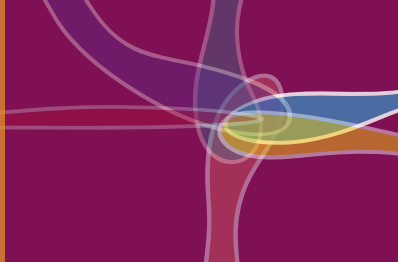


EXACT SCIENCES

# MULTI-USER EQUIPMENT

ADVANCED TECHNOLOGY TO  
REACH OF RESEARCHERS

Exact Sciences



## ACQUISITION OF A FLUORESCENCE CORRELATION SPECTROSCOPE FOR THE MEASUREMENT OF FLUORESCENCE CORRELATION AND IMAGE CAPTURE BY FLUORESCENCE LIFETIME

Amando Siuiti Ito

Ribeirão Preto School of Philosophy, Science, and Literature

University of São Paulo (USP)

FAPESP Grant 2009/54044-3

This proposal is aimed at the acquisition of equipment needed in order to conduct experiments involving fluorescence correlation spectroscopy (FCS), which is a technique for the analysis of biomolecules at extremely low concentrations, with high spatial and temporal resolution. Spontaneous fluctuations in intensity, caused by small deviations in the thermal balance of the system, constitute the parameter of interest. The spectroscopic measurements can be combined with those of the lifetime of the fluorescence emissions, and the data can be treated in order to obtain images in the process known as fluorescence lifetime imaging microscopy (FLIM). The technique is employed in biophysics and biochemistry: in experiments designed to measure the diffusion coefficients, kinetic rate constants, molecular aggregation, polydispersity, and molecular mass; in studies of antigen-antibody interactions, receptor-ligand relationships, nucleic acid interactions, interactions among proteins, enzyme activity, and protein folding processes; and in experiments involving single molecules and molecular motors. Project participants include researchers at the USP Ribeirão Preto School of Philosophy, Science, and Literature, the USP Institute of Physics Institute, the USP São Carlos Institute of Physics, and the Federal University of São Paulo. Despite the growing use of FCS and FLIM in studies in the areas of biophysics, biochemistry, and materials sciences worldwide, there is no FCS or FLIM equipment in the state of São Paulo. The acquisition of such equipment for use in the multi-user modality will make it possible for innumerable researchers to employ the technique.

### EQUIPMENT GRANTED

- Pico Quant Micro Time 200

## ASSOCIATED PROJECTS

### **Ribeirão Preto School of Philosophy, Science, and Literature/ USP**

*Fluorescence spectroscopy: applications in biomimetic systems*

Amando Siuiti Ito

Process FAPESP 2007/51177-7

### **Institute of Physics/USP**

*Amphiphilic aggregates in aqueous medium: thermal properties, natural properties, and interactions with molecules of biological interest*

Maria Teresa Maura Lamy

FAPESP Grant 2001/11721-3


### **Department of Biophysics/Unifesp**

*Light microscopy of giant lipid vesicles: "looking" at the biological membrane*

Karin do Amaral Riske

FAPESP Grant 2005/54891-7

### Contacts for instructions for the use of the equipment



**Amando Siuiti Ito**

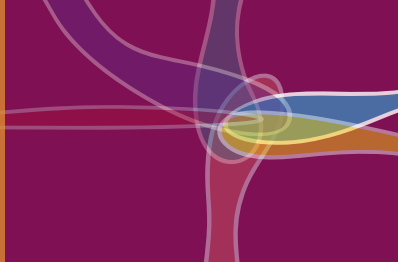
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## UPGRADE OF NUCLEAR MAGNETIC RESONANCE EQUIPMENT

Antonio Gilberto Ferreira

Center of Exact Sciences and Technology

Federal University of São Carlos (UFSCar)

FAPESP Grant 2009/54081-6

The technique of nuclear magnetic resonance (NMR) is without a doubt one of the principal means of elucidating the structure of organic compounds, organometallic compounds, and proteins. Therefore, it is of great utility to research groups working in the areas of natural products (fungi, plants and animals marine), organic/organometallic synthesis, and structural analysis of proteins. More recently, NMR has been employed in the quality control of foodstuffs (“fingerprinting”) and in metabolomic/metabonomic studies. However, it is a technique that is constantly and rapidly being modified. Therefore, it is of fundamental importance that we maintain our equipment up-to-date and in working condition, as well as, principally, making it accessible to as many users as possible. Since its founding in 1994, the NMR laboratory of the UFSCar Department of Chemistry has always functioned primarily as a multi-user laboratory. In addition, the laboratory staff have always attempted to alleviate user difficulties related to the interdisciplinary nature of the work conducted there. The laboratory functions in various areas, including the following: structural analysis; the use of NMR as an analytical tool (fingerprinting) applied to herbal drugs, foodstuffs, fuels, biological fluids etc.; the use of NMR in metabolomic studies of soybeans, other beans, and biological fluids; and NMR studies of solid states. The present proposal is aimed at upgrading the current NMR spectrometer (DRX 400; Bruker), which is designed for the analysis of small volumes. Despite having a number of accessories, the electronic component is quite old. The device was acquired in 1993 with a FAPESP Thematic Project grant. In 1995, the equipment was upgraded with funds from a FAPESP Multi-User Project grant. We are now requesting a new upgrade, which will involve changing out the electronic component, acquiring an automatic tuning and matching accessory (probe with ATMA), together with

### EQUIPMENT GRANTED

- Upgrade of Bruker Nuclear Magnetic Resonance Equipment (NMR), from DRX400 model to Avance III 400 MHz.TXI 5 mm probe with automatic tuning and matching, and automated sample exchanger (Bruker BioSpin)

an autosampler. With these upgrades, it will be possible to conduct fingerprinting and metabolomic studies more rapidly and with reproducibility. We have two other equipment, both of which were also acquired in the 1990s: an ARX-200, which is employed for the screening of samples; and a Unity Plus 400, which is configured for analysis of samples in solid states.

## ASSOCIATED PROJECTS

### Center of Exact Sciences and Technology/UFSCar

*Application of NMR, infrared and chemometric methods in the quality control of herbal drugs*

Antonio Gilberto Ferreira  
FAPESP Grant 2006/15339-7

### Institute of Chemistry/UFSCar

*Discovery and development of potential chemotherapeutic agents from marine invertebrates and associated microorganisms*


Roberto Gomes de Souza Berlinck  
FAPESP Grant 2005/60175-2

### Agricultural Instrumentation/Brazilian Agricultural Research Corporation

*Development of steady-state free precession [SSFP] for the rapid acquisition of high-resolution NMR spectrums in solutions and in solid states*

Luiz Alberto Colgano  
FAPESP Grant 2007/04644-9

### Contacts for instructions for the use of the equipment

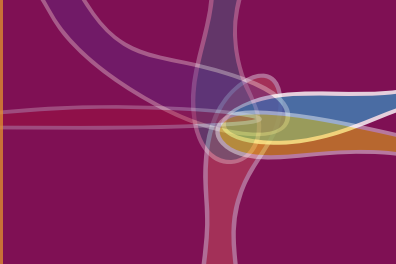


**Antonio Gilberto Ferreira**

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## ACQUISITION OF A NEW ELECTRON MICROPROBE FOR THE UNIVERSITY OF SÃO PAULO INSTITUTE OF GEOSCIENCES

Celso de Barros Gomes

Institute of Geosciences

University of São Paulo (USP)

FAPESP Grant 2009/53835-7

The aim of this proposal is to acquire a new electron microprobe for the USP Institute of Geosciences. The primary purpose of such instruments is the *in situ* determination of the quantitative, semiquantitative, and qualitative chemical composition of minerals and other solid substances occupying small volumes (on the order of a few cubic microns). Electron microprobes are employed in many areas of knowledge, such as geology, metallurgy, dentistry, and materials sciences. Because of their efficiency and great versatility, they are currently viewed as indispensable tools in laboratories performing microanalysis of solid materials. At the USP Institute of Geosciences, which was one of the first institutions in Brazil to utilize - and to train others within the Brazilian geological community in how to use - electron microprobes, the use of this technique (currently with a probe manufactured by JEOL in 1992, which replaced a probe manufactured by ARL in 1971) has been responsible for a considerable amount of important scientific production (masters dissertations, doctoral theses, and articles published in specialized journals, as well as contributions presented at national and international scientific events). In continuous service for more than 17 years, the current equipment not only has technological limitations imposed by its outmoded status but also, principally, presents clear indications of impending operational failure due to wear and to the lack of replacement parts, thereby justifying our request that it be replaced.

### EQUIPMENT GRANTED

- JXA-8530F electron probe microanalyzer (JEOL Ltd.)

## ASSOCIATED PROJECTS

### Institute of Geosciences/USP

*Alkaline magmatism of the South American platform: petrological and geochemical contribution*

Celso de Barros Gomes  
FAPESP Grant 2007/57461-9

*Contributions of the mantle and of different crustal reservoirs to Neoproterozoic granitic magmatism in the southeast of Brazil*

Valdecir de Assis Janasi  
FAPESP Grant 2007/00635-5

*Crust-mantle interaction and the generation and evolution of post-collisional A-type magmatism: geochemical and isotopic records from the Graciosa Province, southern-southeastern Brazil*

Silvio Roberto Farias Vlach  
FAPESP Grant 2008/00562-0

### Institute of Geosciences/Unicamp

*Pre-collisional geological evolution of the Rio Itapicuru greenstone belt, Serrinha Block, state of Bahia, Brazil: field, geochronological, and geochemical relationships*

Elson Paiva de Oliveira  
FAPESP Grant 2006/06222-1

### São Paulo State University, Unesp

*Metamorphic pressure-temperature-time evolution of the north-south belt running between the Group Araxá and the northern end of the Socorro Nappe*

Marcos Aurélio Farias de Oliveira  
FAPESP Grant 2006/58128-9

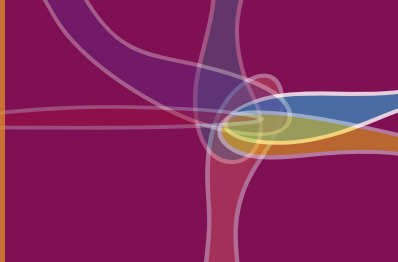
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## ACQUISITION OF A ROBOTIC TELESCOPE FOR THE BRAZILIAN ASTRONOMICAL COMMUNITY

Cláudia Lúcia Mendes de Oliveira

Institute of Astronomy, Geophysics, and Atmospheric Sciences

University of São Paulo (USP)

FAPESP Grant 2009/54202-8

The main goal of this application is to fund the acquisition of an 80-cm robotic telescope to be installed at the Cerro Tololo Interamerican Observatory (CTIO) for use by the astronomical communities of Brazil (90% of the time) and Chile (10% of the time). The telescope will be used, at first light, with a  $9.2k \times 9.2k$  pixel CCD camera, delivering a 2 square degree field of view at a scale of 0.55 arcsec/pixel. In the first two years this telescope will be dedicated to a survey of the whole southern sky in 12 narrow- and intermediate-band filters. In the following years it may be equipped with a polarimeter for a survey of the southern sky in polarimetric light and it will be dedicated to long-term projects in areas from solar system to extragalactic astronomy. This new facility will complement the science goals of the 1-m Brazilian robotic telescope Impacton, extending its planned search for asteroids to the whole of the Southern hemisphere. This project is being developed in close collaboration among the Institute of Astronomy, Geophysics, and Atmospheric Sciences (IAG/USP), the National Institute for Space Research (Inpe), the National Observatory (ON), and the National Astrophysics Laboratory (LNA). Cerro Tololo was chosen as the location for this robotic telescope because Brazil has access to two other telescopes in a nearby site, Cerro Pachon, the Southern Astrophysical Research Telescope (Soar) and the Gemini-S telescope; these three facilities will be highly complementary. The choice was also made in consideration of the infrastructure already available and the support that CTIO will provide in terms of operations and maintenance.

