,573	34	103
Research Internships and Fellowships Abroad (RIA, RFA)	62,060	3	1
Fellowships – Technical Training	145,400	25	46
Fellowships – PE	29,802	1	1
Total	4,324,566	86	234

BIOEN

Goals: stimulating and organizing research and development by academic and industrial laboratories to advance and apply knowledge in areas relating to bioenergy production in Brazil.
In 2021, FAPESP, via BIOEN, and the São Paulo State Department of Infrastructure and the Environment issued a joint call for scientific research proposals to add value to urban and agroindustrial waste for application in bioenergy. FAPESP will invest $ PPP 5.1 million in basic and applied science opportunities under various funding lines.

TABLE 27 BIOEN

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grant BIOEN	550,838	8	34
Research Grant BIOEN – Thematic	1,006,814	1	9
Research Grant BIOEN – PIPE	47,400	2	5
Research Grant BIOEN – YIG	251,484	0	7
Research Grants – Regular	7,866	0	4
Young Investigator – Phase 2	64,451	0	2
Regular Scholarships/Fellowships	1,229,863	16	70
Research Internships and Fellowships Abroad (RIA, RFA)	170,072	4	9
Fellowship BIOEN – JP	39,735	0	1
Fellowship BIOEN – PE	39,735	0	2
Fellowship PE	8,990	2	2
Fellowships – Technical Training	83,869	18	31
Total	3,501,117	51	176

MEDIA COVERAGE OF RESEARCH RESULTS: BIOTA

Environmental tax aims to increase protected Atlantic Rainforest areas, but with limited results

A study by the University of São Paulo (USP) investigated a fiscal transfer mechanism whereby states transfer part of their tax revenue to municipalities in exchange for the creation of nature conservation areas. The mechanism is known as ICMS-E. ICMS is state-collected sales tax, and the "E" stands for ecological. The researchers concluded that the mechanism has stimulated the creation of nature reserves in Atlantic Rainforest areas in recent years but may be less effective than expected because it mainly incentivizes the creation of Environmental Protection Units (APAs), which impose few restrictions on land use change and entail lower levels of fiscal transfer to municipalities. The effect of ICMS-E on the creation of APAs is almost seven times greater than on the creation of other types of reserve, such as those involving comprehensive protection.

An article on the study was published in *Ecological Economics*. News stories about it were carried by **116** media outlets.


Seca e incêndios causaram morte de 3 bilhões de plantas entre 2015 e 2018, diz estudo

Ecology

Research Grant – Thematic/BIOTA, DR Scholarship in Brazil, BEPE-DR and PD Fellowships in Brazil – FAPESP Processes 2013/23457-6, 2015/16587-6, 2017/20245-9 and 2014/11676-8

INSTITUTIONS: Institute of Biosciences, University of São Paulo (IB-USP); Duke University, USA

PRINCIPAL INVESTIGATOR IN BRAZIL: Jean Paul Walter Metzger

SUPERVISOR ABROAD: Alexander Pfaff

GRANTEES: Patrícia Guidao Cruz Ruggiero e Elizabeth Stevens Nichols

https://agencia.fapesp.br/37381

First genetic sequencing of native wild passionfruit is completed

Researchers at the University of São Paulo's Luiz de Queiroz College of Agriculture (ESALQ-USP) completed the first whole-genome sequencing of a wild passionfruit species native to Brazil, paving the way for the development of novel cultivable varieties that cost less to produce. The scientists identified several genes associated with self-incompatibility – the inability of pollen grains to fertilize flowers of the same plant or its close relatives. This was an important discovery because 40% of the cost of production for commercial plantations arises from the need to pollinate plants manually. In nature, this role is performed by the bumble bee.

An article on the study was published in *The Plant Genome*. News stories about it were carried by **14** media outlets.


Cultivar
Concluído sequenciamento genético de espécie de maracujá silvestre nativo do Brasil


INVESTSP
Concluído o primeiro sequenciamento genético de espécie silvestre de maracujá nativa do Brasil

Genetics and Agronomy

Research Grants – Regular/BIOTA, PD and DD Fellowships in Brazil – FAPESP Processes 2017/11815-6, 2019/07838-6 and 2017/04216-9

INSTITUTION: Luiz de Queiroz College of agriculture, University of São Paulo (ESALQ-USP)

PRINCIPAL INVESTIGATOR: Maria Lúcia Carneiro Vieira

GRANTEE: Zirlane Portugal da Costa e Luiz Augusto Cauz dos Santos

Research Grants – Regular and DR Scholarship in Brazil – FAPESP Processes 2018/21469-0 and 2018/25242-0

INSTITUTION: Institute of Biology, State University of Campinas (IB-UNICAMP)

PRINCIPAL INVESTIGATOR: Marcelo Carnier Dornelas

GRANTEE: Helena Augusto Gioppato

https://agencia.fapesp.br/36494

MEDIA COVERAGE OF RESEARCH RESULTS: BIOTA

Drought and fire increase Amazon tree deaths and CO_2 emissions

Extreme droughts are becoming more and more frequent and intense owing to climate change, and this could have significant effects on the Amazon Rainforest. In the summer season between late 2015 and early 2016, severe drought and forest fires associated with El Niño ravaged parts of the region. The effects of this climate-driven event lasted at least three years, resulting in the death of 3 billion trees by 2018 and in the emission of 495 million metric tons of carbon dioxide (CO2), more than the annual average for the entire Brazilian Amazon. These were among the findings of a study conducted by researchers affiliated with institutions in Brazil and the United Kingdom

An article on the study was published in *Proceedings of the National Academy of Sciences (PNAS)*. News stories about it were carried by **28** media outlets.

Ecology

Research Grants – Thematic/BIOTA – FAPESP Process 2012/51872-5. Cooperation agreement with Natural Environment Research Council (NERC), UK

INSTITUTION IN BRAZIL:
Institute of Biology, State University of Campinas (IB-UNICAMP)

INSTITUTION ABROAD:
Lancaster University, Inglaterra

PRINCIPAL INVESTIGATOR IN BRAZIL:
Carlos Alfredo Joly

PRINCIPAL INVESTIGATOR ABROAD:
Jos Barlow

https://agencia.fapesp.br/38647

MEDIA COVERAGE OF RESEARCH RESULTS: BIOEN

More attention to plant time

Research has shown that crop yields can be increased by changing the time at which fertilizer is applied, using new technology or adjusting the plants' biological clock via genetic engineering. In an article in Science, Alex Webb, a biologist at the University of Cambridge in the United Kingdom, advocated the creation of a new discipline called chronoculture or circadian agriculture. A PhD student of Webb's, Carlos Hotta, a biologist at the University of São Paulo's Chemistry Institute (IQ-USP), found that time was different for different parts of a sugarcane plantation because the plants provided shade for each other. Plants on the west side had more shade shortly after sunrise, and their metabolism was two hours behind plants on the east side.

An article on the study was published in the *Journal of Experimental Botany and New Phytologist*. News stories about it were carried by **26** media outlets.

Biochemistry

Research Grants– Regular/BIOEN, JP/BIOEN and Regular – FAPESP Processes 2019/08534-0, 2015/06260-0, 2011/00818-8 and 2017/50326-0

INSTITUTION:
Instituto de Química da Universidade de São Paulo (IQ-USP)

PRINCIPAL INVESTIGATOR:
Carlos Takeshi Hotta

https://agencia.fapesp.br/36045 and
https://revistapesquisa.fapesp.br/mais-atencao-ao-tempo-das-plantas

RESEARCH ON STRATEGIC THEMES

RESEARCH PROGRAM ON GLOBAL CLIMATE CHANGE (RPGCC)

Goals: support for research projects that contribute to decision making on the societal and economic impacts of global warming for Brazil.
Regional estimates in the report issued on August 9, 2021, by the Intergovernmental Panel on Climate Change (IPCC) were presented by RPGCC scientists who took part in a webinar held on the day to discuss the implications of the report for Brazil.

TABLE 28 RPGCC

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grant RPGCC	249,246	2	14
Research Grant RPGCC – YIG	232,446	0	4
Research Grant RPGCC – YIG Phase 2	244,208	0	1
Research Grant RPGCC – Thematic	1,645,651	3	17
Research Grant RPGCC – PIPE	13,047	1	1
Research Grants – Regular	8,491	0	6
Research Grants – Visiting Researcher	6,368	1	1
Research Grants – Publications	5,674	2	3
Regular Scholarships/Fellowships	2,241,334	42	145
Research Internships and Fellowships Abroad	397,677	5	10
Fellowship RPGCC – YIG	76,159	0	2
Fellowship RPGCC – PE	29,801	1	1
Fellowships – Technical Training	174,307	22	41
Fellowships – Science Jornalism	9,987	2	2
Total	5,334,396	81	248

eScience and DataScience

Goals: supporting integration between research groups involved in investigating algorithms, computational modeling and data infrastructure, and groups of scientists involved in other knowledge areas, from biology to social science.
In 2021, researchers in different areas attended two events on data management and advances in eScience. Data Science for Social Good discussed how advances in this field can contribute to social research and public policy formulation. The Second Latin American and Caribbean Scientific Data Management Workshop, organized in partnership with World Data System (WDS), Research Data Alliance (RDA) and the Brazilian Academy of Sciences (ABC), discussed best practices in repository-based data management, new trends, and prospects for scientific data systems.

TABLE 29 eScience and DataScience

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Research Grant eScience	126,497	1	7
Research Grant eScience – PIPE	15,536	0	3
Research Grant eScience – Temático	162,243	0	1
Fellowship eScience – PE	56,292	0	3
Regular Scholarships/Fellowships	154,161	5	9
Fellowships – Technical Training	50,535	2	5
Total	565,264	8	28

MEDIA COVERAGE OF RESEARCH RESULTS: GLOBAL CLIMATE CHANGE

Researchers identify causes of extreme drought affecting Pantanal

The extreme drought suffered by the Pantanal in 2019-20, considered the worst in the last 50 years, was caused by natural climate conditions similar to those underlying the 2014-16 water crisis in São Paulo State. The cause was a meteorological phenomenon known as atmospheric blocking, in which a high-pressure area prevented the formation of rainclouds throughout the central-western portion of South America. According to the researchers, lack of rain combined with high temperatures and very low humidity led to a heightened risk of fire, which extended to agricultural areas as well as natural parts of the Pantanal.

An article on the study was published in *Frontiers in Water*. News stories about it were carried by **53** media outlets.

Geosciences

Research Grants – Thematic/RPGCC/INCT Climate Change – FAPESP Process 2014/50848-9

INSTITUTION:
Natural Disaster Surveillance and Early Warning Center (CEMADEN)

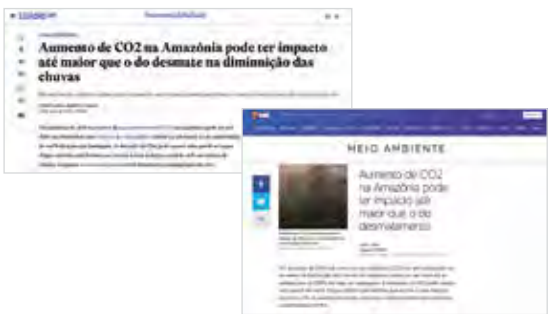
PRINCIPAL INVESTIGATOR:
Jose Antonio Marengo Orsini

https://agencia.fapesp.br/35939

Impact of rising levels of CO_2 in the Amazon could surpass that of deforestation in reducing rainfall

Simulations run on a supercomputer at Brazil's National Space Research Institute (INPE) showed that the direct impact of a 50% rise in levels of carbon dioxide over the Amazon would be a reduction in rainfall equivalent to or even greater than the impact of complete substitution of the forest by pasture. The rise in CO2 would reduce the amount of water vapor emitted by the forest, leading to a 12% annual drop in the volume of rainfall, while total deforestation would reduce rainfall by 9%. These estimates were presented by scientists affiliated with INPE, the University of São Paulo (USP), the University of Campinas (UNICAMP) and Munich Technical University (TUM) in Germany, drawing attention to the need for regional and global action to mitigate the adverse effects of climate change.

An article on the study was published in Biogeosciences. News stories about it were carried by **48** media outlets.



Geosciences

Research Grant – YIG/RPGCC – FAPESP Process 2015/02537-7

INSTITUTION:
Center for Meteorological Research Applied to Agriculture, State University of Campinas (CEPAGRI-UNICAMP)

PRINCIPAL INVESTIGATOR:
David Montenegro Lapola

https://agencia.fapesp.br/36224

RESEARCH ON STRATEGIC THEMES

PUBLIC POLICY RESEARCH PROGRAMS

Goals: support for research projects that aim to meet societal demand and result in public policy implementation:

- **FAPESP Public Policy Research Program (PPP)**
- **Research on Public Policy for the National Health System (PP-SUS)** – Transfers of funds from the Ministry of Health and the National Council for Scientific and Technological Development (CNPq) to FAPESP under the agreement to fund PP-SUS are detailed in Tables 53 and 53a at **www.fapesp.br/relatorio2021**.
- **Public Education Research Program** – FAPESP updated the rules governing this program to include the possibility of research in partnership with nursery schools, among other changes. The rules include two appendices with guidelines on how to draft a proposal with goals, scientific basis, material and methods, and the requirements regarding submission of scientific reports during the project (**www.fapesp.br/14961**).

TABLE 30 PPP, PP-SUS AND PUBLIC EDUCATION

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
PPP	**6,848,176**	**29**	**100**
PPP Grants	6,552,533	9	39
Regular Fellowships in Brazil	93,531	4	5
Fellowships – Technical Training	202,112	16	56
PP-SUS	**0**	**0**	**0**
Public Education	**170,596**	**24**	**89**
EP Grants	53,977	2	10
EP Fellowships	96,514	17	66
Fellowships – Technical Training	20,105	5	13

SCIENCE FOR DEVELOPMENT CENTERS (SDC-SP)

In 2021, FAPESP issued a second call for proposals to establish Problem-Oriented Research Centers in São Paulo under the aegis of its Science for Development Centers Program. The results, expected in mid-2022, will be projects in health, energy efficiency, agriculture and food supply, manufacturing and advanced materials, smart cities and public safety, environmental management and sustainability, culture and the creative economy, and sports. The 12 centers listed below were selected in 2020 under the first call. The announcement of the selected projects between late 2020 and early 2021 was covered by **103** media outlets.

