MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÕES

nit rio
NÚCLEO DE INOVAÇÃO TECNOLÓGICA

CBPF

PHYSICS AND INNOVATION AT THE BRAZILIAN CENTER FOR PHYSICS RESEARCH

Marcelo Portes de Albuquerque
CBPF Technologist
Technology Development Coordination - COTEC

DATA SCIENCE IN (ASTRO)PARTICLE PHYSICS and COSMOLOGY: the BRIDGE to INDUSTRY

27-30 JUNHO 2022, Universidade de Coimbra, Coimbra, Portugal

Um evento que mostra o potencial da ciência de dados na sociedade moderna e estimula sinergias entre investigação fundamental e indústria

LIP

CBPF - MISSION

- **Carry out fundamental research in Physics and develop its applications**
- **Act as the National Institute of Physics of the MCTI**
- **Physics Hub for:**
  - Scientific investigation
  - postgraduate training and improvement of scientific personnel.

73 years

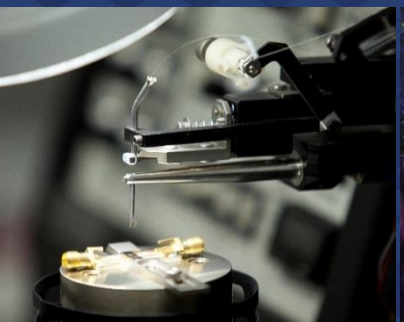
MINISTÉRIO DA CIÊNCIA,TECNOLOGIA E INOVAÇÕES

PÁTRIA AMADA BRASIL GOVERNO FEDERAL

CBPF – R&D

Experimental, Theoretical and Applied

- High Energy Physics and Astroparticles
- Materials and condensed matter
- Nanoscience and Nanotechnology
- Biophysics and Biomaterials
- Statistical Mechanics and Complex Systems
- Information and Quantum Computing
- Cosmology and Gravitation
- Signal Processing and Artificial Intelligence
- Scientific Instrumentation



Science and Technology driving

INNOVATION

Fundamental Research → Application

Medicine:

- X-rays, NMR
- PET-CT (Positron Emission Tomography)

Materials and Biology → Synchrotron Radiation

Semiconductors

- Lithography → Nanotechnology
- measurement in the manufacture of microelectronic devices → Scanning Electron Microscope

Industrial process control

Robotic sensing

Software

High vacuum → production, measurement and maintenance in increasing volumes;

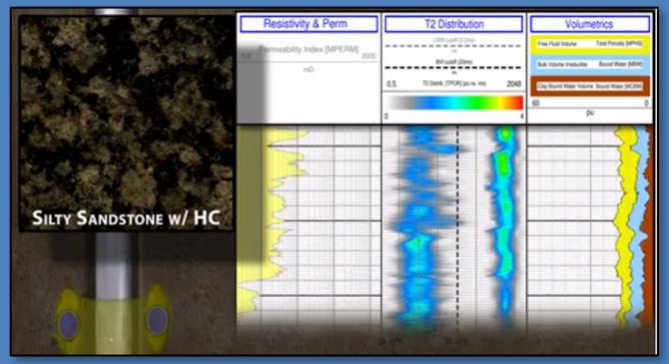
Cryogenic techniques

Industrial-scale superconducting magnets

Communication → Optical Fibers and Laser

Oil &e Gas

Resistivity measurement during oil well drilling.



NMR allows real-time measurement to locate and identify fluids.
http://www.bakerhughes.com/products-and-services/evaluation/logging-while-drilling/eval-magtrak-magnetic-resonance

R&D benefits → ***are not fully anticipated in the origin of pure scientific knowledge*** → ***Neither the possible applications of this new knowledge***

Infrastructure Bottlenecks

2012 - Brazilian Physics Society made a report of "*Physics and National Development*":

*"**Scientific instrumentation** and **multi-user laboratories** were identified as the main bottlenecks, both important to increase interactions with the business sector."*

Tabela 10 – Respostas sobre as áreas em que cada comunidade de Física acredita existirem gargalos de infraestrutura que devem ser superados para induzir competitividade à Física brasileira.

Total de respondentes: 3063	Nº de respondentes	Nº de respostas	Instrumentação científica	Registro de patentes	Programa espacial	Lab. nacionais multiusuários	Computação larga escala	Programa nuclear	Outros
Universidade	**1.240**	**3.260**	814	532	257	833	477	189	158
Colégio/Escola	**302**	**864**	199	121	78	212	144	84	26
Empresa	**88**	**214**	45	45	17	55	28	14	10
Instituto de Pesquisa	**253**	**703**	163	102	81	163	80	77	37
Outros/não declarados	**1.180**	**2.623**	617	424	233	629	402	224	94
TOTAL	**3.063**	**7.664**	1.838	1.224	666	1.892	1.131	588	325
TOTAL		**100%**	24%	16%	9%	25%	15%	8%	4%

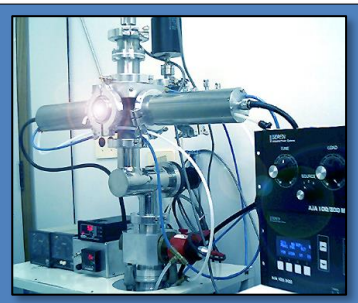
Context in CBPF

- **CBPF tradition in Scientific and Technological Instrumentation**

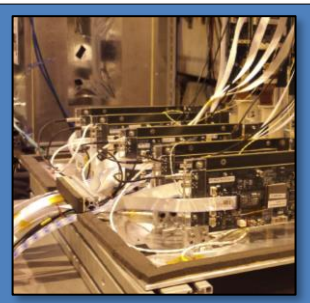
Instrumentation for Linear Accelerators

Electronic Instruments

1980 – Microprocessed Data Acquisition System.


2000 - Magnetron sputtering

2012– Instrumentation for Neutrino


2016 - Sensores SiPM (LHCb)

2019 – Desktop HPC multiGPU

Creation of the Professional Master's Degree in Physics in Scientific Instrumentation

To train professionals who can work in different segments and companies in technologies development:

- Automation of experiments and industrial processes
- Tools for measuring physical quantities (electrical, thermal, magnetic, etc.)
- Construction of equipment, devices, software, prototypes, etc.

The development of high-tech processes and new instruments can make the industry more competitive

Office of Innovation and Technology Transfer

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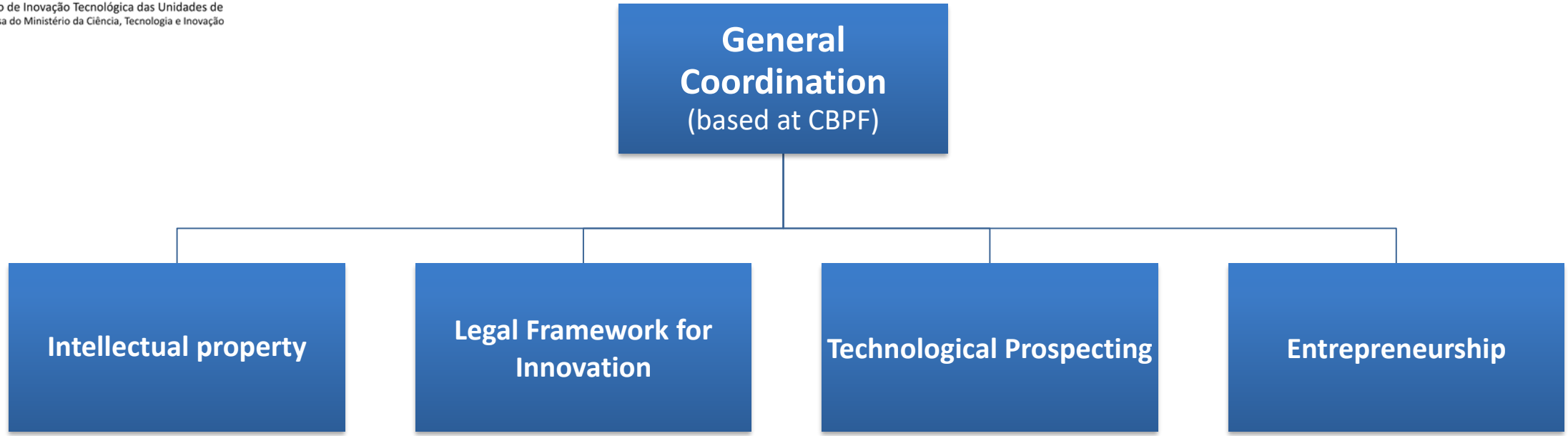
Núcleo de Inovação Tecnológica das Unidades de Pesquisa do Ministério da Ciência, Tecnologia e Inovação

Promote and monitor CBPF's relationship with the productive sector



CBPF Centro Brasileiro de Pesquisas Físicas · CETEM Centro de Tecnologia Mineral · ibict Instituto Brasileiro de Informação em Ciência e Tecnologia · IMPA Instituto Nacional de Matemática Pura e Aplicada · INT Instituto Nacional de Tecnologia · LNCC Laboratório Nacional de Computação Científica · MAST Museu de Astronomia e Ciências Afins · ON Observatório Nacional

http://www.nitrio.org.br

CBPF/R&D in partnership with Industry

Legal Framework of ST&I

- NMR/Quantum Computing for Petrophysics;
- Artificial Intelligence and Deep Learning for Petrophysics and Geophysics;
- Nanotechnology for the O&G industry

- New materials and techniques for medical implants

- Micro and nanoscale magnetic resonance

- New Materials, Nanotechnology and Magnetic Devices

- Mechanical Structure of the Cherenkov Telescope Array

- R&D for efficiency in Materials Surface applications

CBPF Highlights

Research, Technological Development and Innovation Activities at CBPF

Biomaterials for Medical and Environmental Use

Development and Innovation

- Biomaterials for bone and dental tissue regeneration
- Nanostructured biomaterials and nanoparticles for drug delivery and Nanotoxicology
- Immobilization of heavy metals in waste and polluted water

LabioMat

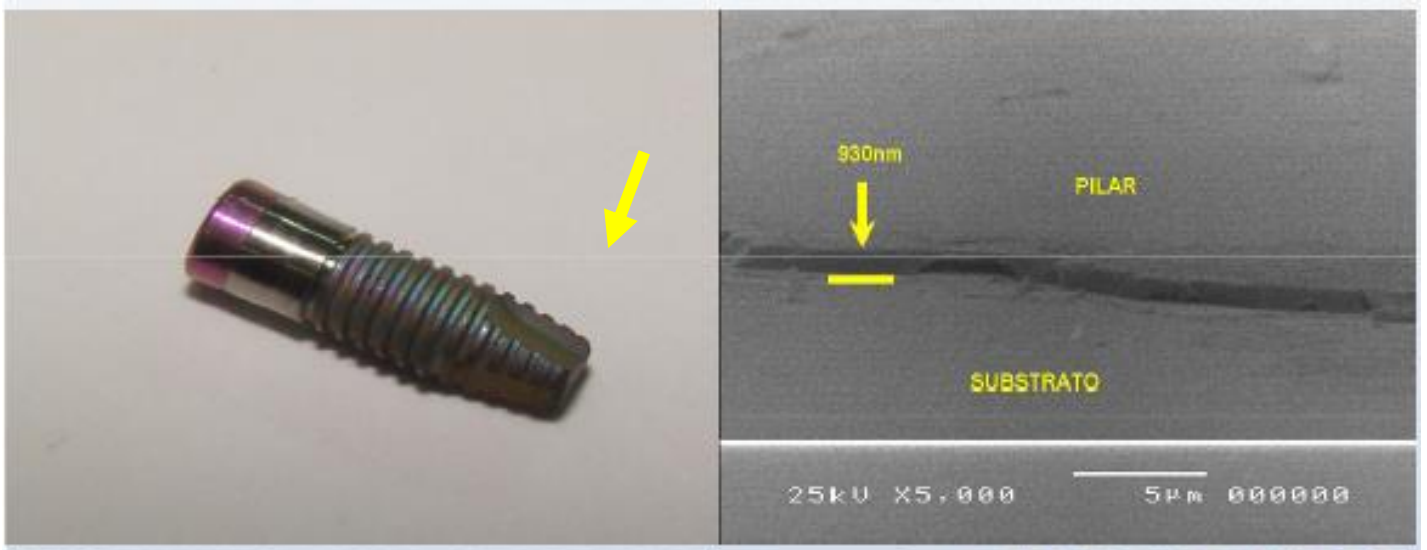
Materials

- Calcium phosphates
- Calcium phosphate/polymer composites
- Coatings on metallic implants

