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Emprendedorismo y Creación de Empresas Biotecnológicas

DEL 31/8 AL 11/9 2015 DE 9.30 A 18.30 HS EN EL CAMPUS MIGUELETE - UNSAM

Coordinación Dres. Manuel Vega y Lila Drittanti
Profesores: Dres. Liliana Haim y Eliezer Barreiro

Dirigido a Graduados en Biología, Biotecnología, Bioquímica, Química, Veterinaria, Agronomía y áreas afines.

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CABBIO Centro Argentino Brasileño de Biotecnología

Universidad Nacional del Sur – Bahía Blanca

Universidad Nacional de San Martín

IIB-INTECH Instituto de Investigaciones Biotecnológicas

Universidade Federal do Rio de Janeiro

Eliezer J. Barreiro

Profesor Titular

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Laboratório de Avaliação e Síntese de Substâncias Bioativas

http://www.lassbio.icb.ufrj.br/

Instituto Nacional de Ciência e Tecnologia de Fármacos e Medicamentos

http://www.inct-inofar.ccs.ufrj.br/

Eliezer J. Barreiro

Farmacêutico, UFRJ 1971

h=40 (6076)

https://br.linkedin.com/pub/eliezer-j-barreiro/26/.../9...

1971-1973 – MSc (QPN)
Prof. Ben Gilbert

1974-1978 – Docteur D´État, Un Scientifique et Médicale de Grenoble, FR

1979-1985 Prof. Ass DQ

1986 - Professor Titular, FF

1994

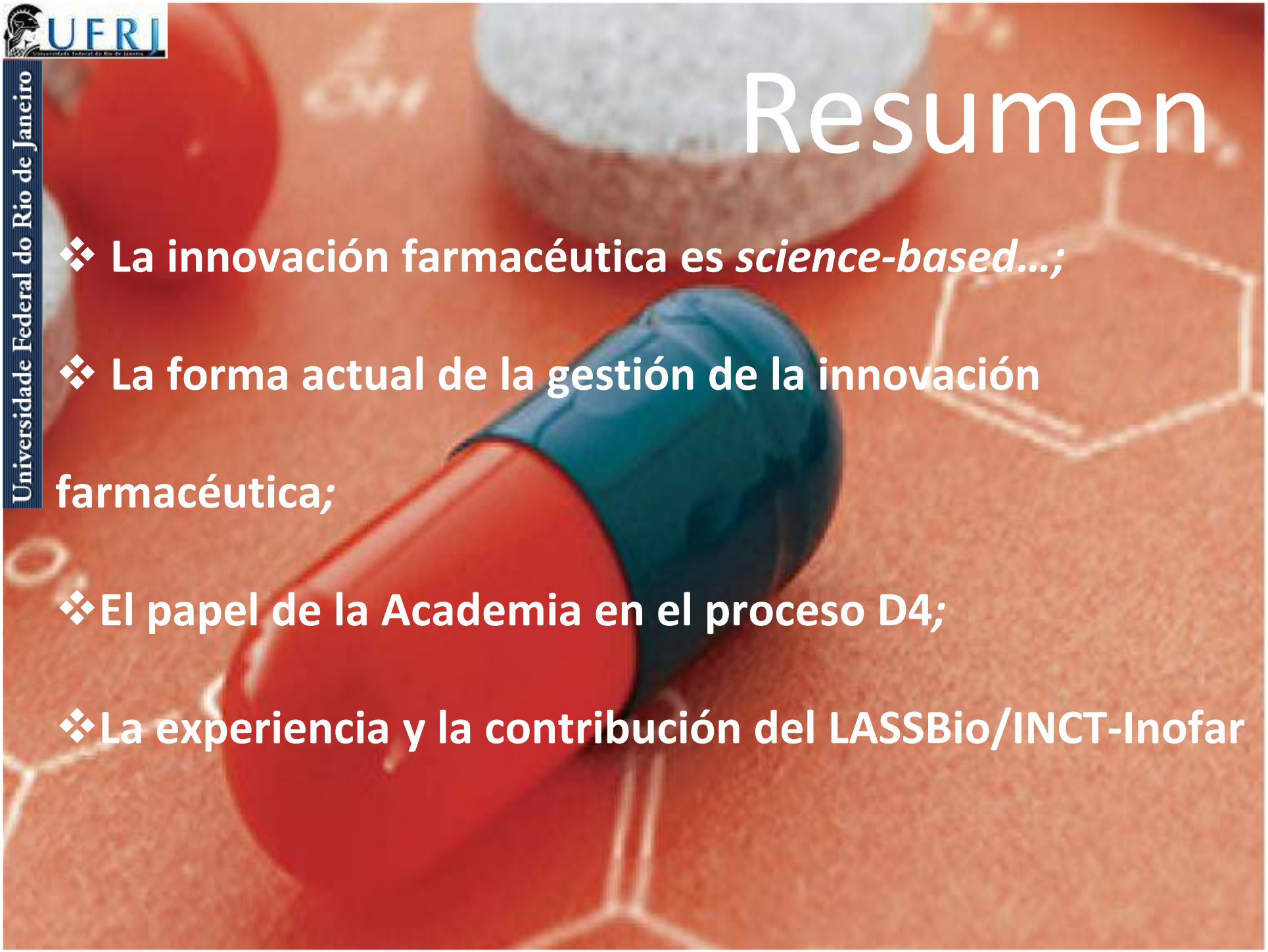
2001 2008 2015

Pós-Graduação em Química IQ-UFRJ

Química Medicinal

instituto nacional de ciência e tecnologia de Fármacos e Medicamentos
www.inct-inofar.ccs.ufrj.br

2009



Resumen

- La innovación farmacéutica es *science-based…;*
- La forma actual de la gestión de la innovación farmacéutica*;*
- El papel de la Academia en el proceso D4*;*
- La experiencia y la contribución del LASSBio/INCT-Inofar

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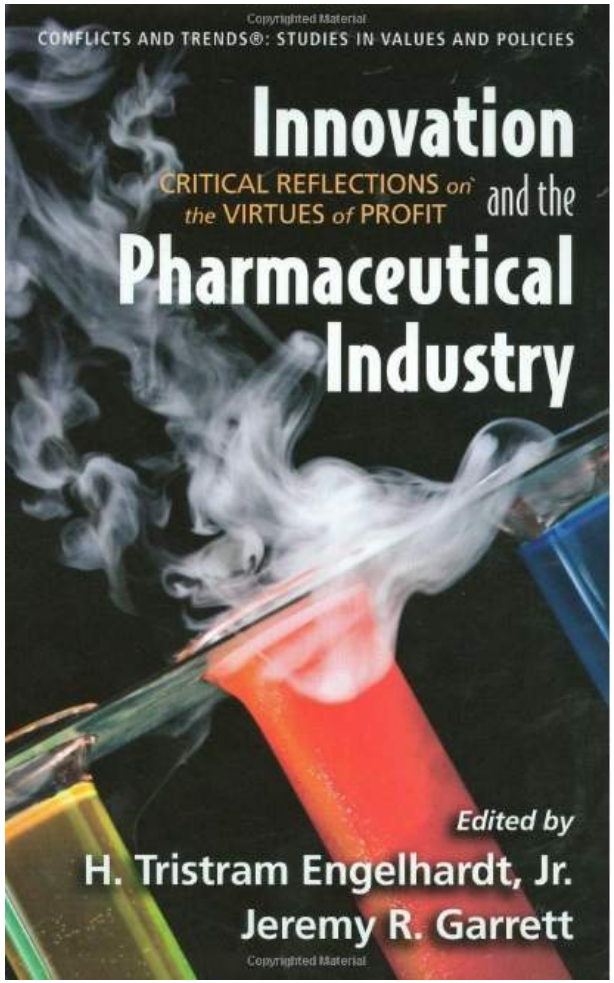

La innovación tecnológica es el proceso más dinámico de la actividad industrial que genera riqueza.

Este dinamismo se acentúa en la innovación farmacéutica radical del sector, más que cualquier otro, depende de la interacción efectiva entre *Ciencia y Tecnología*.

Editorial, Ask the experts: future of the pharmaceutical industry, *Future Med Chem* **2011**, *3*, 1863


El proceso de
innovación
en productos
farmacéuticos
es complejo
e interdisciplinario!

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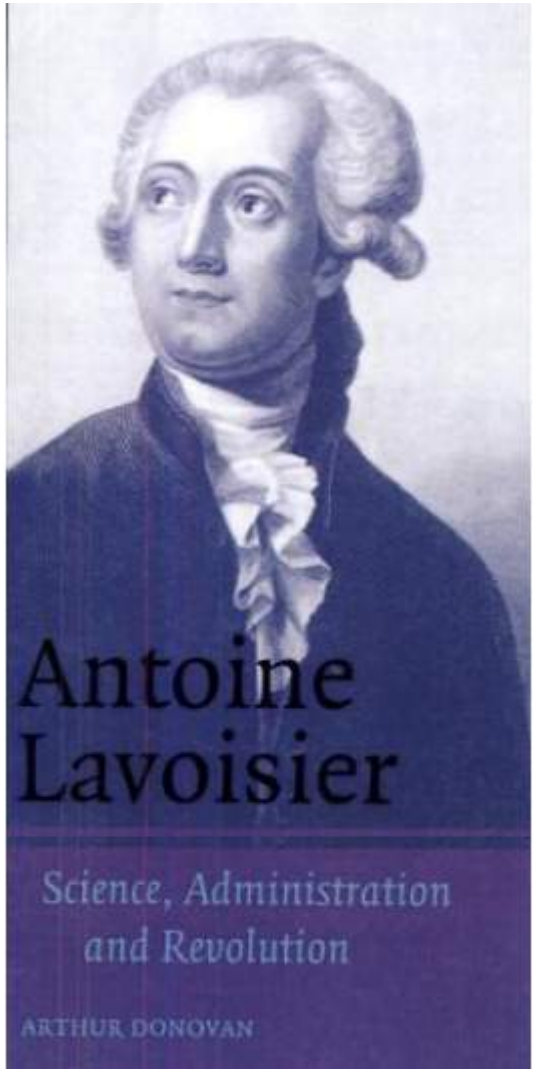

"Most of the work still to be done in science and the useful arts is precisely that which **needs knowledge and cooperation of many scientists and disciplines**.

That is why **it is necessary for scientists and technologists in different disciplines to meet and work together, even those in branches of knowledge which seem to have least relation and connection with one another**."

Antoine Lavoisier, 1793

interdisciplinariedad

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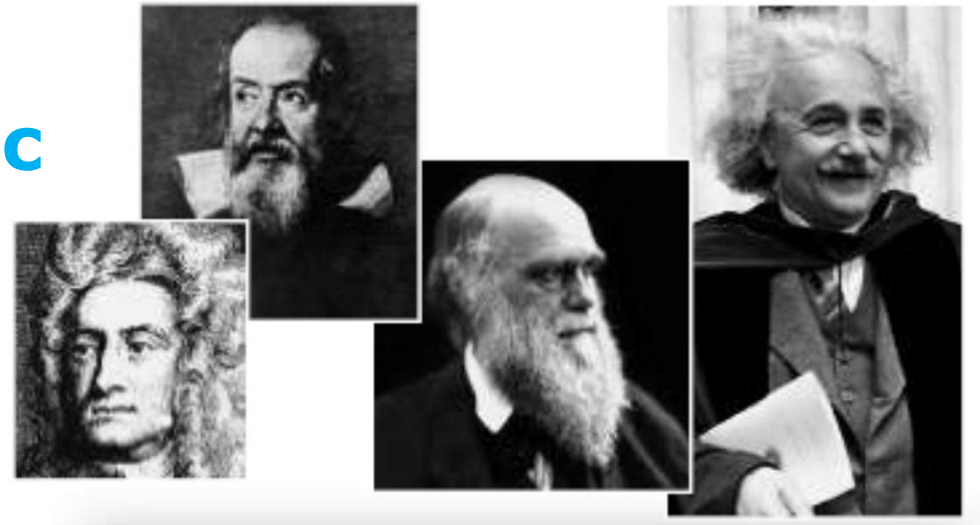
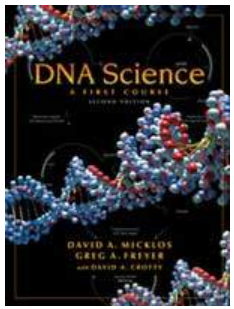
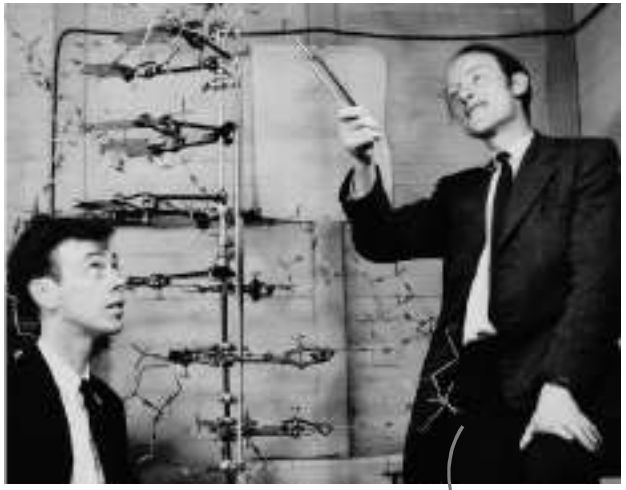
The scientific research through the ages...



Galileo, Newton, Darwin, & Einstein





The physical Crick & the biologist Watson

JD Watson & FHC Crick, A Structure for Deoxyribose Nucleic Acid, *Nature* **1953**, *171*, 737–738 .

The human genome team

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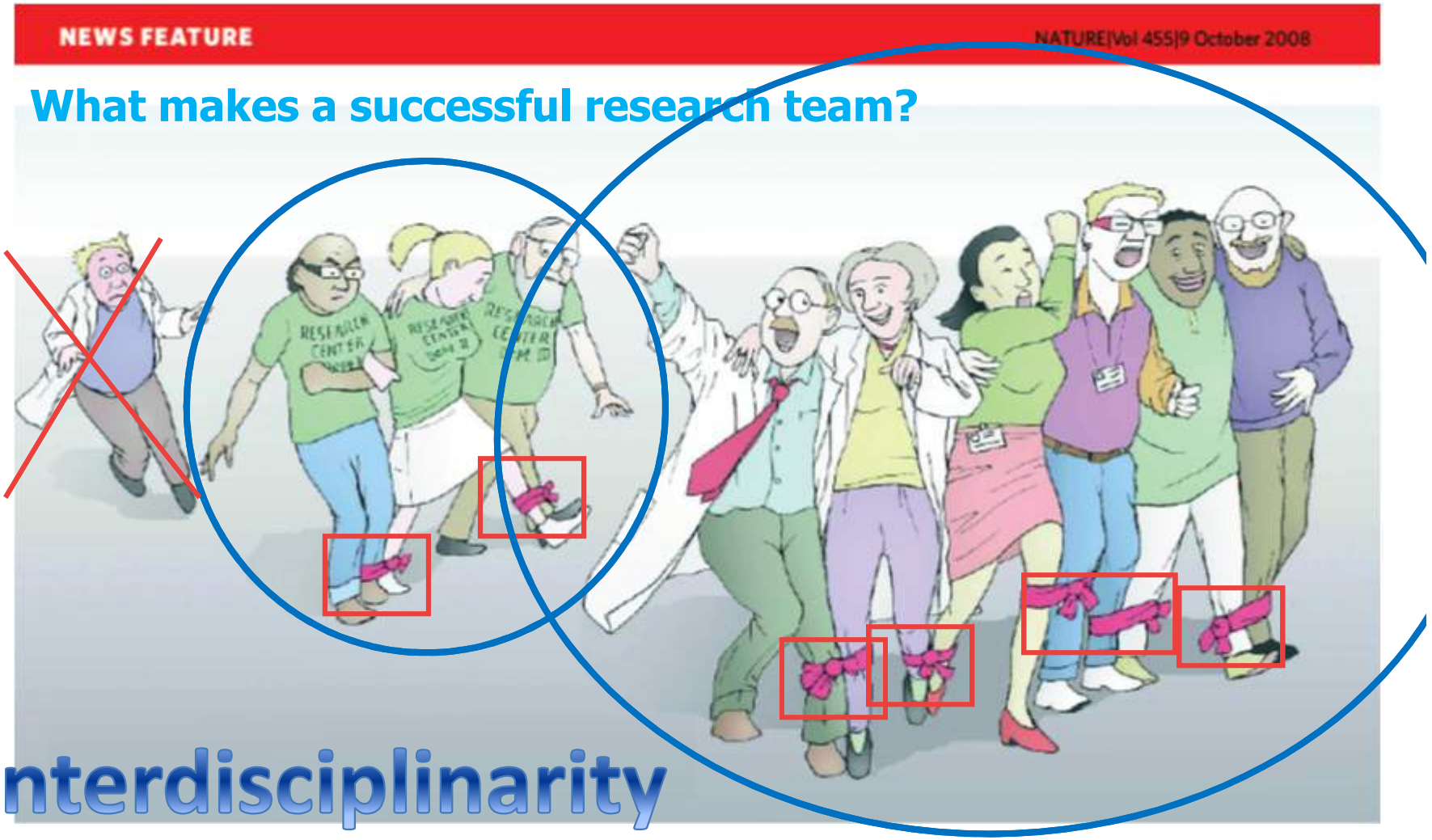
J. Whitfield, *Nature* **2008**, *455*, 720



W Masona, D J Watts, Collaborative learning in networks, *PNAS* **2012**, *109*, 764; M Williams, Productivity Shortfalls in Drug Discovery: Contributions from the Preclinical Sciences?, *JPET* **2011**, *336*, 3; R Guimera, B Uzzi, J Spiro, L A N Amaral, Team Assembly Mechanisms Determine Collaboration Network Structure and Team Performance, *Science* **2005**, *308*, 697.

