

not continue to make contributions to the field of bioinformatics. “I believe one of the reasons for this was the difficulty in developing the field of genome bioinformatics that is still in its infancy at USP.” In any case, “the genome projects had a tremendous impact on USP, but we could have gone much further if we kept groups working on sequence analysis studies, especially from the evolutionary perspective,” he says. “Dobzhansky would have loved this!”

Successful sequencing of the *Xylella* genome broadened the scope of the FAPESP Genome Program, which was later engaged in other projects of significant social and economic interest. One of them was the Sugarcane Genome Project known as the FAPESP SUCEST Project, which was responsible for mapping 238,000 functional sugarcane gene fragments. “The SUCEST project paved the way for the use of molecular markers in crop improvement,” says molecular biologist Glaucia Souza, professor at the USP Chemistry Institute and SUCEST participant. Nearly 240 researchers from 22 institutions worked from 1999 to 2002 to identify the expressed sequence tags (EST) of sugarcane.

“The project enabled us to learn about sugarcane metabolism,” says Souza, who today coordinates the FAPESP Program for Research on Bioenergy (BIOEN) and SUCEST-FUN, which focuses on the functional analysis of sugarcane genes and the identification of genes associated with agronomic traits of interest. The group’s work is directed towards such topics as generating transgenic plants and investigating genes associated with sucrose content, biomass, drought tolerance, phosphate deficiency and climate change.

The researchers still want to understand how these genes work. Souza explains that initially, the project focused only on the functional DNA sequencing of sugarcane, ignoring the genes that had no known function. “Now we’re trying to identify strands of DNA known as promoters,” she says. Under an agreement with the Microsoft Research Institute for a research study on sugarcane genomics, her group is working on the annotation and analysis of the gene activity, which could allow the cultivation of varieties with higher or lower quantities of sugar in areas with little water. ■

BIOLOGY / ZOOLOGY

Evolutionary history in progress

Studies of vertebrates and invertebrates on land and sea aim to understand the processes of species diversification

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or over 40 years, zoologist Miguel Trefaut Rodrigues has been studying snakes and lizards to understand their biology and evolution. But sitting in the sand dunes of the São Francisco River or in areas of the Atlantic Forest or Amazônia to examine the shape and size of scales and measure animals captured by him or his colleagues never gets old. The research study he leads is monitoring advances in evolutionary science, a focus that pervades the Biosciences Institute and its Department of Zoology.

Currently heading up a large FAPESP-funded project that seeks nothing short of investigating the evolutionary history of reptiles and amphibians within the context of environmental changes, his group aligns traditional analysis of physical characteristics with genetic markers and models that take into account climate fluctuations that took place thousands of years ago. One example of the breadth of the research focus is the indication, from the analysis of 25 Brazilian vertebrates, that climate changes approximately 250,000 years ago had a different impact on endemic species diver-



Calyptommatus leirolepis: example of a lizard from the dunes of the São Francisco with loss of limbs

sification when one compares Brazil's northern and southern forests.

In the context of species diversification, the group is also studying how the evolution of crucial characteristics for adaptation to specific environments, such as the reduction or loss of limbs in lizards that slither through the sands along the banks of the São Francisco River, could in some cases be reversed and follow the opposite path, seen in the recovery of digits or paws (see the Special Issue *50 Years of FAPESP*). The presence of functional eyelids in a genus of the family of Gymnophthalmid lizards, characterized by exposed eyes, serves as a reminder of the

importance of correctly reconstructing the genealogical history of the groups in order to understand the processes of natural selection, according to an article that appeared in the January 2014 issue of the journal *The Anatomical Record*.

From land to sea, the group led by Antônio Carlos Marques is following the same line of research and has analyzed a total of 24,671 tiny marine animals in the past three years. The studies have led to the reorganization of the phylogenetic understanding of an entire phylum: the cnidarians, (including such creatures as sea anemones, coral, jelly-fish and hydra) and have established new global dimensions for understanding the evolution of the group.

According to Marques, based on material analyzed by the research group he coordinates, hypotheses have been proposed regarding biogeographical provinces on the scale of southern South America (Atlantic and Pacific) and all of Antarctica (southern Atlantic and sub-Antarctic regions), constituting their most auspicious compilation of data to date.

PIONEERS

According to Rodrigues, however, USP zoology did not always have this evolutionary vision of the world. An important chapter that affected the trajectory of the department took place in late 1962

when a vacancy arose for chairmanship of the Department of Zoology, at the time of the retirement of German professor Ernesto Marcus, who along with colleague Paulo Sawaya had established the study of zoology on the new campus of the University of São Paulo in Butantã during the 1950s.

The selection committee chose Diva Diniz Correa, who aligned herself with the anatomy and histology focus of the university founders, guaranteeing an even longer survival of the vision little

grounded in evolution. The opposite viewpoint was represented by scientist and samba composer Paulo Emílio Vanzolini, who in the face of the selection

went across town and carved out a niche in the neighborhood of Ipiranga, in the historical building that houses the USP Zoology Museum. He would end up directing the institution into the early 1990s. "That outcome could have really changed history," says Miguel Trefaut Rodrigues, former director of the Zoology Museum and currently associate professor at the Biosciences Institute of USP (IB-USP), referring to the choice made in hiring Vanzolini.

Ready in 1957, the zoology building, which today is a part of the Biosciences Institute, was the first project completed on what was then the new Butantã campus, contemporary of only the IPT building. But it was not just the construction of the building that helped Marcus and Sawaya put USP zoology on the map. They began several lines of research until then unknown in Brazil. When Marcus arrived in Brazil from the University of Berlin in 1936 after fleeing the Nazis, he had already published more than 50 scientific papers in his career.

According to Rodrigues, student of Vanzolini and one of Brazil's leading herpetologists, the history of zoology at USP has two very distinct stages. "Particularly in the last 30 years, the work of Vanzolini, who connected zoology to issues of evolution, has generated results both in the museum as well as in the IB. There was a lot of commonality."

It is not only the past that has an interesting history, says Marques. "What's beautiful about this story is that instead of replacing the approaches of the past, more recent approaches have been gradually added in. This has resulted in high-quality zoology that has a strong historical basis, but which contextualizes its questions into relevant, state-of-the-art current themes. And the future is here in the presence of excellent young researchers such as Professors Daniel Lahr, Taran Grant, André Morandini and Federico Brown."

There is one project ready, completed by Rodrigues, which would give the USP Zoology Museum a completely new building on campus, along what is known as the Museum Plaza. For now, though, the construction schedule has not yet been defined. The first date for launching at least part of the Museum Plaza was 2013, but as of yet there has been no construction on the future zoology museum. ■

The building that is now part of the IB was the first building of what was then the new Butantã campus