

# ANNUAL ACTIVITY REPORT **FAPESP**

2017



## YEAR 2017

### SÃO PAULO STATE GOVERNOR

Geraldo Alckmin

### SECRETARY OF ECONOMIC DEVELOPMENT, SCIENCE AND TECHNOLOGY

Márcio França

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José Goldemberg

#### VICE PRESIDENT

Eduardo Moacyr Krieger

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Marilza Vieira Cunha Rudge

Pedro Luiz Barreiros Passos

Pedro Wongtschowski

Suely Vilela

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Fernando Menezes de Almeida (beginning May 10<sup>th</sup>)

## YEAR 2018

### SÃO PAULO STATE GOVERNOR

Geraldo Alckmin (until April 6<sup>th</sup>)

Márcio França (beginning April 6<sup>th</sup>)

### SECRETARY OF ECONOMIC DEVELOPMENT, SCIENCE AND TECHNOLOGY

Márcio França (until April 6<sup>th</sup>)

Marcos Monteiro (April, 18<sup>th</sup> to 28<sup>th</sup>)

Jânio Francisco Benith (beginning April 28<sup>th</sup>)

### SÃO PAULO RESEARCH FOUNDATION

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#### VICE PRESIDENT

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Fernando Ferreira Costa (until June 29<sup>th</sup>)

Ignácio Mario Poveda Velasco (beginning April 19<sup>th</sup>)

João Fernando Gomes de Oliveira

João Grandino Rodas (until April 18<sup>th</sup>)

José de Souza Martins

José Goldemberg

Marco Antonio Zago (beginning April 19<sup>th</sup>)

Marilza Vieira Cunha Rudge

Pedro Luiz Barreiros Passos

Pedro Wongtschowski

Ronaldo Aloise Pilli (beginning July 13<sup>th</sup>)

Suely Vieira (until April 18<sup>th</sup>)

Vanderlan da Silva Bolzani (beginning January 24<sup>th</sup>)

#### EXECUTIVE BOARD

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#### CHIEF OPERATIONS OFFICER

Fernando Menezes de Almeida



SÃO PAULO  
RESEARCH FOUNDATION

ANNUAL  
ACTIVITY REPORT  
**FAPESP**  
**2017**



## INTRODUCTION

This report on FAPESP's activities in 2017 shows how the directives issued by its Board of Trustees have been followed in terms of fostering bolder research by the scientific community in São Paulo State and of integrating fellowships and grants with broader and more ambitious projects generated both in universities and research institutions and in academic-business partnerships.

Advancement of Knowledge accounted for 38% of total disbursement and 85% of the projects contracted. Programs linked to strategic themes – biodiversity, bioenergy, global climate change, eScience, and public policy – also remained essential for FAPESP, accounting for \$ 19.5 million in purchasing power parity (PPP) and 317 new projects.

Furthermore, we continue to bring FAPESP's performance ever closer to the needs of society in general and specifically those of the business sector.

In 2017 FAPESP invested \$ PPP 46.8 million in research involving academic-business collaboration and small business innovation research. This amount encompasses all funding instruments linked to the projects concerned. The establishment of five new engineering research centers and applied research centers was contracted during the year, doubling the number of such centers established by FAPESP and partner firms.

This investment focus is based on FAPESP's view that the interface between academia and the business sector is fundamental to promoting a research environment in universities and research institutions that is more comprehensive and better connected to society, resulting in more scientific and technological development, enhancing business competitiveness, and strengthening the creation of a climate that fosters technological innovation in São Paulo State.

The standout among Research for Technological Innovation programs was Innovative Research in Small Business (PIPE), which posted new records in disbursement and the number of projects contracted.

In 2017 FAPESP disbursed \$ PPP 35.5 million for PIPE projects, more than in any year since the program's inception and 21% more than in 2016. The number of PIPE project grants contracted also set a new record, reaching 269, 18% higher than in 2016, without counting PIPE fellowships (126) or 391 other grants and fellowships linked to the projects concerned. This number was equivalent to one new project contracted per business day.

International cooperation also remained at a high level, with the signature of 26 new cooperation agreements in 2017, raising the total to 213 agreements with organizations in 28 countries.

These directives will continue to be implemented in the years ahead, always with the key concern of maintaining a balanced budget, as FAPESP did in 2017.

José Goldemberg  
*President of FAPESP*

SÃO PAULO, JULY 2018



## SUMMARY

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# 2017 SÃO PAULO SCIENCE & TECHNOLOGY SYSTEM

EXPENDITURES ON R&D IN SÃO PAULO

RESEARCHERS IN THE STATE

EDUCATION & TRAINING

RESEARCHERS IN COMPANIES

SCIENTIFIC PUBLICATIONS

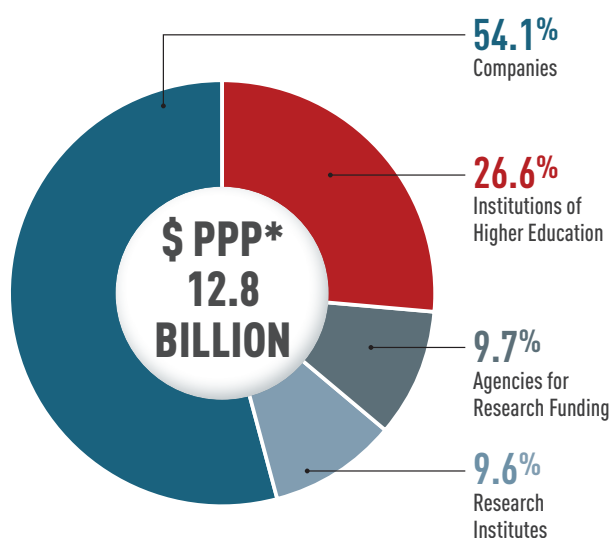
INTELLECTUAL PROPERTY

# 2017 SÃO PAULO SCIENCE & TECHNOLOGY SYSTEM

**151 institutions** with mission guided  
to research activities and around  
**15,000 innovative companies**

<b>6</b> Public Universities	3 state 3 federal
<b>3</b> Other Public Institutions of Higher Education	2 state 1 federal
<b>66</b> Technologies Schools	65 state 1 federal
<b>21</b> Private Institutions of Higher Education	
<b>34</b> Research Institutes and S&T Institutions	23 state 11 federal (5 Embrapa Research Units)
<b>21</b> Private Research Institutes	9 linked to hospitals 1 Federal Social Organization 11 other
<b>15,000</b> Innovative Companies	

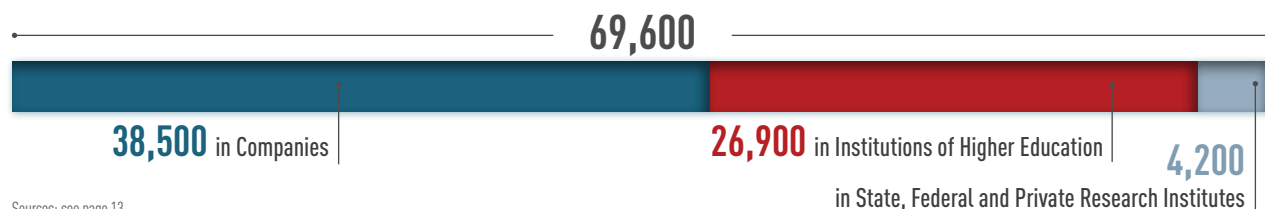
## EXPENDITURES ON R&D IN SÃO PAULO



\* Purchasing power parity (<http://data.worldbank.org/indicator/pa.nus.ppp>)  
Note: For the methodology used to update R&D expenditure, see  
*Indicators of Science, Technology & Innovation in São Paulo 2010*, FAPESP, 2011.

	in \$ PPP million		
	2015	2016	2017
<b>R&amp;D IN SÃO PAULO STATE</b>	<b>12,880.7</b>	<b>12,885.6</b>	<b>12,754.8</b>
<b>Higher Education Institution (HEI)</b>	<b>3,291.1</b>	<b>3,497.4</b>	<b>3,390.8</b>
HEI Federal	446.6	479.1	510.1
HEI State	2,574.2	2,710.2	2,574.3
HEI Private	270.3	308.1	306.4
<b>Agencies for Research Funding</b>	<b>1,389.8</b>	<b>1,336.3</b>	<b>1,233.4</b>
CNPq	258.9	178.9	156.0
Capes	364.1	399.1	370.4
Finep	178.3	215.2	182.9
FAPESP	588.5	563.1	524.1
<b>Research Institutes</b>	<b>1,026.8</b>	<b>969.9</b>	<b>1,224.2</b>
Federal Research Institutes	702.5	663.8	909.1
State Research Institutes	324.3	306.1	315.1
<b>Companies</b>	<b>7,173.0</b>	<b>7,081.9</b>	<b>6,906.4</b>

## RESEARCHERS IN SÃO PAULO STATE (full-time equivalent researchers – FTE)



## EDUCATION & TRAINING



Degrees granted by state:

**7,288 doctors** (34% of the country's total)  
**11,384 masters** (23% of the country's total)

Legal nature of Higher Education Institutions (HEI)	MASTERS	DOCTORATES
<b>Publics</b>	<b>8,665</b>	<b>6,152</b>
HEI State	6,802	5,253
HEI Federal	1,724	884
HEI Municipal	139	15
<b>Privates</b>	<b>2,719</b>	<b>1,136</b>
<b>TOTAL</b>	<b>11,384</b>	<b>7,288</b>

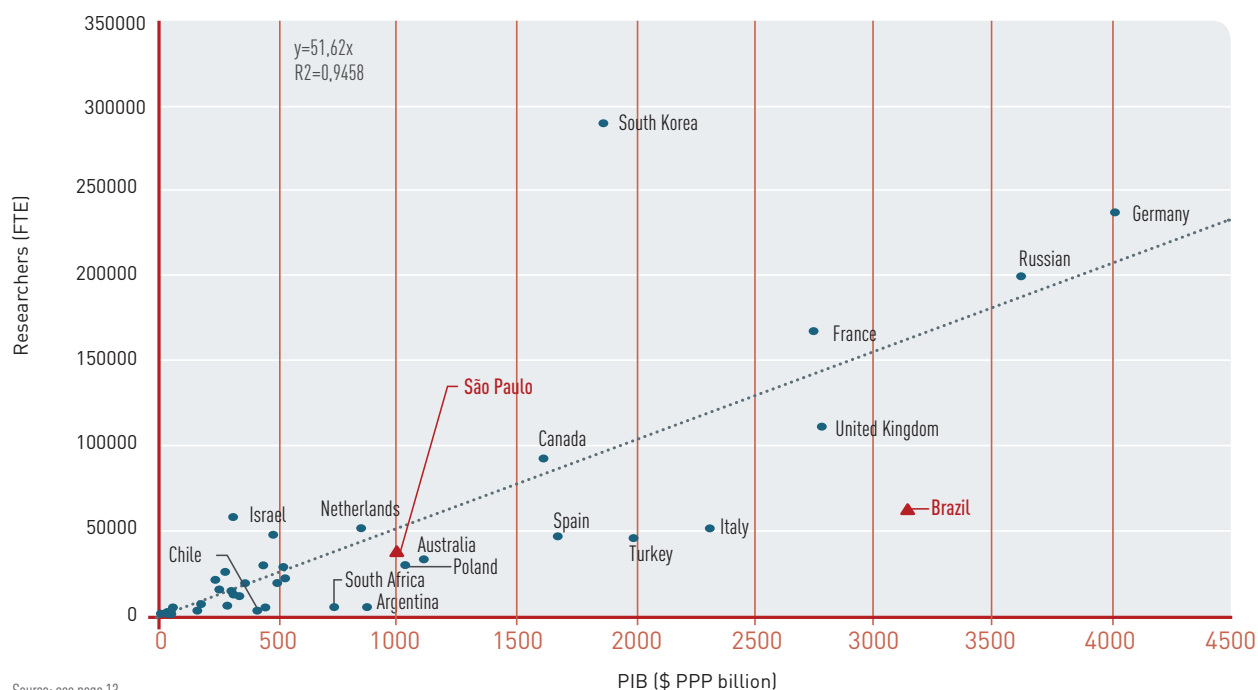
Source: Geocapes

Top 15 HEI by number of graduates with master's degrees and PhDs

INSTITUTION	MASTER	DOCTORATE
USP	3,467	3,006
UNESP	1,846	1,203
UNICAMP	1,290	988
PUC-SP	677	407
UFSCAR	624	348
UNIFESP	624	347
MACKENZIE	240	88
FGV-SP	58	75
UNINOVE	127	62
UFABC	240	58
ITA	147	57
SLMANDIC	2	55
UNIMEP	82	42
UNICSUL	61	36
UNIFRAN	62	33

## RESEARCHERS IN COMPANIES (full-time equivalent researchers – FTE)

Researchers (FTE) in companies and PIB, OECD countries, Brazil and São Paulo (2016)

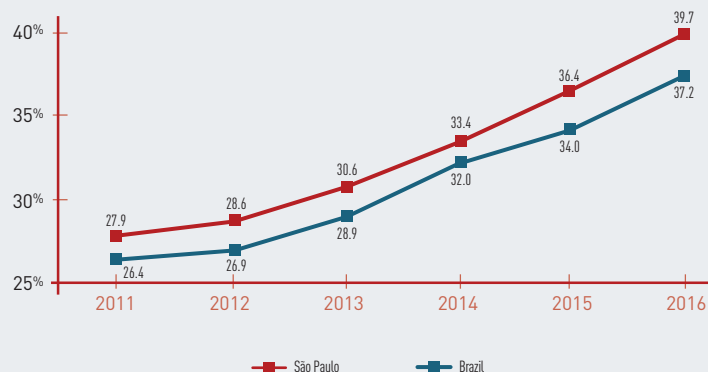


## SCIENTIFIC PUBLICATIONS



**22,640 SCIENTIFIC WORKS PUBLISHED** in journals listed on the Web of Science by authors residing in the state (2016) – 43% of the works authored by Brazilians

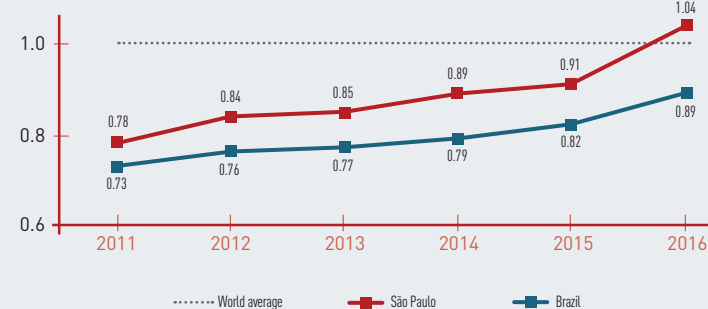
### International Collaboration – Brazil and São Paulo (in percent – 2011-2016)



### COUNTRIES WITH THE MOST FREQUENT CO-AUTHORS (2016)

USA	3,745
United Kingdom	1,544
Spain	1,246
Germany	1,239
France	1,216
Italy	1,055
Canada	916
Portugal	833
Australia	741
Netherlands	637

### Relative Impact of Scientific Production in São Paulo and Brazil (2011-2016)



### INSTITUTIONS LOCATED IN SÃO PAULO STATE WITH MORE THAN 100 PUBLICATIONS INDEXED (2016)

INSTITUTION	PUBLICATIONS
USP	10,762
UNESP	3,955
UNICAMP	3,593
UNIFESP	1,974
UFSCAR	1,267
UFABC	408
INPE	399
CTA	282
ITA	277
CNPEN	247
Hospital Israelita Albert Einstein	226
IPEN	192
Instituto Butantan	183
A.C. Camargo	153
UNINOVE	147
Instituto Botânica	140
Instituto Agrônômico (IAC)	124
Instituto Federal de Tecnologia	116
Fundação Getúlio Vargas	103

Source: Web of Science, Clarivate. (several queries, 2018)

Note: Considers only articles, reviews and papers presented at scientific events or published in 2016. Statistics for years after 2016 are being finalized by Web of Science.

## INTELLECTUAL PROPERTY



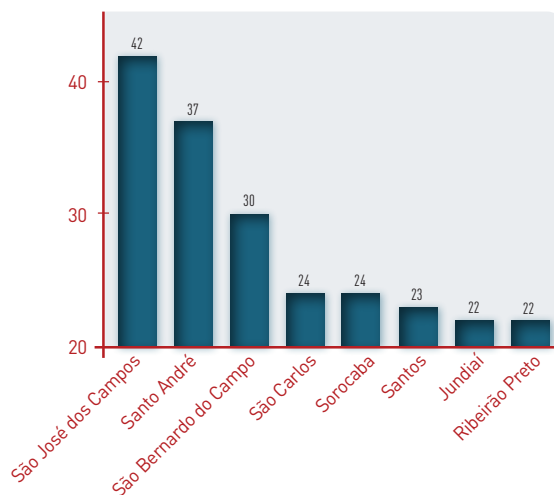
Were filed with INPI\*:

**1,640 INVENTIONS**  
(30% of national total)

**547 COMPUTER PROGRAMS**  
(32% of national total)

### TOP TEN CITIES BY NUMBER OF PATENT APPLICATION

São Paulo filed for **631** patents and Campinas for **208**.  
The other eight cities were as follows:

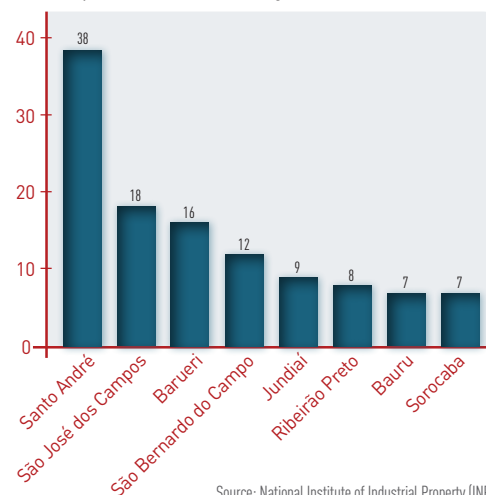


The main patent depositors are:

Unicamp	77	Natura	17
USP	53	Whirlpool	14
CPQd	21	Embraer	12
Bosch	19	Unesp	10
Randon	17		

### TOP TEN CITIES BY NUMBER OF PATENT APPLICATION FOR COMPUTER PROGRAMS

São Paulo filed for **187** computer programs and Campinas, **162**. The other eight cities were as follows:



Source: National Institute of Industrial Property (INPI)

Sources (page 11)

#### NUMBER OF RESEARCHERS:

**Higher Education Institutions:** INEP; Geocapes; CNPq; Painel de Investimentos; Capes; Geocapes e FAPESP.

**Research Institutes:** São Paulo State Department of Planning & Administration;

**Companies:** IBGE – Pintec. Charted by FAPESP.

Note: The data for INEP and Geocapes 2017 reproduced the data for 2016, the latest available year.

For the methodology used here, see *Indicators of Science, Technology & Innovation in São Paulo 2010*, FAPESP, 2011.

#### RESEARCHERS IN COMPANIES:

PPP GDP 2016 – World Bank. For São Paulo: Fundação SEADE; Researchers in companies (FTE) - OECD.

For Brazil and São Paulo: data from IBGE's Survey of Technological Innovation in Industry (Pintec), treated by FAPESP.

Note: USA, Japan and China were considered in the regression but are not shown in the chart for reasons of scale. São Paulo: FAPESP, 2011.



# FAPESP HIGHLIGHTS 2017

DISBURSEMENT AND PROJECTS CONTRACTED

COMPETITIVE INTERNATIONAL RESEARCH

ATTRACTING YOUNG INVESTIGATORS TO THE STATE

PATENTS

UNIVERSITY-BUSINESS COLLABORATION

INTERNATIONAL COOPERATION

RESEARCH DATA BASE



# FAPESP HIGHLIGHTS 2017

Created in 1962, FAPESP is a public foundation funded by São Paulo taxpayers to promote the development of science and technology in the state, by supporting research projects in institutions of higher education and research, public or private, which are selected by a rigorous system of analysis based on the peer-review process.

## NEW PROJECTS CONTRACTED

# 10.186

Regular fellowships in Brazil	5.455
Fellowships abroad	1.129
Regular grants	3.602

Proposals received

# 19,455

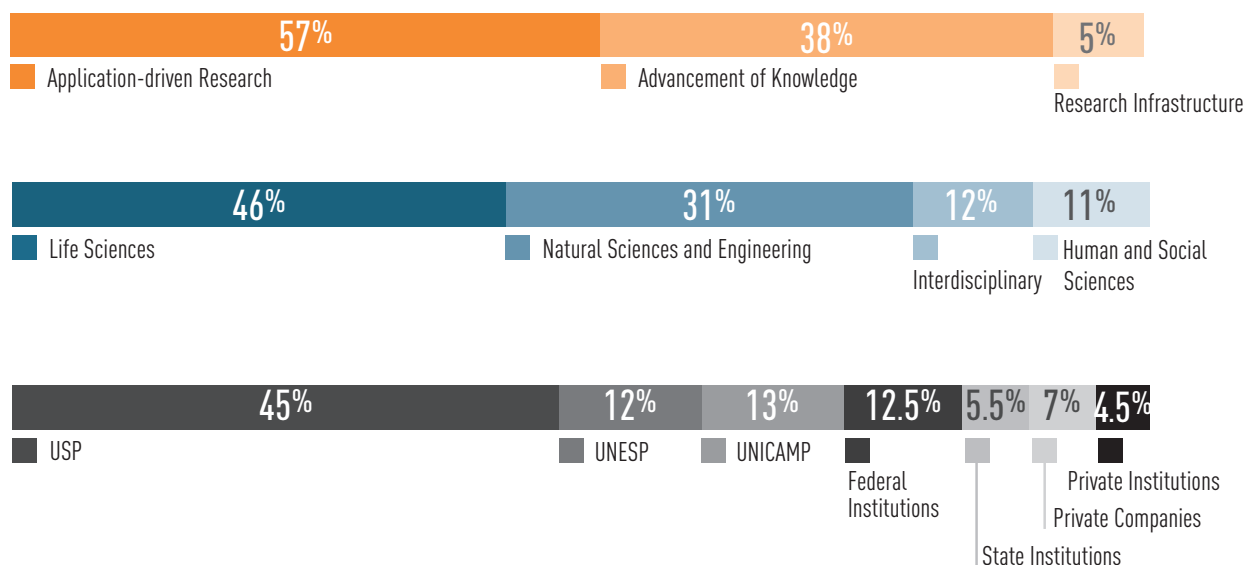
Average time to process first applications

# 72 days

## FAPESP DISBURSEMENT FOR RESEARCH PROJECTS

# \$ PPP 523.0 million

in 24,026 research projects



## COMPETITIVE INTERNATIONAL RESEARCH

FAPESP supports the most advanced research in São Paulo through the Research, Innovation and Dissemination Centers (RIDCs), Thematic Projects, the Young Investigators Program (YIA), São Paulo Excellence Chair (SPEC) and Engineering Research Center. Disbursements for these programs in 2017 where **\$ PPP 205.3 million**, including expenses for Multiuser Equipment, and Fellowships and Grants associated to these programs.

<b>\$ PPP 42.1 million</b>	CEPIDs	<b>17 centers</b>
<b>\$ PPP 122.9 million</b>	Thematic Projects	<b>469</b>
<b>\$ PPP 3.2 million</b>	SPEC	<b>10 SPECS</b>
<b>\$ PPP 29.8 million</b>	Young Investigators	<b>369</b>
<b>\$ PPP 7.3 million</b>	Engineering Research Centers and Applied Research Centers	<b>5 centers</b>

## ATTRACTING YOUNG INVESTIGATORS TO THE STATE

Since 1997, FAPESP has brought  
**1,390** Young Investigators  
to São Paulo Institutions

**\$ PPP 29.2 million**  
were spent on **369**  
Young Investigators projects in 2017

2017: **50** new Young Investigators were hired to begin their scientific careers in research organizations in the state of São Paulo



## PATENTS

FAPESP has **1,316** patents registered in its name (as the patent holder or shared beneficiary).

**231 in effect**  
**924 under analysis**  
**161 terminated**

# FAPESP HIGHLIGHTS 2017

## UNIVERSITY-BUSINESS COLLABORATION

From 2013 to 2017, five Engineering Research Centers/Applied Research Centers were established with the companies: Peugeot-Citroën, hosted by the University of Campinas (UNICAMP); GlaxoSmithKline – two centers, one at the Federal University of São Carlos (UFSCAR) and the other at Butantan Institute; BG Group Shell at the University of São Paulo (USP); and Natura, also at USP. Other research institutions participated.

Additionally, new centers were approved in 2017 and contracts were formalized in 2018: the Genomics for Climate Change Research Center (GCCRC), in partnership with Brazilian Agricultural Research Corporation (EMBRAPA) and UNICAMP; and the Center for Innovation in New Energies (CINE), in partnership with Shell.

