

20 years of the “Practical Course in Developmental Biology” in Latin America: from Santiago to Quintay, via Juquehy, Buenos Aires and Montevideo

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ABSTRACT There is growing demand for learning developmental biology in Latin America and a need for advanced students to interact with world leaders of this discipline. This article summarizes some of the efforts that Latin America is making to satisfy the demand in training young Latin American minds for the developmental biology of the future. I focus on a particular course that has been linked to the origins of the Latin America Society of Developmental Biology (LASDB). I describe the motivations to start organizing this course twenty years ago, its history and setbacks. We tracked back the current situation of former students to find out that more than 90% are still doing developmental biology all across the globe. I describe the state of affairs of the Course in its current location in the CIMARQ campus of the Universidad Andres Bello (UNAB), in a place called Quintay on the Chilean coast and I ask about its future.

KEY WORDS: *Latin America course, developmental biology, Quintay, Chile, teaching, UNAB*

*“A teacher affects eternity;
he can never tell where his influence stops”.*
Henry Brooks Adams

*“The initial one week exposure I had in Chile inspired my interest
in developmental biology for the past 16 years!”*
Nestor Oviedo, 2017, professor at University of California, USA
(former student from Venezuela of the 2001 version of the course)

Latin America contains 8.42 % of the world population but its contribution to science represents only 1.8 % of scientific publications worldwide (Holmgren and Schnitzer, 2004; Goldemberg 1998). Furthermore, investment in research and development by Latin American countries is very low (0.59 % of the regional GDP) when compared with more developed countries such as the United States (2.84%). However, scientific activity has improved in Latin America in recent years, increasing the number of their publications between 1990 and 1997 by 36%, a higher percentage than the growth reached by Europe (10%) and industrial Asia (26%), and much higher than the publications from North America which actually decreased by 8% during the same period (Holmgren and Schnitzer, 2004; UNESCO). Thus, there is growing demand in learning new scientific approaches and techniques in Latin America, and even more importantly, there is an urgent need to facilitate interactions

between young Latin American students and world leading scientists. Developmental Biology is not an exception to this need and this article summarizes some of the efforts that Latin America is doing to satisfy the demand in training the young Latin American minds for the developmental biology of the future.

Although many practical courses on developmental biology have been organized in Latin America (Table 1), this article will focus on one of them, as this is the only one that has been maintained almost without interruption for 20 years. This is the biannual “Practical Course in Developmental Biology” that started in Santiago in 1999 for the first time, and although the name and the location of the course has changed, its structure has remained the same throughout the years: a combination of laboratory experiments using different animal models and lectures given by world leading developmental biologists that cover the paradigms, questions, and

Abbreviations used in this paper: CIMARQ: Centro de Investigacion Marina Quintay; GDP: Gross domestic product; ICRO: International cell research organization; ISDB: International Society of Developmental Biology; LASDB: Latin American Society for Developmental Biology; MBL: Marine Biological Laboratory; MSDB: Mexican Society of Developmental Biology; NSF: National Science Foundation; PASI: Pan American Advanced Studies Institute; RELAB: Red Latino Americana de Biología; SDB: Society of Developmental Biology; UNAB: Universidad Andres Bello; UNESCO: United Nations Educational, Scientific and Cultural Organization.

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technologies of modern developmental biology. The course normally comprises a wide variety of embryonic systems including well established models (*Drosophila*, zebrafish, mouse, chick, sea urchins and frogs), as well as additional models that are equally important in their own right (planarians and locally available species). This wide coverage of metazoan phylogeny allows an examination of the advantages and limitations of each animal model and helps to understand the different developmental strategies through evolution.

Before I describe the history and current situation of the Practical Course in Developmental Biology, a note of caution: this is a personal account for the obvious reason that I have been one of the organizers of this course along the years. Therefore, I apologize for any omission or misrepresentation of the events that I will describe next.

