

The sage of biodiversity



Zoologist Paulo Vanzolini was one of the brains behind the creation of the FAPESP and the author of a theory on the origin of species in South America, as well as an icon of São Paulo samba

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“I revere nature. And I had a rewarding career. I can say I’m a fully realized researcher,” said São Paulo biologist Paulo Emílio Vanzolini to *Pesquisa FAPESP* in 2010 upon the release of his book *Evolução ao nível de espécie – Répteis da América do Sul (Evolution at the species level: the reptiles of South America)*. This 704-page tome is a collection of his 47 most important scientific articles. These papers, published from 1945 through 2004, helped expand the scope of Brazilian zoology. Prior to the mid-twentieth century, the field had been focused on isolated descriptions of species, but based on Vanzolini’s work, it shifted toward searching for the mechanisms underlying the formation of new species from biological, evolutionary, and environmental perspectives.

Vanzolini, who died of pneumonia on April 28, five days after his 89th birthday, had another passion, second only to zoology: writing sambas. His greatest hit was the now classic *Ronda*, written in 1951 (it begins with the following lines: I wander the city at night, vainly searching for you. I prowl

through crowded bars, but you’re not there). In addition to composing, he would also sometimes take to the stage. One of his last appearances was at the Sesc Pompeia pub in São Paulo in January 2012, where his wife, singer Ana Bernardo, performed his songs while he sat at a table on stage, regaling the crowd with stories of his life.

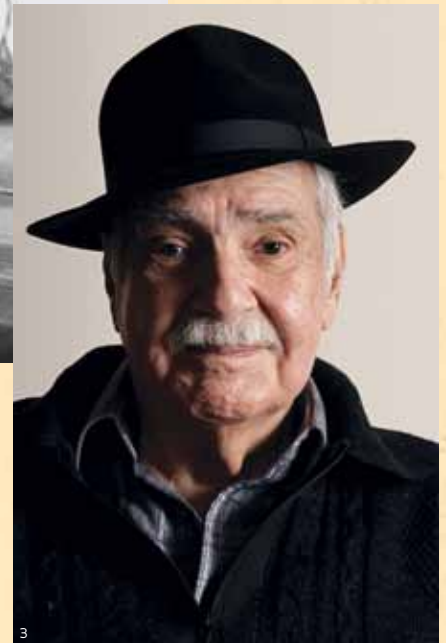
His accomplishments will stay with us because he blazed new trails, not only in biology but also in building Brazilian science. “Vanzolini took part in the movement of professors and researchers who proposed the creation of FAPESP, and under the Carvalho Pinto administration, he made a vital contribution to the institution’s structural design and to the organizational model that is still in place at the foundation today,” said Celso Lafer, president of FAPESP. “I am deeply saddened by his death. Vanzolini was someone for whom I had great admiration.”

Vanzolini participated in the first meetings to discuss the creation of FAPESP, shortly after the enactment of the Constitution of 1947, which authorized the establishment of a research funding



1 The *Anolis chrysolepis*, the basis for his formulation of the refuge theory

2 and 3 Vanzolini in 2012 and on one of his trips to northern Brazil



agency in São Paulo. In 1960, he was responsible for drafting both the law that instituted FAPESP and its Articles. Together with Antonio Barros de Ulhôa Cintra, president of University of São Paulo (USP) and chair of the Board of Trustees for the new foundation, he assisted in selecting the first directors and advisors. He was “one of FAPESP’s binding forces,” science historian Amélia Império Hamburger wrote in her book *FAPESP 40 anos: abrindo fronteiras (FAPESP 40 years: blazing trails)*.

Vanzolini was a member of the Board of Trustees during three separate periods (1961-1967, 1977-1979, and 1986-1993). Oscar Sala was the scientific director from 1969 to 1975, and whenever he had to travel, it was Vanzolini who coordinated the evaluation of applications for research funding and fellowships.

As director of the USP Zoology Museum from 1962 through 1993, Vanzolini expanded its collection from little over 1,000 catalogued specimens to the current holdings of more than 300,000 specimens. He personally typed up labels and

identification cards for the stored animals, recalls Miguel Trefaut Rodrigues, a biologist who earned his doctorate under Vanzolini. Rodrigues was later hired as a professor at USP and became one of the leading herpetologists (reptile experts) in Brazil, alongside Vanzolini. Rodrigues eventually succeeded Vanzolini as director of the museum, which today holds one of the largest and most valuable neotropical zoological collections.