Product Development

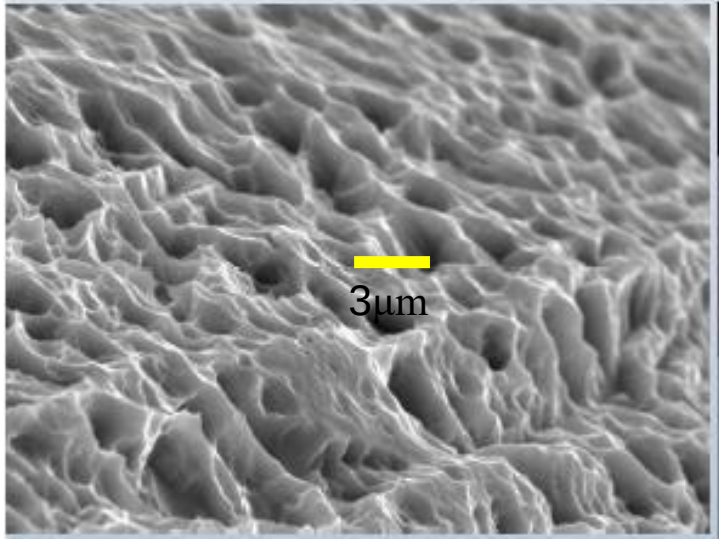
Implants coated with Nanometric Hydroxyapatite

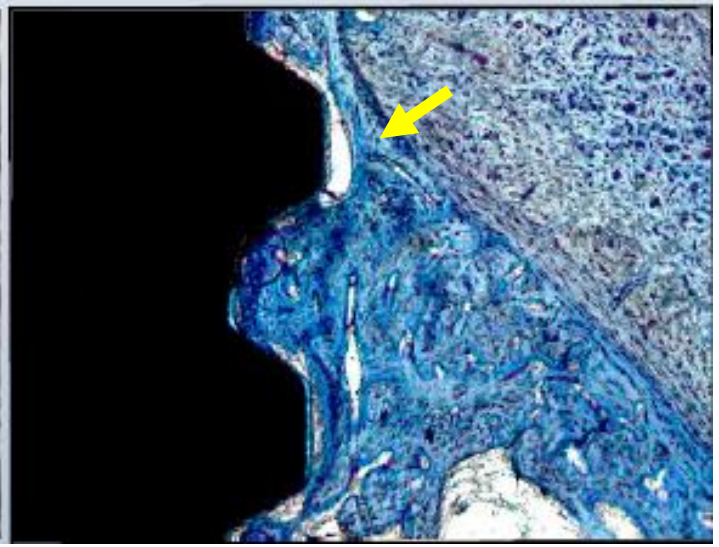
Commercial titanium screw with nanometric hydroxyapatite coating (100nm)



Coating material free from other less biocompatible phosphates or toxic phases such as calcium oxide

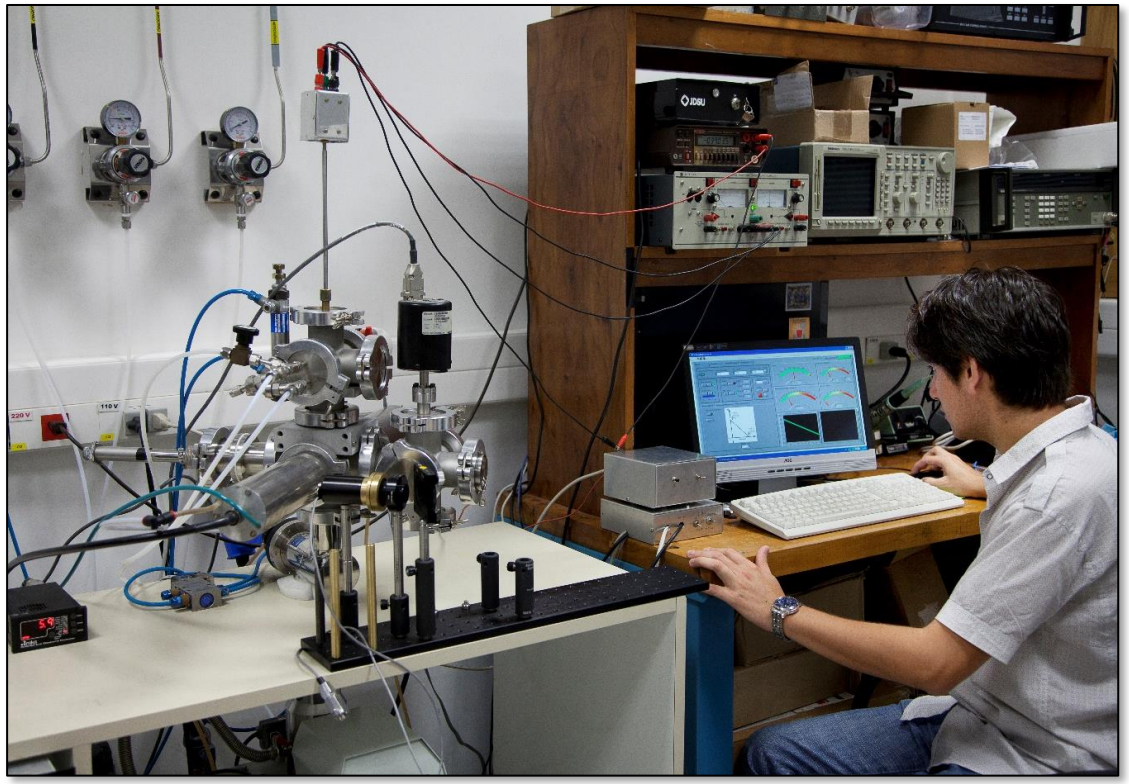
Metallic implant surface with micrometric roughness for mechanical adhesion and homogeneous, biocompatible, nanometric coating to induce bone adhesion without producing toxicity

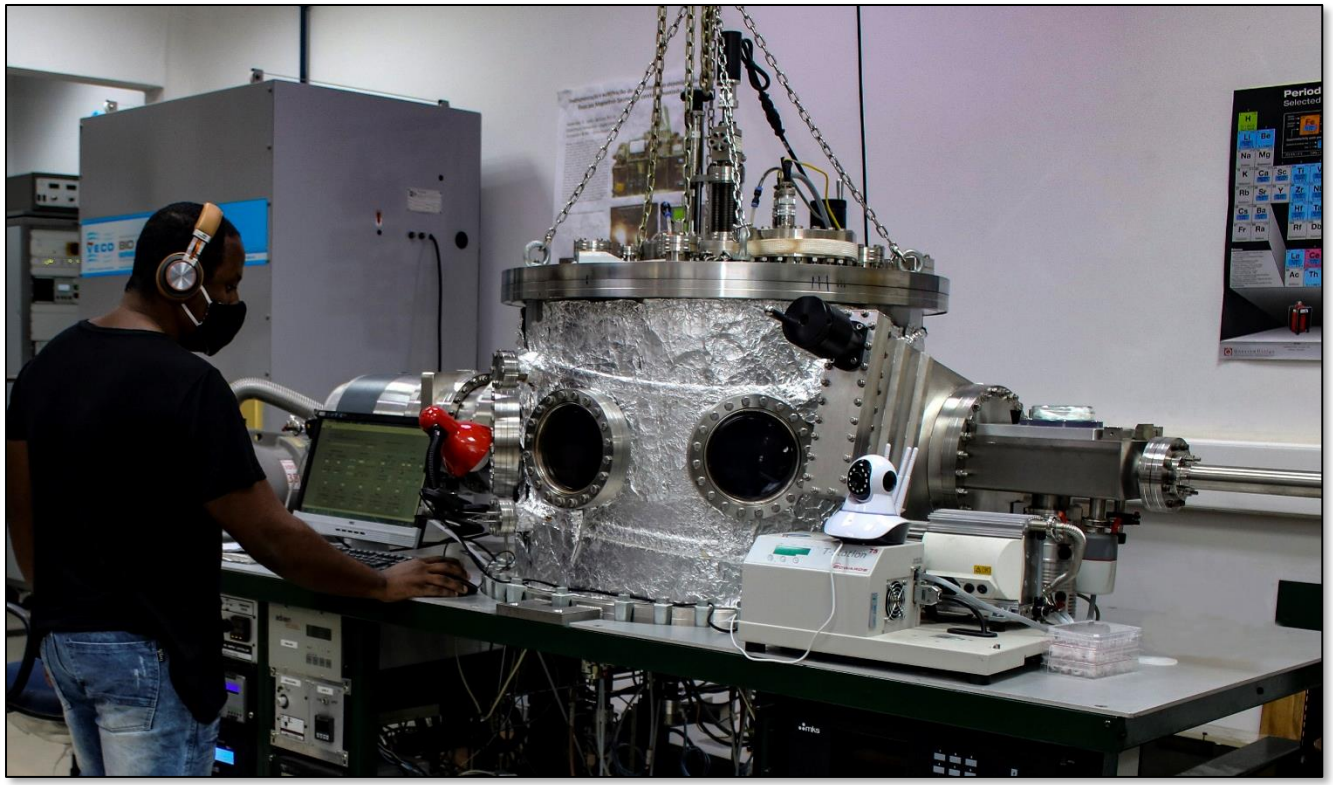




Preclinical tests (In-Vivo) in rabbits and dogs have proven: Strong bonding and bone growth (in blue) to the HAPnano coated screw (in black) compared to the uncoated one

Instrument for Coating Metallic Implants with Nanometric Biomaterial





Developed technology:

- Plasma electrical parameters measurement system
- Real-time measurement of coating deposition rate.

Ready for Technology Transfer:

Equipment for scale production of nano-sized adherent coatings of nano-sized calcium phosphates at room temperature:

Adds biocompatibility to implants and can reduce failure and integration problems of orthopedic metallic implants used by the Public Health System in Brazil (SUS)

13

Nanotechnology Network applied to Health for the development of nanoproducts

Tissue Regeneration, Therapies and Diagnosis (NanoHealth Group).

- NanoHealth works in the R&D of new products based on nanotechnology as well as the technological support to companies linked to health, the hospital sector and regulatory agencies.

Production → Biological Assessments → Product Efficiency/Safety → Market

- Develops drug delivery systems, diagnostic nanomaterials, grafts and implants for dentistry and orthopedics and radiopharmaceuticals based on polymers, ceramics, composites, magnetic oxides, metals, carbon complexes and biological nanostructures

- It brings together 23 laboratories from Universities and Research Institutes in the State of Rio de Janeiro in the areas of materials engineering, chemistry, physics, biology, pharmacy, medicine and dentistry with extensive experience in Nanotechnology applications to Health.

ARTIFICIAL INTELLIGENCE
Classification, Simulations and Forecasts

We participated and won the International Astrophysics Challenge / 2020

International challenge to identify gravitational lensing systems in simulated images.

The team working for the industry contributed to the scientific project.

