



Consortium of the Americas
for Interdisciplinary Science

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RECENT VISITORS TO THE CONSORTIUM

- * Guillermo Abramson (Argentina)
- * Patricio Cordero (Chile)
- * Daniel Escaff (Chile)
- * Sergio Godoy (Chile)
- * Sebastián Gonçalves (Brazil)
- * Tania Hernández (Mexico)
- * Roberto Magaña (Costa Rica)
- * Gustavo Camelo Neto (Brazil)
- * Moyses Nussenzveig (Brazil)
- * Paul Parris (USA)
- * Ignacio Peixoto (Argentina)
- * Susana Ramirez y Andrew (Mexico)
- * Francisco Sevilla (Mexico)

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FEBRUARY 1, 2005
VOLUME I, ISSUE 2

A Center of the College
of Arts and Sciences
University of New Mexico



CONSORTIUM NEWS

MESSAGE FROM THE DIRECTOR



The Consortium continues in 2005 its active program of visitors, lecture miniseries, and workshops. Its financial support helped the organization of MEDYFINOL'04 held in La Serena, Chile, from 6-10 Dec., 2004. This large international conference on Nonequilibrium Statistical Mechanics and Nonlinear Physics was attended by illustrious researchers from USA, Latin America and Europe. They included several scientists directly connected with the Consortium, in particular Katja Lindenberg, Distinguished Professor from the University of California at San Diego (one of our External Advisory Panel members). The conference organizers included two former visitors to the Consortium, Professors Descalzi and Clerc from Santiago. The visit I paid in this connection to Chile has helped forge further collaborations of significant scientific potential with Chilean scientists. Two young students, Escaff and Godoy, from Santiago and three senior investigators—Professors Cordero, Tirapegui, and Clerc—have come/are coming to UNM from Santiago to pursue research in various fields. January 2005 has brought us an intellectually stimulating series of lectures from two of our Distinguished External Advisory Panel members who have come to visit the Consortium: Newell who expounded on powerful mathematical methods for the analysis of pattern formation, and Nussenzveig who conveyed to the listeners the excitement and importance of the physics of cell biology. An amusing article by Professor Nussenzveig also appears in this newsletter. He and another visitor from Brasil, Professor Sebastián Gonçalves, are introduced to our readers by our newsletter editor, Stephanie Martin. Sebastián has taught us here how to understand the microscopic origin of friction. One of our collaborators in that study is Alan Bishop, the Director of the Theory Division of Los Alamos. We are very pleased to report a recent honor, among many, that Alan has received. Efforts that the Consortium is making to involve young USA citizens in scientific collaborations with Latin America are taking fruit. Maureen Ballard, a talented USA student involved in such efforts, has written a noteworthy article in this newsletter. In brief, our work goes forward on all fronts in leaps and bounds.

— V. M. Kenkre, Feb. 1, 2005

SUSURROS DEL SUR

In the cement forest of Buenos Aires, the air is Amazonian thick. It moves viscously between my fingers and flows soundlessly along the curbs into the gutters and up scaffoldings, coating all 15 million and one faces in a muddy vapor. Optimistically named, her smoky breath lingers. I look up past the oversized billboards selling smiling couples sipping Coca-Cola, beyond the sweating leaves of numerous city trees, through the awnings of curbside cafés threaded with spindly streams of cigarette smoke, and along the radial axis extending out of the lenticular sprawl. She is wrapped like a broken eggshell along the lion-colored waters of Río de la Plata. This view sweetly centers a dull blue ceiling in a frame of penthouse suites and broken antennae. Radio tangos waft from open windows. Blooming roses and makeshift gardens adorn the crumbling brick walls where skinny cats perch. And I note a few first impressions of this famed bestial city.

Belching buses bring laborers and wanderers back and forth, caged elevators carry business up and down. She wakes every day to perspire yesterday's

MAUREEN BALLARD
BETWEEN BARILOCHE AND
ALBUQUERQUE
consumption and dawn Buenos Aires, home to millions, and to a large percentage of modern Argentine culture. And I wonder what is my place in this urbanscape on the edge of Latin America?

A boy skips white lines on the black asphalt and offers yellow freesias to grey Renaults. We exchange cent for scent and diffuse into the city again. Shade is precious, plentiful, and well accompanied by a dulce de leche gelato. Beautiful people with black braids and turquoise scarves stroll by wearing Argentine confidence on their collars. Street clowns juggle fire to entertain impatient motorists. And I smile at the discovery that awaits me.