BETWEEN THE WAR AND BOHEMIA

Vanzolini was familiar with both USP and music from a young age, as his father was an electrical engineer and professor at the Polytechnic School at USP, and his mother and sister were both musicians. A visit to the Butantan Institute at the age of 10 sparked his interest in the study of reptiles, and at 14, he did an internship at the Biology Institute of São Paulo. During World War II, as a medical student at USP, he enlisted in the Brazilian Expeditionary Force with the intention of fighting in Italy, but the war ended before he shipped out. He preferred studying animals

VERMILHO

PARAÇO

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CAVERNA

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Large rivers can favor the isolation and differentiation of species

to treating people, so after graduating from medical school in 1947, Vanzolini went to Harvard University to earn his doctorate and continue listening to good music, now in American bars.

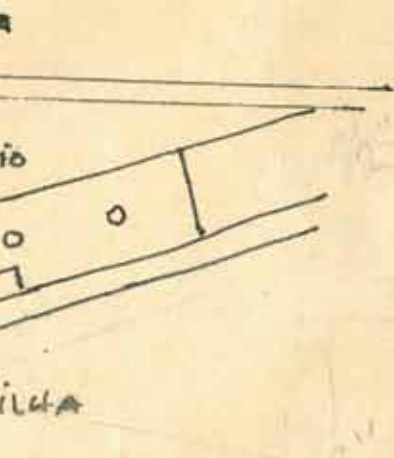
Few doctorates have influenced Brazilian science as much as the one he completed at Harvard University. After working alongside biologists who were exploring the formation and diversification of species from an evolutionary perspective, Vanzolini returned to Brazil in 1951 advocating concepts that revolutionized Brazilian zoology and continue to be used to understand biodiversity today. Vanzolini argued that it was vital to study species not only through isolated specimens, which was the accepted ap-

proach at that time, but also by looking at the distribution of populations of a single species across time and space. He later proposed that the marked diversity of animal species in the Amazon Region was the result of the geographic isolation of animal populations prompted by climate changes that took place thousands of years ago. According to Vanzolini, during eras when the climate was colder and drier, forests would fragment and form islands of plant life, called refugia, where animals were able to survive and form new species.

Although this perspective, like any other, has revealed its limitations over time, it can still be useful. "The refugia alone were not responsible for these

patterns of biological diversity," underscores Célio Haddad, professor at the Universidade Estadual Paulista (Unesp) in Rio Claro. In his opinion, phylogenetic, climatic, and geological processes should generally be examined jointly to properly understand the formation and diversification of species. "The same idea or hypothesis can be used in different contexts," says biologist João Alexandrino, professor at the Federal University of São Paulo (Unifesp). In early May of this year, one of Alexandrino's students began analyzing the genetic diversity among populations of a species of tree frog found in the Atlantic Forest and in the fields of southern Brazil, Argentina, and Uruguay. After examining the diversity patterns suggested by preliminary findings, Alexandrino advised the young man to read an article published by Vanzolini in 1981, in which Vanzolini proposed the concept of vanishing refugia, which explained that forest islands could suffer fragmentation and thereby force less specialized species to adapt to open environments.

PHOTOGRAPHS: PARACUASSU EILERS COLLECTION



1 Sketch of the wooden structure of the Lindolpho R. Guimarães, by Paraguassú Éleres

2 The Lindolpho ready for installation of the propeller shaft and rudder (Vanzolini in canoe)

3 Support team with the first load of the Belém-Brasília collections in May 1967

4 Both boats docked in Oriximiná in 1966 (right: Heraldo Britski, of the Zoology Museum)

5 A page from one of Vanzolini's travel diaries

25.iii, 1975 (Terça)

noite serena. logicamente acordamos tarde, e eram 0830 quando comecei a lavar e rotular o material de ontem. houve o dia interito, até as 2100. lutou pouca coisa, mas bra : Brito, 4 Bolhos ps pequenos, mais um hepteteron.

O material vivo que guardei de ontem para medir hoje sofreu muito - muitos morreram e resultou uma sujeira terrível. Apesar de dois litros de biclor, não consegui uma única larva decente de peço;

"What distinguishes Vanzolini is that his musical thinking is based on contradiction," says Sonia Marrach

"The refugia approach was innovative at the time it was presented, and it guided several generations of researchers," observed Hussam Zaher, director of the USP Zoology Museum, which Vanzolini headed for three decades as the tenured director after being appointed by former São Paulo governor Carvalho Pinto. "Refugia were talked about for a long time," says Zaher. The director says he believes that Vanzolini's greatest merit as a scientist was that he introduced Brazil to the "modern synthesis," consolidating the works of Theodosius Dobzhansky in genetics, Ernst Mayr in zoology, and George Simpson in paleontology, and encouraged its adoption in Brazil. Vanzolini studied under Mayr and Simpson at Harvard, which was already a center for modern science at that

time. Dobzhansky, who also spent time at Harvard, traveled to Brazil four times and played a valuable role in training the country's first geneticists. Vanzo, as he liked to be called, was accustomed to keeping company with intellectuals; his great-grandfather translated the six books of the Roman poet Lucretius' *De rerum natura* (On the Nature of Things) from Latin to Italian, and his grandfather regularly sent interesting Brazilian animal species to museums in Europe. In an interview given to zoologist William Ronald Heyer, Vanzolini said he learned English by reading Shakespeare's plays.