Motivations to organize a developmental biology course in Latin America

To explain the motivations for organizing this first course in 1999 I have to go back to my years as a PhD student in Chile. First, in 1988 when I was doing my PhD in Chile I had the extraordinary opportunity to attend the well-known Embryology course that has been organized at the Marine Biological Laboratory (MBL) at Woods Hole, USA, since 1893. This course was very influential in my career as developmental biologist, as it helped me to decide the animal model that I would use for my future research (see Concha in this issue). In addition, it was very unusual for a Latin American to have this opportunity. Second, in 1989 my PhD supervisor Luis Izquierdo (University of Chile), together with Claudio Barros (P. Catholic University, Chile) and Juan Fernandez (University of Chile), decided to organize a developmental biology course in a marine biological station in Coquimbo (north of Chile) using the MBL Embryology course as a model. But before they did the proper course they prepared a pilot course in order to know what was available in terms of equipment and biological materials. Only the students associated to the labs of these three PIs would attend this pilot course. Thus, on a summer morning of 1988, we packed the PIs' cars with microscopes and pipettes and started the near five-hour trip to the biological station in the north of Chile. The pilot course did not have any lectures, as it only consisted in examining the marine species that the fishermen brought us each morning. We had to roughly identify them, localize their gonads and attempt to get gametes in order to perform fertilizations. Most of our attempts failed, as in many cases we could hardly distinguish the gonads from the heads or other appendices in these extraordinary animals. But in addition to having fun and learning from nature (a perfect exercise of scientific endeavour), we set up the basis for the real course that was going to take place the following years. Indeed, in 1990 the first real developmental biology course was a success and it had the enthusiastic participation of Gerald Schatten (University of Pittsburgh), among many other prominent developmental biologists. However, I could not participate in that course as I had left Chile for my postdoctoral training in the UK 1990. These two experiences taught me that it was possible to

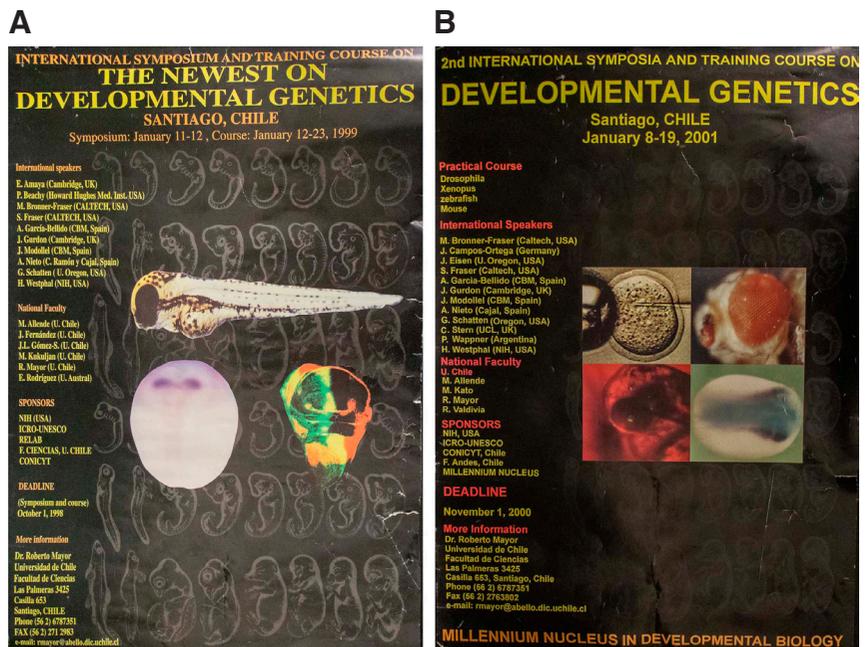


Fig. 1. Original posters announcing the 1999 (A) and 2001 (B) practical developmental biology courses in Santiago, Chile.

organize a “MBL-Like” course in Chile and the impact that such courses could have on Latin American students, who normally have reduced opportunities to have these kinds of experiences.

The beginning of the Practical course of Developmental Biology

When I returned to Chile in 1993, after a postdoctoral training in the UK, Developmental Biology almost did not exist in the whole country. As I recognized the difficulty of doing science in such isolation, soon after my arrival to Chile we created a group of developmental biologists at the Faculty of Science, Universidad de Chile, with Miguel Allende (current professor at Universidad de Chile) being part of it (for details about how this group was created see Concha in this issue). A few years later we decided with Miguel to organize a biannual practical course on Developmental Biology, and so was born the first of a long series of courses that has lasted 20 years.

This first course had the strategic name of “The newest on developmental genetics” (Fig. 1A) because it was easier to get funding for a course with such a name, instead of a course called simply “Embryology”. Funding has always been an issue for organizing these courses in Latin America, as the contribution from the local governments is minimal and often non-existent. A consequence of this lack of reliable funding is that normally we have to apply to many international agencies, each of them contributing a small proportion of the course budget. Although on many occasions we have been on the edge of cancelling the course due to insufficient funding, we have always found at the last minute a generous source of support, so far avoiding the cancellation of any course at all. One of the conditions that we have imposed in this course is that the Latin American students should pay no fees and that they should receive fellowships to cover their travel expenses, in