Approved by the highest Board of the USP Institute of Astrophysics, Geophysics and Atmospheric Sciences, describing the system to be used for distribution of observation time, similar to that adopted for all of the other telescopes in Brazil and for most telescopes worldwide, with the caveat that the robotic telescope will, at first, be dedicated to a whole southern sky 12-filter survey and will then be mainly dedicated to a few long-term projects of high scientific interest to the community, as judged on an on-going basis.

### EQUIPMENT GRANTED

- An 80-cm robotic telescope (built by ASTELCO) and an automated 12-position filter wheel and mechanism for the TigerCam obturator, with other mechanical parts for a CCD Camera (to be built by Metalcard Ind.)



## ASSOCIATED PROJECTS

### **Institute of Astronomy, Geophysics and Atmospheric Sciences/USP**

*Galaxy evolution in groups and clusters*

Claudia Lucia Mendes de Oliveira  
FAPESP Grant 2001/07342-7

*National Institute of Science and Technology in Astrophysics*

João Evangelista Steiner  
FAPESP Grant 2008/57807-5

*STELLES: high-resolution spectrograph for the Soar*

Augusto Daminele Neto  
FAPESP Grant 2007/02933-3

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## ACQUISITION OF A 200KV TRANSMISSION ELECTRON MICROSCOPE FOR THE CHARACTERIZATION OF NANOSTRUCTURES AND BIOLOGICAL MATERIALS

Edson Antônio Ticianelli

São Carlos Institute of Chemistry

University of São Paulo (USP)

FAPESP Grant 2009/54216-9

The objective of this proposal is to acquire a 200kV atomic-resolution transmission electron microscope for high-resolution image capture, to be employed in the characterization of various nanostructured materials, including ceramics, metals, and polymers, as well as biological material, such as yeasts, bacteria, fungi, and some proteins. In addition, the equipment will be used in order to analyze the organization and structure of materials, as well as their surfaces, at the nanometer scale. The project is coordinated by Prof. Edson Ticianelli and involves approximately 33 researchers working on four associated projects (three FAPESP Thematic Projects and one Young Researchers in Emerging Centers Program Project), with grant money of approximately R\$ 1.7 million, plus another US\$ 720,000. There are also 50 complementary projects linked to this request, collectively receiving funding of approximately R\$ 20 million, plus US\$ 3 million. The project teams work in various areas of research (chemistry, physics, biology, engineering, and materials sciences) at institutions of higher learning or research institutes, such as the USP São Carlos Institute of Chemistry, the Federal University of São Carlos Institute of Physics, the USP São Carlos School of Engineering, the São Paulo State University Institute of Chemistry, and the Brazilian Agricultural Research Corporation. In all cases, the use of transmission electron microscopy is a fundamental or even determining step in the characterization of systems and in the elucidation of behaviors, leading to explanations and proposals for practical applications.

### EQUIPMENT GRANTED

- JEM 2100 200kV transmission electron microscope and accessories (JEOL Ltd.)
- PIPS 691 cross-sectioning precision ion polishing system and accessories (Gatan Inc.)
- DESK-V cold sputtering carbon/gold sample coating system (Denton Vacuum LLC)
- PT-XL PowerTome ultramicrotome with separate control (Boeckeler Instruments)

## ASSOCIATED PROJECTS

### São Carlos Institute of Chemistry/USP

*Electrocatalysis IV: fundamental and applied aspects of electrocatalytic processes, bioelectrocatalysis, and kinetic instabilities*

Edson Antônio Ticianelli  
FAPESP Grant 2009/07629-6

*Colloidal magnetic nanocrystals: obtaining self-assembled nanospheres, nanowires, and nanorods, functionalized with macromolecules for application in the areas of advanced magnetic recording, biotechnology, and biomedicine*

Laudemir Carlos Varanda  
FAPESP Grant 2007/07919-9

*Methods of protection against the corrosion of aluminum alloys*

Artur de Jesus Motheo  
FAPESP Grant 2004/12189-1

*Fundamental and technological studies of the chemical and electrochemical use of energy from ethanol*

Germano Tremiliosi Filho  
FAPESP Grant 2003/10037-7

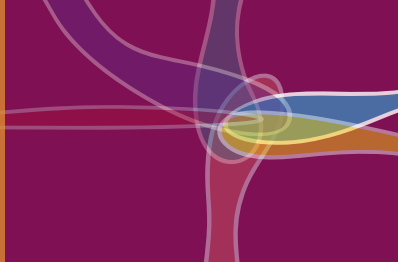
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## ACQUISITION OF A SUITE OF EQUIPMENT FOR ADVANCED SYNCHROTRON LIGHT CHARACTERIZATION OF MATERIALS: TOWARD BECOMING A WORLD-CLASS FACILITY

Eduardo Granado Monteiro da Silva

National Synchrotron Light Laboratory (LNLS)

Ministry of Science and Technology (MCT)

FAPESP Grant 2009/54115-8

The 14 beamlines currently in operation at the Laboratório Nacional de Luz Síncrotron (LNLS, National Synchrotron Light Laboratory) make it the largest multi-user laboratory in Brazil. Most of the projects carried out at the LNLS can be classified as being in the area of “materials science”, which, in its broadest sense, encompasses fields as wide-ranging as condensed matter physics, structural chemistry, materials engineering, pharmacology, and dentistry. This FAPESP Multi-User Equipment Program proposal represents, in a coordinated manner, the concerns of a large portion of the users of the beamlines employed for X-ray diffraction (lines XPD, XRD-1 and XRD-2), X-ray absorption (lines XAFS-1, SAFS-2 and DXAS) and SAXS (lines SAXS-1 and SAXS-2). In 2008, 352 proposals were submitted for the use of these lines. Of those, 276 were carried out, resulting in 141 published articles. Users from within the state of São Paulo accounted for 46% of the total. The superconducting wiggler installed in 2009 will produce X-rays that are 1,000 times more intense than are those of the abovementioned lines. This technology will be employed in a new, state-of-the-art, multipurpose beamline (for X-ray diffraction, X-ray absorption, and small-angle X-ray scattering) that will be dedicated to materials science. It is crucial that modern equipment be installed at the LNLS experimental station, which needs a state-of-the-art detector array, as well as a magnet/cryostat for the sample environment and a set of Be focusing lenses. In addition, we are requesting the acquisition of special diffractometers that will confer greater versatility and efficiency on the current diffraction beamlines at the LNLS. The approval of this proposal in its entirety and the subsequent combined use of the equipment requested will raise the LNLS to the level of a world-class facility for the advanced characterization of materials. This is true not only for the original laboratory (LNLS-1) but also for its sister laboratory (LNLS-2), soon

### EQUIPMENT GRANTED

- 15-element ultrapure germanium fluorescence detector array, with X1A data collection system
- Detectors and electronics: a) Pilatus 300k bidimensional detector; and b) Mythen 6K one-dimensional silicon strip detector – (Swiss Light Source/Dectris Ltd.)
- Diffractometers and accessories: a) heavy duty 3-circle diffractometer; b) Huber diffractometer with tower; c) Huber Eulerian cradle; and d) Be lenses
- 5T compact magnet, 1.7 K cryogen-free cryostat and accessories

to be constructed. There are 11 associated projects and 88 complementary projects linked to this proposal. Of those 99 projects, 24 are funded by FAPESP, which has, to date, invested a total of R\$ 13 million. All of the researchers involved in these projects currently use the LNLS facilities to conduct at least part of the research related to their projects, indicating the relevance of the present proposal for scientific production in the state of São Paulo.

## ASSOCIATED PROJECTS

### National Synchrotron Light Laboratory (LNLS)

*Resonant magnetic X-ray diffraction in EUTE/SNTE(PBTE) multilayers*

Eduardo Granado Monteiro da Silva  
FAPESP Grant 2005/05194-1

### Nuclear and Energy Research Institute (Ipen)

*Study of intergranular phenomena in ceramic materials*

Reginaldo Mucillo  
FAPESP Grant 2005/53241-9

### Center for Natural and Human Sciences/Federal University of the ABC

*Study of polycrystalline pharmaceuticals by polycrystal X-ray diffraction and the Rietveld method*

Fabio Furlan Ferreira  
FAPESP Grant 2008/10537-3

### Federal University of São Carlos (UFSCar)

*Effects of hydrostatic and non-hydrostatic pressure on the structural and dynamic properties of crystalline solids*

Paulo Sergio Pizani  
FAPESP Grant 2007/56463-8

### Araraquara Institute of Chemistry/Unesp

*Study of Ag-Al interaction and of the stabilization of martensitic phase in Cu-Al alloys with Ag additions*

Antonio Tallarico Vicente Adorno  
FAPESP Grant 2006/04718-0

### Gleb Wataghin Institute of Physics/Unicamp

*Study of strongly correlated systems under extreme conditions*

Carlos Rettori  
FAPESP Grant 2006/60440-0

*Single crystal X-ray diffraction study of intermetallic compounds*

Carlos Manuel Giles Antunez Monteiro da Silva  
FAPESP Grant 2008/11527-1

*Structural analysis of nanostructured semiconductors using high-resolution X-ray diffraction*

Lisandro Pavie Cardoso  
FAPESP Grant 2007/08609-3

### Institute of Physics/USP

*X-ray physics applied to the study of nanostructured devices using compact radiation sources*

Sergio Luiz Morelhão  
FAPESP Grant 2009/01429-5

*Nanoparticles and mesoporous systems for catalytic, magnetic, and fuel cells*

Marcia Carvalho de Abreu Fantini  
FAPESP Grant 2008/00140-9

### São Carlos Institute of Physics/USP

*Synthesis and structural characterization of the relaxor ferroelectric ceramics  $Ba_{1-x}AxZrTiO_3$  and  $Pb_{1-x}BxZr_{0.4}Ti_{0.6}O_3$  ( $A=Ca,La$ ;  $B=La,Ba$ )*

Valmor Roberto Mastelaro  
FAPESP Grant 2007/01062-9

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## EXACT SCIENCES

## A COMPUTER CLUSTER FOR THE ASTRONOMY DEPARTMENT OF THE UNIVERSITY OF SÃO PAULO INSTITUTE OF ASTRONOMY, GEOPHYSICS AND ATMOSPHERIC SCIENCES AND FOR THE CRUZEIRO DO SUL UNIVERSITY ASTROPHYSICS CENTER

Elisabete Maria de Gouveia Dal Pino

Institute of Astronomy, Geophysics and Atmospheric Sciences

University of São Paulo (USP)

FAPESP Grant 2009/54006-4

This acquisition seeks to fulfill the current and mid-term high-performance computing needs of the Astronomy Department of the Institute of Astronomy, Geophysics and Atmospheric Sciences of the University of São Paulo (IAG/USP) and of the Theoretical Astrophysics Center of the University of Cruzeiro do Sul (Unicsul). The purchased equipment with FAPESP support includes a super cluster of computers SGI Altix ICE 8400 LX, consisting of 192 AMD Opteron 6172 processors, 12 cores, with 24GB of RAM per processor, totalizing 2304 cores and 4.6 TB of RAM, being the fifth largest super-cluster in Brazil. Besides, several accessories which are necessary for the proper functioning of the cluster have been acquired as well. These include servers, racks, a laser printer, and air conditioning equipment. According to the original proposal and in path with the main objectives of the FAPESP Multi-User Equipment Program, the cluster is currently available to all researchers of both participating institutions and therefore, accessible to approximately 150 individuals, including professors, researchers and students. A significant number of staff members of both institutions have undersigned this proposal. The research projects of these professors and their collaborators alone are allocating most of the super cluster resources. Recently, with the acquisition of a powerful know-break for protection against electric power fluctuation with support of the INCT-A, the two partner institutions have agreed to provide around 10% of the cluster computer time to other researchers participating of the INCT-A nationwide. Considering the current needs of the projects undertaken by the participating research groups, which include high performance numerical modeling of Astrophysical sources and environments, and complex multi-wavelength data analysis and storage, the super cluster is already under intensive use. Therefore, we feel that the acquisition of this equipment is fully justified as its foreseen employment is currently more than fulfilled.

