

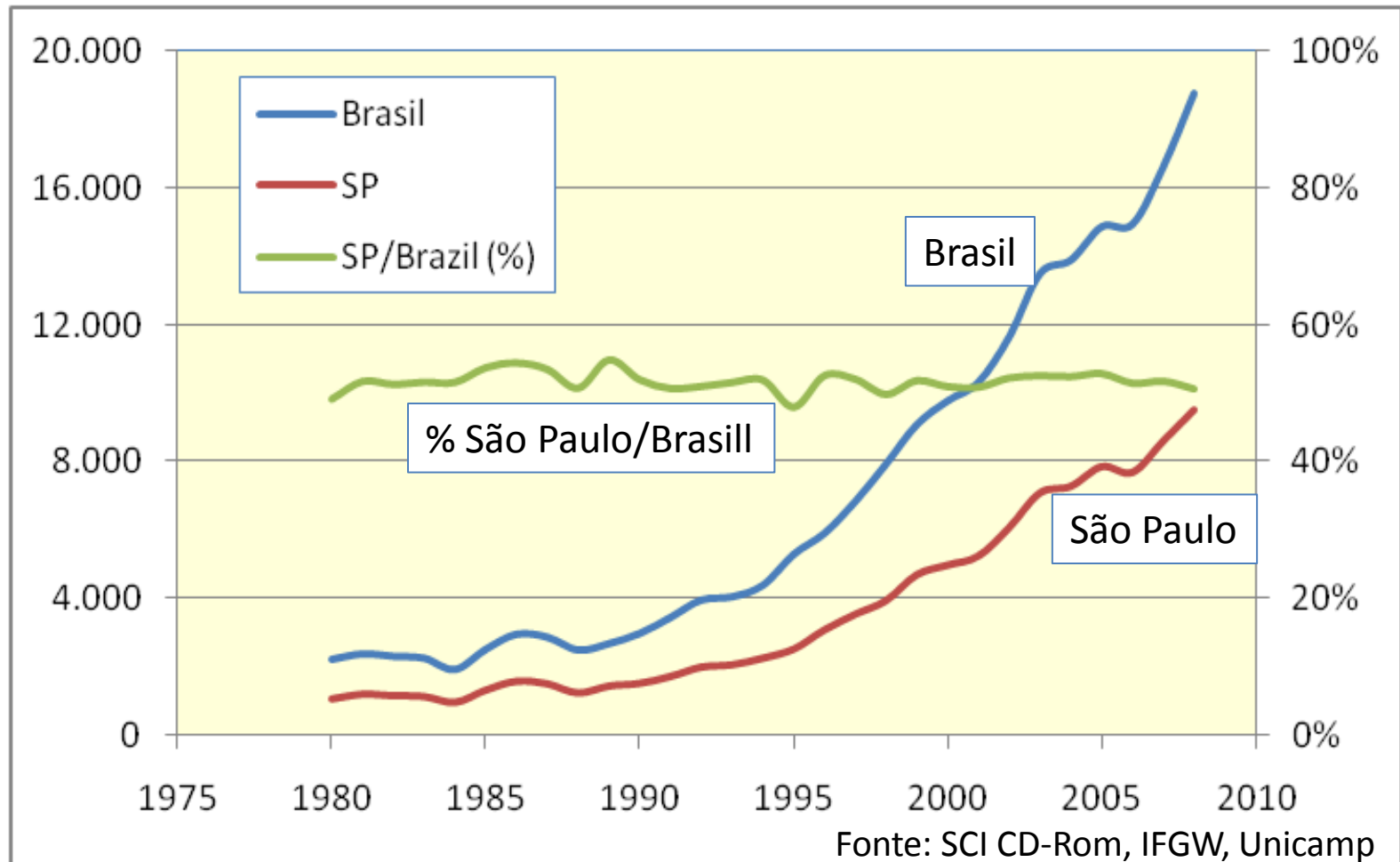
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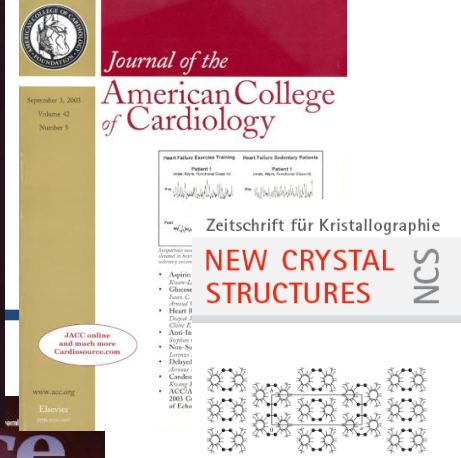
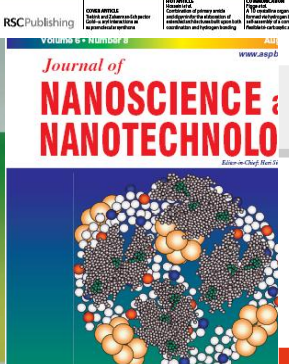
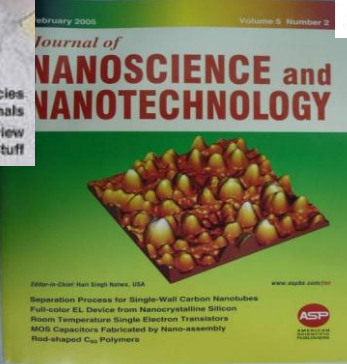
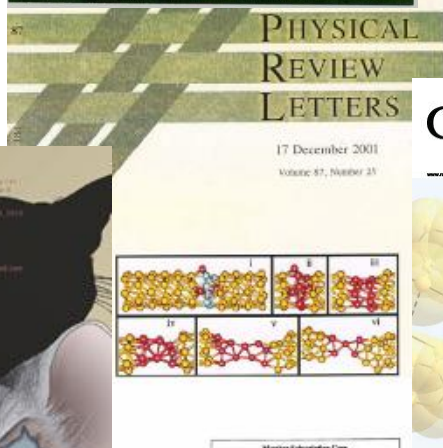
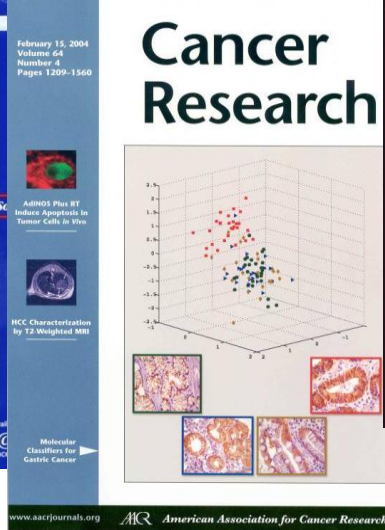
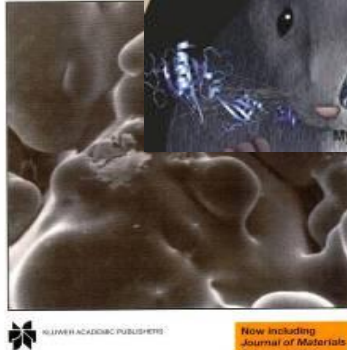
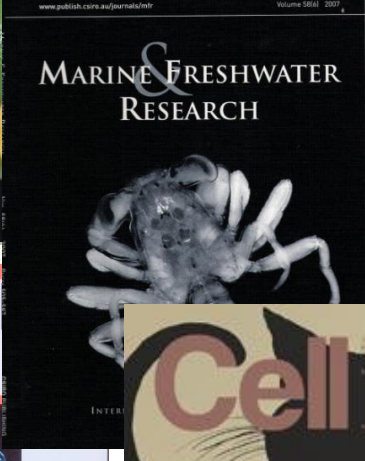
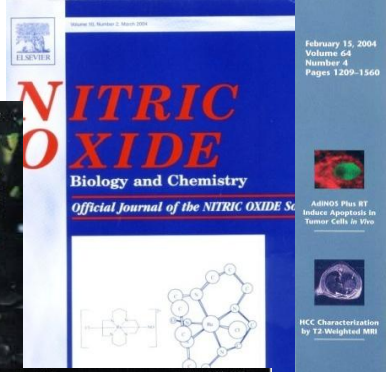
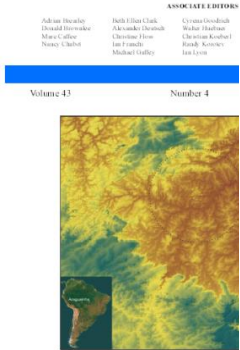
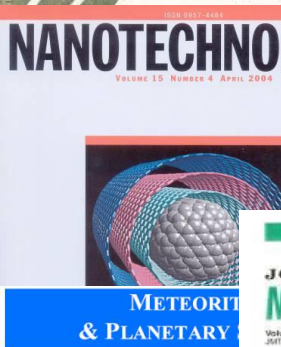
# ***Ciência Fundamental: desafios para a competitividade acadêmica***

