Science and Technology: research opportunities in São Paulo, Brazil

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Scientific Directorate, Special Programs
FAPESP

Presentation for *3rd Brazilian Swedish Workshop in Aeronautics & Defence*
November 12th, 2015
São José dos Campos

Summary

- Setting the scale
- FAPESP
- Some examples of research supported by FAPESP.
- International collaboration.

Setting the scale

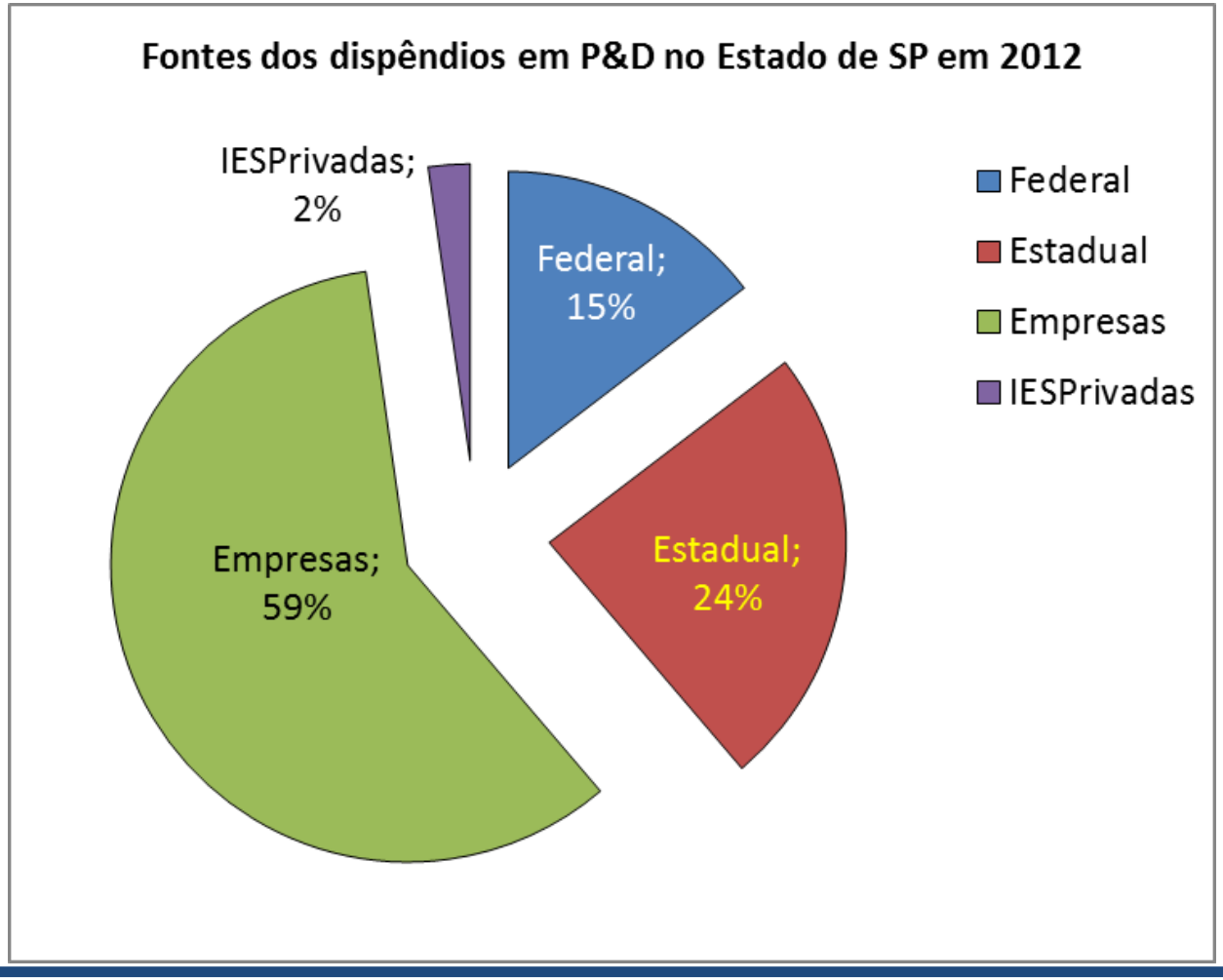
FAPESP supports ***quality research, irrespective of field of knowledge,*** performed in organizations – public or private - located in the state of São Paulo.

Funded by 1% of the state of São Paulo tax revenues (mandated by the State Constitution) and its own financial reserves.

State of São Paulo, Brasil

41	Million people
32%	of Brazil's GDP
50%	of Brazilian science
13%	of State budget to HE and R&D
1.6% GDP for R&D	
3	State Universities
3+1	Federal H.E. institutions
52	State Tech Faculties
45%	of the PhDs graduated in Brazil (4,937 in 2010)
20	Research Institutes (19 State/1 Federal)
2	Major National Labs (Federal)

São Paulo: R&D Expenditures, 2012, by source



- R&D expenditures total 1.6% of state GDP
  - Grew from 1.52% in 2008
- Public expenditures dominated by state
  - State 63%
  - Federal 37%