TABLE 31 SDC-SP

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
SDC-SP Grants	166,739	5	4
Regular Fellowships in Brazil	14,037	2	2
Total	**180,776**	**7**	**6**

SCIENCE JOURNALISM (MÍDIACIÊNCIA)

Goals: supporting the education and training of science disseminators by awarding undergraduate and graduate fellowships (JC) under the aegis of the José Reis Program. FAPESP disbursed **$ PPP 36,700** for eight active projects and contracted for three new JC fellowships in 2021.

MEDIA COVERAGE OF RESEARCH RESULTS: PPP

Citizen scientists help assure quality of coastal biodiversity monitoring

A study conducted in the port city of Santos by researchers at the Federal University of São Paulo (UNIFESP) combined science with citizen participation. The group developed a methodology for integrating civil society and academia, including the creation of a protocol for monitoring coastal biodiversity to be applied collaboratively by citizens and researchers. It is precisely this integration of science with citizen participation that the United Nations aims to bring about in the Decade of Ocean Science for Sustainable Development, launched in April 2021 and due to last until 2030.

An article on the study was published in *Frontiers in Marine Science*. News stories about it were carried by **69** media outlets.

Interdisciplinary

Research Grants – PPP – FAPESP Process 2017/50220-8

INSTITUTION:
Institute of Health and Society, Federal University of São Paulo (ISS-UNIFESP), Santos

PRINCIPAL INVESTIGATOR:
Ronaldo Adriano Christofoletti

https://agencia.fapesp.br/37085

MEDIA COVERAGE OF RESEARCH RESULTS: CCD

Academia, civil society and government join forces in new center for nature-based solutions

Scientists, public administrators and civil society organizations in São Paulo State will join forces in BIOTA Synthesis – the Center for Analysis and Synthesis of Nature-Based Solutions – for the next five years to develop nature-based solutions to socio-environmental problems such as floods, lack of pollinators for agriculture, and zoonoses (infectious diseases transmitted from animals to humans). BIOTA Synthesis is a cluster of 27 institutions such as universities, state government departments and non-governmental organizations, and will focus on the challenges of sustainable agriculture, water security, and control of zoonoses.

According to the head of the new Science for Development Center (SDC), Jean Paul Metzger, this is an opportunity to combine good research with a return to society by dealing with problems that have socio-environmental impacts and are therefore matters of direct social interest.

News stories about BIOTA Synthesis were carried by **13** media outlets.

Ecology

Research Grant – CCD/BIOTA Synthesis – FAPESP Process 2020/06694-8

INSTITUTION:
Institute for Advanced Studies, University of São Paulo (IEA-USP)

PRINCIPAL INVESTIGATOR:
Jean Paul Metzger

https://agencia.fapesp.br/38760

RESEARCH ON STRATEGIC THEMES

INSTITUTIONAL DEVELOPMENT PLAN FOR STATE RESEARCH INSTITUTIONS (PDIp)

FAPESP supports modernization projects at 12 research institutions in São Paulo State with research proposals selected in a 2018 call, disbursing funds for capital and running costs (fixed assets, consumables and contractors, among others), and for scholarships and research grants. The program supports the following state-run research institutions:

	Institutions with PDIp funding approved in 2018	Processo FAPESP
1	Adolfo Lutz Institute	2017/50333-7
2	Agronomy Institute	2017/50338-9
3	Instituto Biológico	2017/50334-3
4	Butantan Institute	2017/50350-9
5	Dante Pazzanese Institute	2017/50342-6
6	Botany Institute	2017/50341-0
7	Energy and Nuclear Research Institute	2017/50332-0
8	Technological Research Institute	2017/50343-2
9	Food Technology Institute	2017/50349-0
10	Animal Science Institute	2017/50339-5
11	Geology Institute	2017/50336-6
12	Office of Endemic Disease Control	2017/50345-5

TABLE 32 PDIp

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
PDIp Grants	2,535,758	0	12
Young Investigator Grant	507,494	0	5
PPP Grants	74,085	1	4
Research Grant – Regular	0	0	2
Research Grants – Publication	5,863	2	2
Regular Scholarships/Fellowships	1,632,484	13	82
Regular Scholarships/Fellowships Abroad	48,314	1	2
Fellowships – YI	195,597	1	5
Fellowships – Technical Training	93,703	10	21
Total	**5,093,298**	**28**	**135**

MEDIA COVERAGE OF RESEARCH RESULTS: PDIp

Mango rind converted into functional ingredient with technology developed by Food Technology Institute (ITAL)

The Food Technology Institute (ITAL) developed a functional ingredient from mango rind for use in food product formulations after showing that it is well-accepted and has technological and nutritional benefits in sourdough panettone and milk chocolate. Recycling food and beverage industry byproducts is one of ITAL's research lines. Knowledge acquired in this project will benefit producers of mango and other fruit pulps.

News stories about the project were carried by **8** media outlets.

Food Science and Technology

Research Grants – PDIp – FAPESP
Process 2017/50349-0

INSTITUTION:
Food Technology institute (ITAL), São Paulo State Department of Agriculture and Food Supply

PRINCIPAL INVESTIGATOR:
Eloísa Elena Corrêa Garcia

https://www.agricultura.sp.gov.br/noticias/cascas-de-manga-sao-transformadas-em-ingrediente-funcional-com-tecnologia-desenvolvida-pelo-ital/

Innovative technology to detect adulteration in dairy products delivered by Animal Science Institute (IZ)

The Animal Science Institute (IZ) developed a methodology to offer consumers quality assurance when buying A2A2 cow's milk and buffalo milk as well as related dairy products. It consists of two techniques – high resolution melting (HRM) and RNase H2 enzyme-based amplification (rhAmp) – for highly reliable detection of the A1A1, A2A2 and A1A2 genotypes of the gene CSN2 in DNA samples from animals and dairy products. The rhAmp technique is ten times more sensitive than HRM and recommended for A2 milk quality assurance. The methodology can be used to detect the addition of A1A1 or A1A2 milk to dairy products marketed as A2A2 and the addition of cow's milk to buffalo milk. The next step is the development of a similar methodology to detect adulteration of goat's milk.

Articles on the research were published in *Food Chemistry* and the *International Dairy Journal*. News stories about it were carried by **16** media outlets.

Animal Science

Research Grants – PDIp – FAPESP
Process 2017/50339-5

INSTITUTION:
Animal Science Institute, São Paulo State Department of Agriculture and Food Supply

PRINCIPAL INVESTIGATOR:
Renata Helena Branco Arnandes

https://www.paginarural.com.br/noticia/295136

FUNDING STRATEGIES

SUPPORT FOR RESEARCH INFRASTRUCTURE

FAPESP maintains seven programs that assure provision of the infrastructure needed for the advancement of research in São Paulo State.

RELATED PROGRAMS

Multi-User Equipment – Acquisition of equipment for shared use by the scientific community.
www.fapesp.br/emu

Equipment Repair – Repair and preventive maintenance of equipment.
www.fapesp.br/339

Support for Infrastructure – Maintenance of museums, information repositories, documents and biological collections.
www.fapesp.br/centrosdepositarios

Three types of Technical Reserve – Additional funding for institutions to cover unforeseen expenses in research projects.
www.fapesp.br/rt

Access to **REDNESP** (Research and Education Network at São Paulo) – formerly ANSP Network, connecting dozens of higher education and research institutions in São Paulo State and abroad via cooperation with consortia and academic networks such as AmLight, RedCLARA and GNA-G.
www.fapesp.br/49

FAPESP completed a thorough review of the rules governing Technical Reserves for Grants and Scholarships officialized in Ordinance PR 67 (https://fapesp.br/15055), dated August 26, 2021.

A section of the Biblioteca Virtual (BV) portal can be queried by researchers to locate multi-user equipment, with information on distances and availability: https://bv.fapesp.br/pt/equipamento_multiusuarios.

TABLE 33 SUPPORT FOR RESEARCH INFRASTRUCTURE

Disbursement, number of active projects and new projects contracted in 2021

Fellowships and Grants associated	Disbursement $ PPP	New projects contracted	Active projects
Multi-user Equipment	11,160,531	59	360
Equipment Repair	1,600,608	89	167
REDNESP	6,669,783	1	2
Overhead – Institutional Research Infrastructure	16,910,298	116	252
Overhead – Program Coordination	292,576	5	14
Overhead – REDNESP	3,825,571	3	14
Total	**40,459,367**	**273**	**809**

MEDIA COVERAGE OF RESEARCH RESULTS: INFRASTRUCTURE

New submarine internet link will accelerate scientific cooperation between Brazil and Europe

The São Paulo Research and Education Network (REDNESP, formerly ANSP) has joint responsibility for management of a 100 Gigabit per second (Gbps) fiber optic cable linking São Paulo (Brazil), Miami (USA) and Santiago (Chile). In 2019, the bandwidth between São Paulo and Miami was raised by an additional 200 Gbps. In 2020, a direct link between Brazil and Africa was unveiled. In August 2021, an important experiment was conducted to launch EllaLink, a fiber optic system created by the scientific consortium BELLA linking Fortaleza (capital of Ceará, Northeast Brazil) directly to Sines on the coast of Portugal. A team from the São Paulo Regional Analysis Center (SPRACE) conducted the experiment involving infrastructure owned by REDNESP and the National Education and Research Network (RNP), Brazil's federally-owned academic internet backbone, to demonstrate the new cable's potential. The data rate between São Paulo and European research centers reached 100 Gbps, almost ten times the current speed.

News stories about the experiment were carried by **17** media outlets.

Physics

São Paulo Regional Analysis Center (SPRACE) and REDNESP – FAPESP Process 2018/25225-9

INSTITUTION:
Scientific Computing Center, São Paulo State University (NCC-UNESP)

PRINCIPAL INVESTIGATOR:
Sergio Ferraz Novaes

https://agencia.fapesp.br/36853

FUNDING STRATEGIES

COMMUNICATING SCIENCE TO THE PUBLIC

This funding strategy encompasses initiatives to inform FAPESP's stakeholders and the general public about its science policy guidelines and the societal and economic impacts of the scientific knowledge produced in São Paulo State with its support, as well as initiatives to map and evaluate the general status of research in the state, as required by the law that created FAPESP.

$ PPP 7 million
for research diffusion, mapping and evaluation projects in 2021.

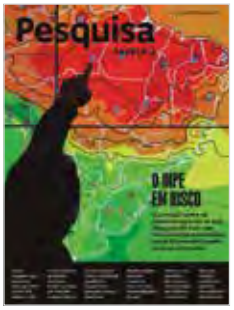
DIVULGAÇÃO DO CONHECIMENTO CIENTÍFICO

PESQUISA FAPESP MAGAZINE (monthly) revistapesquisa.fapesp.br/en

PAPER EDITION

In 2021, the magazine's monthly print run averaged 30,000, including paying subscribers, newsvendor sales, complimentary copies and distribution to state-run high schools in São Paulo:

- 6,607 paying subscribers in December 2021 (+11.3% compared with December 2020).
- Newsvendor sales averaging 668 per month (-19.7% compared with 2020).
- 3,674 copies per month distributed to high schools in São Paulo State.



SITE

Site traffic held steady almost throughout the year, dipping only during school and academic vacations in July and December. Hits and users continued to rise, albeit more slowly than in the previous year, when the growth rate was very high.

5.9 million visits (sessions) (+7.7% on 2020) – monthly average: **492,800**.

4.6 million users visited the site (+8,4%).

7.4 million page views (-4,7%) – monthly average: **615,900**.

TRAFFIC TO THE SITE (how digital content is accessed)

The public access the content produced by *Pesquisa FAPESP* in different ways. Search engines such as Google currently account for almost 75% of visits. Access via alerts or newsletters is minor but rose almost sixfold in the period:

- Organic search (Google): **4.3 million** sessions or **73%** of the total (+28% on 2020).
- Direct search (via the URL): **771,000** sessions or **14%** of the total (-0,7%).
- Social media: **570,000** sessions or **9.6%** of the total (-14,9%).
- Newsletters: **13,900** sessions (+569%).

TRAFFIC TO THE SITE VIA SOCIAL MEDIA (% sessions originating from each platform out of total sessions originating from social media)

- **57.8%** via Facebook (absolute numbers: -25% on 2020).
- **37.3%** via Twitter (absolute numbers: +6,6%).
- **1.7%** via Instagram (absolute numbers: -3%).
- **1.3%** via YouTube (absolute numbers: -20,8%).

SOCIAL MEDIA *Pesquisa FAPESP*

The number of followers increased most compared with 2020 on YouTube, rising **19%**. Facebook again had the largest audience, although the number of followers did not rise in the year.

- **Facebook** – **183,800** followers (-0.03%) and **287,500** reactions, comments and shares (-14.4%)
- **Twitter** – **94,400** followers (+3.6%) and **33,200** retweets and likes (-2.2%)
- **Instagram** – **56,200** followers (+13.6%) and **141,100** likes and comments (+4.5%)
- **YouTube** – **79,800** followers (+19%) and **1,4 million** views (-22.3%)

RÁDIO PROGRAM – Podcast

Weekly radio program "Pesquisa Brasil", a partnership between Pesquisa FAPESP and Rádio USP, with **62** programs – seven thematic, mostly discussing the magazine's cover stories, and the rest featuring interviews on three subjects, one of which was the COVID-19 pandemic and the mobilization of Brazilian researchers. Kantar Ibope's audience surveys covering USP-FM and USP Web (first airing of the program on Fridays at 1:00 pm) showed a rise of 10.4% compared with the previous year, from **8,406** to **9,295** listeners per program.

OTHER NUMBERS

- **91** content items (news stories, infographics, photos and videos) licensed to publishers of teaching material (-10% on 2020).
- **2,175** reproductions or citations of the magazine's content in magazines, newspapers, news sites, scientific journals and other media outlets, as well as citations in scientific articles and theses (+75.4% on 2020).

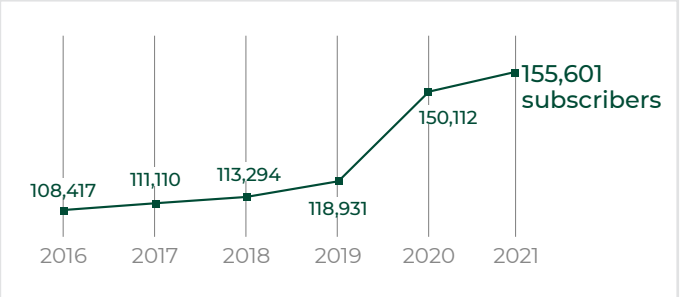
COMMUNICATING SCIENCE TO THE PUBLIC

AGÊNCIA FAPESP DE NOTÍCIAS / FAPESP NEWS AGENCY

agencia.fapesp.br

- 155,601 subscribers
  - Portuguese (daily updates): 146,259 (+5.8%)
  - English (weekly): 8,077 (+13%)
  - Spanish (weekly): 1,582 (+0,8%)

CHART 7 ANNUAL CHANGE TO TOTAL NUMBER OF SUBSCRIBERS



Source: Agência FAPESP, management system (April 5, 2022).