Carlos Henrique de Brito Cruz  
Diretor Científico, FAPESP

# Pesquisa Acadêmica

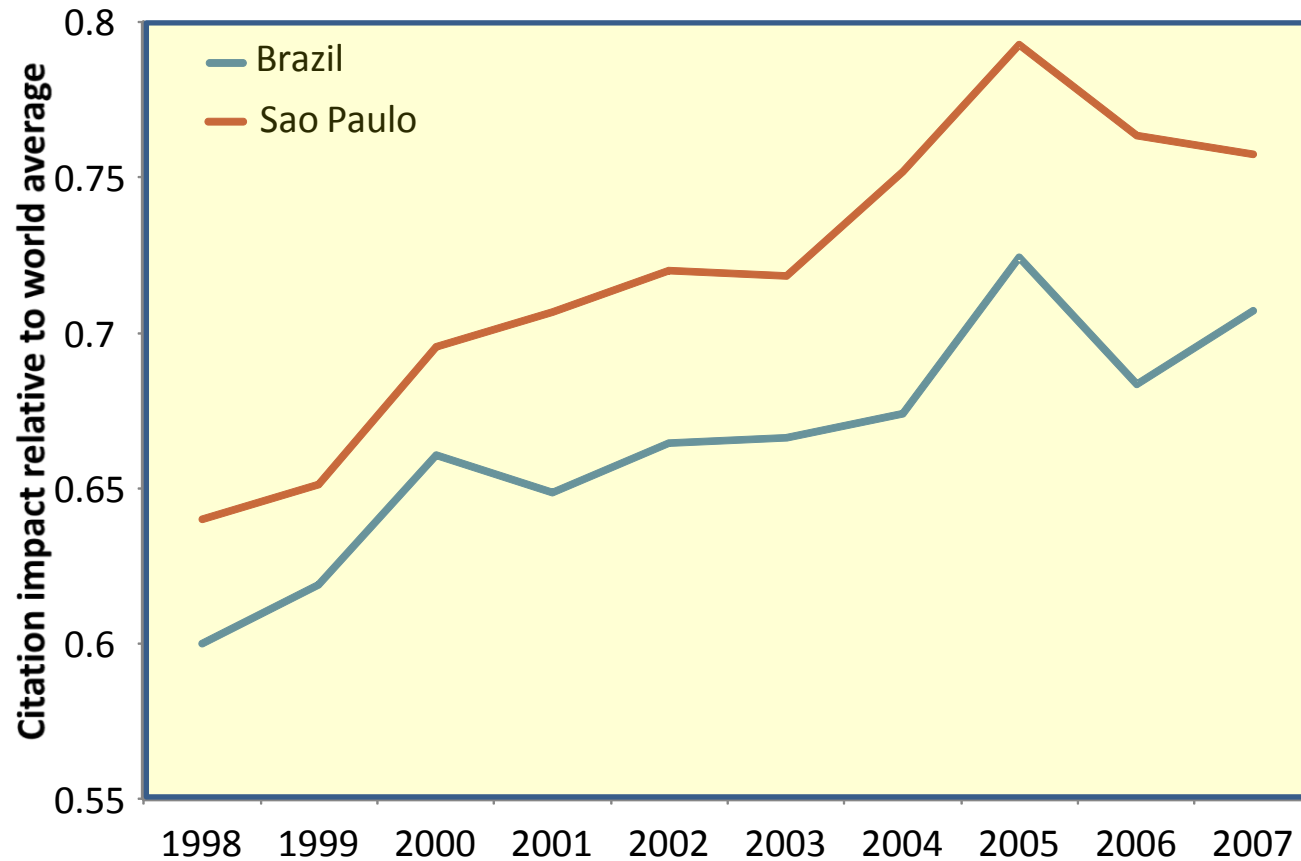
## Artigos Científicos





http://201.200.20.100/~chbritocruz

# *Impacto crescente mas abaixo da média mundial*



# *Ciência Fundamental*

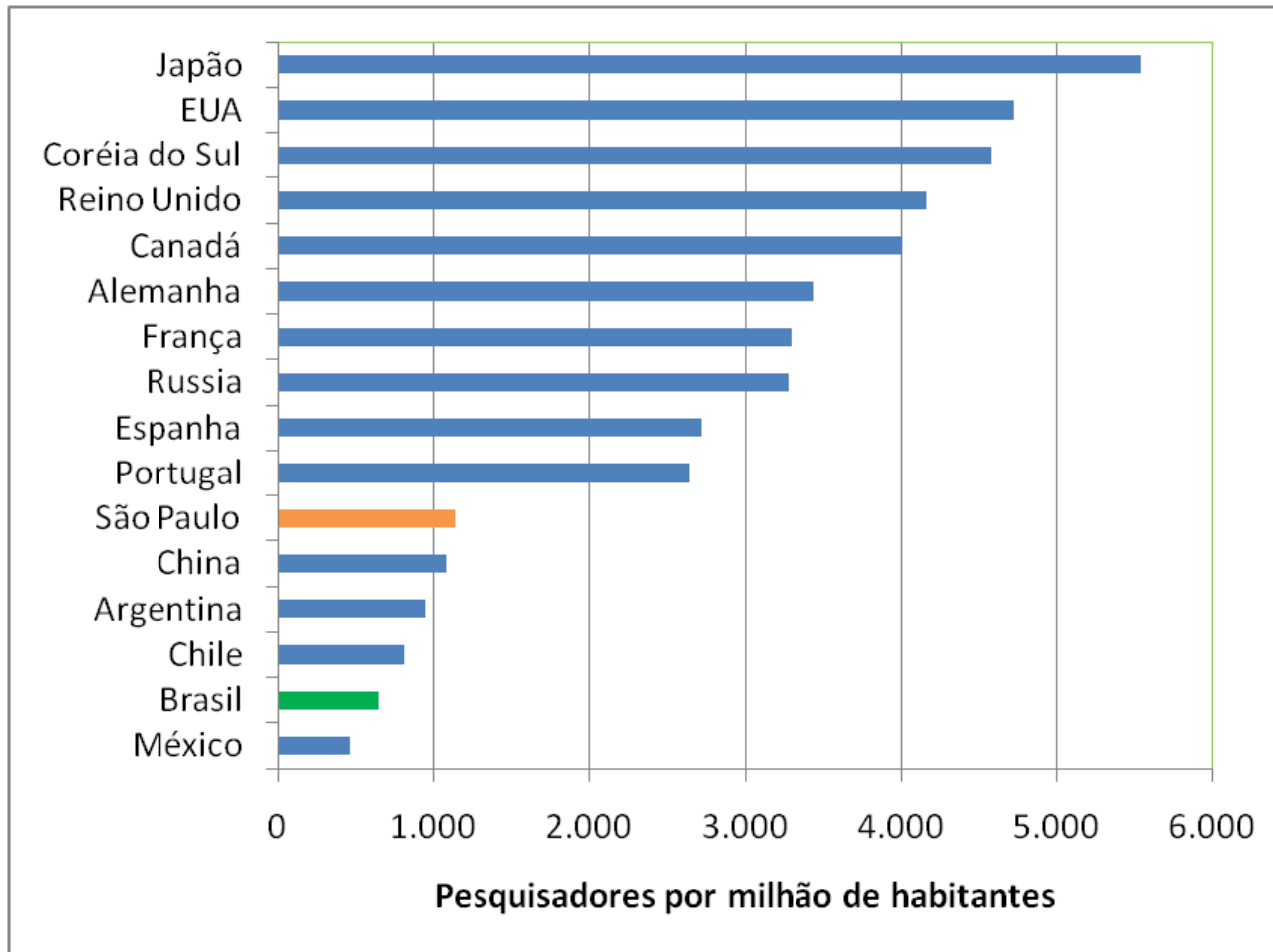
## *Desafios*

- Pesquisadores
- Apoio
  - Valorização
  - Forma de apoio pelas agências
  - Apoio institucional
    - Conferencia Paulista
  - Apoio a instituições excelentes
- Presença internacional
  - Vinda de visitantes, post-docs e estudantes
  - Ida de estudantes de pg por curto período