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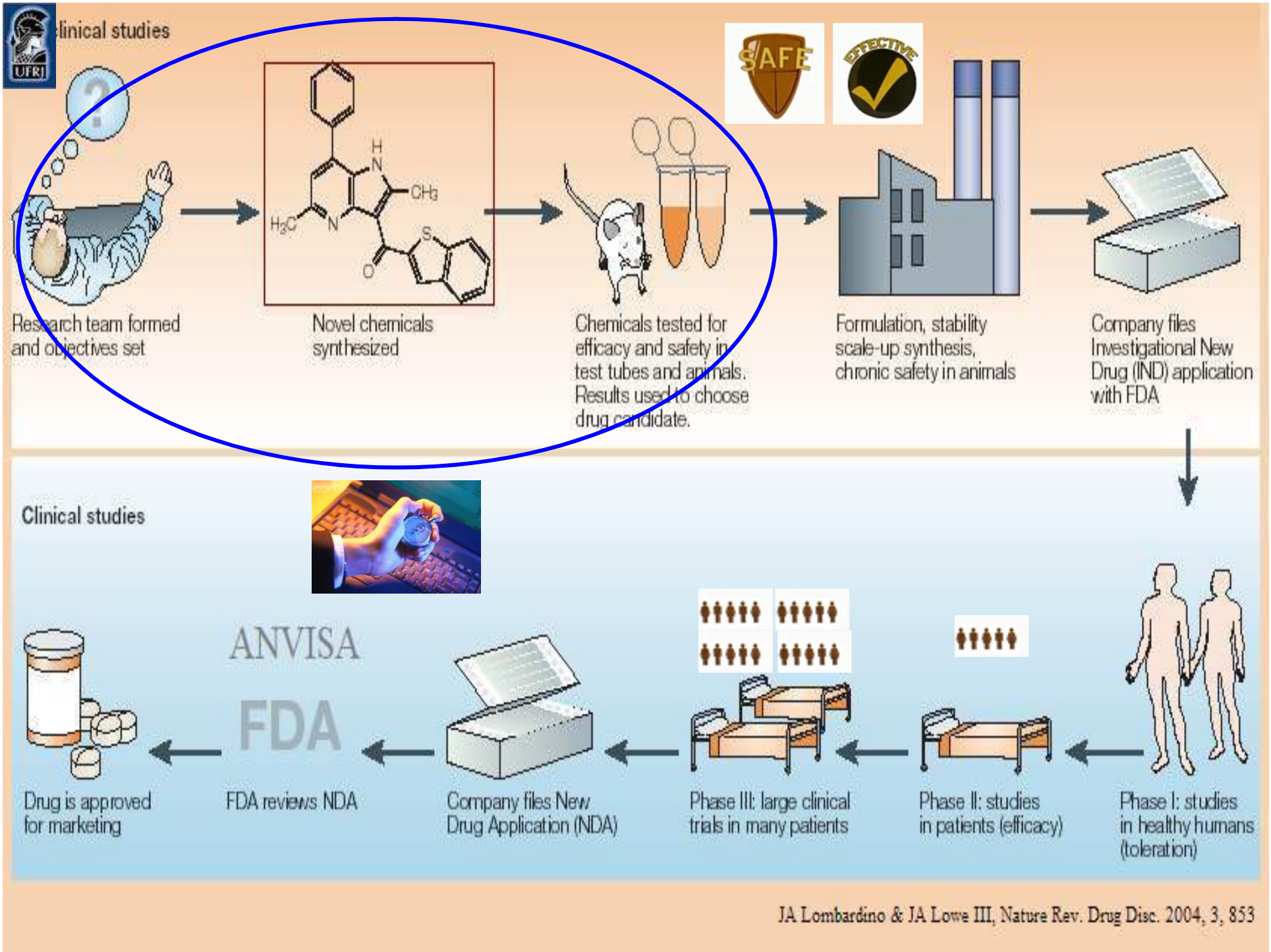
linical studies
SAFE
EFFECTIVE
Research team formed and objectives set
Novel chemicals synthesized
Chemicals tested for efficacy and safety in test tubes and animals. Results used to choose drug candidate.
Formulation, stability scale-up synthesis, chronic safety in animals
Company files Investigational New Drug (IND) application with FDA
Clinical studies
Phase I: studies in healthy humans (toleration)
Phase II: studies in patients (efficacy)
Phase III: large clinical trials in many patients
Company files New Drug Application (NDA)
ANVISA
FDA
FDA reviews NDA
Drug is approved for marketing
JA Lombardino & JA Lowe III, Nature Rev. Drug Disc. 2004, 3, 853

The drug discovery & development process

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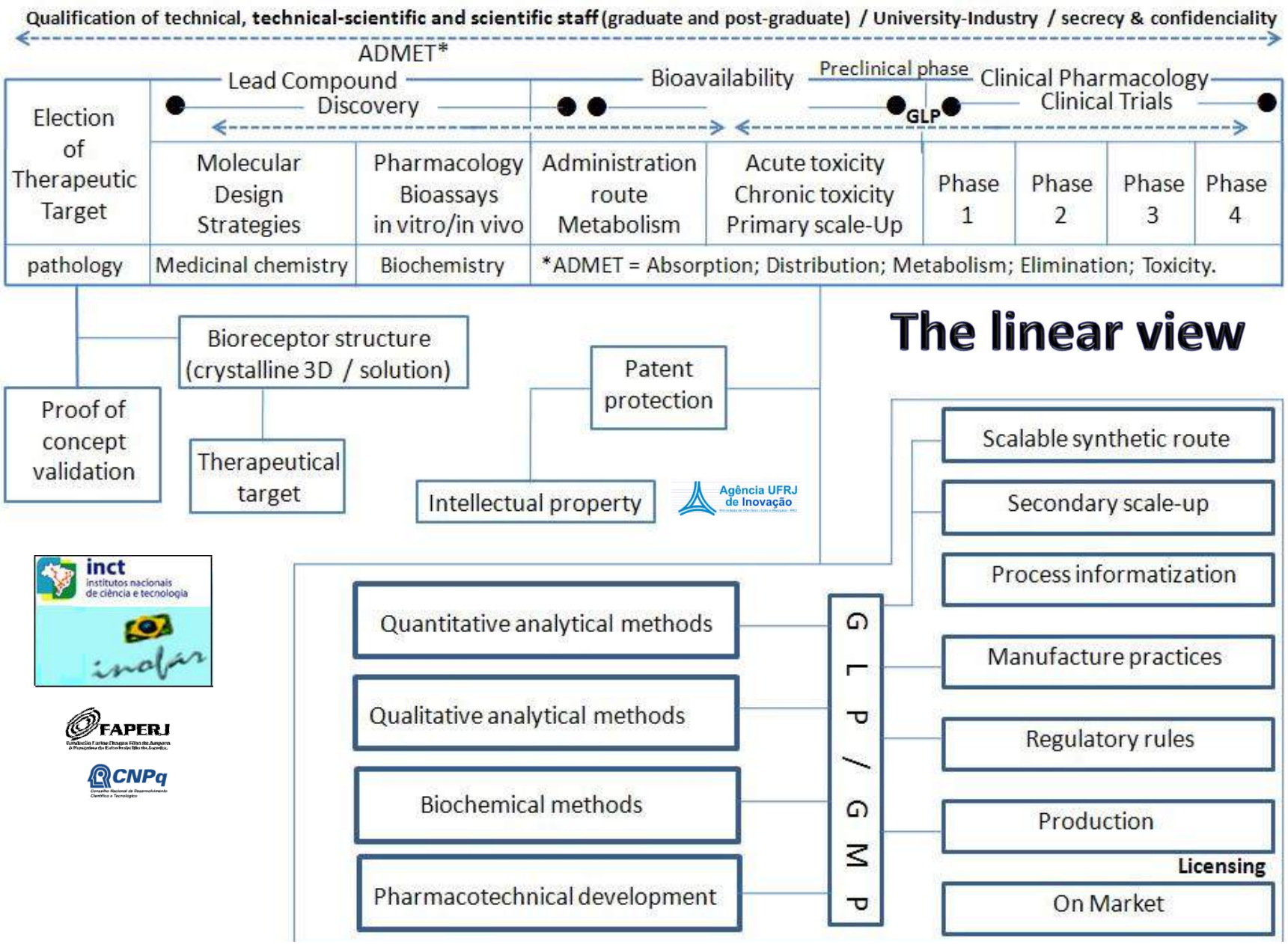
The drug discovery & development process



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INOVAÇÃO Farmacêutica

Pharma

Química Medicinal

med chem

Paso Búsqueda

Paso Desarrollo

Inicial: Realização dos ensaios pré-clínicos
Tardia: Realização dos ensaios clínicos (Fase I, Fase II e Fase III).

Seleção do alvo molecular; Desenvolvimento dos ensaios farmacológicos *in vitro* e *in vivo*; Desenho de ligantes; Síntese; Identificação & Otimização do Protótipo.

Lead compound

Composto-protótipo

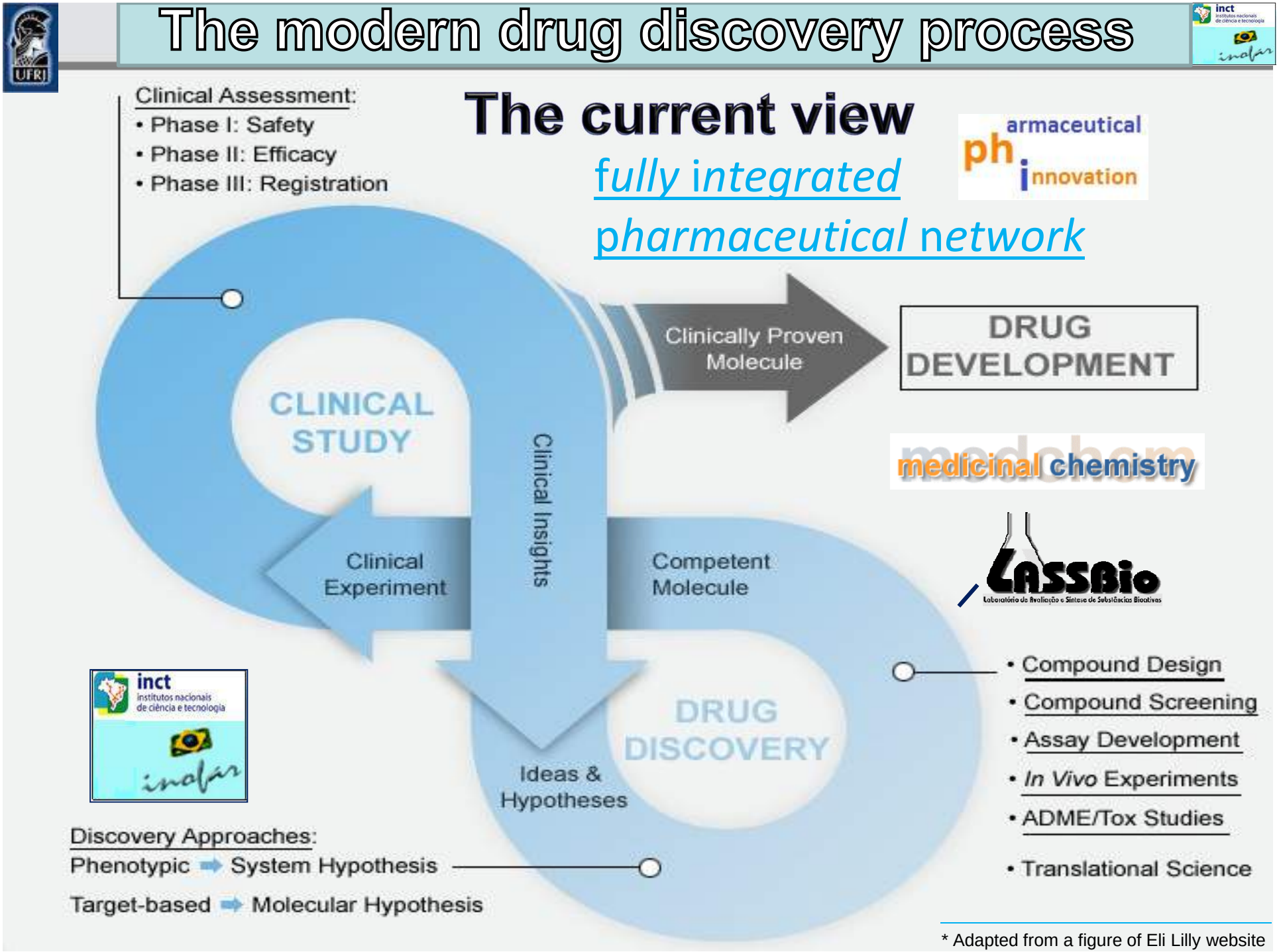
Paso comercialización

Etapa Reguladora

Marketing e vendas

ANVISA;
EMEA;
FDA:

The modern drug discovery process



* Adapted from a figure of Eli Lilly website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La innovación no espera..
Impact
Innovation
Ideas
Inspiration
Initiative

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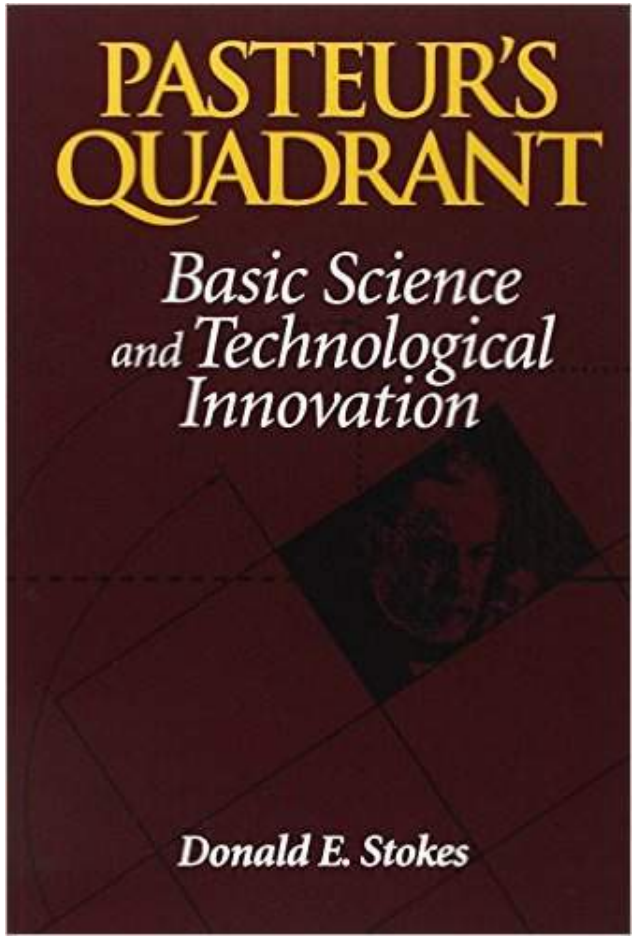
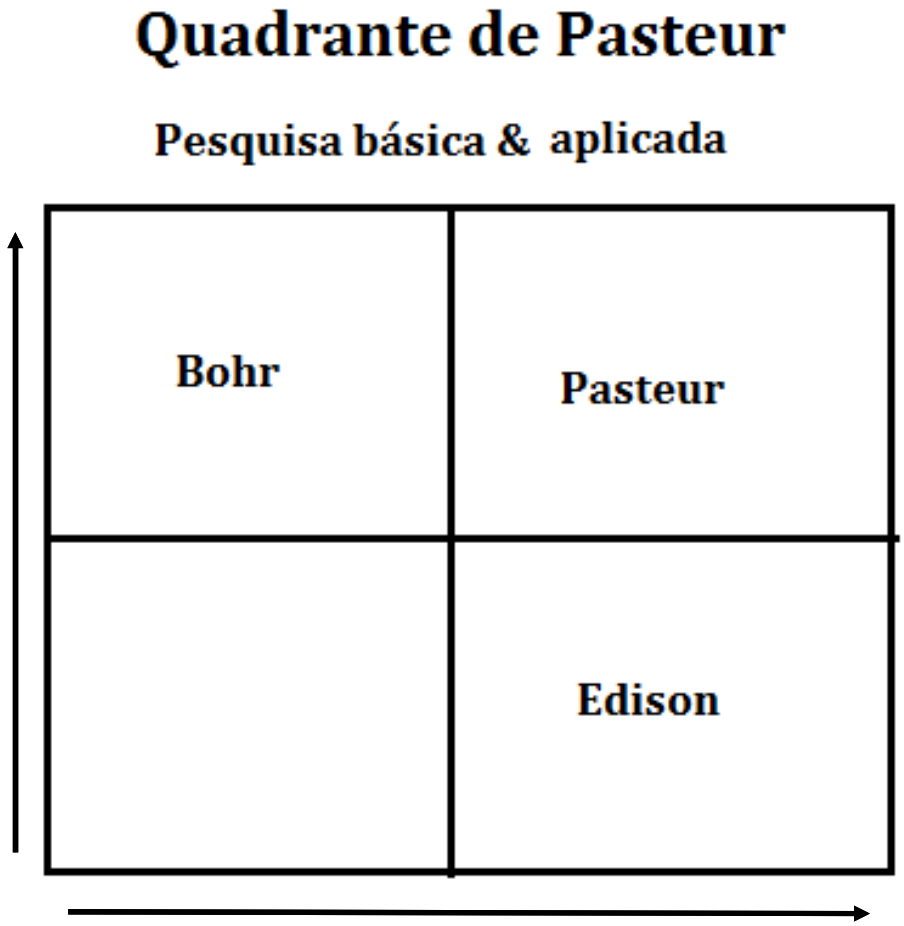
1928-1997



Woodrow Wilson School of Public and International Affairs at Princeton University (1997)



Translational Science

D. Butler, *Nature* **2008**, *453*, 840; doi:10.1038/453840a

La investigación traslacional significa diferentes cosas para diferentes personas, pero parece importante a casi todos [a)]

[a)] S.H. Woolf, *JAMA*, **2008**, *299*, 211; B.S. Coller, R. M. Califf, *Sci Translational Medicine* **2009**, *1*, 1.

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The worldwide drug Market was US$ >945 billion (2014)

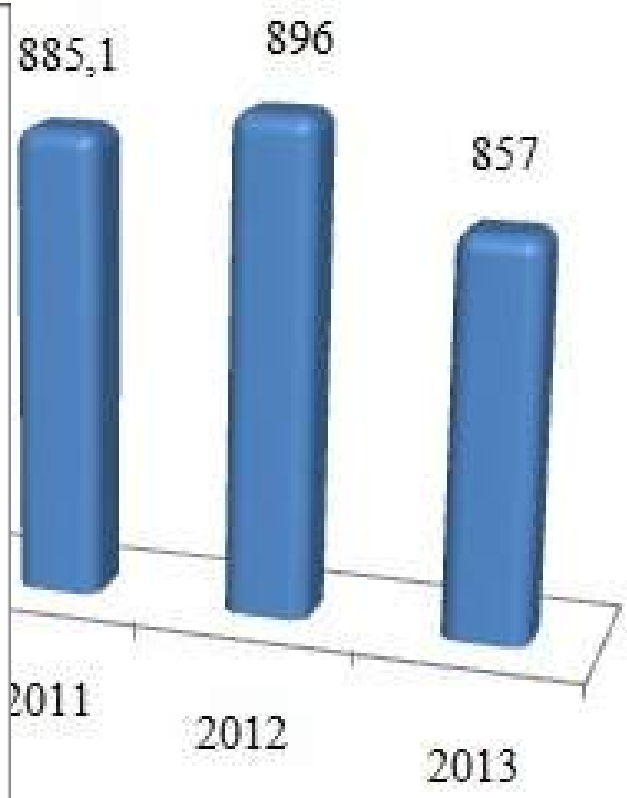
Mercado global de medicamentos

TOP 10 COMPANIES

Sales decline as patents expire

	SALES[a] ($ BILLIONS)	12-MONTH CHANGE IN SALES
Novartis	$50.5	4.0%
Pfizer	43.4	3.0
Sanofi	37.5	6.2
Merck & Co.	35.4	0.2
Roche	35.0	4.1
Johnson & Johnson	32.7	18.3
AstraZeneca	32.3	5.3
GlaxoSmithKline	30.9	1.2
Teva	24.9	3.8
Eli Lilly & Co.	21.2	-2.0
TOTAL	$343.8	0.1%
GLOBAL MARKET	$901.3	5.5%

a For the 12 months ending on June 30, 2014.
SOURCE: IMS Institute for Healthcare Informatics



(Dez. 09) p. 12-17

2014 – Estimado em US$ 945 bilhões

2014 FDA drug approvals

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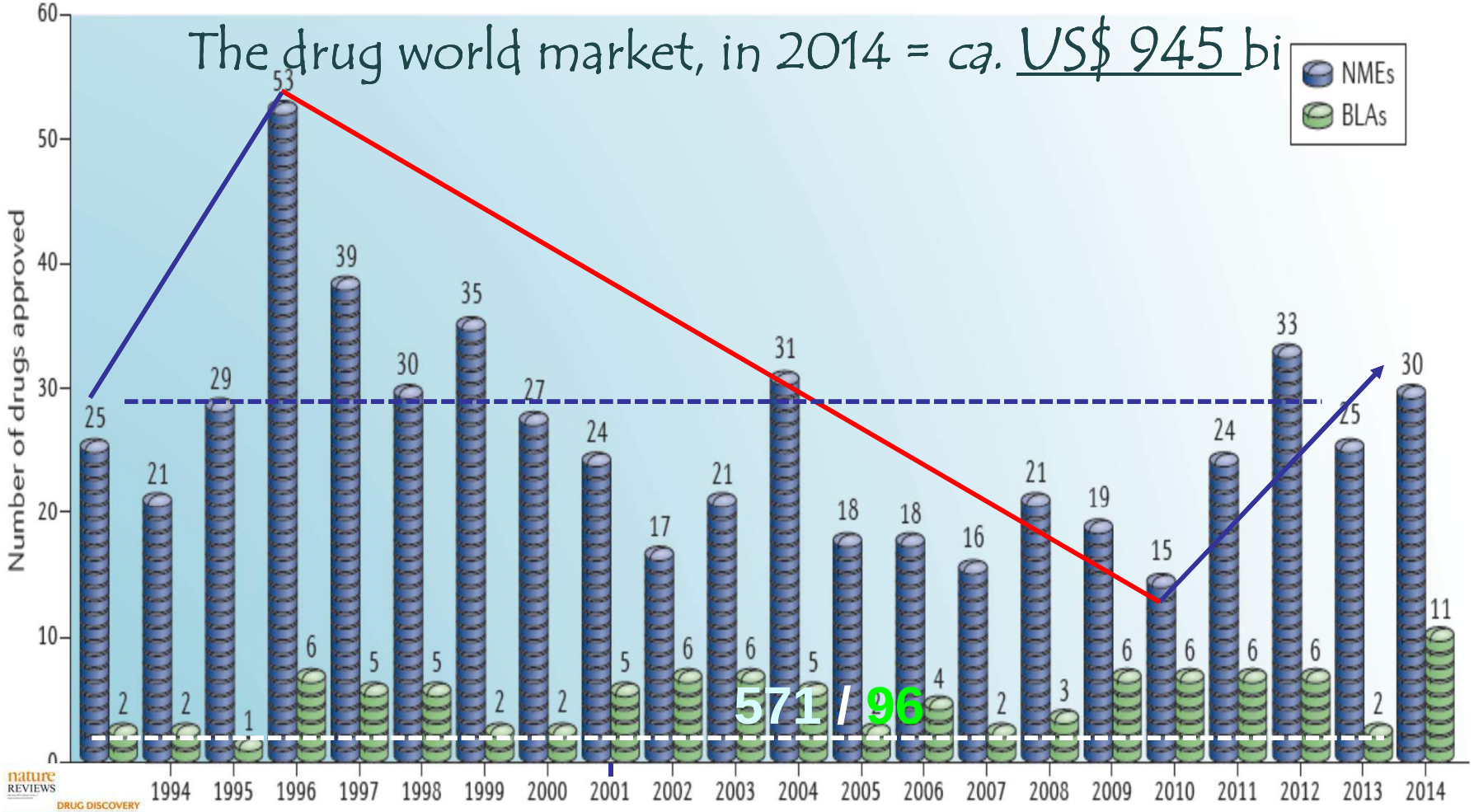