TABLE 1

INTERNATIONAL COURSES ON DEVELOPMENTAL BIOLOGY HELD IN LATIN AMERICA^a

Year	Title	Organizer	Country
1961	Theoretical and practical seminar of experimental embryology	F. Barbieri	Argentina
1966	II Latin American Biology Course	F. Barbieri	Argentina
1978	Biology of Fertilization	F. Barbieri	Argentina
1980	Early Embryonic Development in Vertebrates	F. Barbieri	Argentina
1985	Comparative Embryology, mechanisms of regulation, differentiation and embryonic organization	F. Barbieri	Chile
1992	Developmental biology of marine invertebrates	I. Izquierdo, C. Barros, J. Fernandez and G. Schatten	Chile
1999	The newest on developmental genetics	R. Mayor, M. Allende	Chile
1999	Genes and Development	J. Ortiz, G. Candelas	Puerto Rico
2001	Developmental genetics	R. Mayor, M. Allende	Chile
2003	Practical course on Developmental Biology	R. Mayor, M. Allende	Chile
2003	Satellite course to the Cell Biology Meeting	R. Nunez	Brazil
2005	Model Organisms and Innovative Approaches in Developmental Biology	R. Lehmann, JX. Neto, I. Chow, R. Mayor	Brazil
2005	Transgenesis in zebrafish and Medaka	M. Concha, M Allende	Chile
2005-2007	Developmental genetics	S. Sanchez	Argentina
2005-2006	Biology of reproductive development and its biotechnological applications	S. Maldonado	Argentina
2007	Developmental biology. Concepts, experimental embryological, genetic and molecular management of model organisms and stem cells	M. Aybar	Argentina
2008	Frontiers in Developmental Biology: Concepts, Techniques and Model Organisms	E. Wieschaus, P. Wappner, I. Chow	Argentina
2010, 2012, 2014, 2018, 2020	Practical course on developmental Biology-Quintay	R. Mayor, J. Ewer, K. Whitlock, A. Reyes, A. Molina, F. Faunes	Chile
2010	<i>In vivo</i> 3D Imaging: Computational analysis of cell behaviour in developing embryos	M. Concha, S. Härtel	Chile
2010	Concepts and Model Organisms in Regenerative Biology	R. Harland, J. Larrain, I. Chow, M. Allende	Chile
2011	International Practical Course of the Latin American Zebrafish Network	LAZEN ^b	Brazil
2012	Practical Course in Biology of Development	J. Garcia and R. Nunes	Brazil
2012	International Practical Course of the Latin American Zebrafish Network	LAZEN ^b	Argentina
2012	A Systems Biology Approach to Understanding Mechanisms of Organismal Evolution	M. Levine, I. Chow, F. Zolessi, N. Berois	Uruguay
2013, 2014, 2016, 2019	Optics, Forces & Development	M. Concha, S. Härtel, M. Cerda, R. Soto	Chile
2014	International Practical Course of the Latin American Zebrafish Network	LAZEN ^b	Chile
2014-2017	Comparative Embryology of Marine Invertebrates	F. Brown	Brazil
2016	International Practical Course of the Latin American Zebrafish Network	LAZEN ^b	Brazil
2017	Current Topics and Emerging Models in Developmental Biology	N. Pabón Mora, JP. Delgado, F. González	Colombia
2018	Evolution of Coloniality and Modularity'	F. Brown	Brazil
2018	International Practical Course of the Latin American Zebrafish Network	LAZEN ^b	Mexico
2019	Advanced course in Developmental Biology: Answering questions from concepts, techniques and models	P. Strobl-Mazzula, J. Fernandino.	Argentina
2019	Control mechanisms of gene expression in eukaryotic model organisms	J. Palatnik, Lombardo, R. Rodriguez, C. Schommer	Argentina

^a This list was made by compiling information sent by Latin American developmental biologists, and it may be incomplete. ^b LAZEN: Latin American Zebrafish Network.

addition to boarding and lodging. Consequently, organizing a practical course with these characteristics and with dozens of invited scientists from abroad is very expensive. An important factor in finding the appropriate funding for this course has been the links that we have established with generous scientists in the USA or Europe who have helped us in making the contacts or preparing applications to foreign institutions. For the 1999 and 2001 courses (Fig. 1B, 2D), Heiner Westphal (NIH, USA) played an essential role in helping us to get a grant from the NIH; in addition, we received some funds from the Chilean government (Conicyt, Iniciativa Científica Milenio-Mideplan) and from some international organizations (ICRO-UNESCO, RELAB).