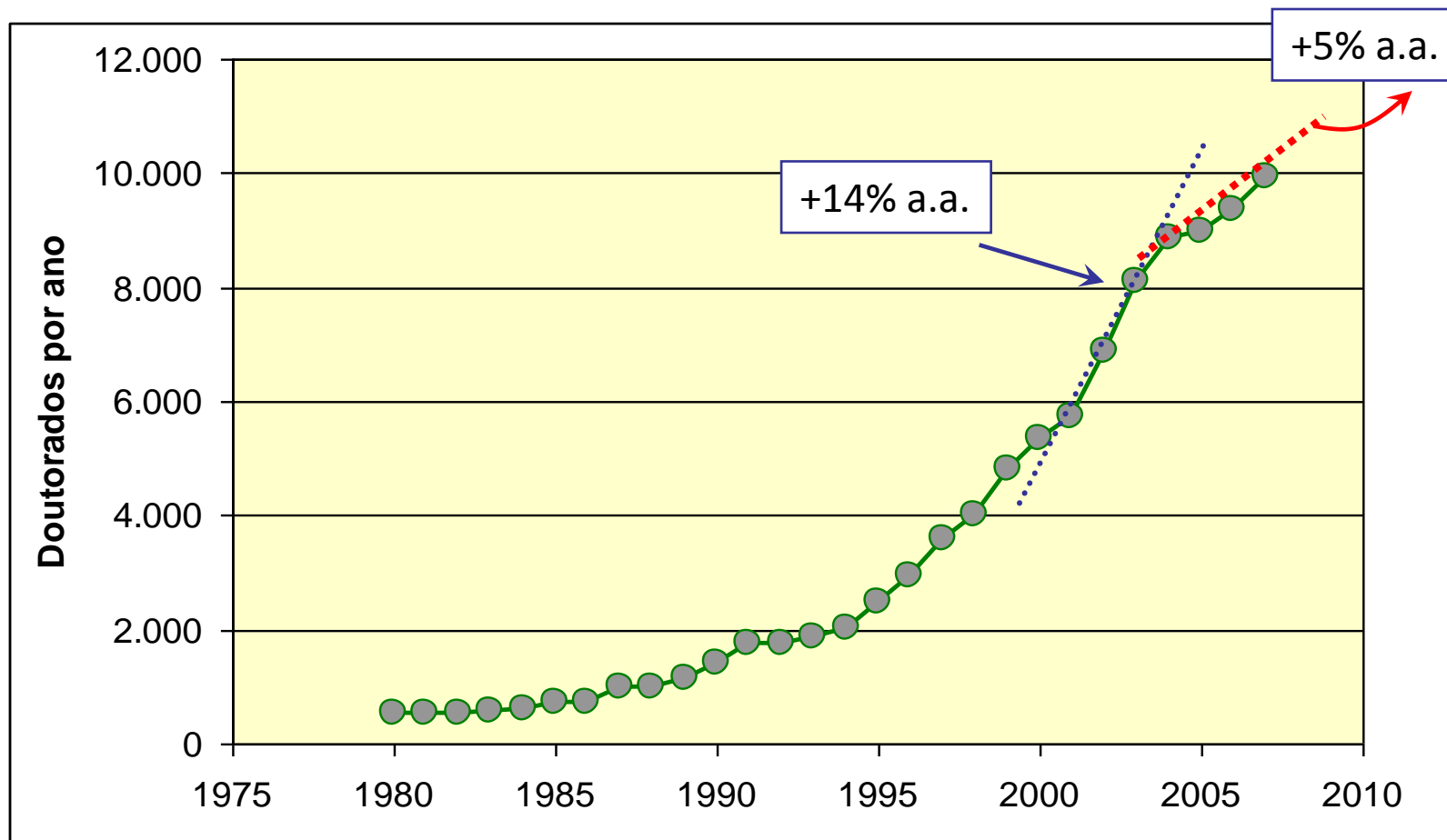
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# ***1) PESQUISADORES***

