The R&D Landscape in São Paulo, Brazil

Carlos H. de Brito Cruz

Science Director

FAPESP

ESPCA Aerosols, IFUSP, 20190722

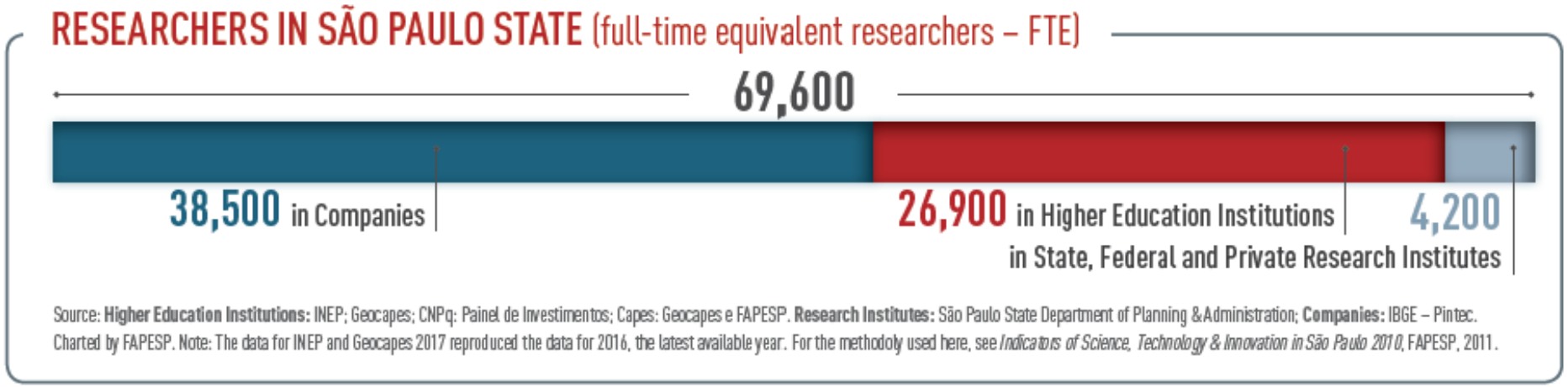
Outline

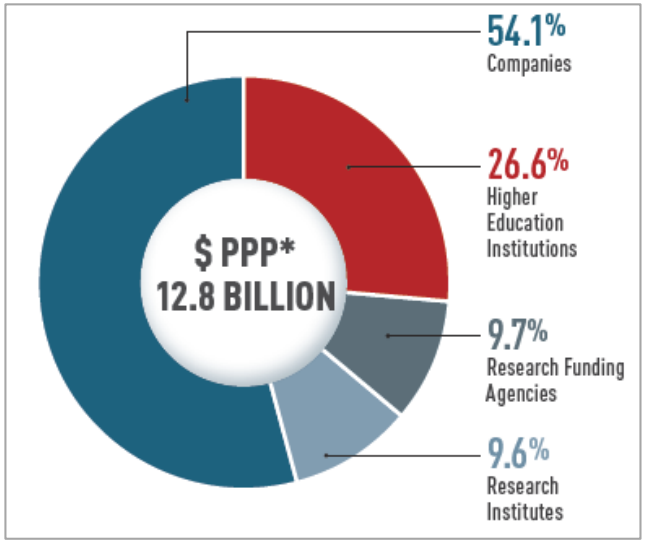
- R&D in the State of São Paulo, Brazil
  - The São Paulo Research Foundation, FAPESP
- A bird's eye view on R&D results in São Paulo
  - The challenge of obtaining more impact from research in three dimensions: Scientific, Social, Economic
- Research collaboration strategy
  - Research collaboration across geographies and institutions
  - University-Industry joint R&D
  - Start-ups and Small Business R&D

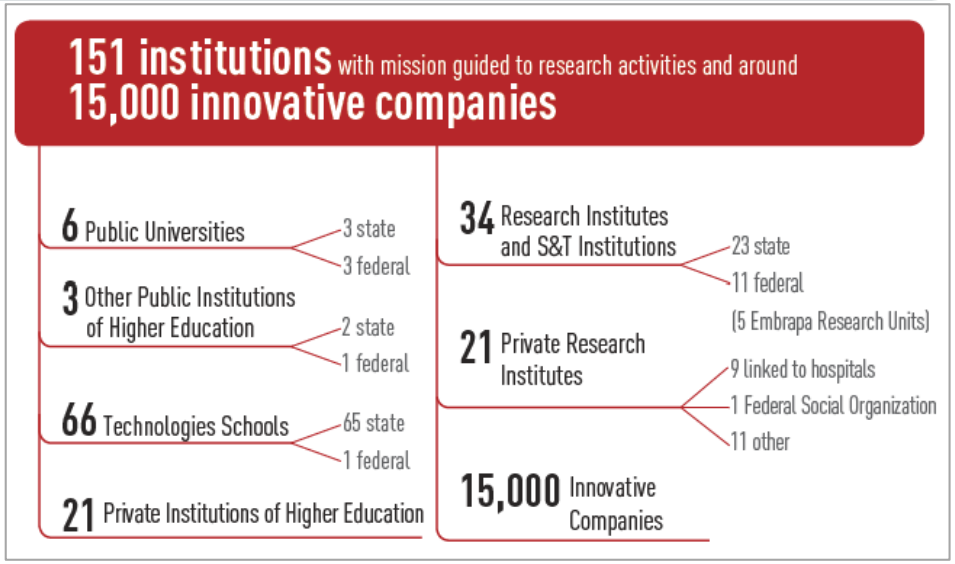
State of São Paulo, Brasil

42	Million people
32%	of Brazil's GDP
45%	of Brazilian science
39%	of the PhDs graduated in Brazil (7,319 in 2017)
13%	of State budget to HE and R&D
1.3%	GDP for R&D (2017)

São Paulo: 69,600 researchers, 151 institutions, 15,000 innovative companies





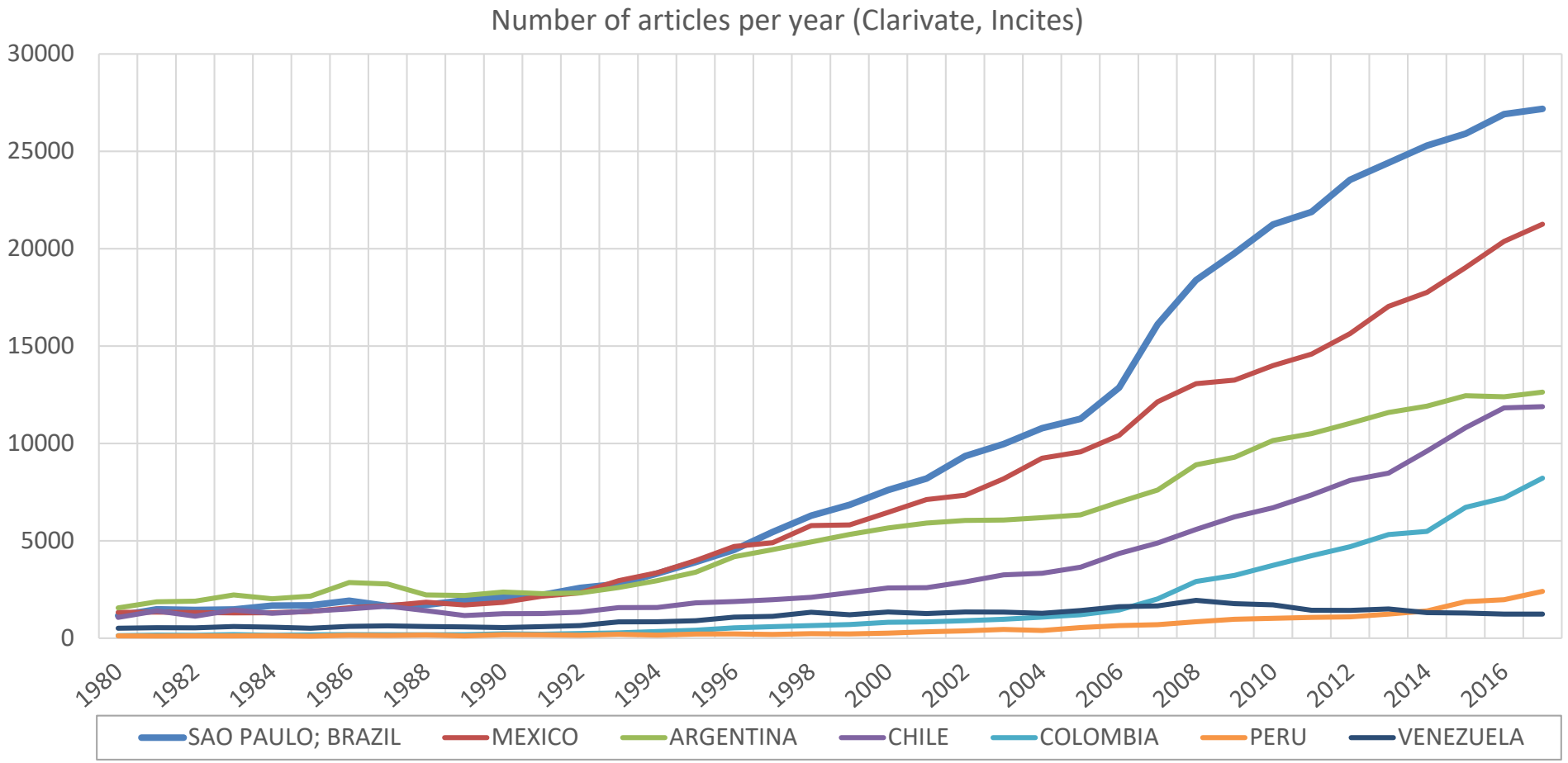


FAPESP: São Paulo Research Foundation

- Mission: support research in all fields
- Funded by the State of SP: 1% of all tax revenues
- All proposals are peer reviewed (26,000 in 2018)
  - Time for decision ~ 70 days; 41% success rate
- Annual budget: R$ 1,216 billion in 2018
  - Fellowships
    - In Brazil: 2,500 SI, 1,150 MSc, 2,400 DrSc, 1,700 Post-docs
    - Abroad: 1,200 per year
  - Academic R&D
    - 17 Centers (11-yrs dur.), 400 Thematic (5-yrs), 300 Young Investigators (5-yrs), 2,800 Regular (2-yrs)
  - University-Industry Joint R&D: Microsoft, Vale, Petrobrás, Embraer, Boeing, etc.
    - 14 Engineering Res. Centers: 10 years joint grants FAPESP/Industry – PCBA, GSK, BG/Shell, Embrapa, …
  - Small business R&D (PIPE): 1,500 SBE's (246 contracts in 2018, many start-ups)