FAPESP expenditures, 2013
Total: R$ 1.103 billion

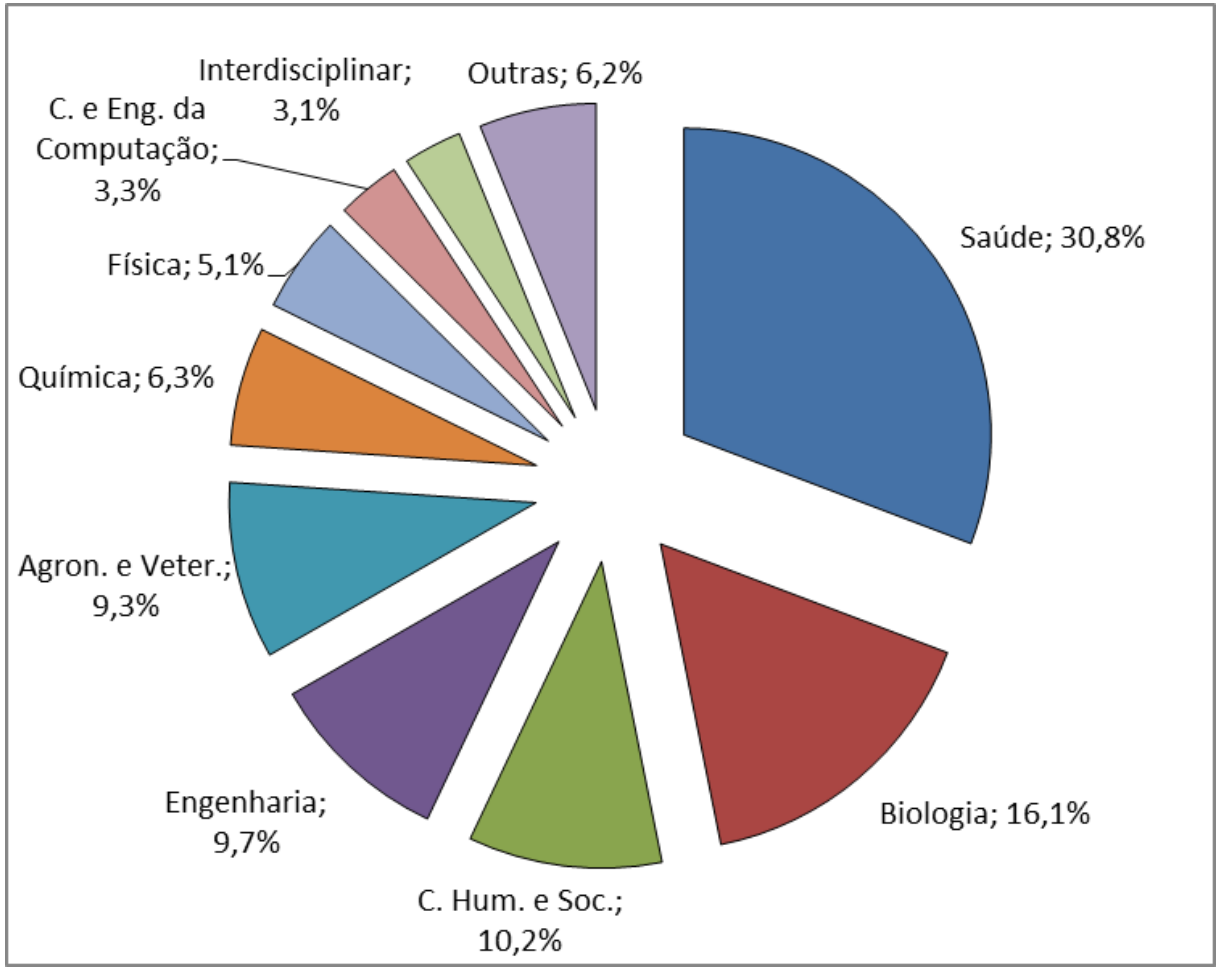
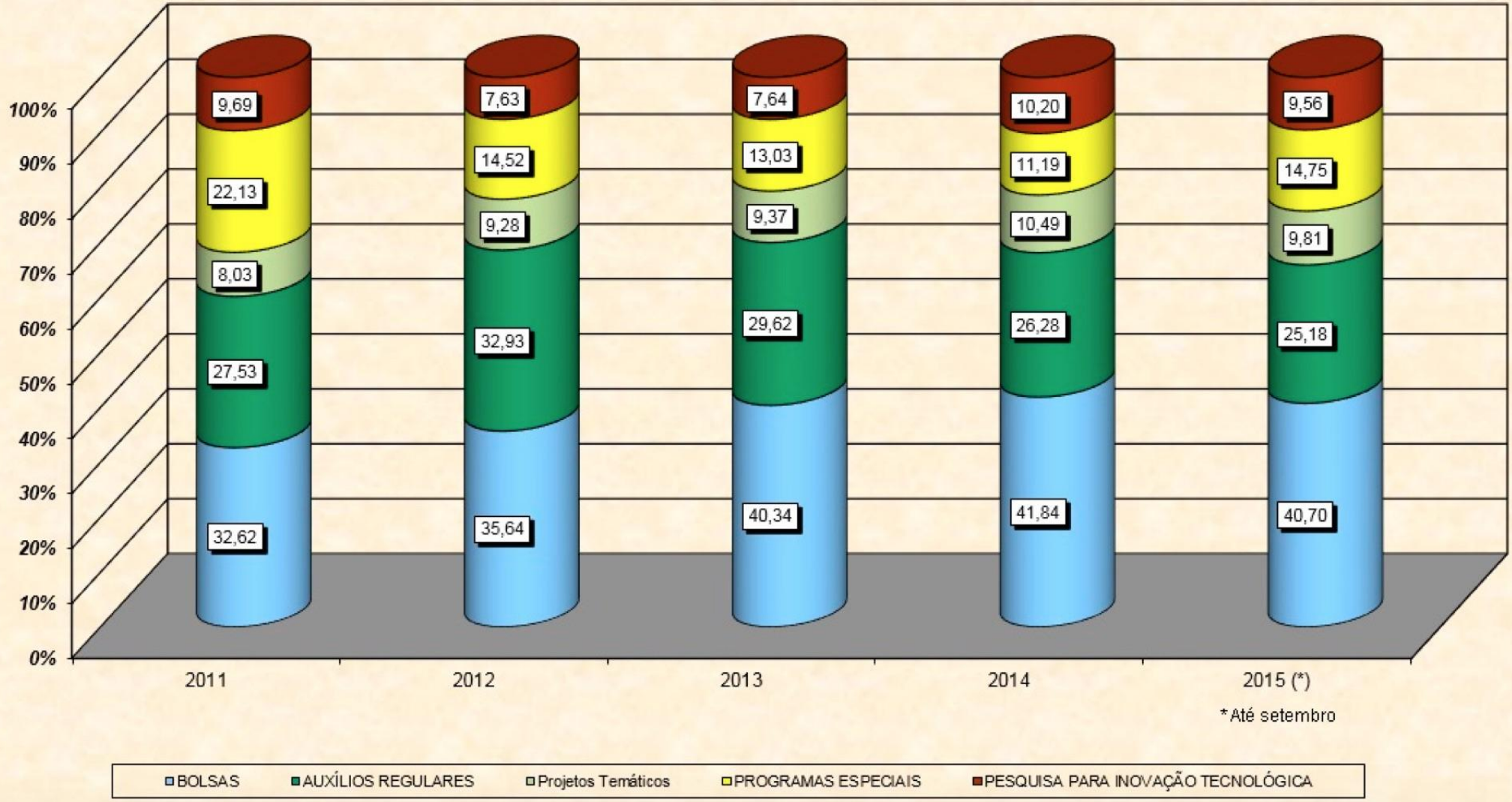


GRÁFICO I - FAPESP: PARTICIPAÇÃO PERCENTUAL DOS INVESTIMENTOS REALIZADOS EM BOLSAS E AUXÍLIOS, NO PERÍODO DE 2011 A 2015.