### EQUIPMENT GRANTED

- SGI Altix ICE 8400 LX, consisting of 192 AMD Opteron 6172 processors
- Laser Color Printer CP3525DW
- 2 Servers Xeon – Dell - PowerEdge T410
- 1 Server Xeon – SUPERMICRO

The Astronomy department of IAG/USP as well as the Research Dean Office of USP have contributed to this effort by supporting the construction of the Laboratory of Astro-informatics (Lai) where this facility was installed along with other computer equipment at IAG/USP. The Astronomy department is also providing computer analyst hours for installation/ activation and maintenance of the cluster and power supplies. An electrical generator of sufficient capacity to guarantee a stable flow of electricity to the equipment is also foreseen.

## ASSOCIATED PROJECTS

### **Institute of Astronomy, Geophysics and Atmospheric Sciences/USP**

*Investigation of high energy and plasma astrophysics phenomena: theory, observation and numerical simulations*

Elisabete Maria de Gouveia Dal Pino  
FAPESP Grant 2006/50654-3

*Chemical evolution and galactic/extragalactic stellar populations, based on spectroscopy and imaging*

Beatriz Leonor Silveira Barbuy  
FAPESP Grant 2006/59453-0

*Photoionized nebulae, stars and the chemical evolution of galaxies*

Walter Junqueira Maciel  
FAPESP Grant 2006/59453-0

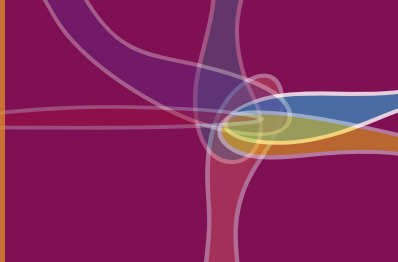
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## ACQUISITION OF A HIGH-RESOLUTION ORBITRAP MASS SPECTROMETER FOR THE DISCOVERY AND STRUCTURAL ANALYSIS OF BIOLOGICALLY ACTIVE COMPOUNDS – APPLICATIONS IN PROTEOMICS; BIOMARKERS; SYNTHESIS, ISOLATION, AND CHARACTERIZATION OF NATURAL PRODUCTS; STUDIES OF REDOX SYSTEMS IN FOOD; AND ENZYMATIC SYNTHESIS

Emanuel Carrilho

São Carlos Chemistry Institute

University of São Paulo (USP)

FAPESP Grant 2009/54040-8

The equipment requested in this proposal is a high-resolution mass spectrometer that works in tandem (MS-MS) in order to carry out multiple fragmentation stages. The equipment consists of a quadrupole linear ion trap (linear trap quadrupole, LTQ) coupled to an “Orbitrap” spectrometer. The LTQ-Orbitrap Velos is capable of providing the high precision necessary for the structural analysis of small molecules; rapid, diverse fragmentation processes for the sequencing of proteins and peptides; and analytical sensitivity for the characterization of trace metabolites, pollutants, and drugs in a wide variety of matrices. The incorporation of this equipment at the Instrumental Chemical Analysis Center of the USP São Carlos Chemistry Institute will make it possible to obtain unprecedented results in terms of the following: the structural analysis of organic compounds of low molecular mass, originating from total synthesis, enzymatic synthesis, redox processes, plant extracts, venoms, or microorganisms; the sequencing of proteins in proteomic, clinical, and biomarker studies, as well as in structural studies, functional studies, and studies of post-translational modifications, *in vivo* and *in vitro*, by heterologous protein expression; the analytical detectability of endogenous and exogenous compounds in complex matrices, such as environmental matrices, as well as those in food and beverages; and the development of human resources that are highly qualified to conduct research using mass spectrometry.

### EQUIPAMENTOS CONCEDIDOS

- LTQ Orbitrap Velos high-resolution mass spectrometer, with NanoLC System (Thermo Scientific)
- Benchtop lyophilizer (> 4 kg of ice/24 h)
- SpeedVac sample concentrator (Thermo Scientific)



## ASSOCIATED PROJECTS

### São Carlos Chemistry Institute/USP

*Bidimensional electrophoresis as a fundamental tool in proteomics analysis*

Emanuel Carrilho  
FAPESP Grant 2008/04050-4

*Employing the biodiversity of marine fungi in biotransformations*

André Luiz Meleiro Porto  
National Council for Scientific and Technological Development (CNPq)

*Biocatalysis and biotransformation of organic compounds with marine fungi, marine algae, and reactions catalyzed with commercial enzymes*

André Luiz Meleiro Porto  
FAPESP Grant 2006/54401-2

*Development of new methodologies in organic chemistry and their applications in the synthesis of natural products. Synthesis of the potent trypanocidal agent komaroviquinone and of cardiotonics Pumiliotoxines and Homopumiliotoxines*

Antonio Carlos Bender Burtoloso  
FAPESP Grant 2007/04170-7

*Evaluation of the estrogenic activity of the waters of the Paraíba do Sul river, in the city of Pindamonhangaba (State of São Paulo)*

Eny Maria Vieira  
FAPESP Grant 2009/11501-5

*Removal of sodium diclofenac from water by complete cycle treatment and adsorption in granular activated coal*

Eny Maria Vieira  
FAPESP Grant 2008/10453-4

*Mechanism and consequences of redox processes in food: chemical and photochemical aspects of the oxidative deterioration and antioxidant activity of beer and dairy products*

Daniel Rodrigues Cardoso  
FAPESP Grant 2009/00858-0

*Studies of the HSP70 and HSP90 molecular chaperone systems in parasites*

Julio Cesar Borges  
FAPESP Grant 2007/05001-4

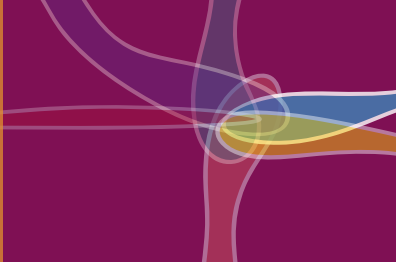
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## ACQUISITION OF A VIBRATING SAMPLE MAGNETOMETER COUPLED WITH A SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE AS SENSOR (SQUID-VSM) WITH CRYOGENIC CLOSED CYCLE

Ernesto Chaves Pereira de Souza

Science and Technology Center

Federal University of São Carlos (UFSCar)

FAPESP Grant 2009/54082-2

The objective of this proposal is to acquire a vibrating sample magnetometer that uses, as sensor, a superconducting quantum interference device (Squid-VSM) with a closed-cycle helium cryostat. This equipment is sensitive down to  $10^{-8}$  emu, being therefore appropriate for measurements of samples emitting faint magnetic signals. This is the case of polyphase magnetic nanostructured materials which are the main subject of investigation of the researchers. It is of note that there are currently no magnetometers with this level of sensitivity in the State of São Paulo. In addition, with the inclusion of the closed-cycle helium cryostat, the cost of the experiments will be a small fraction of that of the measurements that are currently being made.

### EQUIPMENT GRANTED

- Squid DS magnetometer with closed-cycle cryostat and GBP accessories (Cryogenic Ltd.)

## ASSOCIATED PROJECTS

### Science and Technology Center/UFSCar

*Center of excellence in electrochemically synthesized nanostructures*

Ernesto Chaves Pereira de Souza

FAPESP Grant 2003/099336-8

*Functional molecular composites derived from polyurethanes:  
synthesis and characterization*

Edson Roberto Leite

FAPESP Grant 2007/51002-2

*Investigation of hybrid magnetic nanostructured semiconductors  
and multiferroic materials*

Adilson Jesus Aparecido de Oliveira

FAPESP Grant 2006/10276-4

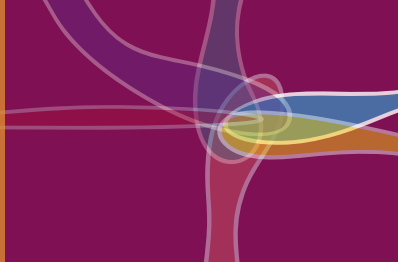
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## SYSTEM OF EPITAXIAL GROWTH OF GROUP III-V SEMICONDUCTORS DILUTED WITH MAGNETIC MATERIALS

Euclides Marega Júnior

São Carlos Institute of Physics

University of São Paulo (USP)

FAPESP Grant 2009/54033-1

This proposal is for the acquisition of a system of epitaxial growth (molecular beam epitaxy) for use on group III-V semiconductors diluted with magnetic materials for applications in basic studies and studies involving nanophotonics. This epitaxial growth system will be installed at the USP Institute of Physics at São Carlos. The Nanostructured Semiconductors Research Group, whose members have more than 15 years of experience in the area, will be the responsible for the management, operation, and maintenance of the system. With the installation of this epitaxial growth system, the Institute will come to act as a hub for the growth of samples based on compounds and group III-V heterostructures, diluted or not with magnetic materials. Although there are currently four epitaxial growth systems installed in universities and research institutes within the State of São Paulo, none are equipped to promote the growth of group III-V semiconductor films diluted with magnetic materials. The creation of this hub for sample growth will be of major importance to the various researchers and groups that develop research based on these materials in the State of São Paulo.