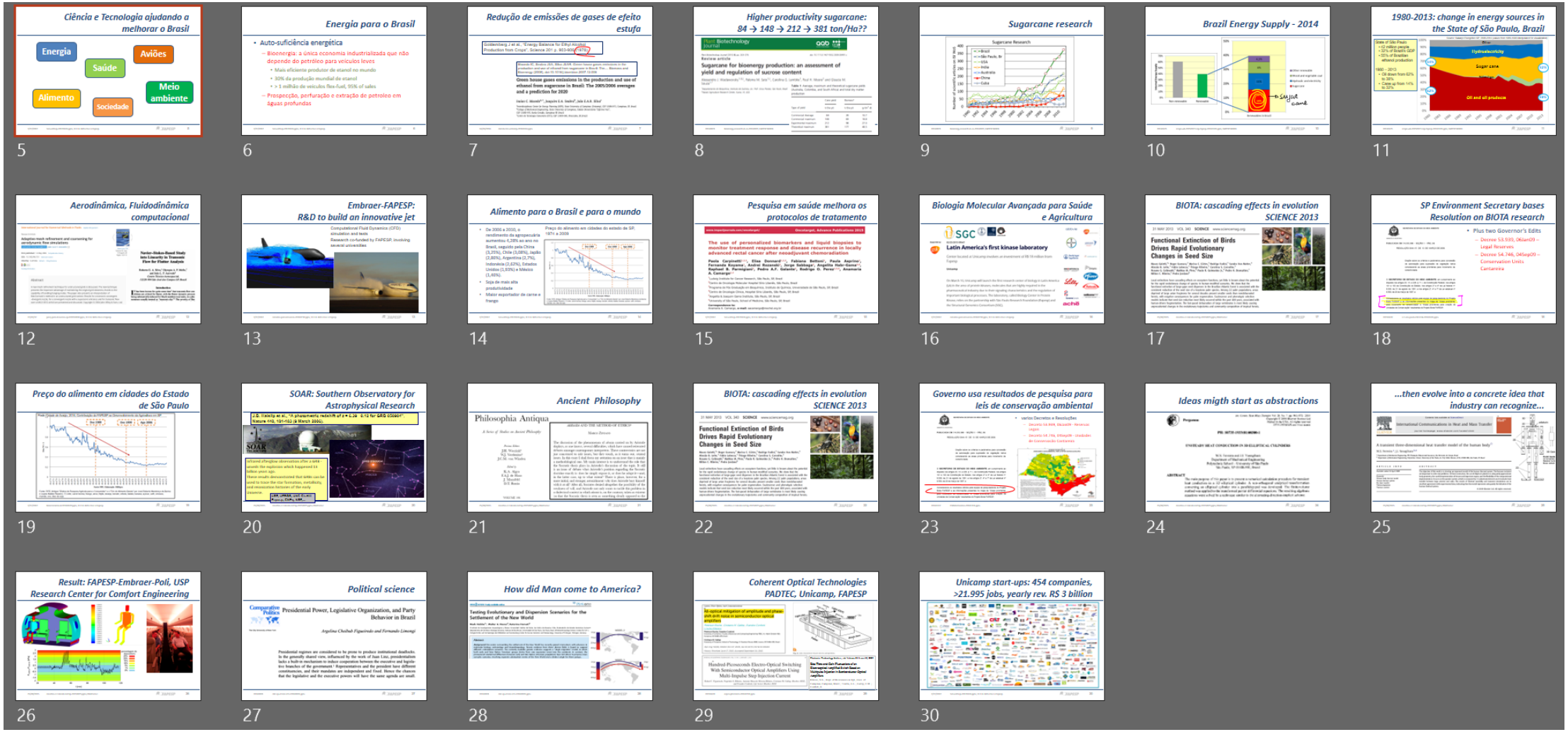
FAPESP: BASIC, APPLIED, ACADEMIC, BUSINESS RESEARCH

Researchers in São Paulo, Brazil publish more than any Latin American country




nature
Citrus pathogen sequenced
Invertebrate Systematics
NITRIC OXIDE
Biology and Chemistry
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
Microbes and Infection
nature biotechnology
PCCP
ECOLOGY LETTERS
bioTROPICA
Selection for fleshy fruits in tropical wetland forests
Systematic Biology
Zeitschrift für Kristallographie
NEW CRYSTAL STRUCTURES
NCS
Science Signaling
NANOTECHNOLOGY
Analyst
MARINE & FRESHWATER RESEARCH
CERN COURIER
Cosmic collisions
PHYSICAL REVIEW LETTERS
17 December 2001
CrystEngComm
Analyst
JOC The Journal of Organic Chemistry
Science
EMPHYSCHEM
OF CHEMICAL PHYSICS AND PHYSICAL CHEMISTRY
Long-Lasting Oscillations keep going...
nature physics
LANGMUIR
The ACS journal of fundamental interface science
Cell
Acta Crystallographica Section E
Structure Reports Online
Volume 67
Part 7
Au
Science
METEORITICS & PLANETARY SCIENCE
JOURNAL OF MATERIALS SCIENCE
THE JOURNAL OF PHYSICAL CHEMISTRY
siam REVIEW
THE JOURNAL OF PHYSICAL CHEMISTRY
ADVANCED FUNCTIONAL MATERIALS
cellular microbiology
nature REVIEWS NEUROSCIENCE
Proteomics
BAMS
Storms over Brazil
JOC The Journal of Organic Chemistry
Journal of NANOSCIENCE
Proteomics Clinical Applications
12/2016
Science
FAITHS TO A ZIKA VACCINE
Cell Reports
CHEMNANOMAT
nature genetics
PHYSICAL REVIEW LETTERS
PHYSICAL REVIEW LETTERS
8 APRIL 2016

A growing list of high impact research results……



Higher productivity sugarcane: 84 → 148 → 212 → 381 ton/Ha??

Plant Biotechnology Journal

Plant Biotechnology Journal (2010) **8**, pp. 263–276 doi: 10.1111/j.1467-7652.2009.00491.x

Review article

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

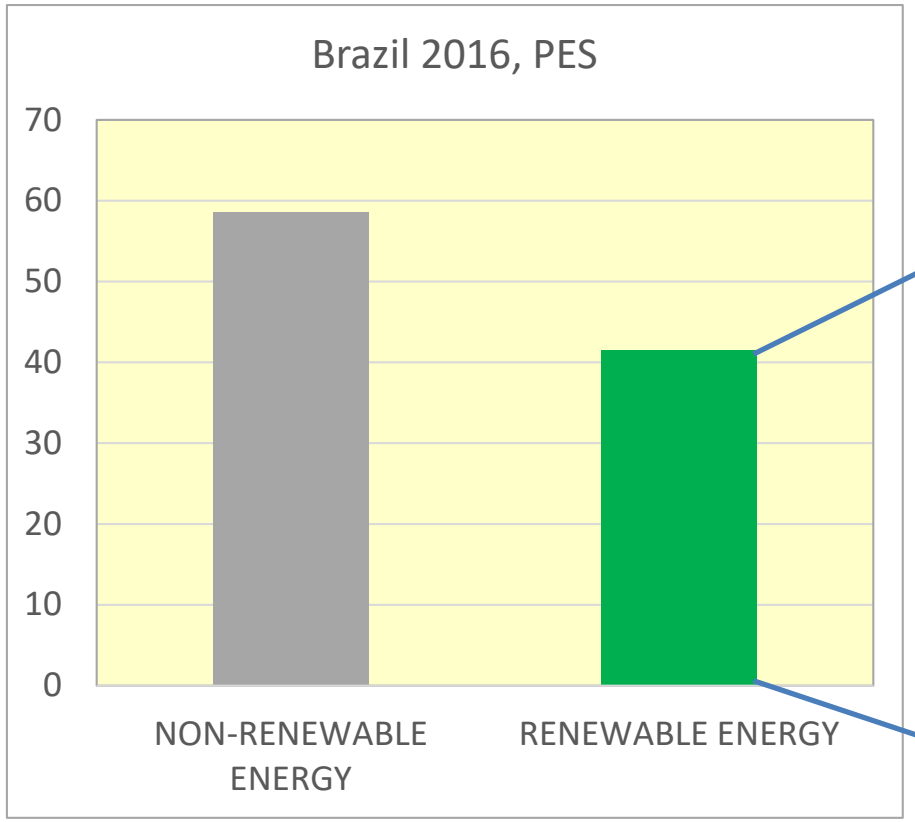
Alessandro J. Waclawovsky[1,†,‡], Paloma M. Sato[1,‡], Carolina G. Lembke[1], Paul H. Moore[2] and Glaucia M. Souza[1,*]

