

Feature

Essay from the 2012 Bruce Alberts Award for Excellence in Science Education

International Institute for Collaborative Cell Biology and Biochemistry—History and Memoirs from an International Network for Biological Sciences

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I was invited to write this essay on the occasion of my selection as the recipient of the 2012 Bruce Alberts Award for Excellence in Science Education from the American Society for Cell Biology (ASCB). Receiving this award is an enormous honor. When I read the email announcement for the first time, it was more than a surprise to me, it was unbelievable. I joined ASCB in 1996, when I presented a poster and received a travel award. Since then, I have attended almost every ASCB meeting. I will try to use this essay to share with readers one of the best experiences in my life. Because this is an essay, I take the liberty of mixing some of my thoughts with data in a way that is not usual in scientific writing. I hope that this sacrifice of the format will achieve the goal of conveying what I have learned over the past 20 yr, during which time a group of colleagues and friends created a nexus of knowledge and wisdom. We have worked together to build a network capable of sharing and inspiring science all over the world.

OUR HISTORY

We began 20 yr ago in South America. We had an idea about a regular school. Since then, we have not created a real website, we do not have a president or a director, and we do not have a statement of intent. What we do have is almost 200 romantic scientists who travel around the world to share their work with other colleagues and students. We also have a name that nobody can remember. We named our school the International Institute for Collaborative Cell Biology and Biochemistry (IICCB). We are working hard to transition to a more friendly and easily remembered mnemonic (Figure 1 and Supplemental Video S1). And as with any impressive

enterprise, we have a vision: *to inspire scientists and future scientists in biochemistry and cell biology*. We hope to inspire a new era of international scientific cooperation by exposing scientists to diverse, multidisciplinary learning experiences. Our strategies include practical courses and symposia, during which established scientists connect with one another and share their wealth of experience with the next generation of scientists who, in turn, act as ambassadors to their colleagues.

Early on, we had a lot of problems in South America. In addition to funding challenges, we also experienced many inconveniences in doing science. We would wait 1 to 2 yr to have a reagent released to our lab bench. In this situation, planning an experiment was not only an exercise of science, but also of patience and perseverance. There were customs problems with reagents and equipment, and there was a dearth of companies represented in our countries. It was common to lose essential resources due to radionuclide decay or enzymatic activity loss. And you can imagine the situation when we needed an instrument to be repaired or replaced. That was our situation 20 yr ago in South America; it was especially a Brazilian reality. I do not think that South America has changed a lot; indeed, scientific development in South America is very uneven. It is difficult to compare scientific development and funding in South American countries.

DOI: 10.1187/cbe.13-06-0108

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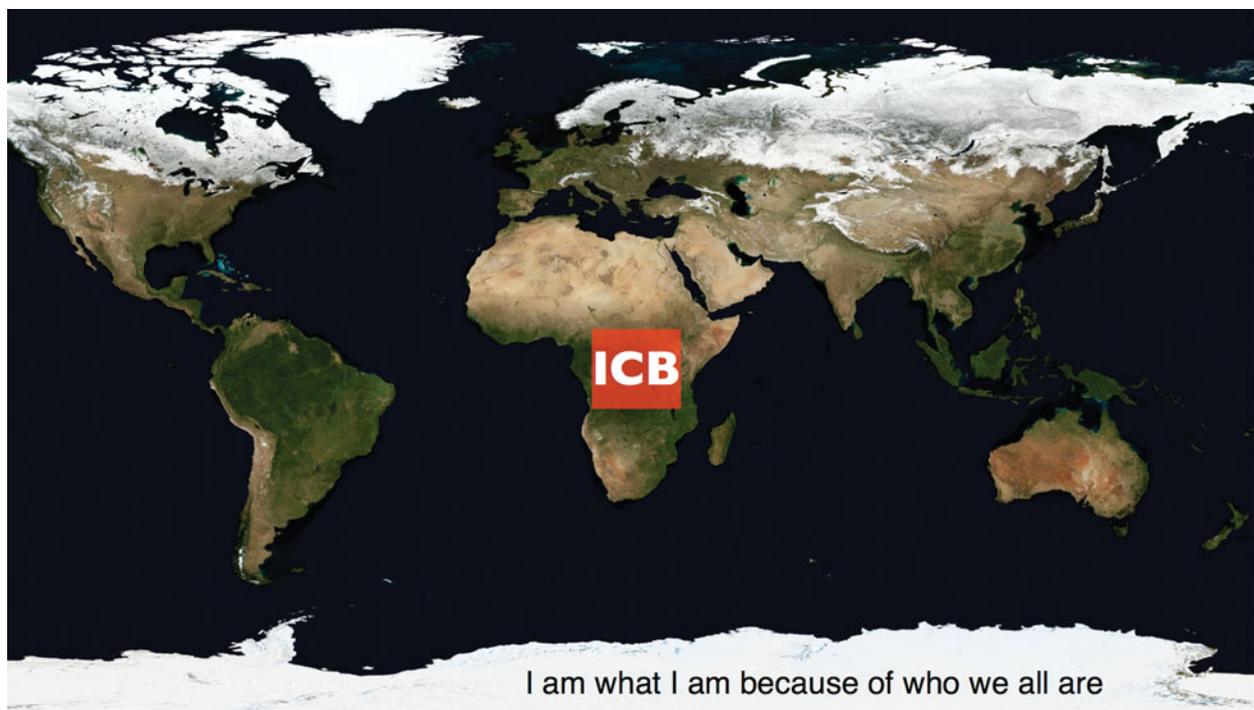