# Quantidade de pesquisadores por milhão de habitantes

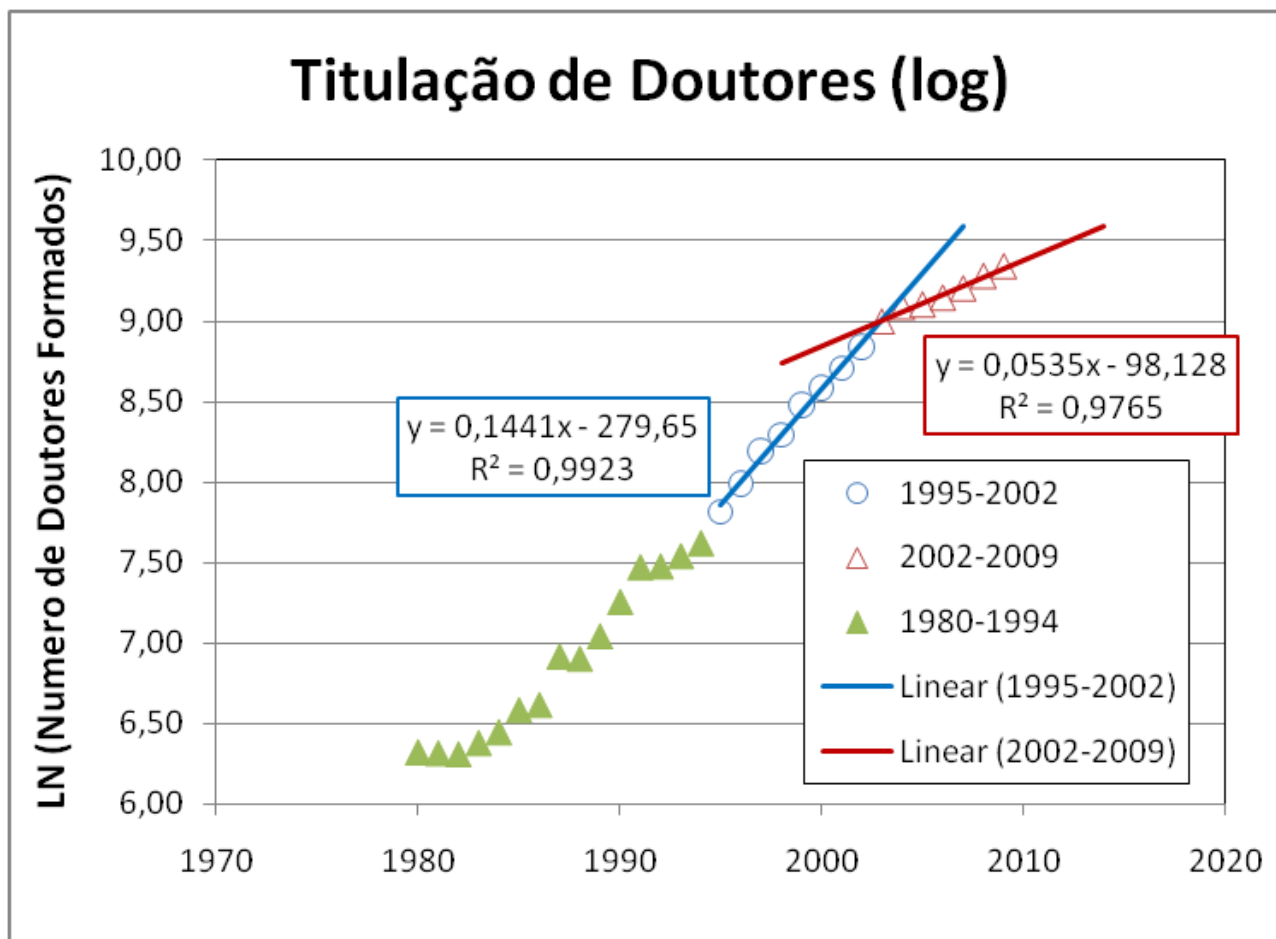


# Brasil: Arrefecimento na formação de Doutores

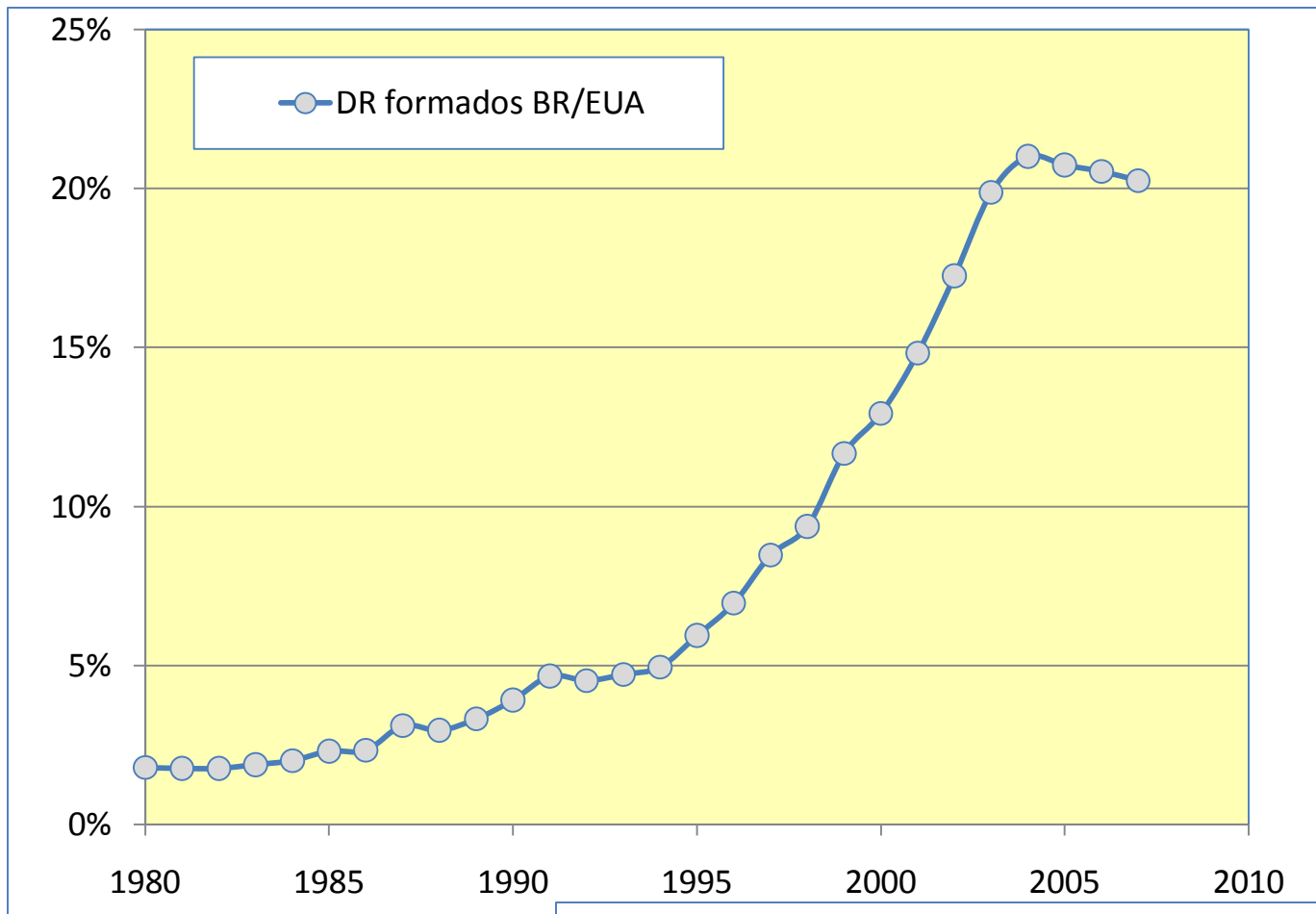




***De 1995 a 2002: + 14% por ano***  
***De 2003 a 2009: +5% por ano***



# *Doutores formados: Brasil parou de crescer em relação aos EUA*



Viotti, E. e Baessa, A., "Características do Emprego dos Doutores Brasileiros", CGEE 2008)

# *Questões qualitativas na PG*

---

- Qualidade das Teses
  - Exposição nacional e internacional
  - Publicações associadas
- Domínio de língua estrangeira
- Tendência à redução de standards
  - Exames de qualificação
  - Seleção dos candidatos

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## ***2) APOIO À CIÊNCIA FUNDAMENTAL***

# *Apoio para a Ciência Fundamental*

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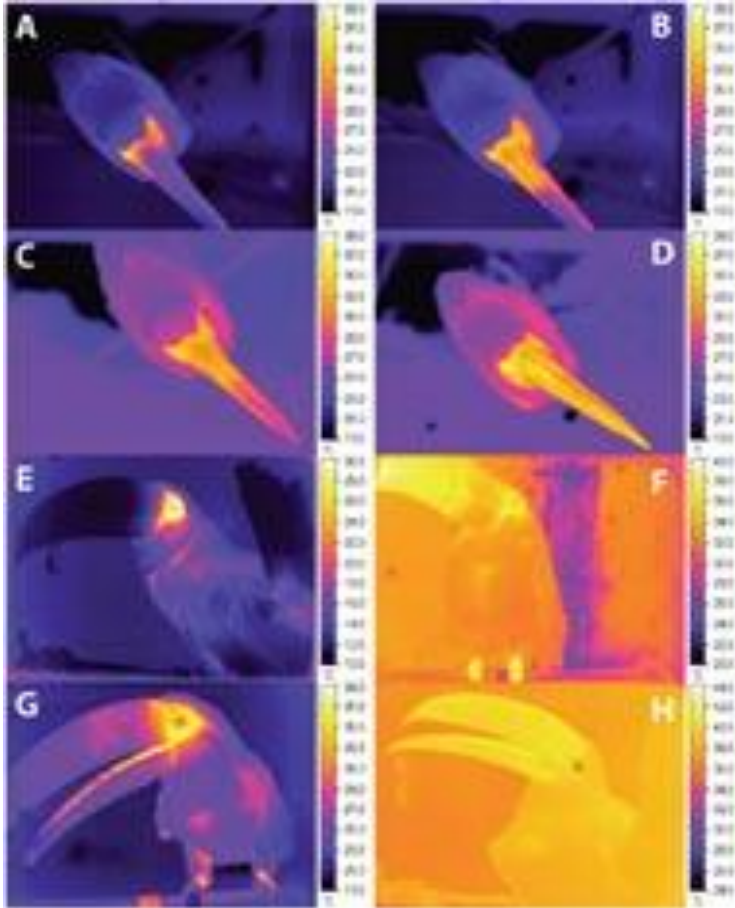
- Valorização
- Forma de apoio pelas agências
- Apoio institucional
  - Conferencia Paulista
- Apoio a instituições excelentes
- Internacionalização
  - Vinda de visitantes, post-docs e estudantes
  - Ida de estudantes de pg por curto período
  - Publicação internacional de livros

# *Valorização da Ciência Fundamental*

---

- Momento utilitarista (Brasil e Mundo)
  - Ciência que faz a empresa competitiva
  - Ciência que faz o doente são
  - Ciência que faz o pobre menos pobre
  - Ciência que faz a humanidade mais sábia
    - Existe em todas as áreas
    - Perguntas fundamentais
    - Filosofia, Arqueologia, Literatura, Física de Altas Energias, Artes, Astronomia, Biologia,..

# Biodiversity and Evolution: 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.

# BIOTA: Science – Perspectives, April 6, 2009



## PERSPECTIVES

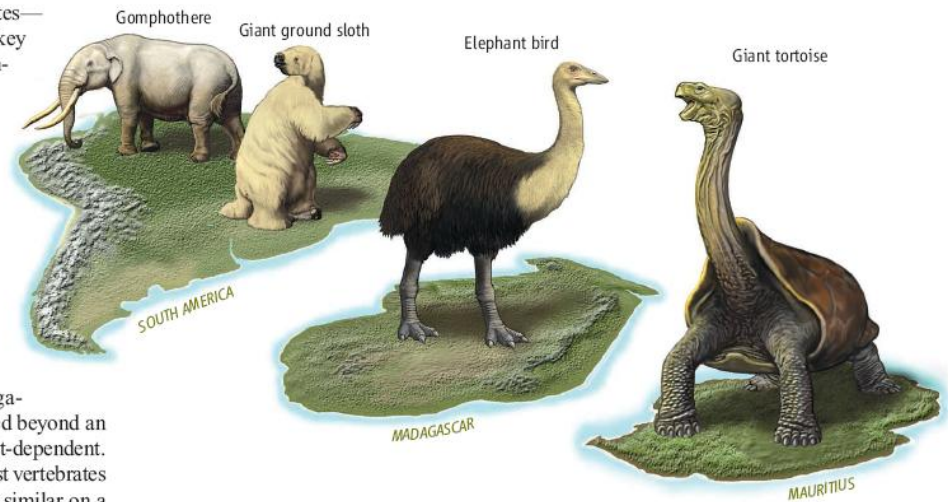
ECOLOGY

### The Forgotten Megafauna

Dennis M. Hansen<sup>1</sup> and Mauro Galetti<sup>1,2</sup>

Large terrestrial vertebrates—called megafauna—play key roles in ecosystem dynamics by feeding on plants and by maintaining habitat heterogeneity (1). A global wave of megafauna extinctions occurred 50,000 to 10,000 years ago, when many large continental mammals were lost (2–5). Classical definitions of megafauna are based on such continental mammals and are variously given as animals larger than 44 kg (6) or above 1000 kg (7). Here, we argue that the megafauna concept should be extended beyond an absolute animal size to be context-dependent. In any given ecosystem, the largest vertebrates have ecosystem impacts that are similar on a relative scale to those of the largest vertebrates in another ecosystem: One ecosystem's mesofauna is another ecosystem's megafauna.

An ecosystem function that clearly illustrates this argument is animal-mediated seed dispersal. Here, the link between animal body



An expanded megafauna concept elucidates how extinctions of the largest vertebrates in any ecosystem have similar effects.

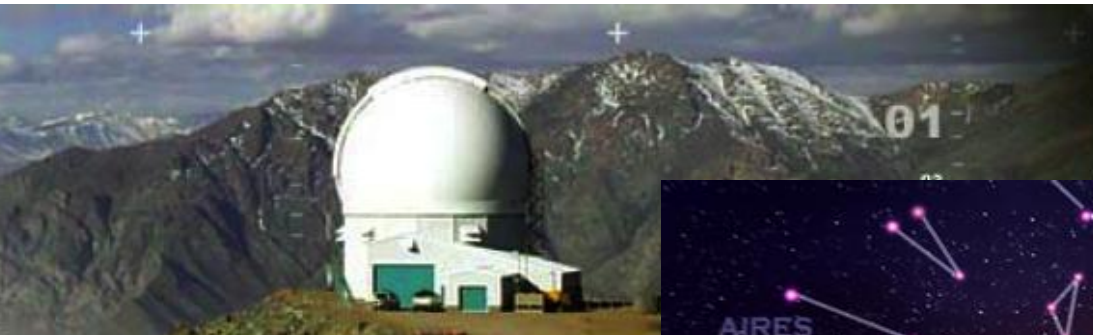
**Scaling the megafauna.** The magnitude of loss of frugivorous megafauna is currently most dramatic on islands, as illustrated by the smaller drawn sizes of the giant ground sloth and the gomphothere from South America, compared with the elephant bird in Madagascar and the giant tortoise of Mauritius. However, many continental regions are poised to catch up.

