

Two Postdoctoral Positions Universidade de São Paulo Brazil

Marcelo G. Munhoz

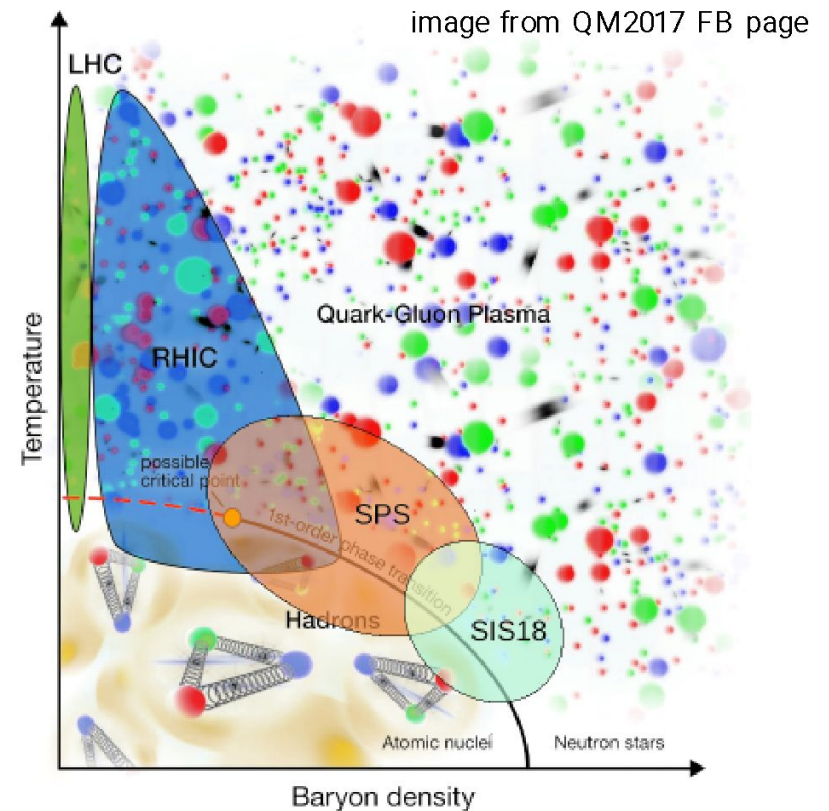


Possible Research Topics

- Heavy flavour and/or jet physics in the ALICE experiment
- Heavy-quark and/or jet phenomenology on relativistic heavy ion collisions

Nuclear matter phase diagram

- Probe nuclear matter in extreme conditions
 - QCD predicts the formation of the quark-gluon plasma (QGP)
- It can be done experimentally through high energy nuclear collisions



Quark-Gluon Plasma (QGP)

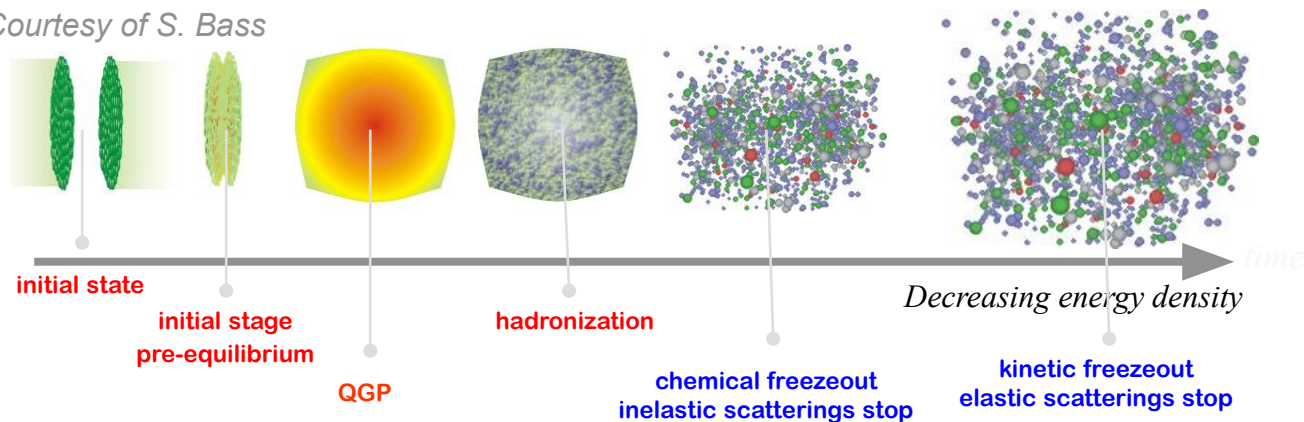
- *“A locally thermally equilibrated state of matter in which quarks and gluons are **deconfined** from hadrons, so that color degrees of freedom become manifest over nuclear, rather than merely nucleonic, volumes.”*
(STAR Collaboration’s Critical Assessment of the Evidence from RHIC Collisions - 2005)
- *“It is the simplest form of complex matter that we know of, ..., most directly connected to the fundamental laws that govern all matter in the universe.”*
(W. Busza, K. Rajagopal and W. van der Schee,
Ann. Rev. Nucl. Part. Sci. 2018. 68:1–49)