Figure 1. IICCB mark.

Scientific development in Brazil is similarly uneven. We have very distinct developments in different Brazilian scientific regions. I emphasize these issues to frame both our problems and goals.

OUR COURSE

In the early 1990s, a little course was held in Montevideo, Uruguay, to teach undergraduate and graduate students (Benech *et al.*, 1995). At the time, three Brazilian PhD students (L. C. “Cam” Cameron, A. Galina, and A. Teixeira) were invited by Juan C. Benech and José R. “Boli” Sotelo to teach 28 students about the molecular basis of muscle contraction. With the help of other Uruguayans (A. Calliari, R. Garcia, A. Kun, A. Sasso, J. R. “Coya” Silveira-Sotelo, and J. M. “Gallego” Verdes), we conducted a weeklong practical course. The International Union of Biochemistry and Molecular Biology (IUBMB) Brazilian and Uruguayan funding agencies sponsored this first course in April 1993, inviting us to conduct the course in Uruguay. At the time, they asked us to travel there by bus, which meant 2½ days on buses from Rio to Montevideo. The three of us said: “Okay, we will pay the air tickets’ difference and that’s okay.”

We had a typical South American scientists’ trip to Uruguay, meaning we transported lots of reagents (including hot ATP), frozen skinned skeletal muscle fibers, and other little things. I want you to imagine two big Brazilians, and one not so big, arriving full of energy, bringing all the material for the course plus baggage. Juan was waiting for us, with his wife and a little car, kindly called by Uruguayans by the nickname of “Fitito” (Figure 2). When he pointed out the car, we thought that it was a joke. It was not. Let us make a deal:



Figure 2. El Fitito (little Fiat).

you do not remind me about the laws of physics and I will not say how we fit inside.

In 2000, I held the First International Symposium on Myosin V (I ISMV). This was certainly a breakthrough for me. I had been wondering about it after finishing my PhD (I completed the degree at the advanced age of 35 in 1997). When presented with the idea of bringing almost 25 world-class myosin researchers to Rio, my former advisor (Martha Sorenson) gave me a very optimistic opinion: “You are a megalomaniac.” She was right and always helped us in making the courses and meetings successful. I was also very stubborn. I asked for Roy Larson’s help. He sent emails to myosin

researchers, inquiring about the idea of having a Myosin V meeting in Rio. The first answer, which arrived in 10 min, was groundbreaking: "I am already there," said John Mercer. After his email, Roy began to receive many emails, and a young student of his, Sinji Tauhata, acted as a spy, forwarding me invitees' acceptances. When we reached almost 20 acceptances, we realized that our problem was to obtain the necessary funding for the meeting. To make a long story short, it was not easy, but we did it.