### ENGINEERING RESEARCH CENTERS AND APPLIED RESEARCH CENTERS

THE TOTAL PREDICTED VALUE OF THESE  
**5 ACTIVE CENTERS**

**\$ PPP 128.3 MILLION**

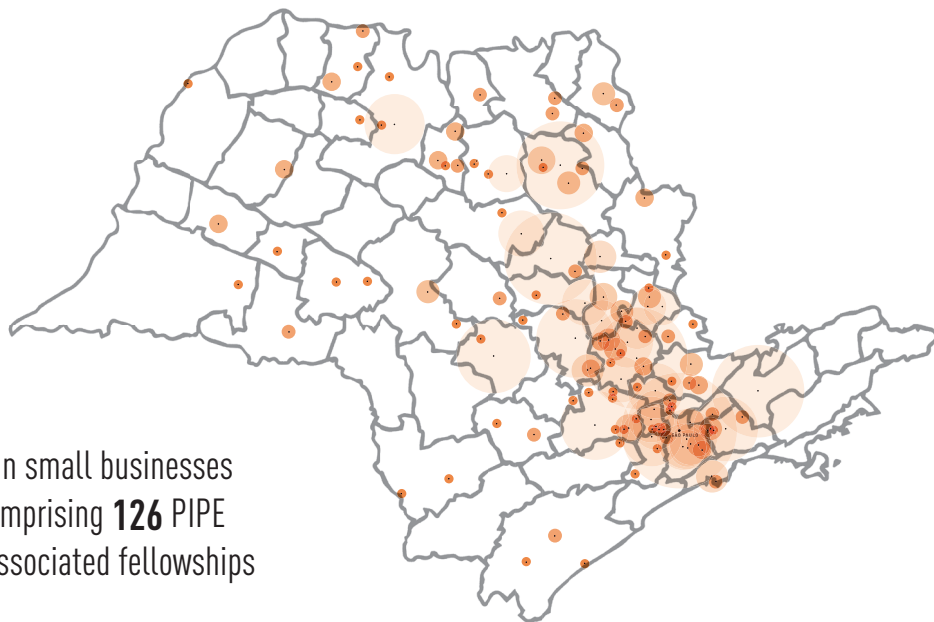
## INNOVATIVE RESEARCH IN SMALL BUSINESS PROGRAM – PIPE

Until 2017, the program has supported **2,060** projects  
at **1,224** companies in **132** cities in the state of São Paulo

**5 PROJECTS  
PER WEEK**

**269**

new research projects in small businesses  
in the state in 2017, comprising **126** PIPE  
fellowships and **391** associated fellowships  
and grants



## FOSTERING INTERNATIONAL COOPERATION IN RESEARCH

**805** research grants and **1,217** fellowships were contracted in 2017 for international cooperation in research

**\$ PPP 73.2 MILLION**

**\$ PPP 17.8 million**

were committed to research that began in 2017 under agreements with universities, research funding agencies, and companies.

**182 international cooperation agreements** are in effect with organizations from **28** countries, **26** of which were signed in 2017.

FAPESP resources are matched with similar value from foreign entities.

**\$ PPP 56 million**

were committed to 711 grants and 1,424 fellowships for scientific exchange, which were not part of agreements in 2017.

## RESEARCH DATA BASE

[www.bv.fapesp.br](http://www.bv.fapesp.br)

FAPESP maintains a Research Data Base on its website that contains over **218,000** items related to all the grants and fellowships financed by the Foundation since 1962.

	Fellowships in Brazil	Fellowships abroad	Research Grants
<b>TOTAL</b>	<b>145,078</b>	<b>14,579</b>	<b>114,116</b>
Since 1992	127,412	11,260	95,670
From 1962 to 1991	17,666	3,319	18,446



**CHAPTER**

**1**

**THE INSTITUTION**

ABOUT FAPESP

MANAGEMENT

EVALUATION SYSTEM

# 1 THE INSTITUTION

## ABOUT FAPESP

The São Paulo Research Foundation (**FAPESP**) is one of Brazil's leading public agencies for research funding.

FAPESP was formally created in 1960 by State Law 5918 (October 18), which established that its remit was to support scientific research in São Paulo State. It began operating in **1962** in accordance with Decree 40132 (May 23).

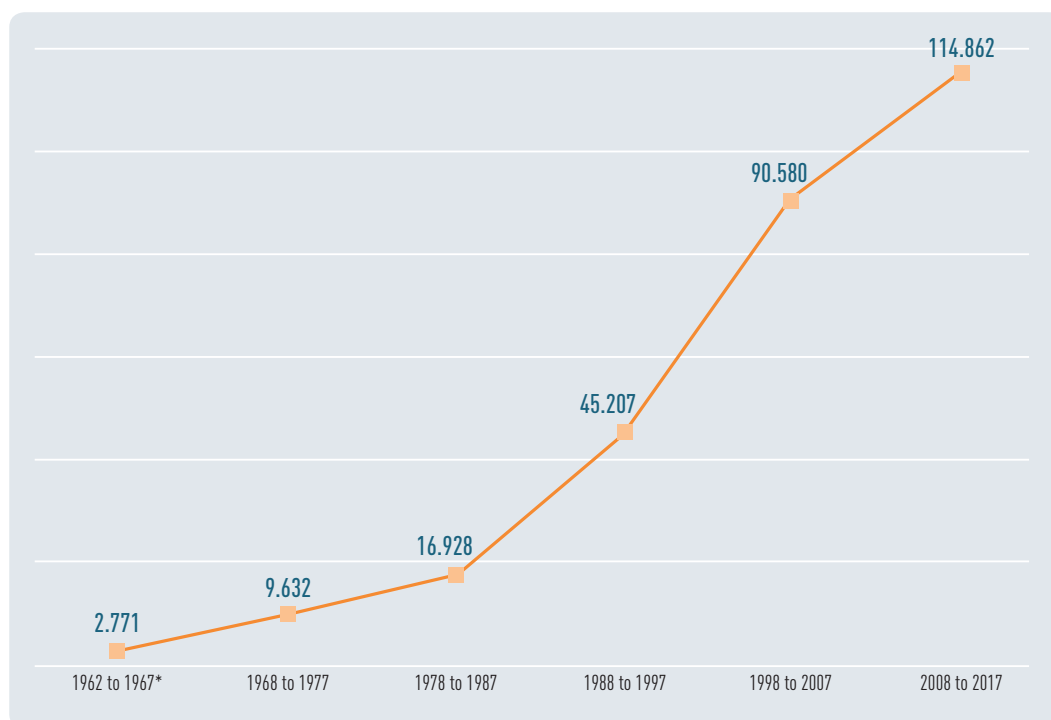
Pursuant to São Paulo State's 1947 Constitution, as ratified by the state's 1989 Constitution, the law requires that 1% of the state's annual tax revenue be transferred

to FAPESP for its mission of investing in scientific and technological development.

This investment takes the form of funding for research projects in all knowledge areas led by researchers affiliated with public or private higher education and research institutions in São Paulo State, often in collaboration with researchers employed by private enterprise.

FAPESP has two main funding lines: a permanent line of Regular Grants and Fellowships, and a set of Programs designed to achieve specific strategic objectives.

### NUMBER OF PROJECTS CONTRACTED – 1962 A 2017



\* Number of projects calculated by decade except for the first six years of FAPESP's operations

## MANAGEMENT

FAPESP is overseen by a Board of Trustees and managed by an Executive Board. The São Paulo State Constitution guarantees FAPESP's administrative autonomy.

The Board of Trustees sets general guidelines for FAPESP and makes key decisions regarding its scientific, administrative and asset management policy. The Board has 12 members who each serve a six-year term that can be renewed once. Six 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. The 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 Chief Operations Officer. They are chosen by the governor from three-name shortlists drawn up by the Board of Trustees, and are retained by FAPESP for a period of up to three years.

## DECEMBER 2017

### BOARD OF TRUSTEES

José Goldemberg PRESIDENT	2015 – 2018
Eduardo Moacyr Krieger VICE PRESIDENT	2013 – 2019
Carmino Antonio de Souza	2015 – 2021
Fernando Ferreira Costa	2012 – 2018
João Fernando Gomes de Oliveira	2015 – 2021
João Grandino Rodas	2012 – 2018
José de Souza Martins	2013 – 2019
Marilza Vieira Cunha Rudge	2013 – 2019
Pedro Luiz Barreiros Passos	2013 – 2019
Pedro Wongtschowski	2015 – 2021
Suely Vilela	2012 – 2018

### EXECUTIVE BOARD

Carlos Américo Pacheco EXECUTIVE DIRECTOR	2016 – 2019
Carlos Henrique de Brito Cruz SCIENTIFIC DIRECTOR	2017 – 2020
Fernando Menezes de Almeida CHIEF OPERATIONS OFFICER	2017 – 2020



## THE INSTITUTION

## PROPOSAL SELECTION

The research projects proposed in applications submitted to FAPESP for support from its various funding lines are evaluated by peer review. Committees of recognized experts called Area Panels are responsible for coordinating the evaluation process within each major knowledge area under the aegis of FAPESP's Scientific Directorate.

## THE STEPS IN THIS

**PROCESS** ●●●●●●●●●●●●●●●●  
are summarized below. More details of FAPESP's research project appraisal process can be found in Portuguese at

**www.fapesp.br/analise**

## 1

## AREA PANELS RECEIVE APPLICATIONS

Each application received by FAPESP is forwarded to the Area Panel corresponding to the knowledge area for the project.

## 2

## SELECTION OF AD HOC REVIEWERS AND ISSUANCE OF OPINIONS

After analyzing the project summaries and the applicants' institutional affiliations, Area Panels select specialists with specific competence in each project's subject-matter, avoiding potential conflicts of interest, and ask them to issue expert opinions. These ad hoc reviewers analyze the proposals and issue their expert opinions.

**8,969**  
ad hoc reviewers in 2017

## 3

## REVIEW BY AREA PANELS

The proposals return to the Area Panels, which review the expert opinions and recommend approval or denial by the Scientific Directorate.

## Main areas of proposals appraised in 2017

HEALTH SCIENCES

**28%**

HUMAN AND SOCIAL SCIENCES

**18%**

ENGINEERING

14%

# 22,594

initial opinions from  
ad hoc reviewers

4

## REVIEW BY SUPERVISORY PANEL

The Science Directorate also  
maintains a

**SUPERVISORY PANEL**  
comprising **TEN RESEARCHERS**  
who are recognized leaders in  
their respective fields.

They examine all recommendations  
made by the Area Panels to ensure  
compatibility with the available  
expert opinions. They may endorse  
recommendations or question them  
and suggest further analysis, among  
other measures.

5

## SCIENTIFIC DIRECTORATE'S DECISION

The Science Directorate's  
decision is based on the  
recommendations of the  
Supervisory Panel and  
Area Panels.

**72 days**  
for **19,445**  
applications received

6

## RATIFICATION BY EXECUTIVE BOARD

FAPESP's Executive  
Board (CTA) ratifies the  
Scientific Directorate's

**decision**

subject to approval by  
the Board of Trustees  
or requests a fresh  
analysis.



## CHAPTER

# 2

### **FAPESP IN 2017**

INCOME

DISBURSEMENT AND  
NUMBER OF PROJECTS CONTRACTED

FUNDING LINE

Regular Fellowships

Regular Grants

Programs (Fellowships and Grants)

## INCOME

In 2017 FAPESP's  
income totaled

**\$ PPP\* 661.6 million**

FAPESP's income consists of: 1% of São Paulo State's annual tax revenue, transferred by the state treasury as required by the state's Constitution; income from the endowment fund established to supplement transfers from the treasury; and additional sources of revenue such as joint research funding agreements with other institutions and companies.

\* Purchasing power parity (World Bank)

STATE TREASURY TRANSFERS (\$ PPP)

**549.1 million**

83%

CAPITAL REVENUE (\$ PPP)

**64.2 million**

9.7%

OTHER REVENUE SOURCES (\$ PPP)

**48.2 million**

7.3%

### RESERVE FOR FUTURE PROJECTS

In 2017 FAPESP committed **\$ PPP 533.5 million** to projects contracted in the year and prepared to proceed in coming years. The total including projects contracted in previous years and still in progress was **\$ PPP 785.6 million**.

# DISBURSEMENT AND NUMBER OF PROJECTS CONTRACTED

In 2017 FAPESP  
disbursed

**\$ PPP 523.0 million**

for **24,026** scientific and technological research projects that were in progress in the period. During the year FAPESP received **19,980** applications for funding and contracted **10,186** new projects. The projects have different costs: large-scale projects require more funding than some types of grant or scholarship, for example.

The total disbursed can be broken down in various ways:

## BY FUNDING LINE

**REGULAR FELLOWSHIPS AND GRANTS:** Regular Fellowships and Regular Grants are permanent lines that accept proposals submitted spontaneously by researchers and represent the most traditional form of research support, as conceived since 1962.

**PROGRAMS (FELLOWSHIPS AND GRANTS):** Programs designed to foster research in strategic areas or to meet specific needs.

## BY MAJOR KNOWLEDGE AREA

**LIFE SCIENCES:** Health, Biology, Agricultural and Veterinary Sciences.

**NATURAL SCIENCES AND ENGINEERING:** Astronomy, Physics, Engineering, Geoscience, Chemistry, Mathematics, Computer Science.

**HUMAN AND SOCIAL SCIENCES:** Human and Social Sciences, Economics, Business and Public Administration, Architecture and Urbanism.

**INTERDISCIPLINARY**

## BY FUNDING OBJECTIVE

**APPLICATION-DRIVEN RESEARCH:** Regular fellowships and grants in Engineering, Health, and Agronomy & Veterinary Sciences for research on strategic themes (biodiversity, bioenergy, climate change), public policy, and eScience, as well as research in and with companies, and RIDCs.

**ADVANCEMENT OF KNOWLEDGE:** Regular and thematic fellowships and grants in all areas except those classified as application-driven, SPEC, Young Investigator Awards (YIA), and projects associated to these programs.

**INFRASTRUCTURE:** Grants to refurbish and modernize the installations, laboratories, libraries and archives of research institutions in São Paulo State, and for programs to support intellectual property protection and SciELO.

## BY RESEARCH STRATEGY

**BASIC AND APPLIED RESEARCH:** Ambitious and internationally competitive medium-or long-term projects (Research Grants, YIA, RIDCs, SPEC and fellowships and grants associated to these programs).

**EDUCATION & TRAINING:** Fellowships solely for education and training, not associated to any other funding instrument.

**RESEARCH IN AND WITH COMPANIES:** Initiatives that foster technological innovation by small businesses and academic-business partnerships (PITE, ERCs, PIPE, and fellowships and grants associated to these programs).

**STRATEGIC THEMES:** Research on specific themes such as biodiversity, bioenergy, climate change, eScience and public policy, and fellowships and grants associated to these themes.

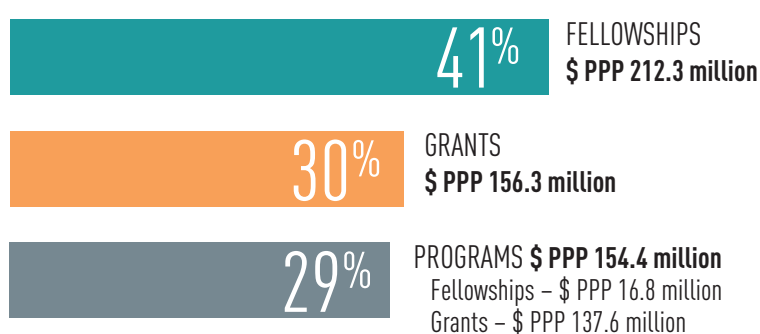
**INFRASTRUCTURE:** Programs that refurbish and modernize the installations, laboratories, libraries and archives of research institutions in São Paulo State, and support intellectual property protection and SciELO, as well as grants associated to these programs.

## BY INSTITUTION

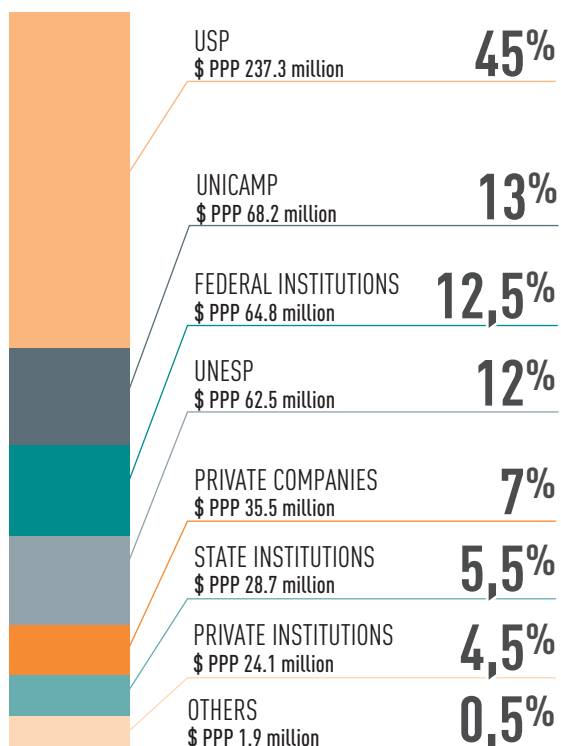
# DISBURSEMENT

**DISBURSEMENT: \$ PPP 523.0 million**

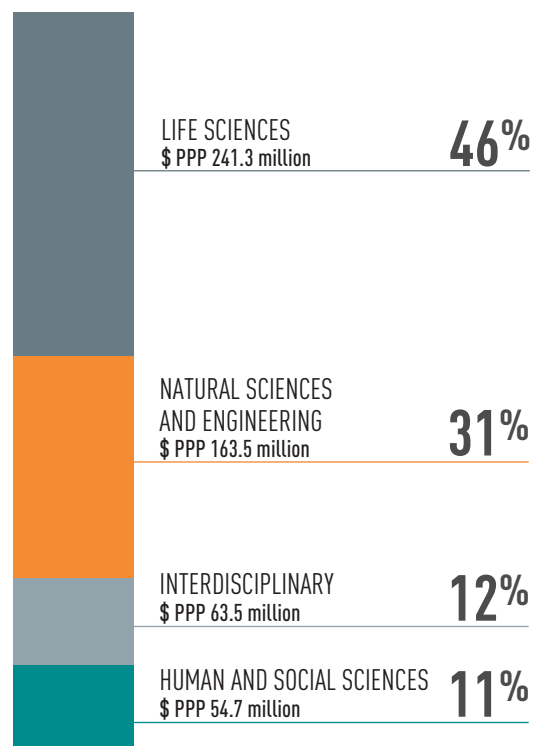
## BY FUNDING LINE



## BY INSTITUTION



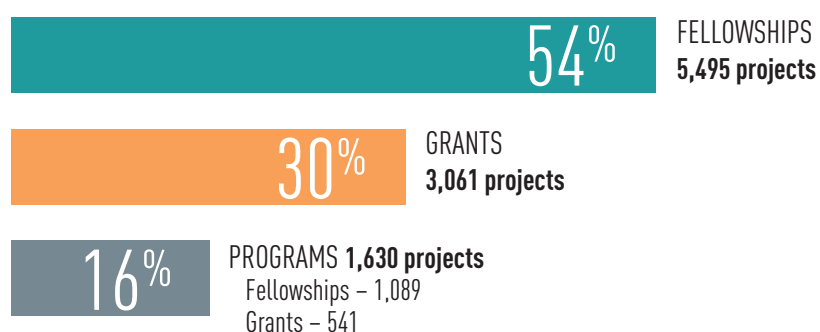
## BY MAJOR KNOWLEDGE AREA



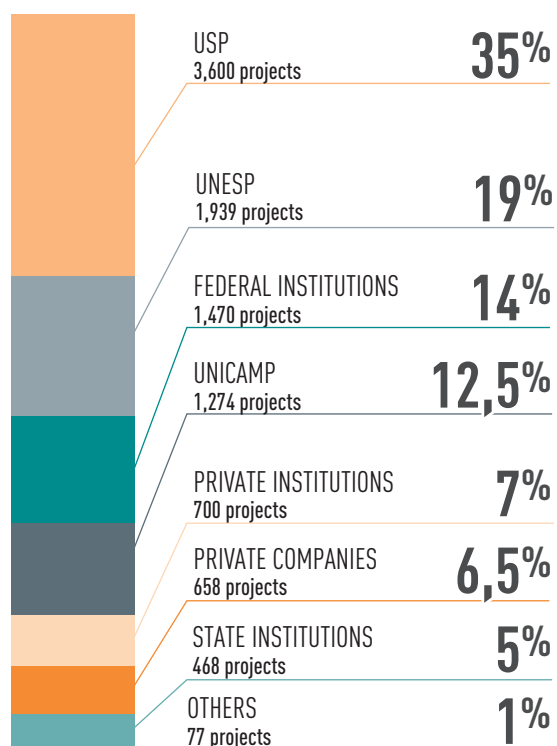
# NUMBER OF PROJECTS CONTRACTED

NUMBER OF PROJECTS CONTRACTED: **10,186**

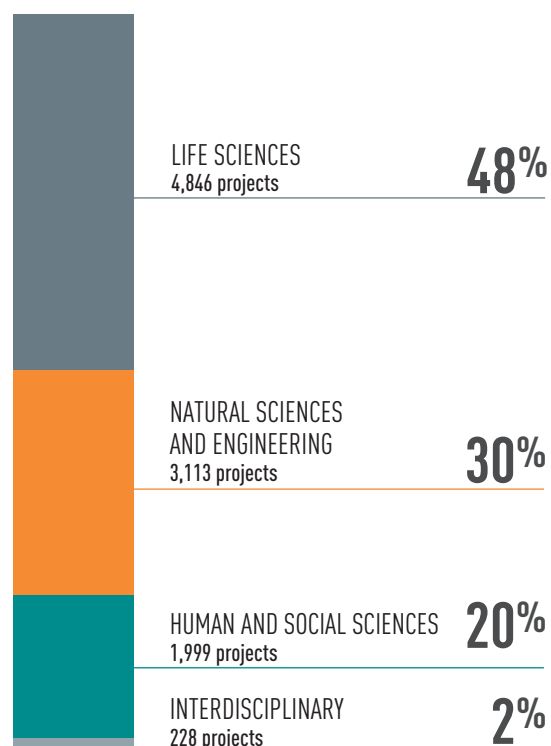
## BY FUNDING LINE



## BY INSTITUTION



## BY MAJOR KNOWLEDGE AREA

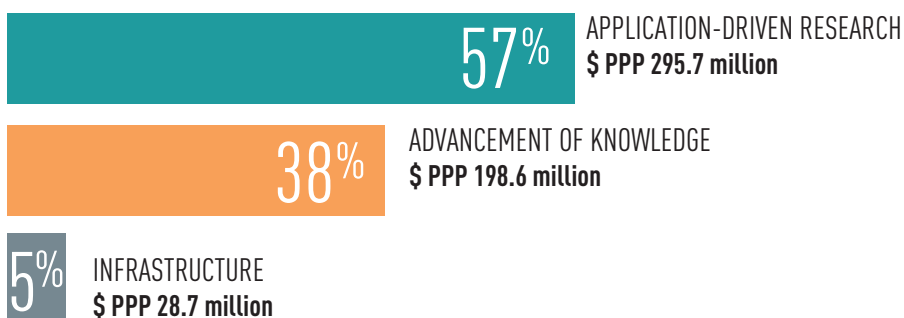




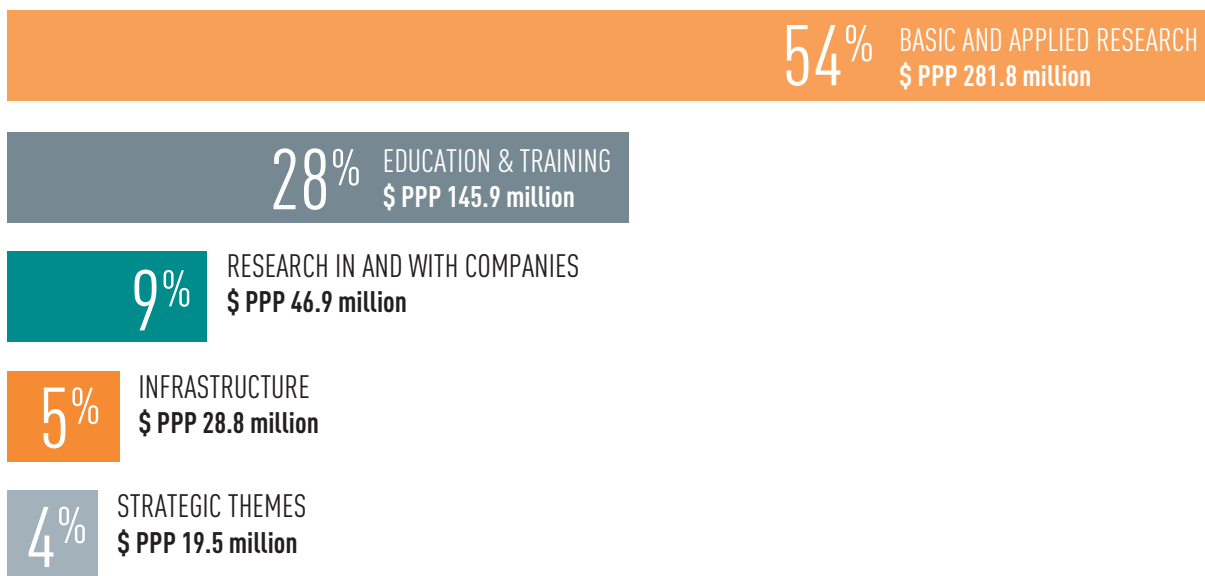
## DISBURSEMENT

**DISBURSEMENT: \$ PPP 523.0 million**

### BY FUNDING OBJECTIVE



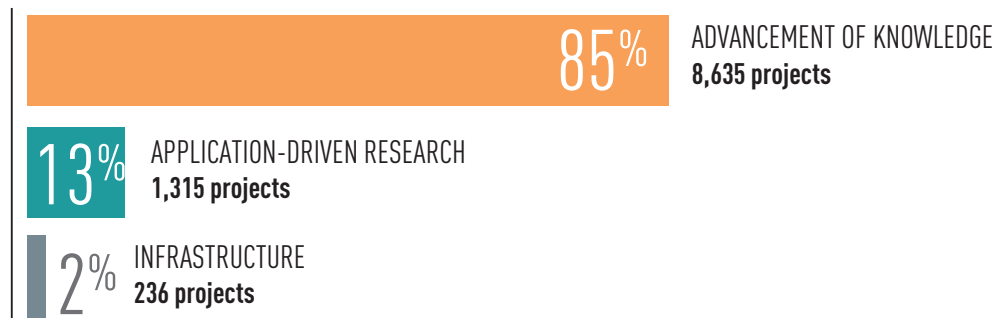
### BY RESEARCH STRATEGY



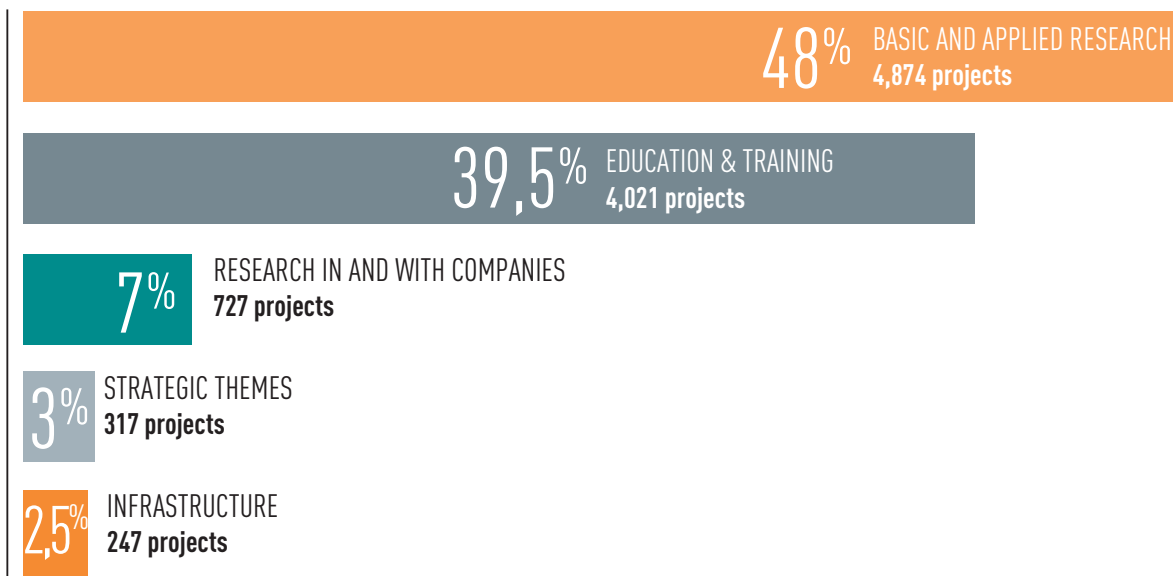
# NUMBER OF PROJECTS CONTRACTED

NUMBER OF PROJECTS CONTRACTED: **10,186**

## BY FUNDING OBJECTIVE



## BY RESEARCH STRATEGY



## FUNDING LINE

### REGULAR FELLOWSHIPS

In 2017 FAPESP disbursed

**\$ PPP 212.3 million** for **14,034** regular fellowships.

It received **11.933** applications and approved **5,495** new fellowships.