### EQUIPMENT GRANTED

- Growth chamber and accessories – epitaxial growth system composed of two ultra-high vacuum chambers (Ribber compact 12) and electron gun (Rheed)

## ASSOCIATED PROJECTS

### **São Carlos Institute of Physics/USP**

*National Institute for Optics and Photonics (Inof)*

Euclides Marega Junior

FAPESP Grant 2008/57858-9

*Effects that various bodies have on the static and dynamic properties of nanostructured semiconductors*

Guoqiang Hai

FAPESP Grant 2008/53303-2

### **Federal University of ABC (UFABC)**

*Complex defects in semiconductors: applications in spintronics and wide band gap materials*

Gustavo Martini Dalpian

FAPESP Grant 2005/00668-5

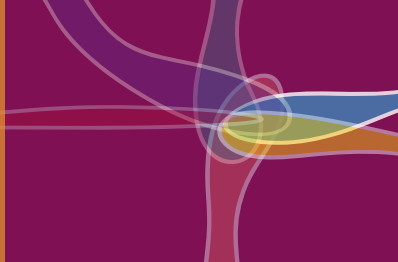
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## PAU-BRASIL: ACQUISITION OF CCD DETECTORS FOR THE PANORAMIC CCD CAMERA USED OF THE JAVALAMBRE PHYSICS OF THE ACCELERATING UNIVERSE SURVEY

Laerte Sodré Júnior

Institute of Astronomy, Geophysics, and Atmospheric Sciences

University of São Paulo (USP)

FAPESP Grant 2009/54162-6

Dark energy, or the source of the newly discovered acceleration of the expansion of the Universe, is, presently, Cosmology's deepest mystery. A key observation to help solving it is the detection of baryon acoustic oscillations (BAOs) in the galaxy distribution. We will map positions and redshifts for tens of millions of galaxies over an unprecedented volume of the observable Universe to detect BAO imprints and to provide the deepest glimpse into the nature of dark energy by the time our survey, J-PAS, for Javalambre - PAU (Physics of the Accelerating Universe), is finished. This survey is a collaboration between Spanish and Brazilian scientists and will be conducted with the 2.5m telescope of the Javalambre Astrophysical Observatory (JAO), in Temel, Spain. JAO (commissioning estimated by December 2011) is managed by the Centro de Estudios de Física del Cosmos de Aragón, which is also responsible for operating the facility. The Brazilian side of this collaboration, PAU-BRASIL, will be coordinated by Observatório Nacional of Rio de Janeiro and IAG in São Paulo. JAO will be responsible for J-PAS, whose main objective is to measure BAOs with unprecedented accuracy by the time of its completion (2016-2017). The telescope will be equipped with a wide field camera with field-of-view of 6 sq. deg. which will image the sky with many filters (54 narrow and two broad) in the visible part of the spectrum. It will be the main (or the sole) instrument at the JAO 2.5 m telescope for at least seven years. The core of this camera consists of 14 CCDs of 10.5k x 10.5k pixels each. The survey will map an area of 8000 sq. deg. allowing the determination with large accuracy of photometric redshifts for tens of millions of galaxies ( $z$  less than 1 for red luminous galaxies). Besides cosmology, the

### EQUIPMENT GRANTED

- CCD detectors for a PCC (STA) camera, with accessories

survey will allow investigations of extra-galactic astronomy (e.g., stellar populations, galaxy evolution), of the Galaxy (e.g., halo populations, satellite debris), and even of solar system objects (e.g., asteroids). The funding for the camera final design and construction is the Pau-brasil contribution to J-PAS. The objective of this EMU proposal – the counterpart of São Paulo – is to partially fund this wide field camera through the purchase of the 14 CCD detectors that it requires, at an estimated cost of US\$ 2.5 million.

## ASSOCIATED PROJECTS

### **Institute of Astronomy, Geophysics and Atmospheric Sciences/USP**

*Galactic populations of the universe*

Laerte Sodré Junior  
FAPESP Grant 2006/00490-4

*New physics from space: formation and evolution of structures in the Universe*

Reuven Opher  
FAPESP Grant 2006/56213-9

### **Physics Institute/USP**

*Gravitation and cosmology: perturbations, phenomenology and exact results*

Elcio Abdalla  
FAPESP Grant 2006/07148-0

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**Laerte Sodré Júnior**

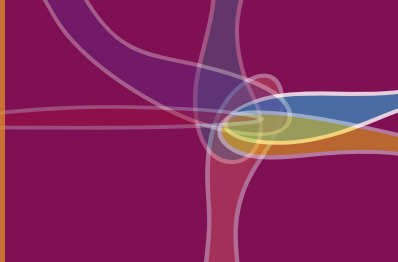
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## ACQUISITION OF EQUIPMENT FOR THE CHARACTERIZATION AND MANIPULATION OF PULSED LASERS

Luis Gustavo Marcassa

São Carlos Institute of Physics

University of São Paulo (USP)

FAPESP Grant 2009/53987-1

At the USP São Carlos Institute of Physics, there are various researchers that employ pulsed lasers in order to study and characterize distinct physical systems. Among such systems are those of atomic physics and condensed matter physics. In atomic physics, cold Rydberg atoms and cold heteronuclear molecules are explored with nanosecond and femtosecond pulses of light. In condensed matter physics, picosecond and femtosecond pulses are employed for the characterization of the nonlinear optical properties of organic molecules, as well as in studies of their arrangement on surfaces, in interfaces, and in microfabrication by multiphoton absorption polymerization. In all of these experiments, researchers encounter a common problem: the need to characterize and manipulate the light pulses in order to understand and model the experiments conducted. The characterization/manipulation of the light beams requires the use of various separate devices, which are never in continuous use by a given researcher or project team. Such devices are quite costly, making it unfeasible to acquire them for a single project. Therefore, the acquisition of such equipment is practical only if a large group of researchers will be able to use them, avoiding redundant acquisition of the same devices within the same institution. Consequently, the objective of this proposal is the acquisition of a set of such devices for the characterization/manipulation of laser pulses, to be employed by a large group of researchers working in various fields of study.

### EQUIPMENT GRANTED

- Autocorrelators for femtosecond pulses, with accessories
- NIR-Quest 256-2.5 portable spectrometers (Ocean Optics Inc.)
- Laser Spectrum Analyser-LSA – spectral range: 350-1,100 nm (standard) and 200-1,100nm (UV); spectral resolution: 30,000 (4  $\mu$ m fiber) and 10,000 (50  $\mu$ m fiber) – (HighFinesse GmbH)
- WS7 wavelength meters (HighFinesse GmbH)
- Pyrocam PY-III-C-A pyroelectric array detector, chopped and pulsed, Grade A (Ophir Optronics)
- MIIPS Box 640 high-resolution pulse shaper (Biophotonic Solutions Inc.)
- Knife-edge beam profiler and UV laser beam profiler



## ASSOCIATED PROJECTS

### São Carlos Institute of Physics/USP

*Bosonic and fermionic gases in an optical trap*

Luis Gustavo Marcassa  
FAPESP Grant 2007/0375800

*Microfabrication and micromachining of polymeric materials with femtosecond laser*

Cleber Renato Mendonça  
FAPESP Grant 2008/00652-0

*Vibrational spectroscopy and microscopy of Langmuir films by sum frequency generation*

Paulo Barbeitas Miranda  
FAPESP Grant 2007/07263-6

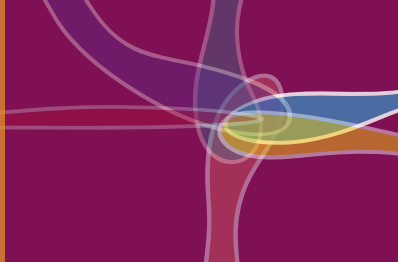
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## ACQUISITION OF A MULTI-STAGE MASS SPECTROMETER FOR A LABORATORY/ FACILITY IN THE CHEMISTRY DEPARTMENT OF THE UNIVERSITY OF SÃO PAULO RIBEIRÃO PRETO SCHOOL OF PHILOSOPHY, SCIENCE AND LITERATURE

Luiz Alberto Beraldo de Moraes

Ribeirão Preto School of Philosophy, Science and Literature

University of São Paulo (USP)

FAPESP Grant 2009/54094-0

Recent advances in instrumentation, principally in the modalities of ionization and mass analysis, have made the mass spectrometer one of the most versatile devices for use in the analytical sciences. The discovery and development of electrospray ionization (ESI) revolutionized mass spectrometry, allowing the ionization of thermally unstable molecules, such as proteins, carbohydrates, inorganic complexes, and glycosylated compounds, which are impossible to analyze by electron ionization. The principal objective of this proposal is the acquisition of a mass spectrometer with ESI to be employed in the analytical science center of the Chemistry Department of the USP Ribeirão Preto School of Philosophy, Science, and Literature, which currently has no equipment of this type. The proposal involves 29 researchers and more than 90 graduate students, at various institutions, working in diverse areas of knowledge, such as organic and inorganic synthesis, chemistry of natural products, materials science, characterization of bioactive secondary metabolites, degradation of drugs and pesticides, and the biotransformation of drugs, as well as affinity and multidimensional chromatography. Because of its analytical versatility, the mass spectrometer requested should meet the basic needs of the various research groups, as well as furthering the understanding of the processes involved, thereby accelerating the research of the groups involved in the proposal and of other groups that might avail themselves of the Analytical Science Center facilities. It should be noted that the Center has the necessary infrastructure for the installation and immediate activation of the equipment requested: 35 m<sup>2</sup> of available floor space; a liquid nitrogen station; a high level of technical expertise; and, principally, a professor specializing in analytical methods that require mass spectrometry. These factors ensure that the spectrometer will be maintained in good working order and that the full analytical potential of the equipment will be achieved.

### EQUIPMENT GRANTED

- Xevo TQ-S multi-stage mass spectrometer, with accessories, MassLynx 4.1 software, and Acquity UPLC Core System (Waters GmbH)

## ASSOCIATED PROJECTS

### **Ribeirão Preto School of Philosophy, Science and Literature/USP**

*Using mass spectrometry to accelerate the process of identifying and characterizing bioactive secondary metabolites produced by actinobacteria*

Luiz Alberto Beraldo de Moraes  
FAPESP Grant 2009/51145-3

*Chemistry, photochemistry, and biological applications of ruthenium with nitric oxide complexes and related species. From solution to materials*

Elia Tfouni  
FAPESP Grant 2006/53266-4

*Development and applications of enzymatic columns in screening for selective inhibitors and in the phytochemical analysis of natural products*

Carmen Lucia Cardoso  
FAPESP Grant 2008/04371-5

### Contacts for instructions for the use of the equipment

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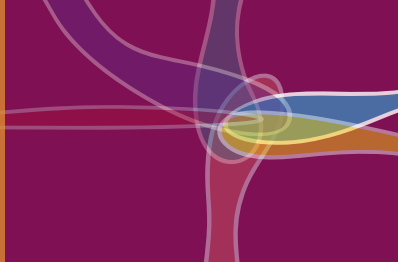
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## COMPUTATIONAL APPLICATIONS: OPTIMIZATION, FLUID MECHANICS, DYNAMICAL SYSTEMS, DIFFERENTIAL EQUATIONS, SINGULARITIES

Marcos Nereu Arenales

Institute of Mathematical and Computer Science

University of São Paulo (USP)

FAPESP Grant 2009/54136-5

This project is based on FAPESP-funded Thematic Projects which are lead by researchers of the Institute of Mathematical and Computer Science of the University of São Paulo and involve researchers of various other institutions in the state of São Paulo, Brazil.

The themes of the research projects associated to the Thematic Projects are combinatorial optimization with application on cutting and packing problems, the non stationary mechanics of moving fluids with applications in aeronautics and rheology, nonlinear dynamical systems and their applications, singularities, differential equations and geometry.

The installation of this infrastructure will boost the execution of these projects and of others which are carried out around them.

The equipment is a computer cluster with high processing power, a high performance storage system together with the supporting software.