Already it has been four years since I first stepped from my little red truck onto the sun-baked soil of that desert duke city: Albuquerque, New Mexico, with its faded Route 66 promises, flowering and thorny cacti, dusty neon lights, peppered adobe abodes, and dramatic sandia sunsets, welcomed me in the harshest and warmest of manners. Arriving from a small mountain town in north Idaho, the

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decision to move was easily made, though it took some time to accommodate to the change. I came to Albuquerque to study physics and see for myself what this New Mexico mystique was that so many artists and writers profess. Slowly, I uncovered the both. The process of adaptation can be very difficult and frustrating at first. A sensation of discordance and awkwardness pervades until one discovers how to move within new surroundings; how to interact with the city, where to find the comfortable niches, and where to leave one's own impression in the clay of its history.

After becoming lost on the first day of classes, I arrived late to my first physics class, a room wallpapered in blackboards and swivel desks, where a professor was writing calligraphic equations in white chalk. He informed us that he would be absent the following week for a conference in Concepción, Chile. A physics meeting in southern Chile, that's oddly interesting, I thought at the time. You see, as budding scientists we more often hear about research and meetings that are going on in U.S. universities or certain European institutions. Only my friends studying political science, Latin American culture/language, or social work were the ones speaking of study or travel to South and Central America. Not surprisingly, there were to be found many universities of high quality scattered throughout the southern hemisphere. But why was there so little information on such distant institutes? Maybe I wasn't looking in the right places, or perhaps popular opinion in graduate studies was governing the dispersal of applications. Regardless, an unconventional path within a physics career intrigued me for several reasons. Upon his return, I asked my professor, Dr. Kenkre, what he was up to in the southern hemisphere and what sort of science was brewing in developing Latin-American nations.

It was at this moment that I first heard word of the Consortium of the Americas, a mere seedling of an organization. The idea was to cultivate an environment where interdisciplinary scientists from nations throughout the Americas could come together and share research and ideas and projects and culture and discussion on a variety of interests. The central hub would be at UNM and would branch out to connect institutes in Mexico, Costa Rica, Brazil, Chile, Argentina, and more, via scientific collaboration. Led by Dr. Kenkre and assisted by Adriana Recalde, the Consortium of the Americas for Interdisciplinary science grew from a passing thought into a breathing, pulsing institution. While finishing up the last year of my bachelor's degree, I had the opportunity to work for the Consortium as a research assistant. During this time I met many visiting scientists from all over South and Central America. From condensed matter physicists to biologists, epidemic specialists to Bose-Einstein Condensate experts, the physics department was teeming with people interested in a range of topics that together might be united under the statistical physics umbrella of complex systems. As far as my personal interests went, while I found the beauty of physics tantalizing, I was not convinced that the abstraction from humanity, the fierce competition amongst peers, and complete devotion to the career were that to which I wanted to dedicate the majority of my life. With this internal question, I soaked up the stew of interdisciplinary studies that were transpiring and considered how my physics education might evolve to incorporate other interests. Different cultures and the evolution thereof fascinated me. Art and books occupied my free time. Politics frustrated and intrigued me. Spanish was something that I always had wanted to learn but never got around to. And like any other North-American college student, I wanted to remain open to the richness and variety within the university



education by stubbornly trying to unite several curiosities. While such idealistic endeavors may not have been successful, the dreaming was fruitful enough. During my involvement with the Consortium of the Americas, I came to learn about an institute in Bariloche, Argentina. Within Instituto Balseiro of Centro Atómico Bariloche was based a statistical physics group working in several topics of eclectic interest.

A year and many tedious visa tramitaciones later, I found myself stepping out of a tinted bus and again onto foreign land. This time I was welcomed by glacial lakes and Patagonian mountain peaks, flocks of winter parrots, and gingerbread German architecture. And here I remain. The culture is very different from that in which I have been immersed for the past 25 years, the language has yet to flow eloquently from my mouth, the physics classes are challenging, and thus the process of adaptation has been a bit more intense. Though infinitely rewarding.

With financial assistance from the OAS and the Consortium of the Americas, I am now pursuing a master's degree at Instituto Balseiro in Bariloche, Argentina. Between classes on stochastic processes and biological systems as well as research on dynamic social networks and cultural propagation, I find some time to explore the land spread beneath my feet. There is so very much to be learned within and without the institute that the experience has become much more than simply completing a master's degree.

As I write this letter, I wonder what eyes will be receiving these words; perhaps persons that I have met through the Consortium, or maybe students such as myself, wondering in which direction they should next step. I would like to end this letter with a few statements aimed at the latter audiences. Friends and countrymen, damas and caballeros, strangers and students, circus folk of all acts, how are you involved in your own lifelong educations? Which personal boundaries do you challenge and which do you justify away? Will you seek out experiences that enrich yourselves and those around you? Where will you find yourself mentally and physically in the next few years? And finally, why not take on those crazy dreams and sculpt them into realities? With such diversity in North American universities, I believe it is fair to say that the global flow of students is primarily unidirectional. The reasons for such asymmetry are understood and often legitimate. However, by participating in exchange, perhaps science and personal experience are both ultimately enhanced. While I do not want to advocate cultural homogenization by suggesting that everyone should pick up their skirts and trade places, I would like to humbly say that the choice to continue my education in Argentina will surely be one of the best decisions that I have made in my lifetime. This is for certain.