Developing a Victorious Strategy to the Second Strong Gravitational Lensing Data Challenge

C. R. Bom[a,b], B. M. O. Fraga[a], L. O. Dias[a], P. Schubert[a,1], M. Blanco Valentin[d,2], C. Furlanetto[e], M. Makler[a,c], K. Teles[a], M. Portes de Albuquerque[a], R. Benton Metcalf[f,g]

[a]Centro Brasileiro de Pesquisas Físicas, Rua Dr. Xavier Sigaud 150, CEP 22290-180, Rio de Janeiro, RJ, Brazil
[b]Centro Federal de Educação Tecnológica Celso Suckow da Fonseca, Rodovia Mário Covas, lote J2, quadra J, CEP 23810-000, Itaguaí, RJ, Brazil
[c]International Center for Advanced Studies & Instituto de Ciencias Físicas, ECyT-UNSAM & CONICET, 25 de Mayo y Francia. C.P.: 1650, San Martín, Buenos Aires, Argentina
[d]Electrical and Computer Engineering Department, McCormick School, Northwestern University, 633 Clark St, Evanston, IL 60208
[e]Universidade Federal do Rio Grande do Sul, Departamento de Física, CEP 91501-970, Porto Alegre, RS, Brazil
[f]Dipartimento di Fisica e Astronomia, Università di Bologna, via Gobetti 93/2, I-40129 Bologna, Italy
[g]INAF - Osservatorio di Astrofisica e Scienza dello Spazio di Bologna, via Gobetti 93/3, I-40129 Bologna, Italy

Abstract

Strong Lensing is a powerful probe of the matter distribution in galaxies and galaxy clusters and a relevant tool for cosmography. Analyses of strong gravitational lenses with Deep Learning (DL) and Convolutional Neural Networks (CNNs) have become a popular approach due to these astronomical objects' rarity and image complexity. Next-generation surveys (both ground and space-based) will provide more opportunities to derive science from these objects and an increasing data volume to be analyzed. However, finding strong lenses is challenging, as their number densities are orders of magnitude below those of galaxies. Therefore, specific Strong Lensing search algorithms are required to discover the highest number of systems possible, with high purity and low false alarm rate to minimize human intervention. The need for better algorithms has prompted the development of an open community data science competition named Strong Gravitational Lensing Challenge (SGLC) by the Bologna group. In this work, we present the Deep Learning strategies and methodology used to design the highest-scoring algorithm in the II SGLC, which was based on Euclid-like simulations. We discuss the approach used for this dataset, the choice for a suitable architecture, particularly the use of a network with two branches to work with images in different resolutions, and its optimization. We also discuss the limit of what tailor-made architecture in a survey in contrast pipeline, and discuss the best choice to easily ment. This work helps to take a step towards ks.

networks

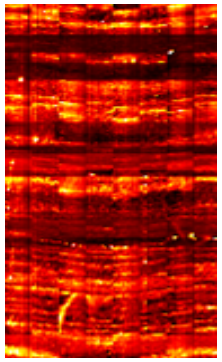
Submitted 2022 Monthly Notices of the Royal Astronomical Society

Da esq. para dir., Patrick, Marcelo, Martín, Paulo, Clécio, Pedro, Manuel, Marcos e Luciana

(Crédito: NCS/CBPF)

https://portal.cbpf.br/pt-br/ultimas-noticias/grupo-do-cbpf-vence-desafio-internacional

RattlePy



Contents lists available at ScienceDirect

Journal of Petroleum Science and Engineering

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

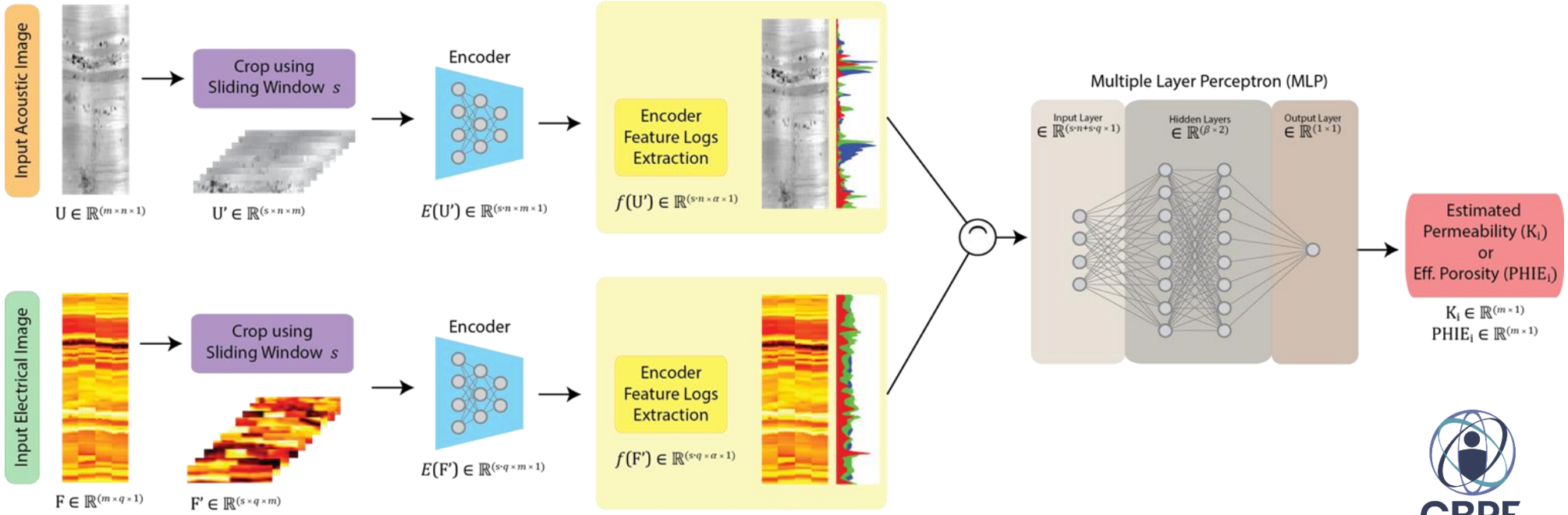
Journal of Petroleum Science and Engineering 170 (2018) 315–330

Estimation of permeability and effective porosity logs using deep autoencoders in borehole image logs from the brazilian pre-salt carbonate

Manuel Blanco Valentín[a,*], Clécio R. Bom[b], André Luiz Martins Compan[c], Maury Duarte Correia[c], Candida Menezes de Jesus[d], Anelise de Lima Souza[d], Márcio P. de Albuquerque[a], Marcelo P. de Albuquerque[a], Elisângela L. Faria[a]

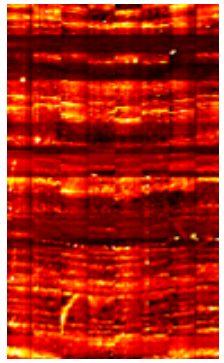
https://doi.org/10.1016/j.petrol.2018.06.038

Deep Learning technique to estimate perm/porosity along the borehole using a combination of enhanced ultrasound and resistivity images

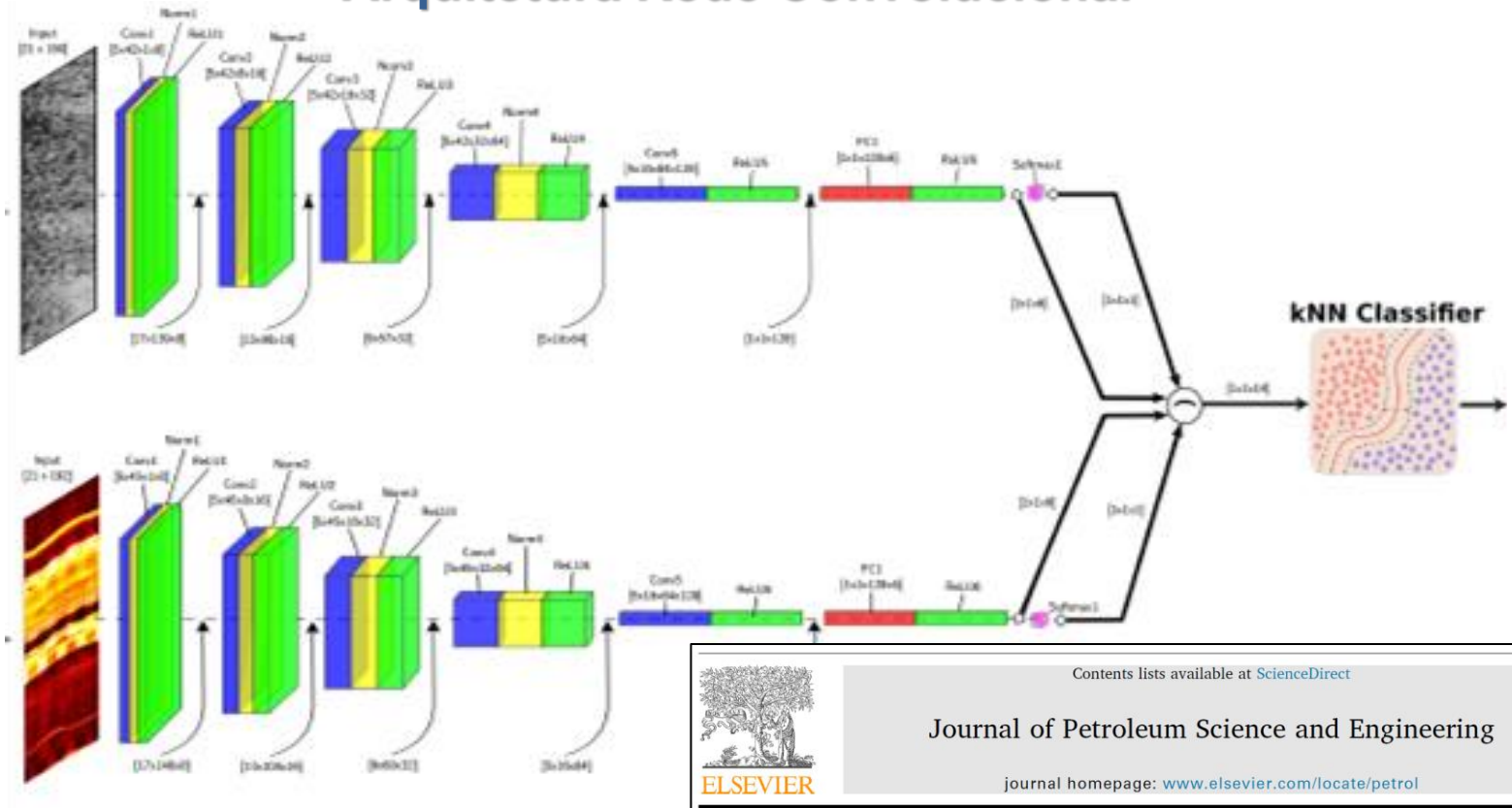


CBPF

Lithology Classification in Pre-Salt

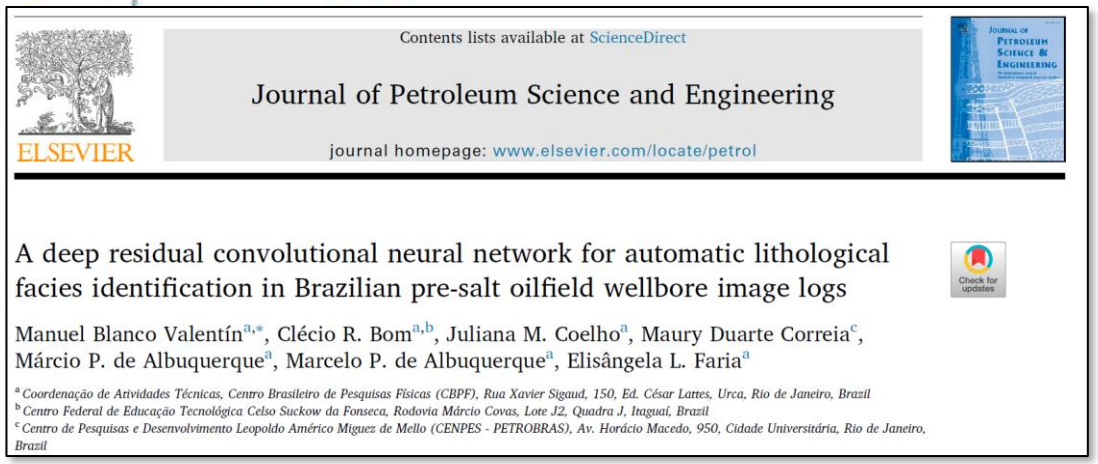


Arquitetura Rede Convolucional



Deep Learning architecture to make a fast and reliable analysis from the Ultrasound and Resistivity images that can be validated by the geologist.