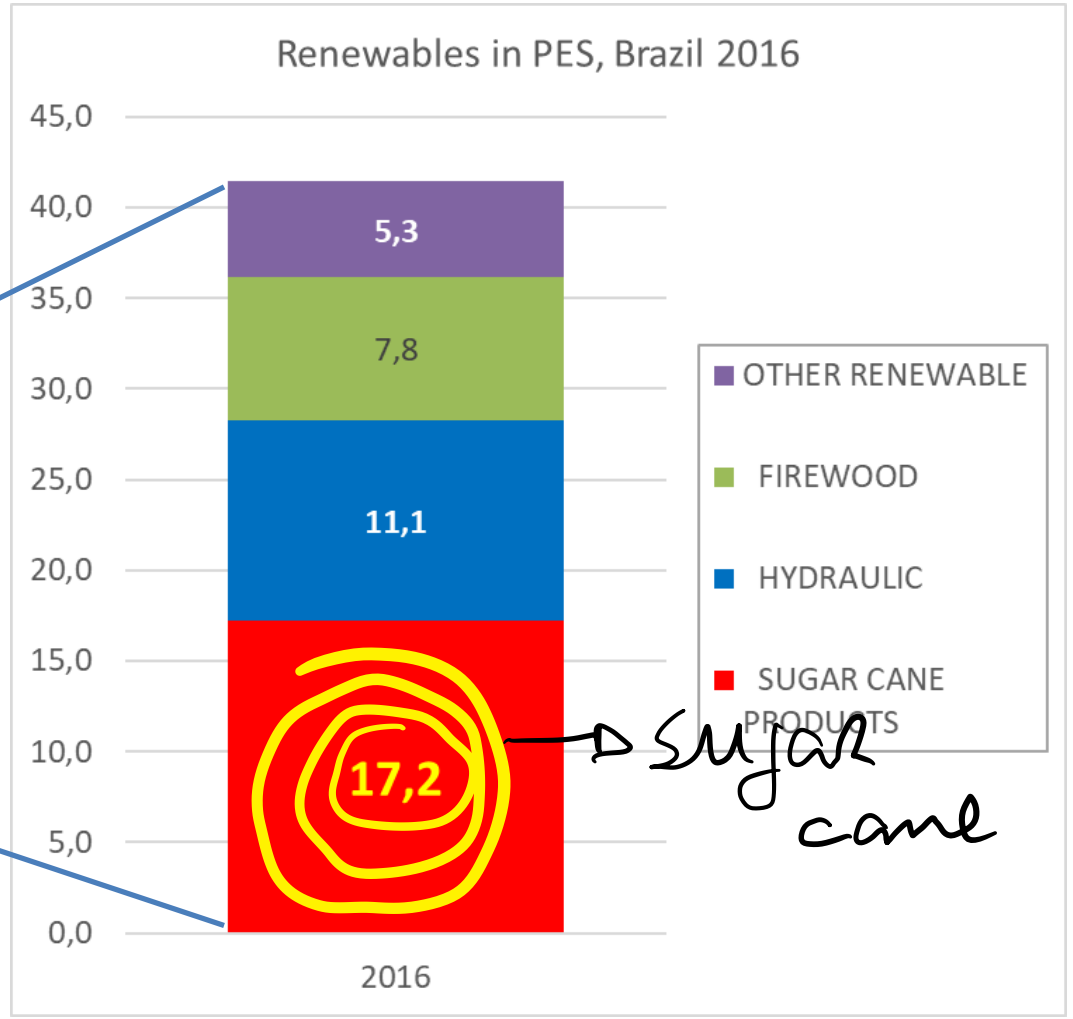
[1]*Departamento de Bioquímica, Instituto de Química, Av. Prof. Lineu Prestes, São Paulo, Brazil*
[2]*Hawaii Agriculture Research Center, Kunia, HI, USA*

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

	Cane yield	Biomass*	
Type of yield	t/(ha yr)	t/(ha yr)	g/(m^2 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 Energy Supply - 2016

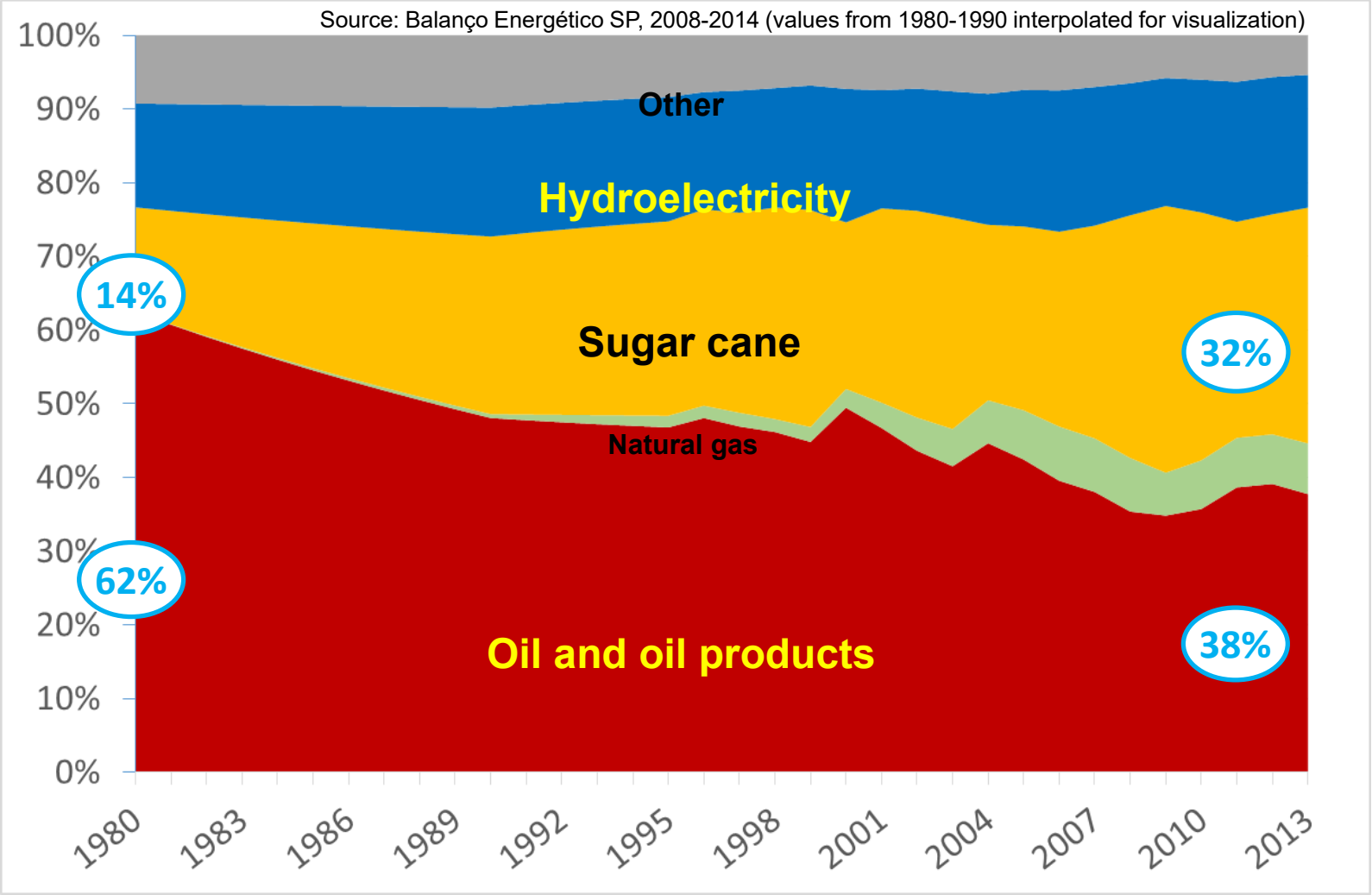




1980-2013: change in energy sources in the State of São Paulo, Brazil

State of São Paulo
- 42 million people
- 32% of Brazil's GDP
- 55% of Brazilian ethanol production

1980 – 2013
- Oil down from 62% to 38%
- Cane up from 14% to 32%



Research about the Amazon

HOME ABOUT PROGRAM REGISTRATION DIRECTIONS PUBLICATIONS

http://fapesp.br/amazonsymposium/category/public

PUBLICATIONS

Science of the Amazon

The São Paulo Research Foundation (FAPESP) has beer
providing continuous support to research projects that stu
[…]

FAPESP-U.S. COLLABORATIVE RESEARCH ON THE AMAZON

There will be a live webcast of the symposium on October 28 at: www.wilsoncenter.org/event/fapesp-us-collaborative-research-the-amazon

The São Paulo Research Foundation (FAPESP) and the United States Department of Energy Office of Science, in partnership with the Wilson Center's Brazil Institute, cordially invite you to an all-day symposium on collaborative research projects led by scientists in the state of São Paulo, Brazil and in the U.S. targeting the discovery of new science about the Amazon.