The first two courses (1998, 2001) included some of the world leaders in developmental biology, such as Enrique Amaya (University Cambridge, UK), Phil Beachy (Howard Hughes Medical Institute, USA), Marianne Bronner (Caltech, USA), Scott Fraser (Caltech, USA), Antonio Garcia-Bellido (CBM, Spain), John Gurdon (University of Cambridge, UK), Juan Modollet (CBM, Spain), Angela

Nieto (C. Ramon y Cajal, Spain), Gerald Schatten (University of Oregon, USA), Heiner Westphal (NIH, USA), Jose Campos Ortega (Germany), Judith Eisen (University of Oregon, USA), Claudio Stern (UCL, UK) and Pablo Wappner (Instituto Leloir, Argentina) (Fig. 1). As the first course was advertised by UNESCO we received many applications from all over the world, although the priority in the selection was for Latin American students, as they were the main targets of this course. Thus, we started the first course in January 1999 with students from Argentina, Chile, Mexico, Peru, Uruguay, Ecuador and one student from USA (Fig. 2 A,B); for the 2001 version, in addition of the above countries we added students from Bolivia, Brazil, Colombia and Venezuela (Fig. 2 C,D; Fig. 3A).

Although international courses have been previously organized in Latin America (see Table 1), something happened in these two courses that was going to change the future of Developmental Biology in the region. The students were highly motivated and, together with some faculty members, we created a network that allowed us to keep in touch with the students and faculty that had



Fig. 2. Original practical courses on developmental biology in Santiago, Chile. (A) 1999 class, students plus some faculty and teaching assistants (TAs). (B) Group of students learning *Xenopus* microinjection at the 1999 course. Almost all these students have become principal investigators (PIs) in their respective countries. From right to left: Flavio Zolessi at the microscope (Universidad de la Republica, Uruguay), Jesus Chimal (UNAM, Mexico, past president of the Mexican Society of Developmental Biology), Ivan Velasco (UNAM, Mexico), Manuel Aybar (Universidad de Tucuman, Argentina), Alexandra (Peru), Hugo Olguin (P. Universidad Catolica de Chile), Sandra Villanueva (U. de los Andes, Chile). (C) Part of the 2001 class. Students, the faculty and TA ready to play football. Almost all these students have become PIs across the world. From left to right, front row: Andres Sarrazin (P. Universidad Catolica de Valparaiso, Chile), Lazaro Centanin (Heidelberg Universität, Germany), Manuel Aybar (University of Tucuman, Argentina), Nestor Oviedo (University of California, USA); back row: Miguel Allende (University of Chile), J. Arredondo, Federico Brown (University of Sao Paulo, Brazil), Jose Luis Ferran (Universidad de Murcia, Spain) and unidentified. (D) Dinner during the 2001 course. Heiner Westphal (NIH, USA) talks with M. Muzzopappa (currently at Institute for Research in Biomedicine, Spain) and L. Sulz. (E) 2003 class, plus some of the faculty and TAs. (F) Poster view at the 1st LASDB meeting that took place immediately after the 2003 course. John Gurdon talks with Eduardo Villablanca (currently at the Karolinska Institut, Sweden).

participated in the courses. Later, this network was going to evolve into the Latin American Society of Developmental Biology (LASDB), with the important support from Eddy De Robertis, president of the International Society of Developmental Biologists (ISDB) at that time (see Wappner and Zurita, and Concha in this issue).

The first meeting of the LASDB took place in Chile in January 2003, following the third version of our course (Fig. 2 E,F) which, in addition of Miguel and myself, was co-organized with John Ewer (Cornel University, USA) and Katherine Whitlock (Cornel University, USA). Thus, in these three first versions of the course we managed to train nearly 50 Latin American students. Now, 20 years later it is worth asking what happened with those first students. To answer this question, we have been able to track most of them and found that more than 90% of the former students have remained in sci-

ence doing research related to developmental biology (Table 2, first line; see some examples in Fig. 2 B,C,D,F). They are currently PIs in different Latin American countries (Argentina, Chile, Ecuador, Peru, Mexico, Uruguay and Colombia) and across Europe and the USA (Fig. 3B). In conclusion, this notable group of students that took our course 20 years ago have contributed enormously to the growth of developmental biology in Latin America.