Relativistic heavy-ion collisions

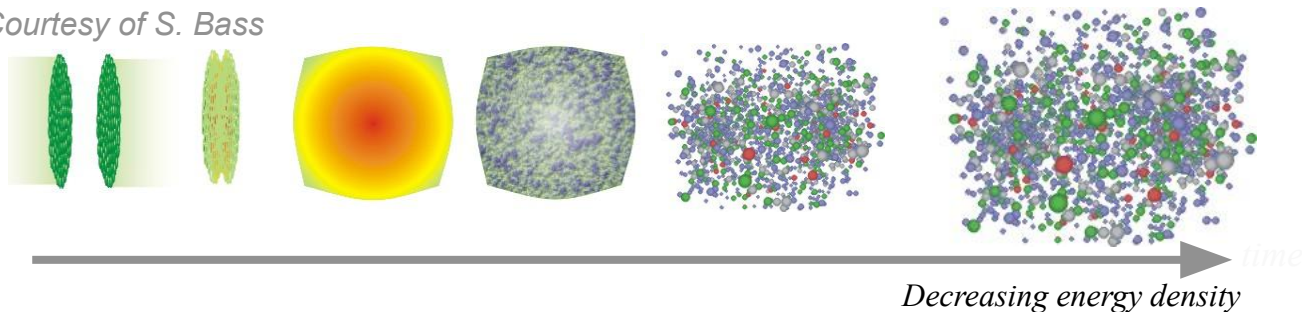
- Describe the dynamics of relativistic heavy ion collisions
 - Access to fundamental QCD processes
- Schematic description of collisions time evolution:

Courtesy of S. Bass



How to study the QGP?

Courtesy of S. Bass



- **Microscopic (short wavelength or quasi-particle) characterization of QGP**
 - High energy probes (Hard Probes)
- Macroscopic (long wavelength) characterization of QGP
 - Global (bulk) observables of the freeze-out state
- In both cases, comparison with more elementary collisions, p-p and p-Pb types, is essential.