After meeting Ernesto Carafoli during a previous course of Boli's and realizing that we shared many interests, I invited him as a calcium expert to join us in 2000. In 2001, Ernesto proposed that I arrange an International Cell Research Organization (ICRO) course on molecular motors in Rio, which was an embryonic version of the current course. Since then, we have attracted funding from several local and international sources for subsequent international meetings, courses, and conferences. More than 1800 scientists, including undergraduate and graduate students and junior and senior scientists, have attended these meetings.

After the first course in Uruguay, we held more than 30 conferences, symposia, and courses to help students from Latin and South America and other countries to learn about and gain skills in molecular and cell biology research. Although these events are geared toward students, postdoctoral fellows, and researchers from the region where the event is held, they are open to peers from all over the world. Our aim is to promote interactions and discourse that will bring people together in scientific pursuit in a stimulating and friendly atmosphere. To facilitate this discussion, world experts from a wide variety of fields involving cell and molecular techniques are invited to present general lectures related to their field, specific lectures relating to their own work, and laboratory practicals that expose students to cutting-edge methodologies. We decided to create an organization that could be a catalyst for organizing these events. After some discussion we decided to call it IICBB (aka The Club). The Club is an organization without borders or physical location and with a mission to inspire scientists.

THE FACULTY

The choice of faculty to lead these courses is critical. We choose scientists who have made significant contributions in their fields and who are very flexible. Flexibility is very important to us. There are continuous changes in our programs and funding, so we count on colleagues who will be happy to make last-minute modification in their talks and practicals. In other words, faculty members must have at least a plan B, plan C, plan D . . . Although our faculty members are world-class scientists in their fields, they know that we will engage them in challenging and meaningful discussion.

Owing to the length of the course, we invite faculty to stay for half of it. Most faculty members come for a 5- to 8-day period. Since we began these meetings, we have had close to 200 collaborators, most of them coming for more than three events and some coming to 10 or more. We have faculty members from different nationalities who are established in their fields at some of the best universities from all over the world (Table 1). It is very important to emphasize that our faculty members do their best in helping to obtain funding to

support the courses in formal and informal ways. We use the phrase: "Bring as much as you can." An uncountable number of colleagues have paid their own expenses partially or totally, depending on their resources. The commitment is such that, when finishing a course and giving them a reimbursement, I heard hundreds of times: "Can you really reimburse me? In case it jeopardizes a course, I can afford this."

My friends are so generous that a lot of them, led by Adriana Bassini, signed the proposal to nominate me for the Bruce Alberts Award, even though they suffered through and helped solved the many problems we encountered in hosting the courses. Indeed, the award belongs to all of us; I am merely the person who accepts it on behalf of The Club.

THE COURSE LOGISTICS

The course framework basically consists of general *lectures*, during which we typically have two or three 1-h lectures each morning, followed by an afternoon lab *practical* that may continue over several days. The practical is usually led by an investigator who has made important contributions to our understanding of the molecular basis of a given field. In addition, 3 days are reserved for a research *symposium*, wherein recent results are presented and discussed. Since our very first meeting, we have encouraged young scientists and students to attend and to present their own scientific data, either in poster format or as short talks. Recently, we have learned that the students prefer to present their work as talks, which exposes them to a very critical audience that is certainly very tough. The students get very nervous, of course, but they succeed. In general, each invited investigator is present for at least 8 days of the school (i.e., 5 lab practical days and the 3 days of the symposium). A *free day* is reserved for general science discussions. The lectures and symposia are open to all university- or institute-registered students, postdoctoral fellows, and researchers who apply (we have ~100 attendees per course). The lab practicals are limited to 30–40 students.

In general, a 2-wk school is designed to introduce the biochemistry and cell biology field and the interdisciplinary approach used to address major questions in these areas. Students are divided into groups that rotate through a series of laboratory modules designed to provide them exposure to a range of techniques, including protein biochemistry, computational modeling of biological processes, analysis of cellular function, generating and analyzing gene expression/protein-profiling data, and investigating phylogenetic relationships between protein family members. Students present the results from each lab module to the class; the results are then discussed by the other students and faculty. These will either be formal presentations or chalk talks. Faculty members from the host university generously open their labs and resources to invasion by a horde of students, causing discomfort to the staff and also a lot of fun and scientific interaction. We have never had a single faculty member, after hosting us, close the laboratory to the next course offering.