To illustrate our point, we have examined in relative terms, led to a greater megafaunal



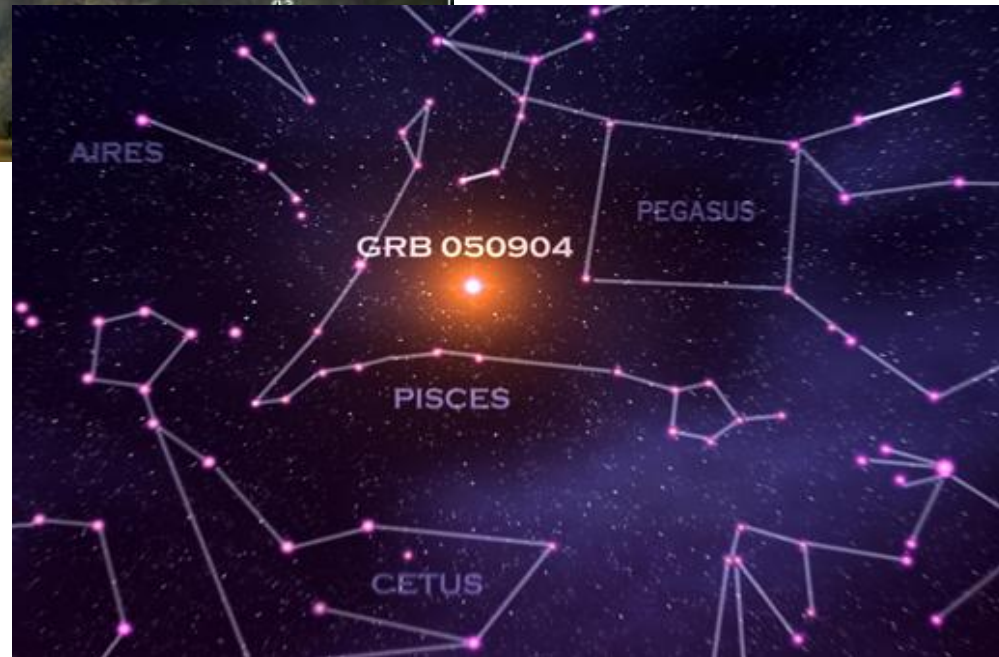
# SOAR: Southern Observatory for Astrophysical Research

J.B. Haislip et al., "A photometric redshift of  $z = 6.39 \pm 0.12$  for GRB 050904", Nature 440, 181-183 (9 March 2006).



Infrared afterglow observation after a GRB - unveils the explosion which happened 13 billion years ago

IAG, USP; IF, UFRGS  
Fapesp, CNPq



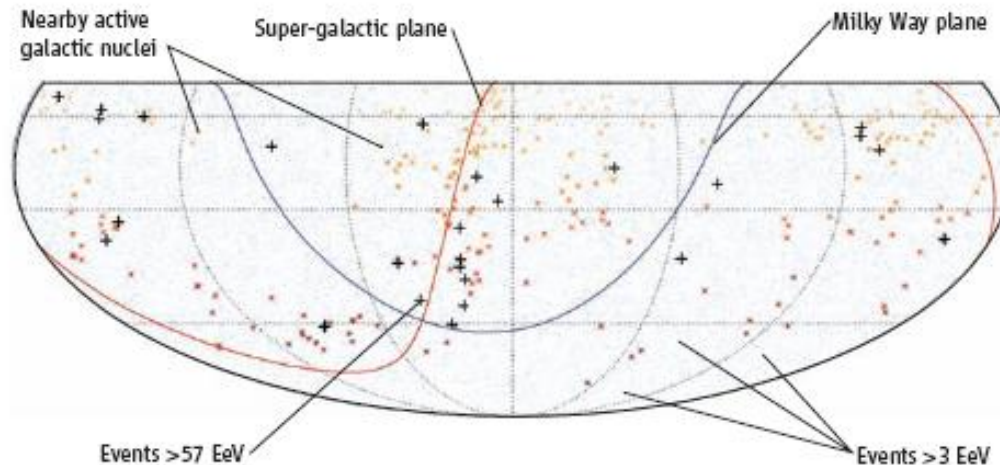
# Cosmic Rays: Science, novembro 2007

## Correlation of the Highest-Energy Cosmic Rays with Nearby Extragalactic Objects

The Pierre Auger Collaboration\*

AUTHORS' SUMMARY

Cosmic rays are particles and nuclei that bombard the Earth from space in all directions (1). A few have astounding energies—beyond 100 EeV (1 EeV = 1 exa-electron volt =  $10^{18}$  eV)—orders of magnitude beyond even the future capabilities of any earthly particle accelerator. Such energies are so extreme that they could arise in only the most violent places in the universe. One possible location is within active



Sky map (2) showing cosmic rays detected by the Pierre Auger Observatory. Low-energy cosmic rays appear to originate from evenly distributed sources (blue dots), but the origins of the highest-energy events (crosses) correlate with the distribution of local matter as represented by nearby active galactic nuclei (red stars). Thus, active galactic nuclei are a likely source of these rare high-energy cosmic rays.



ray events, and about 80 had energies exceeding 40 EeV, the energy at which we expect to begin to see the flux suppression of the GZK effect. First, we examined the data gathered before June 2006. We explored the amount of correlation between the arrival directions and the positions of known AGN by tuning several factors: a cutoff for the maximum distance of an

# Forma de apoio Agências

- Prazos mais longos
  - Projetos ousados requerem 5 ou mais anos
    - Temáticos FAPESP; CEPID FAPESP
    - Teses ousadas podem demorar mais, especialmente em certas áreas
- Avaliação por pares
  - Menos numerologia; Mais leitura e entendimento para a aferição da qualidade
  - Revisão detalhada por pares
    - lendo e não contando
- Cooperação internacional

# *Apoio institucional*

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- Projetos longos e caros requerem apoio institucional
  - Administrativo
  - Gestão
  - Apoio Técnico
  - Serviços
- Agências exigem pouco, instituições garantem pouco

# *Apoio diferenciado à excelência*

- Quantas universidades competitivas internacionalmente o Brasil consegue ter?
- O que determina a excelência?
  - P. ex.: estudo Aghion para a França  
([http://www.sauvonsluniversite.com/IMG/pdf/26\\_janv\\_2010\\_\\_Mission\\_Aghion\\_Rapport\\_d\\_etape\\_VDEF.pdf](http://www.sauvonsluniversite.com/IMG/pdf/26_janv_2010__Mission_Aghion_Rapport_d_etape_VDEF.pdf))
    - Autonomia,
    - Mais meios,
    - Estímulos – recursos em função de desempenho aferido por avaliação por pares e competitividade
- O que concluiríamos sobre isso no Brasil?

# Rankings acadêmicos

- SCIMago Institutions Rankings (Universities, artigos Scopus)
  - USP 11<sup>a</sup>; Unicamp 116<sup>a</sup>; UFRJ 148<sup>a</sup>; UNESP 210<sup>a</sup>
- SJTU Academic Ranking of World Universities
  - USP 101<sup>a</sup> ; Unicamp 201<sup>a</sup>; UFMG 303<sup>a</sup>; UFRJ 303<sup>a</sup>; UFRGS 402<sup>a</sup>; UNESP 402<sup>a</sup>
- Times Higher Education (pesquisa de opinião pesa muito)
  - USP 207<sup>a</sup>, Unicamp 295<sup>a</sup> e UFRJ 383<sup>a</sup>
- Webometrics (acessos Web)
  - USP 38<sup>a</sup>, Unicamp 115<sup>a</sup>, UFSC 134<sup>a</sup>, UFRGS 152<sup>a</sup> e UFRJ 196<sup>a</sup>
- Performance Ranking of Scientific Papers for World Universities (Taiwan)
  - USP 78<sup>a</sup>, Unicamp 288<sup>a</sup>, UFRJ 331<sup>a</sup>, UFRGS 422<sup>a</sup>, Unesp 437<sup>a</sup>, UFMG 476<sup>a</sup>, Unifesp 485<sup>a</sup>

# ***Características das iniciativas para excelência estrangeiras*** (Aghion, 2008)

1. Um pacote financeiro extraordinário com base em convites para propostas institucionais abrangentes
2. Orientadas para os pólos, departamentos ou núcleos de elevado potencial científico: em média, 10% a 15% das propostas são financiados
3. Ambição para fortalecer o plano de competitividade internacional (potencial científico reconhecido internacionalmente, melhores professores, pesquisadores e estudantes a nível internacional ...). Especial atenção deve ser dada, no entanto, para determinadas disciplinas das ciências humanas e sociais para as quais algumas vezes a competição internacional não é tão relevante
4. Forte participação da comunidade científica internacional na orientação e acompanhamento das iniciativas
5. Compromisso financeiro a longo prazo (pelo menos 5 anos)

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## ***3) INTERNACIONALIZAÇÃO***



# Internacionalização

- Projetos de Pesquisa em cooperação
  - Acordo FAPESP-RCUK e DFG
    - Análise unificada das propostas (escolha de reviewers e decisão)
- Vinda de visitantes, post-docs e estudantes
  - Ousadia para convites no estrangeiro
  - Busca de pos-docs estrangeiros (anúncios FAPESP)
  - Teses em inglês quando oportuno
- Ida de estudantes de PG por curto período
  - Enfatizar as possibilidades
- Publicação internacional de livros
  - Criar bibliografia usável em cursos de PG no exterior
- Escolas com participação de estudantes estrangeiros
  - São Paulo Schools of Advanced Science (SPSAS)

# FAPESP convida pesquisadores Nature, mensalmente

UPCOMING CONFERENCES AT THE FOREFRONT OF  
**Cancer Therapeutic Development**

July 11-14, 2010  
Translational Cancer Medicine 2010 (USA)  
San Francisco, CA  
Abstract Deadline: May 14, 2010

October 17-22, 2010  
Translational Cancer Research  
for the Ph.D. Workshop  
Boston, MA  
Visit [www.aacr.org/workshops](http://www.aacr.org/workshops) for application details.