### EQUIPMENT GRANTED

- PowerEdge R410 servers, with Quad core Intel Xeon, 2.26 GHz, 8M Cache, and 32 GB of RAM (Dell)
- EqualLogic PS4000E data storage system (16 TB + 8 TB), and transaction line processing software (Dell)

## ASSOCIATED PROJECTS

### **Institute of Mathematical and Computer Science/USP**

*Theory and practice of cutting and packing problems*

Marcos Arenales

FAPESP Grant 2006/03496-3

*Nonstationary mechanics of fluids: applications in aeronautics and rheology*

José Alberto Cuminato

FAPESP Grant 2004/16064-9

*Nonlinear dynamical systems in infinite dimensional spaces*

Alexandre Nolasco de Carvalho

FAPESP Grant 2008/55516-3

*Singularities, geometry and differential equations*

Maria Aparecida Soares Ruas

FAPESP Grant 2008/54222-6

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## UPDATE FOR THE HIGH-PERFORMANCE COMPUTER CLUSTER OF THE INSTITUTE OF PHYSICS GLEB WATAGHIN

Maurice de Koning

Institute of Physics Gleb Wataghin

State University of Campinas (Unicamp)

FAPESP Grant 2009/54213-0

The objective of this request is a partial update of the high-performance cluster of the Unicamp Institute of Physics Gleb (IFGW). This update will make the cluster available to all the groups that require parallel computation, as well as to the graduate students of our Institute. As one of the largest institutions of higher learning and research in Brazil, the IFGW has contributed to a considerable portion of the national scientific and technological production and innovation. The IFGW computational network is key to that contribution. Therefore, all the IFGW research groups who use the network will benefit from this upgrade, as will all of the IFGW graduate students who require access to high-performance computation. We are requesting resources for the acquisition of a high-performance processing cluster in order to create new computational opportunities for the following projects: Computer modeling of condensed matter – (CM)<sup>2</sup>; Atomic and molecular physics (Prof. Marco Aurélio P. Lima); The Pierre Auger Observatory (José Augusto Chinellato); Computer simulations of many-body quantum systems (Eduardo Miranda) and Spontaneous speciation in spatially distributed populations (Marcus A. M. Aguiar); Neutrinos in cosmology (Pedro Holanda); Structural and mechanical properties of carbon nanotube fibers (Douglas Galvão); Investigation of simple quantum systems with applications in quantum computation and cryptography (José Antonio Roversi); Computer simulations of many-body quantum systems (Prof. Silvio A. S. Vitiello); Use of a high-intensity, high-resolution beamline for the development of advanced spectroscopy techniques applied to materials of technological interest (George G. Kleiman); and Nanomaterials (Varlei Rodrigues).

### EQUIPMENT GRANTED

- Altix XE240 high-performance server and accessories: Altix ICE 8200EX with Intel Xeon processor E5570 (code-named Nehalem) and 640 GB of RAM

## ASSOCIATED PROJECTS

### **Institute of Physics Gleb Wataghin/Unicamp**

*Atomistic and multiscale modeling: mechanical, thermodynamic and kinetic properties of condensed matter*

Maurice de Koning  
FAPESP Grant 2009/02256-7

*Pierre Auger Observatory*


José Augusto Chinellato  
FAPESP Grant 2007/06651-2

### **Center for Bioethanol Science and Technology/National Synchrotron Light Laboratory (LNLS)**

*Processing of sugarcane cellulose employing atmospheric pressure plasmas*

Marco Aurelio Pinheiro de Lima  
FAPESP Grant 2008/58034-0

### Contacts for instructions for the use of the equipment



#### Maurice de Koning

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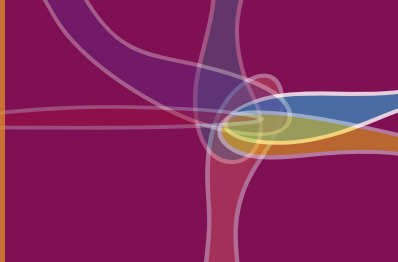
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## ACQUISITION OF EQUIPMENTS FOR A CENTRALIZED MULTI-USER LABORATORY

Mauro Monteiro Garcia de Carvalho

Institute of Physics Gleb Wataghin

State University of Campinas (Unicamp)

FAPESP Grant no. 2009/54047-2

Our objective is to provide the multi-user laboratory of the Unicamp Institute of Physics Gleb Wataghin (IFGW) with equipments for general use that can be employed in the majority of the lines of research at the Institute. We request the following equipments: 1) a helium leak detector, which is useful to those who work with vacuum equipments (cryostats, analytical equipments, and those for deposition etc.); 2) an X-ray diffractometer, of great usefulness because of the various types of analysis it provides, some of which are fundamental to condensed matter physics; 3) an atomic force microscope, which has become increasingly more indispensable, especially in the analysis of surfaces and nanostructures deposited on surfaces; 4) a Fourier transform infrared spectrometer, which has a wide variety of analytic capabilities (thin films, multilayered films, microanalysis in attenuated total reflectance mode, quantification of contaminants etc.); and 5) a laser writer, which is quite useful to researchers whose projects involve photolithography because it imprints the pattern directly onto the sample, providing great flexibility to those who often need to change the pattern. We emphasize the fact that all of these equipments will be made accessible to all IFGW researchers, in accordance with the multi-user laboratory guidelines approved by the IFGW Council.

### EQUIPMENT GRANTED

- VS helium leak detector and DS-302 rotary-vanepump (Varian Inc./Agilent Technologies)
- X-ray diffractometer and accessories (BUKER)
- Nanosurf EasyScan 2 FlexAFM atomic force microscope and accessories (Nanoscience Instruments Inc.)
- FTIR 6100 Fourier transform infrared spectrometer, with Spectra Manager software and accessories (Jasco UK Ltd.)
- $\mu$ -PG 101 compact LaserWriter (Heidelberg)



## ASSOCIATED PROJECTS

### Institute of Physics Gleb Wataghin/Unicamp

*Xenon implantation into amorphous carbon for use in brachytherapy*

Francisco das Chagas Marques

FAPESP Grant 2007/58374-2

*Semiconductor nanowires in isolation and in arrays: synthesis and electrical properties*

Mônica Alonso Cotta

FAPESP Grant 2008/55023-7

*Time-resolved luminescence in semiconductor heterostructures*

Maria José Santos Pompeu Brasil

FAPESP Grant 2008/51043-3

*Optical properties of nanostructures based on type II semiconductor heterostructures*

Fernando Iikawa


FAPESP Grant 2007/58375-9

*Analytical transmission electron microscope for spectroscopic nanocharacterization of materials*

Daniel Mario Ugarte

FAPESP Grant 2002/04151-9

### Contacts for instructions for the use of the equipment

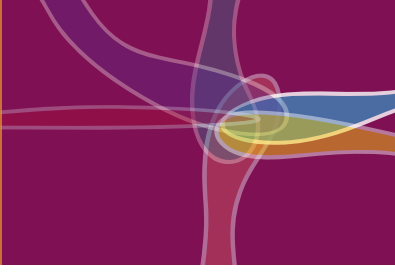


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## ACQUISITION OF A RAIETH E-LINE SYSTEM OF ELECTRON BEAM LITHOGRAPHY: NANOFABRICATION OF NEW GENERATIONS OF PHOTONIC AND ELECTRONIC COMPONENTS/CIRCUITS

Newton Cesário Frateschi

Semiconductor Components Center

State University of Campinas (Unicamp)

FAPESP Grant 2009/54064-4

We propose the purchase and installation of a ultra-high-resolution electron beam lithography system at the Center for Semiconductor Components - UNICAMP. This system will be integrated into the already established microfabrication and nanofabrication infrastructure in the laboratory, creating a center of excellence for research and development in the area of new components for integrated electronics and photonics. Such components can have great impact on developing disruptive technologies for the processing, storage, and transmission of information. Therefore, this project has the full support of two national institutes of science and technology, one in telecommunications and the other in quantum information.

### EQUIPMENT GRANTED

- e-LiNE PLUS nanoengineering workstation and accessories (Raith Inc.)
- Uninterruptible power supply

## ASSOCIATED PROJECTS

### **Institute of Physics Gleb Wataghin/Unicamp**

*Optical pumping of electron injection microdisks with active nanostructured regions*

Newton Cesário Frateschi  
FAPESP Grant 2004/01795-8

*National Institute of Science and Technology for Quantum Information*

Amir Ordacgi Caldeira  
FAPESP Grant 2008/57856-6

*National Institute of Science and Technology in Photonics for Optical Communications*

Hugo Luis Fragnito  
FAPESP Grant 2008/57857-2

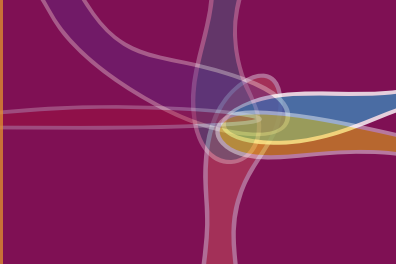
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## ACQUISITION OF A HELIUM LIQUEFIER FOR THE SÃO CARLOS REGION

Otaciro Rangel Nascimento

São Carlos Institute of Physics

University of São Paulo (USP)

FAPESP Grant 2009/53983-6

In this project, we propose the purchase and installation of a helium liquefier, our objective being to ensure the supply of liquid helium to all of the users in the São Carlos region. The USP São Carlos Institute of Physics (IFSC) has a long tradition in cryogenic infrastructure, routinely having been able to furnish nitrogen and liquid helium to its users since the early 1970s. The IFSC currently has a helium liquefaction plant made by Koch (now Linde), model 1410, that was installed in April of 1986 and serves all of the research laboratories in the region. This helium liquefier has been in operation for more than 23 years, producing 1000 to 1500 l of helium monthly. The liquid helium produced was distributed to the following users: those at the IFSC; those at the Federal University of São Carlos; those at the Nuclear Magnetic Resonance Imaging Center of the São Carlos Santa Casa de Misericórdia Hospital; those at the Brazilian Agency for Agricultural Research Instrumentation Center at São Carlos; those at the USP Ribeirão Preto School of Philosophy, Science, and Literature; and those at the USP São Carlos Institute of Chemistry. Because of the extensive use, this liquefier has already long surpassed the lifetime estimated by the manufacturer. Therefore, it has undergone innumerable repairs and its production of liquid helium (in l/h) has been progressively diminishing over the last few years. The specialists have informed us that it will undoubtedly fail at any moment. In view of these facts, we propose the acquisition of a new liquefier to replace the current one. The liquefier that we are requesting is nearly identical to the one it will replace, the only difference being that the manual control system has been replaced with a computerized electronic system that provides greater precision and ease of operation.