A Mullard, *Nature Rev. Drug Discov*. **2015**, *14*, 77-81

Fuerte 2012, pero sólo unos pocos *blockbusters* potenciales (apixaban; Elequis^{R})

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ACS Medicinal Chemistry Letters

medicinal chemistry

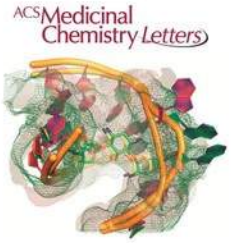
Viewpoint

pubs.acs.org/acsmedchemlett

Drug Discovery in an Academic Setting: Playing to the Strengths

Donna M. Huryn*

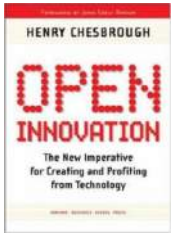
Department of Pharmaceutical Sciences, University of Pittsburgh, 712 Salk Hall, 3501 Terrace Street, Pittsburgh, Pennsylvania 1526 United States



Inter-alia: CJ Tralau-Stewart et al., UK academic drug discovery, *Nature Rev. Drug Discov*. **2014**, *13*,15; **M Alvim-Gaston** et al. Open Innovation Drug Discovery (OIDD): A Potential Path to Novel Therapeutic Chemical Space, *Curr Top Med Chem* **2014**, *14*, 294; SP Forster et al. Virtual pharmaceutical companies: collaborating flexibly in pharmaceutical development, *Drug Discov. Today* **2014**, *19*, 348; JM Abou-Gharbia, WE Childers, Discovery of Innovative Therapeutics: Today's Realities and Tomorrow's Vision. 1. Criticisms Faced by the Pharmaceutical Industry , *J. Med. Chem*. **2013**, *56*, 5659; BS Slusher et al., Bringing together the academic drug discovery community, *Nature Rev. Drug Discov.* **2013**, *12*, 811; H Wild, C Huwe, M Lessl, Collaborative Innovation — Regaining the Edge in Drug Discovery, *Angew. Chem. Int. Ed*. **2013**, *52*, 2684; A A Toole, The impact of public basic research on industrial innovation: Evidence from the pharmaceutical industry, *Res. Policy* **2012,** *41*, 1; W Scannell, A Blanckley, H Boldon, B Warrington, Diagnosing the decline in pharmaceutical R&D efficiency, *Nature Rev. Drug Discov.* **2012**, *11*, 191; W L Jorgensen, Challenges for Academic Drug Discovery, *Angew. Chem. Int.Ed.* **2012**, *51*,11680; S Frye et al., US Academic Drug Discovery, *Nature Rev. Drug Discov.* **2011**, *10*, 409; C J Tralau-Stewart et al., Drug Discovery: New models for Industry-academic partnerships, *Drug Discov. Today* **2009**, *14*, 95; PG Wyatt, The emerging academic drug discovery sector, *Future Med. Chem*. **2009**, *1*, 1013.

" .... a university has a number of unique characteristics that could contribute to making it an ideal enviroment where drug discovery & medicinal chemistry activities can thrive....*There is no doubt that academia can play an important role in drug discovery*"

ACS Med. Chem. Lett. **2013**, *4*, 313



Henry Chesbrough

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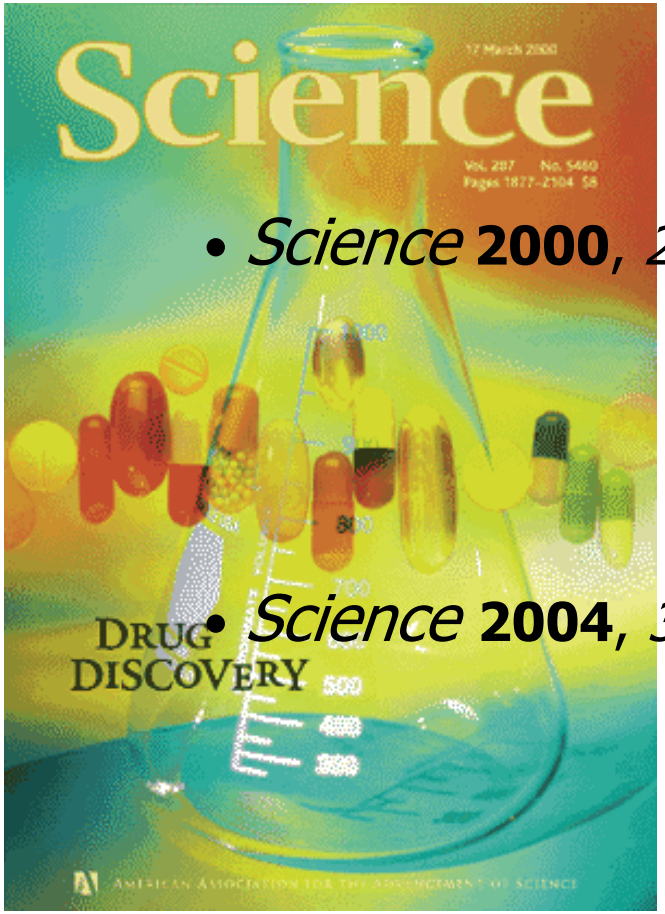
La innovación farmacêutica...



- *Science* **2000**, *287*, 1951 (J. Uppenbrink,J.Mervis)

- *Science* **2004**, *303*, 1713 (D. Kennedy)

...es science-based!

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1902

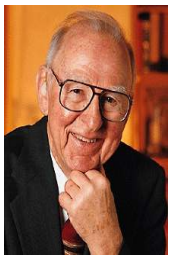
- *207* pesquisadores ganharam o Prêmio Nobel de Medicina desde 1901-2014

- *168* pesquisadores ganharam o Prêmio Nobel de Química desde 1901-2014

Alexander Fleming
Robert J. Lefkowitz

Emil Fischer
Sune K Bergström
George Hitchings
Ernest B Chain
Edwin G Krebs
Howard W. Florey

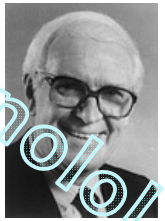
John R Vane



Dorothy C Hodgkin
Robert Robinson

Arieh Warshel
Brian K Kobilka
Gerhard Domagk

Martin Karplus
Gertrude B Elion
James W Black
Bengt I Samuelsson
Edmond H Fischer
Michael Levitt



2014

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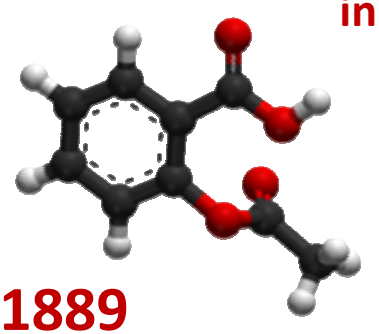
The Nobel Prize in Medicine & Physiology 1982



1889

AAS

$C_9H_8O_4$

Sune Bergström (66)

(1916-2004)

1982

John Vane (55)

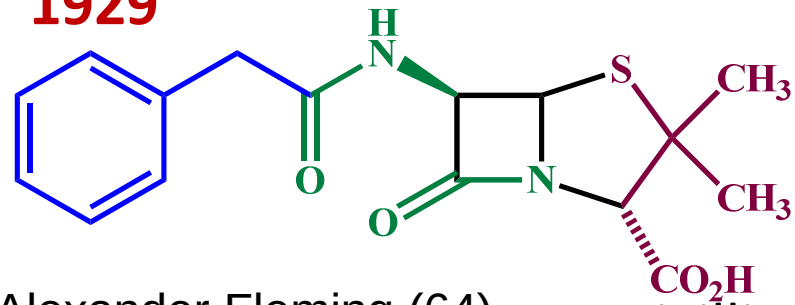
(1927-2004)

Bengt Samuelsson (48)

(1934)

1945

1929



Sir Alexander Fleming (64)

(1881-1955)

penicillin

$C_{16}H_{18}N_2O_4S$

E. Boris Chain (39)

(1906-1979)

Howard W. Florey (47)

(1898-1968)

1964

Dorothy C. Hodgkin (54)

(1910-1994)

The Nobel Prize in Medicine & Physiology 1945

The Nobel Prize in Chemistry 1964

Tinibes: inibidores de TK's

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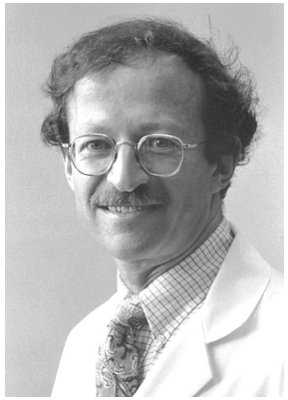
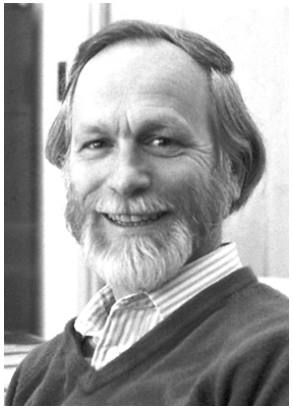


Harold E. Varmus (50)
(1939)

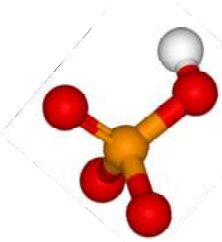
1989



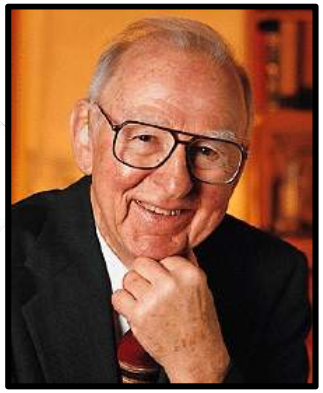
"for their discovery of the cellular origin of retroviral oncogenes"

J. Michael Bishop (53)
(1936)

1989

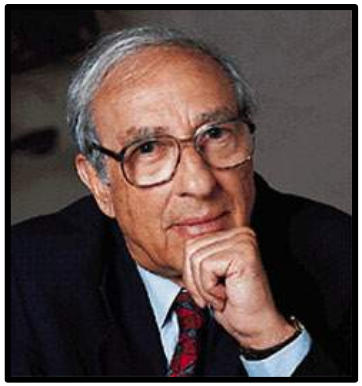


kinoma

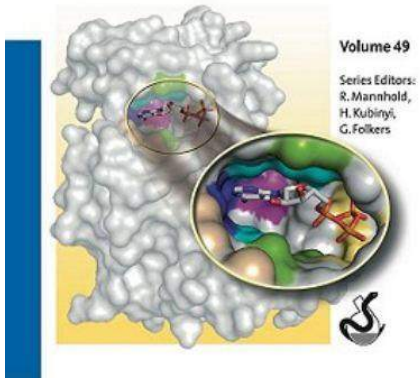


Edwin G. Krebs (72)
(1918 –2009)

1992



Edmond H. Fischer (72)
(1920)

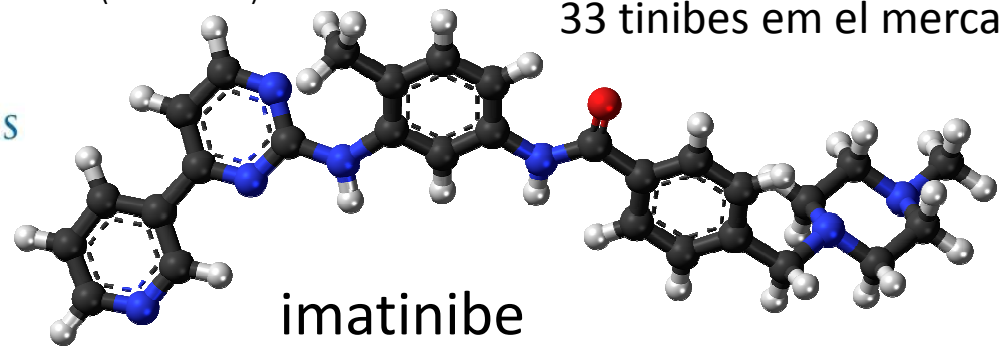


NOVARTIS

2001

Nicholas Lydon
(1957)

33 tinibes em el mercado



imatinibe

Estatinas: multimillonario innovación

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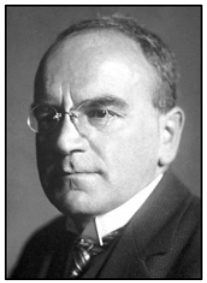
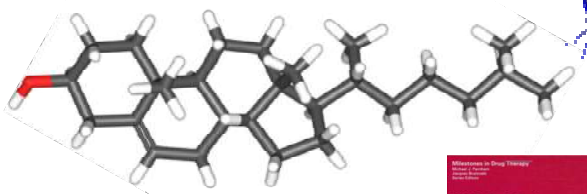


Heinrich Wieland (50)
(1877-1957)

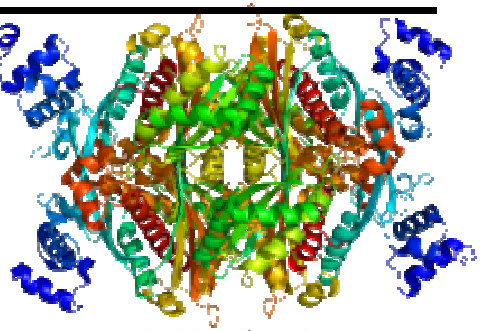
1927

Adolf Windaus (52)
(1876-1959)

1928



colesterol

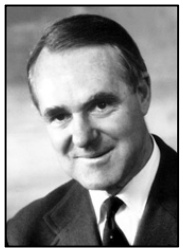


HMGCoAR

1964

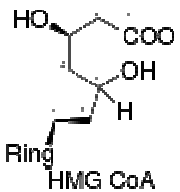
Konrad Bloch (53)
(1912-2000)

Feodor Lynen (54)
(1911-1979)

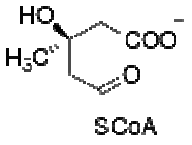


John Cornforth (58)
(1917-2013)

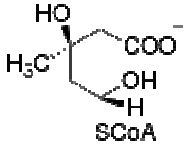
1975



HMG CoA Reductase inhibitor

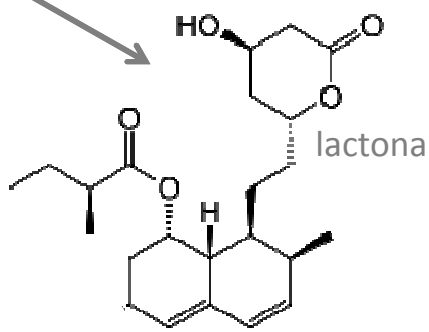


HMG CoA



Mevaldyl CoA transition state intermediate

J Med Chem
1985, *28*, 1



lactona

1985

LDL

Joseph L Goldstein (45)
(1940)

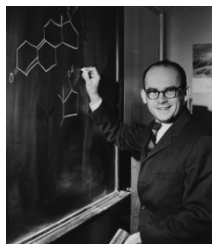
Michael S Brown (44)
(1941)

University of Texas, Dallas

Akira Endo
(1933)

Albert Lasker Award
for Clinical
Medical Research, 2008*

Daiichi-Sankyo



Mevilonina
/compactina

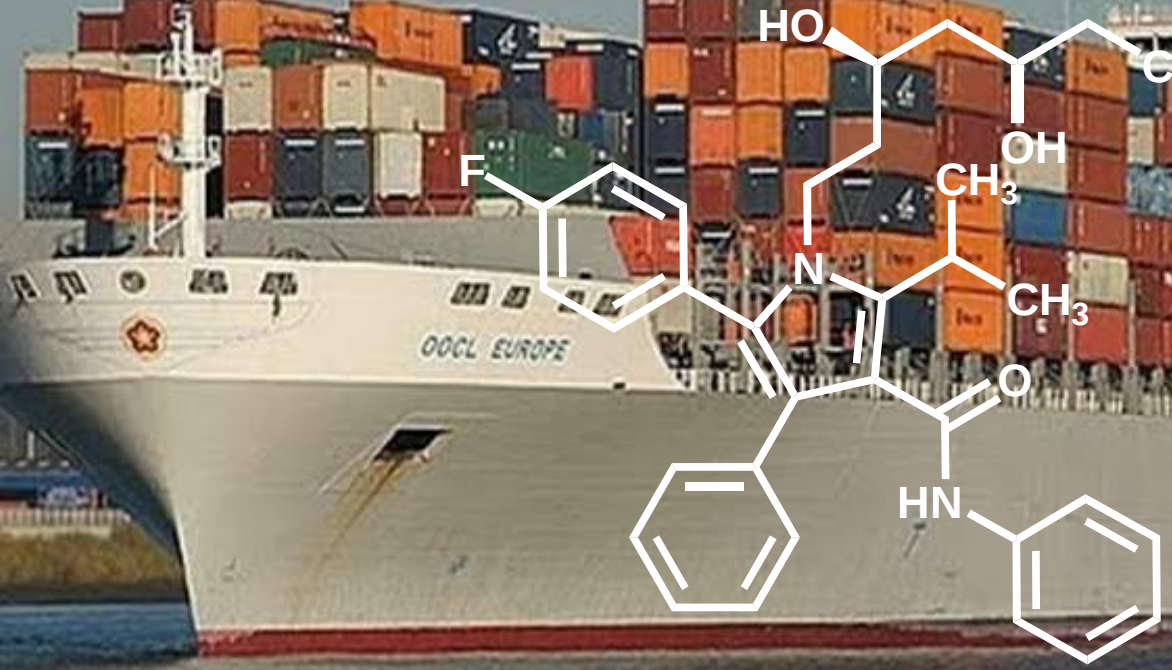
1979 Simvastatina

Arthur A Patchet
(1929)

New Lead Discovery Department
Merck Co.

Universidade Federal do Rio de Janeiro

La Big-Pharma ...