BECK, BETHE, RIEZLER AND EDDINGTON

H. M. NUSSENZVEIG
FEDERAL UNIVERSITY
OF RIO DE JANEIRO
BRAZIL

Guido Beck, my thesis adviser and one of the founding fathers of theoretical physics in Argentina and Brazil, had a highly developed sense of humor. The often inflated egos of theoreticians were among his favorite targets. Soon after Kruschew's denunciation of Stalin, he threatened to deduct 10% from a seminar payment to a left-leaning physicist who had just given a self-laudatory newspaper interview, explaining that this was a fine for "falling into the historical error of personality cult."

Several decades earlier, together with his friends and colleagues

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Hans Bethe and Wolfgang Riezler, Beck was responsible for one of the most celebrated successful pranks in the history of physics. The year was 1931, 65 years before Alan Sokal's hoax. Arthur Eddington, besides his important contributions to astrophysics, liked to delve into numerological and mystical speculations about the fundamental constants of nature. In particular, he tried to derive the value of Sommerfeld's famous fine structure constant in terms of whole numbers. Around 1923, he proposed an explanation for the denominator 136, in terms of a complicated 16-dimensional equation that led to:

$$136 = (1/2)(16^2 - 16) + 16.$$

When a more accurate measurement was found to be close to 137, he amended the value by introducing an extra "vacuum degree of freedom."

Beck, Bethe and Riezler promptly sent a letter to the editor of a then very prestigious journal, *Die Naturwissenschaften* (somewhat like *Nature* nowadays). It appeared in vol. 2, p. 38 (1931). Here is my English translation of the German original:

"Remarks on the quantum theory of zero-point temperature

G. Beck, H. Bethe and W. Riezler

Consider a hexagonal crystal lattice. It is characteristic of zero-point temperature that all degrees of freedom are frozen. This implies cessation of every internal lattice motion. However, it of course does not hold for an electron on a Bohr orbital. According to Eddington, each electron has $1/\alpha$ degrees of freedom, where α is the Sommerfeld fine structure constant. Besides electrons, the crystal contains only protons, for which the number of degrees of freedom is the same, since, according to Dirac, the proton can be regarded as a hole in the electron sea. Thus, to reach absolute zero-point temperature, we must remove from the crystal $(2/\alpha) - 1$ degrees of freedom per neutron (The crystal as a whole is electrically neutral; 1 neutron = 1 electron + 1 proton. One degree of freedom remains because of the orbital motion).

Therefore, for the absolute zero of temperature, we obtain

$$T_0 = -[(2/\alpha) - 1] \text{ degrees}$$

Taking $T_0 = -273$ we obtain $(1/\alpha) = 137$, which agrees within experimental error with the value obtained by an entirely different method. It can easily be shown that this result is independent of the assumed crystal structure."

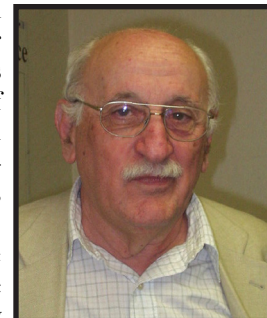
When the editor, who was not a physicist, was told what he had published, he wrote a furious letter to the authors. In a later issue, he published an editorial note stating that the authors had admitted that their paper "was not meant to be taken seriously."

A final footnote to this story has to do with the political climate that was already building up in Germany. Some time later, a German newspaper accused the authors of the paper, who were in England at that time, of unpatriotically vilifying Germany by their thinly veiled allusion to the "freezing of degrees of freedom."

Professor H. Moysés Nussenzveig earned his doctorate in physics from the University of São Paulo in 1957. He is a member of the Brazilian Academy of Sciences and was a recipient of the Max Born Award (Optical Society of America) in 1986, the "Almirante Alvaro Alberto" award (Brazilian National Council for Scientific and Technological Development) in 1995, and the Brazilian National Medal for Scientific Merit (1995). A Chair in Statistical Physics was created in his name at Tel Aviv

University, by the Friends of Tel Aviv University-Brazil.

When Professor Kenkre first set about shaping the Consortium of the Americas, he traveled throughout Latin America seeking to establish relationships with researchers. In Brazil, he met up with his old friend, Moysés, from their days together in the 70s at the Institute for Fundamental Studies in Rochester, N.Y. Kenkre sought advice and Nussenzveig had many suggestions, some based on his experiences as scientific coordinator of Coordenação de Programas de Estudos Avançados (COPEA). Now, as a member of the Consortium's Distinguished External Advisory Panel, Professor Nussenzveig continues to offer counsel on the Consortium's administrative and scientific directions.



