



# Address for excellence

The Unicamp facility combines modern equipment for research in genomics, proteomics, bioinformatics and cell biology under a single roof

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The University of Campinas (Unicamp) has set up a laboratory that features state-of-the-art equipment designed for research in genomics, bioinformatics, proteomics and cell biology. Located in the Science and Technology Park of the university and modeled after university research facilities abroad, the Central High Performance Technologies Laboratory (LaCTAD) seeks to ensure a high level of quality in the research conducted at Unicamp and in the state of São Paulo; the facilities are made available to researchers from other institutions. “The university has signed two significant agreements as a result of the laboratory’s existence. This unit will be very useful for research into the proposed areas and will give a major boost to Brazilian science,” asserted the president of Unicamp, Fernando Ferreira Costa, at the inaugural ceremony.

FAPESP has invested approximately R\$5.5 million into the purchase of laboratory equipment under the Multi-user Equipment Program (EMU), whereas the construction of buildings and the hiring of staff were left to the university. “It is notable that Unicamp has invested almost as much as FAPESP and that LaCTAD has a well-demonstrated cost structure and institutional support critical to hiring employees in bioinformatics and technical support staff with doctorates,” said Carlos Henrique de Brito Cruz, the scientific director of FAPESP, who attended the opening of the laboratory on March 1st. The proposed creation of LaCTAD was submitted as part of the request for proposals of the Multi-user Equipment Program of FAPESP in 2009. In 2011, services began to be offered from temporary facilities in the teaching and research units.

Three modern sequencers have been acquired to perform work in the field of genomics, including two models. One is the Illumina HiSeq 2500, which enables complex sequencing studies through its ability to produce a large number of genome sequences for bioinformatics analysis. The other model is the ABI 3730XL DNA Analyzer from Applied Biosystems, which does not produce as many sequences as the former model but is able to map a larger number of base pairs. “It’s not easy to find a scientific study in the life sciences published by a leading journal that does not contain some element of gene sequencing or changes in the genome and that doesn’t use such data to design research or plan experiments,” says Ronaldo Pilli, Unicamp’s Dean of Research. “This equipment is improving the quality of research carried out at Unicamp.” Providing bioinformatics services, another goal of LaCTAD, is supported by a collection of computers that includes IBM servers and HP machines. “We have invested in the training of human resources by offering bioinformatics courses every semester,” says Dean Pilli. Approximately 160 students have already been trained.



LaCTAD is equipped with an isothermal titration calorimeter (1 and 2) a chromatograph (3) and a confocal microscope (4)

## EPILEPSY

One of the projects currently underway at the facility is led by Professor Iscia Lopes-Cendes of the Department of Medical Genetics at the School of Medical Sciences at Unicamp. She is using one of the LaCTAD sequencers to study the molecular mechanisms in the development of epilepsy, seeking to identify gene expression from brain tissue samples of rats. Selected neuronal networks from the hippocampus in animal models induced to present this disease are subjected to deep sequencing to search for transcripts (messenger RNA) that may be used to differentiate between the pathological and normal states. “As this [work] involves deep sequencing, we needed a fast sequencer, and we even helped to upgrade its software with funding from our research project,” she said.

Professor Gláucia Mendes de Souza of the University of São Paulo (USP) Chemistry Institute, who conducts research and is one of the coordinators of the Program for Research on Bioenergy (BIOEN) at FAPESP, also made use of the Unicamp facility to sequence a sugarcane reference genome. “LaCTAD is providing sequences obtained using the

Illumina sequencer, which complement the sequences we determined with the Roche 454 sequencer. We have one 454 at USP, but not an Illumina, hence the importance of the services they provide,” says Professor Mendes de Souza. Paulo Arruda of the Institute of Biology at Unicamp has also used the LaCTAD services. A project of his doctoral student, Vagner Katsumi Okura, involves constructing and sequencing the bacterial artificial chromosome (BAC) library of sugarcane. BAC libraries are funda-

## LaCTAD has invested in training human resources by offering courses in bioinformatics

mental tools used to characterize chromosomal regions that contain genes of interest. A second research project, by doctoral student Pedro Barreto, involves investigating how plants regulate mitochondrial biogenesis. The mitochondrion is an organelle responsible for cell bioenergetics. “There is a reasonable knowledge base about mitochondrial biogenesis in mammals, but little is known about it in plants,” says Arruda, whose work encompasses sequencing plant RNAs that overexpress the mitochondrial uncoupling protein (UCPI).

In the field of proteomics, LaCTAD offers liquid chromatography equipment, which can be used to analyze and purify proteins, and a calorimeter, which can be used to determine the thermodynamic parameters of biochemical reactions. A mass spectrometer (model Xevo Q-TOF MS) belonging to the Chemistry Institute at Unicamp will be made available to LaCTAD users until the laboratory is able to purchase its own equipment. Within the field of cell biology, the laboratory is equipped with a Leica confocal microscope that is capable of producing high-resolution fluorescence images of a variety of biological samples. Another piece of equipment is a Bio-Rad multiplex immunoassay instrument, which can quickly and accurately measure dosages of hormones or cytokines, the molecules involved in the signals emitted between cells during immune responses. “We are organizing an international workshop on cell biology to be held in May. We’re going to hear from outside experts who are conducting the same type of work in the life sciences in a central laboratory, so that we can exchange experiences and improve our services. The idea is to generate greater momentum for LaCTAD in cell biology,” says Dean Pilli. ■

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