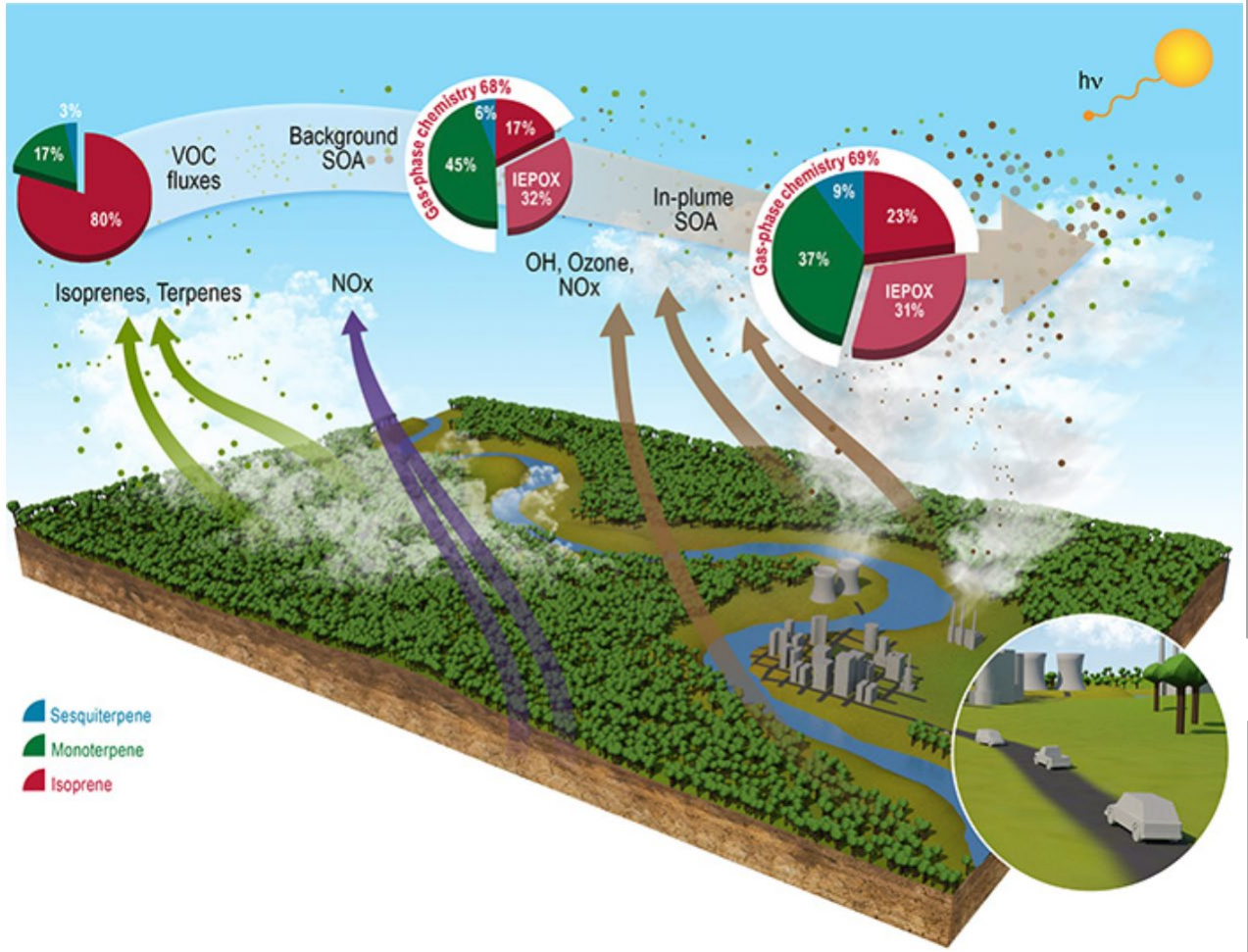
The presentations will include the projects that are part of the Green Ocean Amazon (GOAmazon) research initiative, as well as other FAPESP partnerships.

Venue: Wilson Center – Washington – DC
One Woodrow Wilson Plaza
1300 Pennsylvania Ave. NW
Date: October 28th – 8:30AM

U.S. Secretary of Energy, Ernest Moniz, will keynote the event.

GO Amazon is financed by the U.S. DOE, FAPESP and the Amazon Research Foundation (FAPEAM), among other partners.

Pollution above Manaus and the formation of aerosols over the rainforest



nature COMMUNICATIONS

ARTICLE

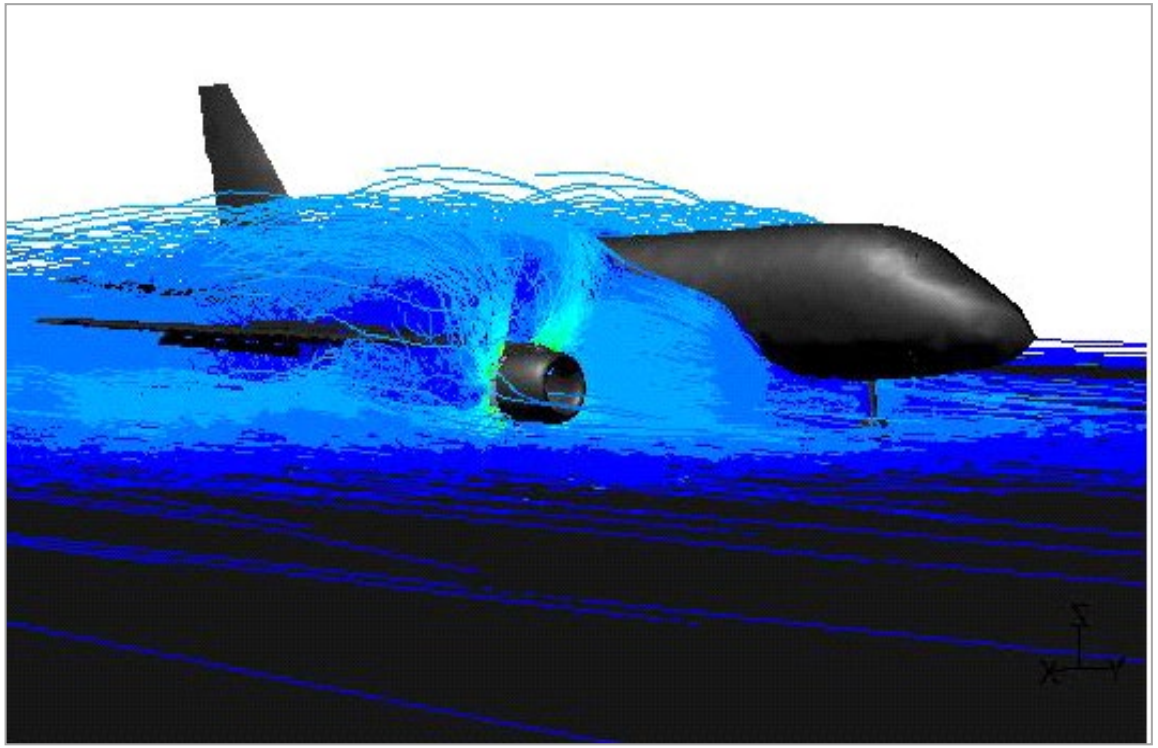
https://doi.org/10.1038/s41467-019-08909-4 OPEN

Urban pollution greatly enhances formation of natural aerosols over the Amazon rainforest

Manish Shrivastava[1], Meinrat O. Andreae[2,3,4], Paulo Artaxo[5], Henrique M.J. Barbosa[5], Larry K. Berg[1], Joel Brito[6], Joseph Ching[7], Richard C. Easter[1], Jiwen Fan[1], Jerome D. Fast[1], Zhe Feng[1], Jose D. Fuentes[8], Marianne Glasius[9], Allen H. Goldstein[10], Eliane Gomes Alves[11], Helber Gomes[12], Dasa Gu[13], Alex Guenther[1,13], Shantanu H. Jathar[14], Saewung Kim[13], Ying Liu[1], Sijia Lou[1], Scot T. Martin[15], V. Faye McNeill[16], Adan Medeiros[17], Suzane S. de Sá[15], John E. Shilling[1], Stephen R. Springston[18], R.A.F. Souza[19], Joel A. Thornton[20], Gabriel Isaacman-VanWertz[21], Lindsay D. Yee[10], Rita Ynoue[22], Rahul A. Zaveri[1], Alla Zelenyuk[1] & Chun Zhao[23]

The implication is that increasing anthropogenic emissions in the future might substantially enhance biogenic SOA in pristine locations like the Amazon.

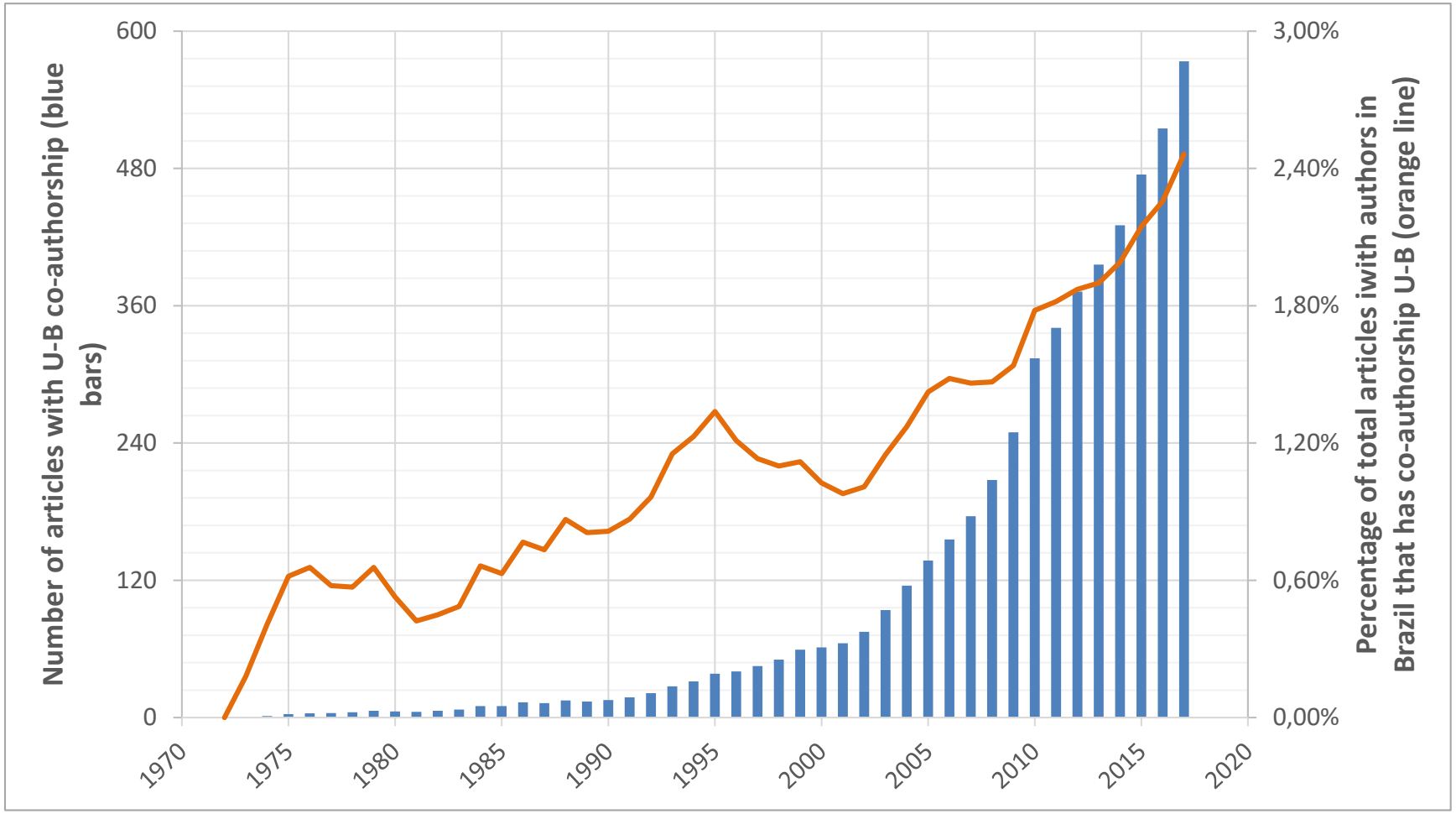
Embraer-FAPESP: R&D to build an innovative jet



