

**Serrapilheira/ICTP-SAIFR  
Training Program in Quantitative Ecology**

call for applications no. 3/2022

## **Serrapilheira/ICTP-SAIFR Training Program in Quantitative Ecology**

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**Application window: September 15 – November 8, 2022**

The third call for applications for the Training Program in Quantitative Ecology is intended for students interested in exploring the different subfields of ecology through a transdisciplinary approach drawing on the fields of physics, mathematics, and computer science and using mathematical and computational models to enhance ecological theory.

The program will offer a two-month in-person course in January and February 2023 at the ICTP-SAIFR facilities at the Institute of Theoretical Physics at UNESP in the city of São Paulo.

Upon completing the course, students with excellent performance may be invited to participate in a more advanced course to take place at a later date. Participants are expected to be eligible to apply for doctoral fellowships at the world's leading research centers of excellence.

This document contains a detailed description of the program, the eligibility criteria, and the selection process.

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## 1. The Program

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The Training Program in Quantitative Ecology is an intensive course for students who are just starting their scientific careers in the various fields of ecology. In addition to an immersion in the main topics in the field, participants will receive training in mathematical modeling and computational methods to further their careers. The expectation is that they leave prepared to tackle ground-breaking issues in ecology.

### Transdisciplinary Approach

Given the inherent complexity of the life sciences, many of the big unanswered questions in this field will only be solved by combining approaches and tools from different areas.

We understand transdisciplinarity in the life sciences as the cross-referencing and integrating of other fields of knowledge (mathematics, physics, and computer science) to answer complex questions and generate conceptual, theoretical, and methodological innovations.

One of the main goals of the course is to train students to combine traditional and quantitative approaches to better understand ecological processes.

### Quantitative Tools

Describing living systems through the lens of mathematical models and physical principles enables the identification of patterns in natural systems, thereby pushing the boundaries of purely experimental research. Furthermore, technological advances have made it possible to collect and analyze high-quality and accurate data about biological processes. We now have access to a massive volume of data and an enormous capacity to analyze and extract valuable biological knowledge from it.

These resources open up multiple possibilities for research in ecology, facilitating the observation of new critical phenomena for the advancement of a field.

### Thematic overview

By being exposed to a broad range of research lines and approaches—from traditional to predominantly quantitative—in different fields of ecology and its related areas (such as epidemiology and evolution), program participants will be able to explore new research directions through a transdisciplinary approach to later decide on the next step in their careers.

## Goal

The program aims to train students to develop the critical thinking skills necessary for asking big questions in ecology and related fields and to acquire some of the mathematical and computational skills needed for answering them.

We hope that, after completing the course, the students will continue their education in PhD programs of excellence. Our long-term goal is to create a highly qualified generation of young Brazilian and Latin American scientists with the quantitative skills necessary to further the understanding of ecological systems.

## Target Audience

We seek pre-doctoral students, i.e., those who have already completed an undergraduate degree or are at the end of their studies (with at least 75% of the credits completed by January 2023), at a higher education institution in Brazil, in any undergraduate degree program. Those who are pursuing or have completed a master's degree at a Brazilian institution are also eligible, provided they have not entered a doctoral program yet. We want to form a group of students with diverse academic backgrounds who share a curiosity and interest in diving into a wide variety of topics and methodological approaches in ecology.

Although good academic performance is a critical factor in the selection process, we are primarily looking for young researchers who can tackle challenging tasks with methodological rigor, critical thinking, creativity, and a spirit of collaboration.

Candidates must have full-time availability to work on the course and be willing to continue their scientific careers in doctoral programs of excellence.

## Organization

The Training Program in Quantitative Biology and Ecology was launched in 2021 in a partnership between the Serrapilheira Institute and the International Centre for Theoretical Physics - South American Institute for Fundamental Research (ICTP-SAIFR). In 2023, the program's focus will shift to quantitative ecology - so it will be called the Training Program in Quantitative Ecology.

Additionally, the duration of the course is now two months instead of five, during the university recess in Brazil, to allow students to participate without interrupting their undergraduate or master's courses.

The Serrapilheira Institute is Brazil's first private institution to support research excellence and scientific outreach. As a non-profit

organization, with resources from an endowment fund and broad recognition from the Brazilian scientific community, it offers programs for researchers and communicators from all regions of Brazil.

ICTP-SAIFR is a South American hub of theoretical physics, created in 2011 through a collaboration between the International Centre for Theoretical Physics (ICTP) in Italy, the São Paulo Research Foundation (FAPESP), and the Institute of Theoretical Physics of the São Paulo State University (UNESP). ICTP-SAIFR's mission is to conduct research in theoretical physics at the highest international standards, to support research in regions of South America where theoretical physics is less developed, and to function as a global center for scientific training.

### **Advisory Board**

The Training Program in Quantitative Ecology was conceived and structured with the support of an Advisory Board that systematically follows the development and consolidation of the program's different stages.