Regular fellowships and grants were the first funding instruments created by FAPESP as a permanent resource open to researchers who apply spontaneously according to their needs.

With scientific advance, expansion of the scientific community and growing societal requirements, it became necessary to create new types of scholarship and grant, some of which have a research catalyst profile.

They are still classified as “regular” to maintain the time series, but other classifications also exist, as seen in the chapters on research programs and research strategies.

It is important to note that the numbers presented in this chapter refer to regular fellowships with and without links to grants.

	DISBURSEMENT (\$ PPP)		PROJECTS ACTIVE		PROJECTS CONTRACTED	
Fellowships in Brazil	162.2 million	76%	12,228	87%	4,367	79%
Fellowships abroad	50.1 million	24%	1,806	13%	1,128	21%
BPE <sup>(1)</sup>	10.3 million		382		224	
BEPE <sup>(2)</sup>	39.8 million		1,424		904	
<b>TOTAL</b>	<b>212.2 million</b>	<b>100%</b>	<b>14,034</b>	<b>100%</b>	<b>5,495</b>	<b>100%</b>

<sup>(1)</sup> BPE: Research Fellowships Abroad

<sup>(2)</sup> BEPE: Research Internships Abroad

## TYPES OF REGULAR FELLOWSHIPS

Regular fellowships support the education and training of undergraduate and graduate researchers. They take several forms for research performed in Brazil, ranging from Scientific Initiation to Postdoctorate, and two for research conducted in other countries: Research Fellowships Abroad (BPE) for postdoctoral researchers, and Research Internships Abroad (BEPE) awarded to researchers to enable them to perform part of their research in another country during the term of an existing fellowship in Brazil.

**FELLOWSHIPS IN BRAZIL**

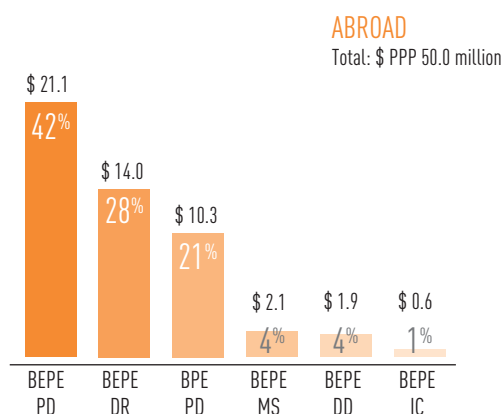
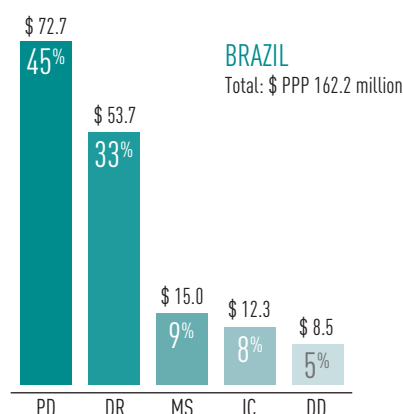
- Scientific Initiation (IC)
- Master's (MS)
- Doctorate (DR)
- Direct Doctorate (DD)
- Postdoctorate (PD)

[www.fapesp.br/bolsas/ic](http://www.fapesp.br/bolsas/ic)  
[www.fapesp.br/bolsas/ms](http://www.fapesp.br/bolsas/ms)  
[www.fapesp.br/bolsas/dr](http://www.fapesp.br/bolsas/dr)  
[www.fapesp.br/bolsas/dd](http://www.fapesp.br/bolsas/dd)  
[www.fapesp.br/bolsas/pd](http://www.fapesp.br/bolsas/pd)

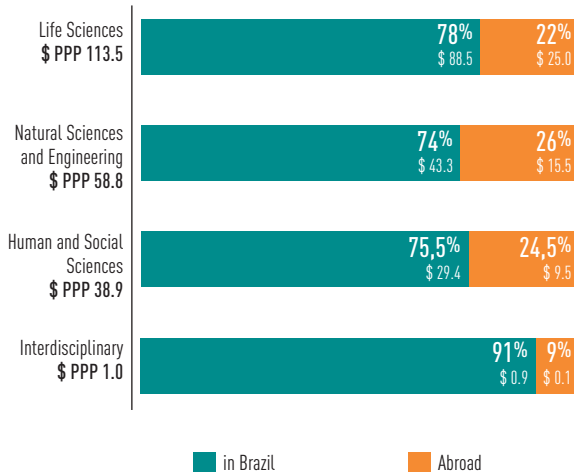
**FELLOWSHIPS ABROAD**

- Research Internships Abroad (BEPE)  
[www.fapesp.br/bolsas/bepe](http://www.fapesp.br/bolsas/bepe)
- Research Fellowships Abroad (BPE)  
[www.fapesp.br/bolsas/bpe](http://www.fapesp.br/bolsas/bpe)

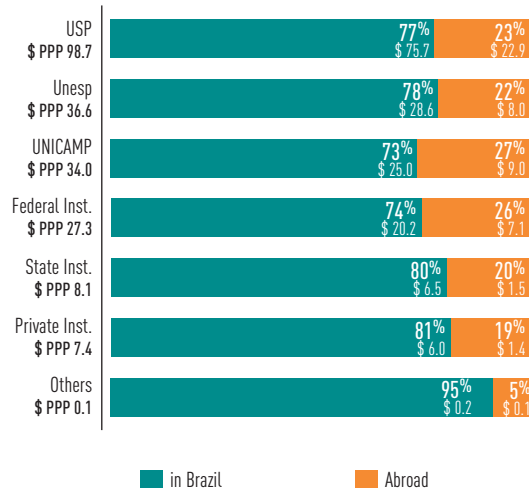
## REGULAR FELLOWSHIPS – DISBURSEMENT BY MODALITIES (in \$ PPP million)



## REGULAR FELLOWSHIPS – DISBURSEMENT BY MAJOR KNOWLEDGE AREA (in \$ PPP million)



## REGULAR FELLOWSHIPS – DISBURSEMENT BY INSTITUTION (in \$ PPP million)



## FUNDING LINE

## REGULAR GRANTS

In 2017 FAPESP disbursed

**\$ PPP 156.3 million** for **6,421** regular grants.

It received **4,959** applications for regular grants and approved **3,061** new projects.

Regular grants, which account for 30% of FAPESP's total disbursement in the year, are awarded to researchers with a PhD or equivalent and affiliated with higher education or research institutions in São Paulo State. This line is maintained for time series purposes in the breakdown of FAPESP's funding.

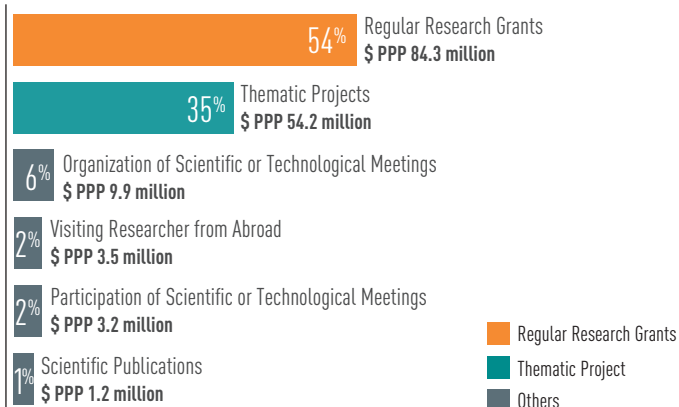
More than 4,000 projects were in progress during the year in the class of grant that supports individual projects (research project grants).

The funding allocated to these projects exceeded \$ PPP 84.3 million.

In the case of Thematic Projects, 469 projects were in progress during the year and the funding allocated to these projects added to \$ PPP 54.2 million, with 251 Thematic Projects hosted by the University of São Paulo (USP) accounting for \$ PPP 34 million. This class of grant supports team research projects with ambitious goals.

	DISBURSEMENT (\$ PPP)		PROJECTS ACTIVE		PROJECTS CONTRACTED	
Regular Research Grants	84.3 million	54%	4,112	64%	1,303	43%
Thematic Projects	54.2 million	35%	469	7%	125	4%
Others	17.8 million	11%	1,840	29%	1,633	53%
<b>TOTAL</b>	<b>156.3 million</b>	<b>100%</b>	<b>6,421</b>	<b>100%</b>	<b>3,061</b>	<b>100%</b>

## REGULAR GRANTS – DISBURSEMENT BY MODALITIES



## TYPES OF REGULAR GRANTS

Regular Research Grants

[www.fapesp.br/apr](http://www.fapesp.br/apr)

Thematic Projects

[www.fapesp.br/tematico](http://www.fapesp.br/tematico)

Organization of Scientific or Technological Meetings

[www.fapesp.br/auxilios/organizacao](http://www.fapesp.br/auxilios/organizacao)

Participation of Scientific or Technological Meetings

[www.fapesp.br/auxilios/participacao](http://www.fapesp.br/auxilios/participacao)

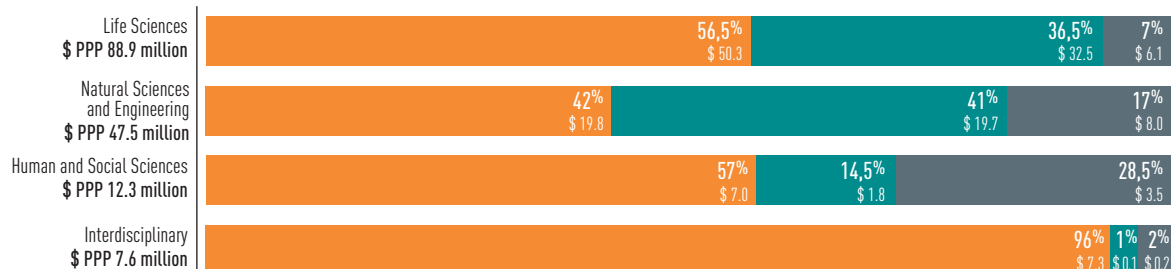
Visiting Researcher Program from Abroad

[www.fapesp.br/auxilios/visitante](http://www.fapesp.br/auxilios/visitante)

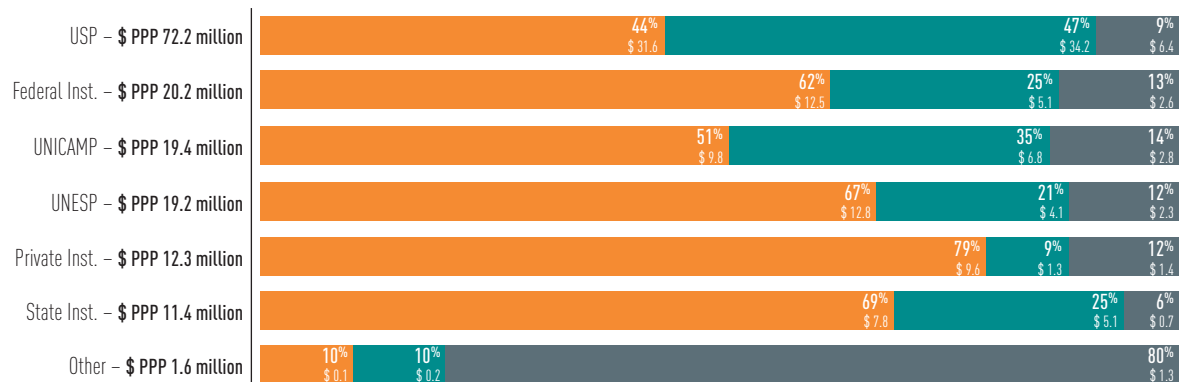
Scientific Publications

[www.fapesp.br/auxilios/publicacoes](http://www.fapesp.br/auxilios/publicacoes)

## REGULAR GRANTS – DISBURSEMENT BY MAJOR KNOWLEDGE AREAS (in \$ PPP million)



## REGULAR GRANTS – DISBURSEMENT BY INSTITUTION (in \$ PPP million)



## FUNDING LINE

### RESEARCH PROGRAMS

In 2017 FAPESP disbursed

**\$ PPP 154.4 million** for **3,571** ongoing projects linked to research programs and contracted **1,630** new projects.

Based on its understanding of the need to guarantee different types of support to foster scientific investigation in strategic areas and themes with specific requirements, FAPESP established Special Programs and Technological Innovation Programs, classifications created mainly for the purposes of administrative organization. The classification persists today to maintain the time series, as in the case of the regular line.

Support is also provided in the form of fellowships and grants. Some research projects require different kinds of support and are included through links to programs. Funding instruments linked to programs are not counted in the numbers presented in this chapter.

The consolidated data, encompassing all types of support awarded to the same project, will be presented in the next chapter, which addresses Research Strategies.

In 2017 disbursement to support research infrastructure through Special Programs totaled almost \$ PPP 40.4 million, with \$ PPP 9.0 million going to Special Projects, \$ PPP 8.4 million of which was to projects in Astronomy & Space Science, such as a project that assures participation by researchers from São Paulo State in the Giant Magellan Telescope, under construction in the Chilean Andes, among others.

	DISBURSEMENT (\$ PPP)		PROJECTS ACTIVE		PROJECTS CONTRACTED	
Special Programs	78.4 million	51%	2,556	72%	1,202	74%
Research for Technological Innovation Programs	76.0 million	49%	1,015	28%	428	26%
TOTAL	154.4 million	100%	3,571	100%	1,630	100%

## TYPES OF RESEARCH PROGRAMS

FAPESP funds two types of research programs: **SPECIAL PROGRAMS**, for education and training, and for research infrastructure; and **RESEARCH FOR TECHNOLOGICAL INNOVATION PROGRAMS**, for initiatives with clear potential applications.

### SPECIAL PROGRAMS

Young Investigators Awards (YIA)

[www.fapesp.br/jp](http://www.fapesp.br/jp)

Special Projects

São Paulo Excellence Chair (SPEC)

Research Program on eSCIENCE

[www.fapesp.br/escience](http://www.fapesp.br/escience)

Training Human Resources for Research  
(Technical Capacity-Building)

[www.fapesp.br/capacitacaotecnica](http://www.fapesp.br/capacitacaotecnica)

Public Education

[www.fapesp.br/ensinopublico](http://www.fapesp.br/ensinopublico)

Scientific Journalism (Mídia Ciência/Science Media)

[www.fapesp.br/jornalismocientifico](http://www.fapesp.br/jornalismocientifico)

Programs for Research Infrastructure

[www.fapesp.br/aip](http://www.fapesp.br/aip)

- Support for Research Infrastructure (Museums, Information and Document Depositories, and Biological Collections)
- FAP-Livros Book Program
- ANSP Network
- Multiuser Equipment (EMU)
- Program Technical Reserves Institutional Research Infrastructure
- Technical Reserves for Connectivity to ANSP Network
- Technical Reserves for Program Coordination
- Scientific Electronic Library Online (SciELO)

### RESEARCH FOR TECHNOLOGICAL INNOVATION PROGRAMS

Research, Innovation and Dissemination Centers (RIDCs)

[www.fapesp.br/cepid](http://www.fapesp.br/cepid)

Program for Support of Intellectual Property

[www.fapesp.br/papi](http://www.fapesp.br/papi)

#### STRATEGIC THEMES

BIOTA-FAPESP Research Program on Biodiversity

[www.fapesp.br/biota](http://www.fapesp.br/biota)

FAPESP Bioenergy Research Program (BIOEN)

[www.fapesp.br/bioen](http://www.fapesp.br/bioen)

FAPESP Research Program on Global Climate Change (RPGCC)

[www.fapesp.br/mcg](http://www.fapesp.br/mcg)

#### RESEARCH IN AND WITH COMPANIES

Innovative Research in Small Business (PIPE)

[www.fapesp.br/pipe](http://www.fapesp.br/pipe)

Research Partnership for Technological Innovation (PITE)

[www.fapesp.br/pite](http://www.fapesp.br/pite)

Engineering Research Centers and Applied Research Centers

[www.fapesp.br/cpe](http://www.fapesp.br/cpe)

#### PUBLIC POLICIES

Research in Public Policies

[www.fapesp.br/politicaspUBLICAS](http://www.fapesp.br/politicaspUBLICAS)

Research in Public Policies for the National Health  
Care System (PP-SUS)

[www.fapesp.br/ppsus](http://www.fapesp.br/ppsus)



## FUNDING LINE

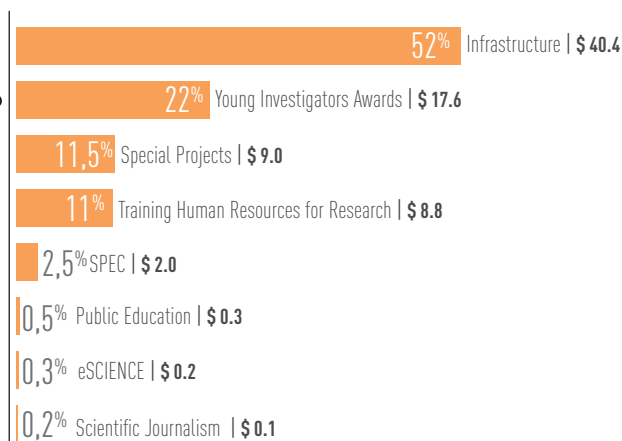
### The **Young Investigators Awards (YIA) Program**,

of the ways FAPESP seeks to attract talented young PhDs with significant potential and enable them to stay in São Paulo State, especially at centers without expertise in scientific research or research in strategic areas, received funding mainly for projects in Health (\$ PPP 7.4 million), Biology (\$ PPP 3.5 million) and Physics (\$ PPP 2.5 million).

#### SPECIAL PROGRAMS

##### DISBURSEMENTS BY MODALITIES (in \$ PPP million)

Total disbursement: \$ PPP 78.4 million



The standouts among Technological Innovation Research Programs were

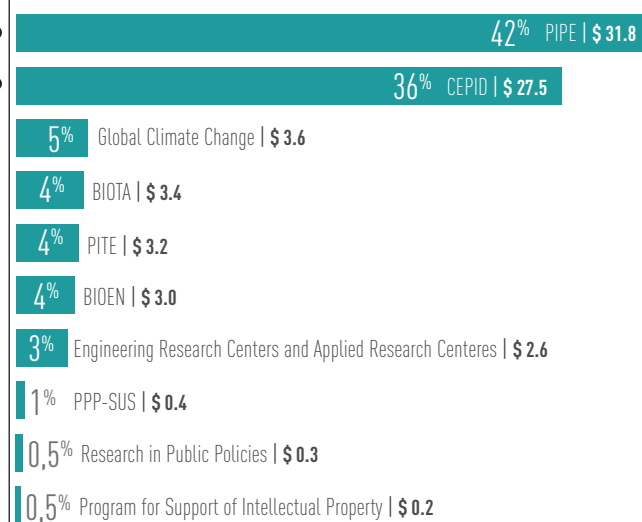
### **Innovative Research in Small Business (PIPE)**,

which posted a new record in disbursement and numbers of projects contracted, and **Research, Innovation & Dissemination Centers (RIDCs)**, multi-institutional and interdisciplinary centers of research excellence in São Paulo State that receive long-term investment (up to 11 years).

#### RESEARCH FOR TECHNOLOGICAL INNOVATION PROGRAMS

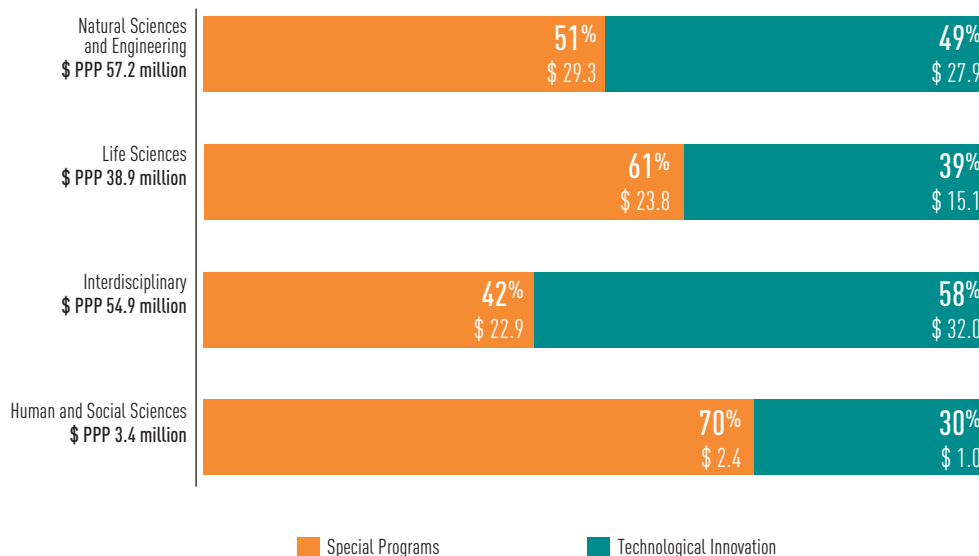
##### DISBURSEMENTS BY MODALITIES (in \$ PPP million)

Total disbursement: \$ PPP 76.0 million

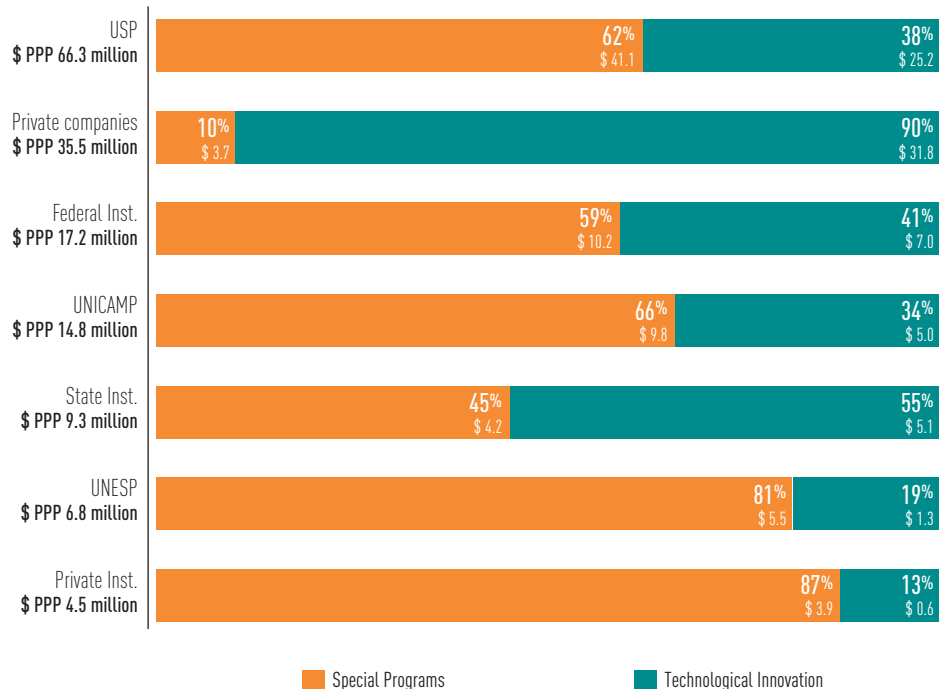


# RESEARCH PROGRAMS

## DISBURSEMENT BY MAJOR KNOWLEDGE AREA (in \$ PPP million)



## DISBURSEMENT BY INSTITUTION (in \$ PPP million)





**CHAPTER**

# 3

## **RESEARCH STRATEGIES**

EDUCATION & TRAINING

BASIC AND APPLIED RESEARCH

RESEARCH IN AND WITH COMPANIES

RESEARCH ON STRATEGIC THEMES

RESEARCH INFRASTRUCTURE

### 3 RESEARCH STRATEGIES

The numbers for disbursement and projects contracted presented in previous chapters considered only the specific funding instruments for each line or type of support. This chapter offers a more comprehensive and integrated picture by counting all types of support awarded for each purpose, including the fellowships and grants associated to the same project. The data are categorized as follows:



EDUCATION & TRAINING

BASIC AND APPLIED RESEARCH

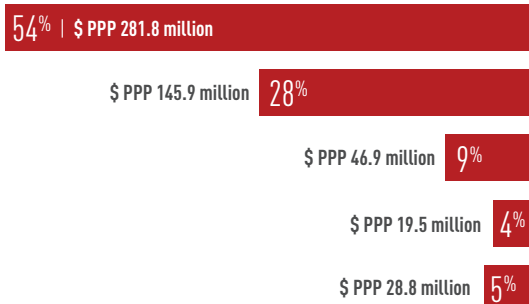
RESEARCH IN AND WITH COMPANIES

RESEARCH ON STRATEGIC THEMES

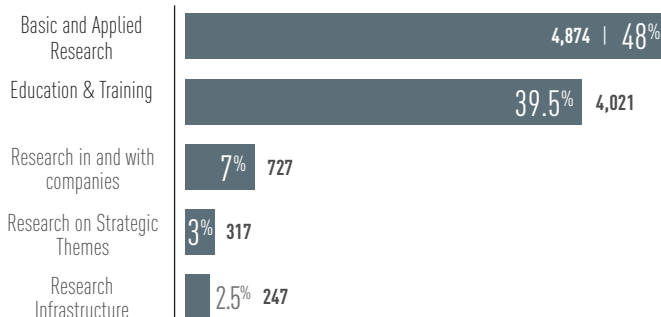
RESEARCH INFRASTRUCTURE

#### RESEARCH STRATEGIES – BY CATEGORIES

##### DISBURSEMENT

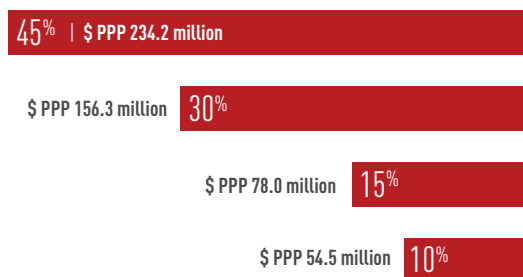


##### NUMBER OF PROJECTS CONTRATED

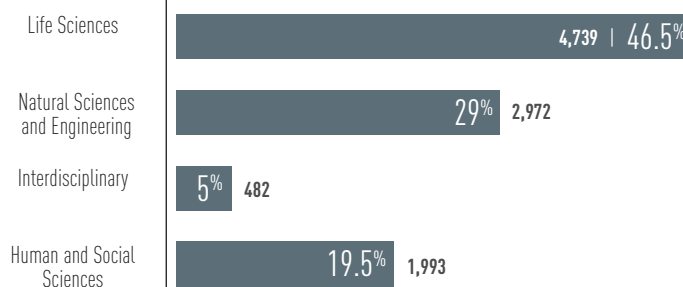


#### RESEARCH STRATEGIES – BY MAJOR KNOWLEDGE AREAS

##### DISBURSEMENT



##### NUMBER OF PROJECTS CONTRATED



## EDUCATION & TRAINING

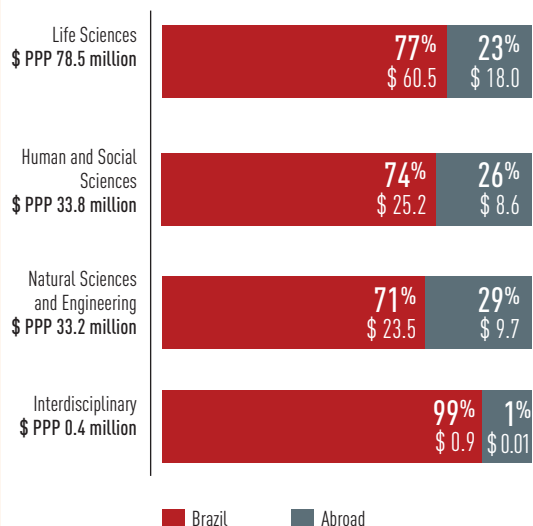
In 2017 FAPESP allocated **\$ PPP 145.9 million** to fellowships tied exclusively to the education and training of new researchers. The Foundation awarded **4,021** new fellowships during the year.

