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# *Science and Technology in São Paulo, Brazil*

Carlos H. de Brito Cruz  
Scientific Director  
Fapesp

Presentation at  
FAPESP Week London, Sep. 25, 2013

# Brazil: 198 million people, 6th GDP in the world (2011)



Brazil



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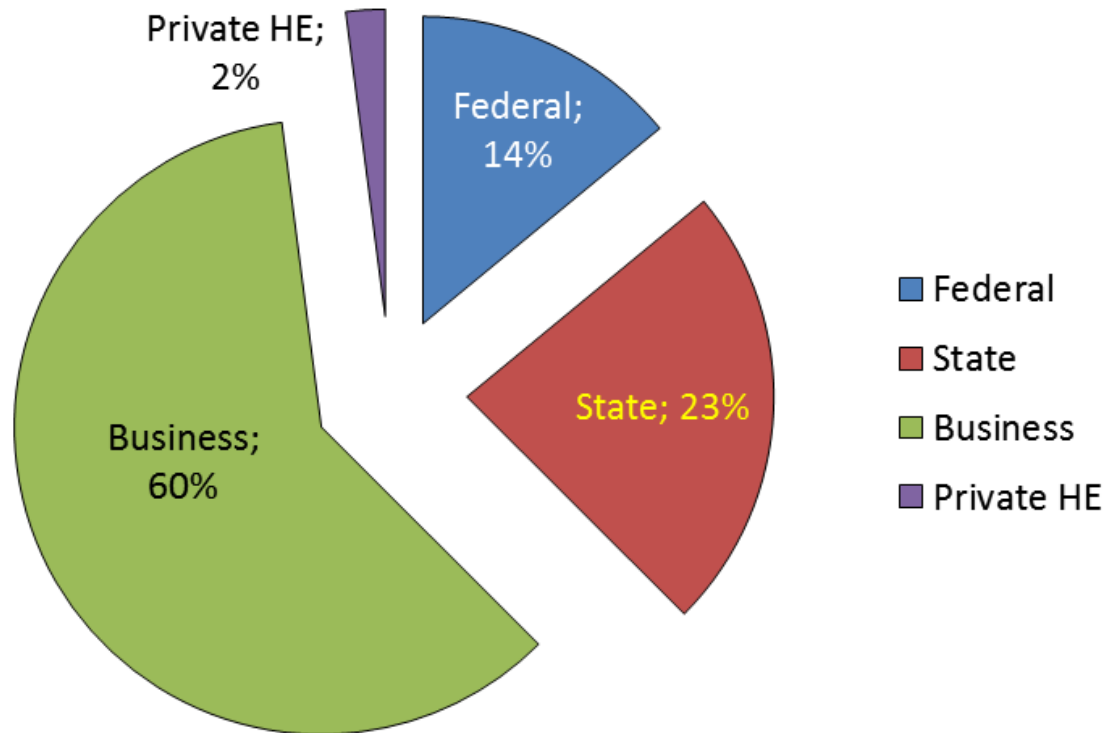
# State of São Paulo, Brasil



- 41 Million people
- 34% 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)
- 22 Research Institutes (19 state/3 federal)
- 62% of R&D public support comes from State sources

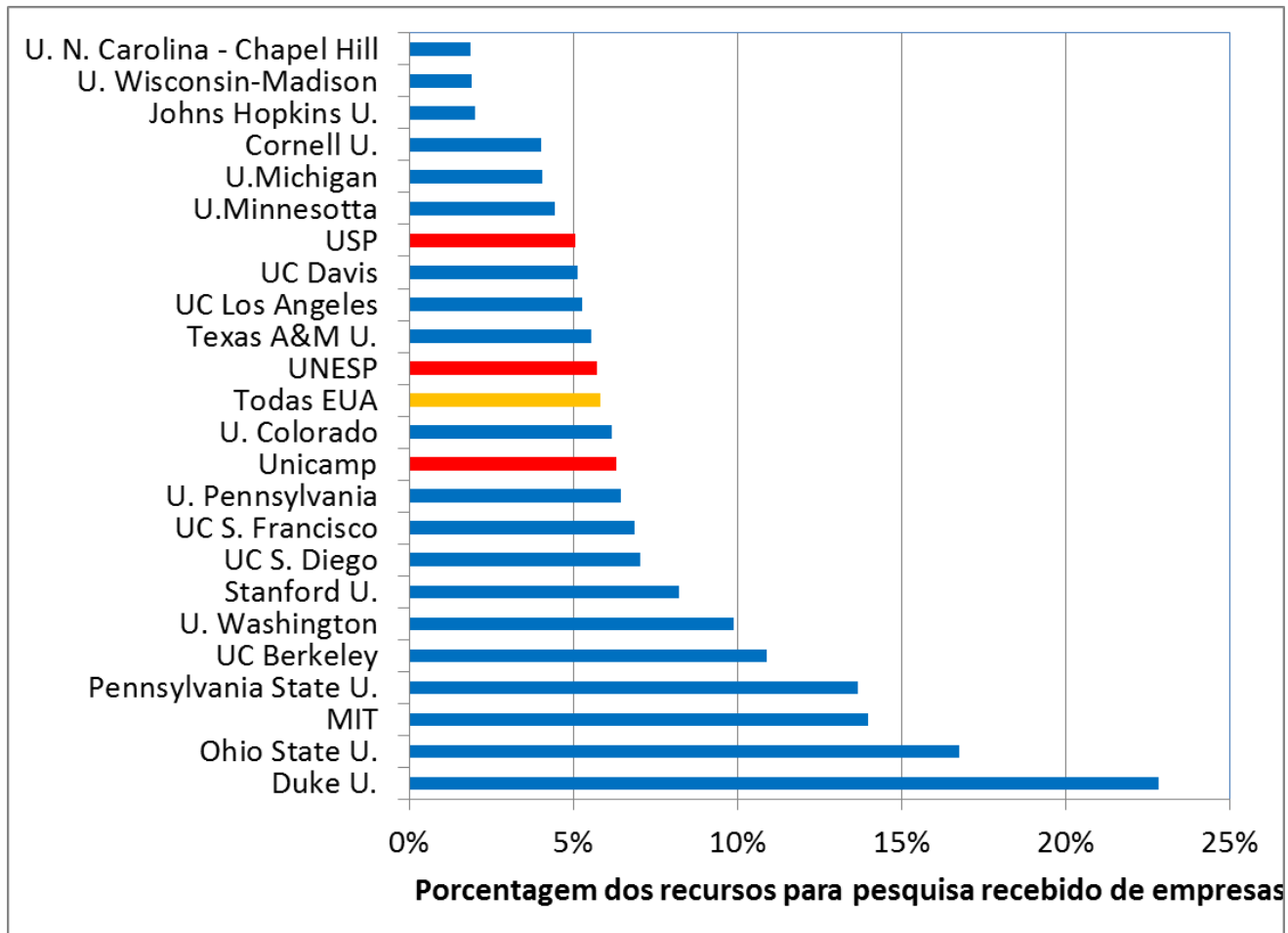
# São Paulo: R&D Expenditures, 2010, by source