Journal of Petroleum Science and Engineering
Volume 179, August 2019, Pages 474-503
https://linkinghub.elsevier.com/retrieve/pii/S0920410519303663



Contents lists available at ScienceDirect

Journal of Petroleum Science and Engineering

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

ELSEVIER

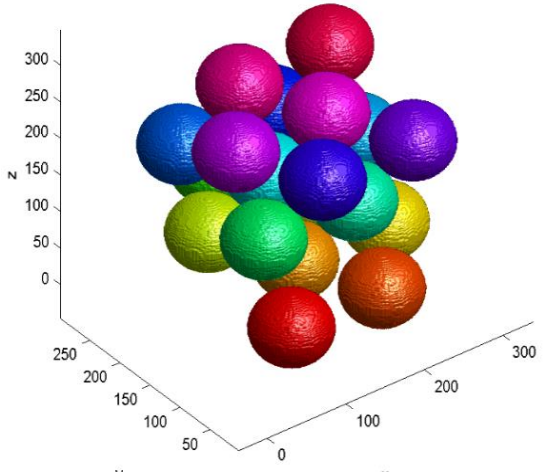
A deep residual convolutional neural network for automatic lithological facies identification in Brazilian pre-salt oilfield wellbore image logs

Manuel Blanco Valentín[a,*], Clécio R. Bom[a,b], Juliana M. Coelho[a], Maury Duarte Correia[c], Márcio P. de Albuquerque[a], Marcelo P. de Albuquerque[a], Elisângela L. Faria[a]

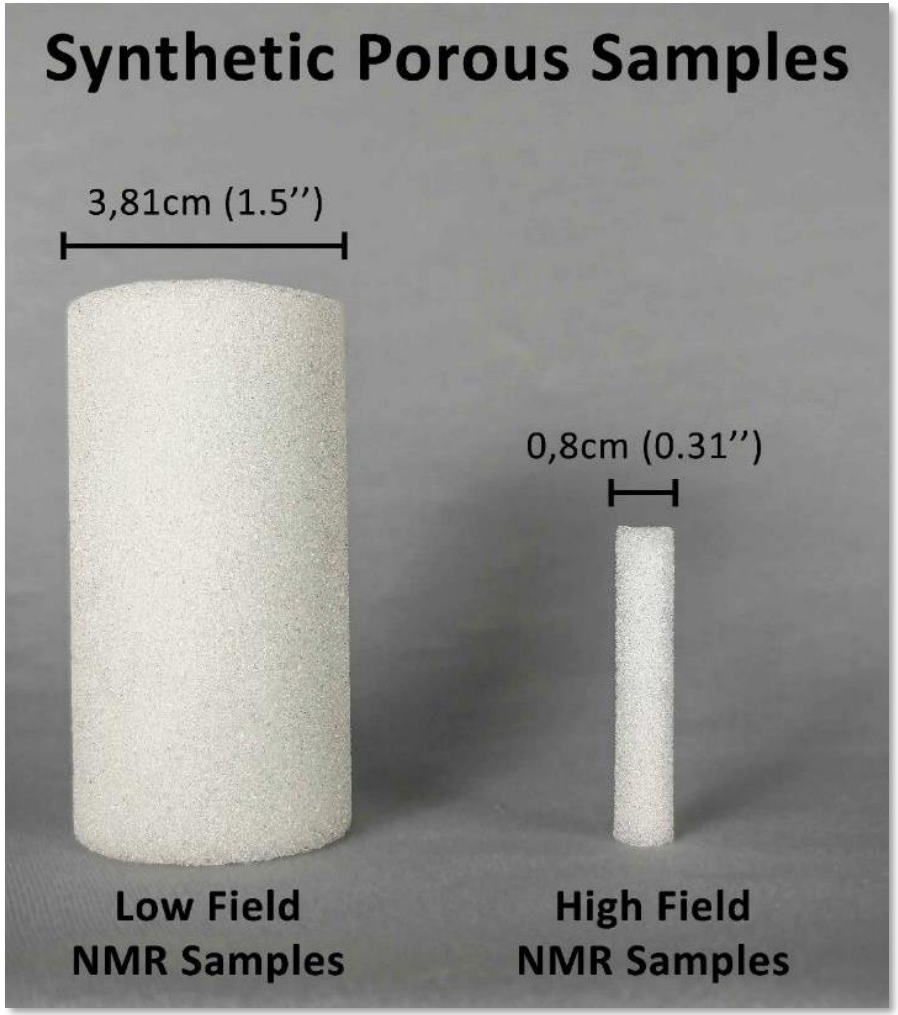
[a] Coordenação de Atividades Técnicas, Centro Brasileiro de Pesquisas Físicas (CBPF), Rua Xavier Sigaud, 150, Ed. César Lattes, Urca, Rio de Janeiro, Brazil
[b] Centro Federal de Educação Tecnológica Celso Suckow da Fonseca, Rodovia Márcio Covas, Lote J2, Quadra J, Itaguaí, Brazil
[c] Centro de Pesquisas e Desenvolvimento Leopoldo Américo Miguez de Mello (CENPES - PETROBRAS), Av. Horácio Macedo, 950, Cidade Universitária, Rio de Janeiro, Brazil

NMR for Petrophysics

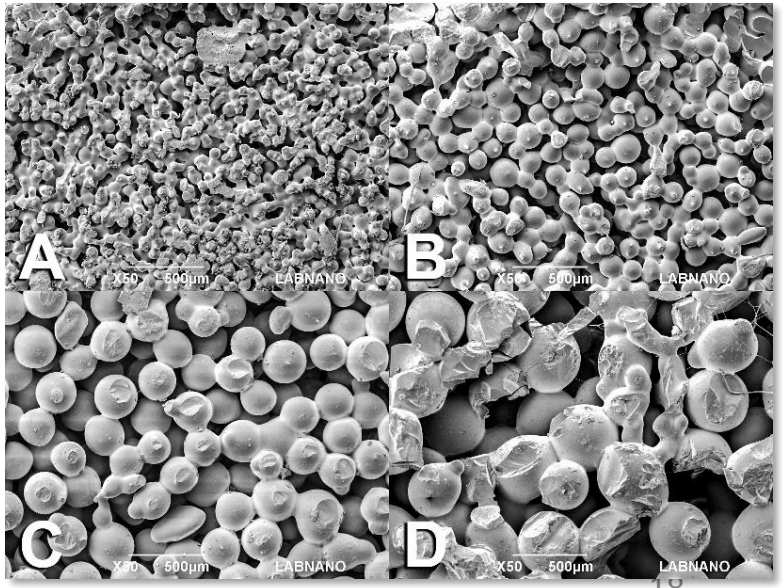
Development of physical models to describe the relationship between relaxation time and porosity



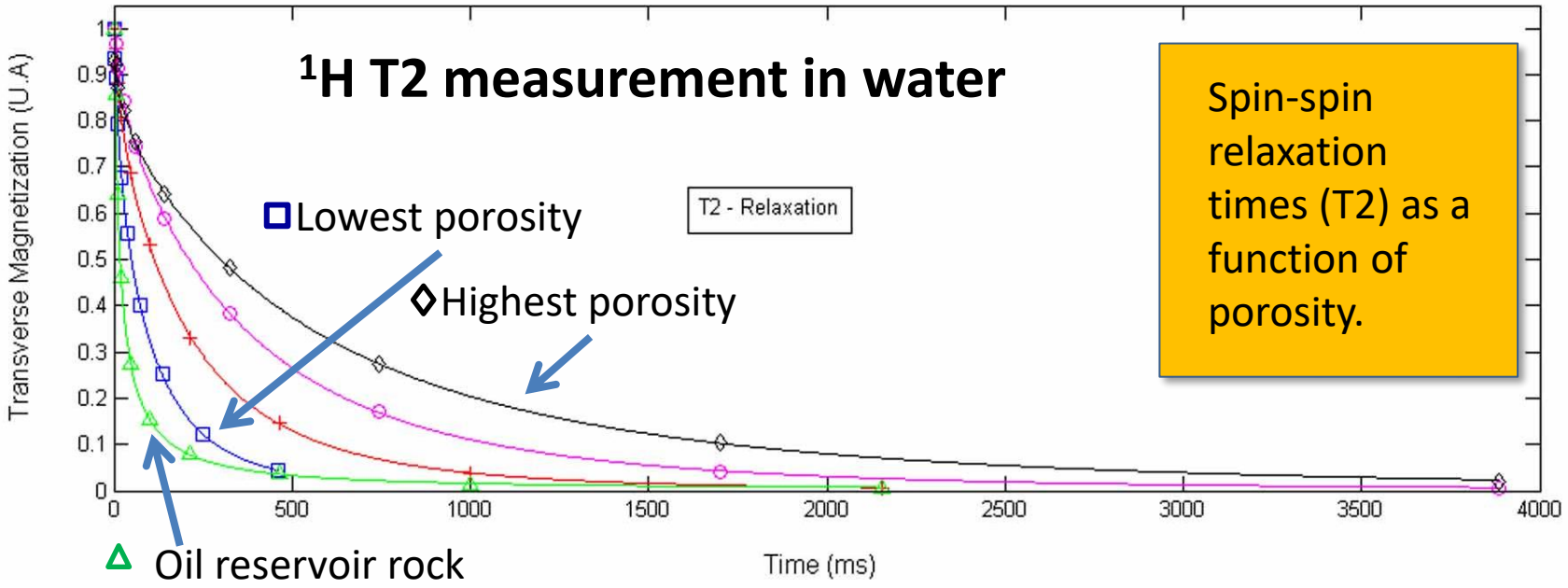
Examples of sintered rock plugs with controlled porosity, for high (or low) field NMR experiments. Produced from glass spheres, with controlled granulometries



TEM images of four sintered Plugs with different porosities for NMR experiments. Porosity can be characterized with NMR relaxometry.



NMR for Petrophysics



Spin-spin relaxation times (T2) as a function of porosity.

Analytical statistical model to interpret the results

Contents lists available at ScienceDirect

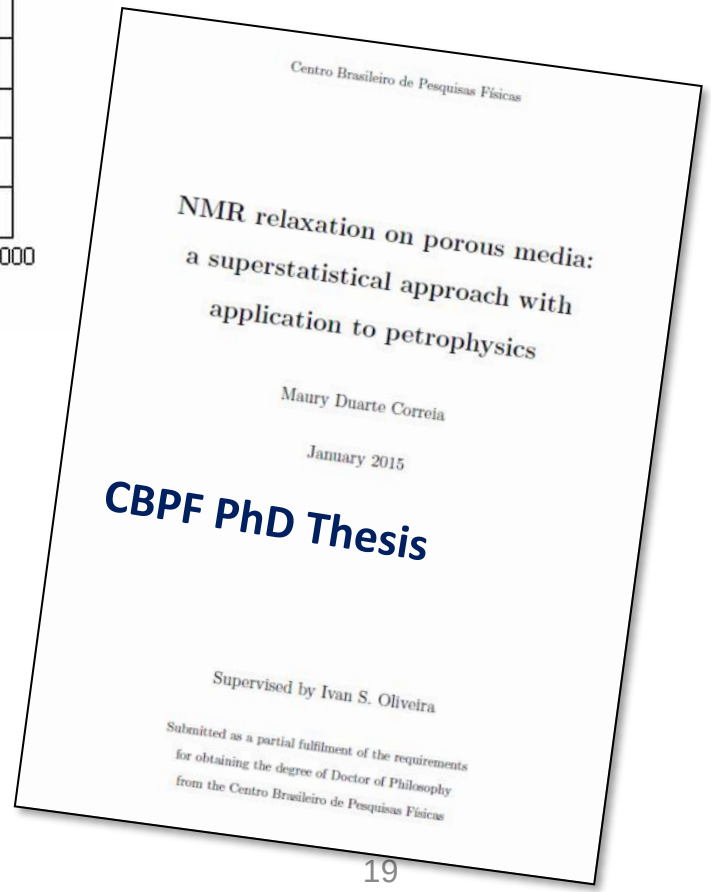
Journal of Magnetic Resonance

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

Superstatistics model for T_2 distribution in NMR experiments on porous media

M.D. Correia [a,b,*], A.M. Souza [b], J.P. Sinnecker [b], R.S. Sarthour [b], B.C.C. Santos [a], W. Trevizan [a], I.S. Oliveira [b]

[a] Petróleo Brasileiro S.A., PETROBRAS, Centro de Pesquisas Leopoldo Miguez de Mello, CENPES, Av. Horácio Macedo, 950, Cidade Universitária, Rio de Janeiro, RJ CEP: 21.941-915, Brazil
[b] Centro Brasileiro de Pesquisas Físicas, CBPF, Rua Dr. Xavier Sigaud, 150, Urca, Rio de Janeiro, RJ CEP: 22290-180, Brazil



NMR on the nanometer scale

Development of high sensitivity NMR systems for nanometric samples.