Computational Fluid Dynamics (CFD) modelling and tests

R&D co-funded by FAPESP, several universities

Collaboration: University-Business research collaboration in the state of São Paulo, Brazil



Main partners

- Petrobras
- Novartis
- Pfizer
- Roche
- GSK
- IBM
- Vale/ITV
- Merck
- Eletrobras
- AstraZeneca
- Fibria
- Westat
- Janssen
- Embraer
- Bayer
- Monsanto
- Agilent
- Braskem
- Boehringer Ingelheim
- Sanofi

Engineering Research Centers at FAPESP: Advanced Joint University/Industry Research

- A long-term plan for Advanced Research
- Center is hosted in a university/institute,
  - Center Director is a professor/researcher
  - Adjunct Director is a researcher from the company as a visiting professor at the university
  - Other company researchers participate as visiting professors
- Up to 10-years contract, w. reviews on years 3, 5, 7
- Cost sharing: FAPESP: Industry: University ~ 1:1:2
  - US$ 0.5 – 4 million per year from FAPESP and Company, plus labor and infrastructure costs by university

Engineering Research Centers: R$ 1,02 billion in contracts; FAPESP+Business+Host (Univ/Res Inst)

1. Peugeot-Citroen/Unicamp: Biofuel Engines Engineering Research Center
2. 10+ Pharmas/SGC/Unicamp/Oxford/Toronto/N. Carolina: Structural Genomics Center @ Unicamp
3. GSK/I. Butantan: Engineering Research Center on Target Discovery
4. GSK/UFSCAR: Engineering Research Center on Sustainable Chemistry
5. Shell (British Gas)/USP: Engineering Research Center on Natural Gas
6. Natura/USP: Applied Research Center on Well-being and Human Behavior
7. Embrapa/Unicamp: Agriculture, Gene Editing, Climate Change
8. Shell (BG)/Unicamp/USP/IPEN: New Energy
    1. Shell (BG)/Unicamp: Dense Energy Carriers
    2. Shell (BG)/USP: Computational Materials Sciences
    3. Shell (BG)/Unicamp: Advanced Energy Storage
    4. Shell (BG)/IPEN: Methane2Products
9. Statoil/?: Oil Reservoirs
10. Koppert/?: Biological Control
11. Usina S. Martinho/?: Biological Control for Sugarcane
12. IBM/?: Artificial Intelligence

Unicamp: 701 start-ups; 604 active; 30,000 jobs, R$ 4.8 billion in revenues (2018)

Griaule: internationally competitive biometry technology

EXAME

PME

Empresa de Campinas ganha licitação de US$ 75 milhões do Pentágono

A brasileira Griaule vai fornecer o sistema de certificação dos dados biométricos de 55 milhões de cidadãos no Iraque e 30 milhões no Afeganistão.

Por **Mariana Desidério**

8 nov 2018, 14h42 - Publicado em 7 nov 2018, 08h04

Starting with a MSc dissertation on "Cooperative multirobot localization…"..

Localização Multirrobô Cooperativa com Planejamento

Dissertação apresentada ao Instituto de Computação, UNICAMP, como requisito parcial para a obtenção do título de Mestre em Ciência da Computação.

Paulo Gurgel Pinheiro[1]

Março de 2009

Prof. Dr. Jacques Wainer (Orientador)

[1]Suporte financeiro de: Bolsa da FAPESP (processo 2007/53606-2) 2007–2009

Planning for Mobile Robot Localization Using Architectural Design Features on a Hierarchical POMDP Approach

PhD Thesis presented to the Post Graduate Program of the Institute of Computing of the University of Campinas to obtain a PhD degree in Computer Science.

Paulo Gurgel Pinheiro[1]

August 16, 2013

Posto isto, pode-se apresentar o modelo de detecção negativa que é definido por $p(x_t^{r_1^-} = x|d_t^-)$:

$$p(x_t^{r_1^-} = x|d_t^-) = \frac{p(d_t^-|x_t^{r_1} = x, vis^{r_1}, obs)p(x_{t-1}^{r_1} = x|d_{t-1}^{r_1})}{\sum_{x^t} p(d_t^-|x_t^{r_1} = x', vis^{r_1}, obs)p(x_{t-1}^{r_1} = x'|d_{t-1}^{r_1})} \quad (4.3)$$

em que r_1 é o robô que executa a detecção negativa, x_t é a postura do robô r_1 e d_t^- é a informação de ausência de detecção de outro. Os obstáculos são representados pela variável *obs* e o campo de visão do robô observador por vis^{r_1}.

Toda vez em que um robô não detectar um outro, as estimativas de crença sobre suas posturas são atualizadas. Quando o robô r_1 não detectar o robô r_2, esta terá suas estimativas atualizadas de acordo com:

$$p(x_t^{r_2} = x|x_t^{r_1^-} = x) = \frac{p(x_t^{r_1^-} = x|d_t^-)p(x_{t-1}^{r_2} = x|d_{t-1}^{r_2})}{\sum_{x^t} p(x_t^{r_1^-} = x'|d_t^-)p(x_{t-1}^{r_2} = x'|d_{t-1}^{r_2})} \quad (4.4)$$

em que $x_t^{r_1}$ é a postura do robô r_1 e $x_t^{r_2}$ é a postura do robô r_2.

...to an idea....+ funding from FAPESP ...+IP protection....

Anticipative Shared Control for Robotic Wheelchairs Used by People with Disabilities

By: Pinheiro, P (Pinheiro, Paulo)[1]; Cardozo, E (Cardozo, Eleri)[1]; Pinheiro, C (Pinheiro, Claudio)[2]

2015 IEEE INTERNATIONAL CONFERENCE ON AUTONOMOUS ROBOT SYSTEMS AND COMPETITIONS (ICARSC)
Edited by: Valente, A; Morais, R; Almeida, L; Marques, L
Book Series: IEEE International Conference on Autonomous Robot Systems and Competitions ICARSC
Pages: 91-96
DOI: 10.1109/ICARSC.2015.26
Published: 2015
Author Information
Reprint Address: Pinheiro, P (reprint author)
+ Univ Estadual Campinas, Sch Elect & Comp Engn FEEC, BR-13083852 Campinas, SP, Brazil.
Addresses:
+ [1] Univ Estadual Campinas, Sch Elect & Comp Engn FEEC, BR-13083852 Campinas, SP, Brazil
+ [2] Fed Inst Educ Sci & Tecnol Ceara IFCE, Dept Telecommun Res, BR-60040215 Fortaleza, Ceara, Br...

Wheelie e Gimme, tecnologia inovadora para dirigir cadeira de rodas

Processo: 15/22624-1
Linha de fomento: Auxílio à Pesquisa - Pesquisa Inovativa em Pequenas Empresas - PIPE
Vigência: 01 de agosto de 2016 - 30 de abril de 2017

The Wheelie - A Facial Expression Controlled Wheelchair Using 3D Technology

By: Pinheiro, PG (Pinheiro, Paulo Gurgel)[1]; Pinheiro, CG (Pinheiro, Claudio Gurgel)[1]; Cardozo, E (Cardozo, Eleri)[2]

2017 26TH IEEE INTERNATIONAL SYMPOSIUM ON ROBOT AND HUMAN INTERACTIVE COMMUNICATION (RO-MAN)
Edited by: Howard, A; Suzuki, K; Zollo, L
Book Series: IEEE RO-MAN
Pages: 271-276
Published: 2017
Author Information
Reprint Address: Pinheiro, PG (reprint autho
+ Univ Estadual Campinas, HOOBOX Robo
Addresses:
+ [1] Univ Estadual Campinas, HOOBOX R
+ [2] Univ Estadual Campinas, Dept Elect

Patente(s) depositada(s) como resultado deste projeto de pesquisa

MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS PCT/BR2017/000136 - Hoobox Robotics Tecnologia do Brasil Ltda ME ; Universidade Estadual de Campinas (UNICAMP) . Eleri Cardozo; Paulo Gurgel Pinheiro - 17 de novembro de 2017

MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS BR1320170243183 - Hoobox Robotics Tecnologia do Brasil Ltda ME ; Universidade Estadual de Campinas (UNICAMP) . Eleri Cardozo; Paulo Gurgel Pinheiro - 13 de novembro de 2017

MÉTODO DE ANÁLISE FACIAL PARA CONTROLE DE DISPOSITIVOS BR1020160270650 - Universidade Estadual de Campinas (UNICAMP) . PAULO GURGEL PINHEIRO; ELERI CARDOZO - 18 de novembro de 2016

...ao produto e empresa

IT SQUARE

MENU

Making HK IT!