VISITS

- 4.5 million visits to Agência FAPESP's sites in all three languages (Figure 8).

AGÊNCIA FAPESP IN THE MEDIA

In 2021, media outlets published 36,779 news items (+31,7%) with content from *Agência FAPESP* (Chart 9).

CHART 8 ANNUAL CHANGE TO TOTAL NUMBER OF VISITS TO SITES

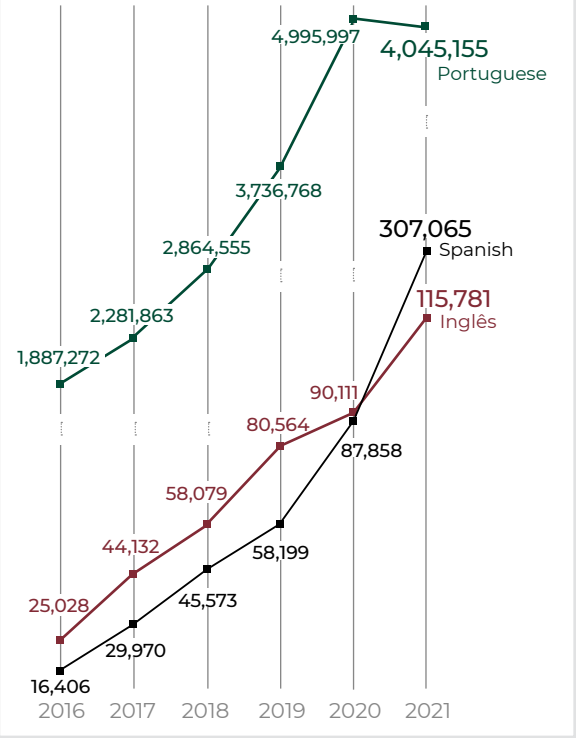
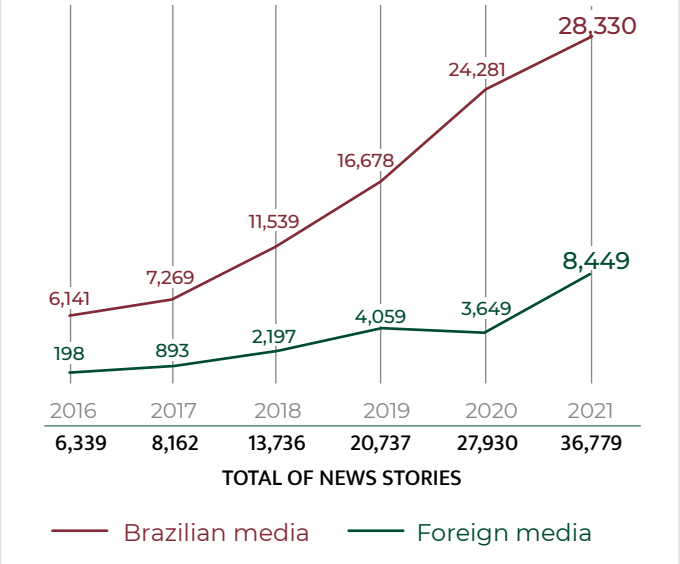


CHART 9 NUMBER OF NEWS STORIES PUBLISHED BY MEDIA OUTLETS WITH AGENCIA FAPESP CONTENT



The above annual figures are sum totals of media citations, reproductions and edited versions of texts published on Agência FAPESP's websites and content from the daily newsletter sent by Media Relations to the Brazilian press and to the EurekAlert and DiCYT platforms.

Source: Sistema FAPESP Na Mídia, March 28th 2022.

SOCIAL MEDIA *Agência FAPESP*

Facebook – @agfapesp

- 49,249 followers: 1,824 new in 2021 (+3,8%).
- 1,225 posts.

MOST POPULAR POST IN 2021: "FAPESP scholarship awardee wins international competition in area of genomics" (13,800 engagements and 99,500 people reached); "Tropical forest recovers 80% of carbon storage and soil fertility after 20 years of regeneration" (11,500 engagements and more than 125,000 people reached).

Twitter – @AgenciaFAPESP

- 81,754 followers: 3,512 new in 2021 (+4,5%).
- 1,794 posts.

MOST POPULAR POST IN 2021: statements by Luiza Caires and FAPESP President Marco Antonio Zago supporting #VacinaSim campaign had the most impressions: 51,064 and 41,431, respectively.

Instagram – @agenciafapesp

- 25,548 followers: 6,518 new in 2021 (+34,3%).
- 309 in feed and 974 in stories.

MOST POPULAR POST IN 2021: "Antibodies against SARS-CoV-2 produced in prior infection are six times less effective against P.1 variant" received 4,400 interactions.

LinkedIn – @fapesp

- FAPESP Innovation profile created in November 2021.
- 30,221 subscribers and 26 posts.

MOST POPULAR POST IN 2021: "Startup develops artificial skin with vascularization" had the most interactions (442); "Molecule derived from dye inactivates SARS-CoV-2 and can be used in oral hygiene products" had the most impressions (12,674).

YouTube – /fapespagencia

- 43,283 subscribers, more than 15,000 new in 2021 (+27,3%).
- 262 videos posted in year.
- 935,300 views and 7,955,476 impressions.

MOST POPULAR VIDEO IN 2021: "Behavior of capuchin monkeys can be identified by marks left on their tools" had 14,266 views.

COMMUNICATING SCIENCE TO THE PUBLIC

PESQUISA PARA INOVAÇÃO (FAPESP INNOVATIVE R&D – WEEKLY) pesquisaparainovacao.fapesp.br

- **33** newsletters produced in 2021.
- **67,966** visits to site (+18,41%).
- **762 news stories** published by media outlets in Brazil and abroad with content from newsletter (text captured directly or distributed by FAPESP Media Relations).
- **12,072** subscribers (mailing FAPESP).

The newsletter is also distributed to affiliates of CIESP/FIESP, SIMPI, Embrapii, ANPROTEC, CNPEN, EMBRAPA, DCTA, CIETEC, Supera Parque (RP), Chambers of Commerce US, UK, Japan, Germany), technolgy parks in São Paulo and other states, innovation hubs (Itaú Cubo, Bradesco Inovabra etc.), trade associations (e.g. ABFIN, ABIMAQ) and innovation agencies.

VISUAL MEDIA

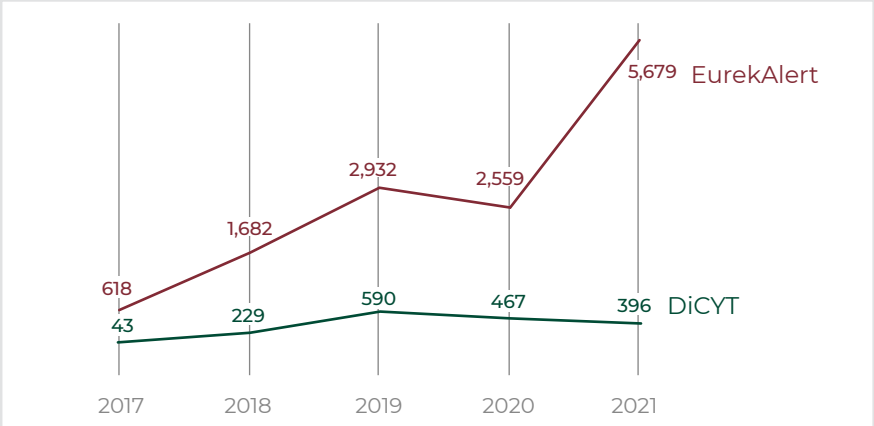
- **49** episodes of the series **Ciência SP** ("São Paulo Science"): one-minute videos on applications of science, research and development in different areas of society.
- **30** news stories and **78** videos covering online events in 2021.
- A total of **355** videos were produced during the year on *Agência FAPESP*'s social media:
  - **YouTube**: **262** videos posted. The channel had **953,300** views and **8 million** impressions in the year.
  - **Facebook**: **121** videos posted, with **69,100** views for at least 3 seconds (**22,600** minutes).
  - **Instagram**: **115** videos with **70,800** views.

MEDIA RELATIONS

- **971** responses to media inquiries.
- **277** texts in English from *Agência FAPESP* posted on EurekAlert.
- Posts on EurekAlert resulted in **5,679** (+122%) reproductions in foreign media outlets and had **214,528** views by journalists.
- **136** publications by DiCYT on *Agência FAPESP* topics resulted in **396** reproductions in Spanish-language media outlets.

CHART 10

ANNUAL CHANGE IN INTERNATIONAL COVERAGE VIA EUREKALERT AND DICYT



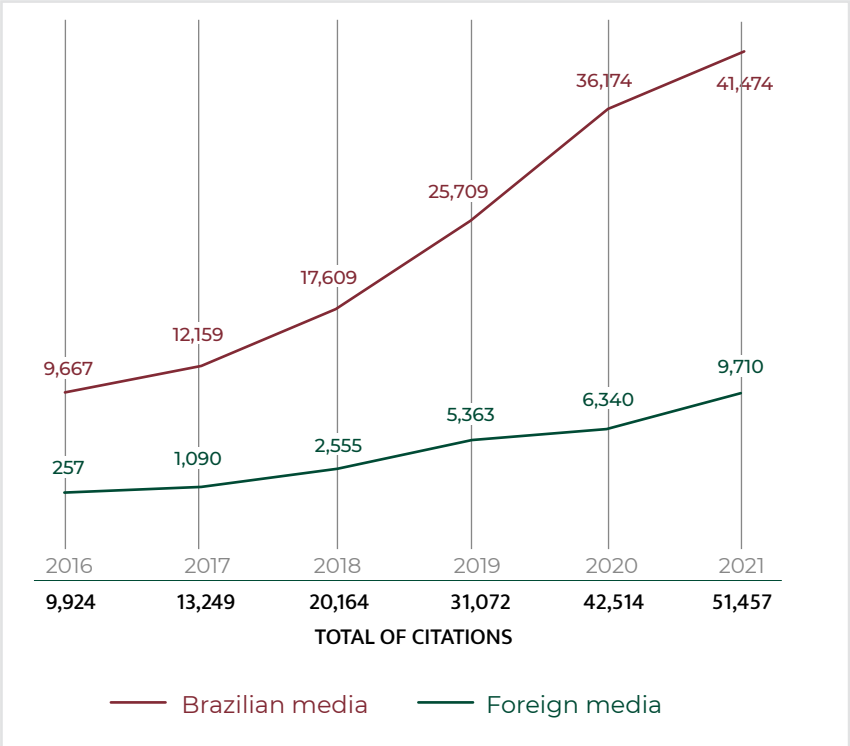
Source: FAPESP Na Mídia system on March 22, 2022.

FAPESP'S VISIBILITY IN THE MEDIA

In 2020, Brazilian and foreign media outlets published **51,457** news stories relating to research or researchers supported by FAPESP and initiatives by institutions, among other subjects, for an increase of 21% compared with 2020. About 95% of the stories mentioned FAPESP, while 5% did not.

- **51,457** news stories about FAPESP (+21%):
  - **41,747** carried by **5,787** media outlets in all Brazilian states.
  - **9,710** carried by **3,498** media outlets in **109** countries.
  - **2.817** in **91** major media outlets in terms of circulation or audience share, such as: : UOL (338), Folha.com & FSP (360), Estadao.com & OESP (274), *Valor Econômico* & *Valor* on-line (139), *Portal R7* (126), *Yahoo!* (122), *O Globo* & *O Globo* on-line (118), *G1* (90), BOL (84), *IstoÉ Dinheiro* (77), *IstoÉ* on-line (63), *Folha de Pernambuco* on-line (70), *Estado de Minas* on-line (63), *Correio Braziliense* (62), *CNN* (48), *Portal Exame* (45), *Nexo Jornal* (45), SBT Interior (40), Rádio Jovem Pan (34), *Veja* on-line (32), TV Globo (27), TV Cultura (22) e Rádio CBN (10).

CHART 11 ANNUAL CHANGE IN CITATIONS OF FAPESP NA MÍDIA



Valores atualizados após ajustes de classificação e eliminação de repetições no acervo digital de *clipping* (Sistema FAPESP Na Mídia)

FAPESP NA MÍDIA WEBSITE

Brazilian and foreign media coverage of FAPESP's activities can be seen on the website "FAPESP na Mídia", which contains a searchable catalogue of over **276,800** news stories published since 1999. The site recorded **129,000** unique visitors in 2021. This database serves as the raw material for FAPESP's media coverage statistics and analysis, as well as a daily electronic clipping service for internal use. The cataloguing procedure includes the FAPESP grant numbers corresponding to the research projects mentioned, so that links to the news stories can also be included on the Virtual Library (BV) pages presenting projects and researchers.

COMMUNICATING SCIENCE TO THE PUBLIC

MOST WIDELY CITED OR REPRODUCED NEWS STORIES IN 2021

TABLE 34 BRAZILIAN MEDIA

Top 10 news stories in terms of media coverage

	Title
469	Life experience shapes dogs' interaction with humans (https://agencia.fapesp.br/37138)
423	Researchers innovate in gluten-free bread formulations, creating more palatable and nutritious product (https://agencia.fapesp.br/36371)
374	São Paulo City has more homes and businesses in vertical than horizontal buildings (https://agencia.fapesp.br/36670)
316	Research at USP shows how lack of cleanliness in the kitchen is a health hazard for Brazilians (https://agencia.fapesp.br/37568)
304	FAPESP will support innovative initiatives by young entrepreneurs (https://agencia.fapesp.br/36806)
228	FAPESP, MCTI and CGIBR announce creation of six research centers on artificial intelligence (https://agencia.fapesp.br/35787)
220	Patent filings increase and industry shows weakness (https://revistapesquisa.fapesp.br/depositos-de-patentes-crescem-e-industria-mostra-fraqueza)
208	New findings confirm that impact of extraterrestrial objects produced Colônia crater (https://agencia.fapesp.br/39360)
181	FAPESP and SEBRAE-SP to invest $ PPP 59.3 million in startups (https://agencia.fapesp.br/36414)
143	Drug for pulmonary hypertension may become an option against cancer (https://agencia.fapesp.br/34837)

TABLE 35 FOREIGN MEDIA

Top 10 news stories in terms of media coverage

	Title
217	Vegan and omnivorous diets promote equivalent muscle mass gain, study shows (https://agencia.fapesp.br/35898)
153	Older people with abdominal fat and weak muscles are more likely to develop mobility problems (https://agencia.fapesp.br/36724)
129	Cognitive-behavioral approach to treatment of obesity yields significant results (https://agencia.fapesp.br/35895)
125	Quantum phase transition discovered in a quasi-2D system consisting purely of spins (https://agencia.fapesp.br/36323)
108	Transcranial stimulation enhances beneficial effect of aerobic exercise on gait in Parkinson's patients (https://agencia.fapesp.br/36664)
106	Experiments simulate possible impact of climate change on crabs (https://agencia.fapesp.br/36109)
106	Obese girls face heightened risk of cardiovascular disease in adulthood more often than obese boys (https://agencia.fapesp.br/35838)
90	Researchers propose a method of magnetizing a material without applying an external magnetic field (https://agencia.fapesp.br/36425)
77	Scientists discover electric eels hunting in a group (https://www.eurekalert.org/news-releases/879792)
77	Study explores role of fungi and bacteria in activation of genes associated with head and neck cancer (https://agencia.fapesp.br/35950)

*News stories about COVID-19 are in the page 70. Source: FAPESP Na Mídia system on March 22, 2022.