Heavy flavor

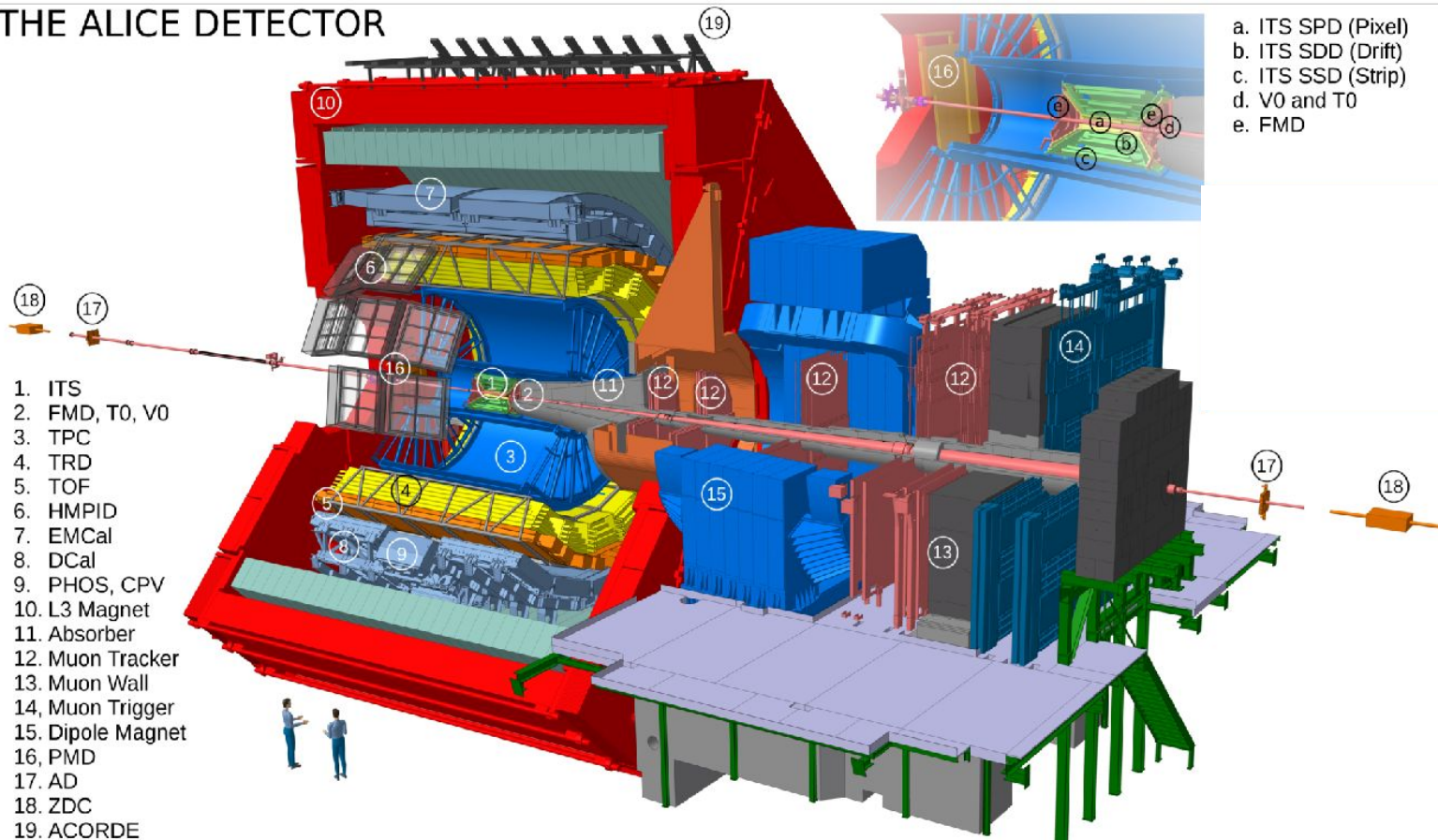
- Heavy quarks produced at the early stages of the collision and survive the QGP lifetime
 - Production time $\tau_p \sim 1/m_Q \sim 0.05 - 0.15 \text{ fm}/c$
- Probe thermalization in the QGP (low p_T)
 - Medium transport properties
- Energy loss in the QGP (high p_T)
 - Heavy quarks are expected to lose less energy than light quarks and gluons
 - Medium density and size



ALICE (Version 1)



THE ALICE DETECTOR



ALICE Collaboration



- 40 countries, 174 institutes (including 18 associates)
- 2001 members (1030 authors)
- 403 papers on Run 1 and 2 data (period of 2009-2018)

System	Year(s)	$\sqrt{s_{NN}}$ (TeV)	L_{int}
Pb-Pb	2010, 2011	2.76	$75 \text{ } \alpha\text{b}^{-1}$
	2015, 2018	5.02	$800 \text{ } \alpha\text{b}^{-1}$
Xe-Xe	2017	5.44	$0.3 \text{ } \alpha\text{b}^{-1}$
p-Pb	2013	5.02	15 nb^{-1}
	2016	5.02, 8.16	$3 \text{ nb}^{-1}, 25 \text{ nb}^{-1}$
pp	2009-2013	0.9, 2.76, 7, 8	$200 \text{ } \alpha\text{b}^{-1}, 100 \text{ nb}^{-1}$ $1.5 \text{ pb}^{-1}, 2.5 \text{ pb}^{-1}$
	2015, 2017	5.02	1.3 pb^{-1}
	2015-2018	13	36 pb^{-1}