Sources for R&D expenditures in São Paulo, 2010



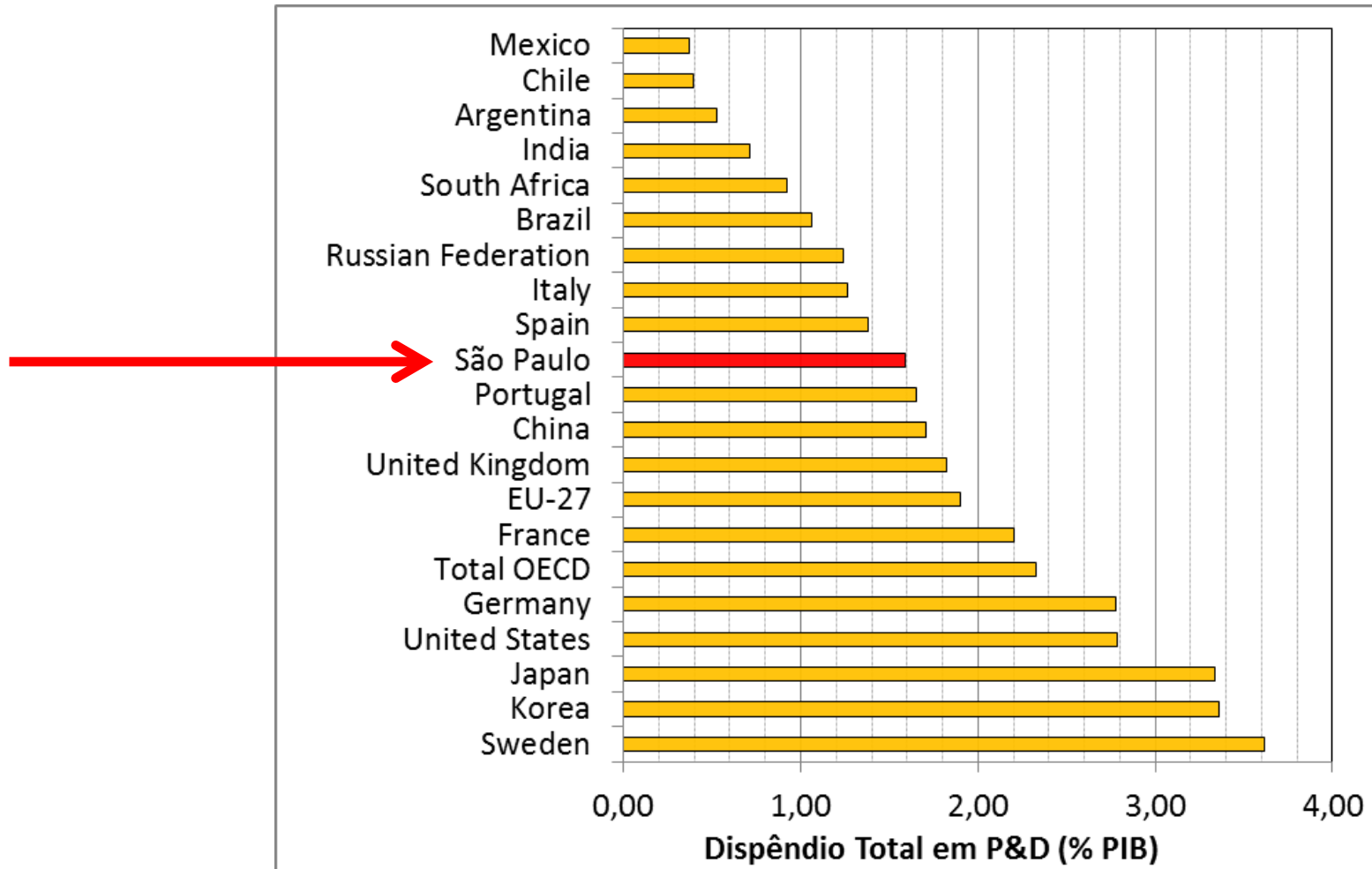
- R&D expenditures total 1.64% of state GDP
  - Grew from 1.52% in 2008
- Public expenditures
  - State 62%
  - Federal 38%