### EQUIPMENT GRANTED

- L1410 helium liquefier, RS compressor, and maintenance kits (Linde Cryogenics)

## ASSOCIATED PROJECTS

### São Carlos Institute of Physics/USP

*Electron paramagnetic resonance in structural studies of proteins, peptides, biomembranes, polymers, model molecules, and their complexes with transition metals*

Otaciro Rangel Nascimento  
FAPESP Grant 2003/09859-2

*Hemoproteins and hemopeptides as effectors of cell death*

Otaciro Rangel Nascimento  
FAPESP Grant 2009/08029-2

*Magnetic resonance imaging and in vivo spectroscopy center for animal model studies*

Alberto Tannús  
FAPESP Grant 2005/56663-1

*Site-directed spin-labeling and electron magnetic resonance imaging: a new approach for the study of membrane-protein and protein-protein interactions*

Antonio José da Costa Filho  
FAPESP Grant 2007/51022-3

*Magneto-Raman and magneto-photoluminescence study of disordered systems forming in semiconductor multilayers*

Yuri Alexander Pusep  
FAPESP Grant 2009/50407-4

*Magneto-photoluminescence study of the quantum Hall regime in multilayer systems*

Yuri Alexander Pusep  
FAPESP Grant 2007/51824-2

*Simulations of tangled magnetic systems in a magnetic resonance quantum computer*

Tito José Bonagamba  
FAPESP Grant 2008/58301-8

*Microcellulose, nanocellulose, and their composites with cellulose, silica gel and gypsum*

Milton Ferreira de Souza  
FAPESP Grant 2006/57117-3

*Magnetic resonance spectroscopy: high-field, low-field, or null-field*

Tito José Bonagamba  
FAPESP Grant 2005/54898-1

*Determination of local structures in ternary phosphate glasses by nuclear magnetic resonance techniques*

José Fabian Schneider  
FAPESP Grant 2006/61218-0

*Studies of the transport properties of glass and polymer ion conductors by nuclear magnetic resonance techniques*

José Pedro Donoso Gonzalez  
FAPESP Grant 2008/54061-2

### Ribeirão Preto School of Philosophy, Science and Literature/USP

*Electron spin resonance techniques for dosimetry, archeological dating, and characterization of biomaterials*

Oswaldo Baffa Filho  
FAPESP Grant 2007/06720-4

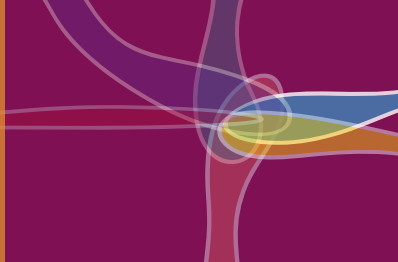
### Contacts for instructions for the use of the equipment

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## ACQUISITION OF A LUMINESCENCE DATING SYSTEM AND A PRECISION MICROSAMPLER, FOR THE STUDY OF ENVIRONMENTAL CHANGES IN THE QUATERNARY PERIOD

Paulo César Fonseca Giannini

Institute of Geosciences

University of São Paulo (USP)

FAPESP Grant 2009/53988-8

We propose the installation of a system for optically stimulated luminescence (OSL) dating, which employs the single aliquot regeneration (SAR) protocol, and the acquisition of a microsampler (micromill) for the collection of samples at the sub-micron scale, with visual control. The OSL-SAR dating system consists of a germanium detector, an automated luminescence reader with a beta radiation source, an accessory for single-grain OSL measurements with a green laser, and a gas exhaust hood for sample preparation. The microsampler consists of a tungsten carbide drill coupled to an optical microscope with an automated, referenced stage. The main goal of this request is to deeper integrate the research into environmental changes during the Quaternary Period, emphasizing the use of the microsampler for high-precision isotopic analysis of microstratigraphic successions in carbonate materials, as well as focusing on implementation of the single-grain OSL-SAR method, for dating of terrigenous sedimentation events, in Brazil. The correlation of the geochronological results which will be obtained by different methods, for both carbonate and terrigenous materials, will represent an unprecedented advance in research regarding environmental changes during the Quaternary Period in Brazil. The acquisition of the OSL-SAR system will fill a gap in the Brazilian field of geosciences, in terms of analytical methods. Despite the fact that the USP Institute of Geosciences (the petitioner) is the most well-equipped and active geochronology research center in Latin America, neither it nor any other institution in Brazil possesses equipment for dating Quaternary terrigenous sediment, combining precision with the capacity of meeting the needs of a large number of users. We plan to explore various other potential geosciences applications of the requested equipment. The microsampler will be applied in ultraprecise collection of samples from rocks, fossils, and archaeological materials in general, regardless of age or nature. The spectrometer will also be employed for the analysis of provenance and stratigraphic correlation in rocks of any age, with potential use for environmental radiation measurements.

### EQUIPMENT GRANTED

- Gas exhaust hood
- 0002-2810 MicroMill sampling prep device (New Wave Research, Electro Scientific Industries Inc.)
- Automated measurement system and accessories – TL/IRSL/Blue OSL system; TL/OSL-DA-20 luminescence reader; 90Sr/90Y beta radiation source; and single-grain OSL attachment (Risø DTU - National Laboratory for Sustainable Energy)
- Gamma spectrometry system with a high-purity germanium (HPGe) detector and ultra-low background blindage

## ASSOCIATED PROJECTS

### Institute of Geosciences/USP

*Evolution of the Atlantic Forest in the South/Southeast of Brazil: approach integrating sedimentological and micropaleontological methods*

Paulo César Fonseca Giannini  
FAPESP Grant 2005/51034-6

*Sedimentary provenance of quartz grains: TL/OSL signals in comparison with thermobarometric data and heavy mineral assemblages*

André Oliveira Sawakuchi  
FAPESP Grant 2007/54889-8

*Neotectonics and Cenozoic evolution of the Bocaina upland in Brazil*

Cláudio Riccomini  
FAPESP Grant 2003/08031-0

*Paleoclimate of the late Quaternary in Brazil based on isotopic ratios of oxygen and carbon in speleothems*

Francisco William da Cruz Júnior  
FAPESP Grant 2006/06761-0

*Geochemistry of stable isotopes [O and C] and microstratigraphy of stalagmites, applied to paleoclimatic studies of the Holocene in Brazil*

Ivo Karmann  
FAPESP Grant 2006/02834-2

*Study of aerosol composition and of the lead [Pb] isotopic signature as a tracer of air pollution sources in the city of São Paulo, Brazil*

Marly Babinski  
FAPESP Grant 2004/15277-9

*Geology and paleontology of tuffs in the Brazilian Bodoquena Sierra (state of Mato Grosso do Sul)*

Paulo César Boggiani

*Study of the genesis of the lagoons in the Lower Nhecolândia region of Brazil [state of Mato Grosso do Sul], based on data related to their pH, chemical composition, limnology, and relative altitude*

Teodoro Isnard Ribeiro de Almeida  
FAPESP Grant no. 2006/61052-4

*Biostratigraphy of trilobites of the family Calmoniidae [order: Phacopida] within the Devonian Ponta Grossa Formation in the Paraná Basin, Brazil*

Juliana de Moraes Leme Basso  
FAPESP Grant 2008/58291-2

*Geochronology of W-MO mineralizations of and their temporal relationship with Neoproterozoic magmatism - Seridó Band (Borborema Province), Brazil*

Maria Helena Bezerra Maia de Holanda  
FAPESP Grant 2007/58974-0

*Analysis of depositional systems and provenance of diamictites in the formations known as Bebedouro (north-central portion of the state of Bahia) and Jequitaiá (northeastern portion of the state of Minas Gerais): a study of Neoproterozoic glacial dynamics*

Renato Paes de Almeida  
FAPESP Grant 2006/61433-8

*Characterization and significance of microbial lamination in the Araras group (Neoproterozoic, Paraguayan Band), state of Mato Grosso, Brazil*

Setembrino Petri  
FAPESP Grant 2008/55833-9

### National Institute for Space Research (INPE)

*Integration of biological and geological data in the Lower Tocantins region of Brazil - Marajó Island: key to the analysis of biodiversity*

Dilce de Fátima Rossetti  
FAPESP Grant 2004/15518-6

### University of Guarulhos

*Juréia-Itatins ecological station (state of São Paulo) and lower-than-current sea levels during the Holocene*

Kenitiro Suguio  
FAPESP Grant 2006/04467-7

### Center of Nuclear Energy in Agriculture/USP

*Reconstruction of vegetation and climate since the middle Holocene in Brazil*

Luiz Carlos Ruiz Pessenda  
FAPESP Grant 2007/03615-5

### Rio Claro Institute of Geosciences and Exact Sciences/Unesp

*Quaternary (late Pleistocene/Holocene) depositional systems in the Pantanal Basin (state of Mato Grosso), central-west Brazil*

Mario Luis Assine  
FAPESP Grant 2007/55987-3

### Museum of Archaeology and Ethnology/USP

*Burial grounds and landscapes: modeling the interactions between natural and cultural processes in the formation of the southern coastal area of the state of Santa Catarina, Brazil*

Paulo Antonio Dantas de Blasis  
FAPESP Grant 2004/11038-0

### Institute of Astronomy, Geophysics, and Atmospheric Sciences/USP

*Sedimentation after the Neoproterozoic glaciations: an integrated study of cap carbonates in Brazil and Africa*

Ricardo Ivan Ferreira da Trindade  
FAPESP Grant 2005/53521-1

### School of Arts, Sciences, and Humanities/USP

*Geoenvironmental geology: analysis of marine areas affected by domestic and oil refinery effluents, with an emphasis on heavy metals and benthic foraminifera*

Wania Duleba  
FAPESP Grant 2009/51031-8

## ASSOCIATED PROJECTS

### **Geological Institute/São Paulo State Secretary of the Environment**

*Stratigraphic analysis of the surface of the Paranavaí alloformation,  
in the western portion of the State of São Paulo*

Alethéa Ernandes Martins Sallun  
FAPESP Grant 2008/03818-6

*Tuffs in the André Lopes Sierra (state of São Paulo): distribution,  
genesis, and paleoclimatic significance*

William Sallun Filho  
FAPESP Grant 2008/08583-7

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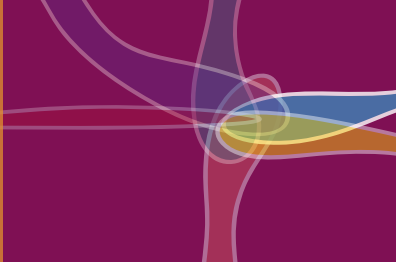
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## ACQUISITION OF AN X-RAY SPECTROMETER FOR THE MEASUREMENT OF TRACE ELEMENTS IN ATMOSPHERIC AEROSOLS

Paulo Eduardo Artaxo Netto

Institute of Physics

University of São Paulo (USP)

FAPESP Grant 2009/54201-1

The objective of this proposal is to acquire an X-ray spectrometer with polarized beam capable of measuring trace elements at very low subnanogram per cubic meter of air. This automated spectrometer has excellent detection limits, high precision and accuracy and large sample processing capacity. Its versatility for use with various secondary targets, together with its special geometry, allows rapid, high-precision analyses, as well as detection limits lower than those X-ray spectrometers currently available in the State of São Paulo. This will allow the analysis of heavy metals and trace elements in aerosol particles collected in the Amazon as part of the Thematic Project designated Aeroclima (The effects of aerosol particles on Amazonian climate), which operates under the auspices of the FAPESP Global Climate Change Research Program. Very low detection limits are needed for the analysis of samples of natural and biomass burning-related aerosol emissions in the Amazon. We will also analyze airborne pollutants in the atmosphere of the São Paulo Metropolitan area, and those data will be cross-referenced with the health effects of such pollutants, as studied in joint projects currently being conducted by the USP School of Medicine and the USP Institute of Astronomy, Geophysics, and Atmospheric Sciences. The use of receptor models in data analysis of trace elements allows the quantitative determination of air pollution sources, helping to establish more efficient public policies to reduce air pollution in metropolitan areas. The spectrometer will be used to design efficient strategies to reduce vehicular emissions in urban areas through better fuels and vehicle control technologies. The acquisition of this equipment will benefit the National Institute of Science and Technology for Global Climate Change and the National Institute of Science and Technology for the Integrated Analysis of Environmental Risk, as well as other large projects already underway.