Applicability

- **Academic:** study of samples at the nanometer scale and manipulating quantum systems.
- 4 Master's dissertations in progress

- **Industrial:** high-sensitivity portable MRI systems.
  - R&D in collaboration with the company
  - Fine Instrument Technology

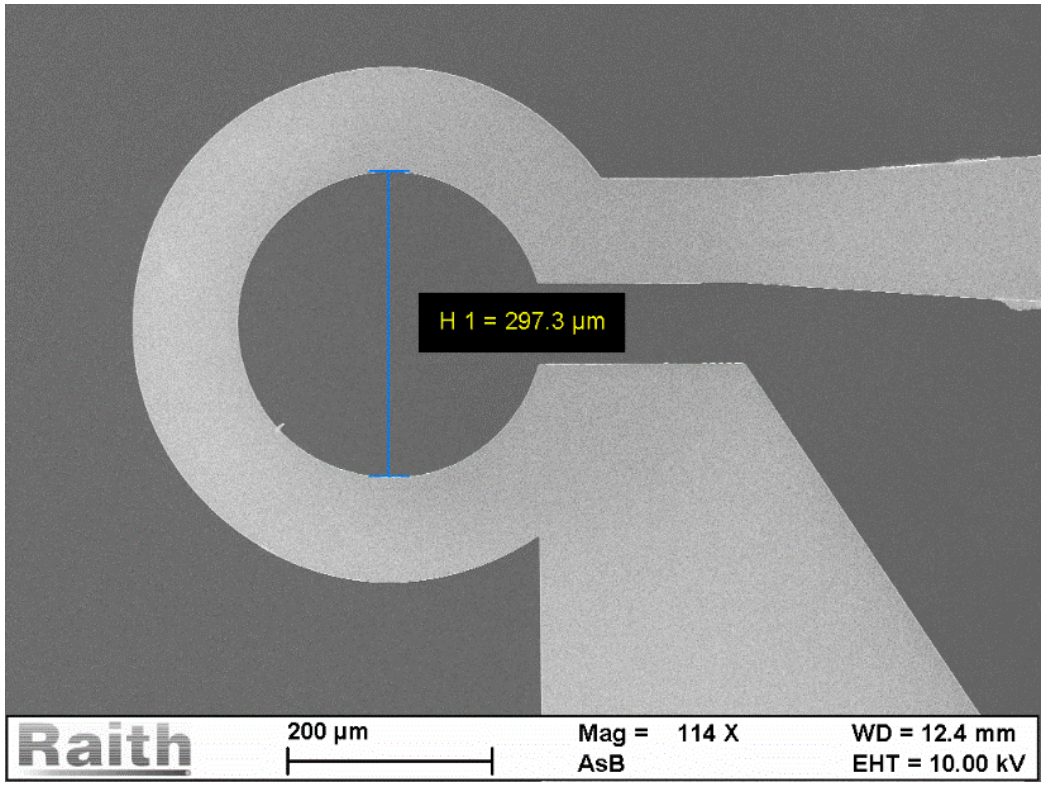


Figure: Example of a resonator produced at CBPF / LABNANO

External collaborations:

Technishe Universität Dortmund (Alemanha)

LABNANO/CBPF

The Multiusers Facilities of Nanoscience and Nanotechnology integrates a set of systems and services open to the Brazilian scientific and technological community and aims to support national development in science, technology and innovation at the nanoscale, with an emphasis on nanofabrication.

Industrial Applications and innovation support at LABNANO

LABNANO/CBPF is the 1st Brazilian Nanocenter

- **Multiuser Laboratory of Nanosciences and Nanotechnology.**
- **Open facility:**operates with project submission and peer review. 50% of the machine time is made available to external users (SisNANO, 2013& 2019). 10% is made available for the provision of services or agreements with companies.
- Created as a *Strategic Regional Facility to drive the fabrication and characterization of nanostructures with a focus on electron beam nanolithography and analytical electron microscopy*.
- It serves users from all over the country.
- It is the only open laboratory in the state of Rio de Janeiro and the second in the country (there are only LABNANO/CBPF and LNNANO/CNPEM/Campinas.
- Strong user training program (we don't do it, we teach you how to do it).
- Shared and growing knowledge base.

About LABNANO

Axes of Operation

Research and Development (knowledge base)
Jointly with CBPF LABs and users

Training and Service to Users
Electronic Microscopy (PG) courses at CBPF and abroad
specialized schools
Individual user training

Technical Training and Infrastructure Expansion
National and international cooperation

- CBPF-INL (1)
- CCNBR-Nano (finished)
- Brazil-Argentina Nano Center

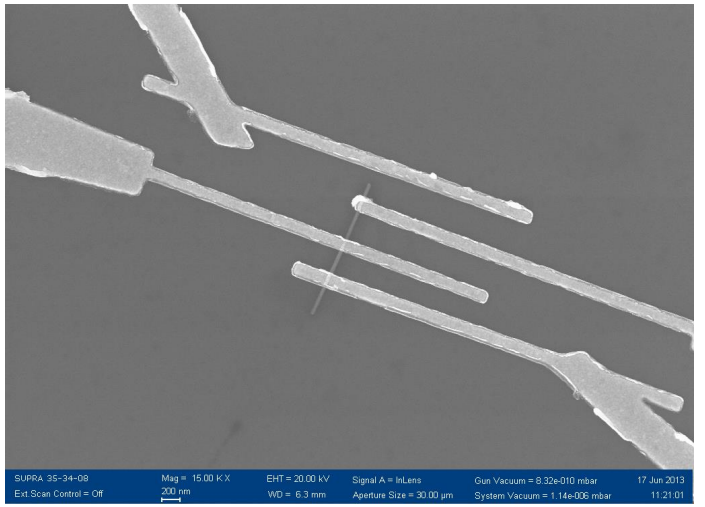
Interaction with the productive sector

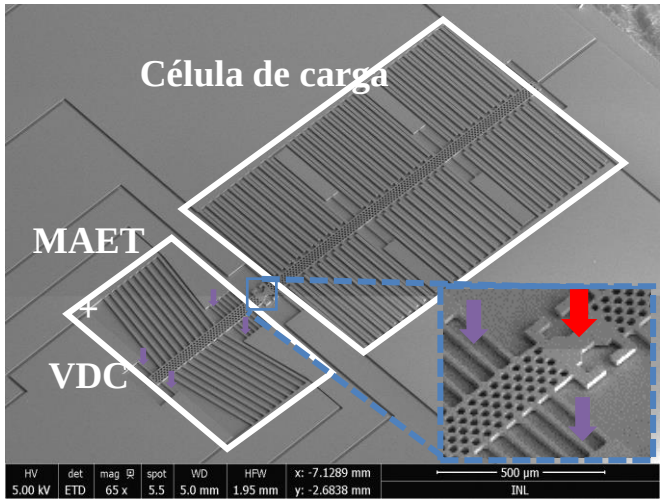
- Brazil NANO Network - SIBRATEC
- Technical-Scientific Cooperation Agreements
- Specialized services for companies

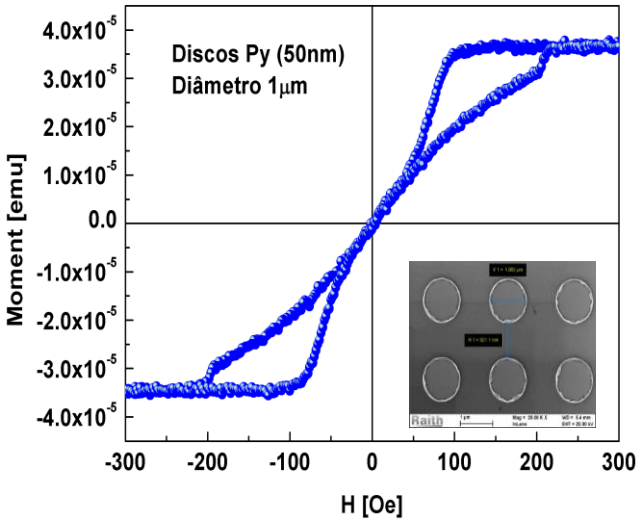
(1) INL - International Iberian Nanotechnology Laboratory, Braga - Portugal

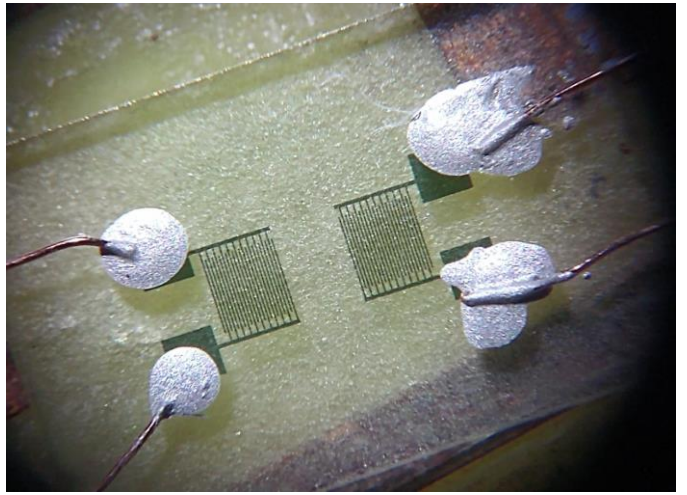
Nanofabrication: examples of projects at LABNANO

- **Thermomechanical actuators** for in-situ studies with MET
- Magnetoelastic **microresonators for medical applications**
- Magnonic crystals and materials for high frequencies
- Mixed systems: nanoscillators by spin torque transfer
- **Semiconductor nanowires for sensors**
- Mixed systems: exciting magnons via IDC in piezoelectric substrate









INTERNATIONAL COLLABORATIONS

SWGO

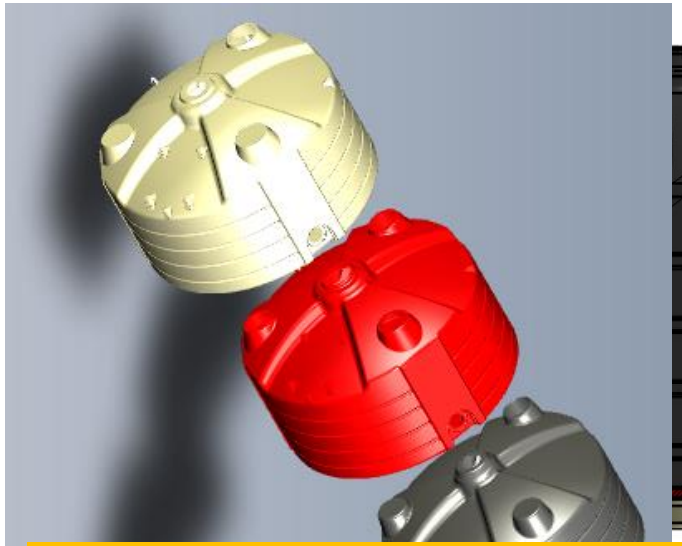
Southern Wide Field Gamma-Ray Observatory – international collaboration for the study of gamma ray sources – brings together experiments such as SGSO and LATTES