EVENTS www.fapesp.br/eventos

FAPESP held **101** events streamed online and watched live by **23,066** people. Recordings were posted to YouTube and had been viewed **123,515** times on February 28, 2021.

MOST WATCHED:

"Meeting to clarify new rules for use of funds and reporting of expenditures by grantees", with **2,230** participants online and **12,762** views of the recording; "New report from IPCC WG1-AR6: implications for Brazil and the planet", with **1,370** participants online and **13,206** views of the recording.

FAPESP PORTAL www.fapesp.br

The portal is the main interface between FAPESP and the general public, offering information on rules and regulations, funding lines, scholarship opportunities, agreements, and pages on many programs, events and institutional publications, among other items. It also provides access to other FAPESP sites, such as *Agência FAPESP*, *Pesquisa FAPESP*, *Pesquisa para Inovação*, and FAPESP na Mídia.

The following sites were created in 2021: FAPESP 60 anos (https://60anos.fapesp.br), A FAPESP e os Objetivos de Desenvolvimento Sustentável (https://ods.fapesp.br), Iniciativa de Mentoria para Consolidação da Carreira em Pesquisa – Bolsistas de Pós-Doutorado da FAPESP (https://mentoriapd.fapesp.br), Chamadas em Colaboração (https://fapesp.br/chamadas/colaboracao), Sistema de gerenciamento da submissão de propostas em chamada (https://fapesp.br/calls/tap-its), Evaluation of FAPESP's program (https:fapesp.br/em/evaluation) and Prestação de Contas de Auxílios e Bolsas (https://fapesp.br/prestacaodecontas).

- **16.7 milion** visits to home page and all sites hosted by portal in 2021.

COMMUNICATING SCIENCE TO THE PUBLIC

PUBLICATIONS www.fapesp.br/publicacoes

Editorial production (writing, editing, revising, graphic design and art editing) of books, reports, booklets on the research programs funded by FAPESP and other printed and digital materials.
The number of items published in 2021 totaled 573: the Annual Report on the activities of FAPESP in Portuguese and English, advertisements, folders, booklets, flyers, and specific materials for science diffusion events (invitations, posts, banners, PowerPoint presentations, certificates, visual identities and site headers, among others).

VIRTUAL LIBRARY (BV) www.bv.fapesp.br

- 4,098,986 unique visits to the site in 2021.
- 6,628,089 views in the year.
- 262,684 records on grants, scholarships and fellowships funded by FAPESP between 1992 and 2020.
- 39,500 records on research projects available in the retrospective database (1962-91).
- More than 177,000 scientific and academic publications associated with research projects funded by FAPESP.
- 553 projects funded by FAPESP indexed by the International Alzheimer's and Related Dementias Research Portfolio (IADRP), created by the US National Institutes of Health (NIH) to index research projects supported by public and private funders worldwide.
- Page on COVID-19 with information referring to approximately 530 scholarships and research grants awarded by FAPESP and links to scientific publications on the subject issued globally by several publishers.
- Page indexing projects supported by FAPESP to UN's 17 Sustainable Development Goals (SDGs).

Sources: Google Analytics, IADRP Database, Relatório de Registros da BV (BV/Sistema Administrador), Base Retrospectiva de Projetos de Pesquisa com Apoio FAPESP, 1962-1991.

INDICATORS OF SCIENCE, TECHNOLOGY AND INNOVATION IN SÃO PAULO

www.fapesp.br/indicadores

In 2021, the Studies and Indicators Unit (GEI) executed the following activities:

PRIMARY DATA PRODUCTION

- Second collection of information regarding expenditure on R&D and personnel dedicated to R&D in São Paulo State for 2020.
- Survey of companies supported under the Innovative Research in Small Business Program (PIPE).

UPDATING AND ORGANIZATION OF SECONDARY DATA

- Updating and organization of microdata from National Industrial Property Institute (INPI) for invention patent applicants and applications.
- Updating and organization of microdata from CAPES for faculty and students in graduate studies programs throughout Brazil.
- Organization of FAPESP's administrative records for use in calculating ST&I indicators.
- Organization of information on public funding for R&D.

ORGANIZATION OF REGISTRATION DATABASES

- Higher education and research institutions in the São Paulo State ST&I System.
- Companies funded by PIPE.

ACTIVITIES RELATING TO TECHNICAL COOPERATION AGREEMENTS

- INPI – study entitled "Patents in São Paulo: applications, applicants and partnerships"
- SEADE Foundation – estimate of value of R&D activities using IBGE's national accounts methodology for calculating gross capital formation in São Paulo State.
  – Assessment of comparability of traditional and continuous National Household Sample Survey (PNAD) for calculating human resources dedicated to science and technology, in accordance with Canberra Manual.
- CNPq – extraction of data from Lattes platform.
- Department of Planning and Administration – exchange of information on funding, execution and results of scientific and technological research projects conducted in São Paulo State and activities of common interest.
- Embrapii – exchange of information and activities of common interest
- Ministry of Labor and Social Security – access to identified data in RAIS employment report database (under discussion).

ROUTINE ACTIVITIES OF GEI

- Production of studies for Data section published monthly in *Pesquisa FAPESP* magazine.
- Development and updating of FAPESP's indicator site, in collaboration with Communication Unit
- Response to FAPESP's internal requests.

ADMINISTRATION AND REPRESENTATION

- CONFAP-CRIS Program: representation of FAPESP in working group responsible for technical studies on ST&I indicators, under current research information system (CRIS) program run by National Council of Research Funding Agencies (CONFAP).
- Participation in working group on database sharing to advise FAPESP's Executive Committee (CTA) on the identification and evaluation of databases and information systems of common interest to its different areas and promote sharing of the data concerned.
- Monitoring of the results of Program 1044 – Development of Science and Technology, and its six deliverables, in accordance with the state's 2020-23 Multiyear Plan and Budget Laws.

OTHER ACTIVITIES

- Production of terms of reference and collection of information for FAPESP 60 Years studies.

CHAPTER

4

FAPESP 60 YEARS

FAPESP 60 YEARS

START OF COMMEMORATIONS OF FAPESP'S 60TH ANNIVERSARY

Commemorations leading up to FAPESP's sixtieth anniversary began with several initiatives launched during 2021. FAPESP officially began operating on May 23, 1962. .

The website "FAPESP and the Sustainable Development Goals" (**https://ods.fapesp.br**) launched on May 27, 2021, indexes the portfolio of programs and projects supported by FAPESP to each of the 17 SDGs with the aim of facilitating access to these programs and projects and as a contribution to public policy in the areas concerned. The FAPESP 60 Years Portal (**https://60anos.fapesp.br**), unveiled in June, indexes all initiatives associated with the commemorations.

On May 23, 1962, São Paulo State Governor Carlos Alberto de Carvalho Pinto signed Decree 40,132 approving FAPESP's bylaws and authorizing it to start operating immediately

FAPESP 60 YEARS CONFERENCES

June 2021 saw the launch of a series of Seventeen FAPESP 60 Years Conferences (**https://60anos.fapesp.br/conferencias**), to be held monthly with leading researchers from Brazil and abroad in discussions of strategic topics and well-founded reflection on the future.

Seven conferences were held in 2021 and ten were scheduled for 2022.

Ronaldo Pilli, Vice President of FAPESP, was responsible for programming the conferences, with the support of two groups of researchers in different knowledge areas. Led by Pilli, the groups began planning two FAPESP 60 Years Schools for August 2022 – one in Exact, Natural and Life Sciences, and the other in Humanities, Social Science and the Arts.

GROUP 1

Vanderlan Bolzani, President, São Paulo State Academy of Sciences (ACIESP)

Adriano Andricopulo, Executive Director, ACIESP

Helena Bonciani Nader, Vice President, Brazilian Academy of Sciences (ABC)

Vanderlei Salvador Bagnato, Physics Institute, University of São Paulo (USP), São Carlos

Euclides de Mesquita Neto, School of Mechanical Engineering, State University of Campinas (FEM-UNICAMP)

Oswaldo Luiz Alves (deceased July 10, 2021), Chemistry Institute, IQ-UNICAMP

GROUP 2

Marco Lucchesi, President, Brazilian Academy of Letters (ABL)

Angela Maria Alonso, Brazilian Center for Analysis and Planning (CEBRAP)

Marta Arretche, School of Philosophy, Letters and Human Sciences, FFLCH-USP

Eduardo Victorio Morettin, School of Communications and Arts, ECA-USP

Claudia Toni, USP

START OF COMMEMORATIONS OF FAPESP'S 60TH ANNIVERSARY

CONFERENCES

https://60anos.fapesp.br/conferencias

SCIENCE AND DIPLOMACY
June 29, 2021
Keynote speaker: Celso Lafer, a former President of FAPESP

CLIMATE CHANGE AND BIODIVERSITY
July 21, 2021
Keynote speaker: Carlos Joly (UNICAMP), Mercedes Bustamante (University of Brasília – UnB), Paulo Artaxo (USP)
Moderator: Ronaldo Pilli

VIOLENT SOCIETIES
August 18, 2021
Keynote speaker: Donatella dela Porta (Scuola Normale Superiore, Florence), Sérgio Adorno (USP), Michel Misse (Federal University of Rio de Janeiro – UFRJ)
Moderator: Angela Alonso

GLOBAL HEALTH CHALLENGES
September 22, 2021
Keynote speaker: Andrea Dessen (CNRS), Ester Sabino (USP), Arnaldo Colombo (Federal University of São Paulo – UNIFESP)
Moderator: Helena Nader

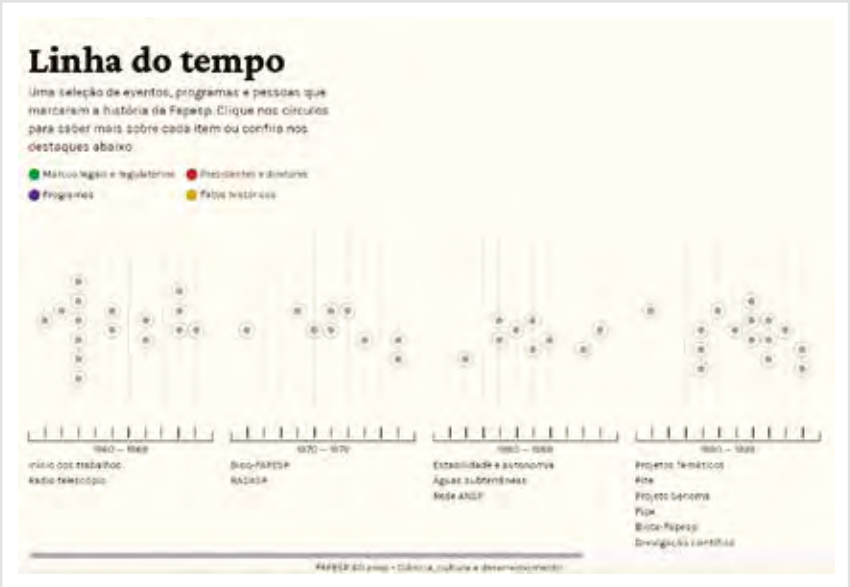
USE OF EVIDENCE AND DATA TO IMPROVE EDUCATION IN BRAZIL
October 20, 2021
Keynote speaker: Rossieli Soares (São Paulo State Education Secretary), Simon Schwartzman (Casa das Garças), Roberto Lent (UFRJ)
Moderator: Mozart Ramos Neves, Board of Trustees, FAPESP

NEGLECTED DISEASES: MEDICINAL CHEMISTRY AND NATURAL PRODUCTS
November 17, 2021
Keynote speaker: Glaucius Oliva (USP), Sir Mike Ferguson (University of Dundee), Jon Clardy (Harvard University)
Moderator: Adriano Andricopulo

CULTURAL HERITAGE: ADMINISTRATION AND PUBLIC POLICY
December 8, 2021
Keynote speaker: Carlos Augusto Machado Calil (USP), Nivaldo Vieira de Andrade Júnior (Federal University of Bahia – UFBA)
Moderator: Renata Vieira da Motta (International Council of Museums – ICOM/Brazil).

TIMELINE

Events, programs and people who made the history of FAPESP are shown on a timeline to highlight the key milestones of these 60 years.



THE STATE OF THE ART IN SCIENCE IN SÃO PAULO

On December 9, 2021, also to commemorate FAPESP's sixtieth anniversary, the São Paulo State Academy of Sciences (ACIESP) held the first of a series of meetings with researchers from across the state for a critical analysis of the state of the art in science in São Paulo and above all a look ahead to the next two decades. The discussion and conclusions will be summarized in seven chapters of *O estado da arte da ciência em São Paulo em sintonia com o desenvolvimento brasileiro e mundial* ("State of the Art in Science in São Paulo in Step with Brazilian and World Development"), a book to be published in 2022 after completion of the webinar cycle on Science in the Nation's Development.

FAPESP 60 YEARS: SCIENCE, CULTURE AND DEVELOPMENT

The introduction and the first of ten digital installments of the book *FAPESP 60 anos – Ciência, Cultura e Desenvolvimento* (**https://60anos.fapesp.br/livro**). were published on July 27, 2021. Edited by Carlos Vogt, a former President of FAPESP and a former Rector of the State University of Campinas (UNICAMP), the book recounts FAPESP's activities in the six decades since its inception and the achievements of researchers in São Paulo State.