The members of the Advisory Board are:

#### **Jordi Bascompte**

Professor of Ecology at the University of Zurich, Switzerland, and director of the Master's Program in Environmental Sciences at the same institution.

#### **William Bialek**

John Archibald Wheeler/Battelle Professor of Physics and Biophysics at Princeton University, USA, Visiting Professor of Physics at the Graduate Center at CUNY, USA, where he also serves as co-director of the Center for the Physics of Biological Function.

#### **Thiago Carvalho**

Graduate Program Coordinator at the Champalimaud Foundation, Portugal.

#### **António Coutinho**

Former director of the Doctoral Program of the Gulbenkian Institute of Science (IGC), in Portugal.

#### **Akiko Iwasaki**

Professor at Yale University and principal investigator at the Howard Hughes Medical Institute (HHMI), USA.

#### **Maria Leptin**

Director of the European Research Council (ERC).

### **Simon Levin**

James S. McDonnell Professor in the Department of Ecology and Evolutionary Biology at Princeton University (USA) and Director of the Center for Biocomplexity at the Environmental Institute, also at Princeton.

### **Gabriel Mindlin**

Professor of physics at the University of Buenos Aires.

### **Stevens Rehen**

Director of Research at Instituto D'Or de Pesquisa e Ensino (IDOR) and Professor at the Federal University of Rio de Janeiro (UFRJ).

## **2. Course**

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The program offers a two-month, full-time (morning and afternoon) in-person course in the city of São Paulo at the ICTP-SAIFR facilities at UNESP's Institute of Theoretical Physics.

### **Structure**

#### **Topics:**

- Quantitative foundations of ecological concepts
- Computational methods
- Mathematical modeling in biology
- Data fitting and statistical modeling

Each topic will include lectures, hands-on clinics, and question and answer sessions. The weekly course load will be complemented by activities such as journal clubs, research seminars with guest speakers, and discussion sessions. During the one-and-a-half-month course, students will develop group projects, applying the content covered throughout the training program.

### **Faculty**

The faculty is made up of scientists working at leading research centers around the world. Besides being highly qualified professors, their careers as scientists illustrate how cutting-edge research is conceived and developed today. Get to know the professors from previous trainings [here](#).

Students will have the unique opportunity to interact inside and outside the classroom with researchers who are leaders in their respective fields. As we will have professors from different parts of the world and students of different nationalities, **all classes will be in English.**

### Students

We look for students with an excellent track record who are eager to learn new concepts and methods, willing to participate actively, ask questions, and interact and collaborate in developing different activities.

We hope that the participants will enjoy the opportunity of interacting with leading scientists whose research has an impact on the international scientific community and who wish to contribute to the process of training the next generation of young researchers with great potential.

Therefore, full dedication is mandatory throughout the course and in all activities. Students with an unexcused absence may be dismissed from the program.

### 3. After the course

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The long-term goal of the Training Program in Quantitative Ecology is to develop a densely connected network of promising Brazilian scientists with solid quantitative skills dedicated to the major issues in ecology and related fields. Participants who have completed this course with excellent performance may be invited to join a more advanced course at a later date. The expectation is that graduates of this training program will be fit to apply for doctoral fellowships at the world's leading research centers of excellence.

## 4. Application

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### Eligibility

We strongly encourage all applicants to acquaint themselves with our selection process before applying.

We seek pre-doctoral students, i.e., those who have already completed an undergraduate degree or are at the end of their studies (with at least 75% of the credits completed by January 2023), at a higher education institution in Brazil, in any undergraduate degree program. Those who are pursuing or have completed a master's degree at a Brazilian institution are also eligible, provided they have not entered a doctoral program yet.

### Students who are pursuing or have completed a doctoral degree are not eligible.

- Mastery of the English language is essential. The selection process, classes, and other course activities will be conducted entirely in English.
- Persons with an academic background in any field of knowledge are welcome. Previous research experience in the biological sciences is desirable but not a requirement. People with a background in exact sciences or computer science with a strong interest in the life sciences are encouraged to apply even if they have no prior experience in ecology.
- Familiarity with differential and integral calculus is required. The selection process will involve questions in line with a basic calculus course; calculus tools will be used in the lectures of some mini-courses.
- Candidates must be available to dedicate themselves entirely to the on-site course in the city of São Paulo throughout its duration.

The application window opens on **September 15, 2022**. Applications may be submitted at <https://www.ictp-saifr.org/qecoprogram/> via an online form and attaching the following documents:

## Curriculum vitae

In **English**, not to exceed two pages as a PDF file.