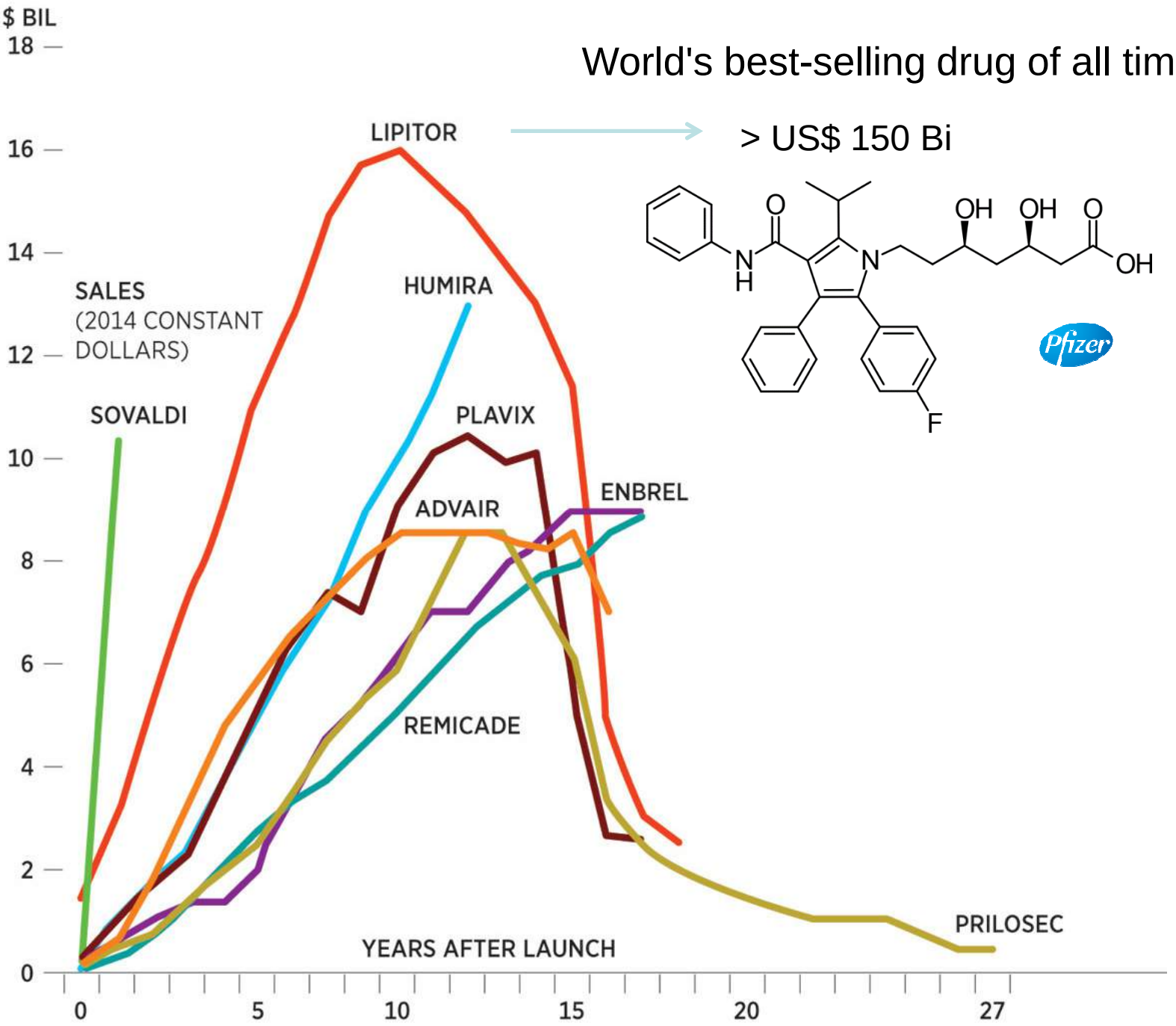
1991-2011 = US$ > 150 bilhões

... y el síndrome de blockbuster!

Universidade Federal do Rio de Janeiro

World's best-selling drug of all time

> US$ 150 Bi



Universidade Federal do Rio de Janeiro

J Adams,
Collaborations:
The rise of research network,
Nature **2012**, *490*, 335

Bright lines in this map of scientific collaborations between 2005 and 2009 show many joint publications.

The rise of research networks

New collaboration patterns are changing the global balance of science. Established superpowers need to keep up or be left behind, says **Jonathan Adams**.

THE NEW MAP OF SCIENCE

Today more nations – from China and India to Singapore, Brazil and South Korea – are taking their place at the high table of research alongside the traditional science superpowers. At the same time national boundaries are being transcended through collaboration networks and 'brain circulation'. In this special issue *Nature* examines how the movement of people and ideas will change how science is done, how it is funded and the questions that it addresses.

Image credit: Jasiek Krzysztofiak

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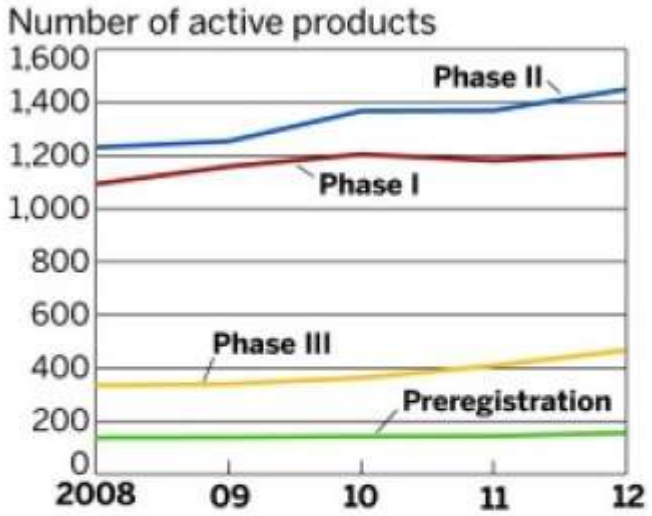
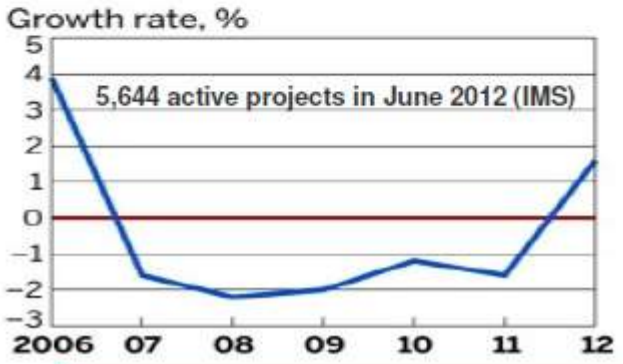
Challenges for Pharmaceutical Industry
The Pipelines are filling up!





60% Phase I projects not from big pharma

Trend to reduce inhouse R&D, but license-in

AZ cuts 2.000 R&D jobs but increase academic and other research partners that perform experiments designed in collaboration with the drug company.

Sanofi eliminate 900 jobs by 2015 but deal with Third Rock Ventures, Greylock Partners and Harvard University

Merck & Co. decided to invest $90 million over seven years to help launch the California Institute for Biomedical Research (Calibr)

Novartis' pact with the University of Pennsylvania to develop immunotherapies for the treatment of cancer.

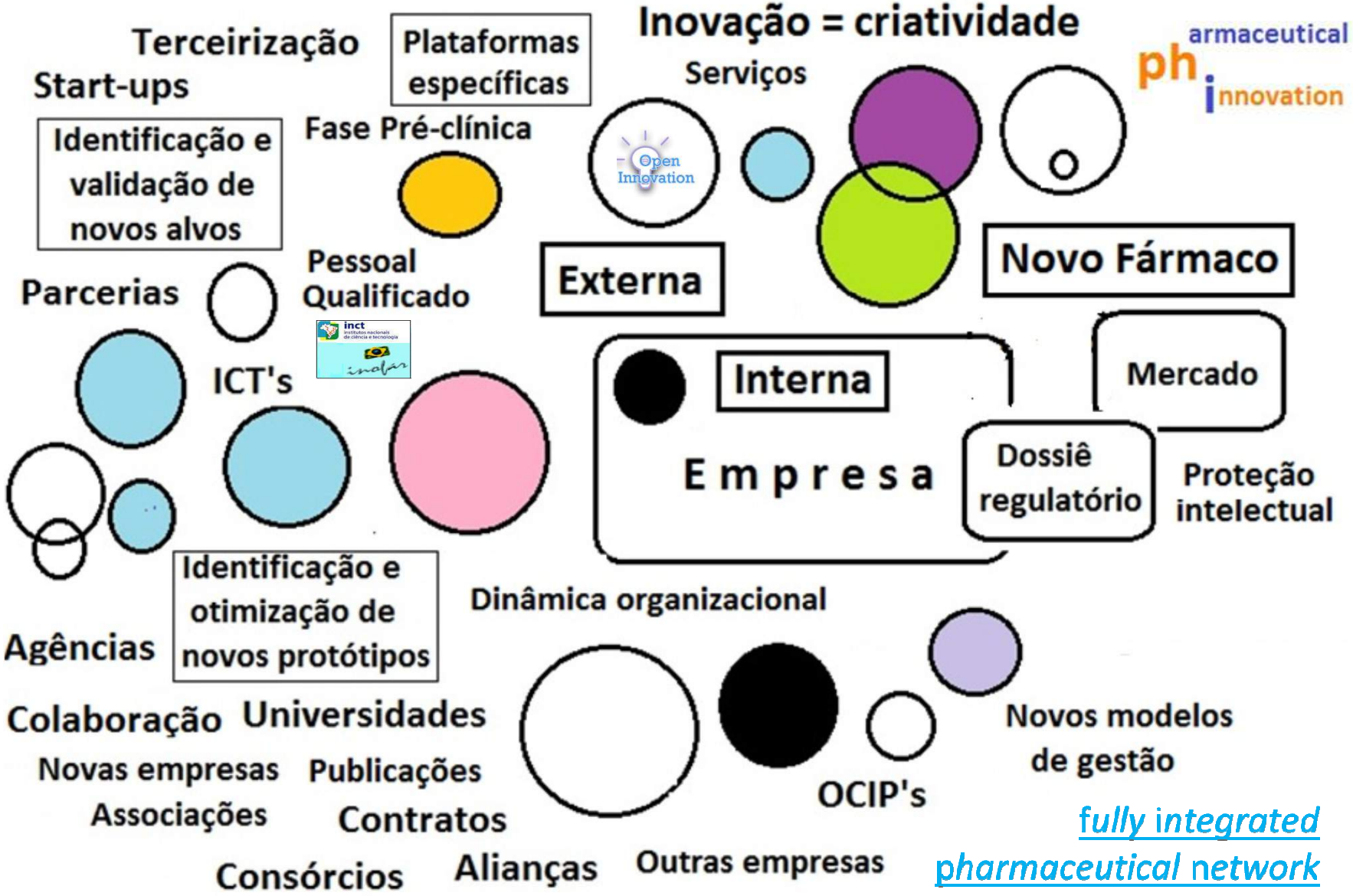
BMS teamed with the Vanderbilt Center for Neuroscience Drug Discovery

Pfizer opens Centers for Therapeutic Innovation (CTI) now operate in San Francisco, San Diego, New York City, and Boston.

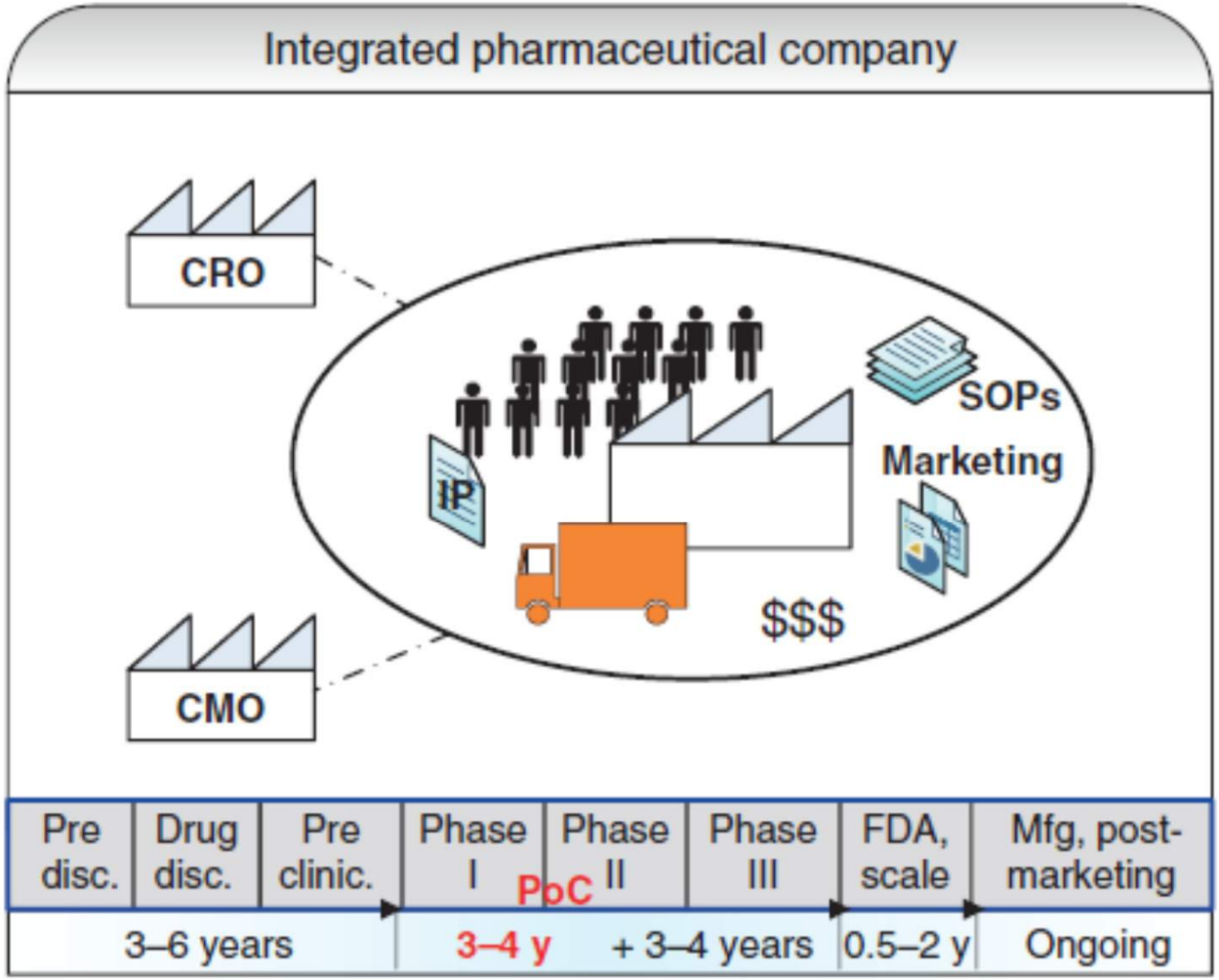
From Professor Stefan Laufer, Un Tuebingen, DE

EJ Barreiro, CAM Fraga, *Química medicinal: as bases moleculares da ação dos fármacos*, Artmed, 3ª Edição, POA, 2015 , pp. 505-524.

La actual gestión de la innovación farmacéutica



Comparison of business models



CMO =Contract manufacturing organization;
CRO = Contract research organization
SOPs = standart operation procedures
PoC = Proof of concept

SP Forster et al., *Drug Discov Today* **2014**, *19*, 348

REVIEWS Drug Discovery Today • Volume 19, Number 3 • March 2014

Reviews • POST SCREEN

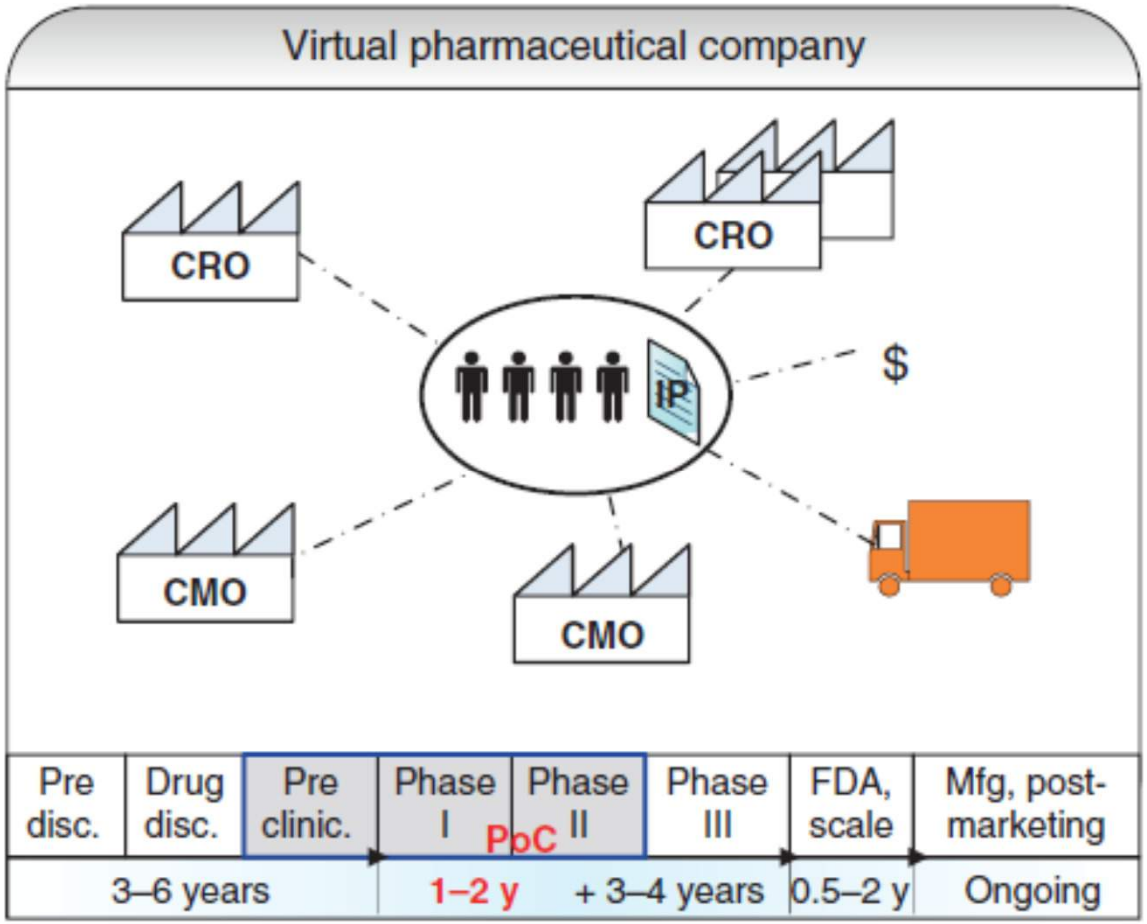
Virtual pharmaceutical companies: collaborating flexibly in pharmaceutical development

Simon P. Forster[1], Julia Stegmaier[2], Rene Spycher[3] and Stefan Seeger[1]

[1] Institute of Physical Chemistry (as from 1 January 2014: Department of Chemistry), Business Chemistry Group, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland
[2] LifeScan, Division of Cilag GmbH International, Johnson & Johnson, Gubelstrasse 34, 6300 Zug, Switzerland
[3] Janssen Pharmaceuticals, Pharmaceutical Development & Manufacturing Sciences, Johnson & Johnson, Hochstrasse 201, 8205 Schaffhausen, Switzerland

Research and development (R&D) collaborations represent one approach chosen by the pharmaceutical industry to tackle current challenges posed by declining internal R&D success rates and fading of the

Comparison of business models



CMO =Contract manufacturing organization;
CRO = Contract research organization

SP Forster et al., *Drug Discov Today* **2014**, *19*, 348

Table 1 | **Drug discovery facilities in the United Kingdom***

Facility	Host institution	Main disease indications	Funding sources	Staff	Platforms	Technologies	No. of screens per year	Medicinal chemistry follow-up
Dundee Drug Discovery Unit†	University of Dundee	Diseases of the developing world and innovative targets and pathways	UK government, charities and industry	>70	Biophysical, biochemical and cellular assays	Multiple	NA	Yes
European Screening Centre Newhouse and European Lead Factory	Multiple sites across the United Kingdom (including Dundee and Lanarkshire) and Europe	All human diseases	Innovative Medicines Initiative and in-kind contributions from EFPIA participants	50	Small molecules (326,000‡), biophysical and biochemical assays	Ultra-HTS plate-reader, SPR and label-free	30	Yes
Edinburgh Cancer Discovery Unit	Edinburgh Cancer Research Centre, University of Edinburgh	Oncology	Industry alliances, MRC and University of Edinburgh	14	Small molecules and chemical library synthesis	HCI, MPA, image informatics, reverse phase protein array and dual ligand	12	Yes
Beatson Institute Drug Discovery Unit	CRUK Beatson Institute, University of Glasgow	Oncology	CRUK	30	Fragments	NMR and SPR	1–5	Yes
Scottish Bioscreening Facility	Institute of Infection, Immunity and Inflammation, University of Glasgow	Neglected diseases and parasitology	Wellcome Trust and SULSA	3	Small molecules and RNAi	HCI and HTS plate reader	6	Yes
Medicinal Chemistry and Chemical Biology Technology Group	University of Leeds	All human diseases	University of Leeds, UK government, charities and industry	5	Small molecules (50,000), drug repurposing, fragments and virtual screening	Biochemical, phenotypic and biophysical	5–10	Yes

Preliminary list of ADDCs in USA

US ADDC	Parent institution	Industry collaboration	Established
Harvard NeuroDiscovery Center	Center in University	1	2001
USCF Small Molecule Discovery Center	Center in University	3	2005
CDRD (In Canada)	University consortium	3	2007
C2D2, Colorado University	Center in University	0	2010
John Hopkins BSi DDP	Center in University	4	2010
UNC Center for Drug Discovery	Center in University	0	2008
CMIDD, Northwestern University	Center in University	0	2009
University of Pittsburgh Drug Discovery	Center in University	0	2010
Scripps, TRI	Non-profit Institute	2	2004
MCDDR, Temple University	Center in University	4	2009
Vanderbilt Center for Neuroscience Drug Discovery	Center in University	3	2004