Currently, Nussenzveig and Kenkre are putting their heads together to organize a two-week Pan-American Advanced Study Institute on optical tweezers. This institute, tentatively planned for next year in Brazil, will be a joint venture of COPEA and the Consortium, and will seek to bring about real collaborations between physicists and biologists of the highest scientific caliber, primarily from the US and Latin America, and also from Europe. The institute will include strong experimental and pedagogical components.

Professor Nussenzveig's main research interests are quantum optics and scattering theory. More recently he has turned his attention to optical tweezers and their applications to molecular cell biology. This area is the subject of a series of lectures the Professor is presenting during his visit at UNM. Professor Nussenzveig will be at UNM until the end of February, when he will return to Brazil and his position as Professor Emeritus at Universidade Federal do Rio de Janeiro.

RESEARCH RECOGNITION FOR CONSORTIUM SCIENTISTS

ALAN BISHOP NAMED LANL FELLOW

Alan Bishop, a member of the Consortium's Distinguished External Advisory Panel, has been named a Los Alamos National Laboratory Fellow by Laboratory Director G. Peter Nanos. Recipients of the annual honor are technical staff members who have demonstrated the highest level of excellence in programs important to the Laboratory's mission, made significant scientific discoveries that led to widespread use, or have been recognized as leaders in their fields both inside and outside of the Laboratory.

Alan Bishop is an internationally recognized leader in condensed matter theory, statistical physics and nonlinear physics. He has made major contributions in the areas of solitons and low dimensional materials, quantum complexity, nonlinear excitations in structural and magnetic transitions, collective excitations in low-dimensional materials and complex electronic materials with strong spin-charge-lattice coupling. He is a Fellow of the American Physical Society, a recipient of the Department of Energy's E.O. Lawrence Award and a Humboldt Senior Fellow.



Si el Señor Todopoderoso me hubiese consultado antes de embarcarse en la Creación, le habría recomendado algo más simple. — Alfonso X el Sabio, 1221-1248

CALL FOR JUNIOR SCIENTISTS

Calling Junior USA Scientists! We are interested in helping provide international experience in Latin America to junior scientists and students from the USA. We have resources for this purpose; a network of contacts, particularly in Argentina, Brazil, Chile, and Mexico; and strong encouragement by the International Division of the NSF. Contact us immediately if interested. Citizenship of the USA is a requirement.

FEBRUARY 20-26, 2005
ANGRA DOS REIS, BRAZIL

Mathematical Methods and Modeling of Biophysical Phenomena. This is the third workshop organized by IMPA on the subject of mathematical methods and modeling of biophysical phenomena.

MARCH 30-APRIL 1, 2005
SANTA FE, NEW MEXICO

Workshop on Stochasticity and Nonlinearity on Three Continents. Organized by the Consortium of the Americas for Interdisciplinary Science, the University of California at San Diego, and the University of Limburg. It is supported by the National Science Foundation, the Office for Naval Research, and the StochDyn program of the European Science Foundation.

2005
JOÃO PESSOA, BRAZIL

Workshop on Pattern Formation and Transport Phenomena will be held in João Pessoa in the state of Pernambuco in Brazil. It will involve advanced students from USA as well as Latin America.



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CONSORTIUM VISITOR SEBASTIÁN GONÇALVES



Sebastián Gonçalves came to the Consortium on March of 2004 for a year long stay during which he has been conducting research in the areas of condensed matter and complex systems, specifically the microscopic origin of friction and the study of sociodynamics, which include econophysics, opinion, and the spread of epidemics.

Sebastián collaborated with V. M. Kenkre and A. R. Bishop to publish "Nonlinear friction of a damped dimer sliding on a periodic substrate" in Physical Review B in 2004.

Sebastián received his doctorate in physics from the University of Buenos Aires. He now makes his home in Porto Alegre, Brazil where he holds a professorship at the Instituto de Física. Sebastião enjoyed the opportunity to do more intensive research and meet other scientists at the Consortium.

The lack of water in Albuquerque caused some regret for Sebastião because he is an avid windsurfer, hitting the waves at least once a week when in Brazil. But, while in the United States, he has taken the opportunity to do different activities. He and his family—his wife, Lucrecia; son, Pablo; and the family dog, Sukuto—who joined him for the year in Albuquerque, have traveled New Mexico, hiking and camping. They also took a two-week trip last summer, to the Grand Canyon and Sequoias National Park in California. Sebastião and his family return to Brazil in March.