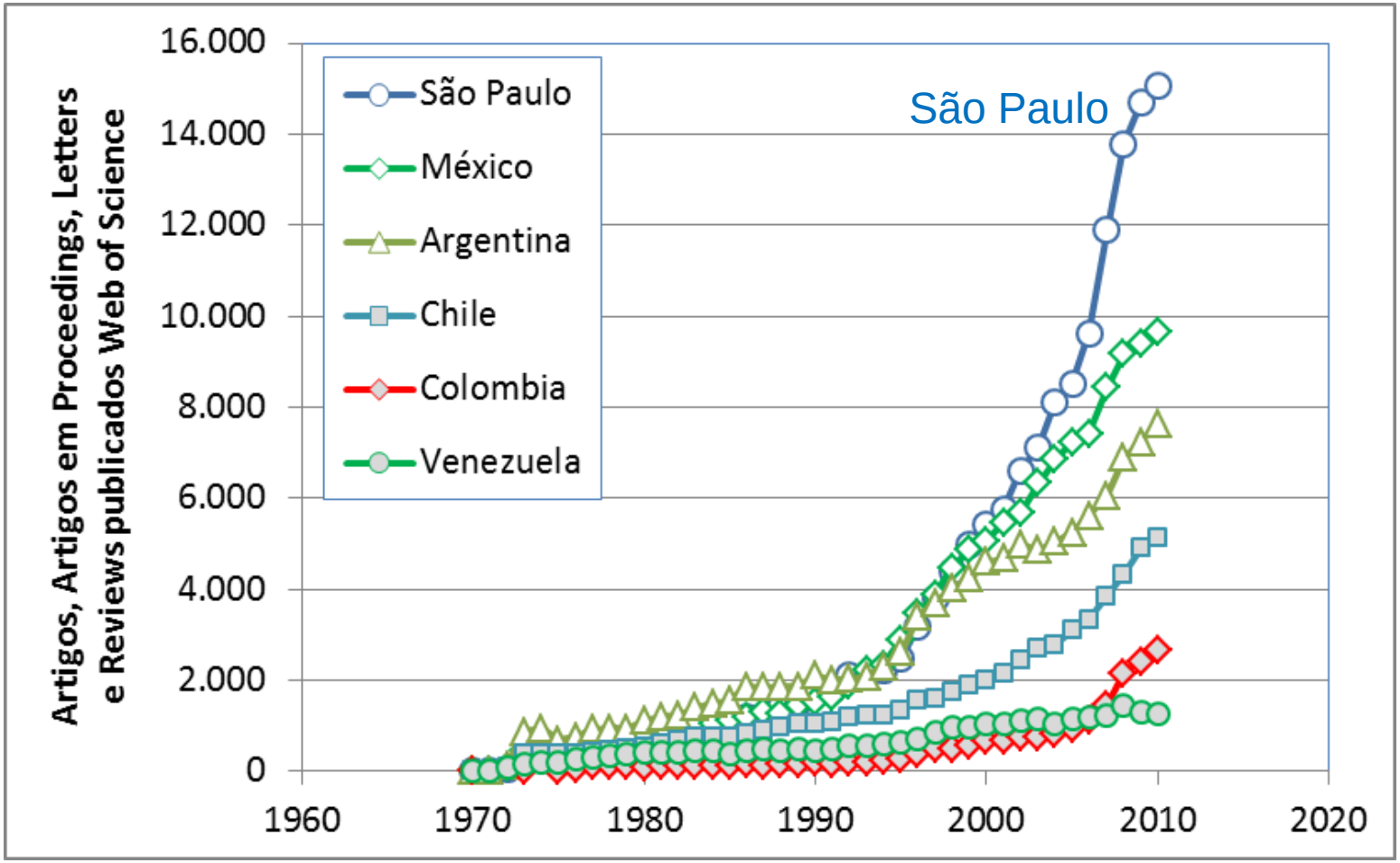


RESEARCH UNIVERSITIES IN SP
(MOSTLY PUBLIC)

Higher Education and Research in São Paulo, Brazil

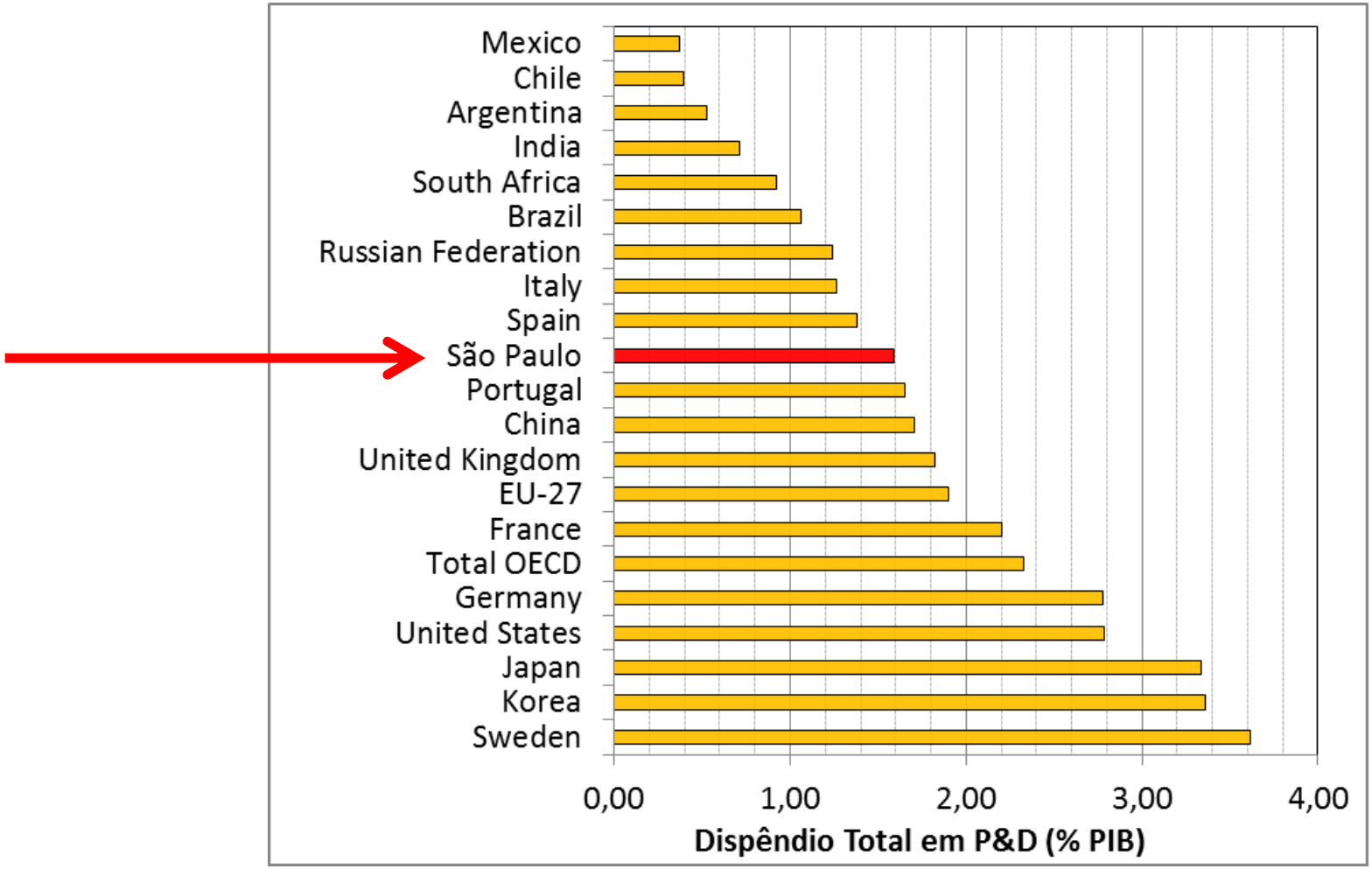
	Faculty	Student selectivity	Undergrads	DR stud. enrolled	DR awarded
USP	5,500	1:12	57,902	14,000	2,214
Unicamp	1,700	1:17	16,682	5,779	818
UNESP	3,400	1:12	35,929	4,395	756
PUCSP	1,406				355
UFABC	410	1:13	4,200		
UNIFESP	1,207	1:29	5,106		235
UFSCAR	1,127	1:14	8,851	914	175
ITA	182	1:50	572		