HS Kirgegaard, F Valentin, *Drug Discov. Today*, **2014**, *19*, 1699

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Eliezer J. Barreiro

Profesor Titular

Universidade Federal do Rio de Janeiro

Laboratório de Avaliação e Síntese de Substâncias Bioativas

http://www.lassbio.icb.ufrj.br/

Instituto Nacional de Ciência e Tecnologia de Fármacos e Medicamentos

http://www.inct-inofar.ccs.ufrj.br/

A experiência & contribuição do INCT-INOFAR

Instituto Nacional de Ciência e Tecnologia de Fármacos e Medicamentos

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UFRJ

Universidade Federal do Rio de Janeiro

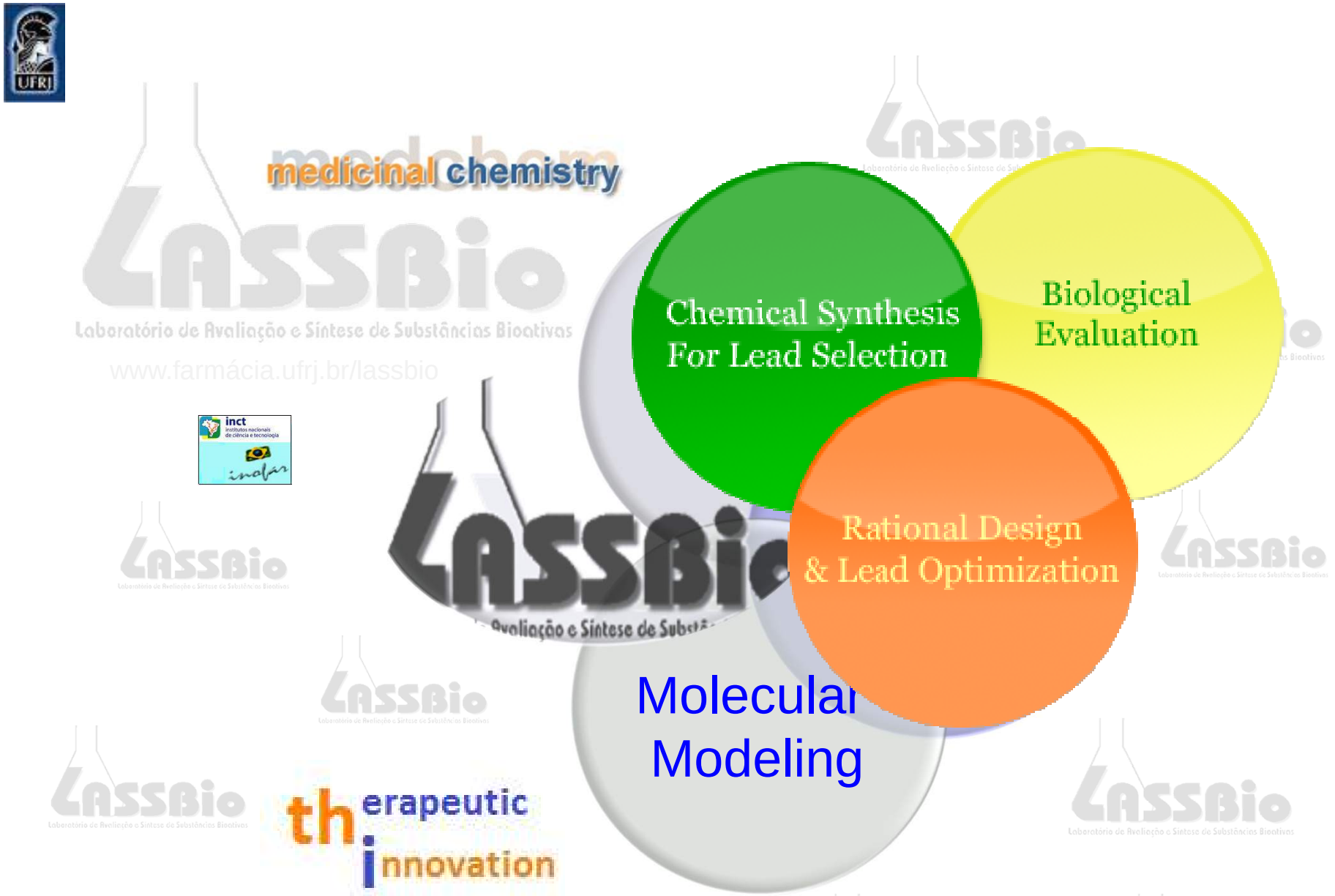
Cidade Universitária, ilha do Fundão,
Rio de Janeiro, RJ

Química Medicinal

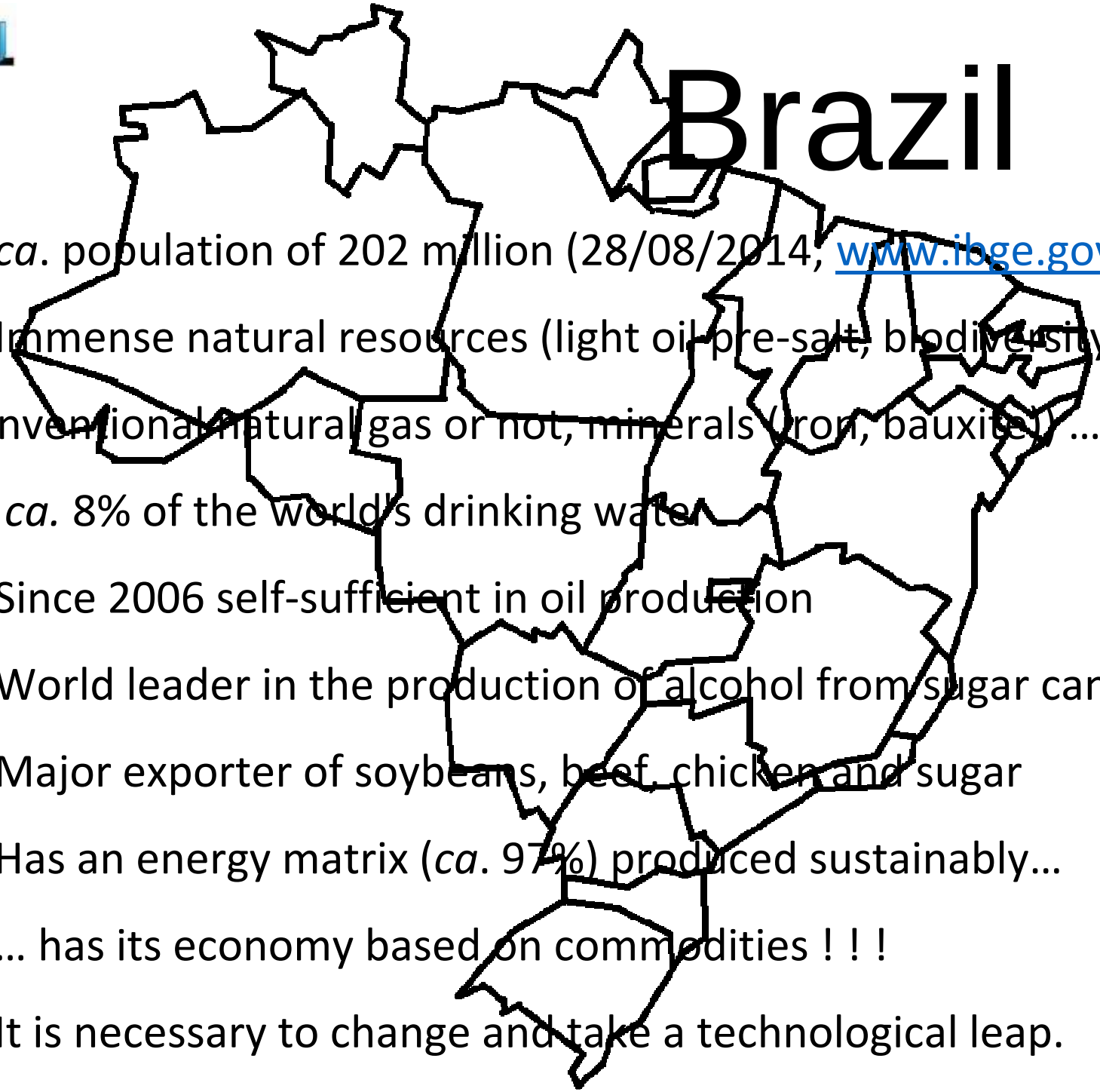
Creado em 19/04/1994 **Laboratório de Avaliação e Síntese de Substâncias Bioativas**

LASSBio

Laboratório de Avaliação e Síntese de Substâncias Bioativas



Brazil



- *ca*. population of 202 million (28/08/2014, www.ibge.gov.br)
- Immense natural resources (light oil pre-salt; biodiversity plant, conventional natural gas or not, minerals (iron, bauxite) …
- *ca.* 8% of the world's drinking water
- Since 2006 self-sufficient in oil production
- World leader in the production of alcohol from sugar cane
- Major exporter of soybeans, beef, chicken and sugar
- Has an energy matrix (*ca*. 97%) produced sustainably…
- … has its economy based on commodities ! ! !
- It is necessary to change and take a technological leap.

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inct instituto nacional de ciência e tecnologia de Fármacos e Medicamentos

www.inct-inofar.ccs.ufrj.br

National Institute of Science and Technology in Drugs and Medicines

- Home
- INCT-INOFAR
- Team
- Scientific adviser board (SAB)
- Research groups
- Research people
- Useful articles
- Publications
- Meetings
- Videos

The Mission

- Organize the Brazilian scientific capacity in an effective drug discovery network;
- Support multi-institutional research projects in drug discovery & design;
- Contribute to Brazilian radical & incremental innovation in new & generic drugs;
- Studies in total synthesis of generic drugs & advanced synthetic intermediates and starting materials;
- Contribute to continuous high qualification of students in medicinal chemistry & pharmacology;

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To do more!

To do faster!

To do better!

To be organized

To be trustable!

To be a team !

Conditions

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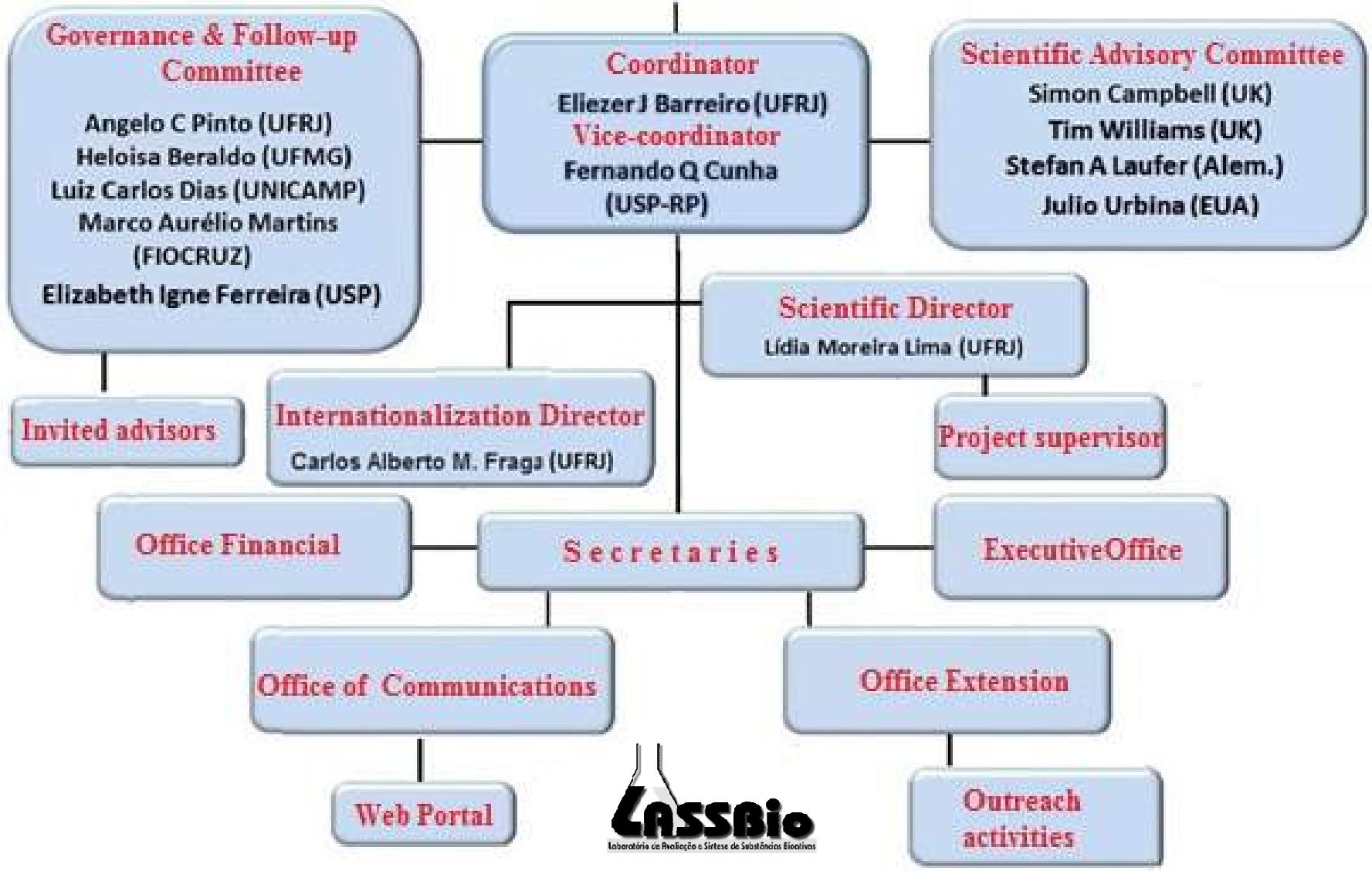
Governance committee



Partnerships

Incremental *In*novation

Generic drugs*

The market of generic drugs in Brazil *ca*. US$ 18 bi (2011)

Active pharmaceutical ingredients (API's)

The INCT-INOFAR seeks to reverse the usual process in which API come from abroad, developing in ours laboratories a scalable synthetic route to generic & future generic drugs.

AC Pinto, EJ Barreiro, Desafios da indústria farmacêutica brasileira, *Quim. Nova* **2013**, *36*, 1557; EJ Barreiro, AC Pinto, Opportunities and challenges for innovation in pharmaceuticals: Now or never!, *Rev. Virtual Quim.* **2013**, *5*, 1059.

Incremental *Innovation*

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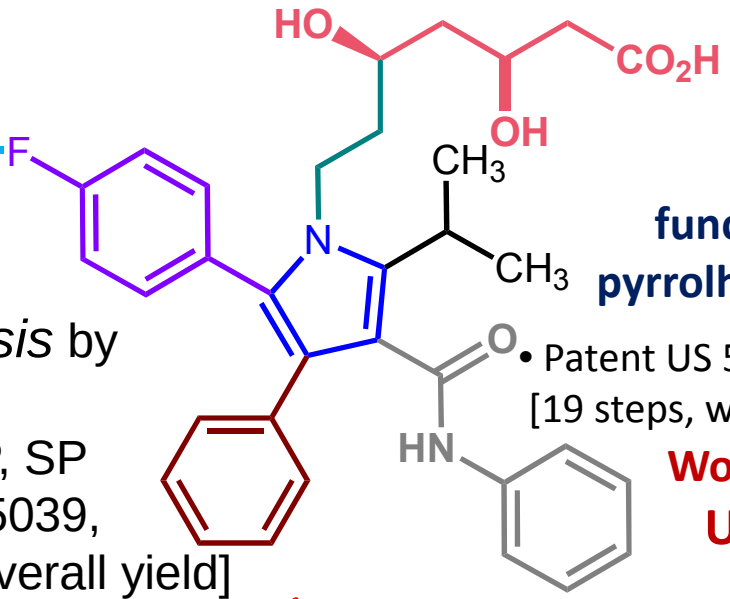
- **Atorvastatin**

1991 Lipitor™ (Pfizer)



functionalized pyrrolheptenoic acid

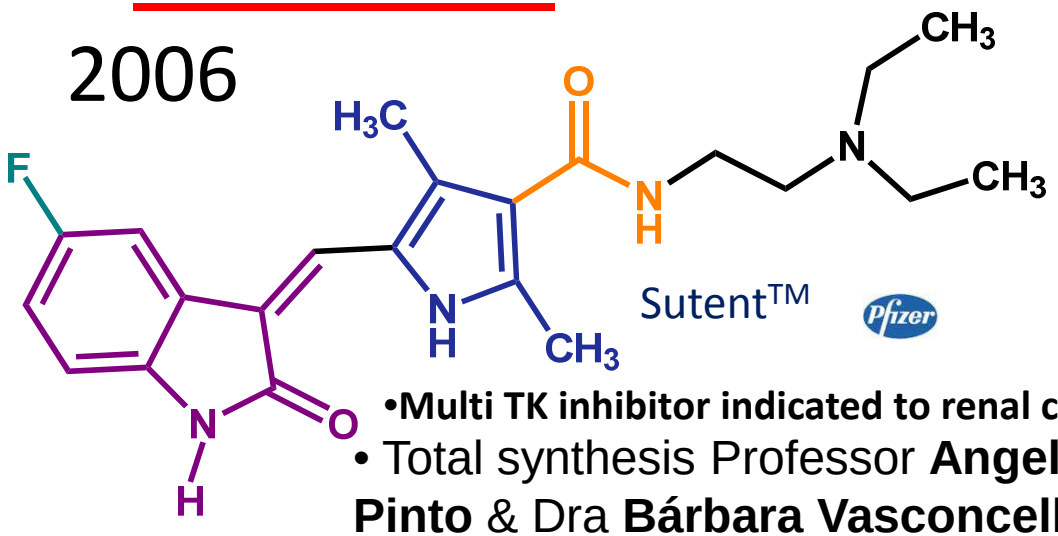
• *New stereoselective synthesis* by Professor **Luiz Carlos Dias** & Dr **Adriano S. Vieira**, UNICAMP, SP (2010) – INPI Patent, 018110015039, 2011 (BR) [18 steps, with 19% overall yield]

• Patent US 5273995 Pfizer (1991) [19 steps, with *ca.* 5% overall yield]

World total sales: US$ > 150 bi (1991-2011)

- **Sunitinib** *super blockbuster-drug*

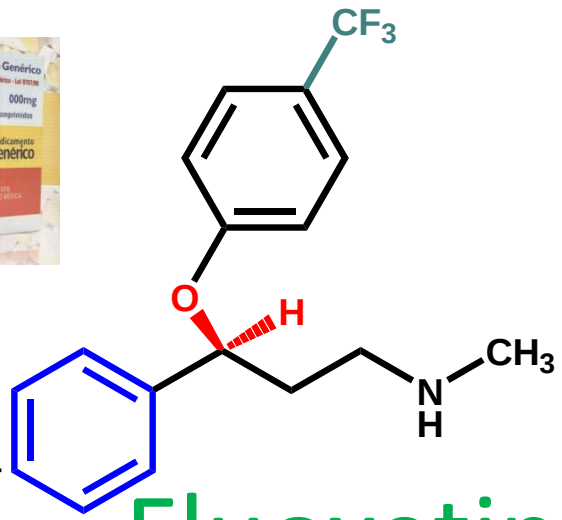
2006



Sutent™ (Pfizer)

•**Multi TK inhibitor indicated to renal carcinoma**

• Total synthesis Professor **Angelo da Cunha Pinto** & Dra **Bárbara Vasconcellos da Silva** IQ - UFRJ, **2011** (BR)



Fluoxetin

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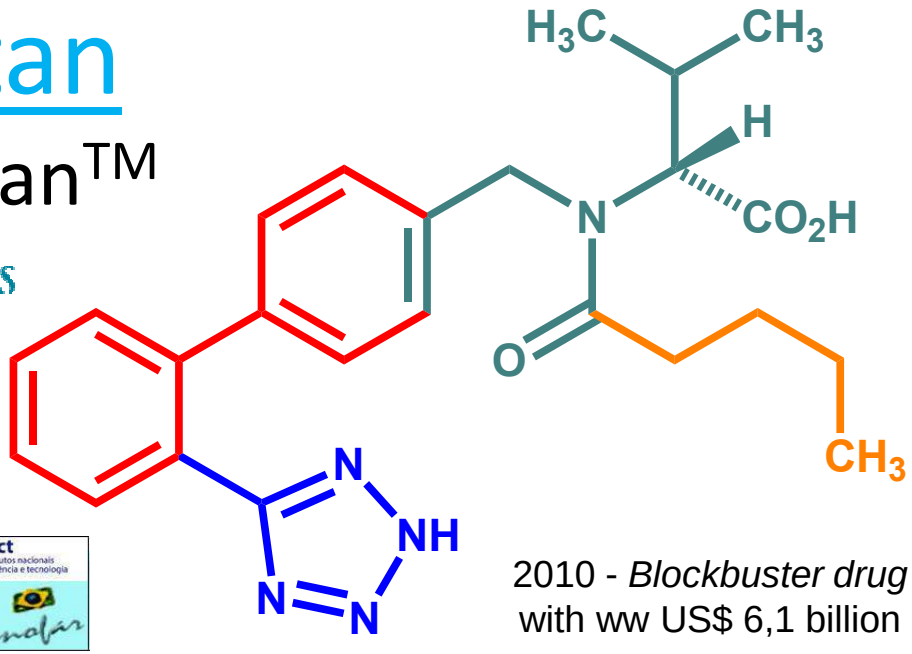
• Valsartan