The so-called refuge theory was introduced by German geologist Jürgen Haffer in the journal *Science* in 1969. Haffer showed that there was a higher concentration of populations of different spe-

cies of toucans in areas that had received more rainfall. Three years earlier, the British ornithologist Reginald Moreau had highlighted the influence of climate changes and refugia on the distribution and differentiation of bird populations in Africa, but he did not go much farther. Around the same time, Vanzolini and a former Harvard colleague named Ernest Williams performed a study on the geographic variation and distribution of a species of lizard of the genus *Anolis* in the Amazon Region, which could be explained by climate variations; they published their paper one year after Haffer. In an interview with *Pesquisa FAPESP* in 2012, Vanzolini reported that his and Williams' research was "a practical example of what Haffer had posited from a theoretical perspective. It's nothing more than a [conceptual] model that can in fact be replicated in other regions."

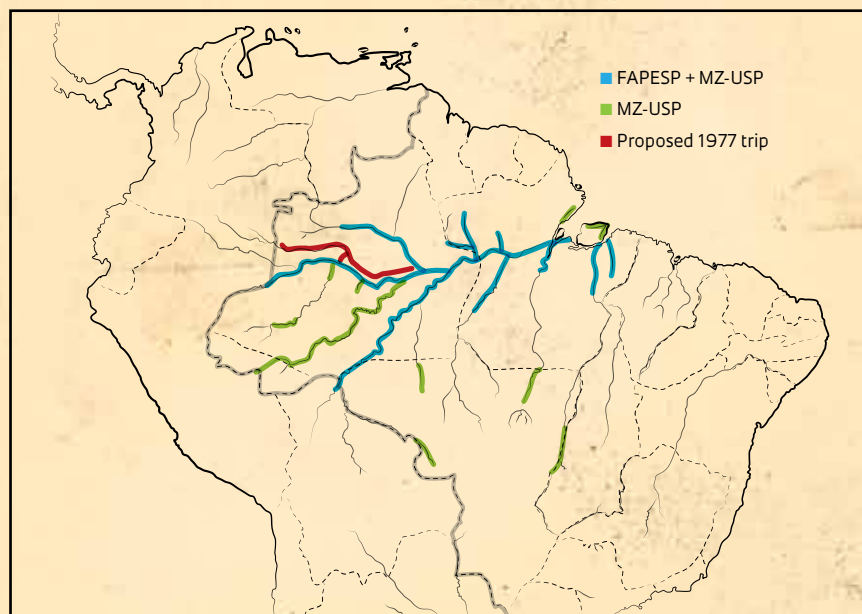
APPLICATIONS AND LIMITATIONS

"You can't deny that the refuge model, as he preferred to call it, applies to some of our fauna," says zoologist Miguel Trefaut Rodrigues. Today, *brejos de altitude*, Caatinga moist forest enclaves found on hilltops surrounded by open fields (especially in the Northeast), are "the most consistent evidence of refugia," he says. These *brejos de altitude* remain areas of climatic stability, favoring the diversification of species. "Each *brejo* has a unique set of fauna, but being a *brejo* is not enough to make it a refuge." In 1980, on the only expedition that Rodrigues and Vanzolini took together, the former (then a doctoral candidate) and the latter (his advisor) went to northern Bahia to gather specimens in the municipality of Caatinga do Moura, which Vanzolini believed had been a refuge. "It was only 10 years after this trip," says Rodrigues, "that I realized that the area of climate stability was really in the highlands near the Diamantina Plateau."

Vanzolini enjoyed traveling, but he hardly ever engaged in field collection, arguing that he wasn't any good at it. But in his own way, he was always adding precious material to the collections held by the museum. Whenever he went somewhere, he would spread the word that he had a bag full of coins with him and was interested in buying animals. "Among the 400 lizards of the genus *Tropidurus* that he bought from

Pioneer travels

The Zoology Museum, FAPESP, and research centers in Belém and Manaus joined forces to investigate unexplored areas of the Amazon





1 Vanzolini with classmates and professors at Harvard in 1951

2 Zoology Museum team, 1959-1962: (left to right, standing): Helio Ferraz de Almeida Camargo, Eurico Alves de Camargo, Messias Carrera, Carlos Otaviano da Cunha Vieira, Lauro Travassos Filho, Werner Carlos Augusto Bokermann; (seated) Paulo Emílio Vanzolini, Lindolpho Rocha Guimarães, and Carlos Amadeu de Camargo Andrade

a bunch of kids in Cocorobó, Bahia, I found six specimens of a new species,” says Rodrigues.