More articles than any country in Latin America

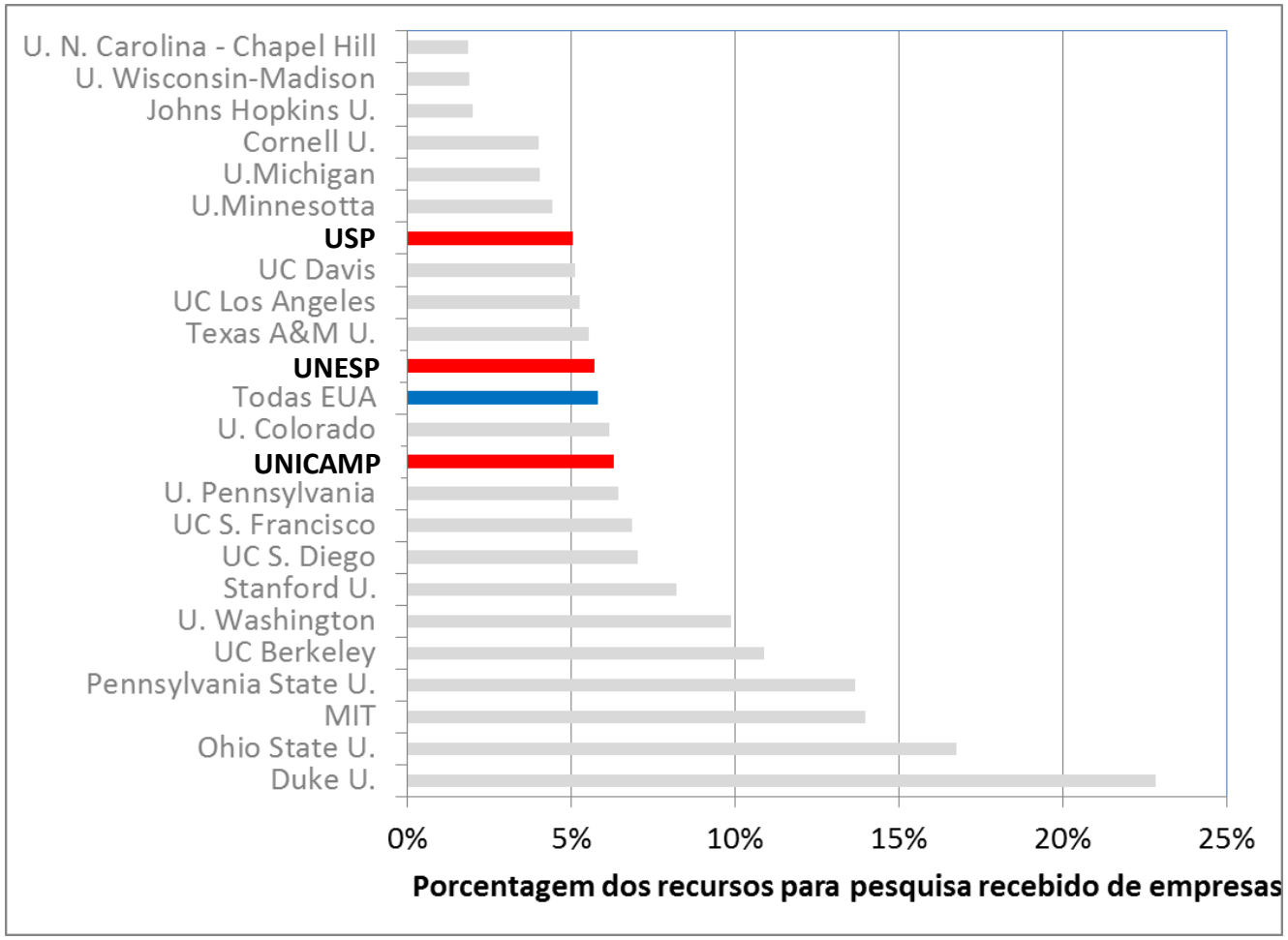


Invertebrate Systematics
NITRIC OXIDE
Biology and Chemistry
Official Journal of
Cancer Research
PHARMACEUTICAL RESEARCH
An Official Journal of the American Association of Pharmaceutical Scientists
nature
SINK OR SOURCE?
Journal of the American College of Cardiology
AIP The Journal of Chemical Physics
Zeitschrift
NEW STRUCTURES
nature
Citrus pathogen sequenced
Science Signaling
Microbes and Infection
PCCP
Analyst
NANOTECHNOLOGY
FRESHWATER RESEARCH
CHEMPHYSCHEM
A EUROPEAN JOURNAL
OF CHEMICAL PHYSICS AND PHYSICAL CHEMISTRY
9/2014
WILEY-VCH
PHYSICAL REVIEW LETTERS
17 December 2001
CrystEngComm
Au
Analyst
JOC
Science
Vanishing fauna
METEORITICS & PLANETARY SCIENCE
JOURNAL OF MATERIALS SCIENCE
Acta Crystallographica Section E
Structure Reports Online
Editors: W. T. A. Harrison, J. Simpson and M. Weil
Science
THE JOURNAL OF PHYSICAL CHEMISTRY C
BAMS
Storms over Brazil
nature REVIEWS NEUROSCIENCE
Journal of NANOSCIENCE AND NANOTECHNOLOGY
JOC
The Journal of Organic Chemistry
PUBLISHED BY THE AMERICAN CHEMICAL SOCIETY
SCIENCE and TECHNOLOGY
International Journal of Inorganic and chemical
ZEITSCHRIFT FÜR KRISTALLOGRAPHIE
Volume 223 7/2008
PHYSICAL REVIEW LETTERS
7 FEBRUARY 2003

São Paulo R&D Expenditures
International standing



University –Industry joint research



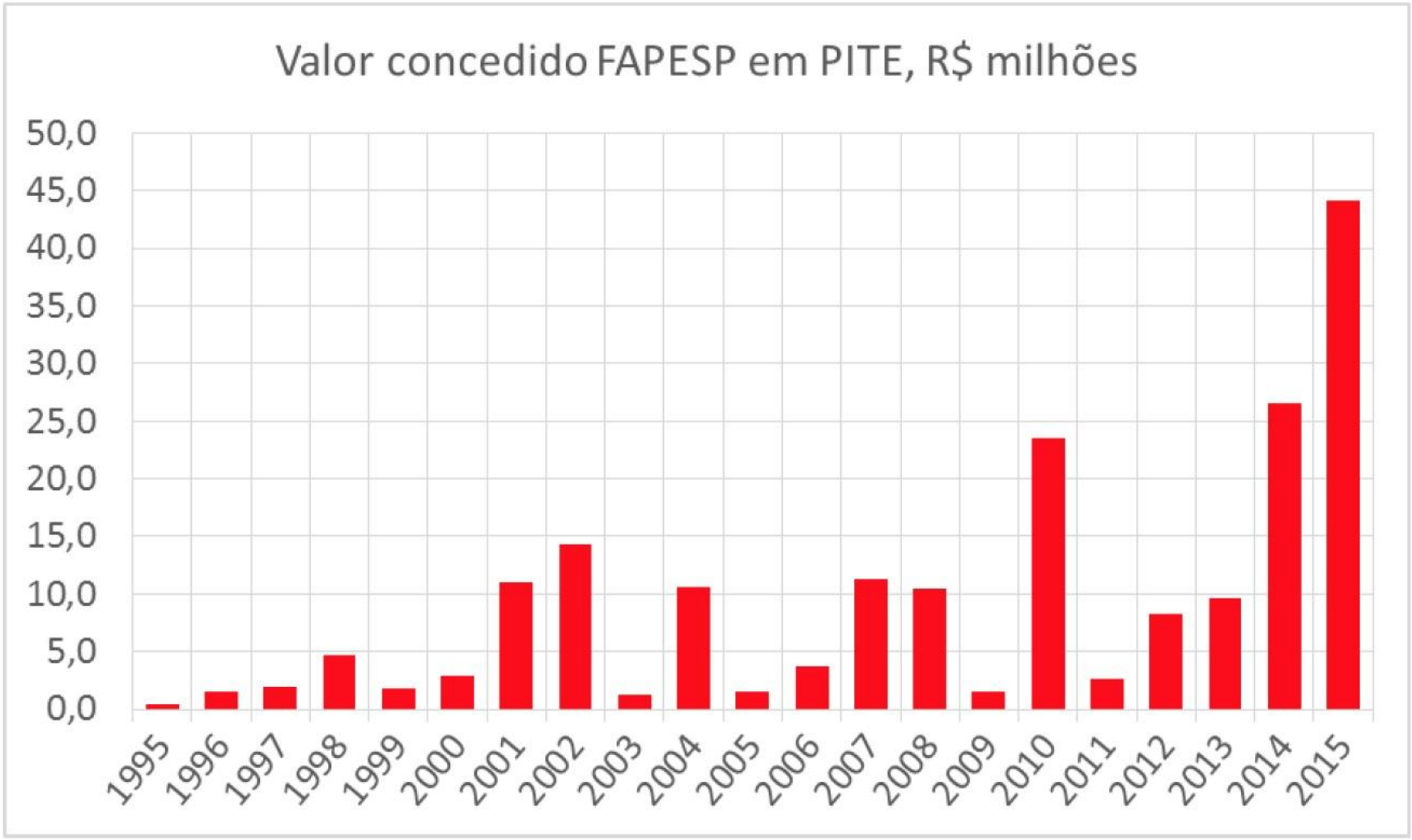


Figura 4. Valores concedidos anualmente a propostas de pesquisa iniciais no programa PITE FAPESP.