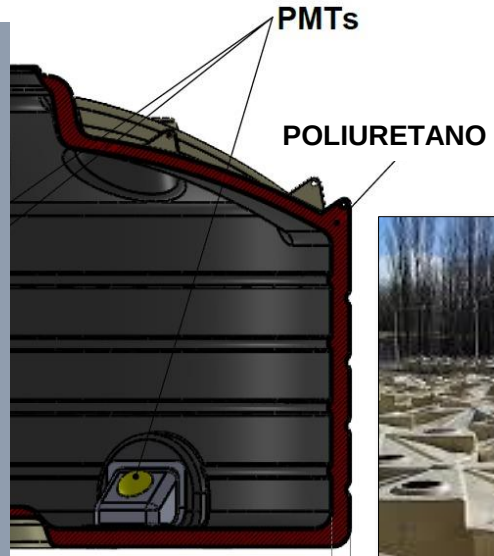
SWGO Project

LABORATÓRIO DE INSTRUMENTAÇÃO E FÍSICA EXPERIMENTAL DE PARTICULAS
http://www.lip.pt/

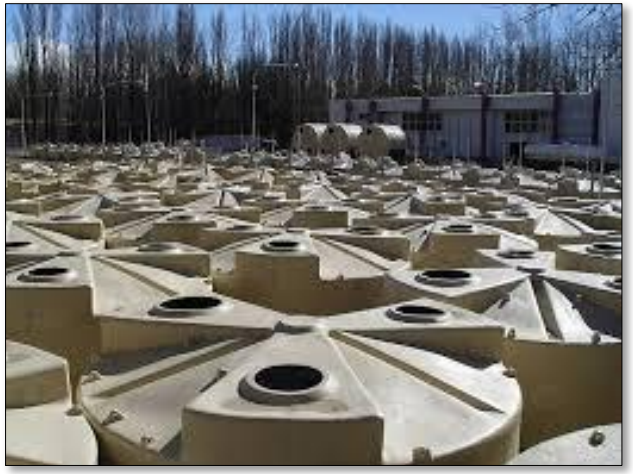
Future Gamma-ray Observatory in the Southern Hemisphere

- **The Southern Wide-field Gamma-ray Observatory (SWGO)**
  - 53 R&D institutions
  - 12 founding countries (Brazil included)
  - 5000 to 6000 rotomolded tanks (detector core only)





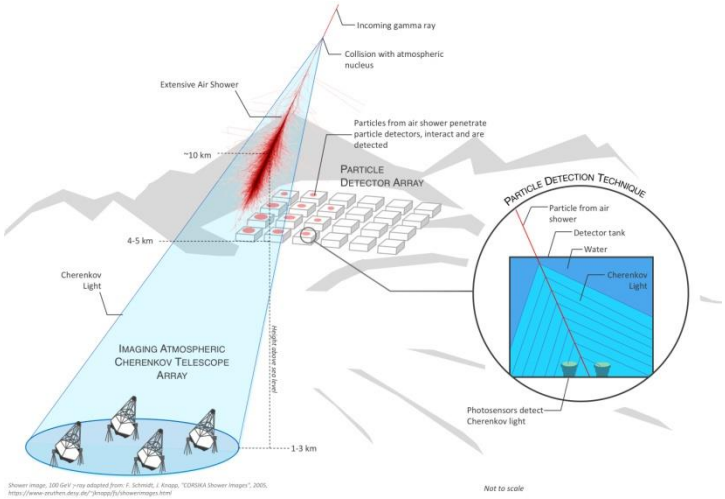
Conexão com:



Proof of concept 1600 tanks produced by the Brazilian industry for the Pierre Auger Observatory

CBPF:
- Demonstrate that it is possible to manufacture rotomolded tanks with the desired specifications (in partnership with the industry).
- **New production technique developed**
- Construction of prototypes

- **Machine Learning**
  - AI studies to complement real data
  - Increase detection capability



CBPF:
- Applications for reconstruction of extensive atmospheric shower parameters

SWGO development of new production techniques

LABORATÓRIO DE INSTRUMENTAÇÃO E FÍSICA EXPERIMENTAL DE PARTICULAS
http://www.lip.pt/

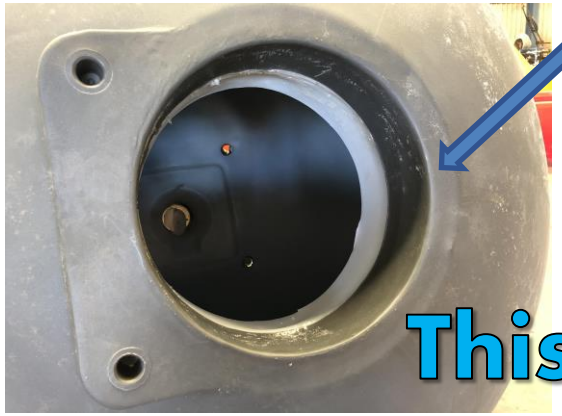
Important spin-out from basic science projects

An example: The first thermally insulated test prototype (for proof of concept)

internal layer

Two layer

Polyurethane



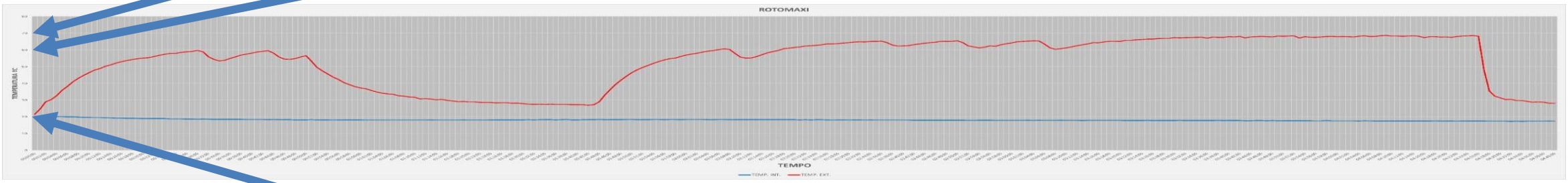
This is a new manufacturing process,

non-existent in the rotomolded industry (until 2021)

SWGO development of new production techniques

LABORATÓRIO DE INSTRUMENTAÇÃO E FÍSICA EXPERIMENTAL DE PARTICULAS
http://www.lip.pt/

70ºC - (in red) Thermocouples outside the chamber
60ºC



20ºC - (in blue) Thermocouples inside the liquid

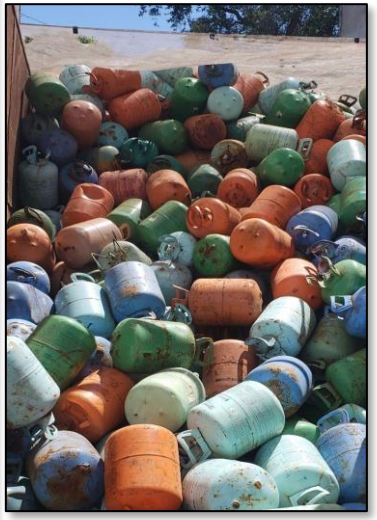
To demonstrate that it is possible to apply this technique:
The industry invested BRL R$ 4 million

The first prototype was made for an agricultural project, using the designed technique for roto-molded tanks with thermal insulation.

Ex: prototype for inoculation of seeds in the planting of: Soybean, corn, wheat and sugar cane (in inoculation the bacteria cannot exceed 30ºC).

It was a success this year in AgriShow International Agricultural Technology Fair in Action

SWGO/MARTA Environmental Protection Projects



Why? GAS REGENERATION

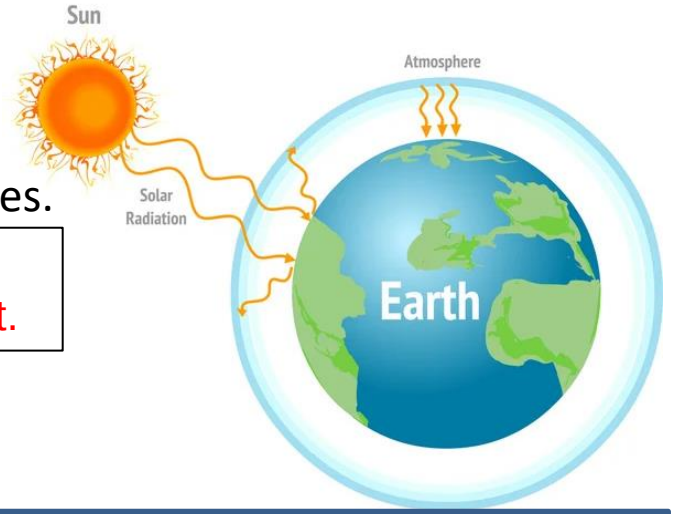
Environment:

- They are polluting substances and controlled by environmental agencies.
- Greenhouse effect

Cooling gases are responsible for 4X more greenhouse effect than all the cars on the planet.

Financial:

- Gas expensive and are getting more and more expensive.
- Regenerating is much cheaper than crafting.



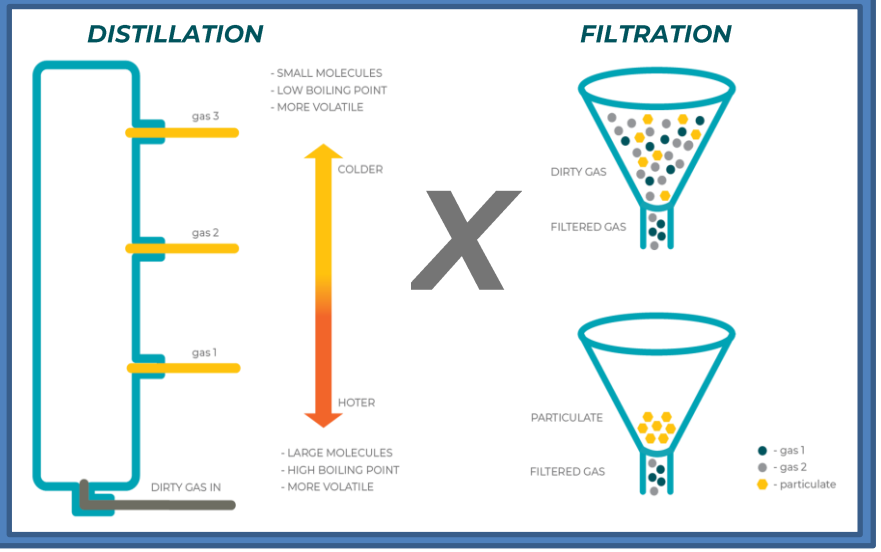
Both projects are using regenerated gas R134a (tetrafluoroethane) for 3.5 years in the Detector Characterization Lab (CBPF)

Collaboration with the Brazilian industry to develop a dedicated system for gas regeneration to RPCs, in a closed circuit.

We count on the support of the Brazilian industry:

- **Company specialized in gas regeneration**
- Chemical engineer of renowned gas manufacturer
- Staff specialized in gas regeneration

- **Distiller produced by Recigases ➡ Closed loop regeneration process control that was developed at Detector Lab (Lab. Neusa Amato - CBPF)**
- **The second unit will be sent to the LIP-Coimbra Detector Laboratory for efficiency tests**



Rio Science Datacenter

TECHNOLOGIES:

High Performance Computing (HPCs)

High Speed Data Communication for Science

Parceiros

RNP Rede Nacional de Ensino e Pesquisa

Laboratório Nacional de Computação Científica

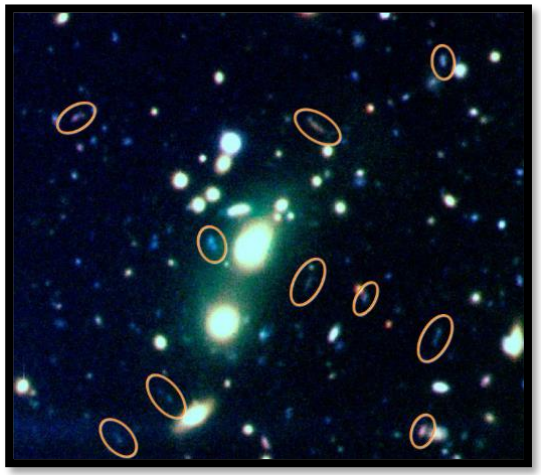
RSDC - Technologies and applications for Science

- **Scientific projects with HPC needs and large data transfer**
  - **High Energy Physics:** WLCG – LHC / CERN
  - **Cosmology :** Stripe-82 Survey (CS82) e SOAR GRAVITATIONAL ARC SURVEY - SOGRAS (Imagens Hi-Res)
  - **Materials Physics:** Nanoscience and Nanotechnology Images
  - **BSDC:** Infrastructure for data storage and astrophysics software (Open Universe).

- **Participation in projects:**

✓ *ScienceDMZ* - RNP

✓ LHC *Open Network Environment*



SOAR: SOuthern Astrophysical Research Telescope

CBPF

Specialized in networking for high-performance scientific computing

Rio de Janeiro Metropolitan Area Network for S&T

CBPF

FAPERJ
Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro

Foundation for Supporting Research in the State of Rio de Janeiro

RNP

REDECOMEP
Redes Comunitárias de Educação e Pesquisa

Laboratório Nacional de Computação Científica

RNP
POP-RJ

RedeRio de Computadores - FAPERJ

25 ANOS
CONECTANDO O PRESENTE AO FUTURO

Inaugurada em maio de 1992, a Rede-Rio conecta à internet cerca de 150 instituições (e, indiretamente, outras 150 delas) no estado do Rio de Janeiro. Nessa lista de afiliados, estão universidades, centros de pesquisa e órgãos governamentais.