# University-Industry Interaction



# São Paulo R&D Expenditures

## International standing

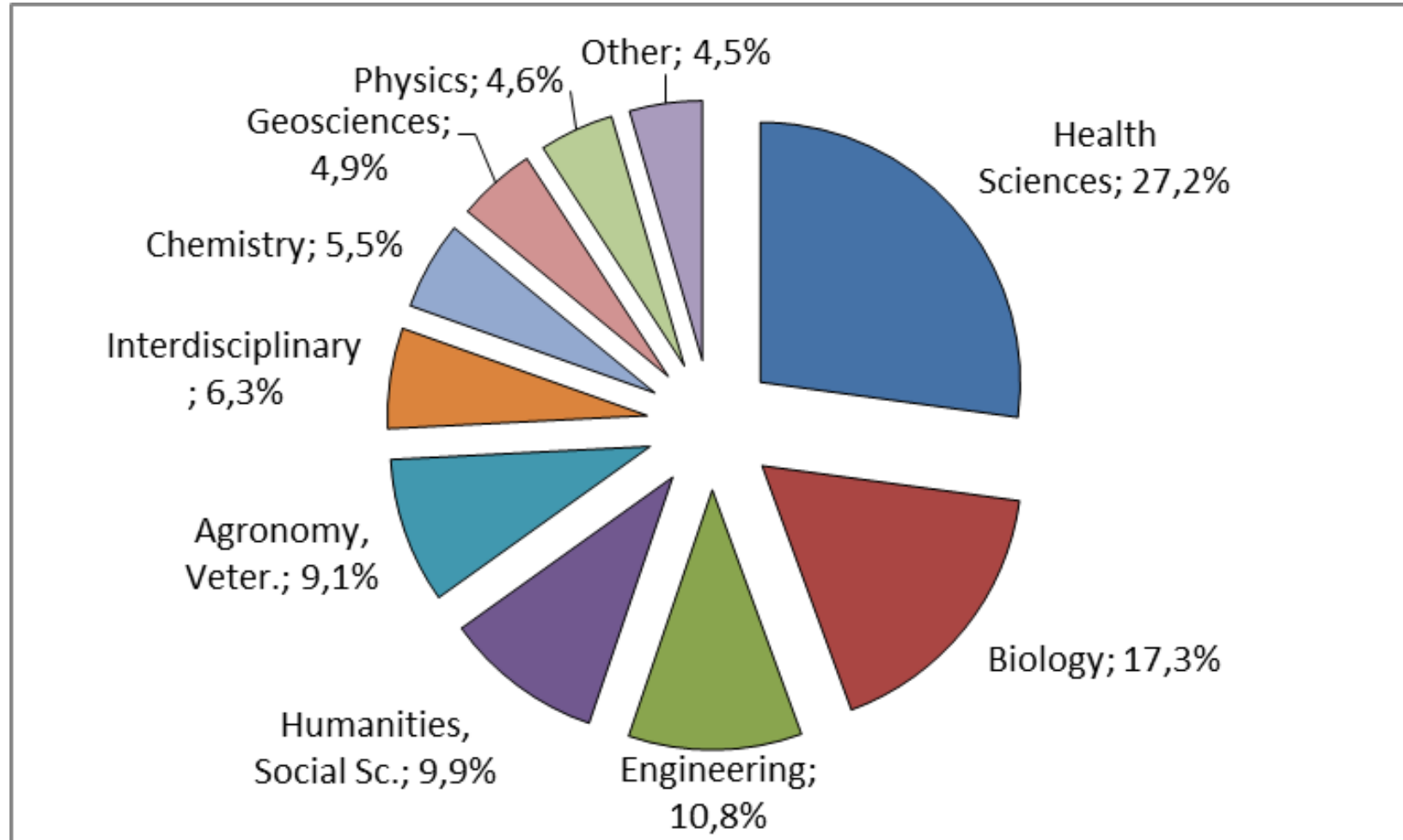


# Fapesp: São Paulo Research Foundation

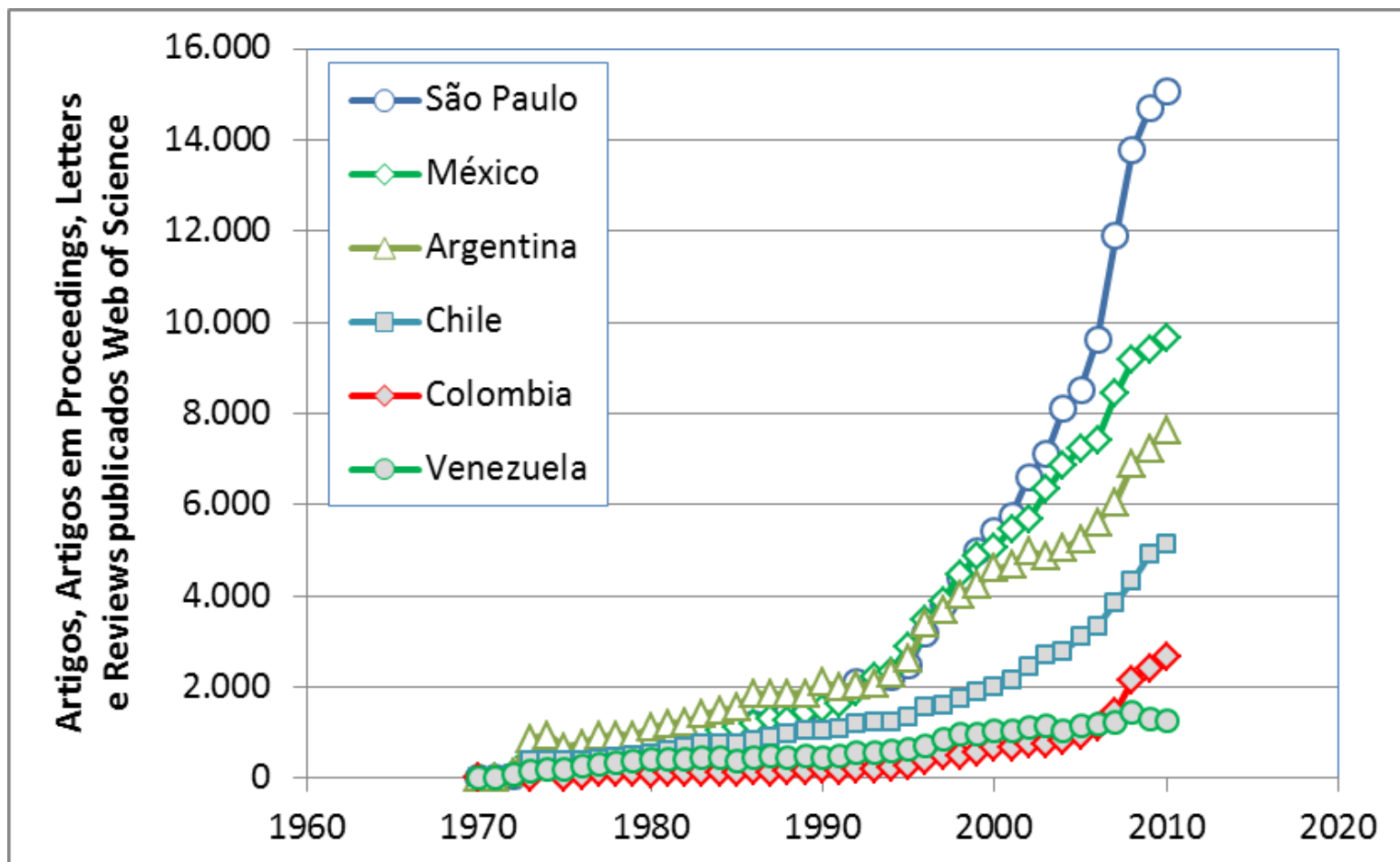
- Mission: support research in all fields
- Funded by the State of São Paulo with 1% of all state revenues
- All proposals are peer reviewed (21,400 proposals in 2012)
  - Average time for decision– 65 days
- Annual budget: \$PPP 600 M in 2012
  - **Fellowships** (3,000 SI, 2,600 MSc, 4,000 DrSc, 1,800 Post-docs, 800 other)
  - **Academic R&D** (RIDC, Thematic, Young Investigators, Regular)
  - **University-Industry Joint R&D:** Microsoft, Agilent, Braskem, Oxitenó, SABESP, VALE, Natura, Petrobrás, Embraer, Padtec, Biolab, Cristalia, Whirlpool, Boeing , GSK, BP, BG, PSA (Peugeot-Citröen), ...
  - **Small bussiness R&D:** 1,200 SBE's (two PIPE+PAPPE awards per week in 2013)

# *FAPESP expenditures, 2011*

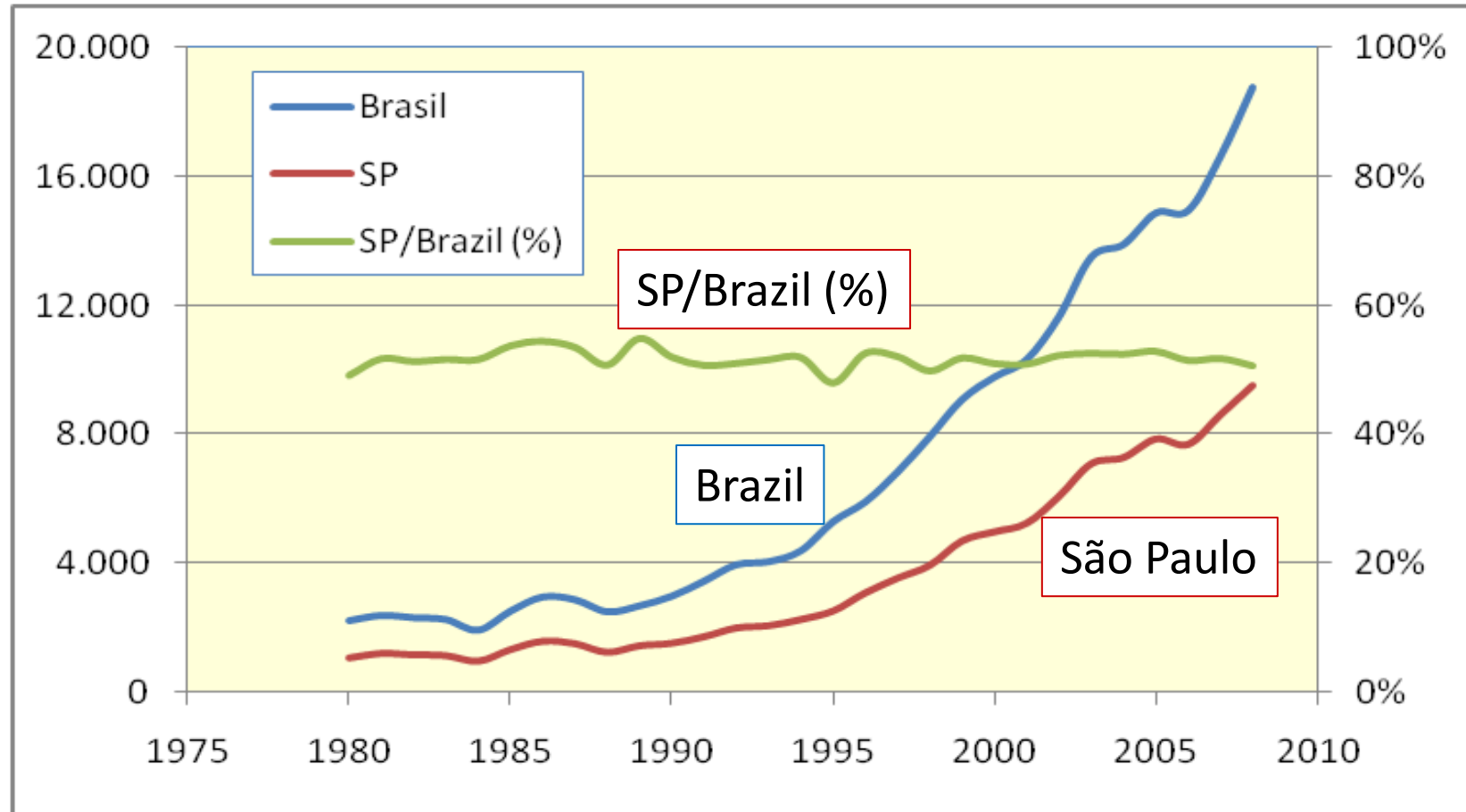
## *Total: R\$ 938 million*



# *São Paulo creates more articles than any country in Latin America*



# Brazil: growing number of scientific articles in international journals



13 July 2008  
**na**  
Citrus pathogen sequenced  
Isotope geology strange sulphates  
Aids: Microbiome responds to critics  
Molecular logic  
Chemistry meets volcanology

Invertebrate Systematics  
Journal of the NITRIC OXIDE Society  
ADINOS Plus RT  
Volume 25 • Issue 6 • 2008

February 15, 2004  
Volume 64  
Number 4  
Pages 1209-1569  
Journal of the NITRIC OXIDE Society

Cancer Research  
PCCP  
Physical Chemistry Chemical Physics

Volume 23, Number 4  
June 2006  
23(4) 1053-1402 (2006)  
ISSN 0954-5741  
PHARMACEUTICAL RESEARCH  
NPR  
Natural Product Reports  
Current developments in natural products chemistry