### EQUIPMENT GRANTED

- Epsilon 5 X-ray – fluorescence spectrometer (PANalytical B.V.)

## ASSOCIATED PROJECTS

### **Institute of Physics/USP**

*Aeroclina: direct and indirect effects of aerosols on climate in Amazonia and Pantanal*

Paulo Eduardo Artaxo Netto  
FAPESP Grant 2008/58100-2

### **School of Medicine/USP**

*Analysis of the chemical signatures of the particulate matter emitted in different diesel/biodiesel concentrations and their toxic effects on biological systems*

Paulo Hilário Nascimento Saldiva  
FAPESP Grant 2007/57747-0

*National Institute of Science and Technology for the Integrated Analysis of Environmental Risk*

Paulo Hilário Nascimento Saldiva  
FAPESP Grant 2008/57717-6

### **Institute of Astronomy, Geophysics and Atmospheric Sciences/USP**

*Systems for evaluating the impact of vehicle emissions on the health of the population of the greater metropolitan area of São Paulo*

Maria de Fátima Andrade  
FAPESP Grant 2007/55787-4

*Evaluation of the air quality regarding ozone in the greater metropolitan area of Campinas*

Maria de Fátima Andrade  
FAPESP Grant 2006/54356-7

### Contacts for instructions for the use of the equipment

**Paulo Eduardo Artaxo Netto**

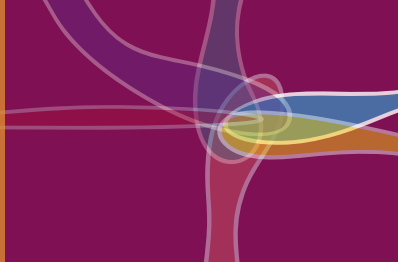
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## ACQUISITION OF A HR-ICP-MS COUPLED TO A LASER ABLATION SYSTEM FOR ELEMENTAL AND GEOCHRONOLOGICAL ANALYSES IN THE LABORATORIES OF GEOCHEMISTRY AND ISOTOPIC GEOCHEMISTRY OF THE DPM-IGCE, UNESP

Peter Christian Hackspacher

Rio Claro Institute of Geosciences and Exact Sciences

São Paulo State University (Unesp)

FAPESP Grant 2009/54146-0

We are requesting a high-resolution inductively coupled plasma mass spectrometer, with a linear sector and single collector, for elemental analyses of rocks, minerals, soil, and water, as well as liquid or solid industrial rejects. The spectrometer will be incorporated into the physical infrastructure and become part of the equipment of laboratories of geochemistry and geochronology of the Department of Petrology and Metallogeny, Unesp Institute of Geosciences and Exact Sciences (DPM-IGCE), a configuration that will allow elemental analysis to be conducted with virtually no interference, even in complex matrices, precluding the need for prior separation and elemental concentration. To ensure resolution and avoid interference, both necessary for the application of thermochronology, we are also requesting a system of laser ablation (rapid-pulse laser) for analyses of trace elements in minerals and in aphanitic matrices, as well as for the identification of isotope pairs in minerals of composition and simple structures (apatite, zircon, etc.), for geochronological purposes. Despite the fact that the spectrometer requested has high resolution, and because it has only a single ion collector, it can be used not only in isotopic geochronological analyses but also in elemental analyses, with no loss of precision or accuracy in the results, because the memory effects expected will be considerably less pronounced than are those with multi-collector systems. The DPM-IGCE laboratories have the appropriate infrastructure for the installation of the equipment. The institution currently has three laboratories, with a combined floor space of 120 m<sup>2</sup>, all maintained at positive pressure, and with class 1000 particulate filters, as well as the capacity to supply triple-distilled, sub-boiling acids and water, thereby ensuring the conditions necessary for the treatment of samples. This proposal is based on a set of projects that encompass the areas of environmental

### EQUIPMENT GRANTED

- ELEMENT 2 high-performance, double-focusing magnetic sector field, inductively coupled plasma-mass spectrometer and accessories (Thermo Scientific)
- Gas Cabinet / Computer – Sens

geochemistry, petrology, geochronology, trace element chemistry, and isotope analysis of minerals. The configuration of the equipment requested makes it well-suited to the needs of the universities and research institutes that make up the geosciences community within the State of São Paulo, because it can produce highly reliable elemental and isotopic geochemical data related to the principal objects of study in the projects conducted by the researchers involved.

## ASSOCIATED PROJECTS

### **Rio Claro Institute of Geosciences and Exact Sciences/ Unesp**

*Exhumation history of the South American plate in southeastern Brazil: thermochronology by fission track analysis and Ar/Ar and Sm/Nd systematics*

Peter Christian Hackspacher  
FAPESP Grant 2000/03960-5

*Hydrogeochemical and radiometric evaluation of the Bauru, Serra Geral, and Guarani aquifers in the State of São Paulo*

Daniel Marcos Bonotto  
FAPESP Grant 2008/06662-7

*The flows and sills of the Paraná magmatic province of Brazil [central-west portion of the State of São Paulo and northern portion of the State of Paraná]: geodynamic implications in the context of the breakup of western Gondwana*

Leila Soares Marques  
National Council for Scientific and Technological Development (CNPq)

*The flows and sills of the northern region of the Paraná magmatic province of Brazil: petrogenesis and geodynamic context*

Leila Soares Marques  
FAPESP Grant 2004/10081-9

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Espectrometria\\_de\\_Massa/index.html](http://www.rc.unesp.br/igce/petro/Laboratorios/Espectrometria_de_Massa/index.html)

## MODERNIZATION OF THE NMR LABORATORY OF THE UNICAMP INSTITUTE OF CHEMISTRY – ACQUISITION OF A 600-MHZ SPECTROMETER FOR EXPERIMENTS IN SOLUTION

Roberto Rittner Neto

Institute of Chemistry

State University of Campinas (Unicamp)

FAPESP Grant 2009/54071-0

The aim of this proposal is the acquisition of a nuclear magnetic resonance (NMR) spectrometer for obtaining data related to the molecular structure of compounds in solution. Although we intend to employ well-known and widely used NMR techniques, we also plan to correlate the basic NMR parameters, especially coupling constants, with the molecular electronic structure. To that end, we will use modern NMR techniques, some of which will have to be modified in order to adapt them to our needs. This will make it possible to determine the heteronuclear coupling constants with precision. Therefore, it is of utmost importance to acquire a spectrometer with a high magnetic field (14 Tesla), which allows various data to be obtained in less time, thus avoiding problems of resolution and sensitivity. This equipment will be also employed for the following: measurements of spin diffusion in the separation and identification of components in complex mixtures; measurements of longitudinal and transversal relaxation ( $T_1$  and  $T_2$ , respectively), for studying solvation and intermolecular chemical exchanges between solutes and solvents; and to determine the porosity of carbonate rock samples impregnated with oil, for obtaining the distribution of pores in reservoir rocks by quantifying proton relaxation within the oil molecules. It will also be possible to obtain images derived from NMR signals in heterogeneous systems, such as emulsions, in order to study their interphases. In addition, we will be able to employ the saturation transfer difference technique, characterizing the epitope of certain enzymes with small molecules (cofactors or inhibitors), in order to clarify the interactions with the enzymes that participate in specific cellular processes. Finally, the spectrometer will be used by research groups responsible for complementary Institute of Chemistry projects, but will also be made accessible to any other qualified researchers, whether working at the Institute of Chemistry or at other institutions in the State of São Paulo, for structural analyses and for other experiments that require high-field equipment.

### EQUIPMENT GRANTED

- AVANCE III 600-MHz superconducting Fourier nuclear magnetic resonance spectrometer (Bruker BioSpin)

## ASSOCIATED PROJECTS

### **Institute of Chemistry/Unicamp**

*Studies of electronic and molecular structures by spectroscopic methods and theoretical calculations*

Roberto Rittner Neto  
FAPESP Grant 2005/59649-0

*Transmission mechanism of scalar coupling study, involving the fluorine atom*

Claudio Francisco Tormena  
FAPESP Grant 2008/06282-0

*Reduction of hydrodynamic friction based on images of drops impact*

Edvaldo Sabadini  
FAPESP Grant 2005/00873-8


### **Center for the Study of Social Insects at the Rio Claro**

#### **Institute of Biosciences/Unesp**

*The search for the most promising compounds for the rational development of new drugs and pesticides based on bioprospecting of the arthropod fauna in Brazil*

Mario Sergio Palma  
FAPESP Grant 2007/57122-7

#### Contacts for instructions for the use of the equipment

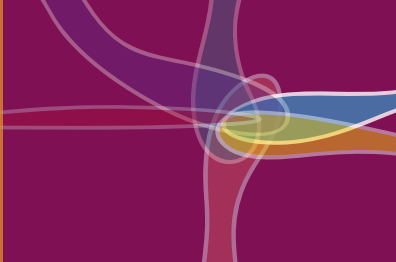


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## ACQUISITION OF A BOAT FOR OCEANOGRAPHIC RESEARCH

Rolf Roland Weber

Oceanographic Institute

University of São Paulo (USP)

FAPESP Grant 2009/54161-0

This proposal is aimed at the acquisition of a mid-sized ocean-going vessel to be used in the service of scientific research on the inner and middle continental shelf, especially along the coast of south and southeastern Brazil, conducted by the USP Oceanographic Institute (IO). The vessel requested is a 65-foot (approximately 20-m), steel-hulled ship, painted with anti-corrosion coating. The ship is powered by a diesel engine (main engine) and has a generator, a fresh water tank, a diesel tank, a side platform for hydrographic survey, and a stern gantry with a hydraulic winch, allowing the launch of various state-of-the-art devices for oceanographic studies in the field of geology, chemistry, physics, and biology. The features of the ship make it particularly well-suited to research conducted along the coast of the State of São Paulo, at low cost. A vessel of this type will enhance the performance of the IO-USP in international studies and will improve coastal marine management, mainly by providing support for public policies recently implemented in the region, such as the São Paulo State Coastal Management Plan and its Ecological and Economic Zoning Project, as well as management plans such as the Marine Protected Areas of the State of São Paulo. The vessel requested will bridge a gap in the floating resources available to the IO-USP, which are or much larger, such as the 165-foot (50-m) oceanographic research vessel “Prof. W. Besnard, or much smaller, such as the 50-foot (14-m) trawlers “Velliger II” and “Albacore”. It will therefore allow data to be collected in part of the research area covered, at a much lower cost than that incurred with larger ships and yet with a degree of autonomy (the capacity to sleep a small crew) not provided by the trawlers. This new, multifunctional vessel will be employed in fostering

### EQUIPMENT GRANTED

- 65 ft (20 m) steel-hulled ocean-going vessel for oceanographic research

national and international partnerships, especially in projects involving the collection of time series data or *in situ* experiments lasting several days. Graduate and postgraduate courses, as well as thesis work, will also benefit from the on-board pursuit of practical studies, because the boat will accommodate a greater number of students at a lower cost. The high cost of operating large ocean-going vessels is currently the major limiting factor to expanding the use of such vessels for teaching purposes.