From 1967 to the mid-1980s, through the Ongoing Expedition to the Amazon Region, Vanzolini and other researchers from Brazil and abroad visited unexplored areas along the main rivers of the region, sailing in two boats that were the first to be funded by FAPESP: the 11.5-meter-long Lindolpho R. Guimarães and the 18-meter-long Garbe.

THE FREEDOM OF THE BOHEMIAN

When asked in an interview about his dual role as scientist and composer, Paulo Vanzolini explained with irritation that no one could do just zoology or just music full time. But the journalist insisted, asking which of the two activities occupied more of his time. He replied,

“How do you think I make a living? As a zoologist.” As Luiz Tatit, professor in the Department of Linguistics at the University of São Paulo (USP), says “In fact, he really liked his lizards. Composing was something done late at night, for fun, as a hobby. He was never a musician to forge a new path ahead of others. He said that university knowledge was enough.”

Researchers should not look for a samba revolutionary in Vanzolini. “He adapted the samba from Rio de Janeiro to São Paulo, similar to what the famous samba composers Adoniran Barbosa or Geraldo Filme did. Since he never needed to make a living through music, and composing was not his main concern, he ignored all of the musical movements that passed by, and the crises that samba faced. His universe was free and very specific,” notes Tatit. According to Regi-

He hated the almost talking style of singing used in bossa nova, and he also disliked songs with exaggerated emotion. His samba was sophisticated



Francisca do Val's watercolors on the cover of Vanzolini's CD *Acerto de contas*

na Machado, professor at the University of Campinas (Unicamp) Art Institute, Vanzolini helped establish the urban samba of São Paulo.

“At the time that he started, there was no São Paulo samba, just samba breaking out of Rio de Janeiro and reaching São Paulo and, with this first generation, of which Vanzolini was part, São Paulo samba took on some unique characteristics,” says Machado, author of *A voz na*

canção popular brasileira (The voice in Brazilian popular song) (Ateliê). One of the characteristics of this style was not the notes but rather the debate in which the São Paulo sambistas participated, affirming their local cultural differences. In addition to pride in the progress of São Paulo, its samba highlighted the inequalities and other ills of urbanization.

“This appears in Barbosa’s lyrics, which mention immigration, or Vanzo-





lini's more autobiographical lyrics on his experience with bar owners or friends in 'dives,' themes that did not appear in Rio de Janeiro samba," notes Tatit. Unlike the effervescence of Rio, samba jazz sessions in Sao Paulo took place exclusively at night, in bars and nightclubs. "Vanzolini, however, grew up listening to samba on the radio, especially Noel Rosa, with whom he identified. After all, Noel left medicine for music. But Vanzolini grad-

uated and became a scientist and composer. For him, a sambista did not need to be a scoundrel, and that word was never used in his songs. He liked to say he was hardworking and a bohemian," says Sonia Marrach, author of *Música e universidade na cidade de São Paulo: do samba de Vanzolini à vanguarda paulista (Music and the university in the city of São Paulo: from Vanzolini's samba to the São Paulo vanguard)* (Unesp Press).

Vanzolini never wanted to become a professional musician. He loved to tell stories. During shows, after he'd received much applause, his partner, Paulinho Nogueira, would turn to the audience and say: "You're good people, but I disagree with your clapping for the only person who does not know the difference between a major and a minor key." He was "musically illiterate" by choice and not for lack of opportunities.

"On the one hand, he was evidence of the intuitive side of the popular musician. On the other, his erudition enabled him to create very elaborate songs. His greatest contribution lies precisely in that combination of the popular universe with an intellectual bias. This influenced the works of Chico Buarque and Caetano Veloso a lot," says Regina Machado. In his presentation of the record collection *Acerto de contas* (Settlement of accounts), Professor Antonio Candido (a critic and essayist) notes that Vanzolini gets maximum yield out of minimum work through his use of expressive words to create true poetic portraits of late night São Paulo.

"What distinguishes Vanzolini in the panorama of Brazilian popular music is that his musical thinking is based on contradiction. For him, the essential character of life in its various aspects is the movement and the change that comes from denial and the transformative conflicts that are both subjective and objective," says Marrach. What is remarkable is that this contradiction is presented with good humor, with a comic outlook and with a willingness to see everything with a light touch.

Legend has it that it took him six months to decide between "shows" or "reveals" in the song *Boca da noite* (Early Evening). But melodically, the result was samba. "His sambas were like mine. But they were not the same. The themes he addresses are different; mine are those of common folk, whereas his were more intellectual because he is a professor, a zoologist, you know, a smart guy. But they are all sambas," said Adoniran Barbosa. And Vanzolini's sambas continued in that same vein, thanks precisely to what Tatit called "his lizards," his work at the university. ■

Scientific articles

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