Journal of the American College of Cardiology  
Zeitschrift für Kristallographie  
NEW CRYSTAL STRUCTURES  
NCS

Journal of the American College of Cardiology  
Zeitschrift für Kristallographie  
NEW CRYSTAL STRUCTURES  
NCS

PHYSICAL REVIEW LETTERS  
NANOTECHNOLOGY  
Volume 15, Number 4, April, 2004

MARINE & FRESHWATER RESEARCH

Analyst  
Interdisciplinary detection science  
Themed Issue on Ambient Mass Spectrometry

PHYSICAL REVIEW LETTERS  
CrystEngComm  
Acta Crystallographica Section E  
Structure Reports Online  
Editors: W. T. A. Harrison, J. Simpson and M. Weil

Analyst  
Interdisciplinary detection science

JOC  
The Journal of Organic Chemistry  
VOLUME 71 NUMBER 12 JUNE 16, 2006

METEORITICS & PLANETARY SCIENCE  
JOURNAL OF MATERIALS

Cell  
Interspecies Fear Signals  
Review  
Myosin VI Struts Its Stuff

JOC  
The Journal of Organic Chemistry  
VOLUME 71 NUMBER 12 NOVEMBER 16, 2006

THE JOURNAL OF PHYSICAL CHEMISTRY C  
Nanomaterials, Interfaces, Hard Matter

PHYSICAL REVIEW LETTERS

JOURNAL OF MATERIALS

JOURNAL OF NANOSCIENCE & NANOTECHNOLOGY  
February 2005

JOC  
The Journal of Organic Chemistry  
VOLUME 71 NUMBER 12 NOVEMBER 16, 2006

ZEITSCHRIFT FÜR KRISTALLOGRAPHIE  
Volume 223 7/2008

PHYSICAL REVIEW LETTERS

Asteroids • Comets • Craters • Interplanetary Dust • Interstellar Medium  
Lunar Samples • Meteors • Meteorites • Natural Satellites • Planets • Tektites  
Origin and History of the Solar System

Now including Journal of Materials Science Letters

Published by the American Chemical Society

Published by the American Physical Society

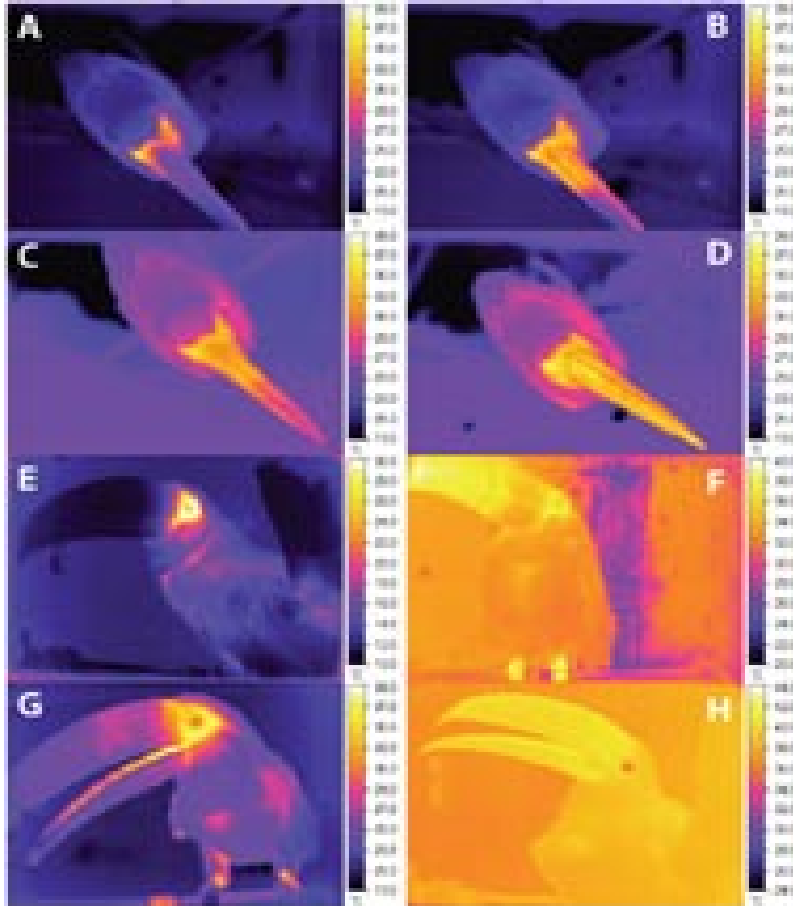
Published by the American Physical Society

Published by the American Physical Society

# FAPESP: Basic Science Focus

- In the World and in Brazil there is in an “utilitarian” view about Science
  - Science that makes business more competitive
  - Science that heals the sick
  - Science that makes the poor rich
- In addition, FAPESP also values a not so “utilitarian” item
  - Science that makes mankind wiser
    - In all fields there are fundamental questions
      - Philosophy, Archeology, Literature, Linguistics, High Energy Physics, Cosmic Rays, Astronomy, Evolution,..

# BIOTA: Science, July 2009



Heat Exchange from the Toucan Bill Reveals a Controllable Vascular Thermal Radiator  
Glenn J. Tattersall, *et al.*  
*Science* 325, 468 (2009);  
DOI: 10.1126/science.1175553

## REPORTS

### Heat Exchange from the Toucan Bill Reveals a Controllable Vascular Thermal Radiator

Glenn J. Tattersall,<sup>1,3</sup> Denis V. Andrade,<sup>2,3</sup> Augusto S. Abe<sup>2,3</sup>

The toco toucan (*Ramphastos toco*), the largest member of the toucan family, possesses the largest beak relative to body size of all birds. This exaggerated feature has received various interpretations, from serving as a sexual ornament to being a refined adaptation for feeding. However, it is also a significant surface area for heat exchange. Here we show the remarkable capacity of the toco toucan to regulate heat distribution by modifying blood flow, using the bill as a transient thermal radiator. Our results indicate that the toucan's bill is, relative to its size, one of the largest thermal windows in the animal kingdom, rivaling elephants' ears in its ability to radiate body heat.

# SP Environment Secretary bases Resolution on BIOTA research



SECRETARIA DE ESTADO DO MEIO AMBIENTE

GABINETE DO SECRETÁRIO

PUBLICADA EM 14/03/88 – SEÇÃO I – PÁG.36

RESOLUÇÃO SMA-15 DE 13 DE MARÇO DE 2008.

Dispõe sobre os critérios e parâmetros para concessão de autorização para supressão de vegetação nativa considerando as áreas prioritárias para incremento da conectividade.

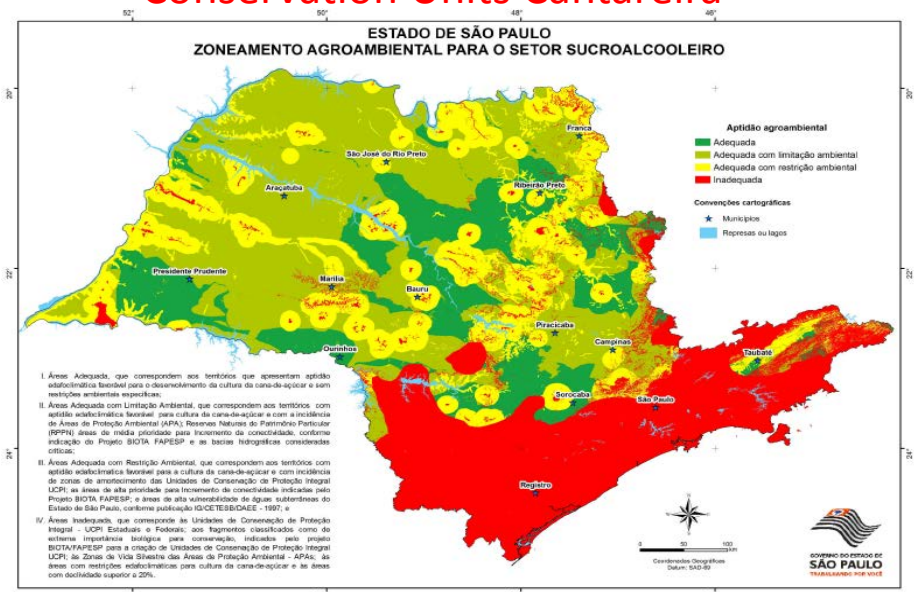
O SECRETÁRIO DE ESTADO DO MEIO AMBIENTE, em cumprimento ao disposto nos artigos 23, VII, e 225, § 1º, I, da Constituição Federal, nos artigos 191 e 193 da Constituição do Estado, nos artigos 2º e 4º da Lei federal nº 6.938, de 31 de agosto de 1981, e nos artigos 2º, 4º e 7º da Lei estadual nº 9.509, de 20 de março de 1997, e