## ASSOCIATED PROJECTS

### Oceanographic Institute/USP

*Influence of the Baixada Santista estuarine complex (State of São Paulo, Brazil) on the ecosystem of the adjacent platform*

Ana Maria Setúbal Pires Vanin  
FAPESP Grant 2003/09932-1

*Isotopic molecular characterization of sedimentary organic material from the embayment the coast of the state of São Paulo, Brazil*

Michel Michaelovitch de Mahiques  
FAPESP Grant 2006/04445-3

*Biomarkers of the effects and the exposure from aromatic compounds in fish from Santos Bay and from the adjacent continental shelf of Brazil*

Márcia Caruso Bicego  
FAPESP Grant 2005/03801-8

*Changes in productivity and ocean circulation along the continental shelf in the south-southeast of Brazil during the Holocene: micropaleontological and geochemical evidence*

Silvia Helena de Mello e Sousa  
FAPESP Grant 2007/54657-0

*Experimental study of biogeochemical processes, mediated by marine microbes, across the sediment-water interface*

Paulo Yukio Gomes Sumida  
FAPESP Grant 2008/04594-4

*Mapping of the benthic habitats of the Abrolhos Bank, State of Bahia, Brazil*

Paulo Yukio Gomes Sumida  
FAPESP Grant 2007/00535-0

*Distribution, rate of entry, chemical composition, and identification of sources of plastic pellets on the beaches of Santos embayment, State of São Paulo, Brazil*

Alexandre Turra  
FAPESP Grant 2007/51924-7

*Evaluating tributyltin (TBT) contamination in the hermit crab *Clibanarius vittatus* (Decapoda, Anomura), in the wild, and experimental determination of the TBT assimilation pathway, clearance time...*

Alexandre Turra  
FAPESP Grant no. 2006/57007-3

*Current sedimentary dynamic on Massaguaçu Beach (State of São Paulo). Accelerated development of erosive phenomena along the shoreline and identification of the processes that inhibit its progression*

Moysés Gonsalez Tessler  
FAPESP Grant 2007/56211-9

*Geological record of anthropogenic activity in the Cananéia-Iguape estuarine-lagoon system, State of São Paulo, Brazil*

Michel Michaelovitch de Mahiques  
FAPESP Grant 2006/04344-2

*Characterization of the molecular structures of polar organic compounds in sediments from the Vale Grande Canal and Iguape-Cananéia estuarine system, State of São Paulo, Brazil*

Rolf Roland Weber  
FAPESP Grant 2006/05675-2

### Contacts for instructions for the use of the equipment

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## HETERONUCLEAR MULTIDIMENSIONAL NMR (16.4 TESLA): A NEW CONCEPT IN THE RESEARCH IN STRUCTURAL CHEMISTRY OF NATURAL AND SYNTHETIC MATERIALS

Vanderlan da Silva Bolzani

Institute of Chemistry

São Paulo State University (Unesp)

FAPESP Grant 2009/54083-9

The primary objective of this proposal is to maintain the excellence of natural products and materials research at the Institute of Chemistry – UNESP and its partner UNESP and UNAERP institutions. This multi-user consortium, which already has two nuclear magnetic resonance (NMR) spectrometers (Inov A-500 and Inov A-300, both in steady operation for the last 10 years), envisions the setup of a center that is highly specialized in advanced NMR studies. The acquisition of three new equipment: superconducting fourier NMR spectrometer avance IITM 600-MHz with cryo probe and sample preparation robot, superconducting FT-NMR spectrometer avance III<sup>TM</sup> 400 MHz and 300 MHz Fourier NMR spectrometer with dual <sup>13</sup>C/ <sup>1</sup>H probe spectrometers will allow NMR spectra to be obtained, using unidimensional and bidimensional pulse sequences among other various modern NMR techniques such as broad band, distortionless enhancement by polarization transfer, insensitive nuclei enhanced by polarization transfer, heteronuclear and homonuclear correlations, long range coupling, heteronuclear correlations, single quantum coherence, heteronuclear multiple quantum and bond coherence and, diffusion ordered spectroscopy. All those experiments can be carried out with or without temperature variations or pulsed field gradient selections. These techniques will be employed in the structural characterization (at the molecular or micromolecular level) of metabolites from natural sources (from animals, plants, or microorganisms, by organic or inorganic synthesis) that are of pharmacological interest, as well as the characterization of vitreous materials, ceramics, polymers, and organic/inorganic complexes of academic, scientific or industrial interest. These studies are related to academic research and projects for innovation and development (through business-academic partnerships). Consequently,

### EQUIPMENT GRANTED

- Superconducting fourier NMR spectrometer avance IITM 600-MHz with cryo probe and sample preparation robot
- Superconducting FT-NMR spectrometer avance III 400 MHz
- 300 MHz Fourier NMR spectrometer

these studies will contribute for the development of graduate programs in Brazil, to the advancement of Brazilian scientific production aiming a greater exposure of national research on the international stage, and to the development of human resources, as well as for sustainable development of science and technology in our country.

## ASSOCIATED PROJECTS

### Institute of Chemistry/Unesp

*Conservation and sustainable use of the plant diversity from Cerrado and Atlantic Forest: chemical diversity and prospecting for potential drugs*

Vanderlan da Silva Bolzani  
FAPESP Grant 2003/02176-7

*Metabolomics in the context of the production of bioenergy from plant biomass*

Vanderlan da Silva Bolzani  
Banco Real

*Mesoporous ceramics and multifunctional organic-inorganic hybrids prepared by the sol-gel process*

Celso Valentim Santilli  
FAPESP Grant 2007/53073-4

*Standardized herbal drugs for the treatment of chronic diseases*

Wagner Vilegas  
FAPESP Grant 2009/52237-9

*Sustainable use of the biodiversity of Brazil: prospecting for novel chemicals and pharmaceuticals in higher plants*

Wagner Vilegas  
FAPESP Grant 2002/05503-6

*Search for potential antitumoral, antioxidant, anti-inflammatory, antifungal and AChE and MPO inhibitors natural compounds from Cerrado and Atlantic Forest*

Dulce Helena Siqueira Silva  
FAPESP Grant 2004/07932-7

*Senna spectabilis's rizosphere: Studies on plant/microorganism interactions using metabolomics*

Ian Castro-Gamboa  
FAPESP Grant 2011/50816-1

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## ACQUISITION OF A SINGLE-CRYSTAL X-RAY DIFFRACTOMETER FOR THE STRUCTURAL ANALYSIS OF SMALL MOLECULES AND PROTEINS

Victor Marcelo Deflon

São Carlos Institute of Chemistry

University of São Paulo (USP)

FAPESP Grant 2009/54011-8

We propose the creation of the appropriate infrastructure, at the USP São Carlos Institute of Chemistry, for the use of single-crystal X-ray crystallography, applied to small molecules as well as to proteins. To that end, we are requesting the acquisition of a single-crystal X-ray diffractometer with high-intensity copper and molybdenum X-ray tubes. There are currently no such diffractometers anywhere in Brazil. The equipment requested will be allocated in the Chemical Analysis Center of the USP São Carlos Institute of Chemistry and will be made available to the researchers in the region and in the State of São Paulo as a whole. This diffractometer is capable of providing structural data at the atomic level with great precision, allowing its use in the structural analysis of solid crystalline compounds of greater complexity, from organic molecules and coordination compounds with small molecules to macromolecules of various sizes, as well as biomolecules or proteins. Therefore, the equipment provides structural data that can be used as references, such as the distances/angles of bonds, molecular geometry, and spatial conformation, as well as intra-, inter-, and supra-molecular interactions, with precision. The acquisition of such data will promote significant advances in all fields of research that involve structural studies, including organic/inorganic synthetic chemistry, medicinal/pharmacological chemistry, organic/inorganic biochemistry, and protein chemistry/biochemistry, as well as catalysis and biocatalysis.

### EQUIPMENT GRANTED

- SuperNova X-ray diffractometer, with Atlas CCD detector, dual X-ray source, Cryojet system (Oxford), and platform (Agilent Technologies)

## ASSOCIATED PROJECTS

### São Carlos Institute of Chemistry/USP

*Synthesis and structural characterization of transition element complexes with potential medicinal applications*

Victor Marcelo Deflon  
FAPESP Grant 2007/03135-3

*Study of the human cyclin-dependent kinases involved in transcriptional regulation*

Fernanda Canduri  
FAPESP Grant 2007/05000-8

*Development of a bioproduct with high affinity for Trypanosoma cruzi glyceraldehyde 3-phosphate dehydrogenase enzyme*

Carlos Alberto Montanari  
FAPESP Grant 2008/04127-7

*Use of combinations of the ancillary ligands P(III), N(III) and S(II or IV) in the development of Ru(II) catalysts for polymerization by olefin metathesis pathway*

Benedito dos Santos Lima Neto  
FAPESP Grant 2006/57577-4

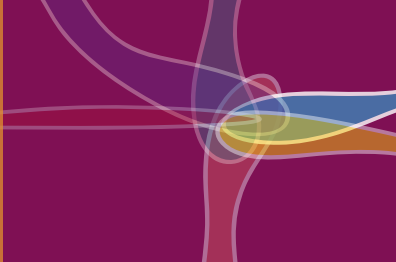
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## MULTI-USER LABORATORY FOR ADVANCED OPTICAL SPECTROSCOPY

Yoshitaka Gushikem

Institute of Chemistry

State University of Campinas (Unicamp)

FAPESP Grant 2009/54066-7

This proposal represents a joint request by six associated researchers, all leaders of FAPESP-funded projects, fifteen collaborating researchers, twelve of whom are coordinators of projects supported by FAPESP, and two young researchers, both of whom are FAPESP scholarship recipients and one of whom is a newly appointed professor at the Unicamp Institute of Chemistry. These independent researchers, whose curricula vitae are attached, submit this proposal with the aim of establishing an “open facility” type of multi-user laboratory, which will provide the scientific community, within or external to the Unicamp Institute of Chemistry, with access to two advanced optical spectrometers: (i) a Raman confocal spectrometer with high spectral and spatial resolution; and (ii) a modular fluorescence spectrometer operating under photostationary conditions, with a broad range of temporal resolution (from picoseconds to seconds) and spectral detection (from UV to near-infrared). Making both of these devices available at one open facility multi-user laboratory is aimed at meeting the needs of the research groups at the Unicamp Institute of Chemistry, which will now have access to two new instruments that are completely dissimilar to the equipment currently in place, as well as those of other research groups in the State of São Paulo. Therefore, we will be able to ensure the present and future quality of the research, making it at least equivalent to the international standard.

### EQUIPMENT GRANTED

- FluoroLog-3 modular spectrofluorometer (wavelength range, 200-1700 nm) and accessories (HORIBA Jobin Yvon)
- T64000 Raman confocal spectrometer (HORIBA Jobin Yvon)

## ASSOCIATED PROJECTS

### **Institute of Chemistry/Unicamp**

*Institute of Science, Technology, and Innovation  
in Complex Functional Materials*

Fernando Galembeck  
FAPESP Grant 2008/57867-8

*Thermodynamic studies of interactions in homogeneous  
and heterogeneous systems, with an emphasis on calorimetry*

Claudio Airoidi  
FAPESP Grant 2000/06635-8


*Microporous and mesoporous molecular sieves and type III  
layered materials*

Heloise de Oliveira Pastore  
FAPESP Grant 2008/00132-6

*Polymeric and ceramic materials*

Inez Valéria Pagotto Yoshida  
FAPESP Grant 2003/09926-1

### Contacts for instructions for the use of the equipment



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