The first six digital installments were published between July and December 2021 and the last four between January and May 2022. A print edition of the book was published on May 23, 2022.

INSTALLMENTS

JULY 22, 2021

INTRODUCTION – Muito prazer, FAPESP ("How do you do, FAPESP")
A brief account of FAPESP's history, its modus operandi, funding strategies and modes, and how research contributes concrete results to society.

INSTALLMENT 1 – Seis décadas de realizações ("Six decades of achievements)
FAPESP's contributions to the social, environmental and economic development of São Paulo State. Investment, projects, scientific production and more in numbers. Foreword by Marco Antonio Zago entitled "FAPESP, heritage of the people of São Paulo".

AUGUST 20, 2021

INSTALLMENT 2 – DNA da ciência paulista ("DNA of São Paulo's science")
Articles by Professor José de Souza Martins (University of São Paulo – USP) and Professor Vanderlan Bolzani (São Paulo State University – UNESP), both members of FAPESP's Board of Trustees, and three articles showing how FAPESP sowed the seeds of science culture in São Paulo, with nationwide repercussions.

(continue...)

INSTALLMENTS

SEPTEMBER 24, 2021

INSTALLMENT 3 – Pioneirismo digital ("Digital pioneer")
Articles by Demi Getschko, Head of NIC.br, and João Carlos Salles, Professor of Philosophy and Rector of the Federal University of Bahia (UFBA), as well as three pieces on the first international link between FAPESP and the Fermi National Accelerator Laboratory (Fermilab) in Maryland (USA), and the latest research in artificial intelligence.

OCTOBER 22, 2021

INSTALLMENT 4 – Grandes projetos, grandes resultados ("Grand projects, grand results")
The groundbreaking Biochemistry Development Program (Bioq-FAPESP), launched in 1971. The establishment of Research, Innovation and Dissemination Centers (RICDs), starting in 2000. The Genome Project, launched in 1977. Thematic and special programs that increased the impact of collaborative research and long-term funding on the advancement of science in São Paulo. Articles on how science serves society by Paulo Artaxo, a professor at USP's Physics Institute and a member of the steering committee for the FAPESP Research Program on Global Climate Change (RPGCC), and on knowledge creation and transfer by Marta Arretche, a professor at USP's School of Philosophy, Letters and Human Sciences and a former director of the Center for Metropolitain Studies (CEM).

NOVEMBER 26, 2021

INSTALLMENT 5 – Políticas públicas baseadas em evidência ("Evidence-based public policy")
Accounts of several initiatives by FAPESP to build a dialogue between science and government based on concrete social needs, such as RIDCs, BIOTA, BIOEN, and the Public Policy Research Program (PPP) implemented more than 20 years ago, with investment of $ PPP 12.7 million in studies of the immunogenicity and safety of CoronaVac, the vaccine produced by Butantan Institute in partnership with Chinese biopharmaceutical company Sinovac. Articles by Olival Freire Júnior, a professor at UFBA's Physics Institute, and Helena Nader, a professor at UNIFESP and former Vice President of the Brazilian Academy of Sciences (ABC).

DECEMBER 20, 2021

INSTALLMENT 6 – Contribuição social, cultural e artística ("Social, cultural and artistic contributions")
Articles on FAPESP's initiatives to support infrastructure for culture grounded in the idea that science is "any rationally systematized and justified body of knowledge obtained by methodical observation, experimentation and reasoning", as stated in its Code of Good Scientific Practice. One of the articles is "The humanities can improve the human sciences" by Renato Janine Ribeiro, a professor at USP, President of the Brazilian Society for the Advancement of Science (SBPC) and former education minister. Another is "Disobedience is necessary" by Giselle Beiguelman, a professor at USP's School of Architecture and Urbanism.

CHAPTER

5

OVERVIEW OF SCHOLARSHIPS, FELLOWSHIPS AND GRANTS

The preceding chapters present indicators according to a segmentation based on funding strategies.

This chapter presents the same data in a manner that provides an overview of total disbursement, new scholarships, fellowships and grants of all types contracted for in 2021, and a breakdown by funding strategy.

OVERVIEW OF SCHOLARSHIPS/FELLOWSHIPS

TABLE 36 SCHOLARSHIPS/FELLOWSHIPS[1] – DISBURSEMENT IN 2021 ($ PPP)

By types or program and funding strategies

Types \ Funding strategies	Trainning of Human for Research	Basic and Applied Research		Research for Innovation	Research on Strategic Themes	Support for Research Infrastructure	Total [1]
		Long Term	Regular Grants				
Regular Scholarships/Felloships	61,813,197	58,301,053	1,712,139	2,461,319	6,853,982	41,737	131,183,427
Scientific Initiation (SI)	6,073,195	1,564,035		65,469	138,111		7,840,810
Master's (MS)	5,641,578	2,847,702		184,102	356,290		9,029,672
Doctorate (DR)	24,243,385	9,953,128		398,904	1,045,896		35,641,313
Direct Doctorate (DD)	4,645,001	5,641,722		91,263	383,452		10,761,438
Postdoctorate (PD)	21,210,038	38,294,466	1,712,139	1,721,581	4,930,233	41,737	67,910,194
Regular Scholarships/ Fellowships Abroad	8,094,742	5,659,680	46,372	127,184	678,123		14,606,101
Research Fellowships Abroad (RFE) - PD	1,630,757	113,319			10,117		1,754,193
Research Internships Abroad (RIA)	6,463,985	5,546,361	46,372	127,184	668,006		12,851,908
RIA - SI	87,073	27,950			35,787		150,810
RIA - MS	401,664	120,013		3,870	12,315		537,862
RIA - DR	2,877,886	1,372,886			203,984		4,454,756
RIA - DD	653,236	693,605		1,726	70,207		1,418,774
RIA - PD	2,444,126	3,331,907	46,372	121,588	345,713		6,289,706
Subtotal	**69,907,938**	**63,960,733**	**1,758,511**	**2,588,503**	**7,532,105**	**41,737**	**145,789,527**
Fellowships – Trainning		2,389,191	1,512,422	4,149,171	816,746	11,657	8,879,187
Fellowships – Technical Trainning		2,258,838	1,512,422	4,149,171	770,032		8,690,463
Fellowships – Scientific Journalism		130,353			46,714	11,657	188,724
Research Fellowships (Programs)		3,022,974		5,225,452	572,625		8,821,051
PE Fellowships				5,225,452	8,990		5,234,442
Public Education Fellowships		12,493			96,514		109,007
Young Investigator Fellowships		3,010,481			195,597		3,206,078
BIOEN Fellowships					79,470		79,470
BIOTA Fellowships					29,802		29,802
Global Climate Change Fellowships					105,960		105,960
eScience Fellowships					56,292		56,292
Total	**69,907,938**	**69,372,898**	**3,270,933**	**11,963,126**	**8,921,476**	**53,394**	**163,489,765**

(1) Encompasses all scholarships and fellowships, both associated and unassociated with grants. Small differences in subtotals may occur due to rounding.

TABLE 37 SCHOLARSHIPS/FELLOWSHIPS[1] – NUMBER OF PROJECTS CONTRACTED FOR IN 2021

By types or program and funding strategies

Types \ Funding strategies	Trainning of Human for Research	Basic and Applied Research		Research for Innovation	Research on Strategic Themes	Support for Research Infrastructure	Total
		Long Term	Regular Grants				
Regular Scholarships/Felloships	**2,219**	**12**	**1,097**	**64**	**116**		**3,508**
Scientific Initiation (SI)	1.419		391	11	40		1,861
Master's (MS)	286		133	10	19		448
Doctorate (DR)	275		119	12	11		417
Direct Doctorate (DD)	58		112	7	12		189
Postdoctorate (PD)	181	12	342	24	34		593
Regular Scholarships/ Fellowships Abroad	**277**	**0**	**157**	**7**	**13**		**454**
Research Fellowships Abroad (RFE) - PD	42		1		1		44
Research Internships Abroad (RIA)	235	0	156	7	12		410
RIA - SI	10		4		3		17
RIA - MS	32		13	2	1		48
RIA - DR	119		53		3		175
RIA - DD	23		20	2	3		48
RIA - PD	51		66	3	2		122
Subtotal	**2,496**	**12**	**1,254**	**71**	**129**		**3,962**
Fellowships – Trainning		**287**	**223**	**308**	**103**	**1**	**922**
Fellowships – Technical Trainning		287	214	307	98		906
Fellowships – Participation Course				1			1
Fellowships – Scientific Journalism			9		5	1	15
Research Fellowships (Programs)			27	134	22		183
PE Fellowships				134	2		135
Public Education Fellowships			4		17		44
Young Investigator Fellowships			23		1		24
BIOTA Fellowships					1		1
Global Climate Change Fellowships					1		1
Total	**2,496**	**299**	**1,504**	**513**	**254**	**1**	**5,067**

(1) Encompasses all scholarships and fellowships, both associated and unassociated with grants.

OVERVIEW OF GRANTS

TABLE 38 GRANTS – DISBURSEMENT IN 2021 ($ PPP)

By types or program and funding strategies

Types \ Funding strategies	Basic and Applied Research		Research for Innovation	Research on Strategic Themes	Support for Research Infrastructure	Communicating Science to the Public	Total
	Long-term research	Regular Grants not associated to other grants					
Research Grants – Regular[3]	2,007,671	45,544,960	25,557	37,135		6,740,906	54,356,229
Research Grants	102,581,117		22,197,443	17,096,304	40,405,973	186,303	182,467,139
Thematic	51,439,260						51,439,260
Special Projects	22,464,199					186,303	22,650,502
SPEC	783,145						783,145
Young Investigators – Phase 1	11,580,797			507,494			12,088,291
Young Investigators – Phase 2	2,375,716			64,451			2,440,167
RIDC's	13,937,999						13,937,999
PITE			1,317,971				1,317,971
PIPE			16,028,392				16,028,392
ERC/ARC			4,757,415				4,757,415
Intellectual Property (PAPI-Nuplitec)			93,665				93,665
BIOTA				2,595,857			2,595,857
BIOEN				1,856,536			1,856,536
Global Climate Change				2,384,598			2,384,598
eScience/Data Science				304,277			304,277
Institutional Development Plan for State Research Institutions (PDIp)				2.535,758			2,535,758
Public Policies (PPP)				6,626,618			6,626,618
Public Education				53,977			53,977
Science for Development Centers				166,738			166,738
Multi-user Equipment					11,160,531		11,160,531
Equipment Repair					1,600,608		1,600,608
REDNESP					6,669,783		6,669,783
Overhead – Institutional Research Infrastructure					16,910,298		16,910,298
Overhead – Program Coordinator					239,182		239,182
Overhead – REDNESP					3,825,571		3,825,571
Research Grants Subtotal	**104,588,788**	**45,544,960**	**22,223,000**	**17,133,439**	**40,405,973**	**6,927,209**	**236,823,368**
Innovation Districts (FIPE)			59,289				59,289
Others (contracts)						148,945	148,945
Total	104,588,788	45,544,960	22,282,289	17,133,439	40,405,973	7,076,154	237,031,602

[3] Regular research grants comprise Research Grants – Regular, Grants for Meeting Organization, Grants for Participation in Meetings, Publication Grants, and Visiting Researcher Awards. Small differences in subtotals may occur due to rounding.

TABLE 39 GRANTS – NUMBER OF PROJECTS CONTRACTED FOR IN 2021

By types or program and funding strategies

Types \ Funding strategies	Basic and Applied Research		Research for Innovation	Research on Strategic Themes	Support for Research Infrastructure	Communicating Science to the Public	Total
	Long-term research	Regular Grants not associated to other grants					
Research Grants – Regular[4]	23	1,039		7		2	1,071
Research Grants	114		243	56	272		685
Thematic	60						60
Young Investigators – Phase 1	35						35
Young Investigators – Phase 2	19						19
PITE			15				15
PIPE			219				219
ERC/ARC			4				4
Intellectual Property (PAPI-Nuplitec)			1				1
BIOTA				21			21
BIOEN				11			11
Global Climate Change				6			6
eScience/Data Science				1			1
Public Policies (PPP)				10			10
Public Education				2			2
Science for Development Centers				5			5
Multi-user Equipment			4		59		63
Equipment Repair					89		89
REDNESP					1		1
Overhead – Institutional Research Infrastructure					116		116
Overhead – Program Coordinator					4		4
Overhead – REDNESP					3		3
Total	137	1,039	243	63	272	2	1,756

[4] Regular research grants comprise Research Grants – Regular, Grants for Meeting Organization, Grants for Participation in Meetings, Publication Grants, and Visiting Researcher Awards.

CHAPTER

6

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

- Institutional funding instruments
- Partnerships with higher education and research institutions
- Research funding agencies and bodies
- Companies
- Most frequent destinations and origins of scholarship/fellowship awardees in 2021
- FAPESP Week
- Map of cooperation with funding agencies and academic organizations
- Map of research collaboration with companies

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

FAPESP promotes research collaboration in Brazil and abroad to strengthen and broaden the domestic and global impact of the science produced in São Paulo State.

As well as fostering collaboration by means of institutional instruments in a continuous flow, FAPESP enters into co-funding agreements with higher education and research institutions, funders, and companies.

Some agreements require the partner organization to transfer its share of the funding to FAPESP in order for disbursement to happen. Others call for the partner to transfer its share of funding directly to the institution that will host the research project supported. The amounts transferred are detailed in Tables 53 and 53a at **www.fapesp.br/relatorio2021**.

In 2021, FAPESP supported 2,554 collaborative research projects: 1,947 were co-funded, with FAPESP contributing $ PPP 37.5 million – and 607 were funded solely by FAPESP, for a total of $ PPP 15.8 million.

TABLE 40

DOMESTIC AND INTERNATIONAL PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

Disbursement, number of active projects and new projects contracted in 2021, including scholarships/fellowships and grants associated

Collaborative research/ type partner organization	Disbursement from FAPESP ($ PPP)	Active projects	New project contracted
Institutional funding instruments[1]	15,779,070	607	526
Higher education and research institutions[2]	2,031,214	207	37
Research funding agencies[3]	26,509,577	1,466	395
Companies[4]	8,991,579	274	109
Total	**53,311,440**	**2,554**	**1,067**

(1) Disbursement by FAPESP for projects funded via continuous flow institutional instruments, in Brazil and abroad.
(2) Disbursement by FAPESP for projects co-funded by higher education institutions and scientific and technological research institutions.
(3) Disbursement by FAPESP for projects co-funded by international and multilateral funding agencies and by domestic partners: CAPES, CNPq, FINEP, MCTIC, FAPs, APAE, FMCSV, São Paulo State Department of Government, EMBRAPII and SEADE.
(4) Disbursement by FAPESP for projects co-funded by Brazilian and foreign companies.