Considerando os resultados obtidos pela equipe de pesquisadores do Projeto Biota FAPESP e as informações presentes no mapa de "Áreas prioritárias para incremento da conectividade" e "Áreas prioritárias para criação de Unidades de Conservação" resultantes do Projeto Biota FAPESP;

- Several Governor Decrees and Resolutions

- Decree 53.939, 06Jan09 – Legal Reserves

- Decree 54.746, 04Sep09 – Conservation Units Cantareira



# Political Science



The City University of New York

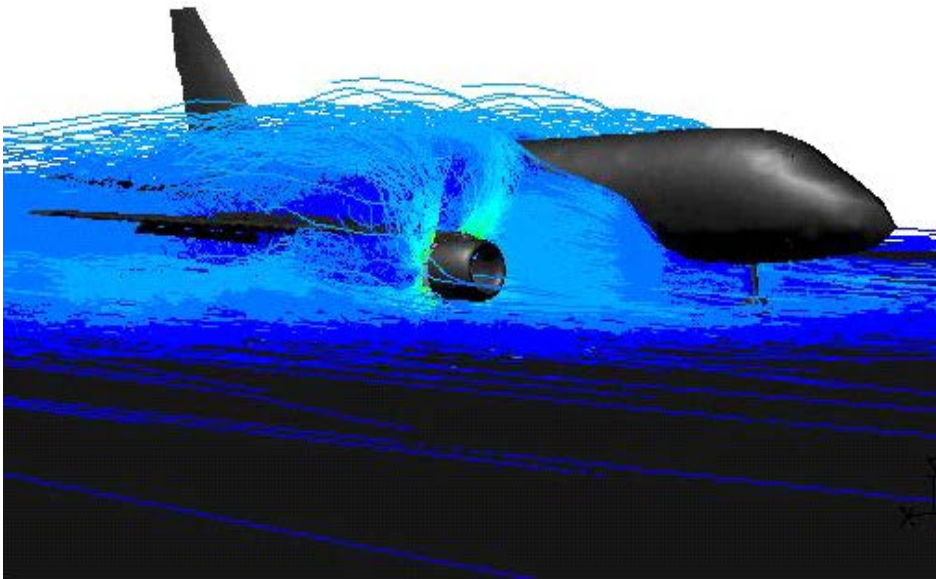
## Presidential Power, Legislative Organization, and Party Behavior in Brazil

*Argelina Cheibub Figueiredo and Fernando Limongi*

Presidential regimes are considered to be prone to produce institutional deadlocks. In the generally shared view, influenced by the work of Juan Linz, presidentialism lacks a built-in mechanism to induce cooperation between the executive and legislative branches of the government.<sup>1</sup> Representatives and the president have different constituencies, and their mandates are independent and fixed. Hence the chances that the legislative and the executive powers will have the same agenda are small.

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

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



# FAPESP's BIOEN research program: 84 → 148 → 212 → 381 ton/Ha??

## Review article

# Sugarcane for bioenergy production: an assessment of yield and regulation of sucrose content

Alessandro J. Waclawovsky<sup>1,†,‡</sup>, Paloma M. Sato<sup>1,‡</sup>, Carolina G. Lembke<sup>1</sup>, Paul H. Moore<sup>2</sup> and Glauca M. Souza<sup>1,\*</sup>

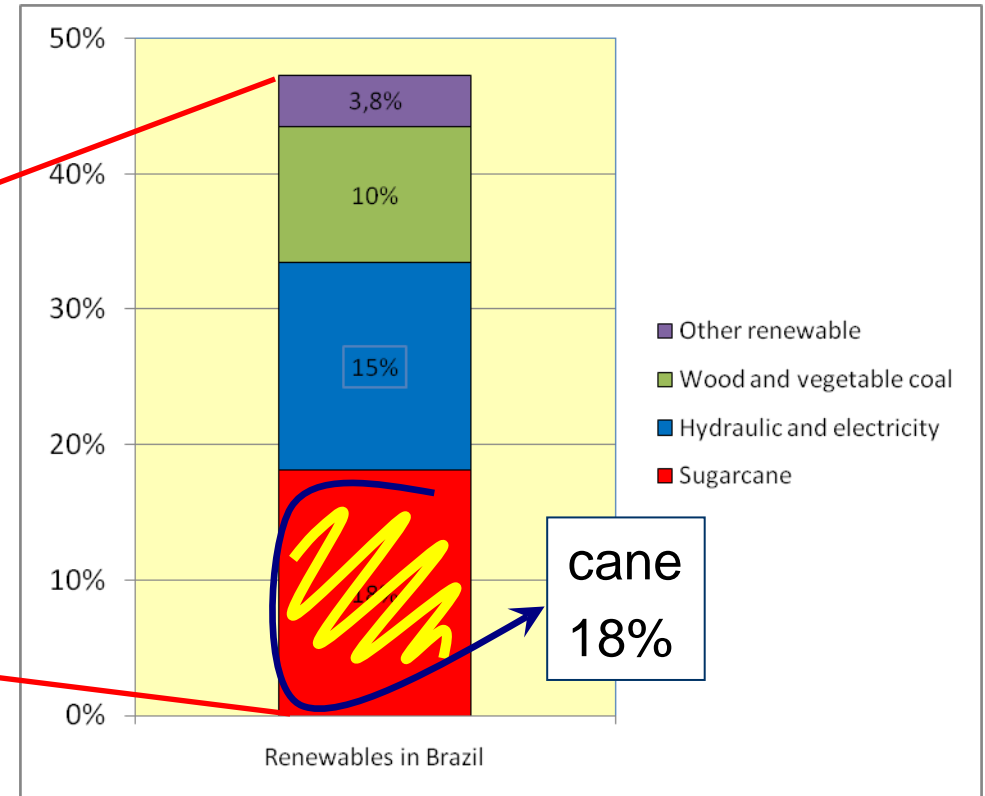
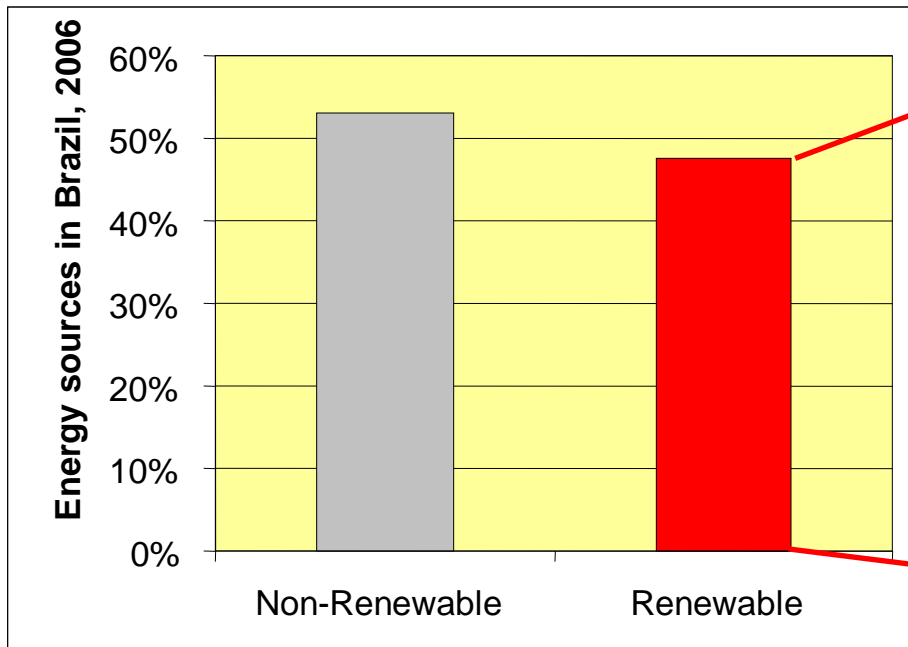
<sup>1</sup>Departamento de Bioquímica, Instituto de Química, Av. Prof. Lineu Prestes, São Paulo, Brazil