The friendly and stimulating atmosphere that we have attained in previous meetings has led to a tradition of exchanging data and ideas. Also, we have had publications and collaborations between senior and junior scientists as an outcome of these meetings. The high level of exchange between students and scientists is one of the strongest reasons to continue

Table 1. Courses and symposia faculty present at three or more events since 2000

Silvestre Alavez	Mexico	Universidad Nacional Autonoma de Mexico
Javier Ambrozio	Mexico	Universidad Nacional Autonoma de Mexico
Munira Baqui	Brazil	University of São Paulo
Adriana Bassini	Brazil	Federal University of State of Rio de Janeiro
Juan Benech	Uruguay	Instituto de Investigaciones Biologicas Clemente Estable
George Bloom	United States	University of Virginia
Charlie Boone	Canada	University of Toronto
Gustavo Brum	Uruguay	Universidad de la República
Alfredo Caceres	Argentina	Universidad de Córdoba
Aldo Calliari	Uruguay	Instituto de Investigaciones Biologicas Clemente Estable
L. C. Cameron	Brazil	Federal University of State of Rio de Janeiro
Ernesto Carafoli	Italy	University of Padova
Alberto Darszon	Mexico	Universidad Nacional Autonoma de Mexico
Enrique De La Cruz	United States	Yale University
Primal de Lanerolle	United States	University of Illinois—Chicago
Foued Espindola	Brazil	Universidade Federal de Uberlândia
Enilza Espreafico	Brazil	University of São Paulo
Gonzalo Ferreira	Uruguay	Universidad de la República
Vladimir Gelfand	United States	Northwestern University
Jeffrey Gerst	Israel	Weizmann Institute
Terry Graham	United States	University of Guelph
Greg Gundersen	United States	Columbia University
John Kendrick-Jones	United Kingdom	Medical Research Council
Jonathan Kipnis	United States	University of Virginia
Alejandra Kun	Uruguay	Instituto de Investigaciones Biologicas Clemente Estable
George M. Langford	United States	Syracuse University
Roy Larson	Brazil	University of São Paulo
José Rodríguez Medina	United States	University of Puerto Rico
John Mercer	United States	McLaughlin Research Institute
Julio Moran	Mexico	Universidad Nacional Autonoma de México
Hans Oberleithner	Germany	University of Muenster
David Odde	United States	University of Minnesota
Michael Ostap	United States	University of Pennsylvania
William Provance	Brazil	Oswaldo Cruz Foundation
Omar Quintero	United States	Penn State College of Medicine
Miguel Roig	United States	St. John's University
Verônica Salerno-Pinto	Brazil	Federal University of Rio de Janeiro
Luigia Santella	Italy	Stazione Zoologica Anton Dohrn
Miguel Seabra	United Kingdom	Imperial College
Mauro Sola-Penna	Brazil	Federal University of Rio de Janeiro
Martha Sorenson	Brazil	Federal University of Rio de Janeiro
José R. Sotelo	Uruguay	Instituto de Investigaciones Biologicas Clemente Estable
Jose Sotelo-Silveira	Uruguay	Instituto de Investigaciones Biologicas Clemente Estable
Igor Stagljar	Canada	University of Toronto
Sinji Tauhata	Brazil	University of São Paulo
Margaret Titus	United States	University of Minnesota
Horst Wallrabe	United States	University of Virginia

these events. We always have soccer or volleyball matches: faculty versus students. Of course, we (the faculty members!) are unbeatable and smash the students every year (I am the author of this essay; I can portray history as I see it . . .).

We endeavor to teach good science that can also be done with inexpensive equipment and higher levels of imagination by those who do not have access to substantial funding. We learned from our predecessors that doing good science does not require cutting-edge equipment. In other words, we try to dismiss the idea that one cannot do science because one does not have the required equipment. We understand that a network like IICCBB can help, catalyzing the exchange of students and opening doors to researchers sharing hardware and, more important, human capital.

To make improvements to the course, we conduct evaluations by getting written feedback on the symposium and practical exercises from the participants and instructors.