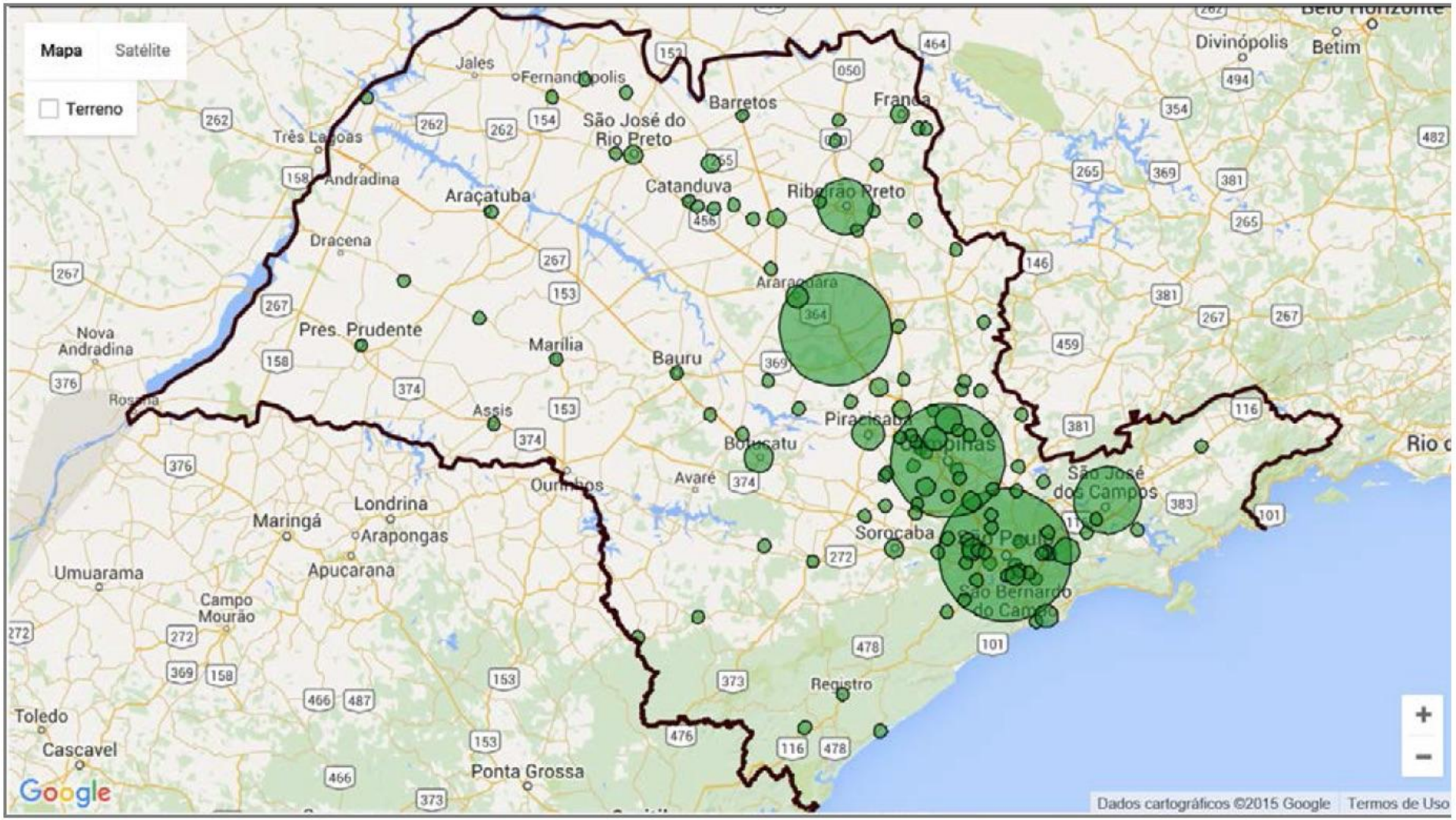


Figura 5. Localização e quantidade de projetos PIPE FAPESP. O tamanho dos círculos é proporcional à quantidade de projetos contratados na localidade.

FAPESP

In many respects, still a unique institution in Brazil.

- Independent Governance - fairly insulated from politics.
- Steady funding for more than half a century.
- Endowment to even out fluctuations.
- Focus on ***research*** and long term.

Fapesp: São Paulo Research Foundation

- All proposals are peer reviewed (25,000 proposals in 2013).
  - Average time for decision– 69 days; 50% success rate.
- Annual budget: $ 500 M in 2013.
  - **Fellowships** (3,000 SI, 2,600 MSc, 4,000 DrSc, 2,000 Post-docs, 800 other).
  - **Academic R&D:**
    - RIDC/11 years, Thematic/5 years, Young Investigators/4 years, Regular/2 years.
  - **University-Industry Joint R&D**: Microsoft, Agilent, Braskem, Oxiteno, SABESP, VALE, Natura, Petrobrás, Embraer, Padtec, Biolab, Cristalia, Whirlpool, Boeing.
    - Engineering Res. Centers: 10 years joint grants FAPESP/Industry – PCBA, GSK, Natura, BG
  - **Small business R&D (PIPE):** 1,200 SBE's (three PIPE+PAPPE awards per week in 2013). Up to MR$ 1.2 per project.

Research, Innovation and Dissemination Centers (CEPID)

- 11 year funding, bold, transformative research
- 11 world class centers
  - 5 in Engineering and Exact Sciences
    - Computational Engineering and Sciences, UNICAMP
    - Functional Materials. UNESP
    - Mathematical Sciences applied to Industry, USP-São Carlos
    - R&D on Glass, Federal Univ. – São Carlos
    - Optics and Photonics, USP-São Carlos
- CEPIDs

Some examples

FAPESP does not try to choose “winners”. Instead, through the way the Foundation shapes its programs, it takes a long term view and seeks to further world class and ethical research.

University-Company Joint Research Centers

- The Center must be located at one University, with a Professor as the Coordinator.
- The Adjunct Coordinator is a researcher employed by the Company, but linked to the University as a Visiting Professor (part time).
  - Other researchers and engineers from the Company can also have formal links to the University.
- The Center must be supported for 10 years. FAPESP and the Company jointly provide financial support from MR$ 2 to 6, annually. Other costs are borne by the University.
  - Investment sharing is typically: FAPESP/Industry/University – 1/1/2.
- Centers in operation:
  - Peugeot-Citroen (PCBA): Light vehicle biofuel engines.
    - Center for light vehicle biofuel engines, located at UNICAMP and involving ITA, USP, Mauá. FAPESP and Peugeot-Citroen: R$ 16 million. Universities: R$ 16 million.
  - Glaxosmithkline (GSK): Green Chemistry and Drug Discovery
    - Center for Green Chemistry, Univ. Fed. De São Carlos (FAPESP and GSK – R$ 32 million).
    - Center for Discovery of Molecules for Drugs, Instituto Butantan (FAPESP and GSK – R$ 32 million).
  - Natura: Human Behavior and Well-Being
    - Center for Research Applied to Human Behavior and Well-Being, University of São Paulo. (FAPESP and Natura - R$ 20 million).
  - British Gas: Research on Oil and Gas
    - Center for Innovation in Natural Gas, Polytechnic School, USP.

FROM BASIC RESEARCH TO PRACTICAL RESULTS

Professors have ideas, often times because they love challenges

Pergamon

Int. Comm. Heat Mass Transfer, Vol. 28, No. 7, pp. 963–972, 2001

0735-1933/01/$–see front matter

PII: S0735-1933(01)00300-1

UNSTEADY HEAT CONDUCTION IN 3D ELLIPTICAL CYLINDERS

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ABSTRACT

The main purpose of this paper is to present a numerical calculation procedure for transient heat conduction in a 3D elliptical cylinder. A non-orthogonal analytical transformation converting an elliptical cylinder into a parallelepiped was developed. The finite-volume method was applied to the transformed partial differential equations. The resulting algebraic equations were solved by a technique similar to the alternating-direction-implicit scheme.