新世代AI 商品 打入2019電子市場

HooBox是全球首部以臉部表情控制駕駛的自動輪椅，只要向輪椅做出表情，就可以來去自如（網上截圖）

美國拉斯維加斯CES消費電子展剛剛閉幕，不少新世代的電子產品，令人留下
深刻印象。機器學習和AI不再單是流行用語，各行各業新產品；包括農業、無
人駕駛機，交通工具，醫療設備等等，都加入 AI

GADGETGUY

ANNOUNCEMENT:

Quadriplegics to get around with a smile: Intel powers HOOBOX Wheelie 7

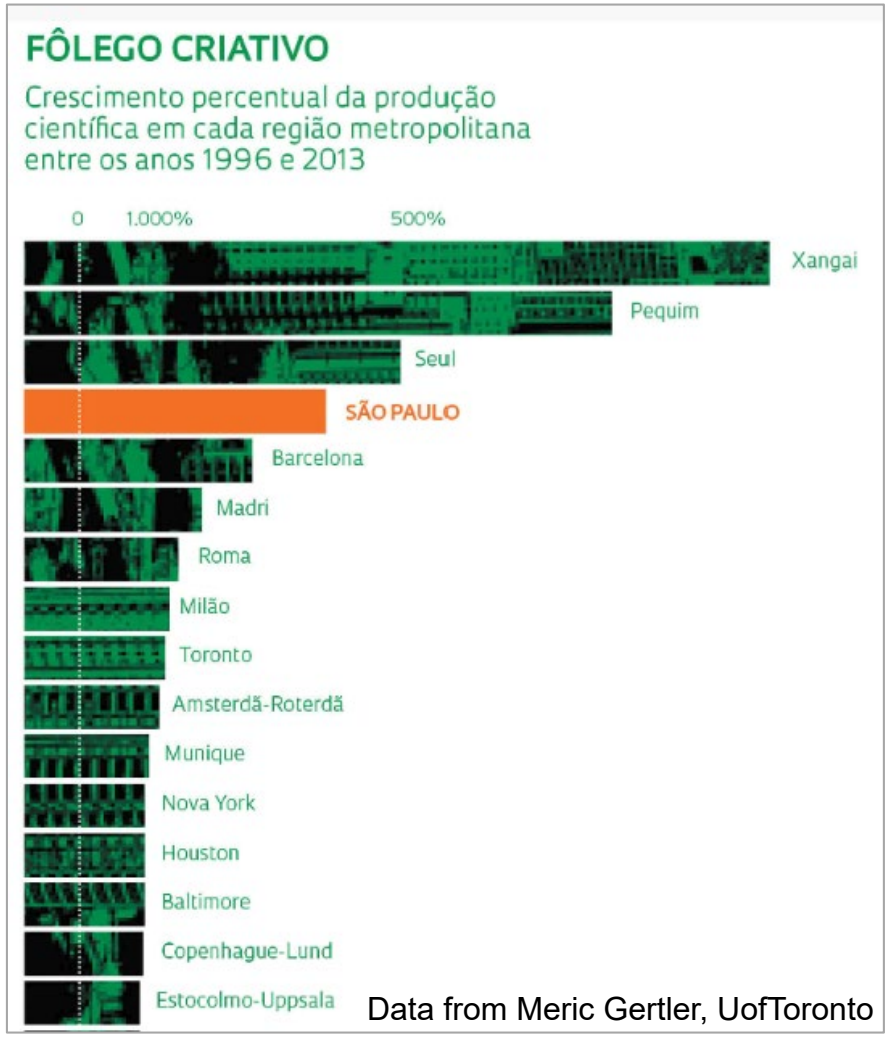
RAY SHAW × December 3, 2018 5 MIN READ

We use cookies to ensure that we give you the best experience on

Hoobox is at J&J Innovation Labs, Houston

SÃO PAULO: A SCI&TECH HUB IN THE SOUTH

Fast S&T Dynamics in the São Paulo Region



Data from Meric Gertler, UofToronto

Pesquisa FAPESP

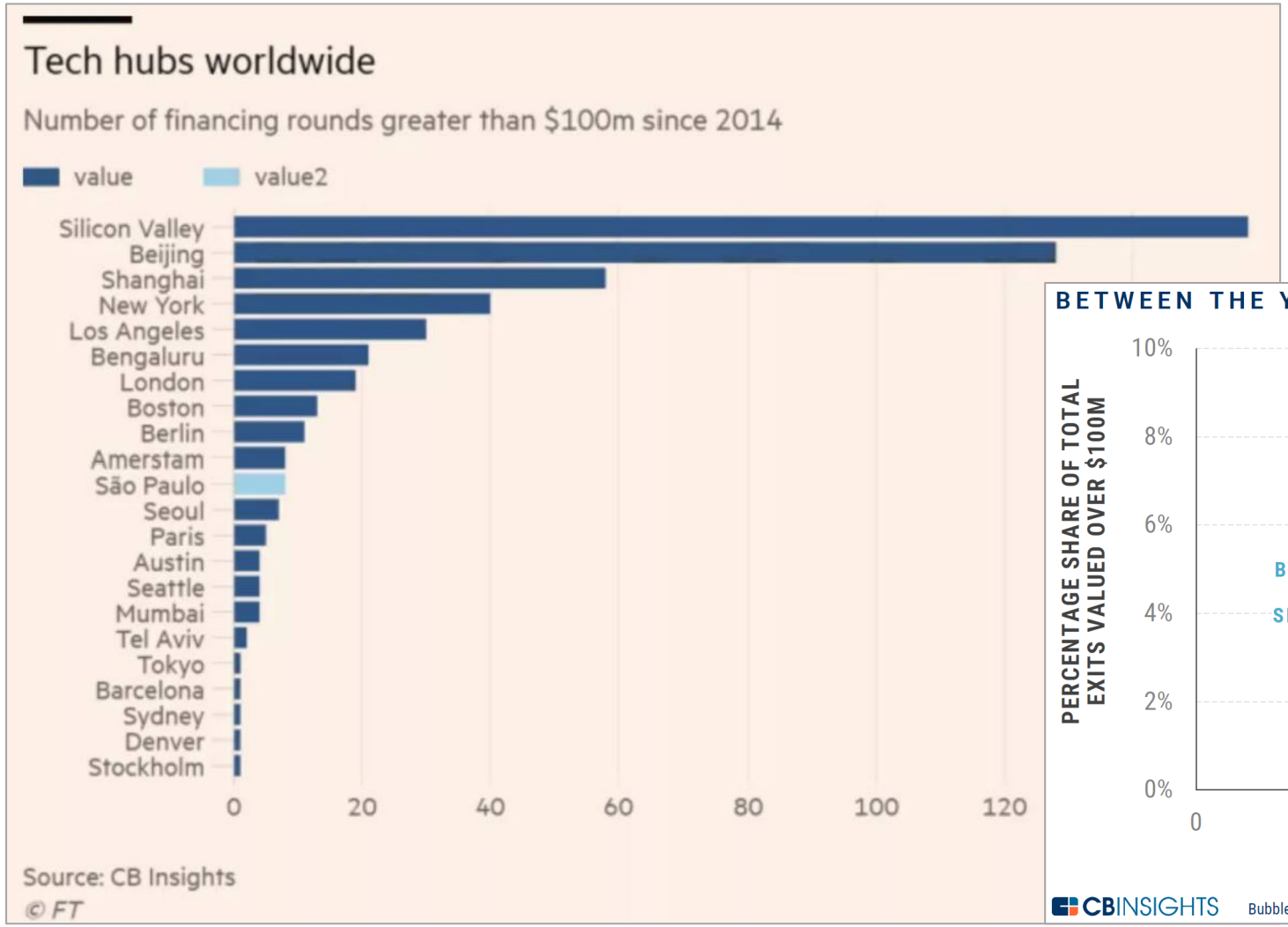
NETWORKS OF KNOWLEDGE

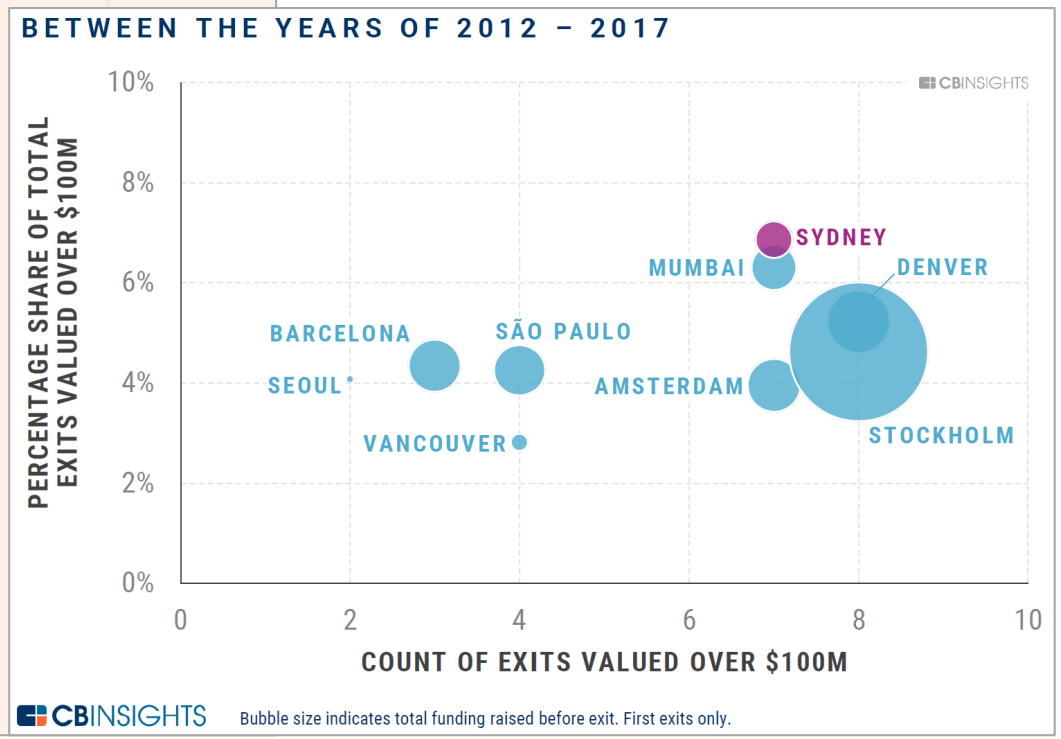
The DNA of innovation in the metropolises

Researcher shows how big universities influence the economy and environment of the urban regions where they are situated

https://revistapesquisa.fapesp.br/en/2016/03/24/the-dna-of-innovation-in-the-metropolises/