September 27-30, 2010  
Fourth AACR International Conference on  
Molecular Diagnostics in Cancer  
Therapeutic Development  
Denver, CO  
Abstract Deadline: July 12, 2010

November 16-19, 2010  
AACR-NCI International Symposium on  
Molecular Targets and Cancer Therapeutics  
Berlin, Germany

[www.aacr.org/meetingcalendar](http://www.aacr.org/meetingcalendar)

Post-doctoral and Young  
Investigator Awards in  
São Paulo, Brazil

**2 Year Research Fellowship**

A two-year research fellowship for Italian physicians or biomedical Ph.D. graduates is available from FIAGOP (Federazione Italiana Associazioni Genitori Oncoematologia Pediatrica - Italian Federation Parents Associations Pediatric Oncohaematology).

The fellowship supports translational research on pediatric cancer in the laboratories directed by Dr. Antonio Iavarone and Dr. Anna Lasorella at Columbia University Medical Center (New York).

The ideal applicant, who will conduct innovative projects on pediatric brain tumors, should have documented research experience, be highly motivated and able to sustain a high-pressure environment. The application form can be found on the FIAGOP Web page ([www.fiagop.it](http://www.fiagop.it)).

For guidance and further information: [if@fiagop.it](mailto:if@fiagop.it)  
Additional information: <http://www.fiagop.it/en>

SPOTLIGHT ON CANCER RESEARCH



## Post-doctoral and Young Investigator Awards in São Paulo, Brazil

Established in 1962, the São Paulo Research Foundation, FAPESP, is one of the main research funding agencies in Brazil. With a US\$ 400 million budget for 2009, it supports 11,000 scholarships and 8,000 research awards. In addition to supporting all fields of science, FAPESP has special research programs in biodiversity, bioenergy, global climate change, neuroscience, information technology and public policy. The State of São Paulo, in Brazil, is a dynamic, fast growing center with a population of 40 million people, producing 40% of Brazil's industrial output. Higher education and research institutions in São Paulo awarded 4,900 PhD degrees last year.

**Post-doctoral positions:** FAPESP invites talented researchers with a recent PhD degree and a successful research track record to apply for postdoctoral fellowships. Currently 16 positions are open (<http://www.fapesp.br/opp>) projects with secured funding in molecular and cell

<http://www.oportunidades.fapesp.br/en/>

**Ainda: para bolsas de PD em quotas é obrigatório anúncio mundial da posição**

# Escolas São Paulo de Ciência Avançada

Título	Instituição	Pesquisador Responsável
São Paulo Advanced School of Computing Image Processing Visualization	Instituto de Matematica e Estatística / USP	Carlos Eduardo Ferreira
2nd Brazil Workshop of the Game Theory Society In Honor of John Nash, on the occasion of the 60th anniversary of the Nash equilibrium	Faculdade de Economia, Administração e Contabilidade / USP	Marilda Antonia de Oliveira Sotomayor
1st São Paulo School of Translational Science	Hospital do Câncer A.C. Camargo / FAP	Emmanuel Dias Neto
Escola São Paulo de Estudos Avançados em Dinâmica Fônica	Instituto de Estudos da Linguagem / Unicamp	Eleonora Cavalcante Albano
1ª Escola São Paulo de Ciência Avançada: Spintronics and Quantum Computation	Instituto de Física de São Carlos / USP	José Carlos Egues de Menezes
São Paulo Advanced School on Primary Immunodeficiencies: Unraveling Human Immuno-Physiology	Fac. Medicina/USP	Magda Carneiro-Sampaio
Advanced School Some Recent Developments In The Field Of Synchrotron Radiation	Associação Brasileira de Tecnologia de Luz Síncrotron / MCT	Yves Pierre Petroff

# *Ciência Fundamental*

## *Desafios*

- Pesquisadores
- Apoio
  - Valorização
  - Forma de apoio pelas agências
  - Apoio institucional
    - Conferencia Paulista
  - Apoio a instituições excelentes
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  - Vinda de visitantes, post-docs e estudantes
  - Ida de estudantes de pg por curto período

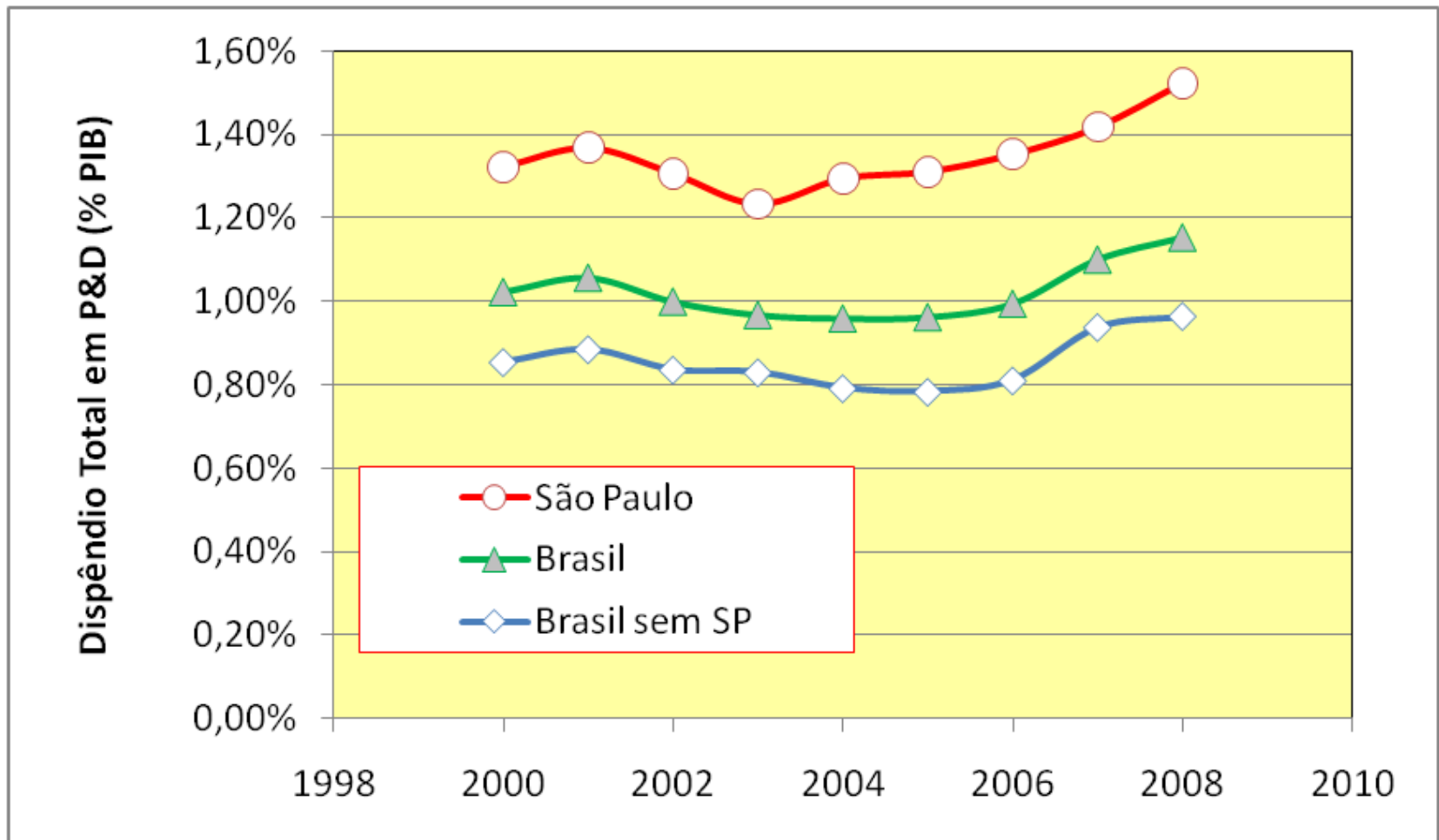
# *Modus in rebus*

- Apoio à excelência não implica excluir o apoio a emergentes e à desconcentração (nem o contrário)
  - Mais centros de pesquisa E Mais centros de excelência são necessários para o desenvolvimento da ciência no Brasil
  - Os dois problemas requerem ações e estratégias diferentes e simultâneas
- Afinal, para tudo há uma medida ....