INSTITUTIONAL FUNDING INSTRUMENTS

In 2021, FAPESP disbursed $ PPP 15.8 million to fund 607 projects supported by its institutional funding instruments. Out of this total, $ PPP 14.7 million went to Research Internships Abroad (RIA) ranging from scientific initiation to postdoctoral, and Research Fellowships Abroad (RFA) at the postdoctoral level; grants to fund visits by researchers from abroad to São Paulo to deliver courses or contribute to research groups; and grants to fund participation by researchers from São Paulo in scientific meetings held abroad.

Funding for visits by researchers from other parts of Brazil and participation in or organization of scientific meetings in Brazil accounted for a further $ PPP 1.1 million.

TABLE 41

CONTINUOUS FLOW INSTITUTIONAL INSTRUMENTS (PROJECTS FUNDED SOLELY BY FAPESP)

Disbursement, number of active projects and new projects contracted in 2021, including scholarships/fellowships and grants associated

Funding Strategies	Disbursement $ PPP	Active projects	New projects contracted
Domestic scientific exchange	**1,073,718**	**71**	**53**
Basic and Applied Research	1,067,350	70	52
Research on Strategic Themes	6,368	1	1
Cross-border scientific exchange	**14,705,352**	**536**	**473**
Training of Human Resources for Research	7,993,182	312	277
Basic and Applied Research	5,906,863	199	175
Research on Strategic Themes	678,123	22	13
Research for Innovation	127,184	3	8
Total	**15,779,070**	**607**	**526**

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

PARTNERSHIPS WITH HIGHER EDUCATION AND RESEARCH INSTITUTIONS

FAPESP has stepped up research collaboration by issuing joint calls for proposals with higher education and research institutions in Brazil and abroad. Research funding is shared between the parties in these cases. In 2021, 108 cooperation agreements – three signed in the year – were active with 105 foreign and three domestic institutions, and 207 projects with 48 foreign institutions were in progress under these agreements. Most involved Regular Research Grants, and 37 were contracted for during the year. FAPESP's contribution to the funding for projects executed under these agreements amounted to $ PPP 2 million, with partner institutions contributing matching amounts. A list of partners and a map showing their locations on all continents can be found on pages 166-169.

TABLE 42

PARTNERSHIPS WITH HIGHER EDUCATION AND RESEARCH INSTITUTIONS, BY FUNDING STRATEGY

Disbursement, number of active projects and new projects contracted in 2021, including scholarships/fellowships and grants associated

Funding Strategies	Disbursement $ PPP	Active projects	New projects contracted
Cross-border partnerships			
Basic and Applied Research	1,955,750	188	37
Research on Strategic Themes	75,464	15	0
Research for Innovation	0	4	0
Total	**2,031,214**	**207**	**37**

RESEARCH FUNDING AGENCIES

In 2021, 102 research co-funding agreements with other agencies and funders were active. Four were signed during the year; 55 of the agreements were with foreign funders and 22 with Brazilian funders, while 18 agreements were with multilateral agencies, and seven with domestic research funding associations.

Among the 102 co-funding agreements, 75 (43 cross-border and 32 local) resulted in support for 1,466 projects, mainly via Research Grants – Regular (381), Thematic Projects (86), Regular Scholarships and Fellowships in Brazil (481), and Technical Training Fellowships (315), most of which were aligned with the strategies Training of Human Resources for S&T and Research for Knowledge Advancement.

In Brazil, FAPESP's main partners are CAPES, the Ministry of Education's Higher Research Council, which supplies funding for FAPESP to award master's to postdoctoral scholarships and fellowships; FINEP, the Brazilian Innovation Agency, for joint maintenance of the PIPE/PAPPE Grant and Tecnova programs; and the National Council for Scientific and Technological Development (CNPq), in federal initiatives in São Paulo State such as National Institutes of Science and Technology (NISTs), Research for the SUS (PPSUS), the Long-Term Ecological Research Program (LTER), and the Training in Taxonomy Program (Protax), among others.

In the same period, the agreement with the Ministry of Science, Technology and Innovation (MCTI) and the Brazilian Internet Steering Committee (CGI.br) to support research projects that contribute to the development of the internet in Brazil remained in effect.

FAPESP also supported research projects in partnership with several state research foundations (FAPs), SEADE Foundation, Jô Clemente Institute (ex-APAE), the São Paulo State Government (via the Pitch Gov program to help startups develop solutions for the public sector), the Brazilian Industrial Research and Innovation Corporation (Embrapii), and the São Paulo State Department of Infrastructure and Environment (SIMA).

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

FAPESP's share of total investment under co-funding agreements with foreign partners amounted to $ PPP 12.5 million, and under agreements with domestic agencies it contributed, $ PPP 14.1 million. To effect disbursement the partners transferred $ PPP 5 million to FAPESP (see Tables 53 and 53a at **www.fapesp.br/relatorio2021**). Under the agreements calling for direct transfer of funds to the institutions hosting the projects supported, FAPESP and its partners disbursed similar amounts.

A list of partners and a map showing where the organizations are located on all continents can be seen on pages 166-169.

TABLE 43

PARTNERSHIPS WITH FUNDING AGENCIES, BY FUNDING STRATEGY

Disbursement, number of active projects and new projects contracted in 2021, including scholarships/fellowships and grants associated

Funding strategies	Disbursement $ PPP	Active projects	New projects contracted
Domestic partnerships	**14,071,503**	**885**	**232**
Basic and Applied Research	10,077,431	533	169
Training of Human Resources for Research	1,578,455	141	0
Research for Innovation	1,181,500	105	27
Research on Strategic Themes	1,234,117	91	35
Support for Research Infrastructure	0	15	1
Cross-border partnerships	**12,438,074**	**581**	**163**
Basic and Applied Research	9,759,073	469	134
Training of Human Resources for Research	101,405	3	0
Research for Innovation	270,362	12	2
Research on Strategic Themes	2,307,234	97	27
Total	**26,509,577**	**1,466**	**395**

COMPANIES

In 2021, 37 companies funded scientific and technological research under the aegis of FAPESP's programs. Ten of these set up 12 Engineering Research Centers (ERCs) in partnership with FAPESP and higher education and research institutions. The fourteenth center, for research on early childhood development, was established with a social organization – Maria Cecilia Souto Vidigal Foundation.

FAPESP allocated $ PPP 7.2 million to 203 projects ongoing in 2021 by the 14 ERCs/ARCs – $ PPP 4.7 million for centers with local partners and $ PPP 2.6 million for centers with foreign partners.

The ERC/ARC Program requires partner companies to match FAPESP's investment in funding during the life of the agreement, while host institutions match both in the form of laboratory and other infrastructure, salaries for researchers and support personnel etc.

In addition, 28 other companies are co-funding research via the PITE program. In 2021, 71 projects were ongoing for a total of $ PPP 1.7 million and 34 newly contracted for in the two modalities of the program, PITE Agreements and PITE Spontaneous Demand (see *p. 104*).

FAPESP's percentage share of PITE co-funding depends on the degree of innovation in the proposals and the associated technological risks, ranging from 20% to 70% of the budget.

A list of co-funding companies can be seen on pages 168-169.

TABLE 44

PARTNERSHIPS WITH DOMESTIC AND FOREIGN COMPANIES, BY FUNDING STRATEGY

Disbursement, number of active projects and new projects contracted in 2021, including scholarships/fellowships and grants associated

Funding strategies	Disbursement $ PPP	Active projects	New projects contracted
Research for Innovation – Local partnerships	**6,429,638**	**225**	**91**
ERC/ARC	4,686,602	154	57
PITE Agreements	521,118	53	27
PITE Spontaneous Demand	1,221,918	18	7
Research for Innovation – Foreign partnerships	**2,561,941**	**49**	**18**
ERC/ARC	2,558,072	49	18
PITE Agreements	3,869	0	0
Total	**8,991,579**	**274**	**109**

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

DISBURSEMENT BY FAPESP AND PARTNER COMPANIES FOR ERC/ARC AND PITE PROGRAMS – 2021

In 2021, three new ERCs began operating, in partnership with the following institutions:

ERC	Partner company	Partner HE/research institution
Center for Research in Immuno-Oncology (CRIO)	GlaxoSmithKline	Albert Einstein Jewish Institute for Education and Research (IIEP)
Brazilian Center for Applied Research on Early Childhood (CPAPI)	Maria Cecilia Souto Vidigal Foundation	Education and Research Institute (INSPER)
Plasticulture Research Center	Braskem	Interdisciplinary Energy Planning Unit (NIPE), State University of Campinas (NIPE-UNICAMP)

Over the next ten years, investment in the four new centers is projected to reach $ PPP 39.5 million, of which $ PPP 10.8 million will be disbursed by FAPESP and $ PPP 7.8 million by the partner companies, with $ PPP 1.4 million coming from other sources, and the higher education and research institutions contributing $ PPP 19.6 million in researchers' and technicians' salaries, facilities, equipment and infrastructure.

Also in 2021, ERC grants were renewed for the Center of Excellence in New Target Discovery (CENTD), a partnership with Butantan Institute and GlaxoSmithKline; and for the Research Center on Greenhouse Innovation (RCGI), a partnership with the University of São Paulo's Engineering School (POLI-USP) and BG E&P Brazil (part of the Shell group), in which all parties plan to invest a total of $ PPP 74.1 million.

In 2021, 14 ERCs were up and running under agreements with ten companies and a social organization: Braskem, EMBRAPA, Equinor (formerly Statoil), GSK (3), São Martinho Group, IBM, Koppert, SANASA, Shell (2, with four research divisions), Peugeot Citröen, and Maria Cecilia Souto Vidigal Foundation.

FAPESP's disbursement for ERCs and ARCs totaled $ PPP 7.2 million in 2021, while the companies concerned invested $ PPP 7.2 million and the host institutions contributed $ PPP 14.5 million, taking the estimated total investment to $ PPP 28.9 million.

Six ARCs in Artificial Intelligence were selected in a joint call with the Ministry for Science, Technology and Innovation (MCTI) and the Brazilian Internet Steering Committee (CGI.br). Two began operating in 2021 and will receive investments totaling $ PPP 34.7 million in the next ten years (*p. 101*).

Under the aegis of the PITE program, 4 companies transferred to FAPESP a total of $ PPP 189,000 as their share in disbursement for projects: Agilent, IBM Brazil, Microsoft and SABESP (see Tables 53 and 53a at: www.fapesp.br/relatório2021). The rest transferred funds directly to the host institutions.

FAPESP WEEK

FAPESP Week did not take place in 2020 or 2021 because of the COVID-19 pandemic. Since 2011, FAPESP Week scientific symposia have helped create an environment for scientific collaboration between Brazilian and foreign researchers with shared or complementary interests.

FAPESP WEEK HELD – 2011 TO 2019

2011 — **UNITED STATES** – Washington, D.C.

2012 — **CANADA** Toronto — **SPAIN** Salamanca, Madri — **UNITED STATES** Washington, D.C., Morgantown (West Virginia) and Cambridge (Massachusetts)

2013 — **UNITED STATES** Charlotte, Chapel Hill and Raleigh (North Carolina) — **ENGLAND** London — **JAPAN** Tokyo

2014 — **GERMANY** Munik — **CHINA** Beijing — **UNITED STATES** Berkeley and Davis (California)

2015 — **ARGENTINA** Buenos Aires — **SPAIN** Barcelona — **BRAZIL** São Paulo

2016 — **UNITED STATES** – Michigan and Ohio — **URUGUAY** – Montevideu

2017 — **UNITED STATES** – Nebraska and Texas

2018 — **BELGIUM** Brussels, Liège, Lovaina — **UNITED STATES** – New York

2019 — **ENGLAND** – London — **FRANCE** – Lyon, Paris

MOST FREQUENT DESTINATIONS AND ORIGINS IN 2021

DESTINATIONS OF 410 RIA AWARDEES

Europe	252
North America	146
Latin American and Caribe	10
Asia	2

DESTINATIONS OF 44 RFA AWARDEES

North America	23
Europe	21

PARTICIPATION IN 12 SCIENTIFIC MEETINGS

Europe	9
Oceania	2
Latin American and Caribe	1

ORIGINS OF 7 VISITING RESEARCHERS

Europe	3
North America	2
Latin American and Caribe	1
Asia	1

PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

FUNDING AGENCIES AND ACADEMIC ORGANIZATIONS

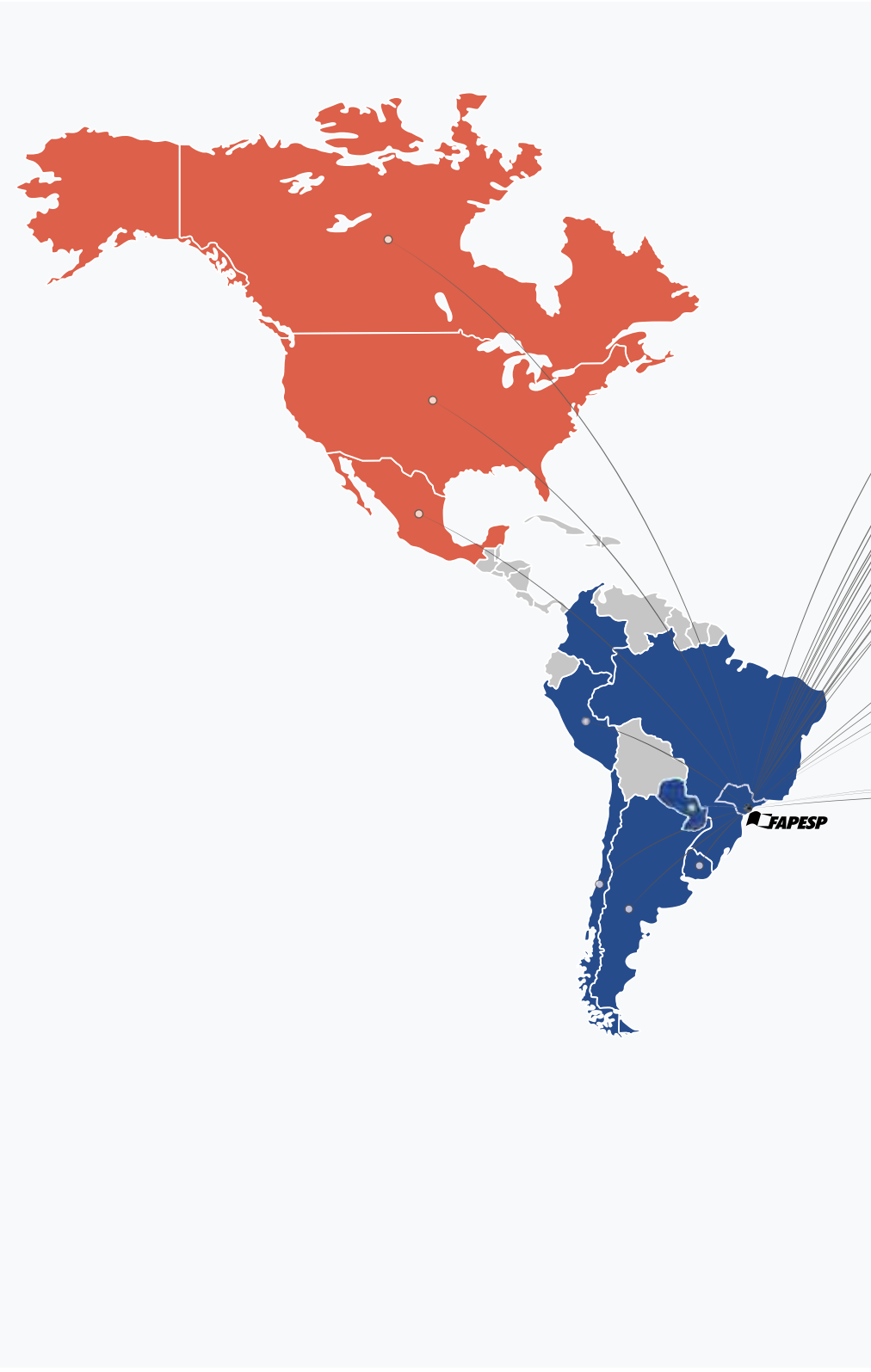
ACADEMIC ORGANIZATIONS:

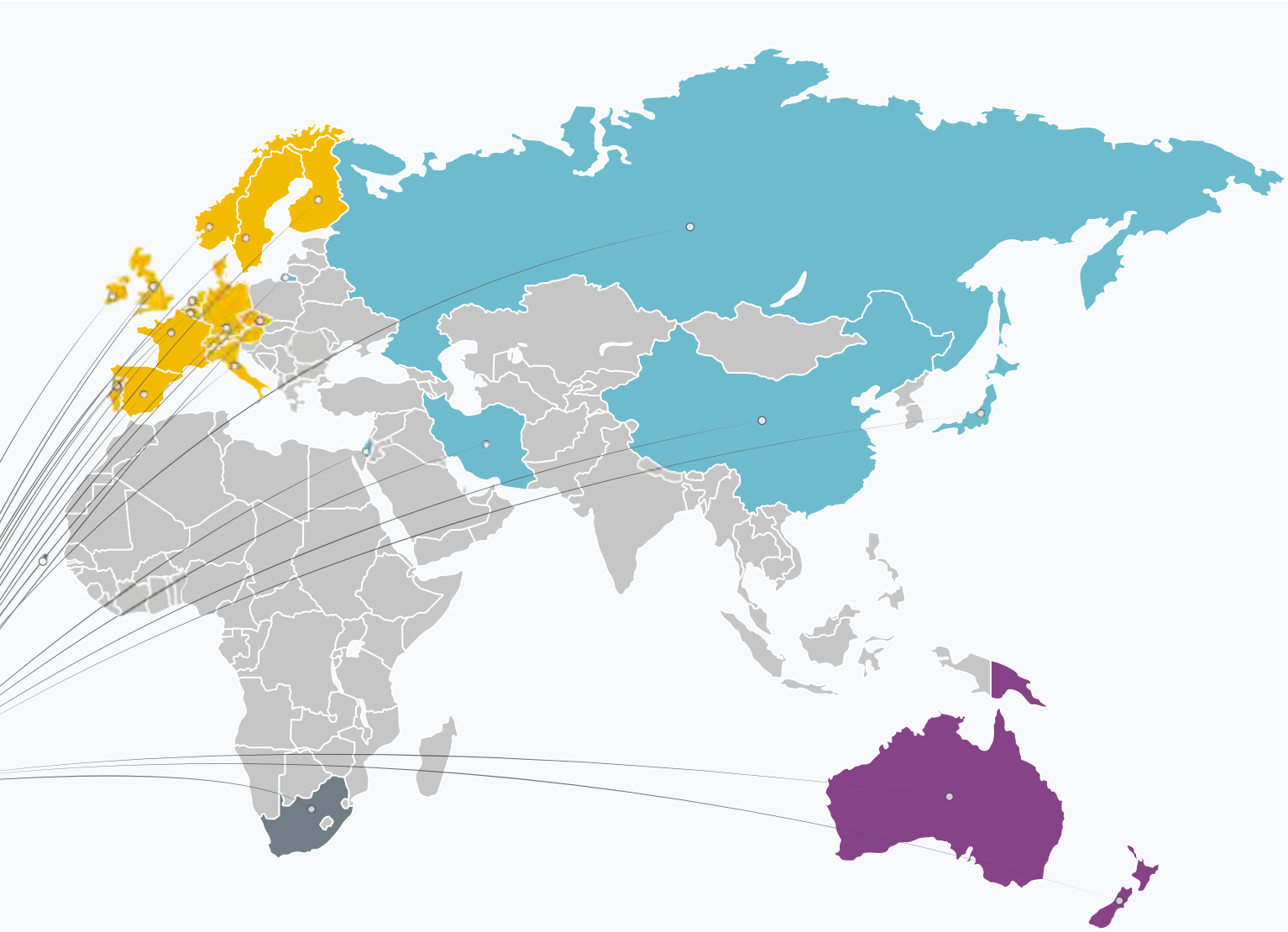
- 108 active agreements with:
  - 105 foreign institutions and 3 local institutions.

FUNDING AGENCIES:

- 102 active agreements with:
  - 77 agencies (55 foreign and 22 local);
  - 18 multilateral agencies;
  - 7 local associations.

The organizations and companies with which FAPESP had agreements in 2021 are listed on pp. 164-165 and pp. 166-167 respectively.





AFRICA
3 organizations of 3 countries

NORTH AMERICA
32 organizations of 3 countries

SOUTH AMERICA
41 organizations of 6 countries

ASIA
13 organizations of 6 countries

EUROPE
83 organizations of 17 countries

OCEANIA
10 organizations of 2 countries

AGENCIES AND ACADEMIC INSTITUTIONS IN 2021

AFRICA

SOUTH AFRICA
- ❖ National Research Foundation (NRF)

CABO VERDE
- ❖ Ministério da Educação Superior, Ciência e Inovação (MESCI)

MOZAMBIQUE
- ❖ Fundo Nacional de Investigação (FNI)

NORTH AMERICA

CANADA
- ❖ International Development Research Centre (IDRC)
- ● Carleton University
- ● Consortium of Alberta, Laval, Dalhousie and Ottawa (Caldo)
- ● McGill University
- ❖ Natural Sciences and Engineering Research Council of Canada (NSERC)
- ❖ National Research Council Canada (NRC)
- ❖ Fonds de Recherche du Québec (FRQ)
- ● University of Victoria

UNITED STATES
- ● Case Western Reserve University
- ● Columbia Global Centers
- ● Duke University
- ● Emory University
- ● Fermi Research Alliance (Fermilab) 2020
- ❖ Gates Foundation
- ❖ John E. Fogarty International Center/National Institutes of Health (NIH)
- ❖ National Science Foundation (NSF)
- ❖ Programa Dra. Ruth Cardoso (Capes/Fulbright/Georgetown University)
- ● Purdue University
- ● Texas Tech University (TTU)
- ● Texas A&M University (TAMU)
- ● The Scripps Research Institute
- ● University of California San Diego (UCSD)
- ● University of Central Florida
- ● University of Georgia
- ● University of Illinois
- ● University of Maryland
- ● University of Missouri
- ● University of Nebraska – Lincoln
- ● University of North Carolina – Charlotte
- ● University of Virginia
- ● West Virginia University (WVU)

MEXICO
- ❖ Conselho Nacional de Ciência e Tecnologia dos Estados Unidos do México (Conacyt)

SOUTH AMERICA

ARGENTINA
- ❖ Consejo Nacional de Investigaciones Científicas y Técnicas (Conicet)

BRAZIL
- △ Associação Brasileira da Indústria de Tecnologia para a Saúde (Abimed)
- ❖ Banco Nacional de Desenvolvimento Econômico e Social (BNDES)
- ❖ Centro Alemão de Ciência e Inovação São Paulo (DWIH)
- ❖ Conselho Nacional das Fundações Estaduais de Amparo à Pesquisa (Confap)
- ❖ Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)
- ❖ Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes)
- ❖ Embaixada Britânica
- ● Embrapa Pecuária Sudeste
- ❖ Empresa Brasileira de Pesquisa e Inovação Industrial (Embrapii)
- ❖ Financiadora de Estudos e Projetos (Finep)
- ❖ Fundação de Amparo à Pesquisa do Estado do Amazonas (Fapeam)
- ❖ Fundação de Amparo à Pesquisa e ao Desenvolvimento Científico e Tecnológico do Maranhão (Fapema)
- ❖ Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (Fapes)
- ❖ Fundação de Amparo à Pesq. e Inovação do Estado de Santa Catarina (Fapesc)
- ❖ Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco (Facepe)
- ❖ Fundação de Apoio à Pesquisa do Estado da Paraíba (Fapesq)
- ● Fundação Getulio Vargas (FGV)
- ❖ Fundação Maria Cecilia Souto Vidigal
- △ Instituto de Estudos de Saúde Suplementar (IESS)
- △ Instituto Jô Clemente (ex-Apae de São Paulo)
- △ Fundação Sistema Estadual de Análise de Dados (Seade)
- △ Instituto Euvaldo Lodi (IEL/SP)
- ● Instituto Nacional de Pesquisas Espaciais (Inpe)
- ❖ Ministério da Ciência, Tecnologia e Inovações (MCTI)
- ❖ Prefeitura Municipal de Jundiaí
- ❖ Sebrae São Paulo
- ❖ Secretaria de Governo do Estado de São Paulo
- ❖ Secretaria de Infraestrutura e Meio Ambiente (Sima) do Estado de São Paulo
- ❖ Secretaria Municipal de Inovação e Tecnologia de São Paulo
- ❖ Secretaria Municipal de Saúde de São Paulo
- △ Sindicato das Empresas de Compra, Venda, Locação e Administração de Imóveis Residenciais e Comerciais de São Paulo (Secovi-SP)
- △ União Nacional da Bioenergia (Udop)

CHILE
- ❖ Comisión Nacional de Investigación Científica y Tecnológica (Conicyt)
- ● Universidad de La Frontera
- ● Universidad de Magallanes (UMAG)

COLOMBIA
- ● Universidad de Antioquia
- ❖ Ministério da Ciência, Tecnologia e Inovação (Minciencias)

PARAGUAY
- ❖ Consejo Nacional de Ciencia y Tecnología (Conacyt)

URUGUAY
- ❖ Agencia Nacional de Investigación e Innovación del Uruguay (ANII)
- ● Asociación de Universidades Grupo Montevideo (AUGM)

ASIA

CHINA
- ❖ National Natural Science Foundation of China (NSFC)
- ● Tianjin University (TJU)
- ● Zhejiang University (ZJU)

SOUTH KOREA
- ❖ National Research Foundation of Korea (NRF)

IRAN
- ❖ Iran National Science Foundation (INSF)
- ❖ Cognitive Sciences and Technologies Council of Iran (CSTC)

ISRAEL
- ❖ Matimop
- ● Technion – Instituto de Tecnologia de Israel
- ● The Hebrew University of Jerusalem
- ● Weizmann Institute of Science

JAPAN
- ❖ Japan Science and Technology Agency (JST)
- ● University of Tsukuba

SINGAPORE
- ● National University of Singapore

EUROPE

GERMANY
- ❖ Rede Cornet (Collective Research Networking)
- ❖ Deutsche Forschungsgemeinschaft (DFG)
- ❖ DWIH – German House of Science and Innovation
- ● Fraunhofer-Gesellschaft
- ● Friedrich-Alexander-Universität Erlangen-Nürnberg
- ❖ Bavarian State Ministry of Science and the Arts of the Free State of Bavaria (StMWK)

❖ Research funding agencies ● Higher education and research institutions △ Research funding associations

❖ Federal Ministry of Education and Research (BMBF)
❖ German Academic Exchange Service (DAAD)
● Max Planck Society for the Advancement of Science
● Technische Universität München
● Technische Universität Berlin (TU Berlin)
● Universität Hamburg

AUSTRIA
● University of Natural Resources and Life Science
● International Institute for Applied Systems Analysis

BELGIUM
❖ Eureka Network
❖ Fonds de la Recherche Scientifique (F.R.S.-FNRS)
❖ Research Foundation – Flanders (FWO)

DENMARK
❖ Danish Agency for Science and Higher Education (DAFSHE)
❖ Innovation Fund Denmark (ex-DCSR)
● University of Copenhagen

SPAIN
❖ Centro para el Desarrollo Tecnológico Industrial (CDTI)
❖ Secretaría de Estado de Investigación, Desarrollo e Innovación (Seidi)
● Universidad Miguel Hernández de Elche
● Universidad de Salamanca

FINLAND
❖ Academy of Finland (AKA)

FRANCE
❖ Agence Nationale de la Recherche (ANR)
❖ Centre National de la Recherche Scientifique (CNRS)
● École des Hautes Études en Sciences Sociales (EHESS)
❖ French Foundation for Research on Biodiversity (FRB)
● Institut National de la Santé et de la Recherche Médicale (Inserm)
● Institut National de Recherche en Sciences et Technologies du Numérique (Inria)
● Sorbonne Université
● Université de Lyon
● Université Grenoble Alpes

NETHERLANDS
● BE-Basic
● Delft University of Technology
● Erasmus Universiteit Rotterdam
● Leiden University
❖ Netherlands Organization for Scientific Research (NWO)
● Eindhoven University of Technology (TU/e)

IRELAND
❖ Irish Research Council (IRC)

ITALY
❖ Consiglio Nazionale delle Ricerche (CNR)
● Network of Italian Universities
● Scuola Normale Superiore
● Università di Bologna

NORWAY
❖ Research Council of Norway (RCN)

PORTUGAL
❖ Fundação para a Ciência e a Tecnologia de Portugal (FCT)