ALICE

Brazil in ALICE

- Contribute to the study of the Quark-Gluon Plasma through a relevant participation in the **ALICE** experiment
 - Physics analysis
 - Development of state-of-the-art instrumentation

USP



UNICAMP



UFABC



UFRGS





ALICE

Brazil in ALICE

- Current personnel:
 - 4 Institutes
 - 11 faculty researchers (1.75% of ALICE)
 - 12 PhD thesis defended + 8 PhD active students (1.4% of ALICE)

USP



Universidade de São Paulo

ALICE Group

- 5 faculty researchers
 - Marcelo Munhoz (supervisor of the positions)
 - Alexandre Suaide
 - Marco Bregant
 - Tiago Fiorini
 - Cristiane Jahnke
- 6 PhD students



Universidade de São Paulo Phenomenology Group

- 3 faculty researchers
 - Fernando Navarra
 - Renato Higa
 - Alberto Torres
- 6 PhD students



Contract Conditions

- Candidates are supposed to have:
 - A recent Ph.D. degree in high-energy nuclear or particle physics
 - Knowledge of English language
 - Experience in C++ programming
 - At least one publication in a peer reviewed journal.



Contract Conditions

- Supported by the state of São Paulo funding agency FAPESP
 - <https://fapesp.br/en/postdoc>
- Salary: R\$8.479,20 (~US\$1700,00)
 - Brazilian average income: R\$2300,00
- Initially for a period of two years, but renewable for an extra one or two years



Contract Conditions

- Within this period of time, a stay of one year abroad can also be requested
 - <https://fapesp.br/en/bepe>
 - Salary depends on the country. At CERN, for instance, the income is CHF 4,230.00
- The positions also include a research grant that can be used for equipment and travel to conferences
 - It is 15% of total annual income



Expected Deliverables (ALICE Position)

- Data Analysis (with analysis notes and participation in papers committees)
- Presentations in conferences
- Leadership within the collaboration
- Tutoring of PhD students
- Desirable participation in phenomenological papers interpreting the data



Expected Deliverables (Phenomenology Position)

- Support for data analysis interpretation
- Explore the possibility of new observables based on theory
- Paper publications
- Presentations in conferences
- Tutoring of PhD students



Universidade de São Paulo



STAFF

Faculty	5,190
Technical-administrative	13,144

CULTURAL AND EXTENSION ACTIVITIES

Extracurricular courses	1,374
Museums	19
Orchestras	3
Choirs	4
Theater	1
Movie theaters	4

UNDERGRADUATE PROGRAMS

Programs	329
Yearly Enrollment	14,052
Applications for the Admission Exam	130,768
Enrolled students	60,817

GRADUATE PROGRAMS

Programs	264
Students	29,454
Regular students in Master Programs	13,980
Regular students in Doctorate Programs	15,474

SCIENTIFIC OUTPUT

Docs in databases Web of Sciences	15,343
Scopus	18,626

INTERNATIONALIZATION

Partnerships and protocols	1,729
Foreign students - Undergraduate	584
Foreign students - Graduate	1,447

Universidade de São Paulo

- Times Higher Education
 - World University Rankings 2023: 201–250th
 - Impact Rankings 2022: =62nd
 - World Reputation Rankings 2022: 81-90th

São Paulo - Brazil

- São Paulo is a metropolis of many faces. At the same time, it is the most important economic center of Brazil and it is the capital of culture in Latin America
 - 101 museums, 282 movie theaters, 146 libraries and around 40 cultural centers
 - 111 parks spread out around the city
 - 15 thousand restaurants and 20 thousand bars

Applications

- Interest candidates should send their CV and two recommendation letters to Marcelo Munhoz (munhoz@if.usp.br)
- Further information can also be obtained through this e-mail address
- These positions will remain open until they are filled