<sup>2</sup>Hawaii Agriculture Research Center, Kunia, HI, USA

**Table 1** Average, maximum and theoretical sugarcane yields (Australia, Colombia, and South Africa) and total dry matter production

Type of yield	Cane yield	Biomass*	
	t/(ha yr)	t/(ha yr)	g/(m <sup>2</sup> d)
Commercial Average	84	39	10.7
Commercial maximum	148	69	18.8
Experimental maximum	212	98	27.0
Theoretical maximum	381	177	48.5

# Brazil: 47% of energy from renewable sources (2009); 18% from sugarcane



Renewables in Brazil: 47%; World: 13%; OECD: 7,2%

# *FAPESP: international agreements for joint research funding*

- Agreements with foreign funding agencies, universities and companies

UK: RCUK; KCL; Surrey; Southampton; Nottingham, Manchester, Keele, IoE/UoL; Bangor, Birmingham, Bath, East Anglia, York, Edinburgh, Cambridge; BG, GSK, BP  
Ge: DFG  
Fr: ANR; CNRS; INSERM; INRIA; INRA  
Ca: ISTEP; NSERC; U. Toronto; U. Western Ontario, McMaster, CALDO  
EU: CNPq (Bioenergy)

Is: Hebrew Univ. Jerusalem ; MATIMOP  
Ar: CONICET; Cl: CONICYT  
U.S.: NSF – CNIC and ICC; Microsoft Research; Boeing; Agilent Technologies  
MIT, USC, U Michigan, UC Davis  
Portugal: FCT  
Fi: AKA / De: DCSR  
Spain: Salamanca, CSIC

- 303 joint proposals supported, 2005-2010
  - U.S 115; France 87; Germany 41; U.K. 27; Argentina 11; Canada 8; Portugal 8

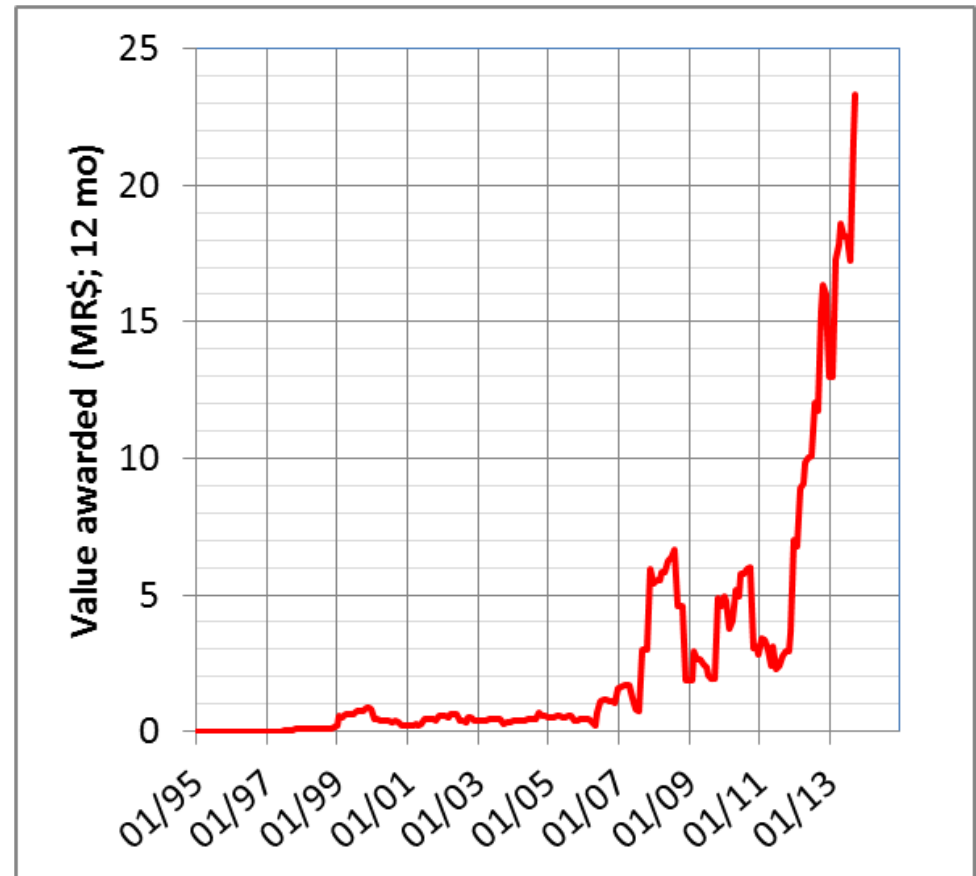
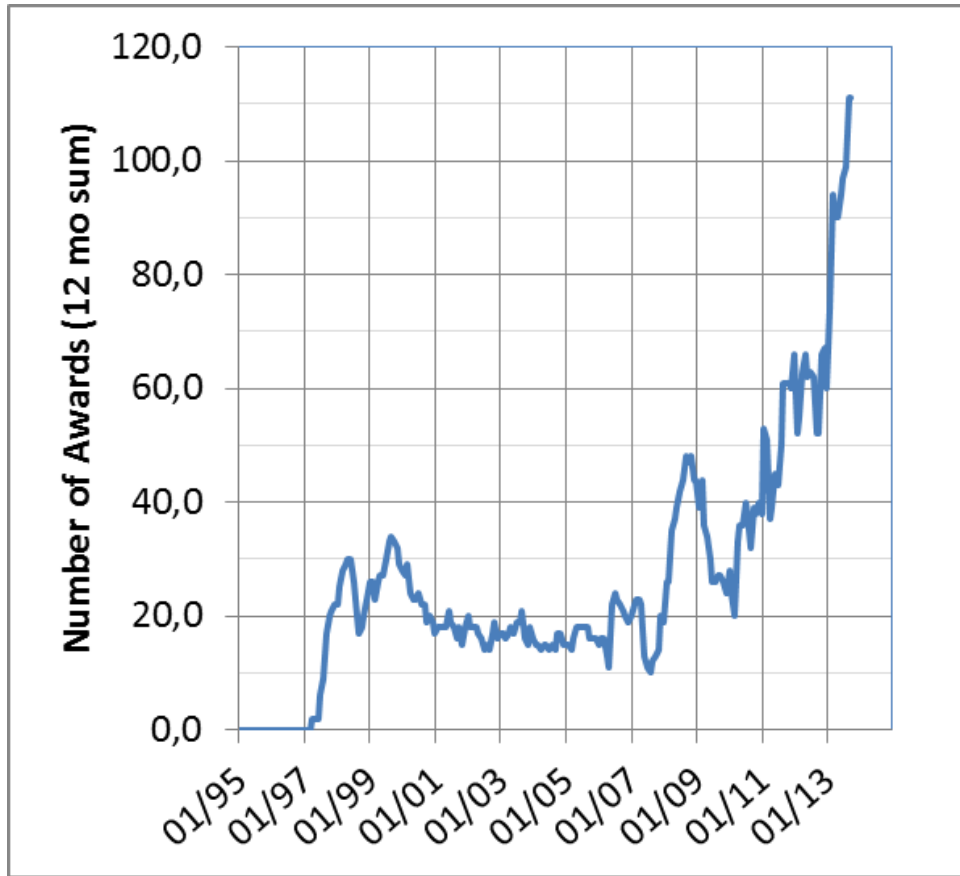
# ***FAPESP international collaboration: bringing foreign scientists to SP***

- 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 young Dr 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