The fellowships in question are for scientific initiation, master's degrees, doctorates, direct doctorates and postdoctoral research in Brazil and abroad, associated to individual projects submitted spontaneously by researchers and contracted without ties to any other research project.

	DISBURSEMENT (\$ PPP)		PROJECTS CONTRACTED	
Fellowships in Brazil	109.6 million	75%	3,152	78%
Fellowships Abroad	36.3 million	25%	869	22%
<b>TOTAL</b>	<b>145.9 million</b>	<b>100%</b>	<b>4,021</b>	<b>100%</b>

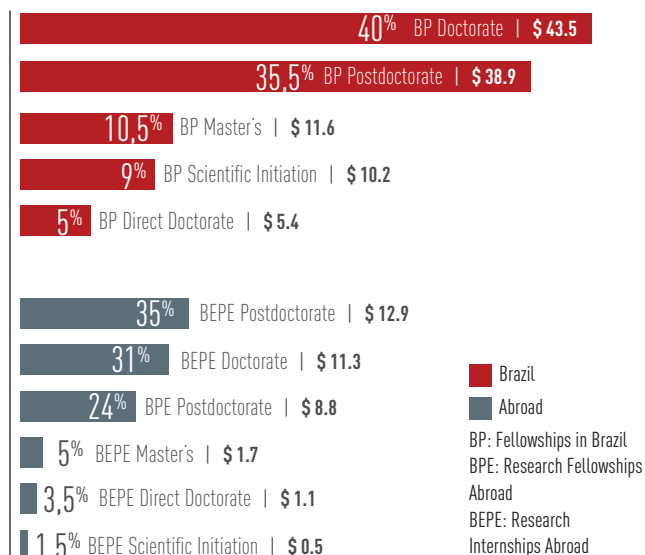
### DISBURSEMENT BY MAJOR KNOWLEDGE AREAS

(in \$ PPP million)



### DISBURSEMENT BY FELLOWSHIPS MODALITIES

(in \$ PPP million)



# 3 RESEARCH STRATEGIES

## BASIC AND APPLIED RESEARCH

In basic and applied research projects, including all fellowships and grants associated to these projects, FAPESP invested a total of **\$ PPP 281.8 million**, or 49% of all the funding disbursed in 2017.

This classification encompasses the most ambitious and internationally competitive medium- and long-term scientific and technological investigations.

The category includes projects developed by FAPESP's

**17 Research, Innovation & Dissemination Centers (RIDCs)**, which up to 11 years and have the mission of conducting internationally competitive research, extracting from it results applicable to technological innovation and/or public policy, and disseminating this knowledge to society.

Another example is the **Young Investigators Awards** program. Projects are funded for up to four years. The program is designed to strengthen the research system in São Paulo State by encouraging young researchers with outstanding potential to create new research groups at institutions without a research tradition. The idea is that they focus on contemporary subjects of international relevance not yet covered by researchers in the state.

Also part of this category are **Thematic Projects**, conducted by groups of researchers for up to five years, and the São Paulo Excellence Chair (**SPEC**), a type of Thematic Project that brings top-tier scientists from other countries to lead research initiatives in São Paulo.

FAPESP also awards research grants to support individual projects developed by PhDs in search of solutions to challenges faced by society.

## BASIC AND APPLIED RESEARCH – BY MODALITIES

### DISBURSEMENT

39% | \$ PPP 109.1 million

34% | \$ PPP 97.6 million

\$ PPP 42.1 million 15%

\$ PPP 27.8 million 10%

\$ PPP 3.1 million | 1%

\$ PPP 2.1 million | 0.7%

Thematic

Regular Research Grants

RICD and associated

Young Investigators and associated

SPEC and associated

Training Human Resources for Research and associated

### NUMBER OF PROJECTS CONTRACTED

26% 1,248

2,619 | 54%

5.5% 271

8% 401

0.5% | 25

6% 310

## BASIC AND APPLIED RESEARCH – BY MAJOR KNOWLEDGE AREAS

### DISBURSEMENT

46% | \$ PPP 130.5 million

\$ PPP 82.9 million 29%

\$ PPP 50.0 million 18%

\$ PPP 18.4 million 7%

Life Sciences

Natural Sciences and Engineering

Interdisciplinary

Human and Social Sciences

### NUMBER OF PROJECTS CONTRACTED

2,159 | 44%

31% 1,495

6% 309

19% 911



# 3 RESEARCH STRATEGIES

## RESEARCH IN AND WITH COMPANIES

In 2017 FAPESP allocated **\$ PPP 46.9 million** to research involving academic-business collaboration and research for innovation by small business. This amount includes all funding instruments associated to the projects concerned.

The investment is based on FAPESP's view that the interface between academia and the business sector is fundamental to promoting a research environment in universities and research institutions that is more comprehensive and better connected to society, thereby increasing scientific and technological development, enhancing business competitiveness, and strengthening the creation of a climate that fosters technological innovation in São Paulo State.

The FAPESP Program to Support Research Collaboration between Universities/Research Institutions and Business Enterprises encompasses the programs **Research Partnership for Technological Innovation (PITE)** and **Engineering Research Centers and Applied Research Centers.**

These programs support collaboration between academics and researchers employed by companies, while the program **Innovative Research in Small Business (PIPE)**

stimulates innovation in smaller enterprises.

.....PITE  
**\$ PPP 4.1 million**  
37 projects contracted

.....CPE  
**\$ PPP 7.3 million**  
5 centers with 30 new projects contracted

.....PIPE  
**\$ PPP 35.5 million**  
660 projects contracted

# RESEARCH IN WITH AND COMPANIES

## PITE

Research Partnership for Technological Innovation (PITE) supports scientific and technological research projects developed at universities and research institutions in São Paulo State and involving partnerships between researchers employed by companies of all sizes and academic researchers.

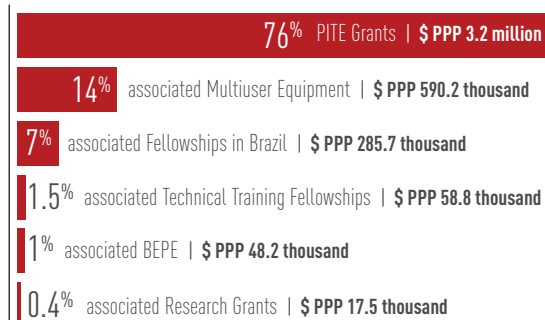
Applications may be submitted spontaneously or selected in calls for proposals issued by FAPESP in partnership with companies that will contribute counterpart funding in pursuit of results to help address challenges pertinent to their own business or to their sector.

In 2017 FAPESP contracted 11 spontaneously presented projects – eight by IBM, and one each by Embraer, Ananse Química and bioMérieux Brasil.

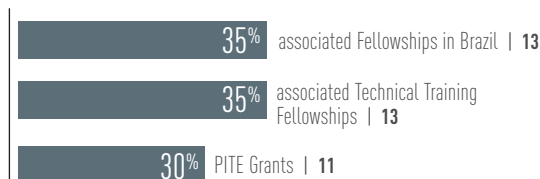
Moreover, in 2017, FAPESP signed cooperation agreements with COPAG and São Martinho Group. It also issued calls for proposals with Microsoft, Intel, IBM and Agilent.

The selection procedures will be completed in 2018. Other companies with projects supported in 2017 can be found in the chapter on Research Collaboration.

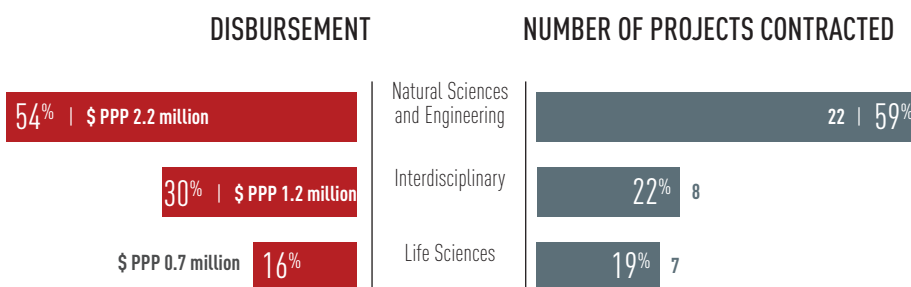
### PITE – DISBURSEMENT BY MODALITY



### PITE – NUMBER OF PROJECTS CONTRACTED BY MODALITY



### PITE – BY MAJOR KNOWLEDGE AREAS



## RESEARCH IN AND WITH COMPANIES

## ENGINEERING RESEARCH CENTERS AND APPLIED RESEARCH CENTERS

The Engineering Research Center (ERC) and Applied Research Center Program uses the successful model developed for the RIDC program, which receives long-term funding for interdisciplinary approaches to complex problems, in conjunction with PITE, in which a company contributes counterpart research funding on the basis of a strong motivation to participate actively in defining the focal themes to be investigated and in the research projects conducted, with intent to use the results obtained by the Center.

The primary mission of an ERC is to

execute complex research projects at the knowledge frontier, oriented to address problems and in pursuit of well-defined results that help form a world-class research center during its existence. In addition, the ERC's internationally competitive core research team must develop effective means to transfer technology, promote education, and disseminate knowledge.

Five ERCs were established and became actively operational between publication of the first calls for proposals in 2013 and the end of 2017, with: Peugeot-Citroën, hosted by the University of Campinas (UNICAMP);

## ENGINEERING RESEARCH CENTERS AND APPLIED RESEARCH CENTERS ESTABLISHED BY 2017

NAME OF CENTER	PROFESSOR URBANO ERNESTO STUMPF ERC	CENTER OF EXCELLENCE FOR RESEARCH IN SUSTAINABLE CHEMISTRY	MOLECULAR TARGET DISCOVERY RESEARCH CENTER	RESEARCH CENTER FOR GAS INNOVATION (RCGI)	CENTER FOR APPLIED RESEARCH IN HUMAN WELLBEING AND BEHAVIOR
Partner company	Peugeot-Citroën	GlaxoSmithKline (GSK)	GlaxoSmithKline (GSK)	BG Group Shell	Natura
Host institution	School of Mechanical Engineering, UNICAMP	Chemistry Department, UFSCar	Butantan Institute	Engineering School (POLI), USP	Psychology Institute, USP
Institutions involved	USP, ITA, Maua Technology Institute	UNICAMP, USP Ribeirão Preto, UNESP, Federal University of Santa Catarina (UFSC)		Energy & Environment Institute (IEE) and Chemistry Institute, USP São Carlos, Law School, USP, IPEN	Federal University of São Paulo (UNIFESP), Mackenzie Presbyterian University (UPM)
Principal Investigator	Waldyr Luiz R. Gallo	Arlene G. Correa	Ana Marisa C. Tavassi	Julio R. Meneghini	Emma Otta
Research target	Research on combustion engines adapted or developed specifically for biofuels	Development and use of sustainable chemistry to address current challenges in organic synthesis	Discovery and validation of therapeutic targets for development of new drugs to treat inflammatory diseases	Increase in share of natural gas in Brazil's energy balance	Multidisciplinary studies to evaluate and promote wellbeing of Brazilian population

DISBURSEMENT  
\$ PPP 7.3 million

**30** PROJECTS CONTRACTED  
22 associated fellowships in Brazil  
5 technical training fellowships  
2 associated research grants  
1 associated multiuser equipment project

GlaxoSmithKline – two centers, one at the Federal University of São Carlos (UFSCar) and the other at Butantan Institute; BG Group/Shell at the University of São Paulo (USP); and Natura, also at USP. Other research institutions participated.

The establishment of two new centers was approved in 2017 and contracts were formalized in 2018: the Genomics for Climate Change Research Center (GCCRC), in partnership with Brazilian Agricultural Research Corporation (EMBRAPA) and UNICAMP; and the Center for Innovation in New Energies (CINE), in partnership

with Shell. CINE will have four research divisions, hosted by UNICAMP (Advanced Energy Storage, and Dense Energy Carriers), USP (Computational Material Science & Chemistry), and IPEN (Sustainable Route for Conversion of Methane with Advanced Chemical Technologies).

Calls for proposals to establish new ERCs were also issued during the year, this time in partnership with Koppert do Brasil, Statoil, and the São Martinho Group. In the same period FAPESP also issued invitations to companies interested in co-funding ERCs in advanced manufacturing.

## ENGINEERING RESEARCH CENTERS AWAITING SELECTION, APPROVAL OR CONTRACTING IN 2017

NAME OF CENTER	GENOMICS FOR CLIMATE CHANGE RESEARCH CENTER (GCCRC)	CENTER FOR INNOVATION IN NEW ENERGIES (CINE)	ERC IN BIOLOGICAL PEST CONTROL	ERC IN OIL AND GAS PRODUCTION AND RESERVOIR MANAGEMENT	ERC IN SUGARCANE DISEASES
Partner company	Embrapa	Shell	Koppert	Statoil	Usina São Martinho
Research target	Development of biotechnological solutions that increase plant resistance to drought and heat; technology transfer to business sector	Development of new energy storage devices with zero greenhouse gas emissions, among others	Research on biological pest control	Development of innovative solutions to optimize the production and efficiency of oil wells, among others	Internationally competitive research on sustainable action to control sugarcane pests and diseases

## RESEARCH IN AND WITH COMPANIES

### INNOVATIVE INNOVATION IN SMALL BUSINESS (PIPE)

The Innovative Research in Small Business (PIPE) program supports entrepreneurs and startups that aim to convert knowledge into novel products and services. The pioneering funding platform for technology companies in Brazil, PIPE reached its **20<sup>th</sup> year** in 2017.

Since its inception in 1997, the program has supported **2,060** projects conducted by small and medium enterprises in **132** cities in São Paulo State, as seen from the map.

Growing numbers of SMEs have shown interest in winning support from PIPE. The number of research projects submitted jumped from 350 in 2012 to **1,013** in 2017.

In 2017 FAPESP disbursed **\$ PPP 35.5 million** for PIPE projects, more than ever before and 21% more than in 2016. The number of PIPE project grants contracted also set a new record, reaching **269**, 18% higher than in 2016, without counting PIPE fellowships (126) or **391** other grants and fellowships associated to the projects concerned. This value was equivalent to **one new project contracted per business day**.

New opportunities created during the year included a call for proposals in partnership with Pitch Gov SP, a public service innovation program hosted by the São Paulo State Government, and five calls issued in partnership with the Brazilian Innovation Agency (FINEP) for proposals to develop innovative solutions in health inputs, methods of combating arboviruses, agricultural productivity and efficiency, advanced manufacturing, and a selection of PIPE Phase 3 projects. Calls were also issued in the four annual cycles for Phase 1 and Phase 2 PIPE projects with support from FAPESP.

Nine projects were approved in the selection processes begun with FINEP in 2017 and now completed, in addition to **151** in the FAPESP cycles.

NUMBER OF PROJECTS  
IN 20 YEARS:  
**2,060**

## THE GEOGRAPHY OF INNOVATION IN SÃO PAULO STATE

Cities in São Paulo State where PIPE projects have been contracted since 1997



Adamantina	3	Botucatu	28	Franco da Rocha	1	Jandira	1	Patrocínio Paulista	2	São Caetano do Sul	15
Alumínio	1	Bragança Paulista	5	Garça	1	Jarinu	1	Paulínia	11	São Carlos	287
Americana	4	Brotas	1	Guararema	2	Jundiáí	12	Pereiras	1	São João da Boa Vista	1
Américo de Campos	1	Caieiras	1	Guarujá	1	Juquitiba	1	Pindorama	2	São Joaquim da Barra	2
Amparo	2	Cajamar	8	Guarulhos	5	Leme	1	Piracicaba	50	São José do Rio Preto	17
Analândia	2	Cajobi	3	Holambra	9	Lençóis Paulista	1	Pirassununga	7	São José dos Campos	146
Angatuba	1	Campinas	316	Hortolândia	1	Limeira	9	Poá	4	São Manuel	1
Araçariguama	2	Capivari	4	Ibiúna	1	Mairinque	1	Porto Feliz	1	São Paulo	510
Araçatuba	4	Carapicuíba	2	Ilha Comprida	1	Marília	1	Rafard	6	São Roque	5
Araraquara	12	Cataji	1	Ilha Solteira	1	Matão	1	Rancharia	1	Serrana	3
Araras	8	Catanduva	3	Indaiatuba	10	Mauá	4	Registro	2	Sertãozinho	6
Airirinha	2	Charqueada	2	Itapeçerica da Serra	1	Mirassol	1	Ribeirão Pires	3	Socorro	1
Artur Nogueira	2	Cotia	14	Itapetininga	2	Mococa	4	Ribeirão Preto	105	Sorocaba	25
Arujá	2	Cravinhos	4	Itapeva	1	Mogi das Cruzes	20	Rio Claro	10	Sumaré	5
Assis	3	Diadema	8	Itapira	7	Mogi Guaçu	4	Riolândia	2	Suzano	1
Atibaia	2	Dois Córregos	2	Itararé	1	Mogi Mirim	8	Salto	1	Taboão da Serra	2
Barretos	3	Dumont	1	Itatiba	1	Monte Alto	1	Santa Bárbara d'Oeste	3	Taruma	1
Barueri	9	Engenheiro Coelho	4	Itu	3	Monte Aprazível	1	Santa Maria da Serra	1	Tupã	1
Batatais	3	Estiva Gerbi	1	Itupeva	1	Monte Mor	1	Santana de Parnaíba	12	Valinhos	5
Bauru	4	Ferraz de Vasconcelos	2	Jaboticabal	8	Orlândia	2	Santo André	9	Vinhedo	2
Boituva	1	Franca	6	Jacareí	2	Osasco	2	Santos	7	Vista Alegre do Alto	1
Bom Jesus dos Perdões	3	Francisco Morato	2	Jaguariúna	2	Palestina	1	São Bernardo do Campo	7	Votuporanga	3
										Outras	141

## RESEARCH IN AND WITH COMPANIES

## PIPE – BY MODALITIES

## DISBURSEMENT

76% | \$ PPP 27.1 million

\$ PPP 3.7 million 10%

\$ PPP 4.7 million 13%

\$ PPP 89.2 thousand | 1%

## NUMBER OF PROJECTS CONTRACTED

PIPE Grants

269 | 41%

associated Technical  
Training Fellowships

261 | 39.5%

PIPE Fellowships

19% 126

Others

0.5% | 4

## PIPE – BY MAJOR KNOWLEDGE AREAS

## DISBURSEMENT

66% | \$ PPP 23.3 million

\$ PPP 8.6 million 24%

\$ PPP 3.0 million 8.5%

\$ PPP 0.6 million | 1.5%

## NUMBER OF PROJECTS CONTRACTED

Natural Sciences  
and Engineering

389 | 59%

Life Sciences

27% 178

Interdisciplinary

12% 80

Human and Social  
Sciences

2% | 13

# RESEARCH STRATEGIES

## RESEARCH ON STRATEGIC THEMES

Research projects for programs linked to Strategic Themes – biodiversity, bioenergy, global climate change, eScience, and public policy – received 4% of the funding disbursed by FAPESP in 2017.

The FAPESP Research Program on Biodiversity Characterization, Conservation, Restoration & Sustainable Use (**BIOTA-FAPESP**) joined the Brazilian Platform on Biodiversity & Ecosystem Services (BPBES), the Brazilian arm of the Intergovernmental Science Policy Platform on Biodiversity & Ecosystem Services (IPBES), which will produce a Brazilian Assessment to contribute to decision making on environmental management in Brazil.

The FAPESP Bioenergy Research Program (**BIOEN**) held the third edition of the Brazilian Bioenergy Science & Technology Conference (BBEST) at Campos do Jordão, São Paulo State, on October 17-19. Entitled “Designing a Sustainable Bioeconomy”, the conference highlighted the roles of the scientific and business communities in addressing technological challenges to the sustainable use of biological resources.

The FAPESP Research Program on Global Climate Change (**RPGCC**) supports research in Brazil conducted on a local, regional and global scale by large multidisciplinary teams.

An example is the program’s scientific contribution to international agreements such as the Paris accord signed at the 2015 United Nations Climate Change Conference (COP 21). The program’s 2017 annual meeting was attended by scientists from institutions across Brazil.

One of the initiatives launched by the FAPESP **eScience & Data Science** Research Program in 2017 was an eScience Workshop on Agriculture in the Digital Age, which discussed changes in agriculture due to the use of information technology. Understanding the challenges involved in the analysis of the extremely large and varied mass of data collected in research of this kind and offering technological solutions to them are part of the role of researchers in eScience.

The programs Public Policy Research and Public Policy Research for the National Health System (**PP-SUS**), which fund research in many knowledge areas for application in public policy formulation and management, contracted 106 new projects.



DISBURSEMENT FOR STRATEGIC THEMES IN 2017 TOTALED

**\$ PPP 19.5 million.**

**317** NEW PROJECTS WERE CONTRACTED.

### STRATEGIC THEMES – BY MODALITIES

#### DISBURSEMENT WITH ACTIVE PROJECTS

35% | \$ PPP 6.8 million

28% | \$ PPP 5.4 million

27% | \$ PPP 5.3 million

\$ PPP 1.4 million

7%

\$ PPP 0.6 million

2.5%

\$ PPP 0.01 million | 0.5%

#### NUMBER OF PROJECTS CONTRACTED

BIOTA

23% 72

BIOEN

16% 52

Climate Change

21.5% 68

Public Policies

33.5% | 106

eScience

6% 19

CInAPCe

0

### STRATEGIC THEMES – BY MAJOR KNOWLEDGE AREAS

#### DISBURSEMENT WITH ACTIVE PROJECTS

60% | \$ PPP 11.7 million

\$ PPP 6.0 million

31%

\$ PPP 1.3 million

7%

\$ PPP 0.4 million | 2%

#### NUMBER OF PROJECTS CONTRACTED

Life Sciences

52% | 165

Natural Sciences  
and Engineering

21% 65

Human and Social Sciences

25% 79

Interdisciplinary

2% | 8

# RESEARCH STRATEGIES

## RESEARCH INFRASTRUCTURE

Disbursement for programs to maintain or upgrade research infrastructure in São Paulo State without links to any other kind of project amounted to **\$ PPP 28.8 million**. When the disbursement for funding instruments to support infrastructure associated to Thematic Projects and the RIDC, YIA and ERC programs are added, the total jumps to **\$ PPP 42.6 million**.

FAPESP runs a group of seven programs that fund a wide array of initiatives from laboratory refurbishment to the purchasing of equipment that can be shared by the entire scientific community in São Paulo State, as well as supporting the maintenance or improvement of museums and collections and access to the Academic Network of São Paulo (Rede ANSP) and providing other types of funding that help ensure the availability of the infrastructure required by researchers in the state.

An example of the importance of this support for infrastructure is the robotic telescope T80-South, built with FAPESP's support in the multiuser equipment category and installed at the Cerro Tololo Inter-American Observatory in Chile. Observations made with this telescope enabled Brazilian researchers to participate in a study that resulted in an important discovery in the area of Physics in 2017: the detection of gravitational waves.