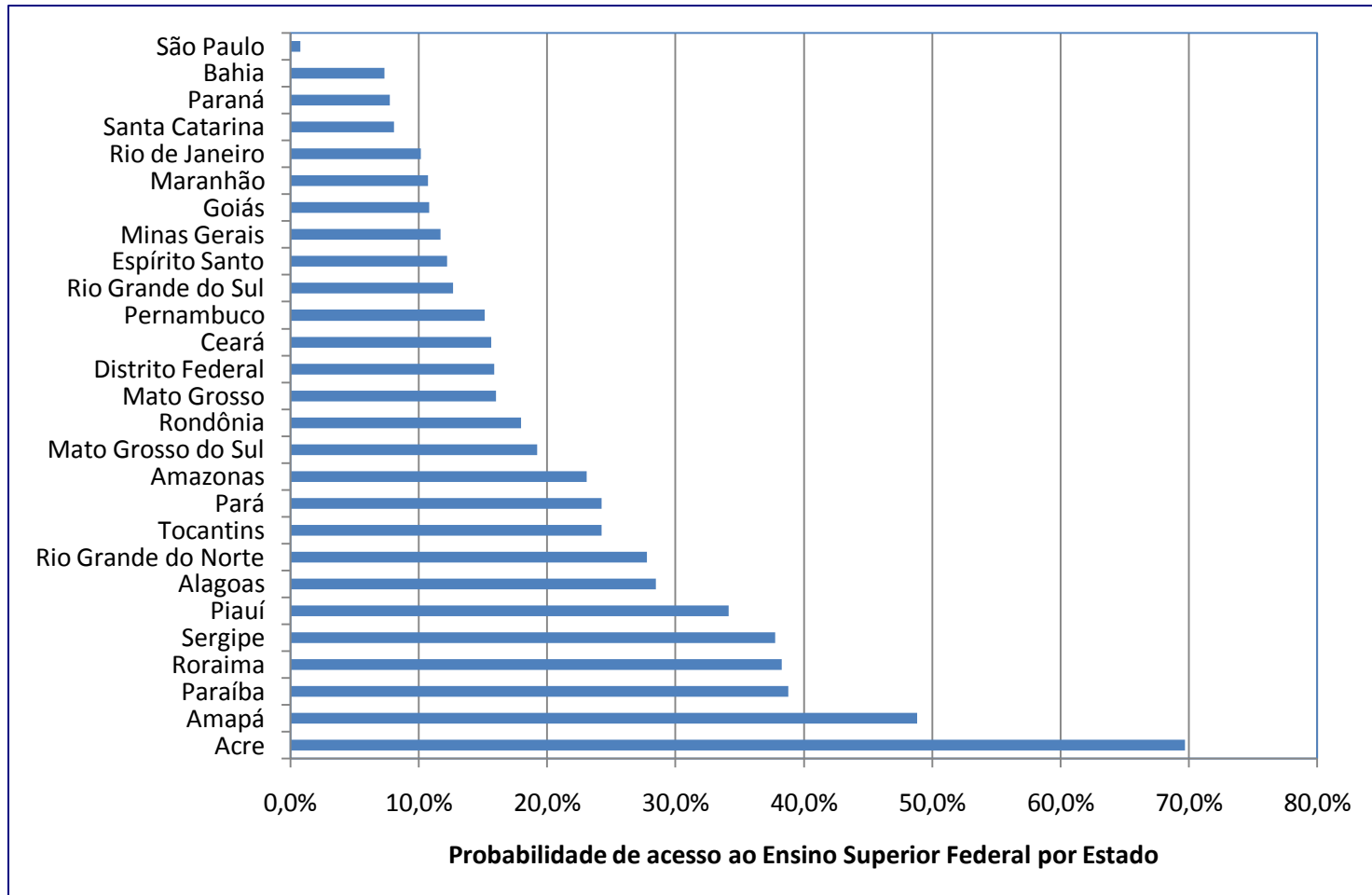


# O dispêndio em P&D em SP: 1,52% do PIB em 2008





# Matrículas em Universidades Federais por concluintes Ensino Médio



# *USP é 11ª em número de artigos publicados*

University	Articles	Cit/Art	Col. Intrn.			
Harvard University	60.559	16,37	32,89	1,14	2,38	HE1
Tokyo Daigaku	43.579	7,54	28,17	1,01	1,27	HE2
University of Toronto	40.464	9,89	42,02	1,05	1,75	HE3
University of California, Los Angeles	36.941	12,11	30,51	1,08	2,00	HE4
University of Michigan, Ann Arbor	35.397	10,94	26,56	1,06	1,93	HE5
University of Washington Medicine	34.296	12,45	28,34	1,08	2,04	HE6
Tsinghua University	33.898	2,43	16,59	0,93	0,85	HE7
Kyoto Daigaku	32.473	7,22	25,53	1,01	1,20	HE8
University of Washington	32.451	12,65	28,69	1,08	2,05	HE9
Johns Hopkins University	31.876	13,5	32,17	1,09	2,05	HE10
Universidade de Sao Paulo	30.518	4,17	30,93	1,00	0,85	HE11
Zhejiang University	30.463	2,52	15,27	0,95	0,79	HE12
Stanford University	29.155	12,79	30,95	1,06	2,24	HE13
University of Pennsylvania	28.019	12,41	26,36	1,10	1,92	HE14
University of California, Berkeley	27.626	11,72	34,73	1,04	2,07	HE15

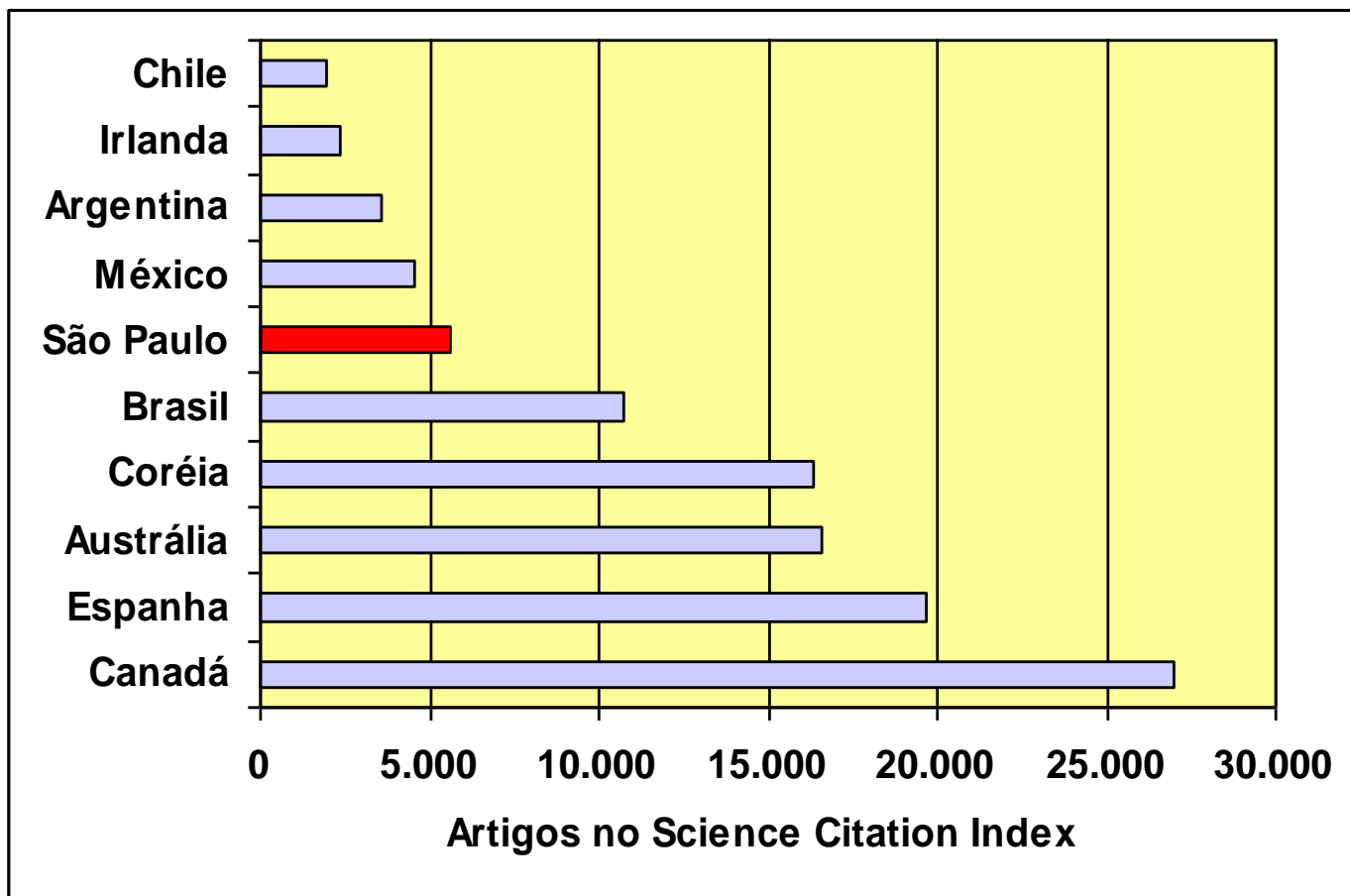
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As universidades públicas e privadas do Brasil terão este ano R\$ 120 milhões para ampliação, modernização e implantação de infraestrutura de pesquisa científica e tecnológica. A FINEP acaba de anunciar na 4ª CNCTI o lançamento de duas chamadas públicas, cada uma no valor de R\$ 60 milhões.