Then the academic idea may develop into na application

Contents lists available at ScienceDirect

International Communications in Heat and Mass Transfer

journal homepage: www.elsevier.com/locate/ichmt

A transient three-dimensional heat transfer model of the human body☆

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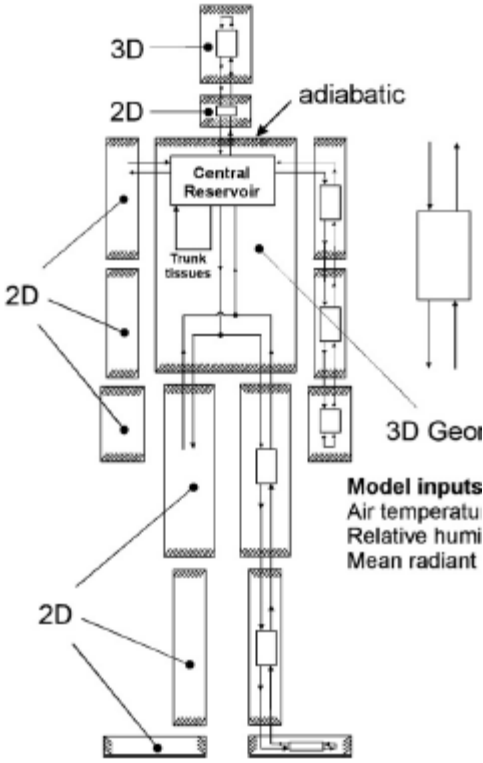
Available online 16 April 2009

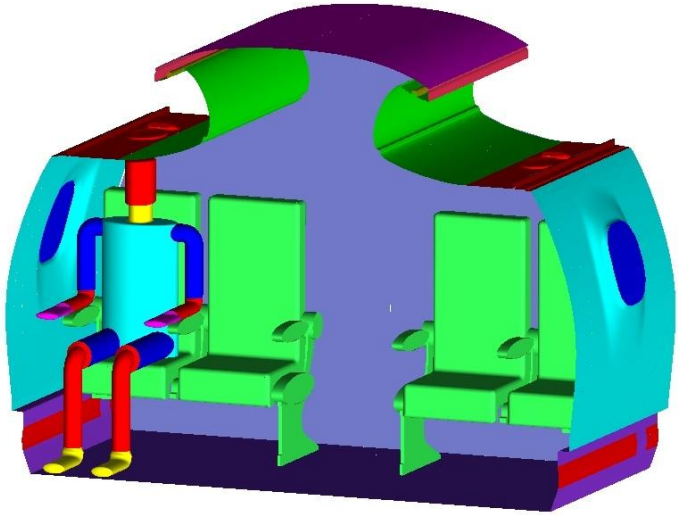
Keywords:
Human body thermal model
Human thermal system
Bio-heat transfer
Thermoregulation
Thermal comfort

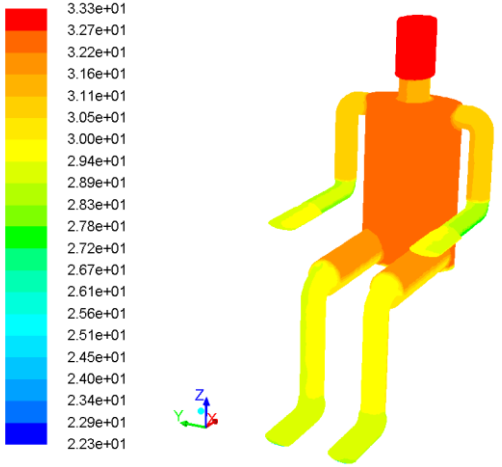
ABSTRACT

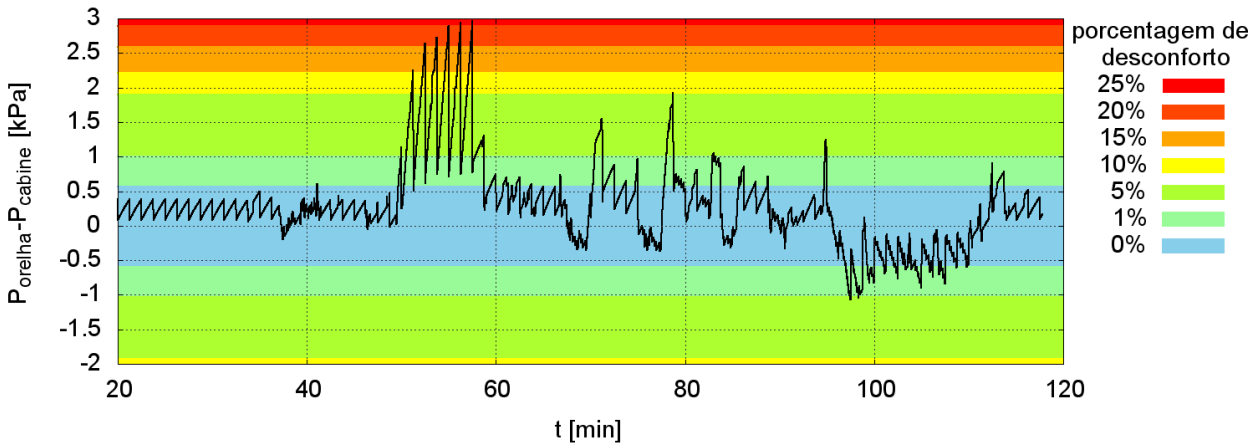
The objective of this work is to develop an improved model of the human thermal system. The features included are important to solve real problems: 3D heat conduction, the use of elliptical cylinders to adequately approximate body geometry, the careful representation of tissues and important organs, and the flexibility of the computational implementation. Focus is on the passive system, which is composed by 15 cylindrical elements and it includes heat transfer between large arteries and veins. The results of thermal neutrality and transient simulations are in excellent agreement with experimental data, indicating that the model represents adequately the behavior of the human thermal system.



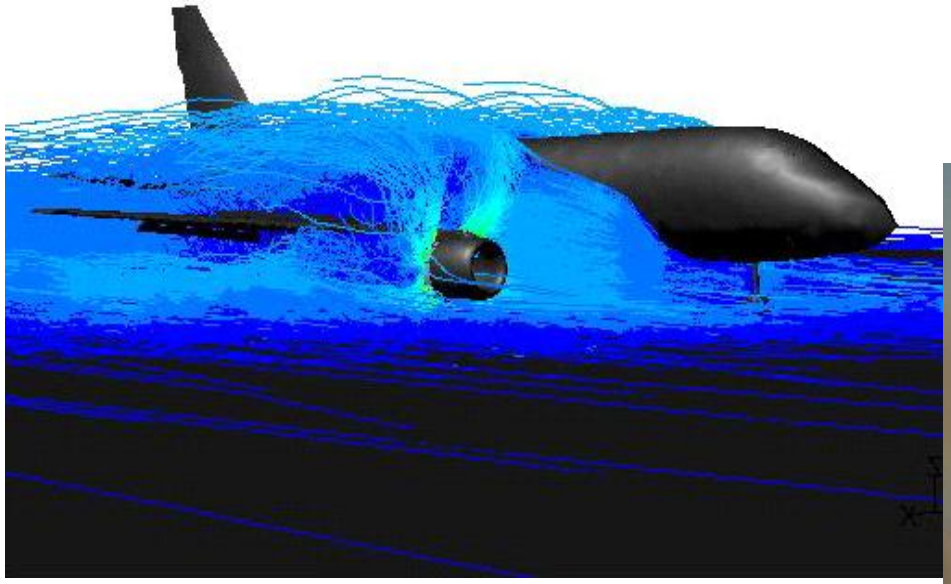
Result: FAPESP-Embraer-Poli, USP Research Center for Comfort Engineering







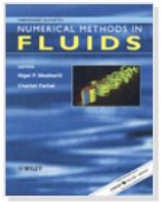
Embraer-FAPESP: R&D to build an innovative jet



Computational Fluid Dynamics (CFD) simulation and tests
Research co-funded by FAPESP, using several universities

Results can be, and are, published

International Journal for Numerical Methods in Fluids *Explore this journal >*



View issue TOC
Volume 45, Issue 1
10 August 2004
Pages 1107–1122

Research Article

Adaptive mesh refinement and coarsening for aerodynamic flow simulations

Leonardo Costa Scalabrin, João Luiz F. Azevedo

First published: 14 May 2004 Full publication history

DOI: 10.1002/fld.731 View/save citation

Cited by: 3 articles Refresh Citing literature

Funding Information

Abstract

A new mesh refinement technique for unstructured grids is discussed. The new technique presents the important advantage of maintaining the original grid skewness, thanks to the capability of handling hanging nodes. The paper also presents an interpretation of MacCormack's method in an unstructured grid context. Results for a transonic convergent –divergent nozzle, for a convergent nozzle with a supersonic entrance and for transonic flow over a NACA 0012 airfoil are presented and discussed. Copyright © 2004 John Wiley & Sons, Ltd.