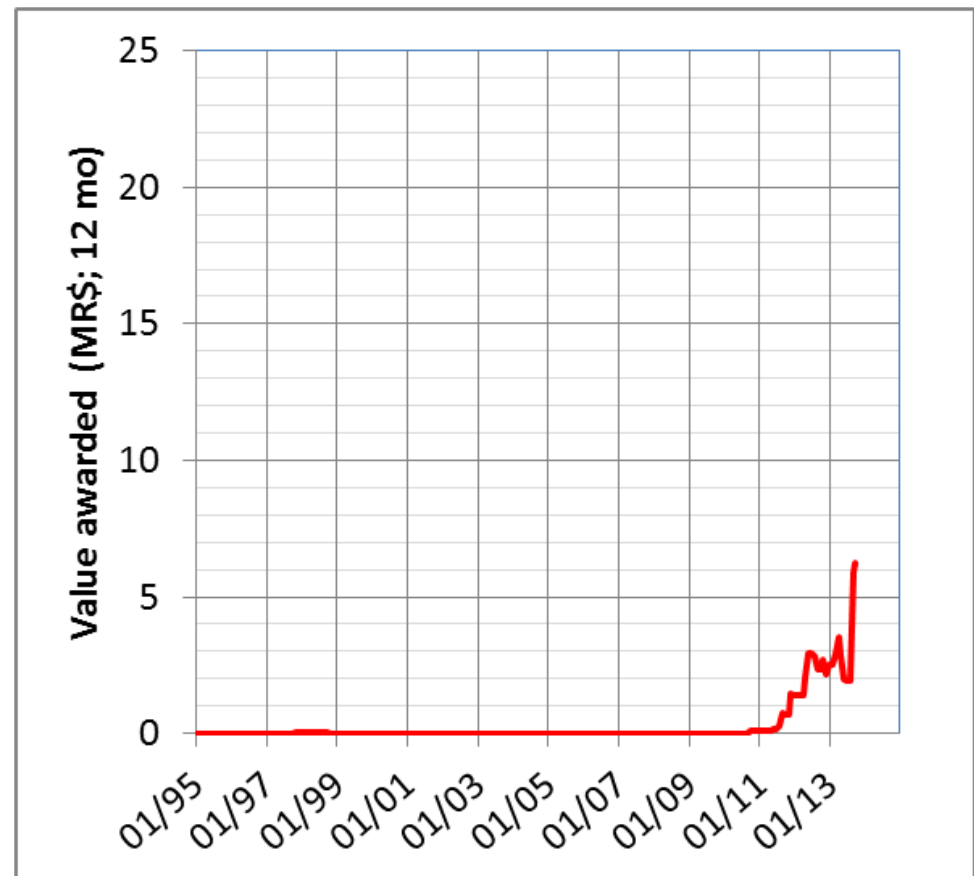
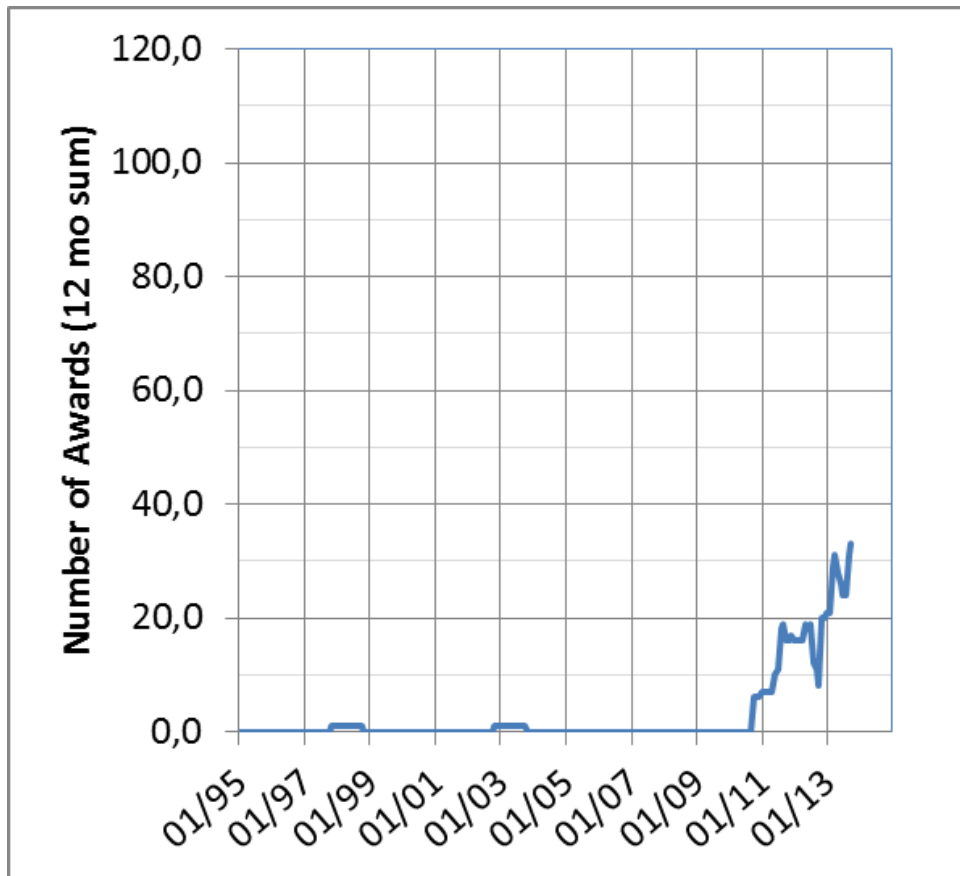
# ***FAPESP international collaboration: sending scientists from SP abroad***