A primeira delas é específica para projetos de universidades privadas, desde que tenham tradição de pesquisa. Elas precisam comprovar a existência de pelo menos um curso de doutorado reconhecido pela Capes.

A outra é destinada à implantação de infraestrutura de pesquisa em novas universidades federais, com ato de criação a partir de 2002, e nos campi fora de sede.

# *SP: 2ª maior produção científica na A.Latina*

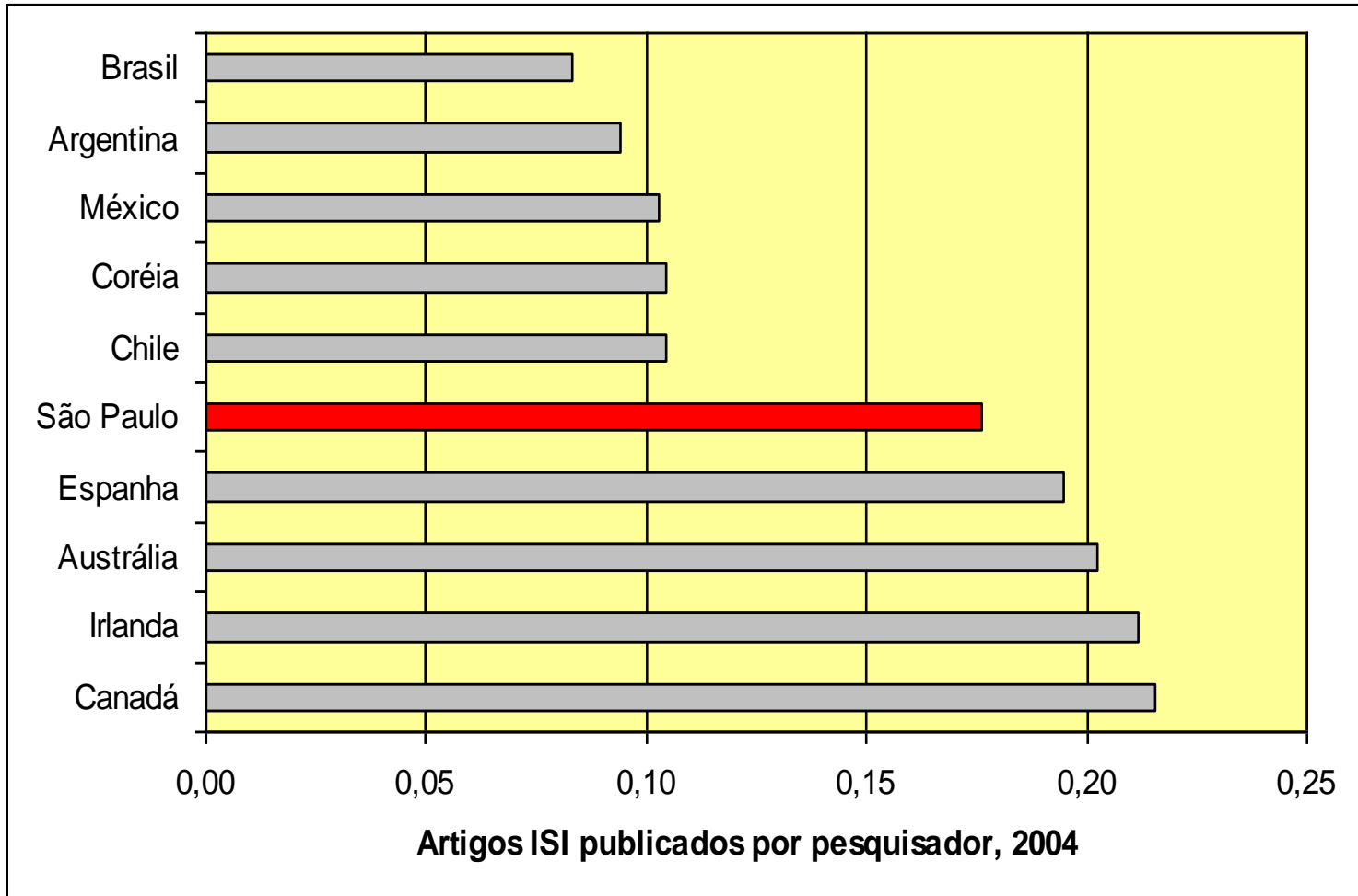


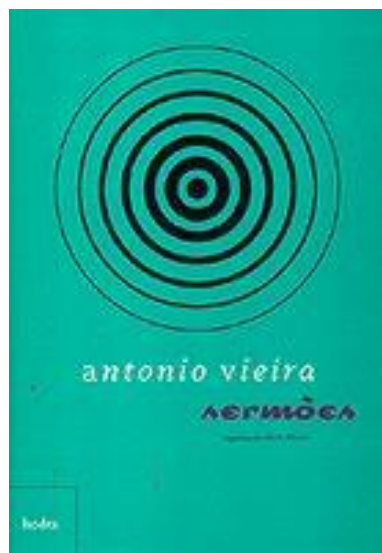
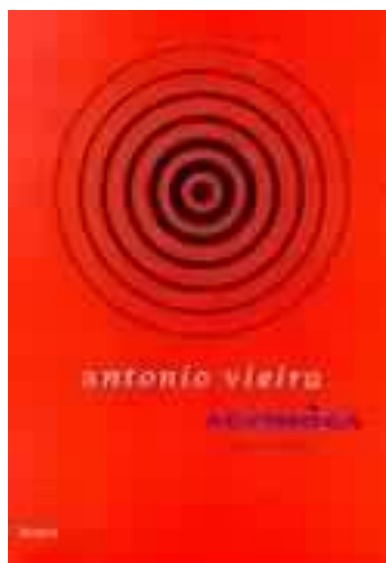
# Pesquisa Acadêmica

## Doutorados defendidos

Brasil	EUA	Doutorados	Professores	DR/Fac
<b>USP</b>		<b>2.265</b>	<b>5.434</b>	<b>0,42</b>
	U. California, Berkeley	802	2.028	0,40
<b>Unesp</b>		<b>765</b>	<b>3.554</b>	<b>0,22</b>
<b>Unicamp</b>		<b>748</b>	<b>1.743</b>	<b>0,43</b>
	U. Texas Austin	716	2.500	0,29
	U. Michigan, Ann Arbor	711	n.d.	n.d.
	U. Wisconsin, Madison	664	2.033	0,33
	U. California, Los Angeles	651	4.016	0,16
	U. Minesotta, Twin Cities	644	4.088	0,16
	Stanford U.	642	1.878	0,34
	U. Illinois, Urbana-Champaign	637	3.081	0,21
	Pennsylvania State U. main campus	606	4.049	0,15
	Ohio State U. main campus	591	5.272	0,11
	MIT	581	1.725	0,34
	U Florida	574	n.d.	n.d.
	U. Southern California	554	3.200	0,17
	Purdue U. main campus	522	2.616	0,20
<b>PUCSP</b>		<b>355</b>	<b>1.406</b>	<b>0,25</b>
<b>UNIFESP</b>		<b>235</b>	<b>775</b>	<b>0,30</b>
<b>UFSCAR</b>		<b>175</b>	<b>832</b>	<b>0,21</b>

# Artigos ISI por cientista, 2004





## Autologous Nonmyeloablative Hematopoietic Stem Cell Transplantation in Newly Diagnosed Type 1 Diabetes Mellitus

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**Context** Type 1 diabetes mellitus (DM) results from a cell-mediated autoimmune attack against pancreatic beta cells. Previous animal and clinical studies suggest that moderate immunosuppression in newly diagnosed type 1 DM can prevent further loss of insulin production and can reduce insulin needs.

**Objective** To determine the safety and metabolic effects of high-dose immunosuppression followed by autologous nonmyeloablative hematopoietic stem cell transplantation (AHST) in newly diagnosed type 1 DM.

**Design, Setting, and Participants** A prospective phase 1/2 study of 15 patients with type 1 DM (aged 14-31 years) diagnosed within the previous 6 weeks by clinical findings and hyperglycemia and confirmed with positive antibodies against glutamic acid decarboxylase. Enrollment was November 2003-July 2006 with observation until February 2007 at the Bone Marrow Transplantation Unit of the School of Medicine of Ribeirão Preto, Ribeirão Preto, Brazil. Patients with previous diabetic ketoacidosis were excluded after the first patient with diabetic ketoacidosis failed to benefit from AHST. Hematopoietic stem cells were mobilized with cyclophosphamide (2.0 g/m<sup>2</sup>) and granulocyte colony-stimulating factor (10 µg/kg per day) and then collected from peripheral blood by leukapheresis and cryopreserved. The cells were injected intravenously after conditioning