
Rio de Janeiro, June 13th, 2008

Dear Academicians,

We are very pleased to announce the five Young Scientists to be admitted as TWAS Affiliated Members 2008, for a five-year period:

Fernanda De Felice - Neurosciences

Jorge Lauret - Mathematical Sciences

Laurent Raymond Loinard - Astronomy and Space Sciences

Carlos Gustavo Moreira - Mathematical Sciences

Santiago Ron - Systems Biology

We thank all academicians who suggested names, and acknowledge the high scientific quality of all the candidates indicated to the Selection Committee.

New members biographical information :

Fernanda De Felice (Brazil):

Since 2002, I have been an Associate Professor at the Institute of Medical Biochemistry at the Federal University of Rio de Janeiro. From 2002 to 2005, Dr. Sergio T. Ferreira, my former PhD and MSc supervisor, accepted to host my initial years as faculty in his laboratory. During that period, I began forming my own small group of students. In 2005, I took a leave of absence to work as an HFSP Post Doctoral Fellow at Northwestern University, and I returned to Brazil at the end of 2007.

During my PhD, I was trained in protein physical chemistry and focused on protein misfolding/thermodynamics. The research I developed at Northwestern represented a great opportunity to combine my previous experience with an investigation of the role of misfolded proteins in Alzheimer's disease (AD). I consider the Central Nervous System a fascinating object of research, due to its intricate structure and because it underlies human emotions, intellectual activity and interactions with the environment. Notwithstanding, and partly for these same reasons, it is also the site of many debilitating, as yet incurable diseases, such as AD. I am, thus, glad that my post-doctoral training in the Neurobiology of AD provided me with a deeper understanding of the cellular/molecular basis of this devastating disease.

I currently have four PhD students and two MSc students working under my direct supervision in Brazil. They have been working with me since they were undergraduate students and even during

my HFSP Fellowship period I coordinated their work very closely (albeit it remotely). Laboratory leadership is at a premium in my Institute in Rio de Janeiro and, as a policy, is only granted to junior faculty once they have successfully supervised students, published in prestigious international journals and obtained highly competitive funding from Brazilian and/or international sources. Following those guidelines, I have been recently recognized as an independent researcher (Head of laboratory) in my Institute, which will be essential to allow my professional development and growth. In practical terms, it will allow me to be independent from my former PhD supervisor, to accept more students and to expand my research lines.

There are only a few groups working on neurodegenerative diseases in Brazil and I consider that this area has a great potential to grow in Brazil and Latin America. I have the goal to follow the steps of my previous supervisors, Professors Sergio T. Ferreira and William L. Klein, who showed me the beauty, importance, and greatness of science. Furthermore, they showed me that we should always be committed to the best possible formation of our students and with the publication of articles of great quality, which will contribute to the development of science in the World. Being nominated "TWAS affiliated member" would be a recognition of my trajectory until here and an important inspiration to the development of my research in Alzheimer's Disease in the future.

Jorge Lauret (Argentina):

The most relevant result of his Ph.D. thesis was to answer on the negative a question made by A. Selberg in 1956 in the framework of his development of the trace formula. Selberg introduced weakly symmetric spaces and proved that the algebra of all invariant differential operators is commutative. In the same paper, Selberg asks whether the converse holds. Lauret answered this question by presenting counterexamples in the quaternionic analogues to the Heisenberg group .

In 2000, Lauret started to study a notion weakening the Einstein condition on a left invariant Riemannian metric on a nilpotent Lie group. He considered Ricci solitons, i.e. a special solution of the Ricci flow moving along the equation by diffeomorphisms. The study of Ricci solitons becomes important because of their relationship with singularities of the Ricci flow; they represent extremal cases for the Harnack estimates and may be limiting cases for the Ricci flow near singularities. Just a few examples of Ricci solitons are known. Lauret proved that a Ricci soliton is unique up to isometry and scaling, and by a variational approach, he furthermore shows that Ricci soliton homogeneous nilmanifolds are precisely the critical points of a natural functional .