FT: São Paulo as a Tech-hub

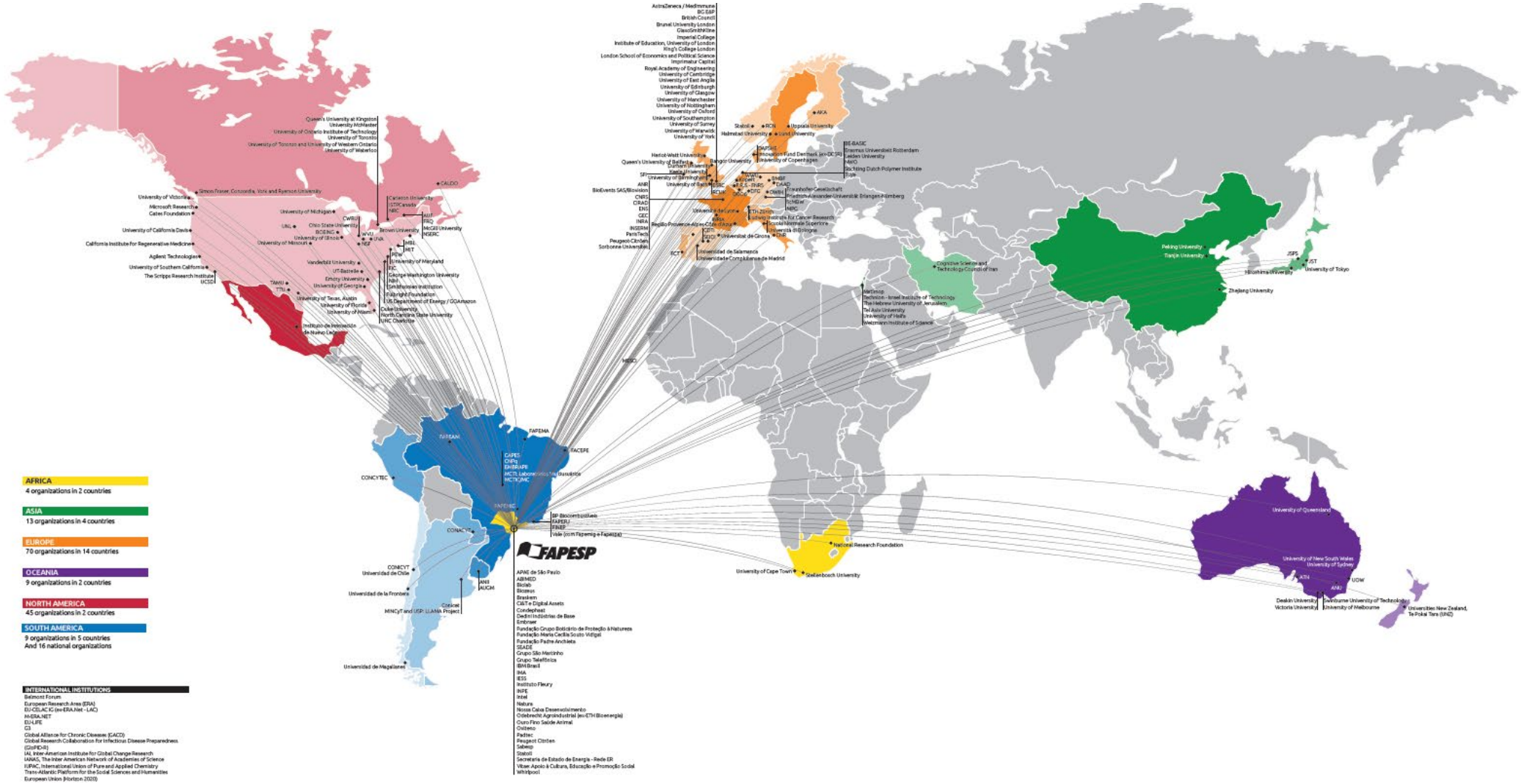




FAPESP: International research collaboration

- Vision
  - Make the State of São Paulo an internationally recognized research hub
- Collaboration entails sending and receiving scientists
  - There is internationally competitive research in São Paulo that attracts qualified foreign researchers
- Collaboration is much more than researcher mobility
  - FAPESP targets full research projects, with multi-year duration, conceived, written, presented and developed together
  - Complex objectives, international competitivity

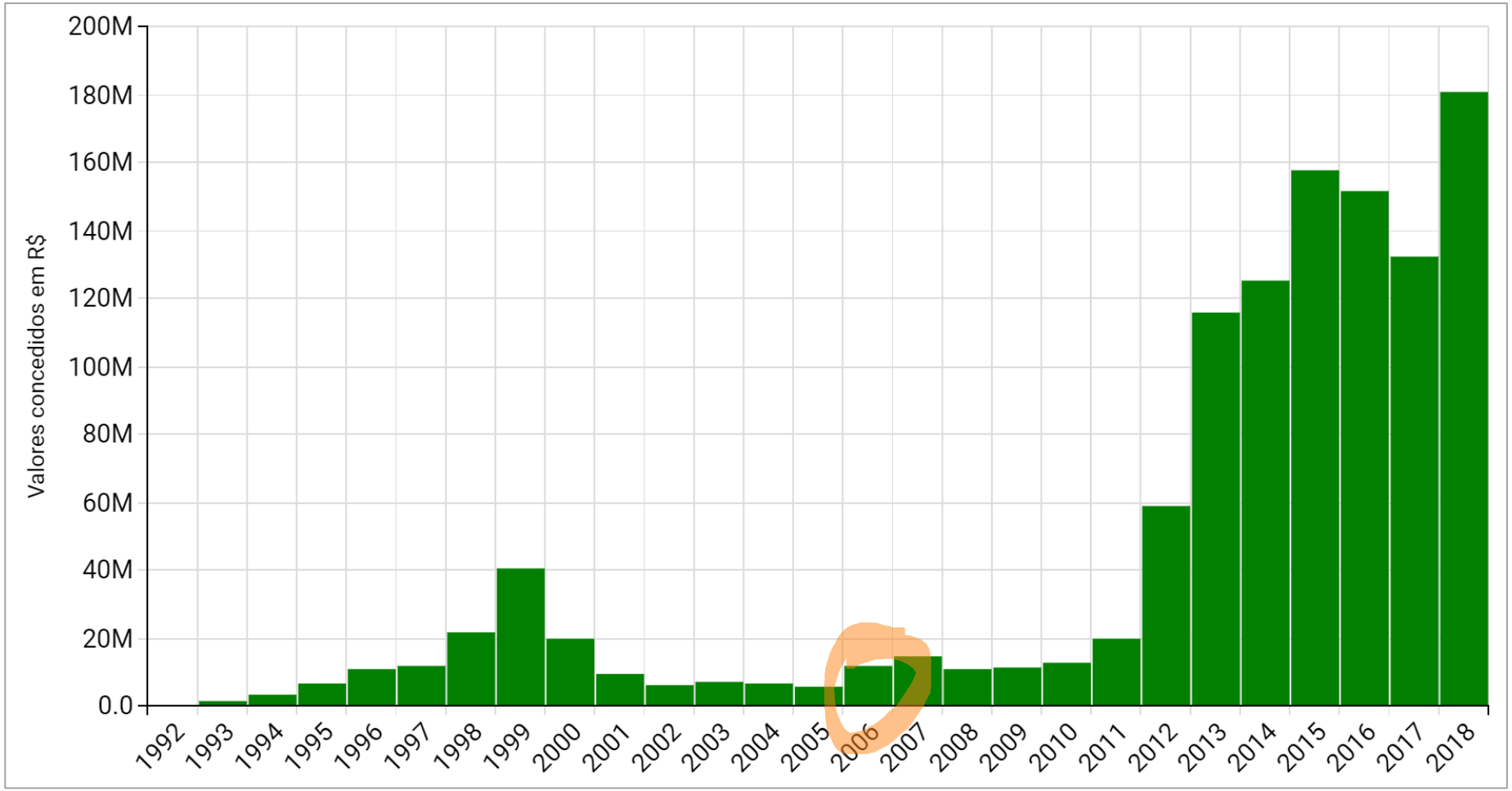
FAPESP's research collaboration connections



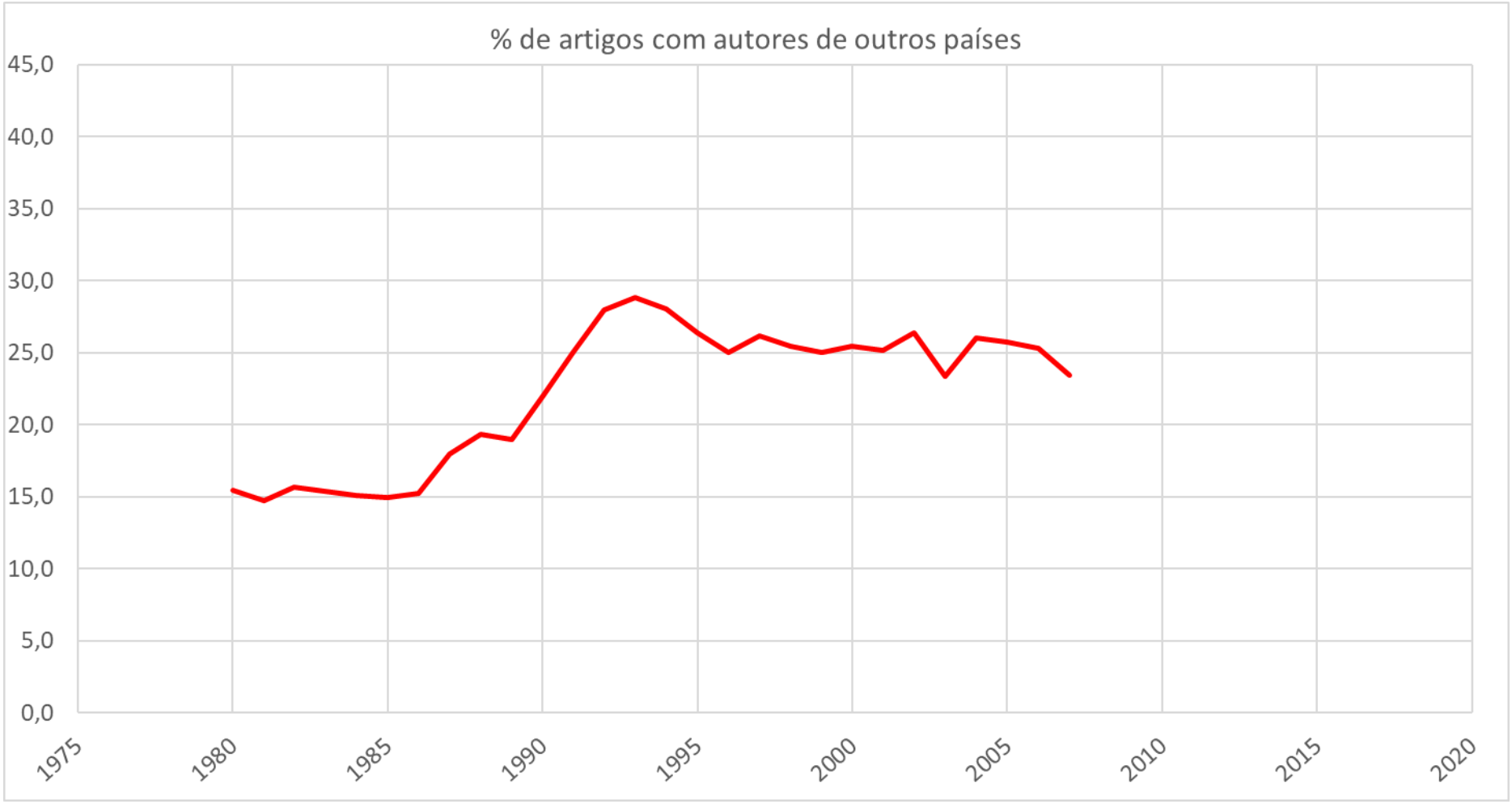
FAPESP: value awarded to grants with (true) international research collaboration