## Complete undergraduate transcripts

Everyone must submit their undergraduate transcripts, including grades of the courses taken. **There is no need to translate this document (i.e., originals in Portuguese or Spanish are valid).**

## Graduate school transcripts

Applicable only to those enrolled in or who have completed a master's program. There is **no need to translate this document (i.e., originals in Portuguese or Spanish are valid).**

## Letter of Motivation

It must be written **in English**, with a maximum of 4,000 characters without spaces. Applicants should demonstrate their affinity for the Training Program in Quantitative Ecology, indicate why they should be selected, and how their profile aligns with the premises presented in this announcement.

## Names and e-mails of two researchers who will send letters of recommendation

At this stage, the applicant is only required to provide the names and e-mail contacts of two researchers who have agreed to make the recommendation and with whom the applicant has previous experience as a student, mentee, and research team member.

After the application has been submitted on the Program's website, the researchers listed by the candidate will automatically receive an electronic form that must be filled in and submitted by 5 pm (Brasília time) on **November 8, 2022**—the application deadline. By logging into the application system, the candidate will be able to check and track whether the letters of recommendation have already been received.

It is important that candidates explain the process of sending the letters of recommendation to those who will recommend them so that they check their inboxes for the email. It is also worth reminding them to check their SPAM folder as messages from unknown senders occasionally end up there.

## 5. Selection process

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Applications will be evaluated in two stages by a committee consisting of researchers from ICTP-SAIFR and members of the Serrapilheira Institute.

### Documentation Evaluation

The first step consists of checking the eligibility criteria, followed by a pre-selection based on the information provided in the application form and the documents submitted (Note: the motivation letter will play a critical role at this point).

### Interview

If necessary, the second step in the selection process will consist of remote interviews with shortlisted candidates. At this point, we will evaluate:

- technical capability in field of study;
- motivation for applying;
- level of English proficiency;
- prior knowledge of basic calculus (differential and integral single-variable). The candidate should be familiar with concepts such as continuous and discontinuous functions, limits and trigonometric, exponential and logarithmic functions, and be able to solve simple derivatives and integrals.

### Result

Up to thirty students will be invited to participate in the course, whose names will be announced by December 1, 2022.

### Schedule

#### September 15, 2022

Application window begins

#### November 8, 2022, 5:00 PM (Brasilia Time)

Application window closes

#### November 21, 2022

Acceptance emails sent to selected students

#### December 1, 2022

Publication of finalists

#### January 9 to March 3, 2023

Term of the course

## 6. Student stipend

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The course will provide housing in the city of São Paulo and a monthly stipend to cover food and transport costs during the term of the course (Jan. 9 – 3 Mar.), equivalent to 1,500 reais. It is worth pointing out that this is an estimated amount, subject to change.

The program will also cover one domestic air ticket (round-trip) between the student's city of origin and the city of São Paulo for students who live in other parts of Brazil.

The stipend is available to all students, regardless of whether they already have a scholarship from any national or international funding agency that provides similar incentives and support, as long as the applicable legislation and the internal rules of the other agencies and their scholarship programs do not bar students from receiving the stipend in addition to their other funding source.

## 7. Relevant considerations

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### Demographics

Applicants may opt-in for spontaneous reporting of demographic data in the Training Program in Quantitative Ecology application process. By opting in, applicants expressly agree to contribute to the collection of diversity data in our selection process. Any processing and publishing of demographic data collected in the call is strictly for statistical purposes related to the Program's commitment to transparency. Therefore, there will be no mention or identification of candidates related to this data, and it will be kept confidential and secret and handled sensitively as set out in the provisions of the law. Opting out of providing demographic data does not impact the selection process in any way, nor does it disqualify any candidate. Opting out can be done by ticking the "I prefer not to inform" option on the application form.

### On a legal note

The organizers reserve the right to cancel, suspend, modify, revise, or postpone, at any time and at their sole discretion according to their criteria and convenience, the process related to this call for applications by simply publishing a notice on the same media channels as the Training Program in Quantitative Ecology was announced, without this implying any compensation or indemnity to those enrolled in the program.

In order to preserve impartiality and equality in the evaluation and selection of applicants for the Training Program in Quantitative Ecology, persons married to, in a civil union with or of kinship by consanguinity or affinity, either in a direct, collateral, or transverse line, up two degrees of separation, with directors of the partner institutions responsible for organizing the Program, are not allowed to apply, directly or indirectly to the Program. Deliberately not abiding by this rule by any person qualifying for the calls for applications to the Training Program in Quantitative Ecology will give the organizers, at their sole discretion, convenience, and time, the right to request that the applicant be eliminated from the applicant pool.

The organizing institutions must evaluate and decide upon exceptions to the rules provided here.

Exhaustive research went into recruiting the course's faculty. That process is a testament to the quality and technical and academic competence the organizers wish to bring into the program. Due to various factors beyond the parties' control, however, some of the names listed may not be able to participate in the entire schedule as planned. In such a case, the organizers will select other instructors while observing the same criteria of quality and recognized competence used in selecting all nominees.

## 8. Contact

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[qecoprogram@ictp-saifr.org](mailto:qecoprogram@ictp-saifr.org)