- 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

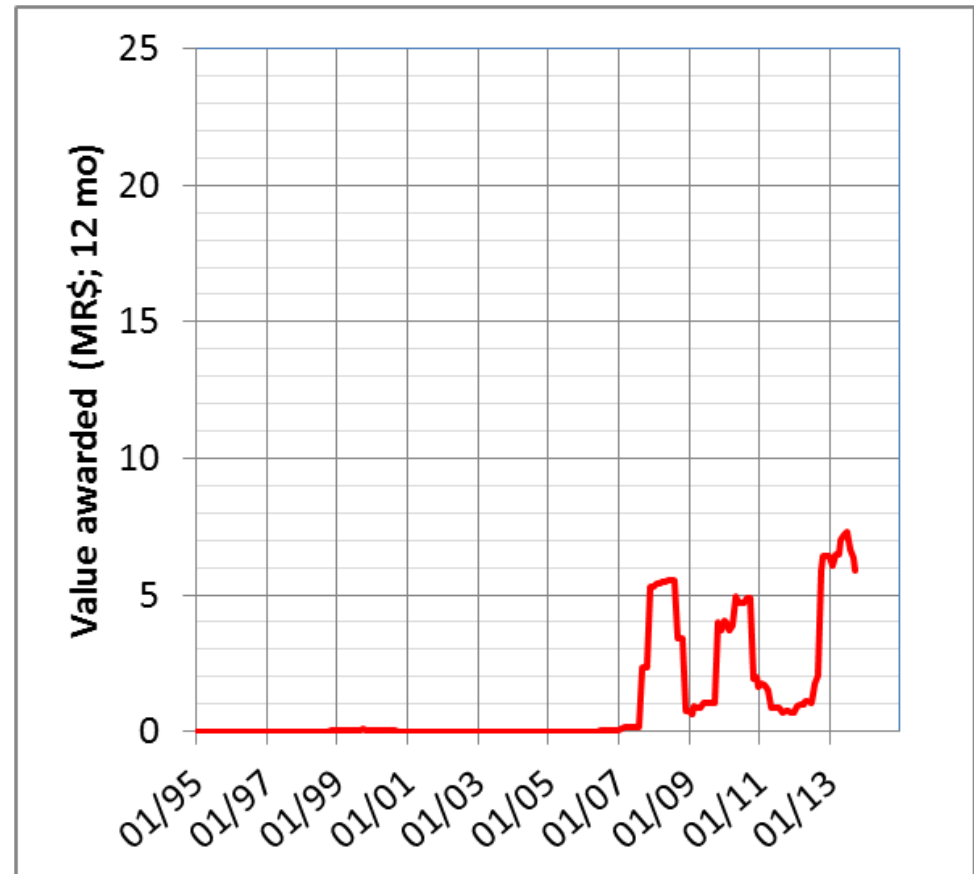
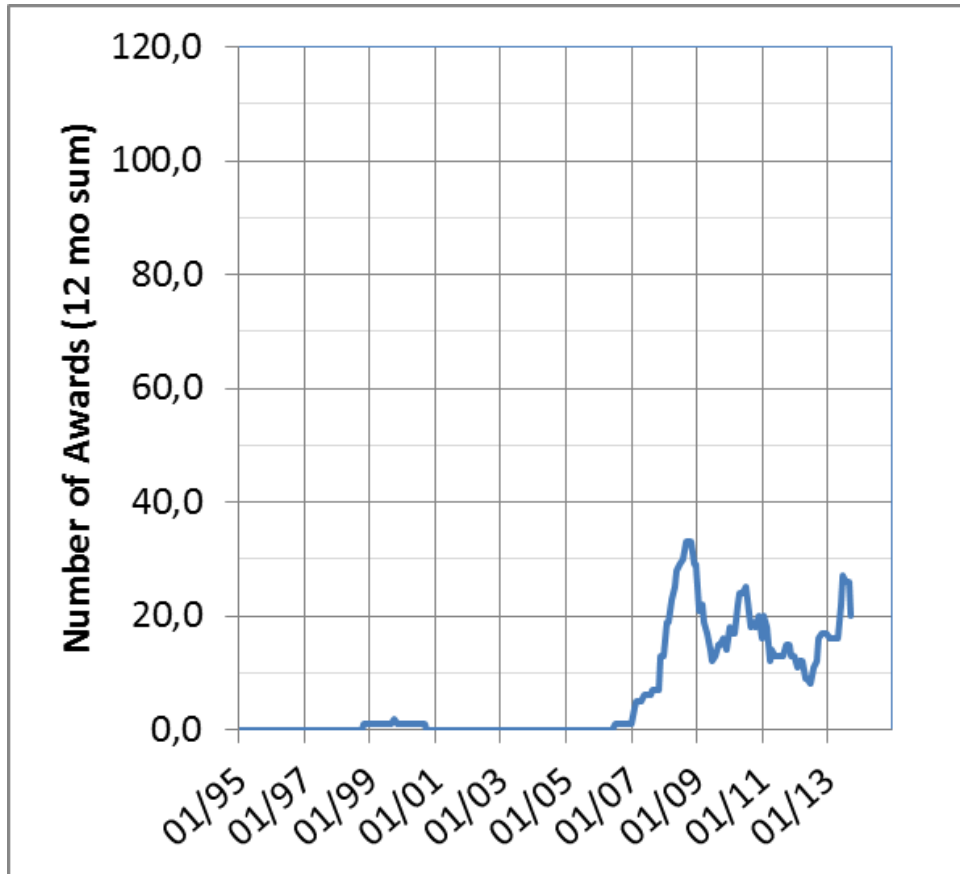
# *International cooperation: number of awards and value (12 mo. running sum)*



# FAPESP-UK cooperation: number of awards and value (12 mo. running sum)



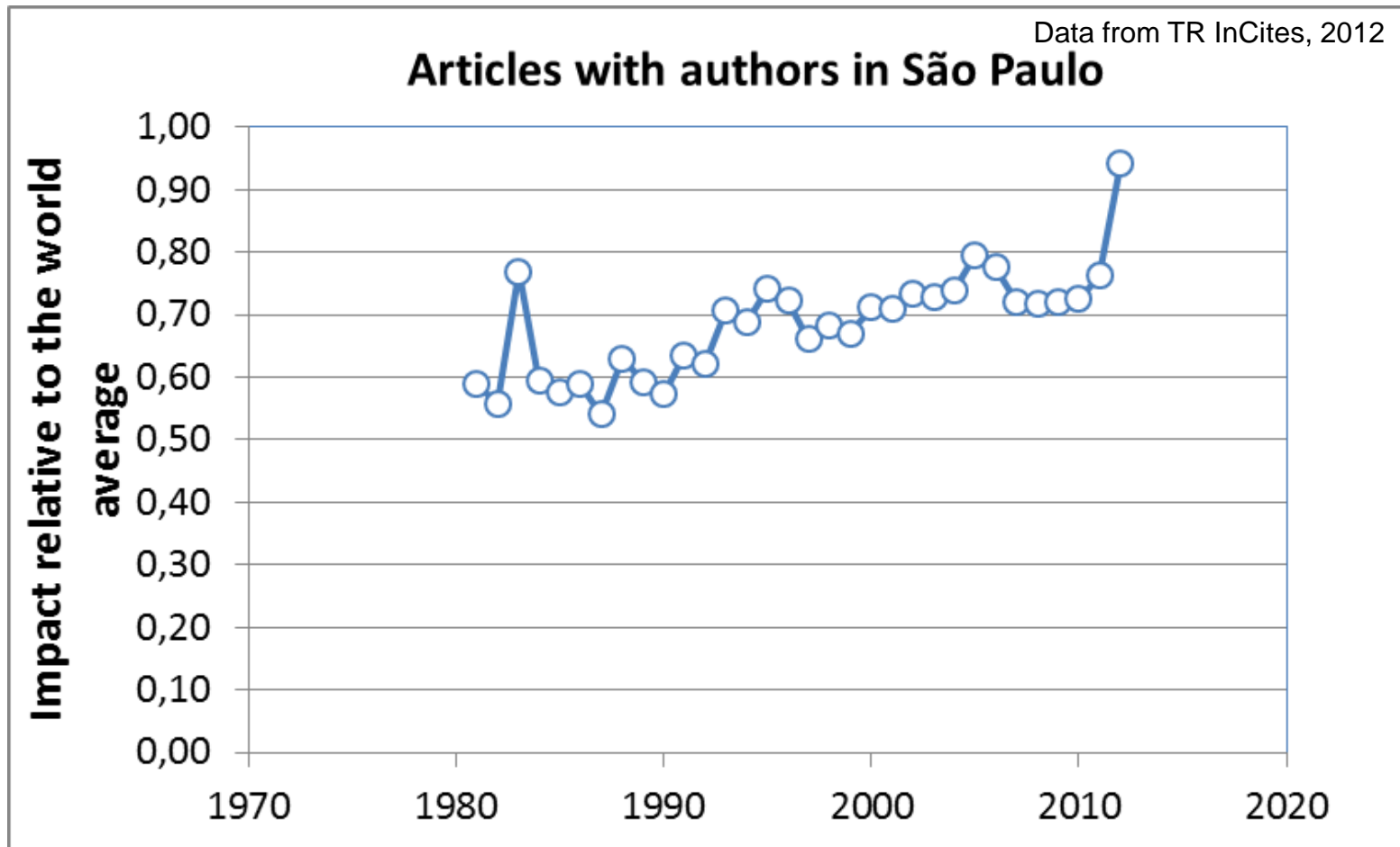
# FAPESP-U.S. cooperation: number of awards and value (12 mo. running sum)



# *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

# Increase in the number of citations per article



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

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

The screenshot displays the website for the Agência FAPESP, the News Agency of the São Paulo Research Foundation. The page is in English, as indicated by the language selector in the top right corner. The main navigation bar includes links for 'Articles', 'About', 'Contact us', 'RSS', and 'Unsubscribe'. A search bar is located on the right side of the page. The content area features three main articles:

- U.S. scientists evaluate FAPESP Week**: Opportunities to learn about cutting edge research in Brazil and conduct partnerships with scientists in the country were highlighted by participants in the Washington symposium.
- FAPESP and GSK in partnership against tropical diseases**: FAPESP and Glaxo SmithKline Brasil signed a letter of intent for joint investment to support research on tropical diseases in São Paulo State.
- FAPESP evaluates impact of programs**: Three FAPESP programs – Fellowships, BIOTA and Multiuser Equipment (EMU) – will be evaluated in a study conducted by the Foundation's Scientific Department with the support of the Study Group on Organization of Research and Innovation (CEOPR).

The website also includes a 'FOLLOW AGENCY FAPESP' section with links to the Newsletter, Facebook, and Twitter. The bottom of the page shows the URL <http://agencia.fapesp.br/en/14774> and a 100% zoom level.