A Rede-Rio transmite dados a uma velocidade média de 10 Gigabps (bilhões de bits por segundo), com capacidade de chegar a 1,9 Terabps (trilhões de bits por segundo). Sua malha de fibra ótica – incluindo sua congênere, a Redecomep – chega a 450 km de extensão.

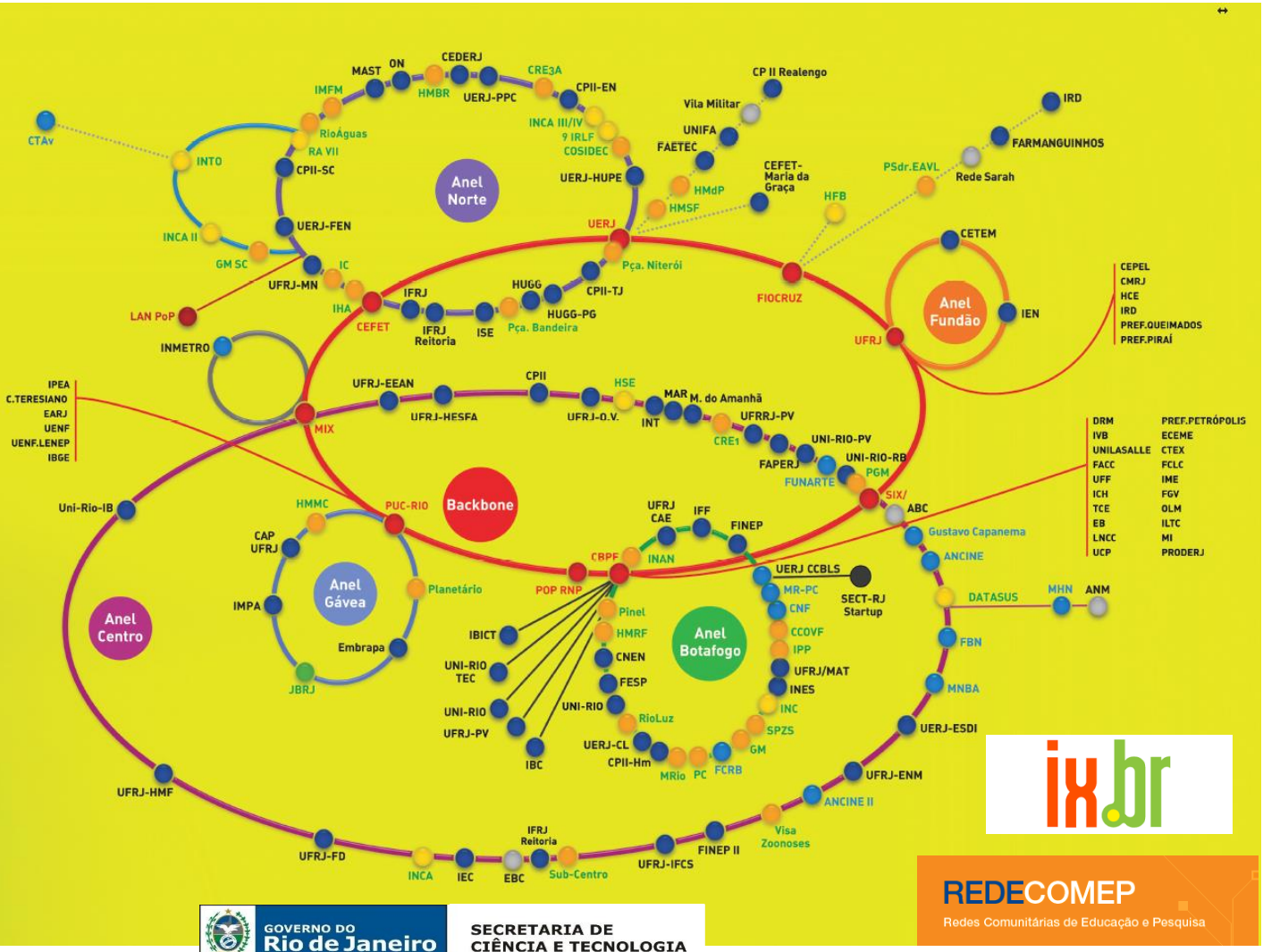
A Rede-Rio é uma iniciativa da Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (Faperj).

www.rederio.br

95 Acadêmicos
28 Prefeitura
31 Metro
2 Supervia

Total: 156

350 Km de Fibras Ópticas



PARCERIAS

RIO PREFEITURA

supervia Trens Urbanos

METRÔ RIO

Light

LAMSA LINHA AMARELA S.A.

ix.br

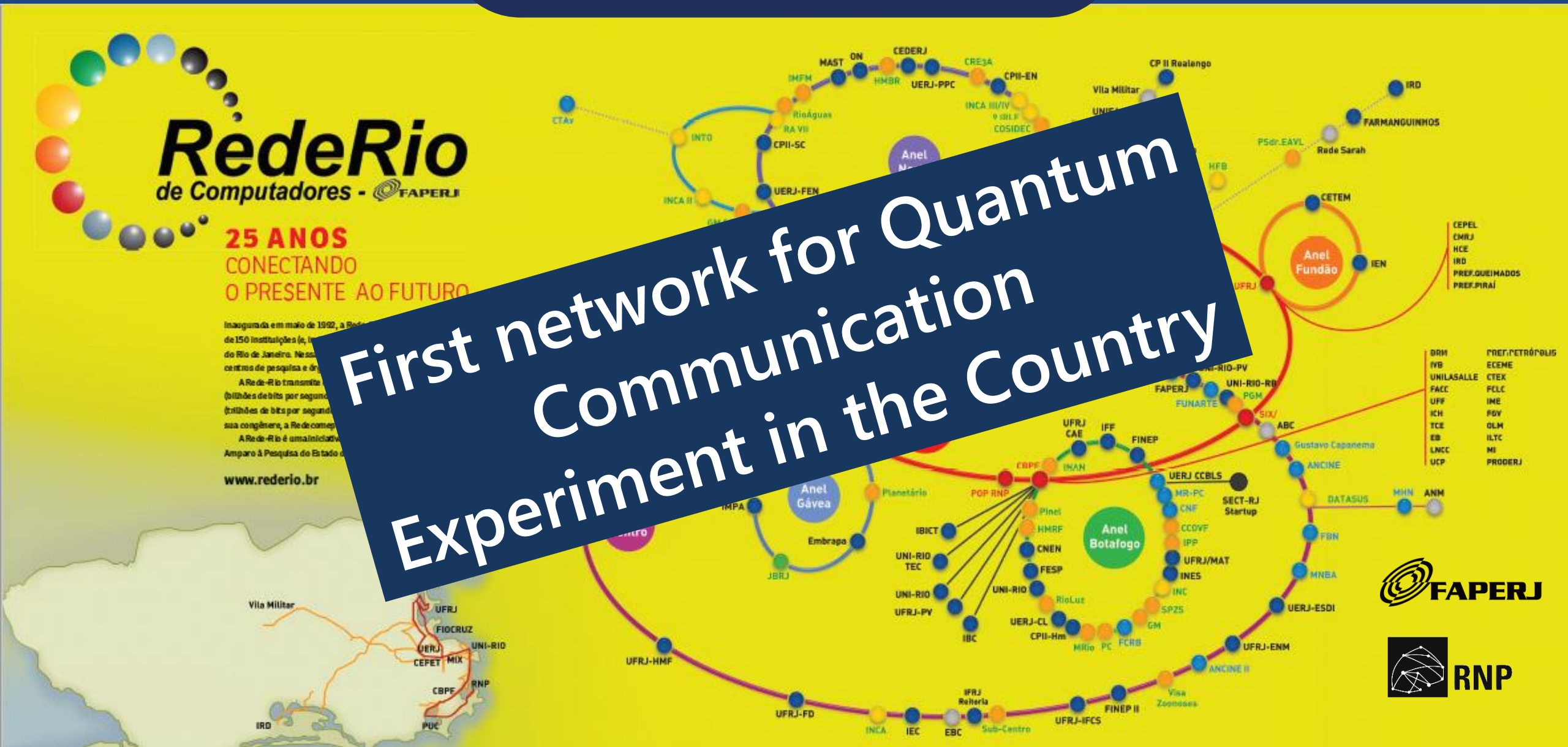
REDECOMEP
Redes Comunitárias de Educação e Pesquisa

FINEP

GOVERNO DO Rio de Janeiro
SECRETARIA DE CIÊNCIA E TECNOLOGIA

Rede-Rio MAN/FAPERJ

Rio Science Datacenter (PoP-RJ/RNP)



CBPF

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Núcleo de Inovação Tecnológica das Unidades de Pesquisa do Ministério da Ciência, Tecnologia e Inovação

ENTREPRENEURIAL SCIENTIST PROGRAM (CE)

A CBPF initiative to promote entrepreneurship in young scientists

ENTREPRENEURIAL SCIENTIST PROGRAM

Building the entrepreneurial mindset in the young scientist

Connect with industry professionals

Stimulate the creation of science and technology-based startups

Entrepreneurship Workshop (Dynamics)

Entrepreneurship for Women

CBPF Entrepreneur Meeting with SEBRAE - Brazilian Support Service for Micro and Small Companies

Entrepreneurial Scientist Training

O GLOBO

DA ACADEMIA PARA O MERCADO

Como transformar pesquisa científica em empresa de base tecnológica

Por Camilla Muniz • 03/10/2020 • 20:47

Entrepreneurship Workshop

(Business model)

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CE Program Results

CBPF graduate students won industry-sponsored hackathons.

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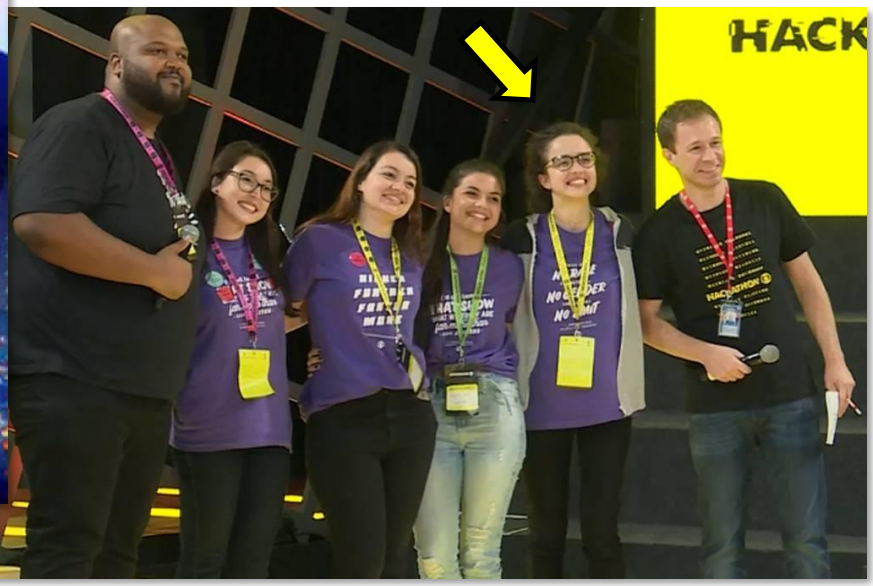
Thiago Palhares – Colaborador CBPF / UFRJ
6th place 1st Hackathon Hacking Health Rio de Janeiro; 2017
https://www.linkedin.com/in/thiago-palhares-11bb55a7/?originalSubdomain=br