1990 Diovan™

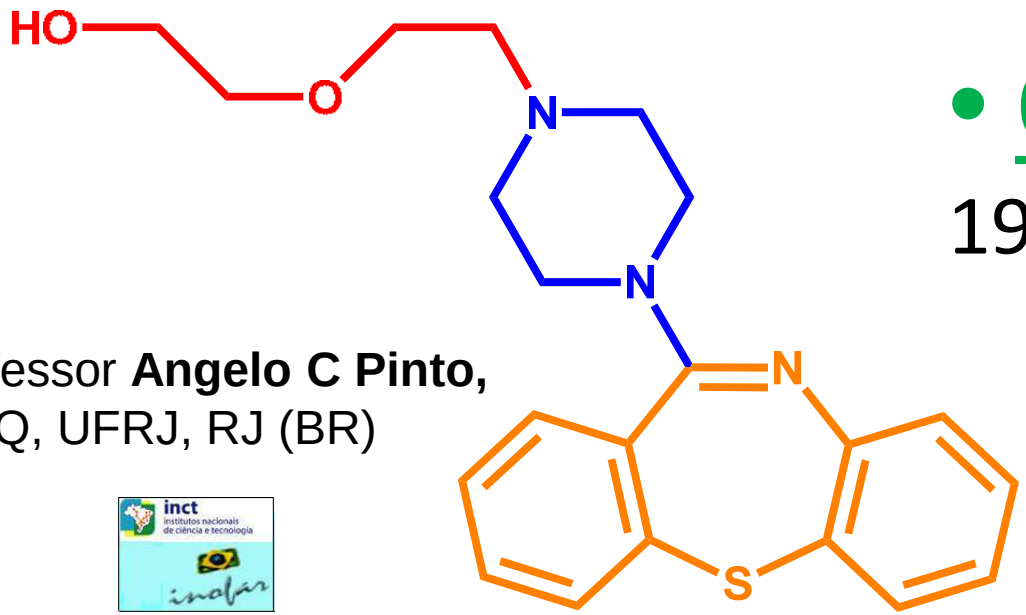
NOVARTIS



Angiotensin II receptor antagonist or AT_1 receptor blocker (ARB)

• Professor **Luiz Carlos Dias,** IQ, UNICAMP, SP (BR)

2010 - *Blockbuster drug* with ww US$ 6,1 billion



• Quetiapine

1996 Seroquel™

AstraZeneca

• Professor **Angelo C Pinto,** IQ, UFRJ, RJ (BR)

5-HT_2 & D2 receptors blocker (multitarget drug)

2011 - Blockbuster drug
US Sales = US$ 4,6 billion

Revista Virtual de Química (SBQ)

Opportunities and Challenges for Innovation in Pharmaceuticals: Now or Never!

Barreiro, E. J.;* Pinto, A. C.

Rev. Virtual Quim., **2013**, *5* (6), 1059-1074. Online publication: 6 September 2013

http://www.uff.br/rvq

Rev Virtual Quim 2013, 5, 1059

Abstracts

The article describes the discovery of new drugs and presents some of the pioneer scientists of these findings. It also shows the innovation in pharmaceuticals and the contributions of INCT-INOFAR that will help Brazil to be one of the players in drug development.

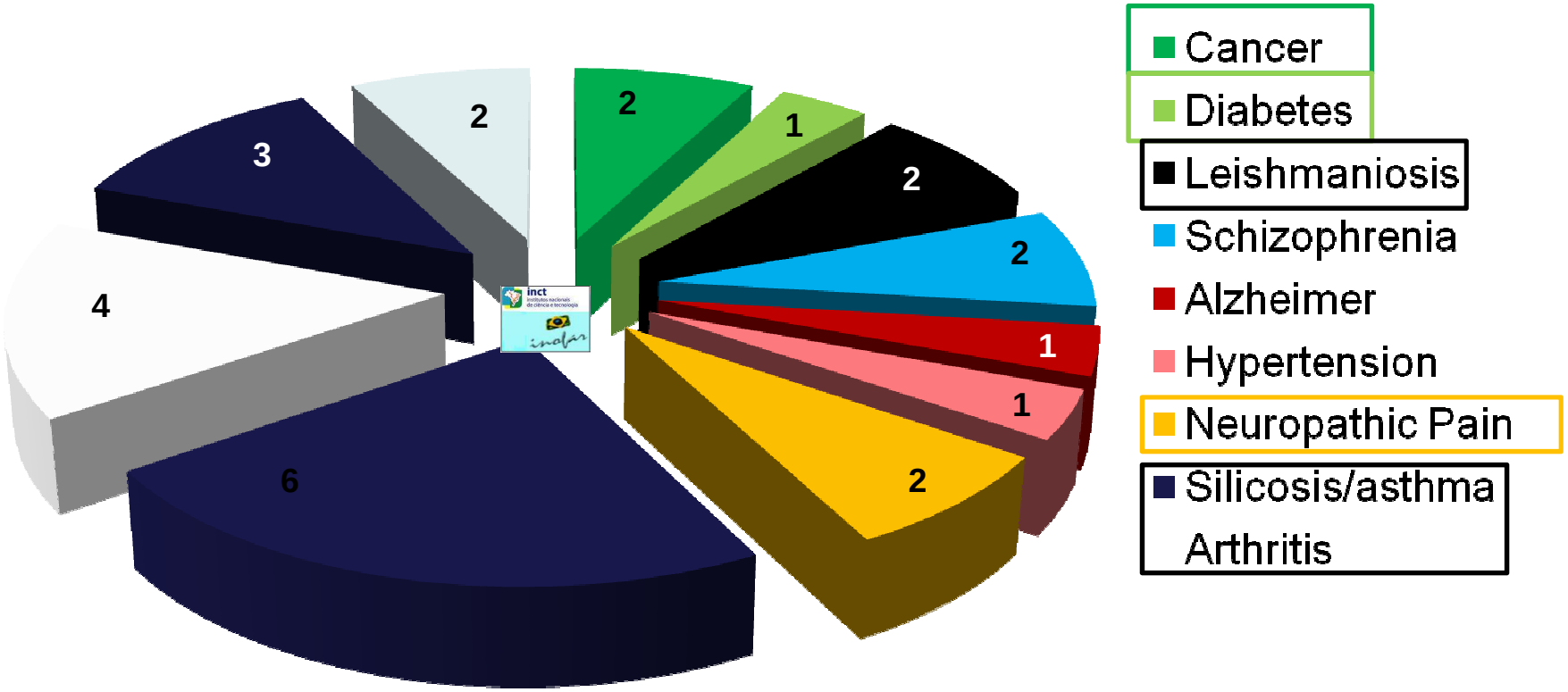
Keywords: Pharmaceutical innovation; new drugs; process of drug discovery.

DOI: 10.5935/1984-6835.20130078

Radical *Innovation*

Universidade Federal do Rio de Janeiro

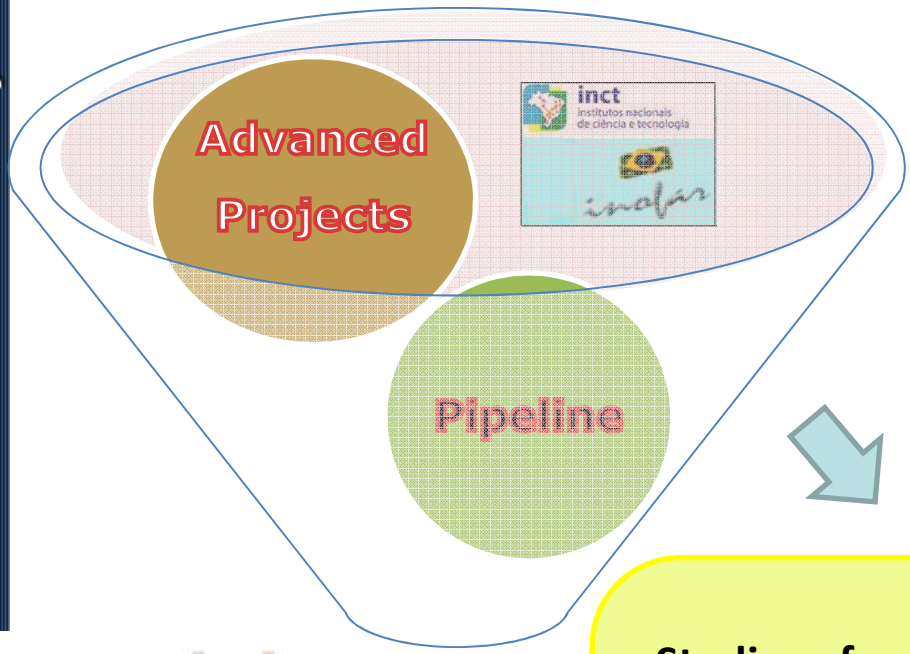
Projects*



* At right **colors** squares the principal's research projects

Radical *Innovation*

Universidade Federal do Rio de Janeiro



medicinal chemistry

Antileishmanial activity of new *N*-acylhydrazone derivatives and analogues ICB-UFAL / LASSBio-UFRJ

Studies on design & discovery of new antidiabetes drug candidates.
LASSBio-UFRJ
BR102013012646-2

Studies of new oncolytic agent, dual inhibitor of kinases
LASSBio-UFRJ
WO2014113859
WO2013142935

Studies of anti-inflammatory & analgesic effect of LASSBio-591, a new candidate of AIA drug.
LASSBio-UFRJ/FM-USP,RP

Studies on new drug candidate useful for neuropatic pain
LASSBio-UFRJ / FM-USP,RP
WO2012054996

Universidade Federal do Rio de Janeiro

INTERNATIONAL ACTIVITIES

http://www.icepha.de/

INCT-INOFAR established, on November 18, 2011, a cooperation agreement with the Interdisciplinary Center of Pharmacogenomics and Pharmaceutical Research (ICEPHA) of the University of Tübingen, Germany. Through this deal, we broaden the international scope of INCT-INOFAR and the bases for scientific exchange and the development of innovative research projects in new pharmaceuticals. On the other hand, the agreement establishes the organization of scientific and academic activities, like courses, conferences, seminars, symposiums, or lectures, and the exchange of researchers and/or students, as well as the exchange of materials and publications of mutual interest.

Professor Stefan Laufer (ICEPHA, University of Tübinben)
& Professor Eliezer J. Barreiro (INCT-INOFAR, UFRJ, BR)

At the end of 2011, INCT-INOFAR through the Dean of the Federal University of Rio de Janeiro (UFRJ) signed a cooperation agreement with the Interdisciplinary Center for Pharmacogenomics and Pharmaceutical Research (ICEPHA) of the University of Tübingen, Germany, directed by Professor Stefan Laufer.

Universidade Federal do Rio de Janeiro

Novel 2-chloro-4-anilino-quinazoline derivatives as EGFR and VEGFR-2 dual inhibitors

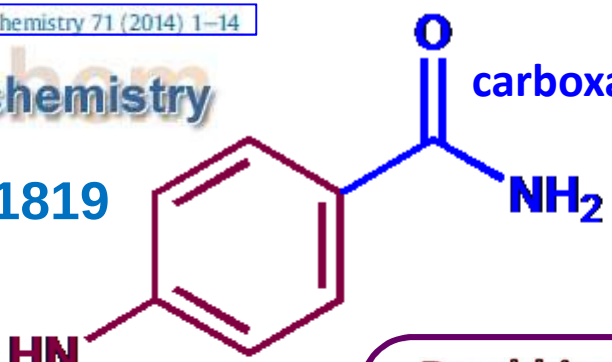
Maria Letícia de Castro Barbosa [a,b], Lídia Moreira Lima [a,b], Roberta Tesch [a], Carlos Mauricio R. Sant'Anna [c], Frank Totzke [d], Michael H.G. Kubbutat [d], Christoph Schächtele [d], Stefan A. Laufer [e], Eliezer J. Barreiro [a,b,*]

[a] Laboratory of Evaluation and Synthesis of Bioactive Substances (LASSBio), Federal University of Rio de Janeiro, P.O. Box 68024, 21944-971 Rio de Janeiro, RJ, Brazil
[b] Graduate Program of Chemistry (PGQu), Chemistry Institute, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil
[c] Department of Chemistry, Federal Rural University of Rio de Janeiro (UFRRJ), Seropédica, RJ, Brazil
[d] ProQinase GmbH, Freiburg, Germany
[e] Department of Pharmaceutical/Medicinal Chemistry, Institute of Pharmacy, Eberhard-Karls-University Tübingen, Tübingen, Germany

European Journal of Medicinal Chemistry 71 (2014) 1–14

medicinal chemistry

LASSBio-1819

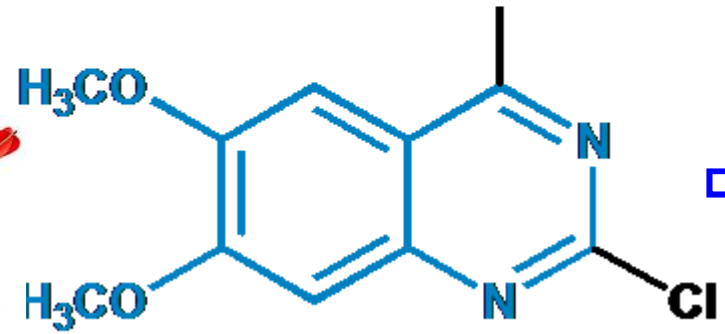


carboxamide

Isosteric replacement

LASSBio
Laboratório de Avaliação e Síntese de Substâncias Bioativas

UNIVERSITÄT TÜBINGEN



Dual kinase activity

IC_{50} (EGFR) = 0,90 µM

IC_{50} (VEGFR) = 1,17 µM

Multifactorial diseases

Dual Inhibitor Dual

MLC Barbosa, Novos derivados quinazolínicos funcionalizados inibidores duais das tirosina cinases receptoras EGFR & VEGFR-2, PhD Thesis, Instituto de Química, UFRJ, 2013.

PEDIDO INTERNACIONAL PUBLICADO SOB O TRATADO DE COOPERAÇÃO EM MATÉRIA DE PATENTES (PCT)

(19) Organização Mundial da Propriedade Intelectual
Secretaria Internacional

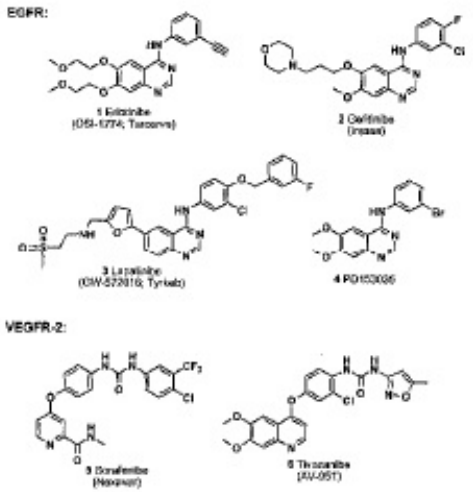
(43) Data de Publicação Internacional
31 de Julho de 2014 (31.07.2014)

WIPO | PCT

(10) Número de Publicação Internacional
WO 2014/113859 A1

(54) Title : 2-CHLORO-4-ANILINO-QUINAZOLINE COMPOUNDS INHIBITING PROTEIN TYROSINE KINASES, PHARMACEUTICAL COMPOSITIONS COMPRISING THE SAME, METHOD FOR PRODUCING THE SAME AND TYROSINE KINASE INHIBITION METHOD

(54) Título : COMPOSTOS 2-CLORO-4-ANILINO-QUINAZOLINICOS INIBIDORES DE PROTEÍNAS TIROSINA CINASES, COMPOSIÇÕES FARMACÊUTICAS COMPREENDENDO OS MESMOS, PROCESSO PARA SUA PRODUÇÃO E MÉTODO PARA INIBIÇÃO DE TIROSINA CINASES



(57) Abstract : The present invention relates to 2-chloro-4-anilino-quinazoline derivatives with EGFR and/or VEGFR-2 protein tyrosine kinase inhibiting activity, to anti-tumour pharmaceutical compositions that comprise said compounds, and to methods for producing the same. The present invention further provides a method for treating solid tumours by inhibition of tyrosine kinases.

(72) Inventores : **BARREIRO, Eliezer Jesus;**
DE CASTRO BARBOSA, Maria Letícia;
MOREIRA LIMA, Lidia;
LAUFER, Stefan, Andreas:
RABELLO SANT'ANNA, Carlos Mauricio;
TESCH, Roberta;

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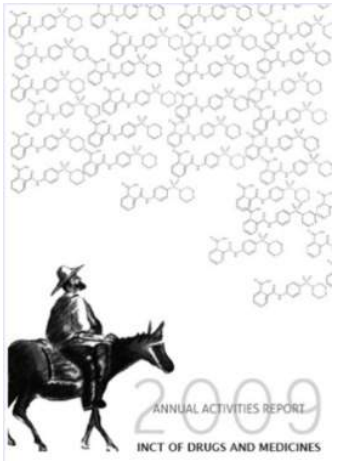
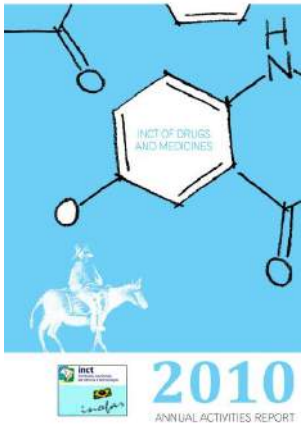
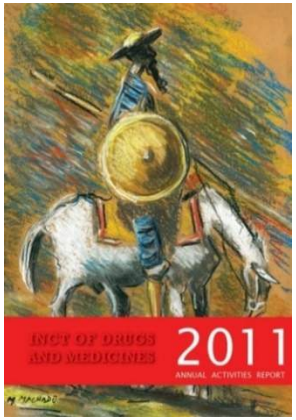
Annual Activities Reports







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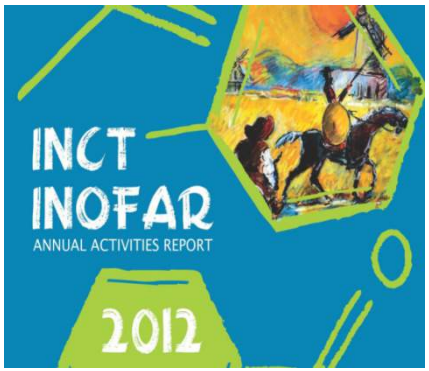
inofar

Coordinator:
Eliezer J. Barreiro



LASSBio
Laboratório de Avaliação e Síntese de Substâncias Bioativas

www.inct-inofar.ccs.ufrj.br/download/aar/2014.pdf

Projeto CNPq nº 573.564/2008-6 «» FAPERJ nº E-26/170.020/2008

Instituto Nacional de Ciência e Tecnologia em Fármacos e Medicamentos / INCT-INOFAR