- Agreements with Funding Agencies and Universities
- Projects are conceived jointly
- Peer review selection
- Proposals compete with all other proposals on the table (no set-asides)

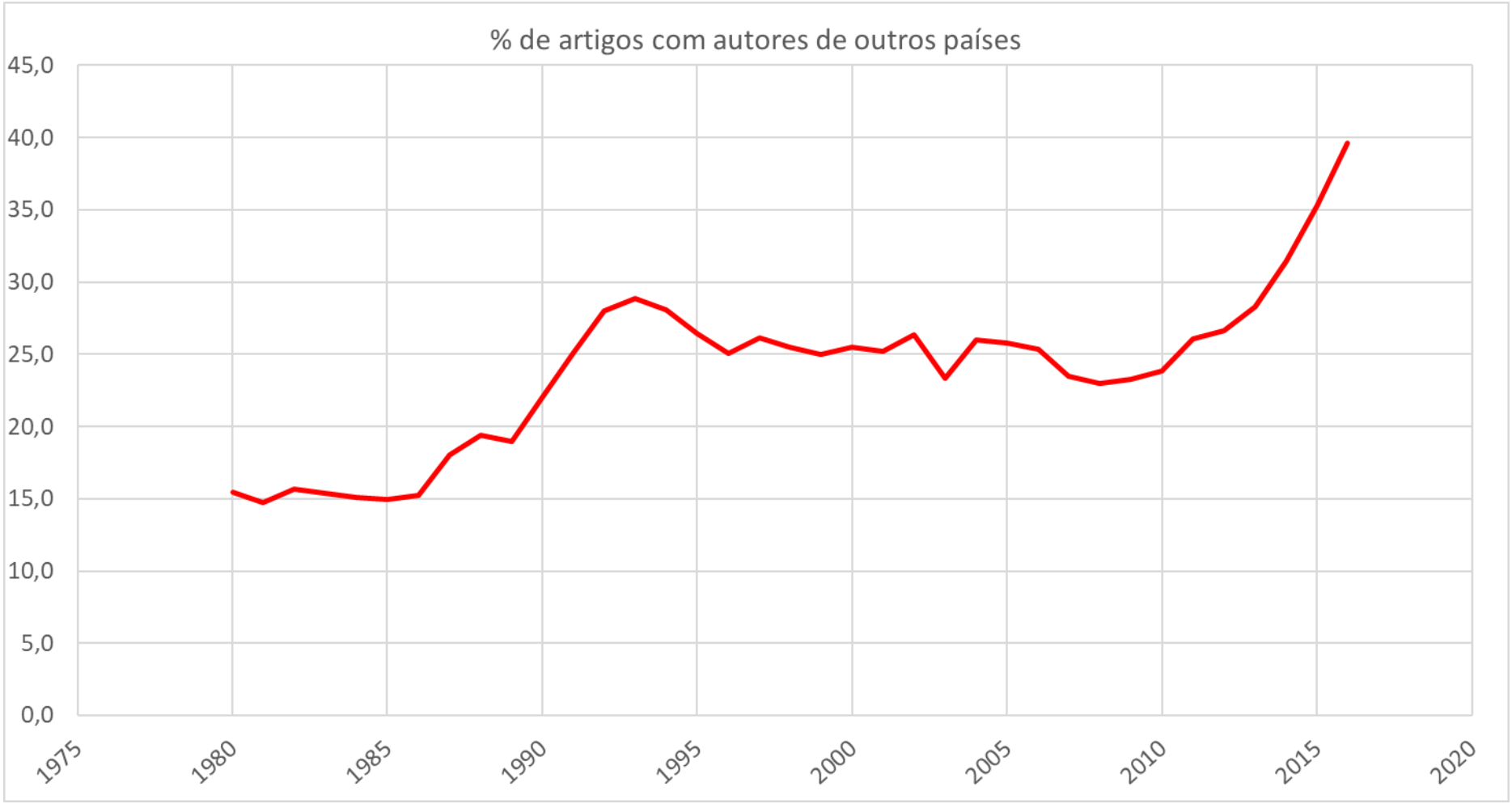
- Plus unilateral FAPESP schemes: visitors, students abroad; Young Investigators



São Paulo: articles with international co-authorship



São Paulo: articles with international co-authorship

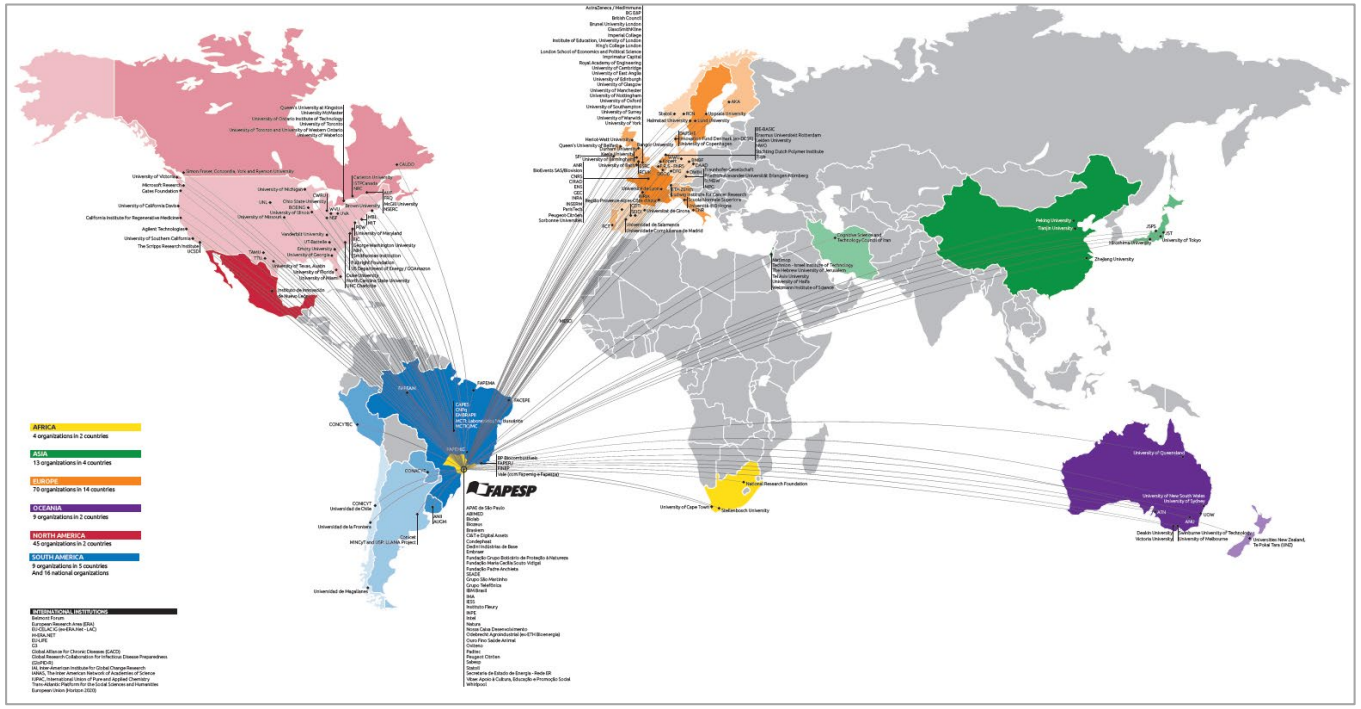


Opportunities for young scientists in SP: Young Investigator Awards

- Targets researchers with 2-5+ years post-doctoral experience in outstanding groups, outside Brazil
  - Open to Brazilians and non-Brazilians
- 5-years grant, extendable for 1-year
  - Value ranges from US$ 200 th to US$ 2 million
    - Fellowship for PI (including travel and installation)
    - Equipment; Consummables; Services; Travel
    - Fellowships for students
- 7,149 proposals, 1,564 awards since 1997
  - 502p/58a in 2018 (1 award every week)
- Info at http://www.fapesp.br/en/4479
- Starting 2017: joint calls with Max Planck Society or YI with Max Planck collaborators
  - http://www.fapesp.br/11986

- **Starting 2018: Young Investigator Award II → 5 years more for outstanding YI in YIA I**

An internationally connected R&D hub in São Paulo, Brazil



- Good supply of qualified researchers
- Stably funded universities and research agency
- Intense, and growing, industrial R&D
  - University-Industry R&D collaboration
  - Lively start-up scene

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

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