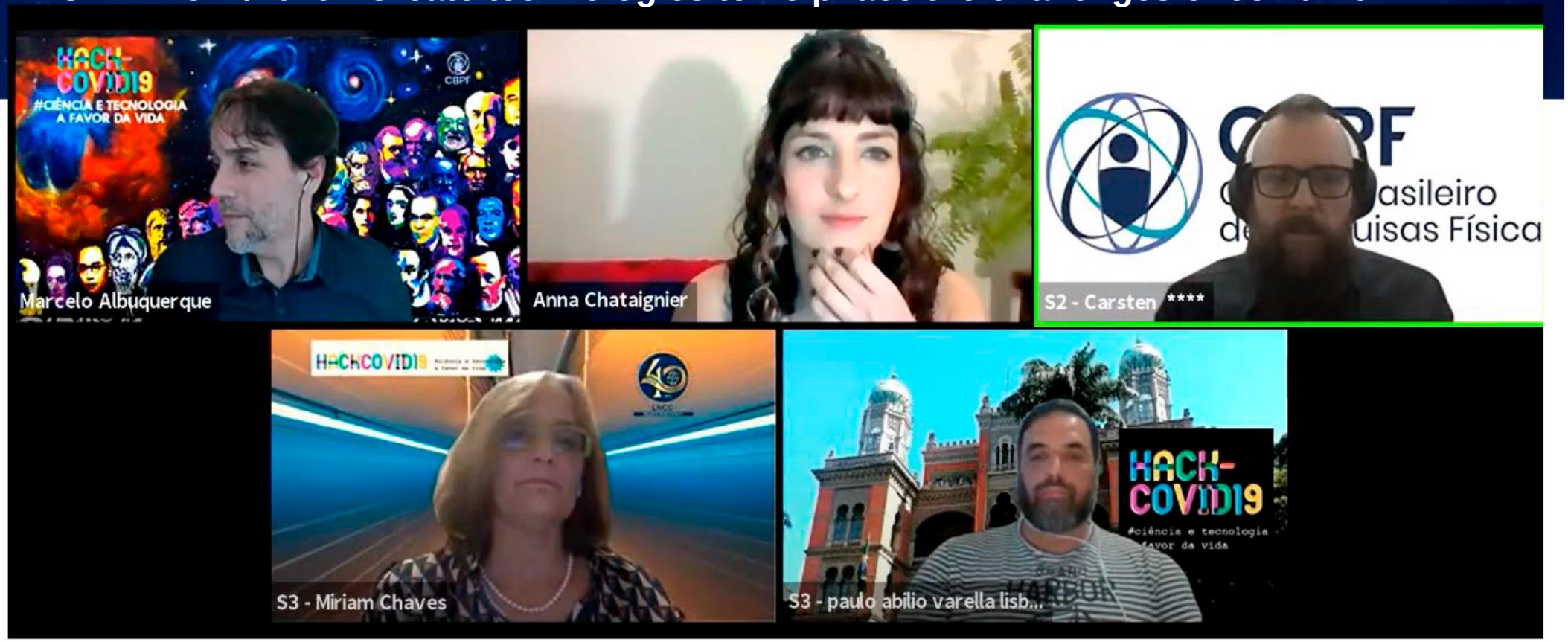
Daniela Leite – MsC Física pelo CBPF
1st place in Hacking Rio; 2018



Daniela Leite – MsC Physics by CBPF
2nd place no Hackathon Globo
Grupo 12: G-Flow; 2019
https://g1.globo.com/economia/tecnologia/hackathon/2019/ao-vivo/hackathon-2019.ghtml

HACKCOVID19

ONLINE HACKATHON /2020 - Create technologies to help face the challenges of covid-19



CBPF
Centro Brasileiro de Pesquisas Físicas
UNIDADE DE PESQUISA DO MCTIC

Laboratório Nacional de Computação Científica
UNIDADE DE PESQUISA DO MCTIC

Ministério da Saúde
FIOCRUZ
Fundação Oswaldo Cruz

UN Development Programme

World Intellectual Property Organization

Brazilian Support Service for Micro and Small Companies

HACKCOVID19 In NUMBERS

CBPF

May 15th to 17th, 2020

72 hours

Participants
984

Challenge
220

Mentors
121

mensagens
slack
⬆25 mil

Projects
82

YouTube View
11,9 mil

XIII CBPF School

TOTALMENTE VIRTUAL

DE 2 A 13 DE AGOSTO DE 2021

CBPF

PROGRAM

Innovation and the legal framework of S&T

1 Inovação e Marco Legal

Intellectual property

1 Introdução a Propriedade Intelectual

2 Estratégia para proteção da criação intelectual

Organization of R&D Projects to Innovate

1 Organização de Projetos de P&D para inovar

Entrepreneurship

1 Empreendedorismo e Modelagem de negócios

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NÚCLEO DE INOVAÇÃO TECNOLÓGICA

The CBPF School is a **traditional event in the Brazilian Physics calendar**, attracting a **large number of undergraduate and graduate students from all regions of Brazil and Latin American countries**. Its periodicity is usually biannual.

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Núcleo de Inovação Tecnológica das Unidades de Pesquisa do Ministério da Ciência, Tecnologia e Inovação

Centro Brasileiro de Pesquisas Físicas
CBPF
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÕES

RIO INNOVATION WEEK

JAN 2022

Participation in the MCTI Science Village – RIW

Space where the research centers of the Ministry of Science, Technology and Innovation presented the initiatives, projects and the most modern that is being developed and researched in the country

CBPF and NIT-Rio booth – RIW 2022

Scientific Instrumentation and Innovation Workshops

Present Institutions

INL – International Iberian Nanotechnology Laboratory

LNLS – Laboratório Nacional de Luz Síncrotron

USP São Carlos

Companies Present

Petrobras, Technip, Gavea Sensors – measurement solutions, MI Partners – Partners in Mechatronic Innovation, PSG Telecom, Magmattec, Soluções a laser – LaserTools, Arcodata, WSN – Sistemas de Monitoramento, PipeWay International, Padtec

Workshop to link Fundamental Research with Industry

2022

CBPF

science deep tech and innovation

16, 17 e 18 de novembro 2022

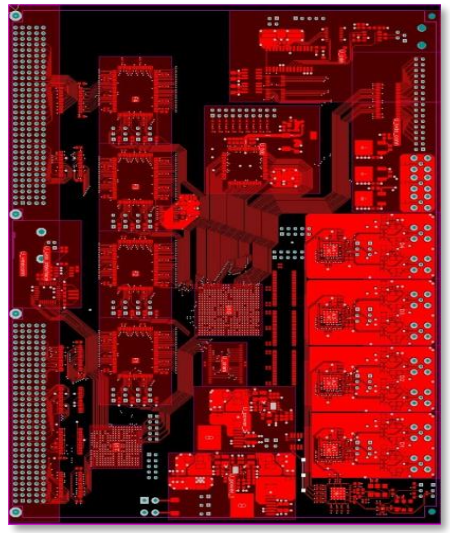
4ª O2I | WORKSHOP OF INSTRUMENTATION AND INNOVATION

Physics and Innovation at CBPF

Well-trained professionals are essential for scientific and technological progress, as well as equipment that allows testing the frontiers of knowledge.

Scientific progress is often associated with new instruments and often in innovative ways.

It is quite common that instruments developed for an experiment will have commercial applications.



CBPF has been promoting technological development, knowledge transfer and an R&D partnership with institutions and companies.

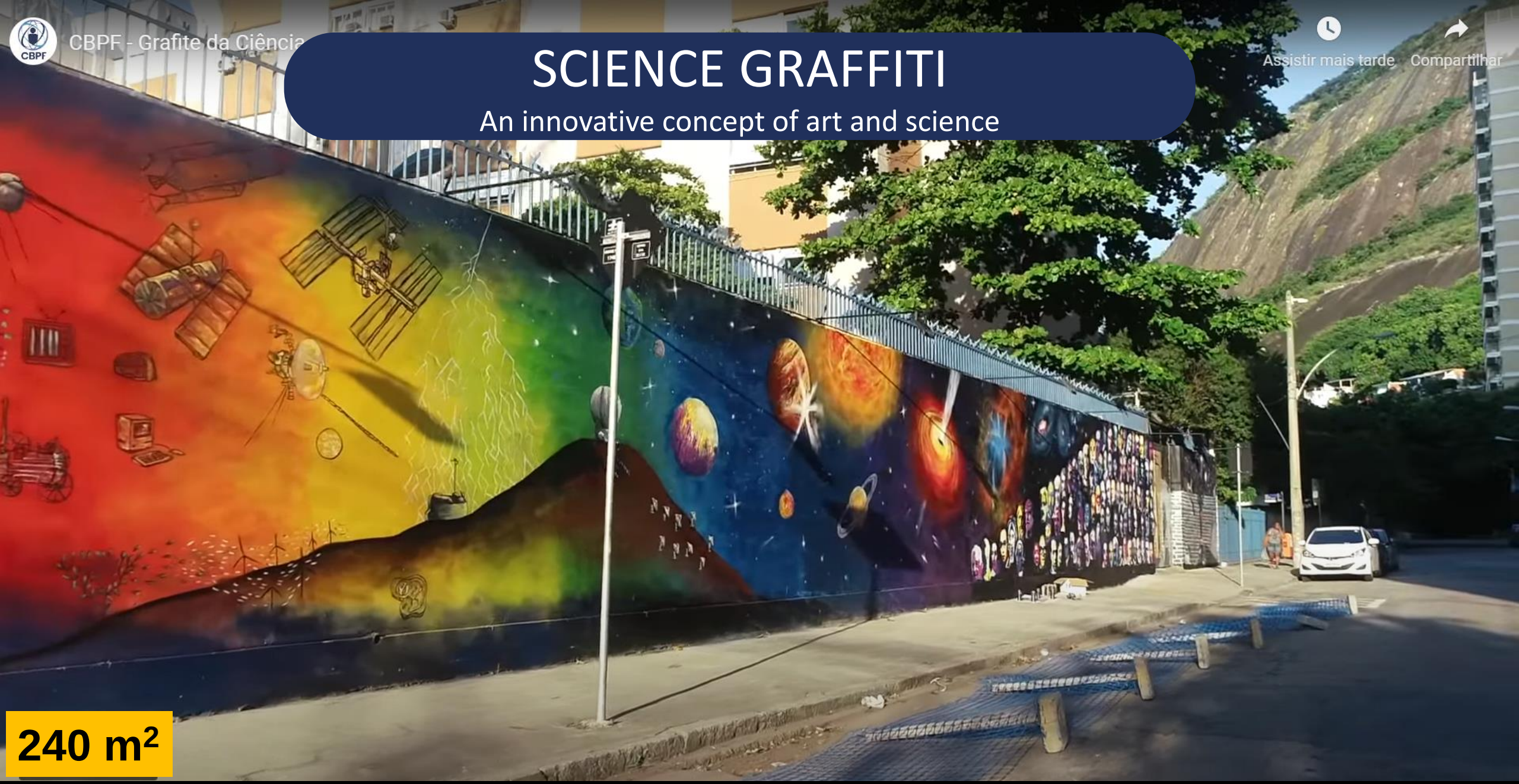
To strengthen these activities, CBPF has been working on:

- **Master's in Physics - Scientific Instrumentation**
- **Multi-User Open Facilities**
- **Office of Technology Transfer and Innovation**

Fundamental research ⟷ Technological Development ⟷ Innovation

Promoting science in society

SCIENTIFIC DISCLOSURE



Painted on the CBPF wall, Graffiti celebrates science as a form of culture with an emphasis on physics and related areas.

GRAFITE DA CIÊNCIA

http://www.grafite-ciencia.cbpf.br/

This ‘Science Graffiti Wall’ is a tribute of CBPF to a hundred of scientists and inventors, the ‘Science Builders.’ They are men, women, Brazilians, foreigners, from all ages and all areas of knowledge.

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÕES

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NÚCLEO DE INOVAÇÃO TECNOLÓGICA

CBPF

PHYSICS AND INNOVATION AT THE BRAZILIAN CENTER FOR PHYSICS RESEARCH

OBRIGADO!

Marcelo Portes de Albuquerque
marcelo@cbpf.br
Technology Development Coordination - COTEC

DATA SCIENCE IN (ASTRO)PARTICLE PHYSICS and COSMOLOGY: the BRIDGE to INDUSTRY

27-30 JUNHO 2022, Universidade de Coimbra, Coimbra, Portugal

Um evento que mostra o potencial da ciência de dados na sociedade moderna e estimula sinergias entre investigação fundamental e indústria

LIP