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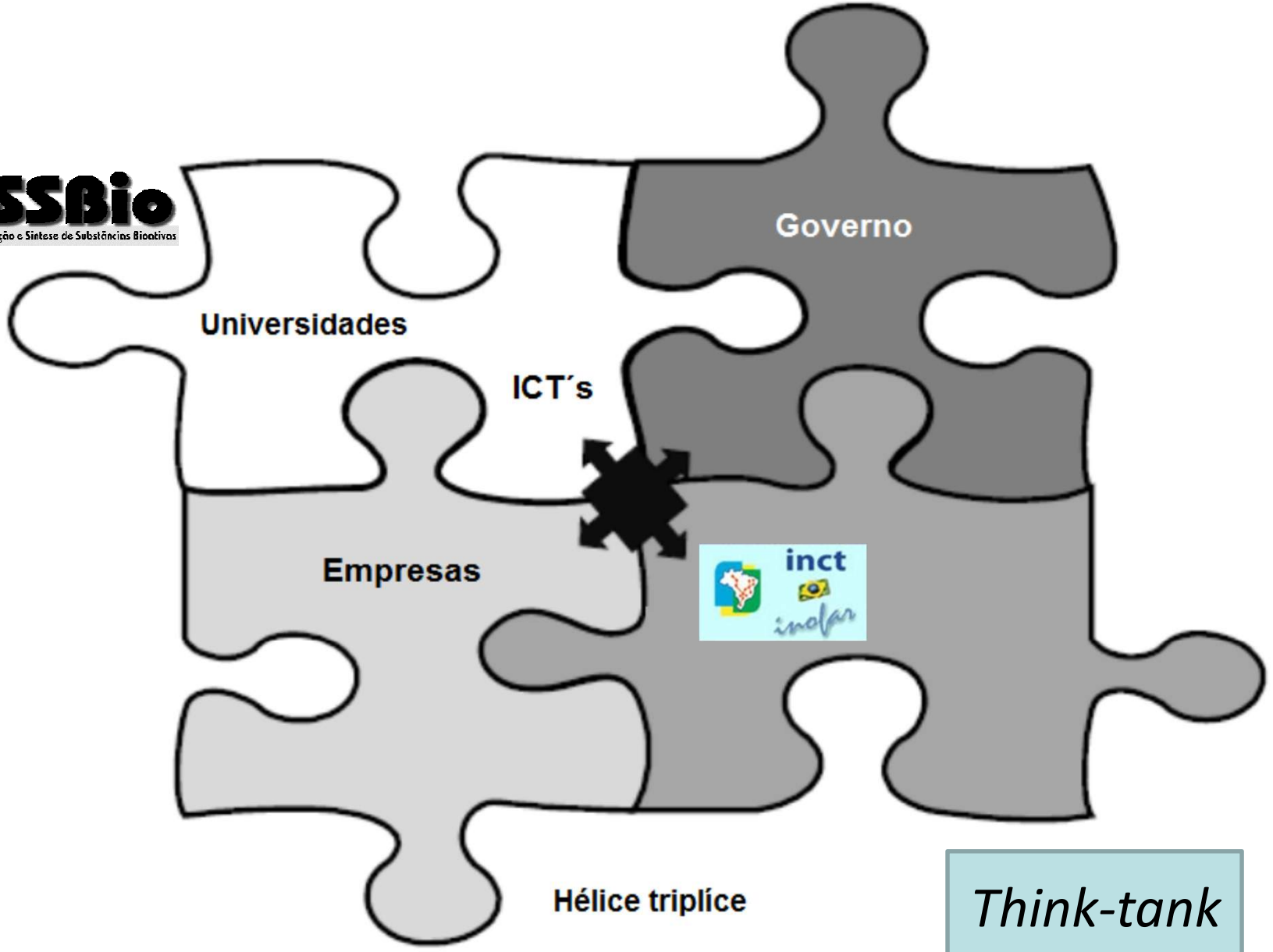
LASSBio
Laboratório de Avaliação e Síntese de Substâncias Bioativas



Think-tank

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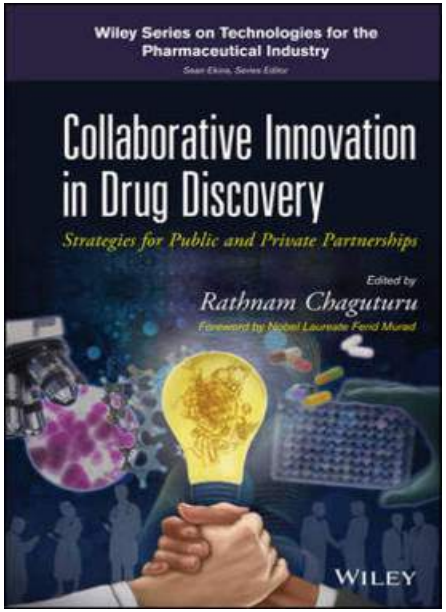
Process of technology transferring



Government ($)

University

Lack of continuity in funding
Legal incertainty
Very slow motion

Poor monitoring
No clear IP policy

Pharma Companies

drawback

Lack of long-terms goals!

Lack of scientific policy for new drugs

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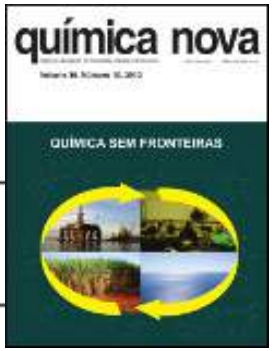
www.scielo.br/



Quim. Nova, Vol. 36, No. 10, 1557-1560, 2013 Quim Nova 2013 36 1557

DESAFIOS DA INDÚSTRIA FARMACÊUTICA BRASILEIRA
Challenges of the Brazilian pharmaceutical industry

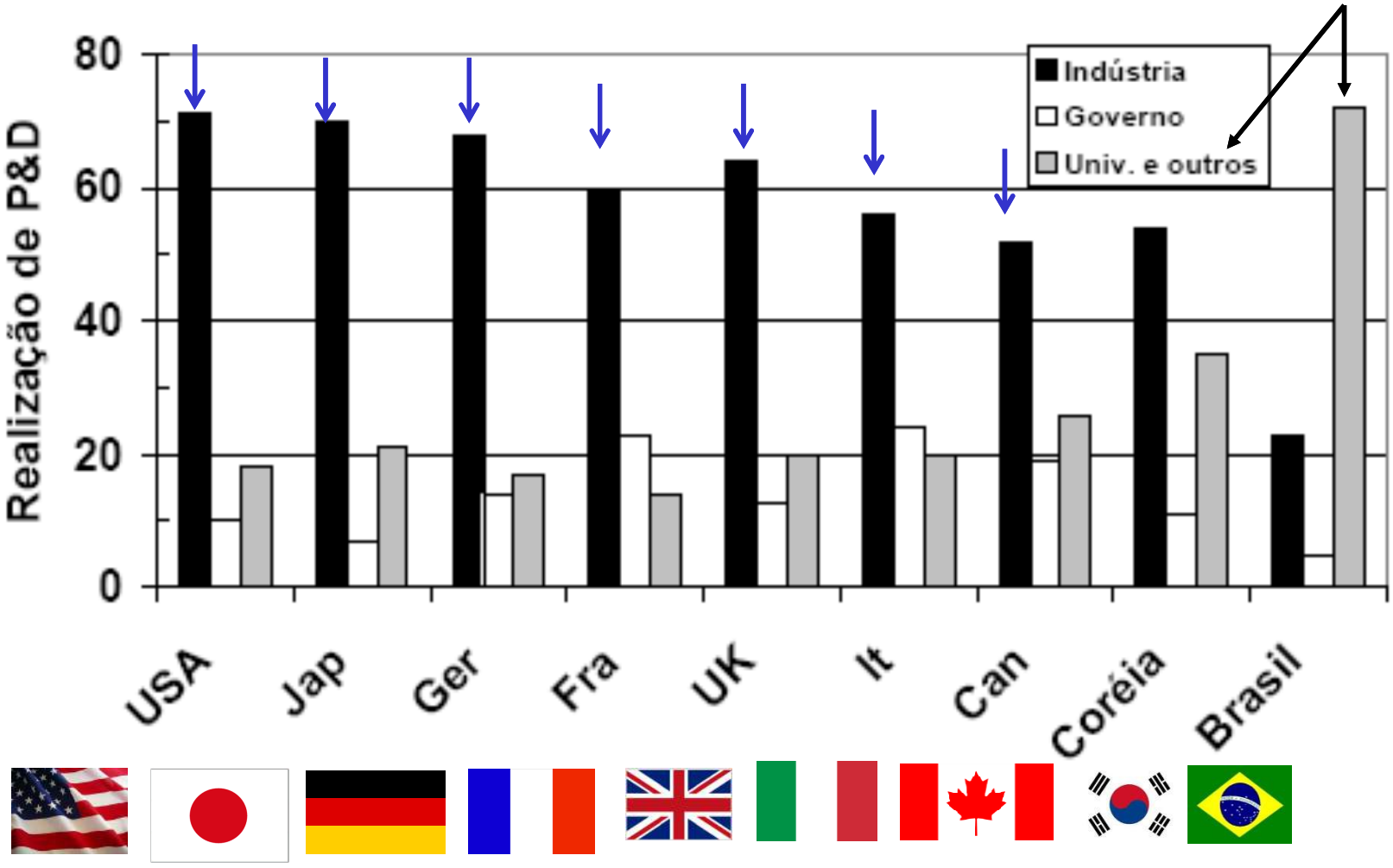
Angelo C. Pinto* e Eliezer J. Barreiro
Instituto Nacional de Ciência e Tecnologia de Fármacos e Medicamentos (INCT-INOFAR), Av. Carlos Chagas Filho, 373, Centro de Ciências da Saúde (CCS), Bloco K, 2º andar, Sala 23, Cidade Universitária; CP 68043, 21944-971 Rio de Janeiro – RJ, Brasil

Recebido em 15/10/13; aceito em 1/11/13; publicado na web em 4/11/13

CHALLENGES OF THE BRAZILIAN PHARMACEUTICAL INDUSTRY. The paper traces a panorama of the development of new drugs and hopes to contribute for Brazil to become a player in the discovery of new drugs. Brazil is the sixth world market retail consumer of medicines prone to expansion, has a pharmaceutical industry focused on the production of generics and a very large number of undergraduate courses in Pharmacy. The national industry has grown over the last decade after the Generics Act 9787/99. Despite these positive aspects, a number of bottlenecks prevent Brazilian pharmaceutical industry to invest in the development of new drugs. There are, however, a number of initiatives to reduce the dependence on imported generic drugs. It is a very good start for the development of new pharmaceutical drugs.

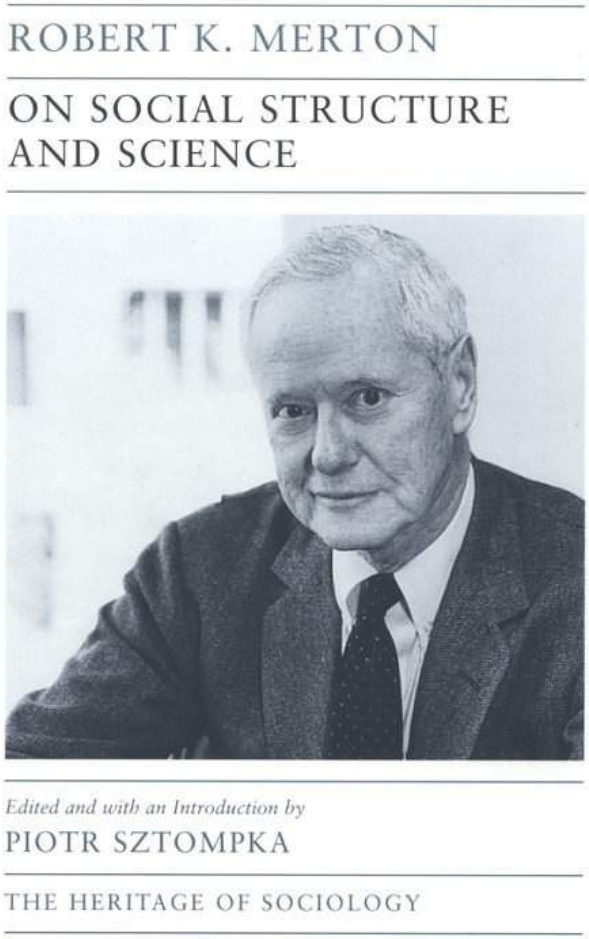
Keywords: Brazilian pharmaceutical industry; generic medicines; bottlenecks of the Brazilian pharmaceutical industry.

Distribuição dos pesquisadores ativos



Adaptado de C. H. Brito Cruz & C. A. Pacheco, “Conhecimento & Inovação: Desafios do Brasil no Século XXI”, em www.inovacao.unicamp.br/report/intc-pacheco-brito.pdf (2/01/2009)

Ciencia, Creatividad & Innovación

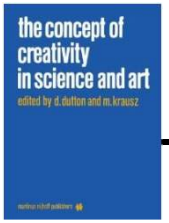


Las invenciones y descubrimientos se convierten virtualmente inevitable cuando:[a)]

(1) el desarrollo cultural de la humanidad acumula requisitos previos de conocimiento suficiente;
(2) la atención de suficiente investigadores se centran en el mismo problema;
(3) hay nuevas necesidades sociales,
o el desarrollo efectivo de la ciencia,
o ambos.

Robert K. Merton

The role of genius in scientific advance, *New Scientist* **1961,** *12*, 306



a) D Dutton & M Krausz, Eds., The concept of creativity in science and art, pp. 19-46, 1981, Martins Pubs., Londres

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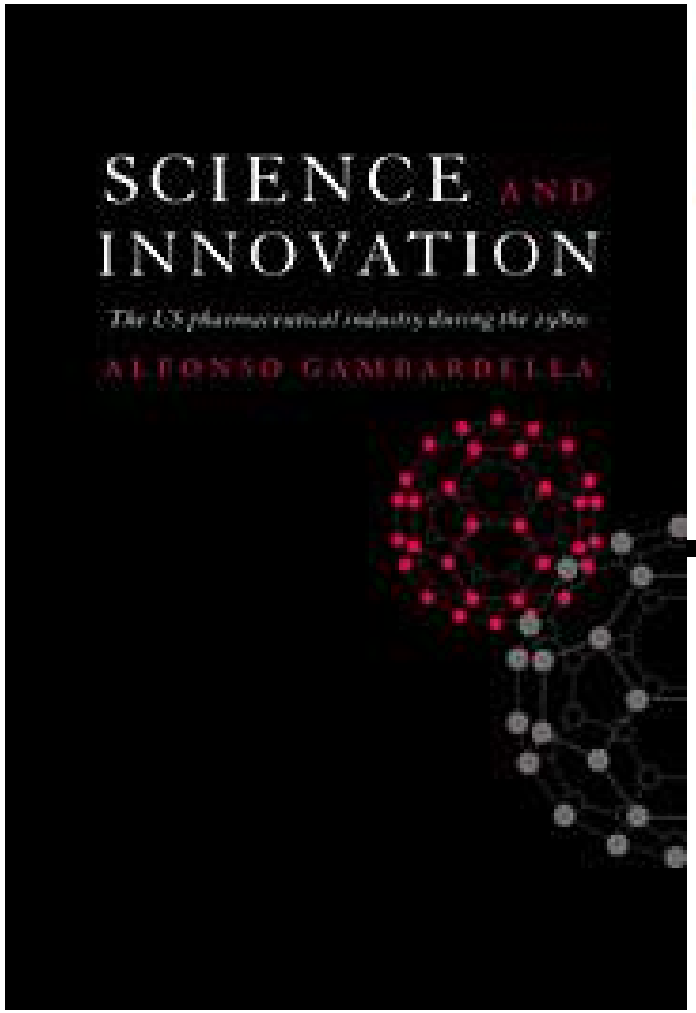
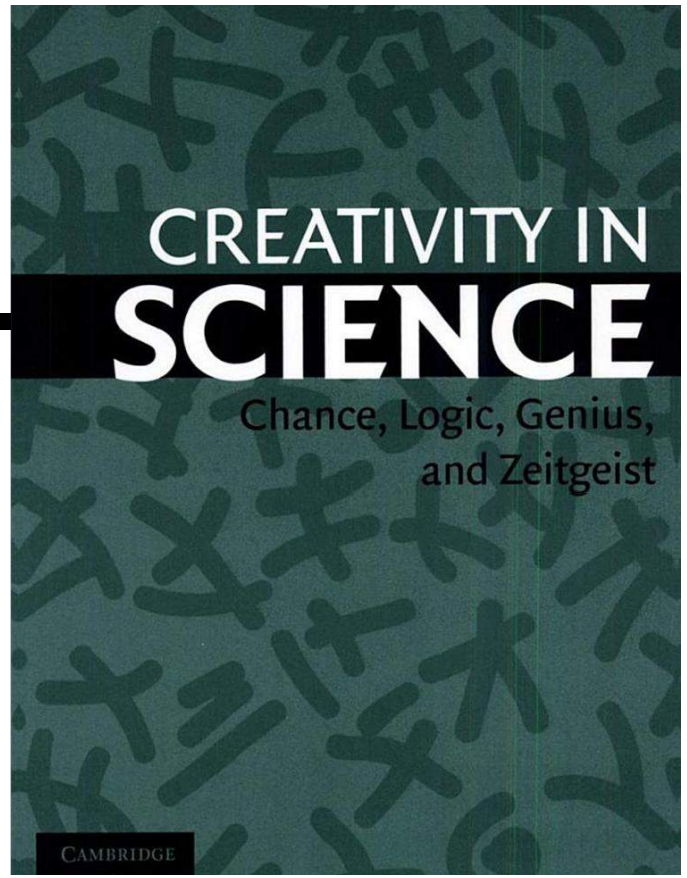
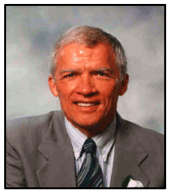
SC=In



Cambridge University Press,
Cambridge UK, 1995

Collaboration Creativity Commercialisation Curiosity Challenging Competitive





*S*cience & *C*reativity = *Im*novation !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creatividad
Curiosidade científica
Curiosidade intelectual
Curiosidade científica
Curiosidade intelectual
Curiosidade intelectual
curiosidad
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Curiosidade científica
Curiosidade científica
Curiosidade intelectual

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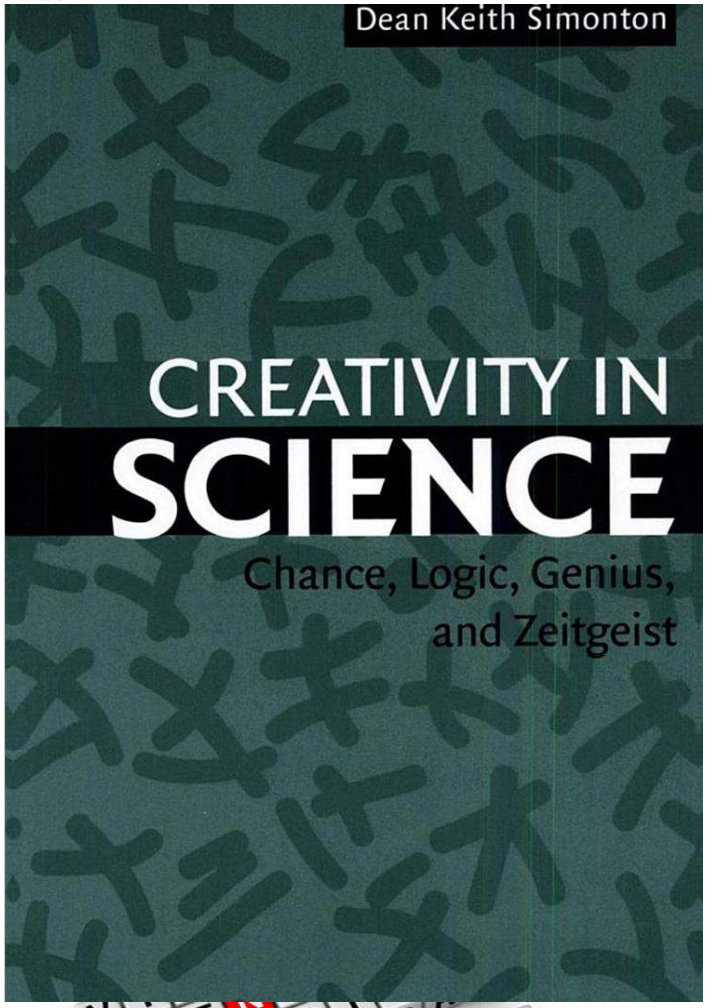
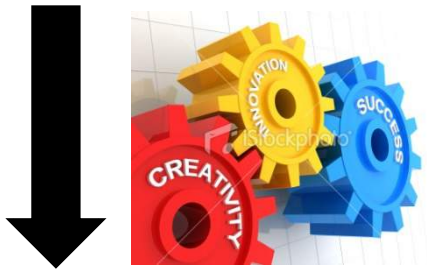


Criatividade & inovação



Inovação criativa

Toda inovação é criativa?

Inovação radical

Inovação incremental

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El éxito no depende de buenas ideas, pero lo que que ver con ellos!