THE STUDENTS

A fundamental goal of the course organizers is to have the class represent the interdisciplinary nature and diversity of researchers in biochemistry and cell biology. Students are selected according to several criteria to ensure that the group reflects the interdisciplinary nature of modern science and the diversity of its researchers. The initial and most important selection criterion for an applicant is the quality of the student and the student's overall potential. This is assessed by examination of the student's personal statement, grades, productivity, and reference letters from his or her advisor and another faculty member familiar with the student's research. The scientific background of the student is taken into account, so the final class consists of an even distribution of students with cell biological, biochemical, genetic, and biophysics/bioengineering backgrounds. It is assumed that the

Table 2. Courses and symposia since 2000

2000	I ISMV Rio de Janeiro e Paraty, Brazil
2000	Symposium and International Conference at the Annual Meeting of the SBBq Caxambú, Brazil
2001	International Symposium in Cytoskeleton and Cellular Death Rio de Janeiro, Brazil
2001	International Symposium in Molecular Motors and Disease—Annual Meeting of the Brazilian Federation of the Experimental Biology Societies Caxambú, Brazil
2002	International Symposium and Training Course on Cell Motility, Molecular Motors, and the Cytoskeleton Rio de Janeiro, Brazil
2002	I Mexican Course on Molecular Motors and the Cytoskeleton Mexico City, Mexico
2003	International Conference at the Annual Meeting of the SBBq Caxambú, Brazil
2004	II ISMV—II International Training Course on Cell Motility, Molecular Motors, and the Cytoskeleton Rio de Janeiro, Brazil
2005	International Conference at the Annual Meeting of the SBBq Aguas de Lindoia, Brazil
2005	Pan American Advanced Study Institutes (PASI) on Unconventional Myosins Great Falls, MT
2005	ICRO–UNESCO–EMBO International Symposium and Training Course: Calcium Signaling, Cell Motility, and the Cytoskeleton Montevideo, Uruguay
2006	III ISMV International Training Course: Proteins as Cellular Nanomachines: The Cell Biology of the Cytoskeleton Rio de Janeiro, Brazil
2007	International Course in Molecular Motors, Cytoskeleton, and Disease Rio de Janeiro, Brazil
2007	International Symposium in Molecular Motors, Cytoskeleton, and Disease—XXXVI SBBq Annual Meeting—10th IUBMB Conference Salvador, Brazil
2007	EMBO Practical Course: International School of Biochemistry, Molecular, and Cell Biology on Calcium and the Cytoskeleton Montevideo, Uruguay
2009	EMBO Practical Course: II International School of Biochemistry, Molecular, and Cell Biology on Current Tools in Cell Biology: Probing Normal and Pathological Cell Functions Rio de Janeiro, Brazil
2010	PASI—Function and Regulation of the Cytoskeleton Rio de Janeiro, Brazil
2010	International Conference at the Annual Meeting of the SBBq Foz do Iguaçu, Brazil
2011	IBRO Practical School: Current Tools in Cell Biology: Probing Normal and Pathological Neural Cell Functions San Juan, Puerto Rico
2011	Advances in Protein Science Methods—Pontifícia Universidade Católica do Rio de Janeiro Rio de Janeiro, Brazil
2012	IBRO–LARC: Calcium Signaling, Regulation, and Cytoskeleton in the Nervous System School Montevideo, Uruguay
2012	International Conference at the Annual Meeting of the SBBq Foz do Iguaçu, Brazil
2012	Current Tools in Cell Biology: Probing Normal and Pathological Cell Functions Fortaleza, Brazil
2014	EMBO–IICCB School of Science: From Biochemistry and Molecular Biology Approaches to Systems Biology: Bench to Bedside, Bench to the Field Course Mato Grosso, Brazil

diversity in students' research interests stimulates interactions between those with different areas of expertise, and we anticipate that some of these interactions will develop into active collaborations, as has been the case for all of the previous courses that we have run. Finally, the class is balanced to mix nationalities and affiliations. All of this requires an active and far-reaching recruitment effort, as well as a plan to ensure that the course has widespread visibility in order to stimulate interest and recruit strong and diverse applicants.