A source of these space-time fluctuations, which Albert Einstein (1879-1955) predicted a century ago, was observed for the first time in visible light by a group of more than 3,000 astronomers including 60 from Brazil.

In addition to infrastructure programs, FAPESP supports the Scientific Electronic Library Online (SciELO), which affords access to scientific journals, and PAPI-NUPLITEC, a program that supports the protection of intellectual property and licensing of rights to the results of research funded by FAPESP via the Technology Patenting & Licensing Center (NUPLITEC).

## RESEARCH INFRASTRUCTURE

## INFRASTRUCTURE – BY MODALITIES

## DISBURSEMENT WITH ACTIVE PROJECTS

72% | \$ PPP 20.8 million

\$ PPP 5.2 million 18%

\$ PPP 1.8 million 6.4%

\$ PPP 0.8 million | 2.6%

\$ PPP 0.2 million | 1%

Technical  
Reserves

ANSP Network

Equipment Repair

Multiuser  
EquipmentIntellectual Property  
(PAPI-Nuplitech)

## NUMBER OF PROJECTS CONTRACTED

45% | 111

0.4% | 1 projeto contratado

50% | 123

3% | 7

2% | 5

## INFRASTRUCTURE – BY MAJOR KNOWLEDGE AREAS

## DISBURSEMENT WITH ACTIVE PROJECTS

78% | \$ PPP 22.5 million

\$ PPP 2.9 million 10%

\$ PPP 3.2 million 11%

\$ PPP 0.2 million | 1%

Interdisciplinary

Life Sciences

Natural Sciences  
and Engineering

Human and Social Sciences

## NUMBER OF PROJECTS CONTRACTED

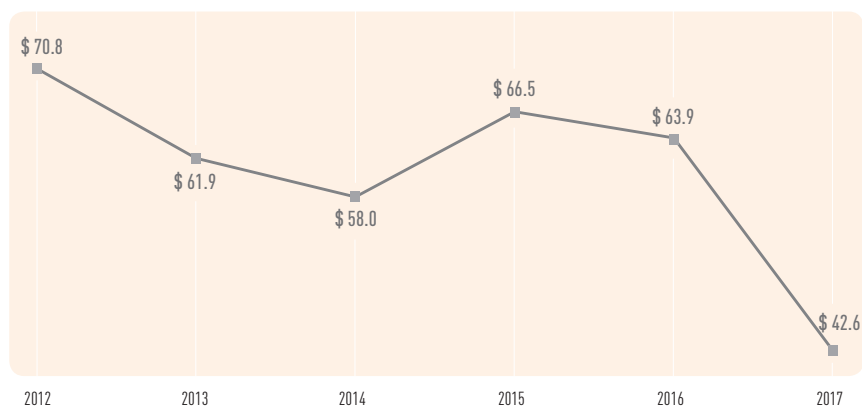
24% 59

42.5% | 105

31.5% | 78

2% | 5

**EVOLUTION OF DISBURSEMENT FOR  
INFRASTRUCTURE – 2012-2017**  
including projects associated to  
Thematic Projects, RIDC, ERC and YIA  
(in \$ PPP million)







**CHAPTER**

**4**

**COOPERATION  
IN RESEARCH**

In 2017 FAPESP disbursed **\$ PPP 86.6 million** to stimulate scientific collaboration between researchers at institutions in São Paulo State and research networks elsewhere in Brazil and abroad. The goal is to bolster the results of scientific research in areas of common interest or complementary areas, and to strengthen the international impact of the science produced in São Paulo State.

Investment in domestic collaboration amounted to **\$ PPP 13.4 million**, and investment in cross-border collaboration amounted to **\$ PPP 73.2 million**. Some of these partnerships are governed by cooperation agreements between FAPESP and other funding agencies, universities and research institutions, multilateral organizations and companies, as detailed on pages 58-63.

Calls for research proposals currently in effect and for previous years can be found (in Portuguese) at [www.fapesp.br/chamadas](http://www.fapesp.br/chamadas). Some of them is at [www.fapesp.br/en/sprint](http://www.fapesp.br/en/sprint).

### RESEARCH COOPERATION FUNDING INSTRUMENTS

The main funding instruments are fellowships for research abroad (BPE), fellowships for research internships abroad (BEPE), research project grants, and grants for participation in scientific meetings in Brazil and abroad, for visiting Brazilian and foreign researchers, and for the organization of scientific meetings such as the São Paulo Schools of Advanced Science, short courses delivered by leading Brazilian and foreign scientists, in which several Nobel Laureates have participated to date.

#### DISBURSEMENT FOR RESEARCH COLLABORATION

(in \$ PPP million)

Type	International	Domestic
<b>Not associated to cooperation agreements</b>	<b>\$</b>	<b>\$</b>
Fellowships for research abroad (BPE)	39.8	0
Fellowships for research internships abroad (BEPE)	10.3	0
Grants for visiting researchers	2.4	1.0
Grants for participation in meetings	3.1	0.1
Grants for meeting organization	0.4	9.7
<b>Subtotal</b>	<b>56</b>	<b>10.8</b>
<b>Associated to cooperation agreements</b>	<b>\$</b>	<b>\$</b>
Fellowships in Brazil	2.3	0.01
Fellowships for technical training	0.6	0.01
Fellowships for research abroad (BPE)	0.2	0
Research grants	13.8	2.6
Grants for visiting researchers	0.1	0
Grants for meeting organization	0.2	0
<b>Subtotal</b>	<b>17.2</b>	<b>2.6</b>
<b>Total</b>	<b>73.2</b>	<b>13.4</b>

## FAPESE WEEK

In 2017 FAPESP organized the 15<sup>th</sup> FAPESP Week, this time in Nebraska and Texas (USA). The organization of FAPESP Week scientific symposia, which began in 2011, is part of a strategy of creating an environment for scientific collaboration between Brazilian and foreign researchers based on the identification of common interests.

FAPESP Week has previously been held in the following countries:

USA – Washington, D.C., in 2011 and 2012; Morgantown (West Virginia) and Cambridge (Massachusetts), in 2012; Charlotte, Chapel Hill and Raleigh (North Carolina), in 2013; Berkeley and Davis (California), in 2014; Michigan and Ohio, in 2016.

CANADA – Toronto (2012)

SPAIN – Salamanca and Madrid (2012), Barcelona (2015)

UK – London (2013)

JAPAN – Tokyo (2013)

CHINA – Beijing (2014)

GERMANY – Munich (2014)

ARGENTINA – Buenos Aires (2015)

BRAZIL – São Paulo (2015)

URUGUAY – Montevideo (2016)

## INTERNATIONAL COLLABORATION

### Most frequent destinations and origins

Of the **904** new awardees of BEPE fellowships, 480 opted for research internships in Europe, 357 in North America, 18 in South America, 14 in Asia, 32 in Oceania, and three in Africa.

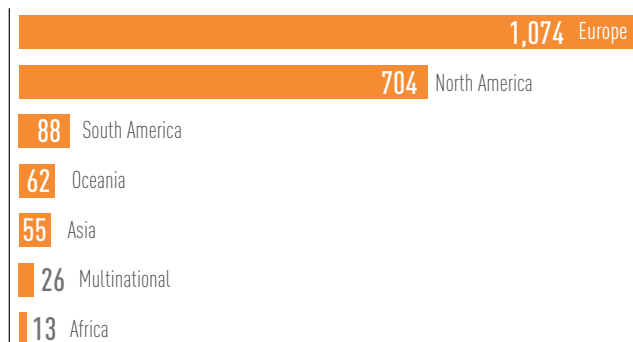
Of the **224** PhDs awarded a BPE scholarship for postdoctoral research abroad in 2017, 112 chose organizations in Europe, 95 in North America, 6 in South America, 10 in Oceania, and one in Asia.

The **525** participations in scientific meetings abroad took place in Europe (274), North America (168), South America (44), Asia (22), Oceania (8), and Africa (9).

Of the **167** visiting researchers from abroad, 96 were from Europe, 39 from North America, 15 from Asia, 13 from South America, 3 from Oceania, and one from Africa.

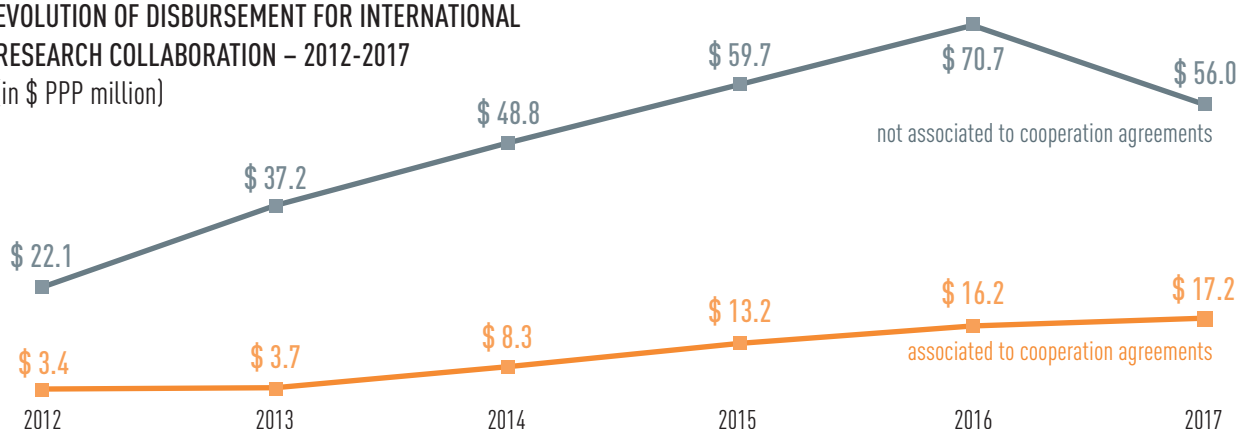
Nineteen scientific meetings were contracted in partnership with organizations in the UK (9), USA (1), Germany (6), and Asia (2), in addition to one with a multilateral organization.

## INTERNATIONAL RESEARCH COLLABORATION PROJECTS CONTRACTED BY REGION



## EVOLUTION OF DISBURSEMENT FOR INTERNATIONAL RESEARCH COLLABORATION – 2012-2017

(in \$ PPP million)

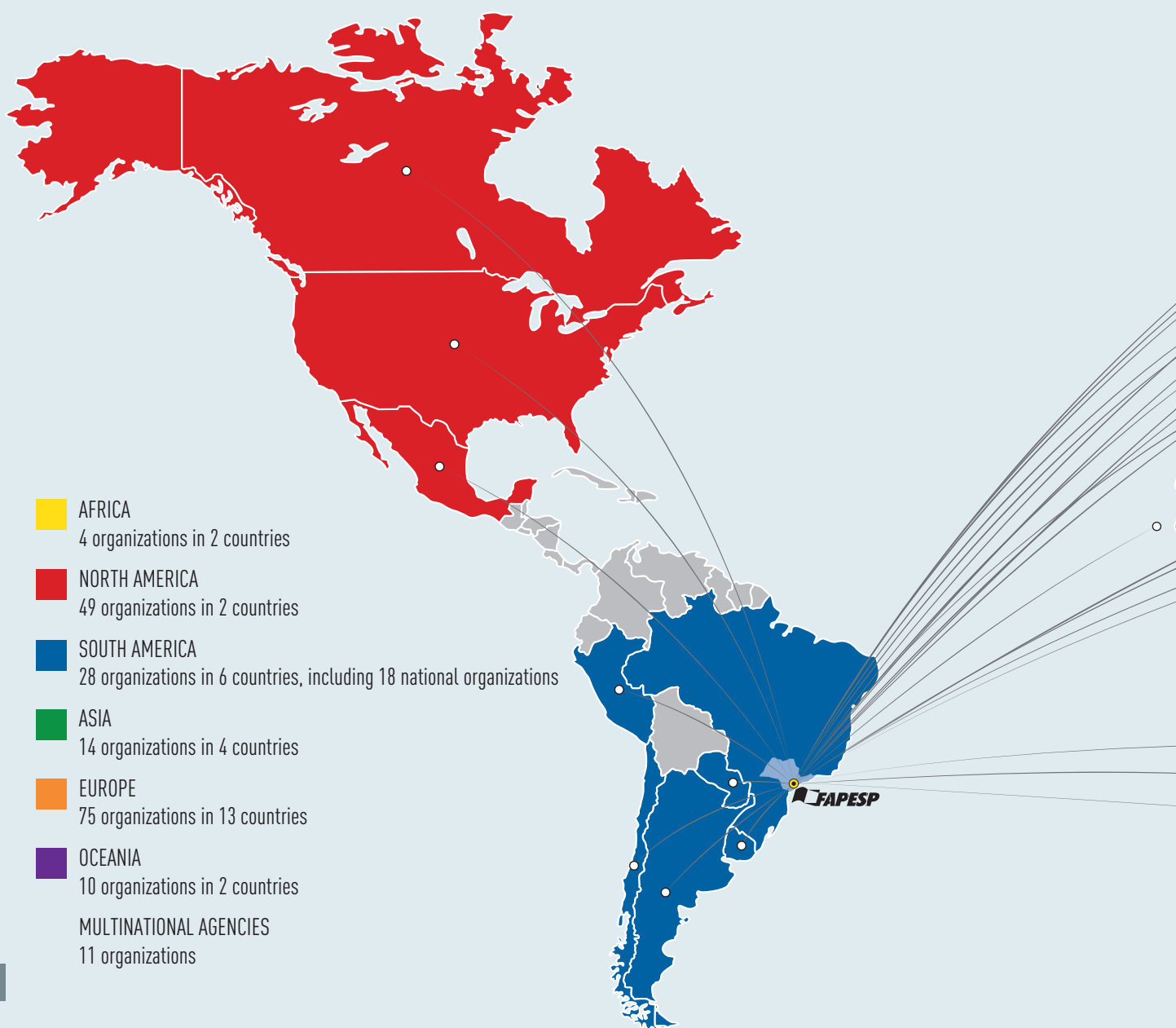




## MAP OF AGREEMENTS WITH FUNDING AGENCIES AND ACADEMIC ORGANIZATIONS

The number of active cooperation agreements in 2017 was **213**, including 21 with the companies listed on pages 62-63. Specifically regarding cooperation agreements with funding agencies and

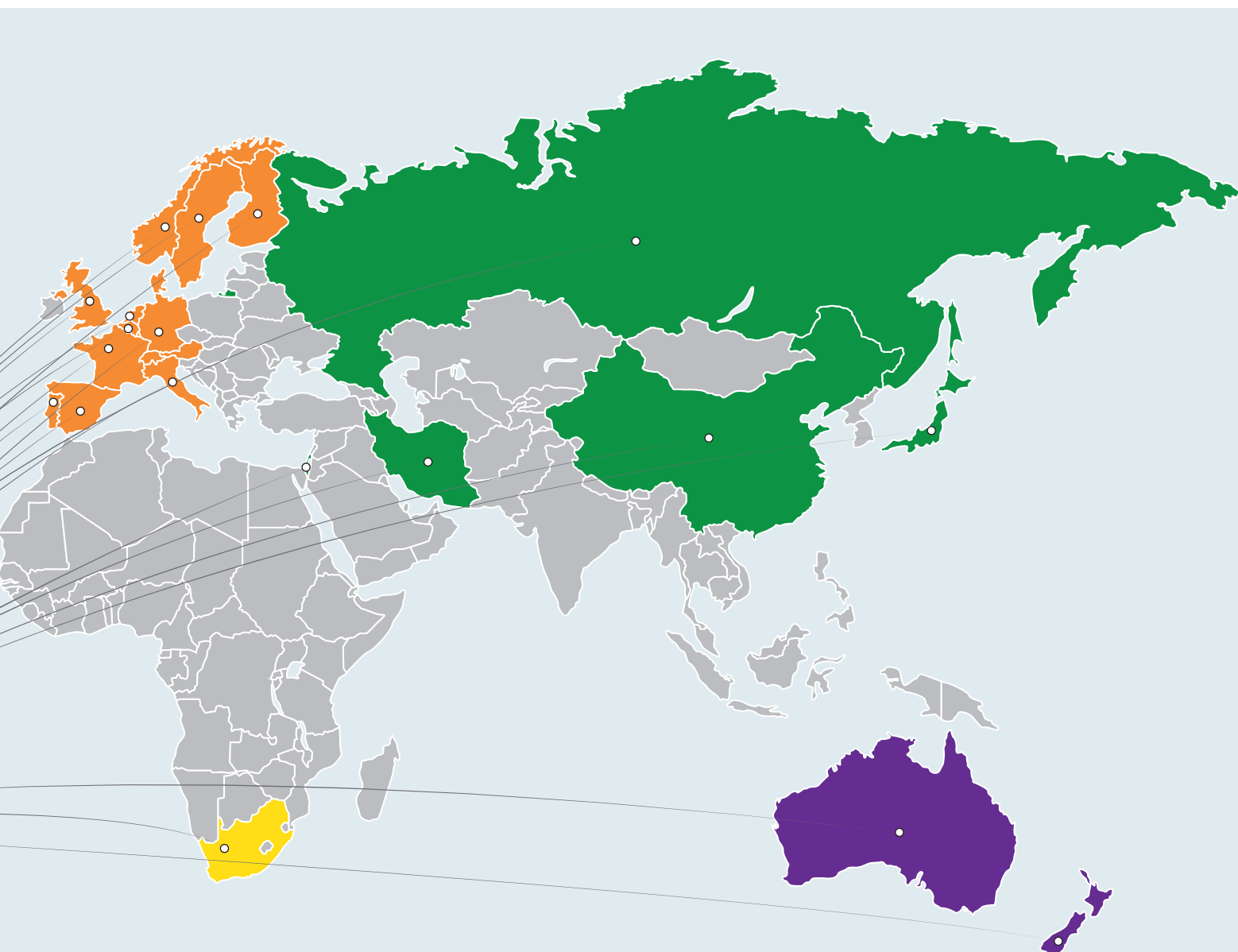
academic organizations were active 191 agreements with 18 Brazilian organizations and 173 international organizations in 28 countries. Twenty-six of these agreements were signed in 2017.



#### TYPES OF ACTIVE AGREEMENT IN 2017

- Agreements with 113 higher education and research institutions:  
112 international and one domestic
- Agreements with 61 funding agencies: 50 international and 11 domestic
- Agreements with 11 multilateral organizations
- Agreements with 6 national associations

Agreements with companies are described on pages 68-69.



## AFRICA

- South Africa
  - National Research Foundation (NRF)
  - Stellenbosch University
  - University of Cape Town (UCT)
- Cabo Verde
  - Ministério da Educação Superior, Ciência e Inovação (MESCI)

## NORTH AMERICA

- Canada
  - Agence Universitaire de la Francophonie (AUF)
  - Carleton University
  - Consortium Alberta, Laval, Dalhousie and Ottawa (CALDO)
  - McGill University
  - Natural Sciences and Engineering Research Council of Canada (NSERC)
  - Queen's University at Kingston
  - National Research Council of Canada (NRC)
  - Universidades Simon Fraser, Concordia, York e Ryerson
  - Fonds de Recherche du Quebec (FRQ)
  - University of Toronto
  - University of Victoria
  - University of Waterloo
- United States
  - Brown University
  - California Institute for Regenerative Medicine
  - Case Western Reserve University
  - Duke University
  - Emory University
  - Gates Foundation
  - George Washington University
  - Instituto de Pesquisa Scripps
  - John E. Fogarty International Center
  - Massachusetts Institute of Technology (MIT)
  - National Institutes of Health (NIH)
  - National Science Foundation (NSF)
  - e universidades americanas
  - North Carolina State University
  - Ohio State University
  - Pew Latin American Fellows Program in the Biomedical Sciences (PEW)
  - Programa Dra. Ruth Cardoso (Capes/Fulbright/ Universidade Columbia)
  - Purdue University
  - Smithsonian Institution
  - Texas Tech University (TTU)
  - Texas A&M University (TAMU)
  - The Scripps Research Institute
  - University of California Davis
  - University of California San Diego (UCSD)
  - University of Florida
  - University of Georgia
  - University of Illinois
  - University of Maryland
  - University of Miami
  - University of Michigan
  - University of Missouri
  - University of Nebraska - Lincoln
  - University of North Carolina - Charlotte
  - University of Virginia
  - US Department of Energy / GOAmazon
  - Vanderbilt University
  - West Virginia University (WVU)

## SOUTH AMERICA

- Argentina
  - Consejo Nacional de Investigaciones Científicas y Técnicas (Conicet)
  - Ministerio de Ciencia, Tecnología e Innovación Productiva (MINCyT) e USP: Projeto LLAMA
- Brazil
  - Apae de São Paulo
  - Associação Brasileira da Indústria de Alta Tecnologia de Produtos para a Saúde (Abimed)
  - Associação Brasileira de Pesquisa e Inovação Industrial (Embrapii)
  - Banco Nacional de Desenvolvimento Econômico e Social (BNDES)
  - Centro Alemão de Ciência e Inovação de São Paulo (DWHI)
  - Conselho de Defesa do Patrimônio Histórico, Arqueológico, Artístico e Turístico do Estado (Condephaat)
  - Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)
  - Coord. de Aperfeiçoamento de Pessoal de Nível Superior (Capes)
  - Financiadora de Estudos e Projetos (Finep)
  - Fundação de Amparo à Pesquisa do Estado do Amazonas (Fapeam)
  - Fundação Maria Cecília Souto Vidigal
  - Fundação Sistema Estadual de Análise de Dados (Seade)
  - Instituto de Estudos de Saúde Suplementar (IESS)
  - Instituto Euvaldo Lodi (IEL/SP)
  - Instituto Nacional de Pesquisas Espaciais (Inpe)
  - Ministério da Ciência, Tecnologia, Inovações e Comunicações
  - Nossa Caixa Desenvolvimento
  - Secretaria de Estado de Energia - Rede ER
  - Sindicato das Empresas de Compra, Venda, Locação e Administração de Imóveis Residenciais e Comerciais de São Paulo (Secovi-SP)
- Chile
  - Comisión Nacional de Investigación Científica y Tecnológica (Conycit)
  - Universidad de Chile (UCH)
  - Universidad de la Frontera
  - Universidad de Magalhaes (UMAG)
- Paraguay
  - Consejo Nacional de Ciencia y Tecnología (CONACYT)
- Peru
  - Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica (CONCYTEC)
- Uruguay
  - Agencia Nacional de Investigación e Innovación de Uruguay (ANII)
  - Asociación de Universidades Grupo Montevideo (AUGM)

## ASIA

- China
  - Peking University (PKU)
  - Tianjin University (TJU)
  - Zhejiang University (ZJU)
- Iran
  - Cognitive Science and Technology Council of Iran (CSTC)
- Israel
  - Matimop
  - Technion - Instituto de Tecnologia de Israel
  - The Hebrew University of Jerusalem
  - University of Haifa
  - Weizmann Institute of Science

# AGENCIES AND ACADEMIC INSTITUTIONS

- Japan**
- Hiroshima University
  - Japan Science and Technology Agency (JST)
  - Japan Society for the Promotion of Science (JSPS)
  - University of Tokyo
  - University of Tsukuba

## EUROPE

- Germany**
- Deutsche Forschungsgemeinschaft (DFG)
  - DWIH – Centro Alemão de C&I São Paulo
  - Fraunhofer-Gesellschaft
  - Friedrich-Alexander-Universität Erlangen-Nürnberg
  - Ministério de Estado de Ciências, Pesquisa e das Artes do Estado Livre da Baviera (StMBW)
  - Ministério Federal da Educação e Pesquisa da Alemanha (BMBF)
  - Serviço Alemão de Intercâmbio Acadêmico (DAAD)
  - Sociedade Max Planck para o Avanço da Ciência
  - University of Münster (WWU)
- Belgium**
- Direction Générale Opérationnelle Economie, Emploi & Recherche du Service Public de Wallonie (DGO/ERR)
  - Fonds de la Recherche Scientifique (F.R.S. - FNRS)
- 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)
  - Consejo Superior de Investigaciones Científicas (CSIC)
  - Secretaría de Estado de Investigación, Desarrollo e Innovación (SEIDI)
  - Universidad Complutense de Madrid
  - Universidad de Salamanca
- Finland**
- Academy of Finland (AKA)
- France**
- Agence Nationale de la Recherche (ANR)
  - Centre National de la Recherche Scientifique (CNRS)
  - Ecole Normale Supérieure (ENS)
  - Groupe des Écoles Centrales (GEC)
  - Institut National de la Santé et de la Recherche Médicale (Inserm)
  - Instituto Nacional de Pesquisa em Informática e Automação (Inria)
  - ParisTech
  - Sorbonne Universités
  - Université de Lyon
- Netherlands**
- BE-BASIS
  - Erasmus Universiteit Rotterdam
  - Leiden University
  - Netherlands Organization for Scientific Research (NWO)
  - Stichting Dutch Polymer Institute
  - Technische Universiteit Eindhoven (TU/e)
- 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 (FCT)

- United Kingdom**
- Bangor University
  - Brunel University London
  - British Council
  - Cardiff University
  - Durham University
  - Economic and Social Research Council (ESRC)
  - Heriot-Watt University
  - Imperial College
  - Institute of Education, University College London
  - Keele University
  - King's College London
  - London School of Economics and Political Science
  - Newton Fund
  - Queen's University of Belfast
  - Research Councils UK (RCUK) – BBSRC, NERC, MRC, ESRC
  - UK Academies
  - Royal Academy of Engineering
  - University of Bath
  - University of Birmingham
  - University of East Anglia
  - University of Edinburgh
  - University of Glasgow
  - University of Manchester
  - University of Nottingham
  - University of Oxford
  - University of Southampton
  - University of Surrey
  - University of Warwick
  - University of York

- Sweden**
- Halmstad University
  - Lund University
  - Uppsala University

- Switzerland**
- Inst. Federal Suíço de Tecnologia de Zurique (ETH Zürich)

## OCEANIA

- Australia**
- Australian National University (ANU)
  - Australian Technology Network of Universities (ATN)
  - Deakin University
  - Swinburne University of Technology
  - University of Melbourne
  - University of New South Wales
  - University of Queensland
  - University of Sydney
  - Victoria University
- New Zealand**
- Universities New Zealand, Te Pokai Tara (UNZ)