UNITED KINGDOM
● Brunel University London
❖ British Council/Newton Fund
● Cardiff University
● Coventry University
● Durham University
● Imperial College London
● Keele University
● King's College London
● Queen Mary University of London
● Queen's University Belfast
❖ UK Research and Innovation (UKRI) – BBSRC, NERC, MRC, ESRC
❖ UK Academies
❖ Royal Academy of Engineering
● University of Bath
● University of Birmingham
● University of Exeter
● University of Glasgow
● University of Leeds
● University of Manchester
● University of Nottingham
● University of Oxford
● University of Southampton
● University of Surrey
● University of Warwick
● University of York

CEZCH REPUBLIC
❖ Czech Science Foundation (GACR)
❖ Technology Agency of the Czech Republic

RUSSIAN
❖ Russian Foundation for Basic Research (RFBR)

SWEDEN
● Halmstad University
● Karolinska Institutet
● Linköping University
● Lund University
❖ Swedish Research Council
❖ Swedish Governmental Agency for Innovation Systems (Vinnova)
● Uppsala University

SWITZERLAND
❖ Swiss National Science Foundation (SNSF)

OCEANIA

AUSTRALIA
● Australian National University (ANU)
● Australian Technology Network of Universities (ATN)
● Deakin University
● Macquarie University
● Monash University
● Queensland University of Technology
● Swinburne University of Technology
● University of Queensland
● University of Wollongong (UOW)

NEW ZELAND
● Universities New Zealand, Te Pokai Tara (UNZ)

MULTINATIONAL AGENCIES

■ Belmont Forum (IGFA)
■ Biodiversa+
■ EU-CELAC IG – Cooperação Birregional em Ciência, Tecnologia e Inovação
■ EU-LIFE
■ Earth BioGenome Project (EBP)
■ European Research Council (ERC)
■ Foundation for Food and Agriculture Research (FFAR)
■ Fundo Global para o Meio Ambiente (GEF)
■ Global Alliance for Chronic Diseases (GACD)
■ Global Research Collaboration for Infectious Disease Preparedness (GloPID-R)
■ GMTO Corporation
■ Incobra
■ Inter-American Institute for Global Change Research (IAI)
■ Inter-American Network of Academies of Sciences (IANAS)
■ M-ERA.NET
■ Parceria G3
■ Trans-Atlantic Platform for the Social Sciences and Humanities (T-AP)
■ União Europeia (Horizon 2020)

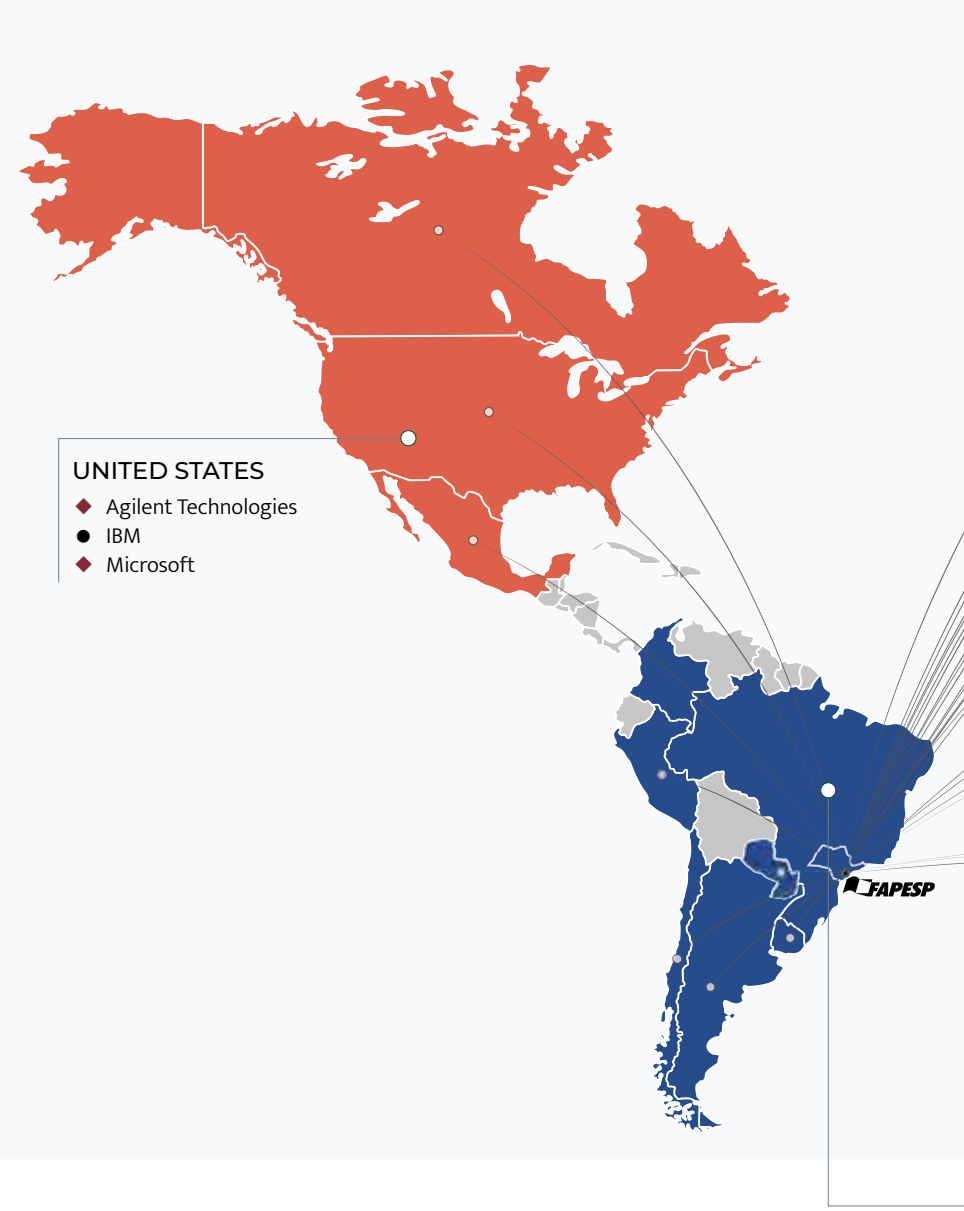
PARTNERSHIPS FOR RESEARCH COLLABORATION AND CO-FUNDING

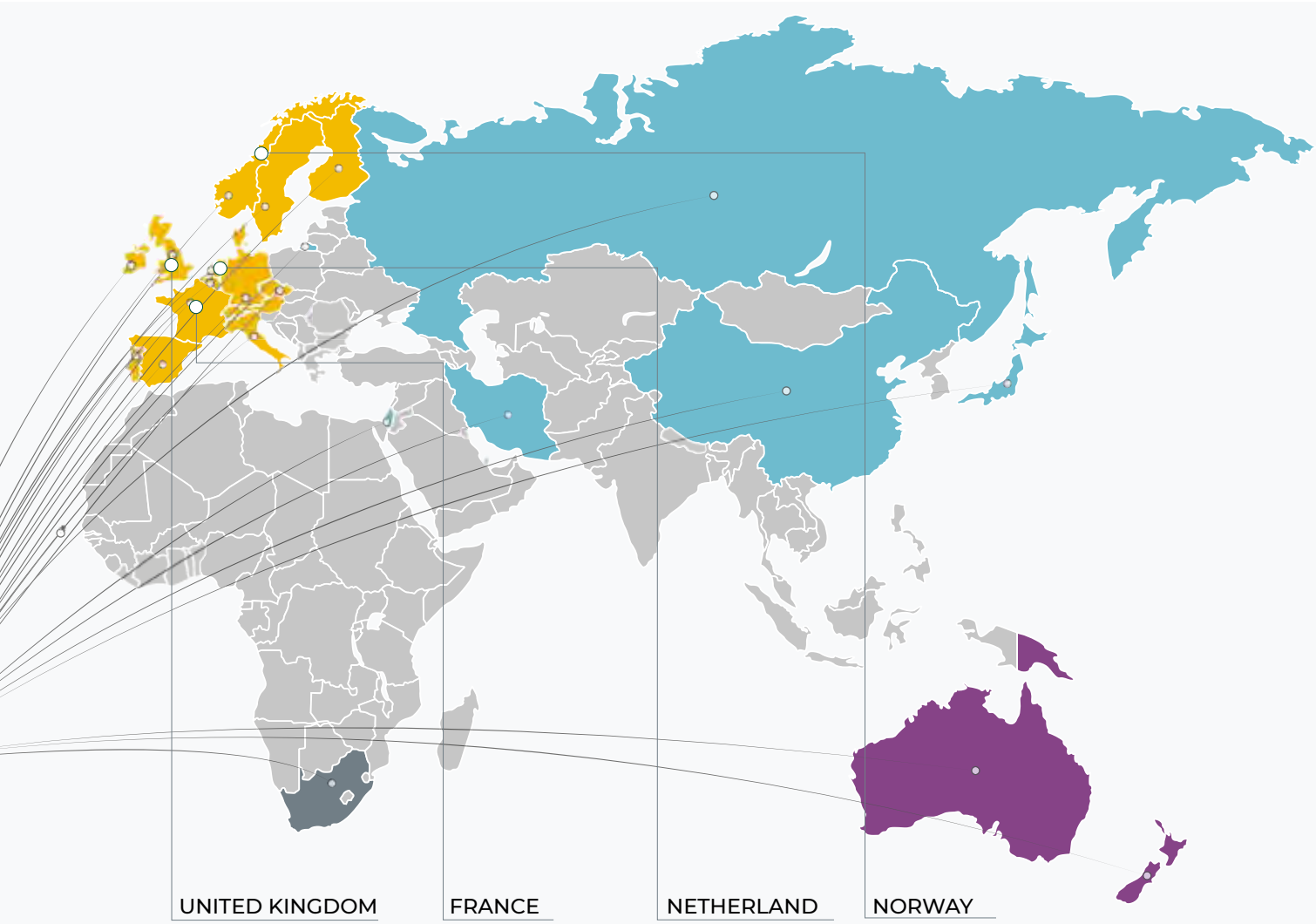
RESEARCH COLLABORATION WITH COMPANIES

PARTNER COMPANIES

- 10* co-funders of Engineering Research Centers (ERC):
  - 6 foreing and 4 local;
  - 203 active projects and 75 newly contracted for in the year.
- 18 co-funders under the PITE Agreement program:
  - 15 local and 3 foreign;
  - 53 active projects and 27 newly contracted for.
- 10 partner companies under the PITE Spontaneous Demand program:
  - 18 active projects and 7 newly contracted for.

* One of the ERC co-funders is not a company: Maria Cecilia Souto Vidigal Foundation.





UNITED KINGDOM

- AstraZeneca
- Grupo Shell
- GlaxoSmithKline (GSK)

FRANCE

- PSA Groupe – Peugeot Citroën

NETHERLAND

- Koppert

NORWAY

- Equinor

BRAZIL

- Andaraguá S.A.
- bioMérieux Brasil S.A.
- BP Biocombustíveis
- Braskem
- Cetesb
- Citrosuco
- Companhia Brasileira de Metalurgia e Mineração
- Copag
- Embraer
- Embrapa
- Empresa Brasileira de Pesquisa e Inovação (Embrapii)
- EMS S.A.
- Energy Source Indústria, Comércio, Importação e Exportação Ltda.
- Biominas Brasil
- Grupo São Martinho
- IBM Brasil
- Infibra S.A.
- Inform. de Municípios Associados (IMA)
- Intel
- Kryptus Segurança da Informação Ltda.
- Laboratório BioVet S.A.
- Maiz Indústria e Comércio de Produtos Agropecuários Ltda.
- Medicines for Malaria Venture
- Natura*
- Sabesp
- Solvay
- Uma unidade não mapeada em parceria com a USP em Piracicaba

* Natura: the cooperation agreement with Natura is due to run until 2023; the agreement governing the ERC established with Natura expired on July 31, 2021.

FAPESP'S TOTAL INCOME AND EXPENDITURE IN 2021

FAPESP's budget execution in 2021 is summarized below. The funding activities described in the Report, as well as the other main items of income and expenditure, are shown on a cash flow basis. FAPESP's complete financial statements on an accrual basis, as required by law, can be found on its website at https://fapesp.br/balancos.

INCOME	in $ PPP
Transfers from the São Paulo State Treasury	669,272,136
Federal funds	908,128
Own income (net)	35,189,677
TOTAL INCOME	**705,369,941**
DISBURSEMENT	
Grants	237,031,602
Scholarships and fellowships	163,489,765
Other expenses associated with grants	12,099,930
Refunds relating to cooperation agreements	-
Running costs*	31,445,218
Institutional investment	1,821,745
SUBTOTAL DISBURSEMENT	**445,888,260**
Grants approved but not yet paid at year-end	-59,467,225
TOTAL DISBURSEMENT	**386,421,035**
Cash and cash equivalents at year-end	318,948,906

FAPESP's commitments as at December 31, 2021, in terms of grants, scholarships and fellowships already approved and to be disbursed in the years ahead, are shown below.

COMMITMENTS	in $ PPP
Grants	561,298,606
Scholarships and fellowships	173,940,991
TOTAL COMMITMENTS	**735,239,597**

* FAPESP is required by law to limit running costs to 5% of its annual budget, which in 2021 was $ PPP 741,789,826, resulting in a cap of BRL $ PPP 37,089,491.

APPENDIX

- List of charts and tables in the report

List of tables and charts in the report

CHAPTER 1 THE INSTITUTION

CHAPTER 2 GENERAL INDICATORS

Disbursement, number of active projects and new projects contracted in 2021

Annual evolution of disbursement ($ PPP) – 2015 to 2021

Annual evolution of the number of projects contracted ($ PPP) – 2015 to 2021

CHAPTER 3 FUNDING STRATEGIES

Trainning of Human Resources for Research

Basic and Applied Research

Research for Inovation

Research on Strategic Themes

Support for Research Infrastructure

Índice de gráficos e tabelas do *Relatório*

ANNUAL CHANGE IN INTERNATIONAL
COVERAGE VIA EUREKALERT AND DICYT

Communicating Science to the Public

CHAPTER 5 OVERVIEW OF SCHOLARSHIPS/FELLOWSHIPS AND GRANTS

By types or program and funding strategies

CHAPTER 6 COLLABORATION AND CO-FUNDING IN RESEARCH

EDITORIAL PRODUCTION

Coordenation
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Editor
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SÃO PAULO RESEARCH FOUNDATION

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Secretaria de Desenvolvimento Econômico