DIVERSITY AND COMBINATION

We strongly believe in “infinite diversity in infinite combinations” (IDIC). In our courses, we always try to select and mix

students, teaching assistants, and faculty from different ethnicities, cultures, genders, and backgrounds. We believe that that is an important part of our institute, and we dedicate significant efforts to do this.

As of now, we have included people born in countries across four continents (Table 2). Until recently, I used to say that we did not have a connection in Australia. Now we do. And how do we accomplish this? To the extent that we can, we provide financial aid for students. In cases in which fellowships permit, we use funding to pay for air tickets, hotel, food, and whatever else the students need to participate, and we strive for an amount that is reasonable to pay. Sometimes we need to choose between bringing one student from Asia or three from Europe. Another thing is that our rooms are



Figure 3. IICCB mascot, Plasticity.

organized randomly, mixing genders, nationalities, cultures, religions, or whatever. We also trade roommates in the second week. In this way, we encourage young scientists to interact with everyone in the group. And, of course, we have a lot of social meetings . . .

The IDIC concept is strongly represented in our mascot: Plasticity. Plasticity was named by us due to her ability to eat anything. She is a completely omnivorous feline and lives at the hotel in Búzios (Figure 3).

FUNDING

One thing that really makes us crazy is funding. Owing to the nature of our meetings and the distances traveled, we use a substantial amount of funds to pay for travel and accommodations for participants from places where travel funding is difficult to obtain. For many, this provides the only opportunity for students to meet accomplished scientists.

The importance of our courses lies in their continuity and results. Since the beginning, we have been funded by several local and international agencies: Conselho Nacional de Desenvolvimento Científico e Tecnológico; Coordenação de Aperfeiçoamento de Pessoal de Nível Superior; European Molecular Biology Organization (EMBO); Fundação de Amparo a Pesquisa do Estado de São Paulo; Fundação de Amparo a Pesquisa no Estado do Rio de Janeiro Carlos Chagas Filho;

International Brain Research Organization (IBRO); ICRO; International Union of Pure and Applied Biophysics; National Science Foundation; Sociedade Brasileira de Bioquímica e Biologia Molecular (SBBq); and the United Nations Educational, Scientific and Cultural Organization (UNESCO). We also had sponsorship from private companies: ABSCEIX, Agilent, BioMed Central, Brüker, Cytoskeleton, Gentec, Olympus, Proximus: Sinc, and Waters.

In general, we have succeeded in funding all of the courses we have organized. A problem is that the funding must be proposed on a course-by-course basis. This means that for every single course, we need someone to lead the effort to find funding. This is a nightmare, because it prevents us from planning 1, 2, 3 yr in advance. In addition, at least in South America, we experience huge funding delays. It has been common for us to begin a course and then receive the funding 3 mo later. It is better now in Brazil, but the memory of struggling through these issues is still fresh. At this point, we are still applying for funding from science foundations and agencies on a yearly basis. We really need a long-term sponsorship for this work to be sustainable.

THE FUTURE

We are trying to include scientists from other nations in the IICCB, as well as from regions of countries that have not been represented in our institute. We are trying to include all the regions of Brazil, and we started this past year to include more South American and African countries. We are also trying to find a more regular funding partner willing to commit support for 5 to 10 yr.

SOME ACKNOWLEDGMENTS (BUT NEVER ENOUGH)

I could not mention most of the important things nor name colleagues and friends in this paper. Indeed, the authorship of this paper should have 200–300 names at least. I will do my best to acknowledge them here. I would like to recognize the efforts of my friends to nominate me for the Bruce Alberts Award for Excellence in Science Education. Also, I am indebted to my colleagues at ASCB who showed that the ASCB is not an American society but an international one, conferring upon me as a non-U.S. citizen this important award. I would love to name all my IICCB colleagues. All of you have honored me. I hope that I can use this vote of confidence in me, and the responsibility of carrying, somehow, the name of Bruce Alberts, to catalyze a scientific transformation of the world.

I am in debt to Hannah Sevian and Erin Dolan for their encouragement and help in writing this essay. I also emphasize that I would never be able to implement these courses without my family in Brazil and my U.S. families, the Blooms and the Mercers (in alphabetical order to avoid jealousy!).

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