## MULTINATIONAL AGENCIES

- Belmont Forum (IGFA)
- EU-LIFE
- European Research Area (ERA)
- Fundo Global para o Meio Ambiente (GEF)
- Global Alliance for Chronic Diseases (GACD)
- Global Research Collaboration for Infectious Disease Preparedness (GloPID-R)
- Inter-american Institute for Global Change Research (IAI)
- Inter American Network of Academies of Science (IANAS)
- Parceria G3
- Trans-Atlantic Platform for the Social Sciences and Humanities
- União Europeia (Horizon 2020)

## WITH COMPANIES

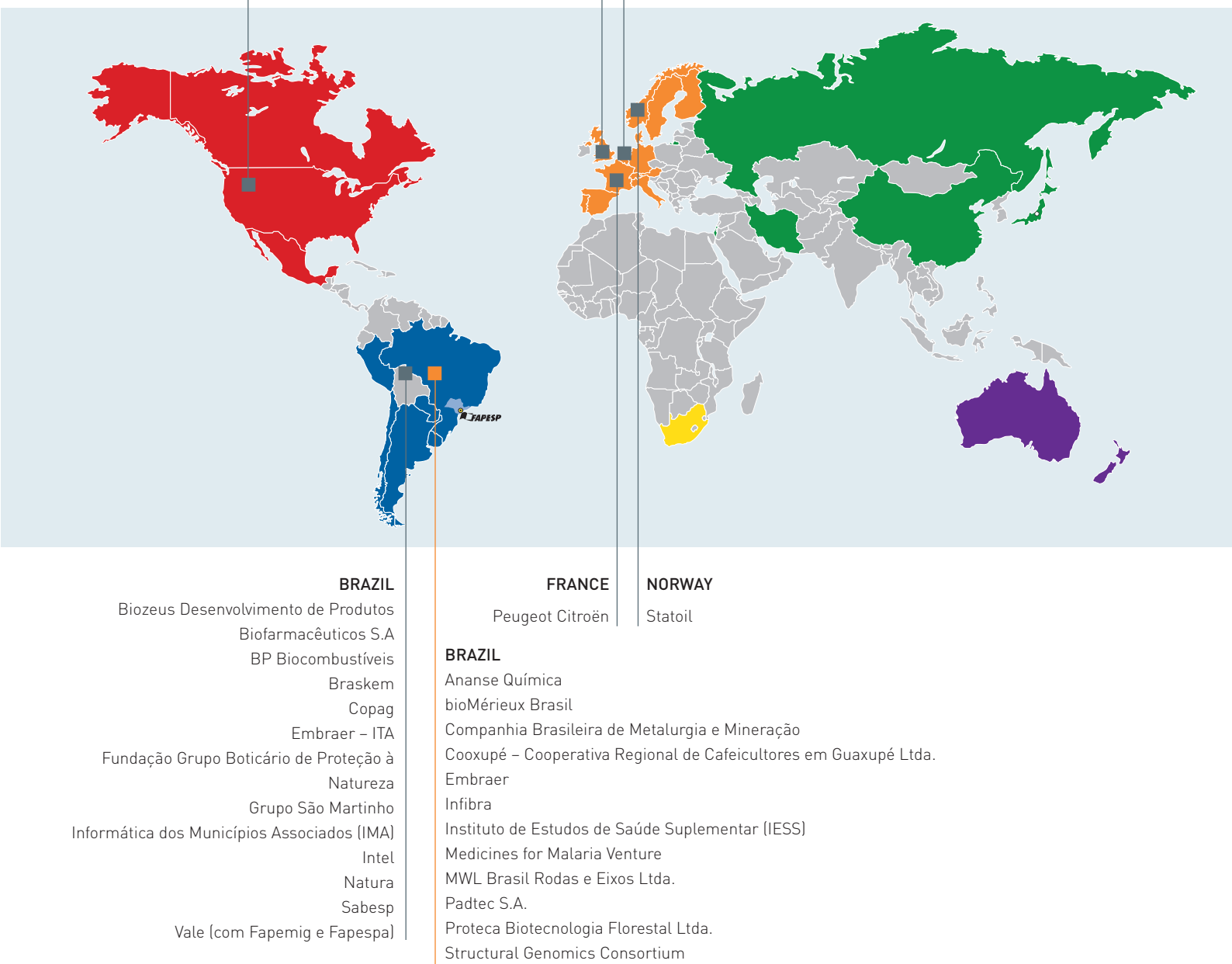
Since the Research Partnership for Technological Innovation (PITE) program began 24 years ago, FAPESP has supported **229** projects proposed by **100** companies and resulting from the academic-business interface. Thirty-six of these projects were under way with PITE funding in 2017.

Under partnerships to fund research of interest to companies, which provide counterpart funding, cooperation agreements were in effect with 21 firms – 12 of them Brazilian and nine foreign, as shown in the map below. Two were signed in 2017: with COPAG and São Martinho for ten and five years respectively. Twenty-one projects selected with Microsoft, Intel, IBM, Braskem, Agilent, AstraZeneca, GSK, SABESP and Fundação Grupo O Boticário were in progress during the year.

FAPESP has had agreements with 11 other companies: Boeing, Imprimatur, Biolab, Ci&T Digital Assets, Dedini, Telefonica, Instituto Fleury, Odebrecht Agroindustrial, Ouro Fino Saúde Animal, Oxiten, and Whirpool.

As a result of applications submitted spontaneously, 15 projects were under way in 2017, at companies including Embraer, Infibra, Padtec, Proteca, Ananse Química, bioMérieux Brasil, MWL Brasil Rodas e Eixos, Companhia Brasileira de Metalurgia e Mineração, and Cooxupé, among others. Proposals for this type of PITE funding are drafted by a researcher affiliated with a company and an academic colleague, and can be submitted to FAPESP at any time (continuous flow).

In previous years FAPESP supported proposals submitted by researchers from companies such as Laboratório Aché, Companhia Siderúrgica Nacional, Cristália, Itaútec, Petrobras, Rhodia, Suzano Papel e Celulose, Tetra Pack, and Villares Metals, among others.



■ PARTNER COMPANIES THAT CO-FUNDED PITE PROJECTS IN 2017

■ ORGANIZATIONS WITH SPONTANEOUSLY SUBMITTED PITE PROJECTS SUPPORTED IN 2017



**CHAPTER**

**5**

**RESEARCH  
HIGHLIGHTS**



## UNESP DEVELOPS WATER LEAK DETECTOR FOR SABESP

Researchers based at the Ilha Solteira and Tupã campuses of São Paulo State University (UNESP) have developed the first prototype of a device that locates leaks in buried water pipes much more precisely and cheaply than existing devices.

The project is funded in equal parts by FAPESP and São Paulo State Basic Sanitation Company (SABESP) under the aegis of a cooperation agreement between them.

Acoustic correlator technology, which locates leaks by analyzing changes in pipe vibration patterns, is being refined and adapted to Brazilian conditions by researchers. The innovation will help combat water losses, which currently account for 37% of all the water treated nationwide.

Acoustic and vibration-based techniques have been used to locate leaks for approximately 30 years, but the substitution of plastic for metal in piping introduced new challenges, as vibrations propagate for much shorter distances in plastic.

The researchers simplified the process by identifying the characteristics of vibratory signals that genuinely correlate with leaks under typical Brazilian conditions. As a result, the system uses less sophisticated sensors and a less powerful microprocessor, with the software selecting the relevant parameters and excluding vibrations produced by cars, subway trains, airplanes, etc. The platform is therefore cheaper and far easier to operate. This indigenous acoustic correlator is expected to cost approximately one-fifth as much as the imported devices available today.

A number of refinements have yet to be made, but the first version of the prototype has drawn attention from companies that could become prospective manufacturers of the new device.

### PITE

#### MECHANICAL ENGINEERING

#### FAPESP PROCESS 2013/50412-3

Development of an indigenous acoustic correlator optimized to locate and detect leaks in SABESP's buried water pipes, together with effective devices for the training of leak detection crews

#### PRINCIPAL INVESTIGATOR

Michael John Brennan

#### COOPERATION AGREEMENT

Sabesp

#### HOST INSTITUTION

Engineering School, São Paulo State University (UNESP), Ilha Solteira and Tupã campuses

#### COVERAGE

6 stories in national news media

## RESEARCH HIGHLIGHTS

### THE COST OF NOT ADAPTING TO CLIMATE CHANGE WOULD BE AT LEAST FIVE TIMES HIGHER

Sea levels are expected to continue rising in the years ahead, and Brazil's coastal city of Santos faces the dilemma of adapting or paying the high price of increasingly frequent storm surges and floods.

Adapting to climate change involves public works that place a costly burden on the budget of any city. In the case of Santos, a wide-ranging study concluded that adaptive construction projects in the Ponta da Praia area and the northwest of the city would cost at least US\$ 79 million. On the other hand, failure to adapt to climate change would cost at least US\$ 395 million, in addition to the suffering it would cause the population.

However, the cost of US\$ 395 million could be underestimated because the model considers only physical buildings and other structures, and the calculations are based on their imputed or taxable values. If losses in other areas, such as health and education, were included, the value would easily reach US\$ 789 million.

These calculations are part of the final results of a Thematic Project supported by FAPESP and the Belmont Forum to study strategies for adapting to the impacts of climate change in three coastal locations: Santos, Selsey (UK), and Broward County (Florida, USA).

The project developed three lines of research: estimating economic losses and adaptive capacities; extreme weather modeling; and health impacts. The scenarios considered projections for 2050 and 2100.

Sea levels in Santos have risen at different rates since the 1940s. Based on time series, the scientists identified two possible scenarios for the city. One is more realistic, with sea levels rising by 0.36 cm per year. The other is the worst-case scenario, with sea levels rising by 0.45 cm per year. They concluded that sea levels could rise 18 cm-23 cm by 2050 and 36 cm-45 cm by 2100.

### THEMATIC PROJECT

#### INTERDISCIPLINARY

FAPESP PROCESS 2012/51876-0

An integrated framework to analyze local decision-making and the capacity to adapt to large-scale environmental change: community case studies in Brazil, the UK and the US

#### PRINCIPAL INVESTIGATORS

José Antonio Marengo Orsini  
Frank Muller Karger

#### COOPERATION AGREEMENT

Belmont Forum

#### HOST INSTITUTION

Natural Disaster Surveillance & Early Warning Center (CEMADEN)

#### INSTITUTION ABROAD

University of South Florida

#### PUBLICATIONS

*Agência FAPESP*: [agencia.fapesp.br/26110](http://agencia.fapesp.br/26110)  
Press releases and editorial suggestions

#### COVERAGE

34 stories in 27 national and  
7 foreign news media

## 5 RESEARCH HIGHLIGHTS

### BRAZILIAN ETHANOL CAN REPLACE 13.7% OF THE WORLD'S CRUDE OIL CONSUMPTION

The expansion of sugarcane cultivation in Brazil for ethanol production in areas not under environmental protection or reserved for food production could potentially replace up to 13.7% of world crude oil consumption and reduce global emissions of carbon dioxide (CO<sub>2</sub>) by as much as 5.6% by 2045.

These estimates come from an international study with Brazilian participation, whose results were published in the journal *Nature Climate Change*.

The study, which was conducted as part of the Global Sustainable Bioenergy (GSB) initiative, set out to investigate how the expansion of sugarcane ethanol could help limit the rise in average global temperatures to less than 2 °C by reducing CO<sub>2</sub> emissions from the combustion of fossil fuels such as gasoline, as agreed by the 196 countries that signed the Paris Climate Agreement in December 2015.

The researchers used specially developed software to simulate the growth of plants such as sugarcane hour by hour based on soil composition, temperature, rainfall and drought, among other parameters. They used three different environmental policy scenarios to simulate sugarcane expansion in the context of climate change projected for 2040 and 2050 by the five main global circulation models.

The analysis showed that sugarcane cultivation for ethanol production could expand to between 37.5 million and 116 million hectares under the three scenarios and that sugarcane ethanol could supply the equivalent of between 3.63 million and 12.77 million barrels of oil per day in 2045 given the projected climate change, while simultaneously ensuring the conservation of forests and areas reserved for food production. As a result, it would be possible to reduce oil consumption by 3.8%-13.7% and net global emissions of CO<sub>2</sub> by 1.5%-5.6% by 2045 compared with data for 2014.

### SPEC AND INCT BIOETHANOL

#### INTERDISCIPLINARY

FAPESP PROCESS 2014/26767-9

Iniciativa Global Sustainable Bioenergy (GSB): geospatial & environmental analysis of pastureland intensification for bioenergy

#### PRINCIPAL INVESTIGATOR

John Joseph Sheehan

#### HOST INSTITUTION

School of Agricultural Engineering,  
University of Campinas (UNICAMP)

#### VISITING RESEARCHER'S INSTITUTION

University of Minnesota, EUA

#### OTHER INSTITUTIONS INVOLVED

Bioethanol INCT, Bioscience Institute/  
University of São Paulo (IB-USP) and  
Luiz de Queiroz College of Agriculture  
(ESALQ-USP), in collaboration with  
University of Illinois Urbana-Champaign,  
Iowa State University, University of  
Copenhagen, Danish Energy Association,  
National Center for Supercomputing  
Applications, and Lancaster University (UK)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26688](http://agencia.fapesp.br/26688)  
Press releases and editorial suggestions

#### COVERAGE

51 stories in 39 national and  
12 foreign news media

## RESEARCH HIGHLIGHTS

### PRIOR DENGUE INFECTION DOES NOT INCREASE ZIKA DISEASE SEVERITY

Individuals who are infected by Zika virus after having dengue fever do not appear to become more severely ill than people with Zika who have never had dengue. This is the conclusion of a study published on June 20, 2017, in the journal *Clinical Infectious Diseases*, involving 65 people living in and around São José do Rio Preto (São Paulo State, Brazil), where dengue is endemic and where there was a particularly rapid outbreak of Zika during the 2016 epidemic.

The study is the first to show that prior dengue infection in human beings infected by Zika does not necessarily lead to a worse illness. Previous research using only cells and rodents suggested that prior dengue infection would intensify Zika disease by facilitating replication of the virus. Some physicians and virologists suspected that this possible viral amplification could explain the concentration of Zika-associated microcephaly cases in the Northeast of Brazil, where dengue is more prevalent than in other regions of the country.

The results show that this aggravation does not occur or occurs only very rarely and cannot be detected by this type of study. Led by the São José do Rio Preto Medical School (FAMERP), the study was performed in partnership with researchers at two US institutions and three others in São Paulo State: São Paulo State University (UNESP), the University of São Paulo (USP), and Butantan Institute.

The suspicion that prior infection by dengue could lead to more severe clinical manifestations of Zika, similar to those of dengue hemorrhagic fever, was strengthened in mid-2016, when research first showed that antibodies against dengue virus also protect individuals against Zika virus but do not neutralize it completely. The results of this study show that the problem does not exist.

#### THEMATIC PROJECT

#### BIOLOGICAL SCIENCES / INTERDISCIPLINARY

FAPESP PROCESS 2013/21719-3

Epidemiological study of dengue (serotypes 1-4) in a cohort of São José do Rio Preto, São Paulo, Brazil, during 2014-2018

#### PRINCIPAL INVESTIGATOR

Maurício Lacerda Nogueira

#### HOST INSTITUTION

São José do Rio Preto Medical School (FAMERP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25572](http://agencia.fapesp.br/25572)

Press releases and editorial suggestions

#### COVERAGE

112 stories in 101 national and  
11 foreign news media

## 5 RESEARCH HIGHLIGHTS

### SOFTWARE DETECTS FRAUDULENT DEFAMATION ON E-COMMERCE SITES

E-commerce companies whose online retail stores use customer recommendations to promote products and services are subject to fraudulent action by fake users. Through coordinated planning, these scammers can, for example, give a product a negative rating with the aim of dissuading new customers from buying it.

A group of researchers at ICMC-USP in São Carlos, São Paulo State, have developed software that promises more efficient detection of this type of action, technically known as fraudulent defamation, in online recommendation systems.

The software tool, called ORFEL, short for Online Recommendation Fraud Excluder, detected more than 95% of potential attacks on online recommendation systems and did so more efficiently than one of the algorithms most widely used for this purpose.

The results of the application of the new method were described in an article published in the journal *Information Sciences*.

According to one of the researchers involved, the new method is designed to identify “lockstep behavior” in the recommendation systems used by online stores such as Google Play and Amazon.

Lockstep behavior consists of coordinated actions by groups of users with fake profiles who simultaneously give the same poor rating to a set of products with the aim of lowering their reputation.

The algorithm keeps track of user ratings in an online recommendation system to assess whether they are all posted at the same time and award identical scores. If so, the software flags the behavior as suspicious so that it can be properly evaluated and potentially identified as fraudulent. If the suspicion is confirmed, the online store can ban the users who posted the fraudulent ratings and remove all of their interactions from its database.

### MASTER'S AND DOCTORAL FELLOWSHIPS IN BRAZIL/RESEARCH GRANT

#### COMPUTING

#### FAPESP PROCESS 2014/21483-2

Similarity-aware relational division  
database operator

#### PRINCIPAL INVESTIGATOR

Robson Leonardo Ferreira Cordeiro

#### FAPESP PROCESS 2016/02557-0

Analytic processing of large graphs:  
identification of patterns for decision  
support in web 2.0

#### FAPESP PROCESS 2014/25337-0

Design of vertex-centric algorithms for  
pattern recognition on large-scale graphs  
using asynchronous parallel processing

#### FAPESP PROCESS 2013/10026-7

Graph analysis based on vertex-centric  
asynchronous parallel processing:  
applications to planetary scale data

#### PRINCIPAL INVESTIGATOR

José Fernando Rodrigues Júnior

#### HOST INSTITUTION

Mathematics & Computer Science  
Institute, University of São Paulo  
(ICMC-USP), São Carlos campus

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25342](http://agencia.fapesp.br/25342)

#### COVERAGE

28 stories in national news media

## RESEARCH HIGHLIGHTS

### LITTLE-KNOWN FRUITS CONTAIN POWERFUL ANTI-INFLAMMATORY AND ANTI-OXIDANT AGENTS

Five native Brazilian berries, four of which belong to the genus *Eugenia*, are just starting to become well-known among scientists but are not yet familiar to the wider public, let alone shoppers. Their bioactive properties are so outstanding that they may soon be on display in supermarkets and highly ranked as fashionable foods.

In addition to their nutritional value, these five fruit trees native to the Atlantic Rainforest have powerful anti-oxidant and anti-inflammatory properties.

There is scant scientific knowledge about the properties of these native plants. The current idea, with the results of this study supported by FAPESP and published in the journal *PLOS ONE*, is for them to be grown by family farmers, increase in production scale and be taken up by retailers.

The study evaluated phenolic compounds – chemicals that can have preventive or curative effects – and the anti-inflammatory and anti-oxidant mechanisms of material extracted from the leaves, seeds and pulp of araçá-piranga (*Eugenia leitonii*), cereja-do-rio-grande (*E. involucrata*, cherry of Rio Grande), grumichama (*E. brasiliensis*), ubajaí (*E. myrcianthes*) and bacupari-mirim (*Garcinia brasiliensis*), all of which are typical of Brazil's Atlantic Rainforest biome.

The study began by exploring the fruits' bioactive properties, since they were likely to contain a large number of anti-oxidants, similar to the well-known berries of the US and Europe, such as the blueberry, blackberry and strawberry, with which scientists are so familiar. Our native berries proved even better.

According to the study, species of the genus *Eugenia* have great economic and pharmacological potential, evidenced not only by many scientific publications but also by the trade in their edible fruits, wood and essential oils and their use as ornamental plants.

### RESEARCH GRANT

#### FOOD SCIENCE AND TECHNOLOGY

FAPESP PROCESS 2014/50235-7

SmartHealth: chemical composition and bioactive potential of native fruits and edible fungi

#### PRINCIPAL INVESTIGATORS

Severino Matias  
Erick Sigisfredo S. Salina

#### HOST INSTITUTION

Luiz de Queiroz College of Agriculture,  
University of São Paulo (ESALQ-USP)

#### INSTITUTION ABROAD

University of the Frontier (UFRO), Chile

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26486](http://agencia.fapesp.br/26486)  
Press releases and editorial suggestions

#### COVERAGE

64 stories in 47 national and  
17 foreign news media

## STARTUP DEVELOPS ANIMAL DETECTION SYSTEM TO PREVENT ROADKILL

Passa-Bicho, a prototype produced by ViaFauna with support from FAPESP's Small Business Innovation Research (PIPE) program, is designed to mitigate the impact of roads on wildlife and increase road user safety by reducing wildlife-vehicle collisions. More than 23,000 road accidents involving users and animals were recorded in São Paulo State alone between 2005 and 2013.

The collisions often involve endangered species such as the tapir (*Tapirus terrestris*), maned wolf (*Chrysocyon brachyurus*) and jaguar (*Panthera onca*), although domestic animals such as horses, cattle and dogs are similarly likely to be victims. In addition to the environmental damage caused by collisions, they put risk the lives of road users and may oblige road operators to disburse costly compensation.

Medium-to-large (over 3 kg) wild and domestic animals are targeted by ViaFauna's detection system because of their detectability and their impact on road safety. The system comprises a pair of motion sensors (transmitter and receiver) affixed to short poles similar to those used for speed traps and installed 100 m apart. "Each pair of sensors covers a roadkill hotspot," Abra explains.

The transmitter sends the receiver a beam of infrared light, which is invisible to humans and other vertebrates. When the beam is interrupted by an animal, the sensor sends a signal to the pole, which in turn transmits the information via radio, activating an electronic message panel or, in a simpler version, a revolving beacon light on top of an animal crossing sign.

This system is far more effective than a mere sign warning that wildlife may cross the road. When drivers see static warning signs, they never know when animals will actually cross, and so they tend not to pay too much attention. ViaFauna's detection system warns drivers hundreds of meters or even a kilometer or two ahead of an actual animal crossing, giving them time to take precautions.

### PIPE

#### FOREST RESOURCES AND FOREST ENGINEERING

FAPESP PROCESS 2015/08607-7

Animal detection system to prevent roadkill – "Passa Bicho"

#### PRINCIPAL INVESTIGATOR

Fernanda Delborgo Abra

#### COMPANY

ViaFauna Estudos Ambientais Ltda

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26016](http://agencia.fapesp.br/26016)

#### COVERAGE

7 stories in national news media



## RESEARCH HIGHLIGHTS

### IN SÃO PAULO, 97.8% OF OLDER PEOPLE CANNOT CROSS THE STREET IN THE TIME ALLOWED BY TRAFFIC LIGHTS

Even though the sidewalks are only a few meters apart, crossing the street can be a challenge, especially for individuals over sixty. Too often, the walk signal goes from green to red before they can safely reach the other side.

A study conducted by FSP-USP found that 97.8% of older people in São Paulo City cannot walk at 4.3 kilometers per hour (km/h), the speed required by the timing of the traffic lights operated by the Traffic Engineering Company (CET-SP). Volunteers older than 60 years of age who participated in the study were able to walk at an average of only 2.7 km/h.

According to the study, the walking speed required to cross a city street is unsafe or actually unattainable for older people. Individuals over sixty accounted for 12.74% of São Paulo's population in 2016, according to SEADE, the state bureau of statistics.

The study showed that the city is not managed for older people but for individuals who can walk between 4 km/h and 6 km/h without much difficulty. The effect is that older people tend increasingly to stay at home.

Data for August 2016 were supplied by CET-SP, which times traffic lights using a formula that assumes a speed of 4.3 km/h for pedestrians who cross the street while the walk signal is green.

The researchers suggest that São Paulo make changes similar to those made in the UK and Spain, or even in Curitiba, the capital city of Paraná State, Brazil, where there are now a number of smart traffic lights in which an older person can insert a card to "tell" the system more time is required to cross the street. This change would ensure autonomy and mobility for older people and, most importantly, would reduce the risk of traffic accidents involving pedestrians.

#### THEMATIC PROJECT

##### COLLECTIVE HEALTH

FAPESP PROCESS 2014/50649-6

SABE study: a longitudinal study of multiple cohorts on the lives and health of older people in the municipality of São Paulo – 2015 cohort

#### PRINCIPAL INVESTIGATOR

Yeda Aparecida de Oliveira Duarte

#### HOST INSTITUTION

Public Health School, University of São Paulo (FSP-USP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25343](http://agencia.fapesp.br/25343)

#### COVERAGE

24 stories in national news media



## ALGAE ARE USED TO DEPOLLUTE SEWAGE AND PRODUCE COMPOST

A partnership between Brazilian and Dutch researchers has demonstrated that it is possible to convert black water – the “heaviest” fraction of household waste, consisting mainly of a relatively undiluted mixture of feces and urine from toilet flushing – into a sort of alga farm.

Single-cell algae of the genus *Chlorella* feed on nutrients in this effluent. As they grow, they help remove the pollutants it contains and produce large amounts of biomass for use as such or for composting.

On the Brazilian side, the partnership receives funding from FAPESP, while European funding comes from the NWO.

According to Luiz Antonio Daniel, a professor in EESC-USP’s Department of Hydraulics & Sanitation and one of the coordinators of the partnership, the main components of the feces and urine flushed from toilets include the carbon in organic matter, nitrogen, and phosphorus. When large amounts of waste are dumped into watercourses, nitrogen and phosphorus cause eutrophication – the excessive growth of aquatic microorganisms, especially algae – leading to potentially serious imbalances in aquatic communities and releasing pathogens into the environment.

In the sewage treatment process most commonly used today, chemicals remove phosphorus from the water, leaving a sludge that cannot be used for much else. Some Brazilian states ban its use as fertilizer in agriculture, for example. The sludge ends up being discharged into landfills. The cost of disposal is therefore considerable.

The aim of the project is to solve the problem of managing the waste generated by today’s sewage treatment process. Field tests will be conducted at the Monjolinho sewage treatment plant in São Carlos, São Paulo State.