The following problem was suggested to Lauret by G. Margulis for a postdoc made by him at Yale University in 2001-2003. An Anosov diffeomorphism defines a very special dynamical system and it is then a natural problem, proposed by S. Smale, to understand which are the manifolds supporting them. After more than thirty years, the only known examples are hyperbolic automorphisms of nilmanifolds and it is conjectured that any Anosov diffeomorphism is topologically conjugate to one of these. It is also important to note that the existence of an

Anosov diffeomorphism is a really strong condition on a nilmanifold. Lauret showed that a reasonable classification up to homeomorphism (or even up to commensurability) of nilmanifolds admitting Anosov diffeomorphisms would not be possible. Also, in a joint paper with Cynthia Will, they give a complete classification in dimensions less or equal than 8 .

In the last years, Lauret proved and applied an adaptation of a stratification method from geometric invariant theory, given by F. Kirwan, to show that any Einstein solvmanifold is standard. In particular, all the nice structural and uniqueness results obtained by J. Heber are valid for any Einstein solvmanifold, and possibly for any noncompact homogeneous Einstein manifold, if the Alekseevskii's conjecture turns out to be true (.

Laurent Raymond Loinard (Mexico):

Laurent Loinard completed his undergraduate studies in physics in 1992 at the University Joseph Fourier in Grenoble (France). He obtained his Ph.D. in astrophysics in 1998 from the same University, although most of his doctoral work was actually performed while at the Harvard-Smithsonian Center for Astrophysics in Cambridge (Massachusetts) and at the Space Telescope Science Institute in Baltimore (Maryland). Following his doctorate, he was a postdoc during two and a half years at the Institute for Millimeter Radio-Astronomy (IRAM), one of the main radio-astronomy research centers in Europe. In 2000, he joined the Institute of Astronomy on the Morelia Campus of the National Autonomous University of Mexico (UNAM) as a faculty member. In 2003, this research center became the Center for Radio Astronomy and Astrophysics. The research pursued by Dr. Loinard focuses mainly on the formation and youth of stars, using observations in the infrared and radio bands of the electromagnetic spectrum. He has made important contributions to the understanding of the chemistry of protostars, and is an internationally recognized leader in the study of the dynamics of young stellar systems. He is the author of 50 research articles published in international refereed journals, in collaboration with a total of about 100 colleagues around the world. These papers have received more than 1000 citations in the international literature. He has participated in more than 30 meetings in Mexico and the rest of the world, and has delivered more than 20 talks on his work. Some of his results have been publicized in the international press. He has also given numerous classes of physics and astronomy at the undergraduate and graduate levels, and has directed or is directing 8 theses of various levels. He is currently *Investigador Titular B* (equivalent to Associate Professor) of the Center for Radio Astronomy and Astrophysics, and is a member of the Mexican *National System of Researchers* (SNI) at the second highest level. In 2007, he received the highest distinction that the UNAM delivers to researchers younger than 40 (the so-called University Award for young Faculty) in the area of exact sciences.

In addition to his research and teaching activities, Laurent Loinard is very active at the institutional level. He has been referee for several prestigious publications (Nature, The Astrophysical Journal, Astronomy & Astrophysics, etc.) and for research projects sent to national and international universities or agencies. He has also been the referee of numerous observing proposals submitted to international observatories. He was a member of the Internal Council of the Center

for Radio Astronomy and Astrophysics between 2003 and 2005, just after the center was created. Since 2003, he is in charge of the Center's Graduate program in astronomy; during this period, the number of students enrolled in the program has increased substantially. Recently, he has participated in the committee of experts of Mexico's main funding agency (CONACyT) and is currently a member of the Users Committee of the National Radio Astronomy Observatory (NRAO), one of the most important radio astronomy observatories in the world.

Carlos Gustavo Moreira (Brazil):

Carlos Gustavo concluded his Ph.D. 12 years ago at the age of 20. His publications have reached top level journals like the Annals of Mathematics (2), Publications Mathématiques de l'IHES, Annales de l'Institut Henri Poincaré, Analyse Non Linéaire (2) and Astérisque.