Navier–Stokes-Based Study into Linearity in Transonic Flow for Flutter Analysis

Roberto G. A. Silva,* Olympio A. F. Mello,† and João L. F. Azevedo‡
Centro Técnico Aeroespacial, 12228-904 São José dos Campos SP, Brazil

Introduction

IT has been known for quite some time[1] that transonic flow conditions are critical for flutter, with the flutter dynamic pressure being substantially reduced for Mach numbers near unity, in a phenomenon usually termed as "transonic dip."[2] The severity of flut-

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portu

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LEL - Lightweight Structures Laboratory

Fiber Placement Machine - production of (convex/concave) large-curvature parts, using pre-impregnated composite fibers

Lightweight structures are essential for the competitiveness of several industrial sectors, such as aerospace, automotive, oil & gas, and wind-turbine blades. They are also important for other industries: defense, infrastructure, marine and recreation, among others.

The Lightweight Structures Laboratory was founded by the Institute for Technological Research of the State of São Paulo (IPT), at the Technology Park of São José dos Campos, Brazil, in order to create in this area an integrated facility for research, and fulfill the demand of

More about this center

Areas of expertise

Contact

Lightweight Structures Laboratory

lel@ipt.br
Tel.: 55 (12) 3905-3354

Location

Av. Prof. Almeida Prado, 532
Cidade Universitária
05508-901 São Paulo, SP, Brazil

Advanced Molecular Biology for Health and Agricultre

Supported by:

02/25/2015 09h47

Latin America's first kinase laboratory

Center located at Unicamp involves an investment of R$ 18 million from Fapesp

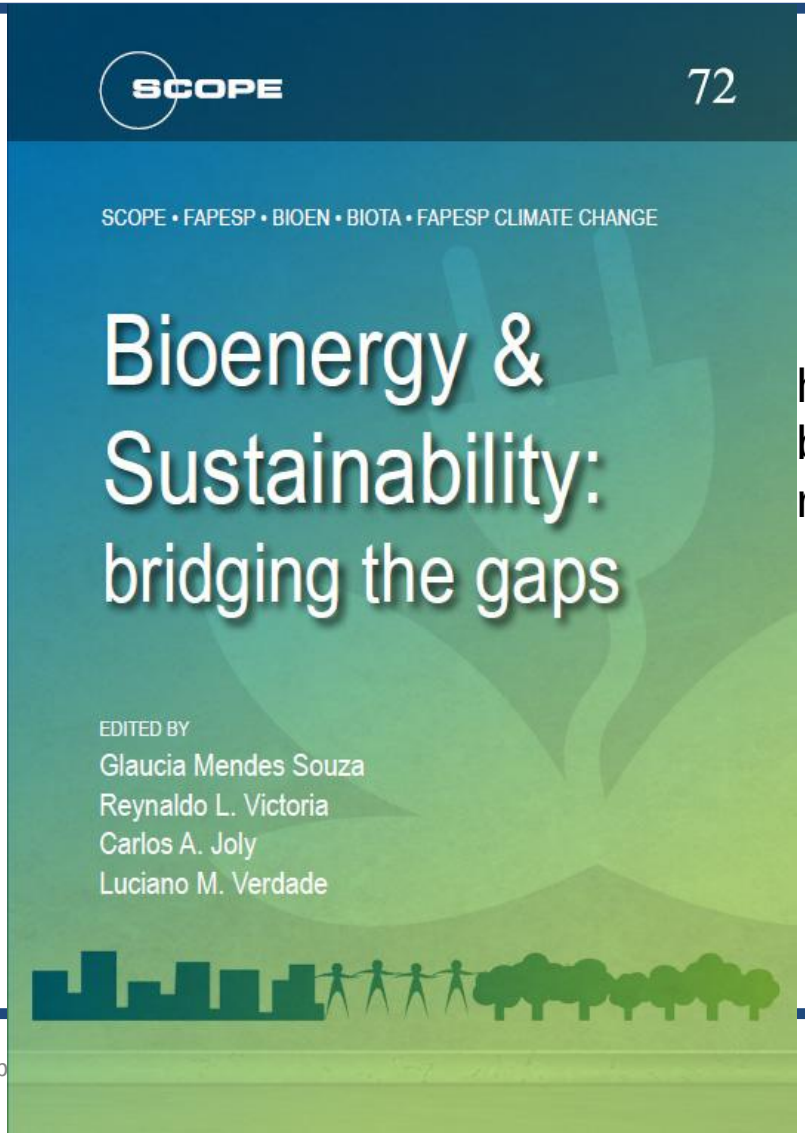
Unicamp

On March 10, Unicamp will launch the first research center of biology in Latin America (LA) in the area of protein kinases, molecules that are highly required in the pharmaceutical industry due to their signaling characteristics and the regulation of important biological processes. The laboratory, called Biology Center in Protein Kinase, relies on the partnership with São Paulo Research Foundation (Fapesp) and the Structural Genomics Consortium (SGC).

http://www.fapesp.br/publicacoes/flightpath-to-aviation-biofuels-in-brazil-action-plan.pdf

FAPESP/SCOPE Report 2015

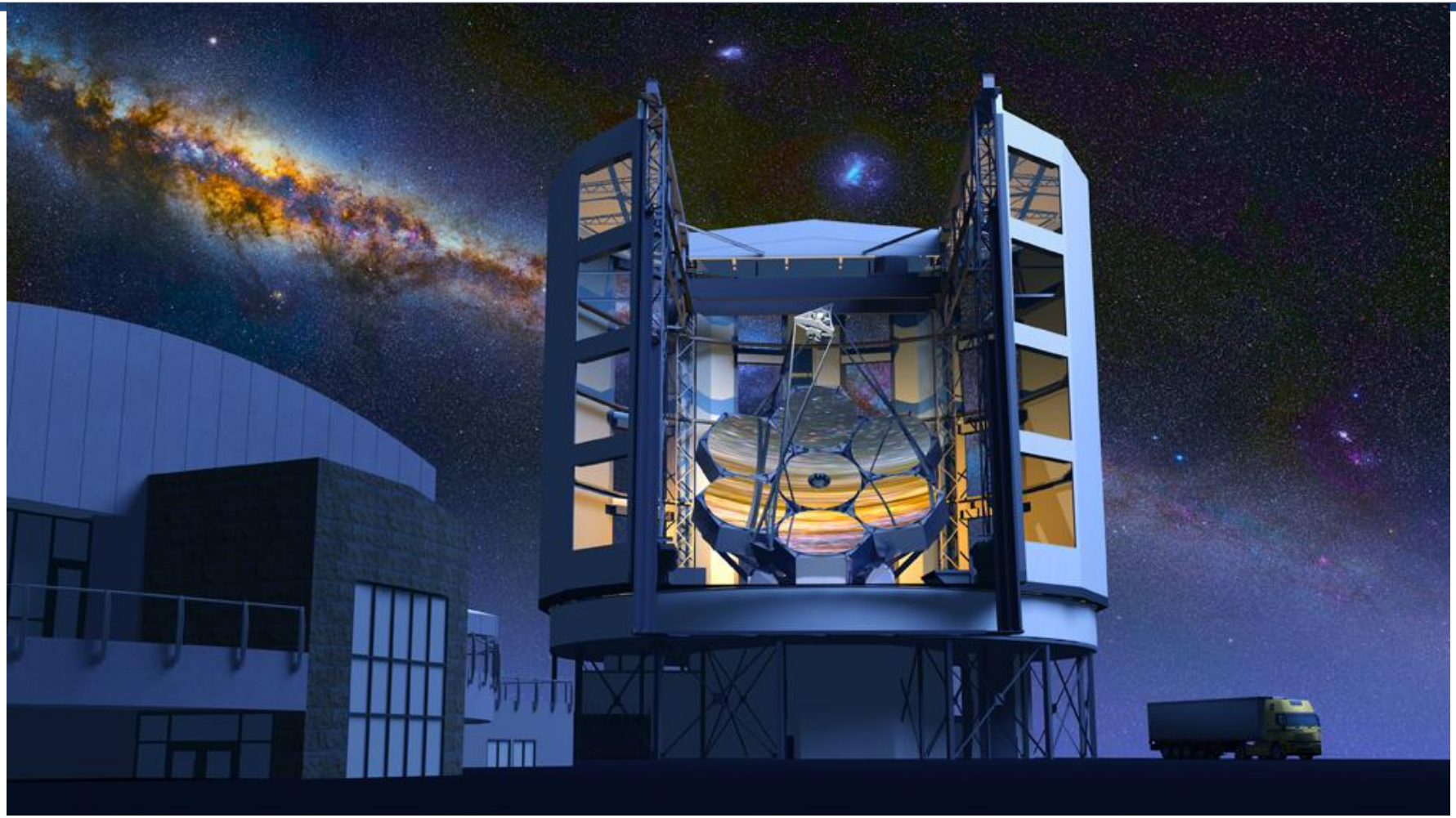
Scientific Committee on Problems of the Environment (SCOPE)