## RESEARCH GRANT

### SANITARY ENGINEERING

FAPESP PROCESS 2013/50351-4

Recovering nutrients and carbon from concentrated black water: a sustainable decentralized approach for wastewater treatment

### PRINCIPAL INVESTIGATORS

Luiz Antonio Daniel  
Luise Vet

### COOPERATION AGREEMENT

Organização Holandesa para Pesquisa Científica (NWO)

### HOST INSTITUTION

Escola de Engenharia de São Carlos da USP (EESC-USP)

### INSTITUTION ABROAD

Royal Netherlands Academy of Arts and Sciences

### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26485](http://agencia.fapesp.br/26485)  
Press releases and editorial suggestions

### COVERAGE

33 stories in 27 national and  
6 foreign news media

## RESEARCH HIGHLIGHTS

### NEW SPECIES OF AMOEBA IS NAMED AFTER A CHARACTER IN THE *LORD OF THE RINGS*

Thecamoebians are among the 30-45 lineages of amoebae known to exist worldwide. During their evolution, they have developed the ability to produce a varyingly shaped outer carapace or shell in which to protect themselves.

A group of researchers have identified a species of thecamoeba with a carapace that resembles the wizard's hat worn by Gandalf, one of the most important characters in *The Lord of the Rings* by J.R.R. Tolkien (1892-1973).

Named *Arcella gandalfi* as a tribute to Tolkien's wizard, the new species of amoeba is described in an article published by the journal *Acta Protozoologica*.

According to the principal investigator for the project, new amoeba species are very rarely discovered because they are tiny and not widely studied. Additionally, very few taxonomists specialize in this group in Brazil.

In recent years, he began receiving reports of the existence of this species of freshwater microorganism from various parts of Brazil, such as Minas Gerais, Tocantins, Paraná, Amapá and Rio de Janeiro. The number of specimens collected in these regions was so small that it was impossible to perform a laboratory analysis to ensure that they genuinely represented a new species.

However, a biologist who is employed by environmental consultants in Espírito Santo State and specializes in the taxonomic identification and population analysis of zooplankton, tiny invertebrates that float freely throughout the seas and other bodies of water, contacted the principal investigator to report that she had found the amoeba in two samples collected from Amapá and Rio de Janeiro. The Rio de Janeiro sample contained 180 specimens.

The researchers' analyses, based on biometric and morphological characterization, showed that the characteristic funnel shape of *A. gandalfi* was unique among species belonging to the genus *Arcella*, one of the largest genera of thecamoebians.

#### THEMATIC PROJECT

#### BIOLOGICAL SCIENCES / INTERDISCIPLINARY

FAPESP PROCESS 2013/04585-3

Deciphering the major trends of molecular and morphological evolution in Amoebozoa

#### PRINCIPAL INVESTIGATOR

Daniel José Galafasse Lahr

#### HOST INSTITUTION

Bioscience Institute, University of São Paulo (IB-USP)

#### OTHER INSTITUTIONS INVOLVED

Department of Zoology, IB-USP, in collaboration with the University of Maringá's Department of Biology, a biologist from a firm of environmental consultants in Vila Velha (Espírito Santo), and a researcher from Minas Gerais

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/24703](http://agencia.fapesp.br/24703)

Press releases and editorial suggestions

#### COVERAGE

40 stories in 12 national and  
28 foreign news media

## SPOROTRICHOSIS, AN EMERGING DISEASE THAT AFFECTS CATS, CAN BE TRANSMITTED TO HUMANS

An emerging disease called sporotrichosis is spreading throughout Brazil but has not been publicized extensively except in Rio de Janeiro. Cats are the main victims of this disease, a fungal infection of the skin that causes serious damage and can be fatal if it is not treated promptly.

The disease is caused by the fungus *Sporothrix sp.*, which lives naturally in wood, plants and soil. In Brazil, the most prevalent etiological agent is *S. brasiliensis*, although *S. schenckii* is also found to a lesser extent. Infected cats transmit the fungus by scratching and biting other cats and dogs, as well as their owners.

Lesions in humans and dogs are not usually as severe as those in cats and are rarely life threatening. Even in cats, the disease is curable, but the treatment is lengthy and expensive. Its cost is the main obstacle because the disease is most frequent among animals living in poor neighborhoods.

Reporting human sporotrichosis is not compulsory in Brazil, so its exact prevalence is unknown. Notification has been required in Rio de Janeiro State since July 2013, owing to its hyperendemic status in the area.

For a very long time, only one or two people caught the disease each year, but in 1998, the number of cases in Rio de Janeiro began to rise. The disease spread to other cities in the same state and from there to other states. The recent emergence of feline sporotrichosis in metropolitan São Paulo drew the attention of researchers at the Federal University of São Paulo (UNIFESP) and the Zoonosis Control Center (CCZ), where 1,093 cases have been confirmed in recent years.

There are cases of sporotrichosis throughout the Southeast and South of Brazil. In addition, a few cases are cropping up in the Northeast as well as abroad: five cases in humans were reported in Buenos Aires in 2015.

### THEMATIC PROJECT/POSTDOCTORAL FELLOWSHIP

#### MICROBIOLOGY

##### FAPESP PROCESS 2009/54024-2

Molecular biology and proteomics of medically interesting fungi: *Paracoccidioides brasiliensis* and *Sporothrix schenckii*

##### PRINCIPAL INVESTIGATOR

Zoilo Pires de Camargo

##### FAPESP PROCESS 2015/19746-8

Comparative and functional genomics in the evolutionary study of emerging pathogens in the *Sporothrix-sporotrichosis* system

##### PRINCIPAL INVESTIGATOR

Zoilo Pires de Camargo

##### GRANTEE

Anderson Messias Rodrigues

##### HOST INSTITUTION

Medical School (Escola Paulista de Medicina), Federal University of São Paulo (UNIFESP)

##### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25049](http://agencia.fapesp.br/25049)

##### COVERAGE

51 stories in national news media

## RESEARCH HIGHLIGHTS

### FAPESP, EMBRAPA AND UNICAMP ESTABLISH APPLIED GENOMICS RESEARCH CENTER

FAPESP and the Brazilian Agricultural Research Corporation (EMBRAPA) are partners in the Center for Research in Genomics Applied to Climate Change, hosted by the University of Campinas (UNICAMP). The center was announced on December 13, 2017, at an event held at FAPESP's São Paulo headquarters, and was formally established in 2018.

The Center's mission is to develop biotechnological solutions that increase plant resistance to drought and heat and to transfer this technology to the productive sector. According to FAPESP President José Goldemberg, applied genomics is a rapidly developing field, and Brazil must not lag behind.

Using genomics and genome editing, genetics and genetic engineering, and research on microbiomes, the Center will create and manage genetic improvement and agricultural biotechnology pipelines for the creation of genetically edited transgenic plant varieties, among other activities.

It will also develop competencies in regulation and patents to ensure that its operations comply with biosafety rules and laws governing access to biodiversity.

This will be the sixth Engineering Research Center (ERC) supported by FAPESP in partnership with companies for a period of up to ten years. Five ERCs are already up and running: two with GSK and one each with Shell, Peugeot-Citroën and Natura.

Investment in the Center for Research in Genomics Applied to Climate Change will total US\$ 27 million, with FAPESP contributing US\$ 6.6 million and EMBRAPA US\$ 8.7 million. UNICAMP will contribute US\$ 11.8 million in salaries and research infrastructure, among other items.

### ENGINEERING RESEARCH CENTER (CPE)

#### GEOSCIENCES

FAPESP PROCESS 2016/23218-0

Genomics for Climate Change Research Center

#### PRINCIPAL INVESTIGATOR

Paulo Arruda

#### HOST INSTITUTION

Center for Molecular Biology & Genetic Engineering (CBMEG), University of Campinas (UNICAMP)

#### COMPANY

Embrapa

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26902](http://agencia.fapesp.br/26902)

#### COVERAGE

13 stories in national news media

## ROBOT FOR REHABILITATION OF STROKE VICTIMS ASSOCIATES PHYSIOTHERAPY AND GAMES

Stroke victims have a new ally to help them recover the ability to move their upper extremities. A newly developed portable robot provides physiotherapy tailored to the individual's needs – plus video games to make it fun. Preliminary testing of a prototype showed that it can produce improvements in chronic patients who had not progressed with traditional therapy. Some had been living with brain damage for over two decades.

The device was developed by Vivax Serviços Ltda. with funding from FAPESP's PIPE program and is the first portable upper-limb rehabilitation robot. It is expected to come to market for only half or even a quarter of the price of comparable imported robots and with the capacity to assist a much broader range of movements, according to the firm's researchers.

Although stroke is most common in older people, it is increasingly frequent in individuals of productive age. The number of annual cases in Brazil among people aged 15-39 is approximately 15,000, according to the Health Ministry. Stroke incapacitated 8,000 people for work in 2014 alone. The rise in obesity and an aging population exacerbate the problem, making effective treatment of the ensuing complications all the more important.

Vivax's robot, which it calls the Assistive Rehabilitation Machine (ARM), promises to be a reliable aid in this process. While conventional physiotherapy can comprise approximately 100 movements per session, ARM can help a patient make between 750 and 1,000, depending on each individual's condition.

ARM is one of the few rehabilitation robots that can assist three-dimensional as well as single-plane movements. It also assists exercises against gravity. These are more real-world movements, similar to basic activities of daily living such as feeding, self-care, work or leisure, and more complex in the sense that they use a larger number of muscle chains simultaneously, requiring far more effort from the brain.

### PIPE

#### BIOENGINEERING

FAPESP PROCESS 2013/50784-8

Research and development for upper-limb neurorehabilitation robot

#### PRINCIPAL INVESTIGATOR

Antonio Massato Makiyama

#### COMPANY

Vivax Serviços Ltda.

#### COVERAGE

13 stories in national news media

## RESEARCH HIGHLIGHTS

### NEW SOURCE OF GRAVITATIONAL WAVES IS OBSERVED

US physicists Rainer Weiss, Barry Barish and Kip S. Thorne were awarded the 2017 Nobel Prize in Physics for their contributions to the detection of gravitational waves. Now, a group of over 3,000 astronomers, including 60 from Brazil, have succeeded in observing – for the first time in visible light – a source of these space-time fluctuations, which Albert Einstein (1879-1955) predicted a century ago.

In an article published in October 2017 in *Astrophysical Journal Letters*, the group, which includes three Nobel Laureates, announced the first-ever observations in several electromagnetic bands of a merger of two neutron stars, which are extremely dense celestial bodies created by the imploding cores of giant stars.

The event produced gravitational waves that were recorded in August 2017 by the US National Science Foundation's Laser Interferometer Gravitational-wave Observatory (LIGO) and by the Virgo detector near Pisa in Italy. This is the first time light associated with a gravitational-wave event has been detected.

The discovery is also described in another article in *Astrophysical Journal Letters* by a group of 55 astronomers, 17 from Brazil, affiliated with the University of São Paulo's Institute of Astronomy, Geophysics & Atmospheric Sciences (IAG-USP), the same university's Physics Institute (IF-USP), the National Observatory (ON), and the Federal Universities of Sergipe (UFS), Santa Catarina (UFSC) and Rio de Janeiro (UFRJ).

The Brazilian researchers participated in the study in collaboration with colleagues from the United States, Argentina, Chile, Spain and Germany via observations performed using T80-South, a robotic telescope built with support from FAPESP's Multiuser Equipment funding program and installed at the Cerro Tololo Inter-American Observatory in Chile.

This is the first time anyone has obtained the optical counterpart (identification of an object in visible light) of a gravitational-wave event.

### MULTIUSER EQUIPMENT

#### ASTRONOMY

FAPESP PROCESS 2009/54202-8

EMU: Acquisition of a robotic telescope for the Brazilian astronomy community

#### PRINCIPAL INVESTIGATOR

Claudia Lucia Mendes de Oliveira

#### INSTITUTION

Institute of Astronomy, Geophysics & Atmospheric Sciences, University of São Paulo (IAG-USP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26639](http://agencia.fapesp.br/26639)

#### COVERAGE

4 stories in national news media

## STUDY PERFORMED AT UNICAMP ESTABLISHES OBESITY TIMELINE

Over the past decade, when investigating the factors associated with the growing epidemic of obesity in the world, scientists have identified two events that greatly contribute to weight gain.

One of them is the changing profile of gut flora bacteria. Studies published in 2005-07 show that obese people's gut flora typically include a group of microorganisms that facilitate the absorption of nutrients from food. Thus, an apple can be richer in calories for an obese person than for a lean person. Whether this is a cause or effect of overweight is unknown.

Another important occurrence is the death of a group of neurons found in a region of the brain called the hypothalamus. Known as POMC neurons, these cells function as nutrient sensors that tell the body that it is time to stop eating, and there is enough energy to expend. Studies have shown that if these sensors are lost, the individual increasingly feels a need to ingest foods rich in fat and sugar. At the same time, the metabolism slows down, and most of the energy provided by the unbalanced diet is stored.

The researchers at the Obesity & Comorbidities Research Center (OCRC) began to wonder which comes first, the change in the patient's eating patterns caused by an error in the brain's system responsible for controlling hunger or the change in gut flora.

Their most recent data suggest that the hypothalamus is impaired well before changes occur in the intestine.

The group conducted a time-series analysis of the tissues of mice fed a diet rich in saturated fats for four months, long enough for the animals to become obese.

The experiment showed that neuronal damage starts well before the individual begins to gain weight but can be reversed early in the process. If the inadequate diet persists, injury to the neurons becomes irreversible.

## RIDC/POSTDOCTORAL FELLOWSHIP

### PHYSIOLOGY

FAPESP PROCESS 2014/00742-0

Characterization of rapid POMC regulation mechanisms involved in high-fat diet response

### PRINCIPAL INVESTIGATOR

Licio Augusto Velloso

### GRANTEE

Daniela Soares Razolli

### INSTITUTION

Medical Science School, University of Campinas (UNICAMP)  
Obesity & Comorbidities Research Center (OCRC)

### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26189](http://agencia.fapesp.br/26189)

Press releases and editorial suggestions

### COVERAGE

31 stories in 23 national and  
8 foreign news media

## RESEARCH HIGHLIGHTS

### STUDY REINFORCES THE IMPORTANCE OF THE AMAZON FOREST IN REGULATING ATMOSPHERIC CHEMISTRY

Airborne measurements show that the Amazon rainforest emits at least three times more isoprene than scientists previously thought. Isoprene is one of the main precursors of ozone in the Amazon and indirectly influences the balance of greenhouse gases in the atmosphere.

The results of a study performed by researchers involved in a Thematic Project supported by FAPESP as part of the Green Ocean Amazon experiment (GOAmazon) were published in May 2017 in the science journal *Nature Communications*.

Previous estimates were based on measurements made using satellites or forest towers as tall as 60 meters. During the GOAmazon scientific campaign, however, it was possible to collect new data using a Grumman Gulfstream-1 research aircraft capable of flying at 6,000 meters or nearly 20,000 feet. The aircraft is owned by Pacific Northwest National Laboratory (PNNL) in the US.

The airborne measurements were made in 2014 and 2015 during both the rainy and dry seasons and compared with data collected at ground level.

With measurements taken at 4,000 meters, it was possible to calculate average emissions for a much larger area than in previous research. As a result, the researchers could see that natural biogenic emissions were far greater than had been supposed.

Isoprene decomposition in the atmosphere gives rise to various byproducts, such as the radical hydroxyl (OH). Under certain conditions, OH reacts with atmospheric oxygen (O<sub>2</sub>) to form ozone (O<sub>3</sub>), one of the gases responsible for the greenhouse effect.

According to the study, the Amazon forest was already considered the world's largest source of isoprene even before the new discoveries. These findings reinforce the importance of this ecosystem in regulating the planet's tropical atmospheric chemistry. The results now need to be included in global climate models to see exactly what effect these new values for isoprene emissions have on the climate.

## GLOBAL CLIMATE CHANGE

### GEOSCIENCES

FAPESP PROCESS 2013/05014-0

GOAmazon: interactions of the urban plume of Manaus with biogenic forest emissions in Amazonia

#### PRINCIPAL INVESTIGATOR

Paulo Eduardo Artaxo Netto

#### COOPERATION AGREEMENT

Campanha GOAmazon –  
Green Ocean Amazon Experiment

#### HOST INSTITUTION

Instituto de Física da USP

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25512](http://agencia.fapesp.br/25512)

Press releases and editorial suggestions

#### COVERAGE

33 stories in 22 national and  
11 foreign news media



## NEW VIRUS TRANSMITTED BY MIDGES COULD EMERGE AND CAUSE PUBLIC HEALTH PROBLEMS IN BRAZIL

After the Zika epidemic that began in 2015 and the outbreak of yellow fever early in 2017, Brazil runs a serious risk of being afflicted by Oropouche, another virus that is widely distributed throughout South and Central America and the Caribbean. It has adapted to urban environments and is moving ever closer to Brazil's major cities. An arbovirus transmitted by a mosquito, like Zika and yellow fever, Oropouche causes acute fever and may lead to meningitis and meningoencephalitis (inflammation of the brain and meninges).

According to researchers at the University of São Paulo, Oropouche virus could potentially emerge at any moment and cause a serious public health problem in Brazil. Approximately 500,000 cases of Oropouche fever have been reported in Brazil in recent decades. Scientists expect the number to grow because the virus, transmitted by the biting midge *Culicoides paraensis*, is no longer found only in Amazonian villages but is spreading to the large cities.

*C. paraensis* is distributed throughout the Americas, so Oropouche has considerable emergence potential, the researchers note, warning that the virus may well spread from the Amazon and Brazil's central plateau to the most densely populated regions of the country.

The incidence of Oropouche fever is also rising in urban areas of Peru and Caribbean countries. In Brazil, the virus has been isolated in birds in Rio Grande do Sul and in a marmoset in Minas Gerais. The presence of neutralizing antibodies (which bind to the virus, tell the immune system to destroy it, and prevent it from infecting the organism) has been detected in primates in Goiânia. A patient in Ilhéus, Bahia, was recently diagnosed with Oropouche fever, showing that the virus is circulating around Brazil.

### THEMATIC PROJECT

#### MICROBIOLOGY

FAPESP PROCESS 2014/02438-6

Studies on Bunyaviridae that produce human disease

### PRINCIPAL INVESTIGATOR

Luiz Tadeu Moraes Figueiredo

### HOST INSTITUTION

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

### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25894](http://agencia.fapesp.br/25894)

Press releases and editorial suggestions

### COVERAGE

61 stories in 52 national and  
9 foreign news media

## RESEARCH HIGHLIGHTS

### NANOPARTICLE COATED WITH ANTIBIOTIC ELIMINATES DRUG-RESISTANT BACTERIA

A new strategy to combat antibiotic-resistant bacteria has been described by Brazilian researchers in *Scientific Reports*, an online journal owned by Springer Nature.

The method consists of coating nanoparticles made of silver and silica – potentially toxic both to microorganisms and to human cells – with a layer of antibiotic. Owing to chemical affinity, the resulting nanopharmaceutical acts only on the pathogens and is inert to the organism.

The antibiotic is used as if it were bait to enable the nanoparticles to target the bacteria with a large amount of the drug. According to the researchers, the combined action of the drug with the silver ions proved capable of killing even resistant microorganisms.

The project is supported by FAPESP and is part of a line of research that aims to develop systems to make the action of nanoparticles selective.

In previous articles, the group showed that nanoparticles can also be used to make anticancer chemotherapy more effective by delivering the drug directly to tumor cells and leaving healthy cells intact (read more in Portuguese at [agencia.fapesp.br/23210](http://agencia.fapesp.br/23210)). It could also be tried as a means of inactivating HIV in transfusion blood bags, for example ([agencia.fapesp.br/23897](http://agencia.fapesp.br/23897)).

In the most recent article, the group described a scheme to synthesize nanoparticles consisting of a silver core overlaid with porous silica to allow the passage of ions. Several molecules of the antibiotic ampicillin were applied to the surface in an arrangement that was far from random.

The researchers used molecular modeling to determine which part of the ampicillin molecule interacted most with the bacterial membrane. They then arranged all the molecules of the drug so that this key part was facing outward from the nanoparticle, increasing the likelihood of interaction with the pathogen.

### RESEARCH GRANT

#### CHEMISTRY

FAPESP PROCESS 2014/22322-2

Functionalization of silica nanoparticles:  
increasing biological interaction

#### PRINCIPAL INVESTIGATOR

Mateus Borba Cardoso

#### HOST INSTITUTION

Chemistry Institute, Federal University  
of Rio Grande do Sul (UFRGS)

#### INSTITUTION INVOLVED

Chemistry Institute, Federal University  
of Rio Grande do Sul (UFRGS)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25473](http://agencia.fapesp.br/25473)  
Press releases and editorial suggestions

#### COVERAGE

25 stories in 13 national and  
12 foreign news media

## 5 RESEARCH HIGHLIGHTS

### MOLECULE INCREASES PREGNANCY RATE AND NUMBER OF OFFSPRING IN CATTLE

A molecule that can increase bovine pregnancy rates and reduce early embryo loss has been discovered by researchers at Inpreha Biotecnologia, a company based in Jaboticabal, São Paulo State, Brazil, working in partnership with colleagues at the University of São Paulo's Ribeirão Preto School of Pharmaceutical Sciences (FCFRP-USP).

The discovery resulted from a project supported by FAPESP's Small Business Innovative Research Program (PIPE) and gave rise to a product that enhances reproductive efficiency in domestic animals such as cattle and horses.

The product has been tested and patented by the company in Brazil and eight other countries as well as the European Union. In Brazil, it is awaiting registration by the Ministry of Agriculture, Livestock & Food Supply (MAPA).

Since Inpreha Biotecnologia was founded in 2008, its two owners have studied ways of increasing animal fertility and reproductive efficiency. They both earned master's degrees and PhDs in veterinary medicine and animal reproduction from São Paulo State University (UNESP) at Jaboticabal, with fellowships from FAPESP.

During their research, they read a scientific paper published in the late 2000s, according to which a recombinant protein in the D-galactoside binding lectin family had immunomodulatory and anti-inflammatory properties, participated in several biological processes, and endowed cells in the trophoblast (the specialized cells of the placenta, which play a major role in the maternal-fetal interface) with immune privilege by modulating a number of regulatory mechanisms for pregnancy establishment and maintenance. For these reasons, it was recommended for use in assisted reproductive procedures such as artificial insemination and embryo transfer.

The partnership between FCFRP-USP and the company confirmed the hypothesis that the molecule increases the bovine embryo implantation rate. Both the product and the process whereby the molecule is obtained have been patented.

#### PIPE

#### VETERINARY MEDICINE

FAPESP PROCESS 2011/50792-5

Method for increasing embryo implantation rate in the mother's uterus in mammals, use of an effective amount of beta-galactoside-binding lectin or derivatives thereof, beta-galactoside-binding lectin or derivatives and product

#### PRINCIPAL INVESTIGATOR

Marcelo Roncoletta

#### COMPANY

Inpreha Biotecnologia e Desenvolvimento Animal Ltda.

#### INSTITUTION INVOLVED

Ribeirão Preto School of Pharmaceutical Sciences, University of São Paulo (FCFRP-USP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25726](http://agencia.fapesp.br/25726)

#### COVERAGE

6 stories in national news media

## RESEARCH HIGHLIGHTS

### ACETONE SENSOR COULD SOON HELP DIABETES PATIENTS SELF-MONITOR BLOOD SUGAR LEVELS

With the technology currently available, patients with diabetes must check blood sugar by pricking a finger and testing a drop of blood in a glucometer. This unpleasant method could soon be replaced by a noninvasive and painless procedure resulting from a study in progress at the Center for Development of Functional Materials (CDMF), one of the Research, Innovation & Dissemination Centers (RIDCs) supported by FAPESP. The device under development by scientists there is a sensor similar to a breathalyzer, except that it analyzes not blood alcohol content but a key biomarker of diabetes in the patient's breath.

The principle underlying the device is the sensitivity of silver tungstate ( $\text{D-Ag}_2\text{WO}_4$ ) to acetone ( $\text{C}_3\text{H}_6\text{O}$ ). The development of gas sensors is one of CDMF's research lines, and special attention is paid to silver tungstate. The main motivation is to use it to detect and measure the acetone vapor in exhaled breath. Everyone's breath contains acetone vapor, but the amount in the breath of a patient with diabetes is approximately double the amount in the breath of a person without diabetes. While a person without diabetes exhales 0.3 to 0.9 parts per million, a person with diabetes exhales over 1.8 parts per million.

The study, whose results are described in an article published in the *Journal of Alloys and Compounds*, brought together researchers at São Paulo State University (UNESP), with which Silva is affiliated, the University of São Paulo (USP), the Federal University of São Carlos (UFSCar) and Piauí State University (UEP) in Brazil; Jaume I University in Castellón, Spain; and Aix-Marseille University in Marseille, France.

In 2014, the group observed for the first time that silver tungstate could serve as a sensor of ozone gas. The finding was published in the journal *Nanoscale*, attracting a great deal of attention at home and abroad. Since then, the method has been used in acetone detection to monitor diabetes. The same principle can be used to identify other diseases via specific gases in exhaled breath.

#### RIDC/POSTDOCTORAL FELLOWSHIP

##### ENGINEERING

FAPESP PROCESS 2013/09573-3

Synthesis and characterization of the  $\text{ZnO}/\text{SnO}_2$  heterostructures obtained by a hydrothermal method: gas sensor applications

#### PRINCIPAL INVESTIGATOR

Elson Longo da Silva

#### BENEFICIÁRIO

Luis Fernando da Silva

#### HOST INSTITUTION

Chemistry Institute, São Paulo State University (UNESP)  
Center for Development of Functional Materials (CDMF)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/24704](http://agencia.fapesp.br/24704)

#### COVERAGE

48 stories in national news media

## “RACIAL” INEQUALITY IN BRAZILIAN ELECTIONS

Even in competitive and relatively inclusive electoral systems where voters and candidates are not sharply divided by “race”, formal democracy can be vitiated by persistent inequality in terms of political representation, with “whites” taking precedence over “nonwhites” in what sociologists call “pigmentocracy”.

This is the conclusion of a study presented at the São Paulo School of Advanced Science in Human Science Methods, held at UNICAMP.

An article on the study, which was supported by Yale University, has been published in the journal *World Politics*. Written by a former holder of a master’s fellowship from FAPESP who is completing a PhD at Yale, the article says, “racial disparity between citizens and their representatives is especially noteworthy in Latin America, where narratives about ‘racial democracy’ celebrate ethnic harmony, integration and interracial relationships. In Brazil, where a majority of the population identify themselves as ‘black’ [*the official terms used in the census are negro, preto and pardo*], politicians at many levels of government are disproportionately ‘white’”.