Together with Yoccoz, he solved a very difficult and important conjecture concerning the arithmetic difference of regular Cantor sets on the line: they contain intervals if and only if the sum of their Hausdorff dimensions is bigger than one. To do that, they exhibited a superb combinatorial and analytical skill. The result, published in the Annals of Math., has far reaching consequences in dynamics, including the frequency of hyperbolic dynamics when unfolding a homoclinic tangency, say in two-dimensions. Moreira's thesis dealing with the same problem has set up the stage for such a remarkable work. He is now applying his refined combinatorial schemes to deal with the problem in higher dimension, which is even more difficult.

Concerning unimodal maps, his work with Avila is again most notable. After a first breakthrough due to Lyubich, using previous works of Sullivan and McMullen, as well as another important one by Avila, de Melo and Lyubich, Avila and Moreira concluded a conjecture that has been considered a sort of ultimate global result in one-dimensional dynamics, in this case for unimodal maps. Their result concerns parametrized families of unimodal maps, with mild non-degeneracy conditions, stating that: "*For almost all parameter values, the corresponding dynamical system displays finitely many attractors which are periodic sinks or carries an absolutely continuous invariant probability measure*". This and other relevant facts are being published in the Annals of Math., Publications Math. IHES and Astérisque.

Santiago Ron (Ecuador):

Santiago Ron was born in Quito, Ecuador on October 16, 1970. In June 1995 he obtained the Licenciatura in Biological Sciences from the Pontificia Universidad Católica del Ecuador (PUCE). In 1996 he entered the graduate program at the University of Kansas and obtained a Master of Arts (May 1998). After serving as professor at the School of Biological Sciences of the PUCE for four years, he entered the Ecology, Evolution, & Behavior graduate program at the University of Texas, Austin, in September 2002. He finished his Ph.D. in May 2007 and in September of the same year began an appointment as Aggregate Professor at the School of Biological Sciences of PUCE, in Quito, Ecuador.

Dr. Ron has been an exceptionally productive scientist. Since 2002, has published 13 scientific papers in peer-reviewed journals including *Evolution*, *Molecular Phylogenetics and Evolution*, *Biotropica*, and *Nature*. He has also contributed a 90-page invited-manuscript for the book series "Biology of Amphibians." During the last five years, he has presented seven papers at professional meetings in Mexico, Brazil, Puerto Rico, and as an invited participant in the World Summit on Evolution, held in the Galapagos Islands in 2005. In total, he has published 18 scientific papers. Recently, he was elected Chair for Ecuador of the Amphibian Specialist Group of the World Conservation Union.

Dr. Ron's research has focused on two main venues: evolution and conservation. In his work on evolution he has contributed to the field of systematics and taxonomy of Neotropical amphibians. He has discovered and described several new species of frogs and has used molecular techniques to derive phylogenies. Using a phylogenetic framework, Dr. Ron has analyzed the evolution of female's preferences for complex courtship traits. He has examined how sexual selection has interplayed with morphological constraints to shape the evolution of male courtship traits. His work in the field of sexual selection and animal communication is currently under review in the journals *Animal Behaviour* and *Behavioural Ecology*.

In the field of conservation, he has studied the global phenomenon of amphibian population declines. In one of his recent publications he employs ecological niche modelling to predict the worldwide distribution of a fungal pathogen linked to population extinctions. He also co-authored a publication that shows that global warming has contributed to the collapse of populations of dozens of species of harlequin frogs (published in the journal *Nature*). He has also studied climate change in the Ecuadorian Andes and how it may have affected frog populations. His research has demonstrated that temperature increase in the Ecuadorian Andes has been significantly higher than the world average. He has also found correlations between climate change and the decline of amphibian populations in Ecuador. Overall, his research in conservation biology has significantly helped to understand the processes that are responsible for one of the most rapid and pervasive conservation crises experienced by any vertebrate group. This baseline information will assist conservationists and policy makers to delineate action plans to protect amphibians worldwide.

With very best regards,



Carlos Alberto Aragão de Carvalho Filho
Chair of TWAS ROLAC