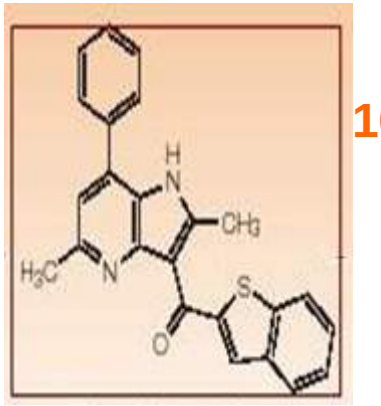
Idea

Abstracción

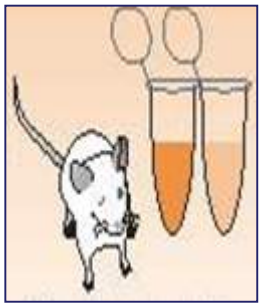
Creatividad

Metodo científico

C H
N O
S Cl
F



10^{25} a 10^{60} son el número de moléculas orgánicas fcon potencial para ser farmacos!



ideas innovador

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"Science is made of facts,
just as houses are made of stones;
but a mere collection of facts is
no more science
than a pile of stones a house"

(1854-1912)

Henri Poincaré, 1902

Muchas Gracias!

ejbarreiro@ccsdecania.ufrj.br

Curso: Emprendedorismo y creación de empresas biotecnológicas
Coordinadores: Dres. Lilia Drittanti y Manuel Vega

Tema 7: Financimiento

Eliezer J. Barreiro

Professor Titular

Universidade Federal do Rio de Janeiro

Laboratório de Avaliação e Síntese de Substâncias Bioativas

http://www.lassbio.icb.ufrj.br/

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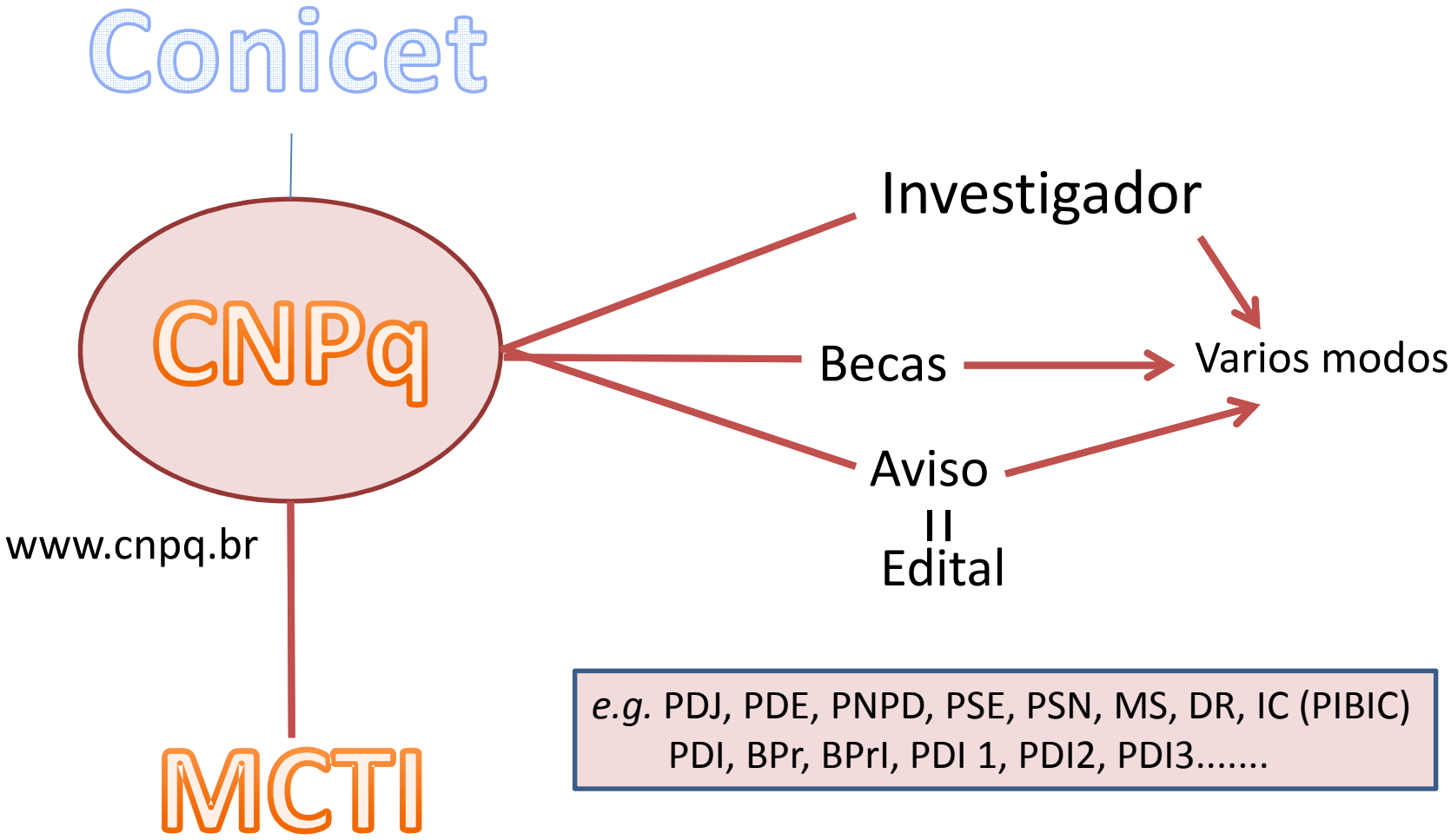
Financiamiento de *ID&I* en BR



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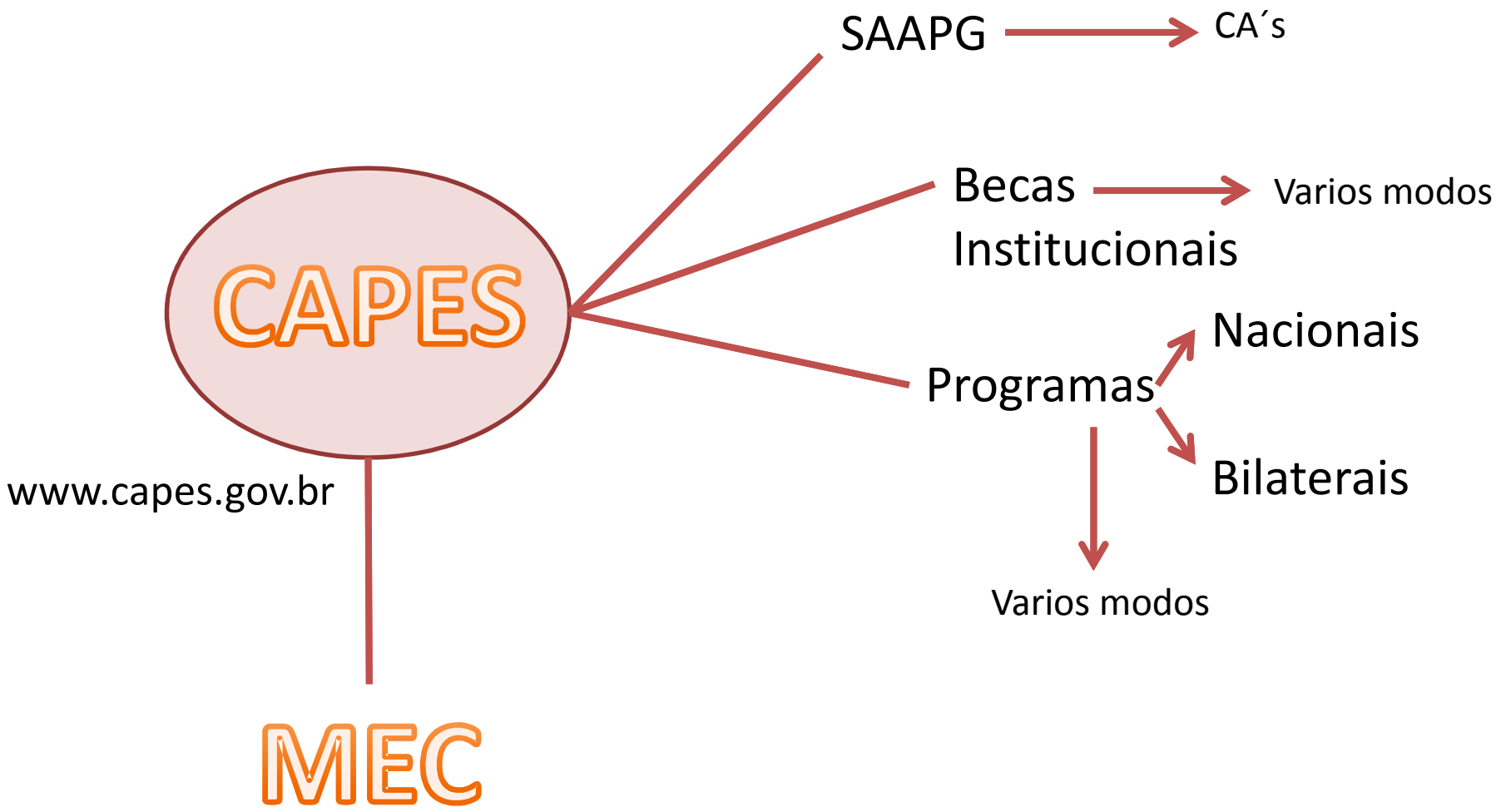
Financiamiento de *ID&I* en BR



Financiamiento de *ID&I* en BR

Fundación estadual de apoijo IC&I

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FAPERJ
FAPESP
FAPEMIG
FAPEAM
FAPERGS
FACEPE

FAP´S

FAPEAL
FAPEC
FAPEES
FAPERN

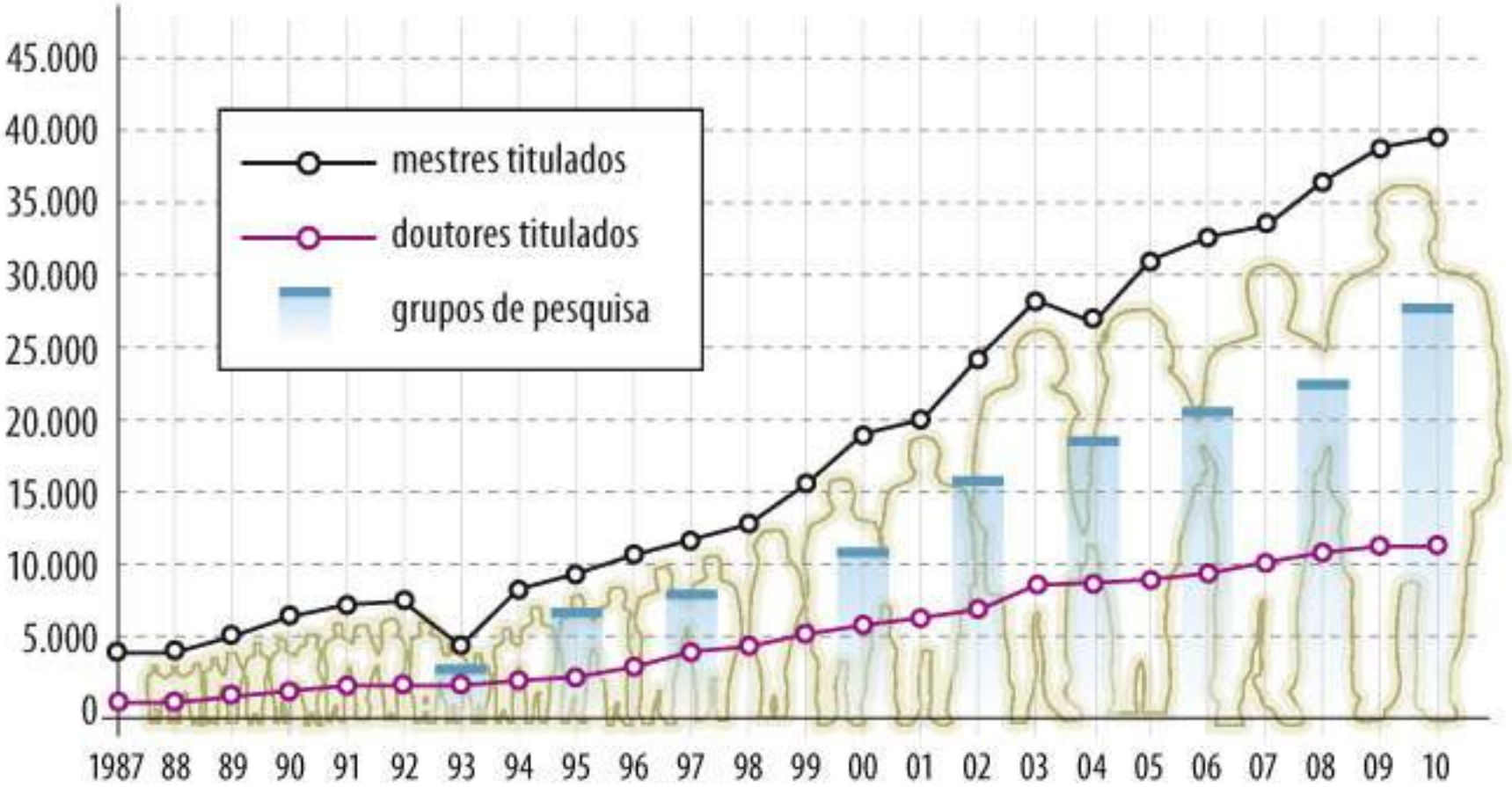
Varios modos

Avisos (Editais)

Per-review: agencias nacionais ou estaduais/distritais/municipais

Número de doutores formados cresce menos que o de mestres

Universidades formam sete vezes mais mestres e doutores que há 25 anos



Fonte: Ministério da Educação e Cultura, 2012

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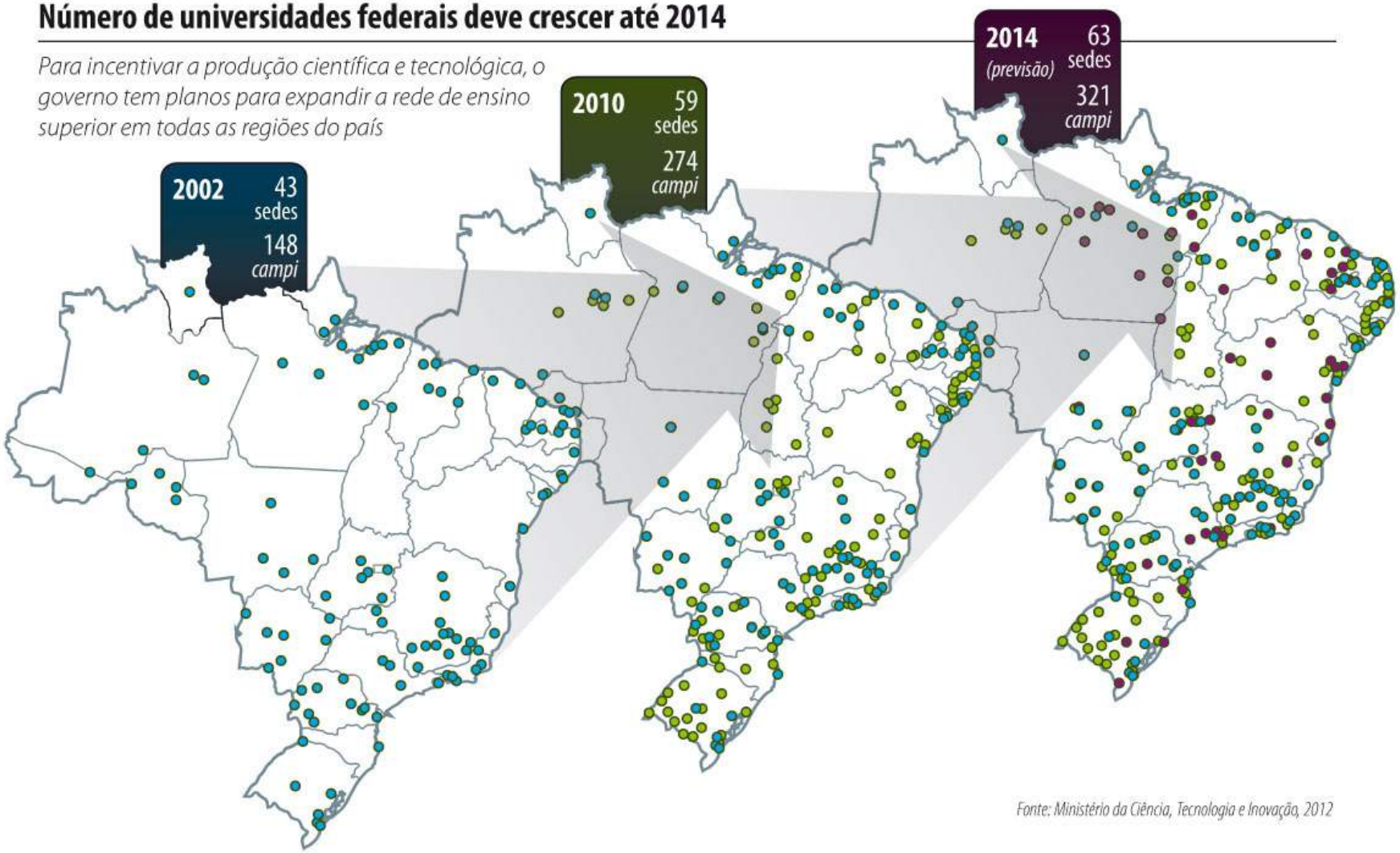

Média mundial no número de pesquisadores/milhão de habitantes: 1000
Brasil: > 70.000 pesquisadores no SFES (vs 203.000); 11000 Dr´s & 40000 MSc em 2014).

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MDIC
Ministério do Desenvolvimento, Indústria e Comércio Exterior

BNDES

Empresas

Consorcios

Sin retorno*

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Banco Nacional de Desairollo Científico y Social

* Financiamiento sob carta de “encomienda”

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FINEP
FINANCIADORA DE ESTUDOS E PROJETOS
MINISTÉRIO DA CIÊNCIA E TECNOLOGIA

promover e financiar a inovação e a pesquisa científica e tecnológica em empresas, universidades, centros de pesquisa, institutos de pesquisa.

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Empresa-universidad
Universidad - empresa

Inversión com interés

Agência de Inovação

EMBRAPII
Empresa Brasileira de Pesquisa e Inovação Industrial

embrapii.org.br

Empresa Brasileira de Pesquisa e Inovação Industrial

ações estratégicas, estruturantes e de impacto para o desenvolvimento sustentável do Brasil.

Embrapa agropecuária

Embraer SA
www.embraer.com

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Complexo Industrial de la Salud
Política de genérico

MINISTÉRIO DA SAÚDE

DECIT

INCT-INOFAR

Importación / exportación

MDIC
Ministério do Desenvolvimento, Indústria e Comércio Exterior

MINISTÉRIO DAS RELAÇÕES EXTERIORES

Defesa Fronteiras
Amazônia (RADAM)
Marinha etc

ICT´s

- Fiocruz
- Ipea
- INPA
- CBPF
- CGEE
- CPMR
- CEPEL
- INT
- IME
- LNCC

Fundos Setoriais

- Os Fundos Setoriais foram criados para fomentar a pesquisa básica nas Universidades e Centros de Pesquisa em 1994 abrangendo as seguintes áreas:
- Petróleo, Infra-estrutura, Informática, Mineral, Hídrico, Espacial, Aeronáutico, Transporte, Energia, Agronegócio, Amazônia, Biotecnologia e Verde-amarelo.

Financiamento Não-Reembolsável

❖ Fundos Setoriais (Principal fonte)

- Contribuições incidentes sobre exploração de recursos naturais pertencentes à União ou sobre impostos/faturamentos /CIDE de empresas de setores específicos para financiamento de projetos e/ou programas de desenvolvimento científico e tecnológico.

- **CT-PETRO – Petróleo e gás**
- **CT-ENERG – Energia**
- **CT-AGRO – Agronegócios**
- **CT-BIOTEC - Biotecnologia**
- **CT-SAÚDE - Saúde**
- **CT-AERO - Aeronáutico**
- **CT-AMAZÔNIA - Amazônia**
- **CT-ESPACIAL – Espacial**
- **FVA – Verde e Amarelo**
- **CT-INFRA — Infra-estrutura**
- **CT-HIDRO – Recursos Hídricos**
- **CT-TRANSPO – Transportes Terrestres**
- **CT-MINERAL – Recursos Minerais**
- **CT-INFO – Tecnologia da Informação**
- **CT-AQUAVIÁRIO – Transp. Aquaviário e constr. naval**
- **FUNTTEL – Telecomunicações**

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FNDCT/Fundos Setoriais (avanços)

- **Editais específicos para regiões N, Ne, CO**
- **Ações transversais** - mecanismo utilizado pela Finep para destinar recursos de vários fundos para apoiar um mesmo projeto/atividade
- **Lei de Inovação -** destinou parcela de recursos do FNDCT para subvenção econômica de empresas
- **Nova Lei do FNDCT -** gestão operacional mais integrada com Conselho Diretor, autoriza aplicação de recursos em empresas e em fundos de investimentos para inovação.

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Ilha do Fundão

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Parque tecnologico

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Muchas Gracias
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