http://bioenfapesp.org/scopebioenergy/index.php/press-release

New synchrotron light source Sirius

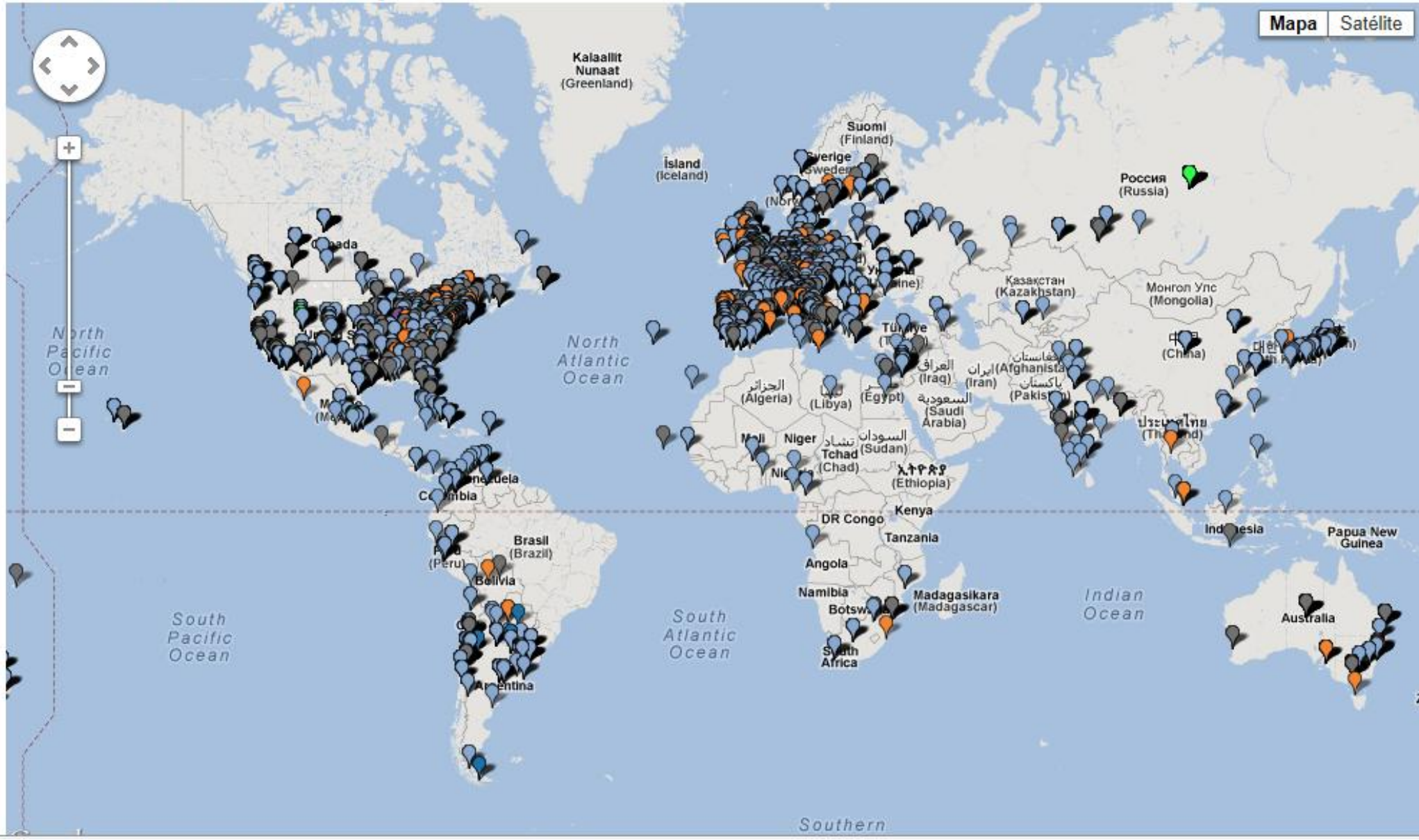
Giant Magellan Telescope



International Collaboration

Expose São Paulo researchers to more competitive environments.
Broaden cultural horizons.
Establish as early as possible in their career worldwide research networks.
Drive research quality.
To know (go from SP) and to be known (bring to SP).

Colaborações em Pesquisa



SP students going abroad

FAPESP's International Collaboration Strategy: two way street

- FAPESP's programs
  - visiting researcher, post-doctoral fellowships, young investigators, scholarships for Brazilian researchers abroad
- International agreements
  - With Funding agencies: fostering joint research projects
    - Conceived together, written together, performed together
    - Typically from 3 years, US$ 300k to 5 years, US$ 5 million
  - With universities: offering seed money for initial exchanges towards preparing full research proposals

FAPESP international collaboration: bringing foreign scientists to SP

- Post doctoral fellowships (1,018 in 2012)
  - Stipend, travel, some research money
- Young Investigator Awards (1.5 awards per week)
  - Stipend, travel, research money
- Visiting scientists
  - 275 in 2010 (travel, stipend; 2 weeks to 12 months)
- São Paulo Schools of Advanced Science (SPSAS)
  - Each one with 50-100 PhD students from abroad
- São Paulo Excellence Chairs (SPEC)
  - For senior level scientists from abroad: full research grant for staying 12 weeks per year in SP for 3-5 years

FAPESP international collaboration: sending scientists from SP abroad

- Research fellowships (2-12 mo; 201 in 2012)
- Special grants for participation in international conferences (863 awarded in 2012)
- Fellowship for short stays for FAPESP fellowship holders (undergrads, grads, post-docs)
  - 4 mo – 12 mo doing research work abroad
  - Eligible: all 11,000 FAPESP fellowship holders
  - International research for FAPESP Fellowship holders

What do we expect to obtain through international collaborations?

- More impact – three impacts/four outcomes
  - Scientific impact
    - Bolder and better science, more citations
    - Better training for the students
  - Economic impact whenever possible
  - Social impact whenever possible

To know about research in São Paulo: FAPESP Newsletter – in English

- http://agencia.fapesp.br/en/

An essential resource

- An importante tool to access information about FAPESP supported research.
- FAPESP Virtual Library

Contacts

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