Counting all candidates, whether or not they were elected, the study found that the proportion of black candidates differed little from the percentage of blacks in the general population. The discrepancy arises among the winners and not the contestants.

The researcher investigated the causes of overrepresentation of “whites” and underrepresentation of “nonwhites” among those elected, testing hypotheses and concluding that “racial” inequality in political representation can exist even in the absence of a strong voter preference for “white” candidates and even in the absence of formidable barriers to the contesting of elections by “black” candidates.

SÃO PAULO SCHOOL OF  
ADVANCED SCIENCE

PHILOSOPHY

FAPESP PROCESS 2016/18835-0

São Paulo School of Advanced Science  
on Research Methods in Human Sciences

### PRINCIPAL INVESTIGATOR

Rachel Meneguello

### HOST INSTITUTION

Institute of Philosophy & Human Sciences,  
University of Campinas (IFCH-UNICAMP)

### COVERAGE

11 stories in national news media

## RESEARCH HIGHLIGHTS

### BRAZILIAN PLATFORM TO PRODUCE BIODIVERSITY ASSESSMENT

The production of a Brazilian Assessment of Biodiversity and Ecosystem Services, the first diagnosis designed to contribute to the nation's environmental decision making, is the main aim of the Brazilian Platform on Biodiversity & Ecosystem Services (BPBES), which was launched on February 21, 2017, at FAPESP's headquarters in São Paulo.

The Brazilian Assessment will use the same concepts, methodologies and indicators as the four Regional Assessments under development by the Intergovernmental Science Policy Platform on Biodiversity & Ecosystem Services (IPBES), which was established in 2012 to assemble scientific information for use in the formulation of public policies on the subject.

The Brazilian Assessment will compile information collected from all parts of the country. To achieve this result, the coordinators of BPBES are meeting with representatives of several federal government agencies and nongovernmental organizations, as well as business leaders.

BPBES was established to meet the same needs as those that led scientists in São Paulo to establish the BIOTA-FAPESP Program in 1999, with its environmental information system (SINBIOTA), which contains technical information generated by researchers combined with a digital cartographic database on biodiversity in the state and disseminates the data to the scientific community, educators, decision makers, and formulators of environmental policies.

The Brazilian Platform focuses above all on the importance of ecosystem services to the quality of life. It consists of researchers from an array of institutions in all regions of Brazil and in fields such as conservation ecology, ecological economics, traditional knowledge, and sustainable development.

#### BIOTA-FAPESP

##### BIOLOGY

Brazilian Platform on Biodiversity and Ecosystem Services (BPBES)

#### PRINCIPAL INVESTIGATOR

Carlos Joly  
Chair, BPBES; Co-chair, IPBES  
Multidisciplinary Expert Panel

#### HOST INSTITUTION

University of Campinas (UNICAMP)

#### PUBLICATIONS

*Agência FAPESP*: [agencia.fapesp.br/24967](http://agencia.fapesp.br/24967)  
Press releases and editorial suggestions

#### COVERAGE

105 stories in national news media

## 5 RESEARCH HIGHLIGHTS

### BRAZILIAN STUDY COULD MAKE SOYBEAN OIL HEALTHIER

One of the reasons olive oil has become known as “the ultimate healthy fat” is its high oleic acid content: up to 84% of the total fatty acid content. Also known as omega 9, oleic acid is a monounsaturated fatty acid to which anti-inflammatory properties have been attributed, as well as the capacity to reduce “bad” cholesterol (LDL).

Soybean oil also contains this nutrient, but in smaller amounts: 23% of total fatty acids on average. The proportion could become significantly higher in the future thanks to a study conducted under the aegis of the BIOEN program by researchers at Santa Cecília University (UNISANTA) in Santos and the University of São Paulo’s Luiz de Queiroz College of Agriculture (ESALQ-USP) in Piracicaba, São Paulo State.

According to these researchers, increasing the oleic acid content of soybean oil would be beneficial not only for human consumption but also for biodiesel production. For this reason, the project seeks genetic markers that can be used to modify soybean oil’s fatty acid profile by means of genomic selection.

Soybean oil contains four other fatty acids in addition to oleic acid. Palmitic acid (11% on average) and stearic acid (4%) are saturated fats, which are considered bad for the cardiovascular system. Linoleic acid or omega 6 (54%) and linolenic acid or omega 3 are polyunsaturated fats, which are considered healthy and associated with the flavor of soybean oil.

In addition to changing the fatty acid profile of soybeans, the project aims to increase their total oil content. However, conventional plant breeding techniques have shown that any increase in the oil content beyond the usual 20% reduces the amount of protein below the normal level, which averages 40%, and this is not desirable.

#### BIOEN

#### AGRONOMY

FAPESP PROCESS 2016/01823-9

Genome-wide association study for seed protein and fatty acids in soybean

#### PRINCIPAL INVESTIGATOR

Regina Helena Geribello Priolli

#### HOST INSTITUTION

Santa Cecília University (UNISANTA)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26645](http://agencia.fapesp.br/26645)

#### COVERAGE

17 stories in national news media

## RESEARCH HIGHLIGHTS

### METROPOLITAN SÃO PAULO NEEDS TO CONTROL DIESEL VEHICLE EMISSIONS

The numbers are still alarming, and air quality in the São Paulo metropolitan area is still very poor, but it has improved in the last 30 years thanks mainly to emission control, according to a review of air quality data for the megacity published in *Atmospheric Environment*.

The study summarizes the results achieved in the Thematic Project “Narrowing the uncertainties on aerosol and climate changes in São Paulo State: NUANCES-SPS”, which was supported by FAPESP until its completion in 2016. Several institutes of the University of São Paulo (USP) participated in the project, as well as the São Paulo Environmental Corporation (CETESB).

Despite growth of the vehicle fleet – 76% between 2002 and 2012, reaching 11 million in 2014 – levels of pollutants have fallen in the last ten years, except for ozone gas and fine particulate matter, both of which are linked to health problems and cognitive disorders, especially in children and the elderly.

Nevertheless, alarm bells are still ringing: every year, over 10,000 deaths are closely linked to pollution by particulate matter in metropolitan São Paulo.

Pollution in São Paulo has certain unique characteristics. The megacity’s vehicle fleet is very large and old, with an average age of 9 years for light vehicles and 10 years for trucks, compared to 7 years and 8 years, respectively, in the US and Europe. The vehicle fuel mix is also different, as a significant proportion of the fleet runs on ethanol or biodiesel.

In a recent study performed as part of the Thematic Project, researchers showed that light vehicles in São Paulo emit 3.5 times more formaldehyde and acetaldehyde than light vehicles in California (USA). Another finding was that despite the reduction in hydrocarbon concentrations in São Paulo, current levels are higher than in other world megacities, such as Beijing, London, Los Angeles or Paris.

#### GLOBAL CLIMATE CHANGE

##### GEOSCIENCES

FAPESP PROCESS 2008/58104-8

Narrowing the uncertainties on aerosol and climate changes in São Paulo State: NUANCES-SPS

#### PRINCIPAL INVESTIGATOR

Maria de Fátima Andrade

#### HOST INSTITUTION

Institute of Astronomy, Geophysics & Atmospheric Sciences, University of São Paulo (IAG-USP)

#### OTHER INSTITUTIONS INVOLVED

USP’s Physics, Chemistry and Geoscience Institutes, and School of Arts, Sciences & Humanities; CETESB

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25607](http://agencia.fapesp.br/25607)

#### COVERAGE

17 stories in national news media



## BEFORE THE BIG BANG

The Big Bang theory began to be formulated in the late 1920s, when the US astronomer Edwin Hubble discovered that almost all galaxies are moving away from each other at ever-faster velocities.

This movement means they were much closer together in the remote past. More precisely, 13.8 billion years ago, all the matter and energy in the Universe were compressed into an initial state with infinite density and temperature.

To define this state, cosmologists paradoxically borrowed the concept of singularity from mathematics, where it refers to indefiniteness. In this case, there was a primordial cosmological singularity that began expanding 13.8 billion years ago. The initial singularity became known as the Big Bang. The hundreds of billions of galaxies in the cosmos were formed from the matter and energy ejected by this initial explosion.

Guided by Einstein's theory of general relativity, which is used to explain cosmic phenomena, from the 1940s onward, scientists constructed a detailed model of the evolution of the Universe since the Big Bang. The model was based on the assumption that the expansion might eventually decelerate in response to the gravitational attraction exerted by the mass of the Universe.

However, for Juliano César Silva Neves, a physicist at IMECC-UNICAMP, the Big Bang never happened.

In a study published in the journal *General Relativity and Gravitation*, Neves suggests the elimination of a key aspect of the standard cosmological model: the need for a spacetime singularity as the beginning of time.

Neves and his postdoctoral supervisor Alberto Vazquez Saa introduced a "scale factor" into the solutions to the general relativity equations that describe the geometry of the cosmos, making the rate at which the Universe is expanding depend not only on time but also on cosmological scale.

This is the proposal presented in the Thematic Project "Physics and geometry of space-time".

## THEMATIC PROJECT

### PHYSICS

FAPESP PROCESS 2013/03798-3

Physics and geometry of spacetime and bouncing cosmologies: the ekpyrotic universe

### PRINCIPAL INVESTIGATOR

Alberto Vazquez Saa

### HOST INSTITUTION

Mathematics, Statistics & Scientific Computation Institute, University of Campinas (UNICAMP)

### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26684](http://agencia.fapesp.br/26684)

Press releases and editorial suggestions

### COVERAGE

26 stories in 16 national and 10 foreign news media

## RESEARCH HIGHLIGHTS

### SEPSIS KILLS MOST IN ICUS, WITH A 55.7% MORTALITY RATE

Brazil has an extremely high rate of mortality from sepsis in intensive care units (ICUs), surpassing even mortality due to stroke and heart attack in ICUs. According to a survey conducted by researchers at the Federal University of São Paulo (UNIFESP) and the Latin American Sepsis Institute (LASI), more than 230,000 adults die from sepsis in ICUs every year. Even more alarmingly, 55.7% of patients with sepsis die after being hospitalized with the disease.

These numbers are from the first nationwide study of patients with sepsis admitted to ICUs, published in the journal *Lancet Infection Diseases*.

Sepsis is triggered by a dysregulated response of the organism in the presence of an infectious agent. The immune system begins to combat not only this agent but also the organism itself, leading to organ dysfunction. Both community-origin infections and healthcare-acquired infections can progress to sepsis, accounting for 40% and 60% of cases, respectively.

The study comprised a survey conducted in 227 institutions, with 15% of Brazil's ICUs. It was found that while the quality of care varies greatly from one institution to another, the difference between mortality in the public system (56%) and in the private system (55%) was not statistically significant. Adult cases of ICU-treated sepsis are estimated to total 420,000 per year, with 230,000 ending in death.

Several factors explain the alarmingly poor quality of treatment for sepsis in Brazilian ICUs, including lack of access to these facilities, late diagnosis, patient failure to seek medical help, inadequate treatment, procedural problems, and lack of funds.

Control of hospital infection, another key factor, is relatively straightforward and can prevent many cases of hospital-acquired sepsis. When sepsis is detected early, it is relatively easy to treat, basically requiring the administration of antibiotics and fluids, monitoring of the patient in the ICU, and analysis of bacterial culture.

#### THEMATIC PROJECT

##### MEDICINE

FAPESP PROCESS 2011/20401-4

Sepsis: integrating basic research and clinical research II

#### PRINCIPAL INVESTIGATOR

Reinaldo Salomão

#### HOST INSTITUTION

Medical School (Escola Paulista de Medicina), Federal University of São Paulo (UNIFESP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26862](http://agencia.fapesp.br/26862)  
Press releases and editorial suggestions

#### COVERAGE

26 stories in 20 national and  
6 foreign news media

### HALF OF ALL ADULTS WITH ANXIETY OR DEPRESSION IN SÃO PAULO SUFFER FROM CHRONIC PAIN

There is a strong two-way correlation between anxiety or depression and certain chronic physical conditions. Researchers at the University of São Paulo measured this correlation in adults who live in the São Paulo Metropolitan Area, and their findings were alarming.

Chronic pain was the most common physical complaint among individuals with mood disorders such as depression and bipolar disorder. Chronic pain occurred in 50% of people with mood disorders. The next most common were respiratory disease (33%), cardiovascular disease (10%), arthritis (9%) and diabetes (7%).

Anxiety disorders were also frequently associated with chronic pain (45%) and respiratory disease (30%), as well as arthritis (11%) and cardiovascular disease (11%). Hypertension correlated strongly with both mood and anxiety disorders (23%). Overall, the survey found that individuals with mood or anxiety disorders were twice as likely to have chronic diseases.

The study is described in an article in the *Journal of Affective Disorders* and was carried out as part of the São Paulo Megacity Mental Health Survey, completed in 2009 in connection with the Thematic Project “Epidemiological study of psychiatric disorders in the São Paulo Metropolitan Region: prevalence, risk factors, and social and economic burden”. The survey involved interviews with 5,037 inhabitants of the São Paulo Metropolitan Area aged 18 or more.

The data showed that over 2 million people were living with depression or anxiety associated with chronic pain in Greater São Paulo at the time of the survey. The authors of the study stressed that in this setting, there is a clear need to make the diagnosis and treatment of mental illness a priority for the health system. They also warned that the prevalence of these diseases is likely to increase in the years ahead.

#### THEMATIC PROJECT

##### PSYCHIATRY

FAPESP PROCESS 2003/00204-3

Epidemiological study of psychiatric disorders in the São Paulo Metropolitan Region: prevalence, risk factors, and social and economic burden

#### PRINCIPAL INVESTIGATOR

Laura Helena Silveira Guerra de Andrade

#### HOST INSTITUTION

Psychiatry Institute (IPq), Medical School, University of São Paulo (FM-USP)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25895](http://agencia.fapesp.br/25895)  
Press releases and editorial suggestions

#### COVERAGE

66 stories in national news media

## RESEARCH HIGHLIGHTS

### SOFTWARE TOOL USES COLLECTIVE INTELLIGENCE TO HELP SCHOOLTEACHERS

Mupi Tecnologia e Serviços de Informação, a startup incubated at the University of Campinas (UNICAMP), is developing a software tool that will use collective intelligence to help schoolteachers prepare classes and assessments. It consists of a virtual smart library with filters to facilitate online searching for teaching material, in addition to a platform for sharing pieces produced by the teachers themselves, including texts, exercises, assessment questionnaires, slides, videos, and even complete lesson plans.

The application will also offer evaluations of the quality of the materials, adaptations to the teacher's needs, suggestions based on their user profile, and payment for each use of shared material.

The product under development by Mupi – founded in 2015 to train teachers in the classroom use of technology – is the result of a feasibility study deriving from the project “Online educational system based on blended learning”, which was supported by PIPE and enabled the firm to produce its first prototype. The goals are to eliminate bottlenecks in basic education and to pave the way for advances in the implementation of blended learning, which involves the use of digital technologies by teachers both remotely and while physically present in the classroom.

According to the principal investigator, this functionality will also permit education tailored to the needs of every child. Individual students will be able to learn at their own pace, using the resources best suited to their inclinations and interests. Blending learning also fosters the self-learning skills that are vital to society in the twenty-first century and have therefore become an irreversible international trend.

#### PIPE

#### INTERDISCIPLINARY

FAPESP PROCESS 2016/16563-2

Online educational system based on blended learning

#### PRINCIPAL INVESTIGATOR

Paula Rodrigues Furtado

#### COMPANY

Mupi Tecnologia e Serviços de Informação

#### COVERAGE

3 stories in national news media

## PRODUCT CAN HELP PREVENT OLDER ADULTS FROM FALLING

A research project conducted in partnership by the University of São Paulo's Mathematics & Computer Science Institute (ICMC-USP) and the Gerontology Department of the Federal University of São Carlos (UFSCar) will lead to the development of a product to help older people avoid falls.

The project won a one-year Latin America Research Award from Google in late August 2017.

Older adults falling is considered a public health problem because of the severity of the injuries it can cause. There are various methods for carers and physicians to help prevent falling, but they typically limit the freedom of the older people involved.

The new project set out to solve this dilemma from a different perspective. An accelerometer – a small device that senses changes in velocity – will be used to detect tendencies that could lead a healthy older person to experience a fall in the near future. The device will be small enough to be built into a wearable such as a wristband or waistband.

The research was conducted by Patrícia Bet for a master's degree in gerontology at UFSCar, with supervision by Moacir Ponti, a professor at ICMC-USP, and support from Paula Costa Castro, a professor at UFSCar. Bet's research was an extension of her scientific initiation with a fellowship from FAPESP.

According to ICMC-USP, one of the advantages of the device is that the existing commercial solutions detect a fall only as it happens, or even afterward, whereas the new model is able to tell whether the person has had one or more falls recently, which enables predictions to be made regarding the likelihood of future falls.

### SCIENTIFIC INITIATION

#### PREVENTIVE MEDICINE

FAPESP PROCESS 2015/09715-8

Accelerometer data analysis for the identification of seniors at risk of falling

#### PRINCIPAL INVESTIGATOR

Paula Costa Castro

#### BENEFICIÁRIA

Patrícia Bet

#### HOST INSTITUTION

Center for Biological & Health Sciences,  
Federal University of São Carlos  
(CCBS-UFSCar)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/26541](http://agencia.fapesp.br/26541)

#### COVERAGE

5 stories in national news media

## RESEARCH HIGHLIGHTS

### ZIKA IMPAIRS THE MIGRATION OF NEURONS TO THE CEREBRAL CORTEX

Recent studies have confirmed that congenital infection by Zika virus, especially in the first trimester of pregnancy, can result in severe forms of damage to the newborn's brain, the most frequent of which cause microcephaly. However, the mechanisms leading to this malformation of the central nervous system are not yet clear.

New hypotheses have been presented by researchers at the Federal University of the ABC (UFABC) in São Paulo, Brazil. In an article published in *Molecular Neurobiology*, they say the scientific evidence currently available suggests that infection by Zika impairs the interaction between neurons and glial cells. This interaction is considered essential to the development of the cerebral cortex, the outermost layered structure of the brain.

The study was conducted during Laís Takata Walter's PhD research, with FAPESP's support and supervision by Alexandre Hiroaki Kihara, a professor at UFABC's Center for Mathematics, Computation & Cognition (CMCC). Márcia Aparecida Sperança, a professor at UFABC's Center for Natural & Human Sciences (CCNH), collaborated on the study, as well as researchers at the University of São Paulo (USP) in Brazil and the University of Reading in the United Kingdom.

The researchers reviewed articles published on the effects of Zika since the 2015 surge in cases of microcephaly and correlated their findings with existing knowledge of neurodevelopmental processes.

They found studies that suggest that Zika infection modifies the expression of genes that code for connexins, a family of gap junction proteins responsible among other things for promoting interconnections between neurons and glial cells. However, the consequences of this fact for brain development have not been explored in these articles.

As another outcome of their review of the scientific literature, the researchers at UFABC suggest that congenital infection by Zika promotes a combination of two different cell death pathways, apoptosis (programmed cell death) and autophagy (intracellular self-degradation of external structures).

#### REGULAR RESEARCH GRANT

##### MORPHOLOGY

FAPESP PROCESS 2014/16711-6

MicroRNAs and cell coupling interact in the development, adaptation and degeneration of the nervous system

#### PRINCIPAL INVESTIGATOR

Alexandre Hiroaki Kihara

#### HOST INSTITUTION

Center for Mathematics, Computation & Cognition, Federal University of the ABC (CMCC-UFABC)

#### PUBLICATIONS

Agência FAPESP: [agencia.fapesp.br/25384](http://agencia.fapesp.br/25384)

#### COVERAGE

66 stories in national news media



**CHAPTER**

**6**

**SCIENCE  
DISSEMINATION**



# 6 SCIENCE DISSEMINATION

FAPESP was mentioned in **13,308** news stories in 2017, and its online content had more than **11 million pageviews** during the year. Various forms of publication of the results of research supported by FAPESP contributed to this visibility

## INSTITUTIONAL SCIENTIFIC JOURNALISM

FAPESP'S scientific journalism, offering content on different platforms and at varying intervals, presents news on the progress achieved with FAPESP's support to society and the scientific community.

### AGÊNCIA FAPESP DE NOTÍCIAS (FAPESP NEWS AGENCY)

[www.agencia.fapesp.br/about-us/2](http://www.agencia.fapesp.br/about-us/2)

- **106,676** subscribers to newsletters
  - Portuguese (daily): 100,865
  - English (weekly): 4,437
  - Spanish (weekly): 1,374
- **2.3 million** pageviews in 2017 (sites in all three languages)
- 7,100 content reproductions by national and foreign news media
- 37,300 Facebook followers in Portuguese
- 60,700 Twitter followers in Portuguese
- 4,700 subscribers to YouTube channel
- 73 videos produced in 2017 with
- 40,902 views on YouTube and 144,000 views on Facebook
- 267 videos produced since 2014.



## PESQUISA FAPESP MAGAZINE

[www.revistapesquisa.fapesp.br/en](http://www.revistapesquisa.fapesp.br/en)

- Average monthly print run: **25,700**
- **3,102** paying subscribers
- 827 copies sold per month by newsvendors
- 3,674 copies distributed to state schools
- 3.36 million site visits (during 2017)
- 544 content reproductions in media
- 42 radio programs in partnership with Rádio USP
- 26 videos produced, with 418,425 views
- 167,301 Facebook followers
- 71,190 Twitter followers
- 16,970 subscribers to YouTube channel



## NEWSLETTER “RESEARCH FOR INNOVATION

[www.pesquisaparinovacao.fapesp.br](http://www.pesquisaparinovacao.fapesp.br)

- **50** newsletters produced
  - Distributed weekly to **10,523** people.
- The newsletter is sent in advance to CIESP, ANPEI, EMBRAPPII, SIMPI, EMBRAPA, CTA and CNPEM for distribution to their respective mailing lists.
- **65** content reproductions in national news media



Coverage of the activities funded by FAPESP in national and foreign news media can be found on [www.bv.br/namidia](http://www.bv.br/namidia). This site has catalogued more than 118,000 news stories since 1995. It received 165,000 hits in 2017.

# 6 SCIENCE DISSEMINATION

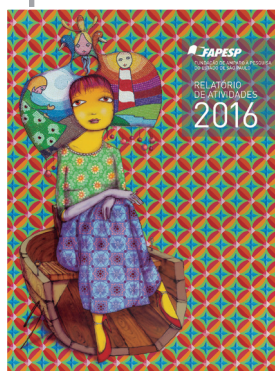
## OTHER SCIENTIFIC DISSEMINATION ACTIONS BY FAPESP

The research supported by FAPESP and its results are also publicized by means of other actions undertaken by the Communication team, with content produced mainly but not only for the scientific community. Examples include the Virtual Library (Biblioteca Virtual, BV) and the FAPESP Portal, as well as Publications and Events, which organize and facilitate access to information on completed and ongoing research projects, debates and opportunities, as well as announcing changes to rules and news on other institutional matters. The Press Office serves as a link between FAPESP's sources and domestic and foreign media, extending dissemination to other audiences reached by newspapers, magazines, websites, blogs, and radio and television broadcasters.

### PUBLICATIONS

[www.fapesp.br/en/5437](http://www.fapesp.br/en/5437)

**41** productions in 2017: books, reports, material on research programs with the results of scientific projects and 184 communication pieces (folders, invitations, advertisements, banners and exhibitions, among others)

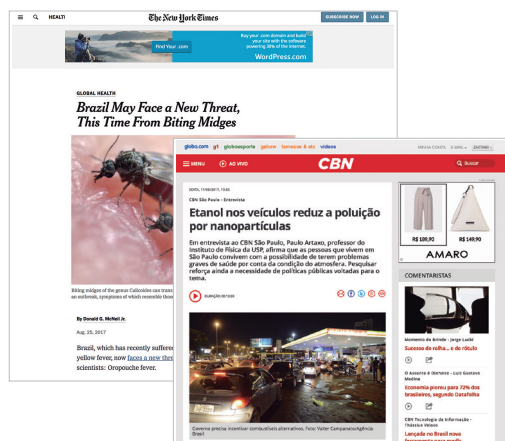


### EVENTS

**70** scientific and institutional events hosted, with **5,686** participants

## PRESS OFFICE

- 295 press releases and editorial suggestions
- 979 news stories covered
- 354 in national media and 651 in foreign media
- 256 press releases posted on Eurekalert! received 271,900 views and resulted in 625 stories in foreign news media



## FAPESP PORTAL

[www.fapesp.br](http://www.fapesp.br)

[www.fapesp.br/en](http://www.fapesp.br/en)

11.1 million visits to the portal (Portuguese version), including all sites and pages: BV, Pesquisa FAPESP, Agência FAPESP, Pesquisa para Inovação, RIDC, PIPE, ESPCA, MEU, and the Opportunities page



## VIRTUAL LIBRARY

[www.bv.fapesp.br](http://www.bv.fapesp.br)

[www.bv.fapesp.br/en](http://www.bv.fapesp.br/en)

- Site was reformulated and received 4.2 million visits in 2017
- 228,200 public interface hits relating to projects supported by FAPESP
- More than 100,000 scientific and academic publications available
- 39,000 project records for the period 1962-91 were digitized in 2017 and added in 2018









## EDITORIAL PRODUCTION

COORDINATION FAPESP Communications Management



EDITOR Maria da Graça Mascarenhas



EXECUTIVE PRODUCTION AND TEXT Jussara Mangini



TRANSLATION INTO ENGLISH Kevin M. B. Mundy



REVISION Nature Publishing Group Language Editing



GRAPHIC DESIGN Hélio de Almeida and Tatiane Britto



ELETRONIC TYPESETTING, FINAL ART AND GRAPHIC PRODUCTION Tatiane Britto



DATA SOURCE FAPESP Computing Management, Documentation and Information Center/  
Research Data Base, FAPESP Financial Management, FAPESP Indicators Coordination,  
FAPESP Website, News Agency FAPESP and *Pesquisa FAPESP* magazine



PRINTING Stilgraf



CIRCULATION 1,500 units







# ANNUAL ACTIVITY REPORT



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