The LASDB as organizer of the course and its interaction with the SDB

Once the LASDB was created it was agreed in the first board meeting that took place in the Chilean Andes that the LASDB should organize a biannual meeting together with a satellite Developmental

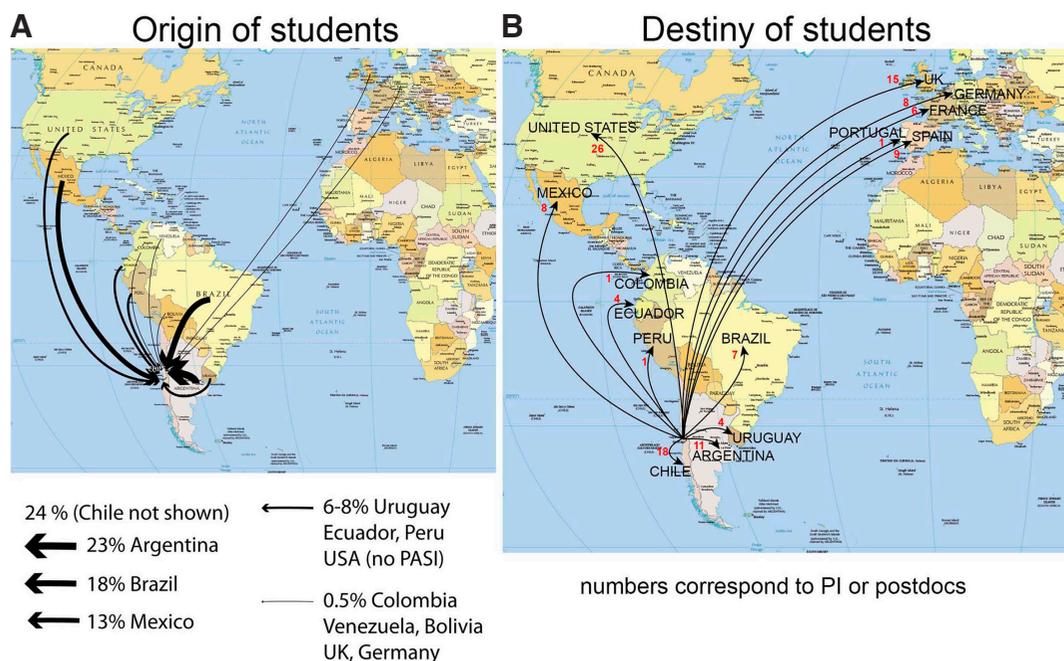


Fig. 3. Origin and destiny of former students of the practical developmental biology courses. (A) Country of origin of students from courses that took place in Santiago (1999, 2001, 2003) and Quintay (2010, 2012, 2014, 2018 and 2020). Students from the USA are included, except for PASI courses. Thickness of the arrow is proportional to the number of students as indicated. (B) Destiny of students that took the courses in 1999, 2001, 2003, 2005, 2008, 2010, 2012, 2014 and 2018 (except USA students from PASI courses). Red numbers: number of former Latin American students that are currently principal investigators (PIs) or postdoctoral fellows in the indicated countries.

Biology course, similar to those three previously organized in Chile, but rotating among different Latin American countries. The first country chosen for such task was Brazil, with Ricardo Guelerman Ramos (University of Sao Paulo, Brazil) in charge of organizing the meeting and Jose Xavier Neto (University of Sao Paulo, Brazil) in charge of the course. Consequently, we ceased organizing our courses in Chile as now they would be organized by the LASDB.

Jose Xavier Neto had a stroke of brilliance and luck when he contacted Ida Chow (Executive Director of the Society for Developmental Biology (SDB), USA), who grew up in Brazil, to ask her for advice to get funding for the course. Ida told Xavier that there was the possibility to apply to the Pan American Advanced Studies Institute (PASI), funded by the NSF. Ida and Xavier decided to apply for a PASI grant under the SDB, initiating a fruitful collaboration

between the LASDB and SDB. Ida Chow and the corresponding co-organizer of the LASDB and SDB were successful in securing funds not only for the course in Brazil, but for three other consecutive courses that were organized in Argentina, Chile and Uruguay.

In 2005, the fourth course was organized jointly by the SDB and LASDB and held in Juquehy, Brazil (Fig 4A). It was on *Model Organisms and Innovative Approaches in Developmental Biology*. Ruth Lehmann (NYU School of Medicine, SDB President 2004-2005), José Xavier Neto (University of Sao Paulo), Ida Chow (SDB) and Roberto Mayor (LASDB President 2005) were the organizers of this course. Additional support came from the National Institute of Child and Human Health and Development (NICHD/NIH, USA), Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP, Brazil), Conselho Nacional de Pesquisa (CNPq, Brazil), ISDB and SDB. In 2008, the fifth course was held at Instituto Leloir in Buenos Aires, Argentina (Fig. 4B), organized by Eric Wieschaus (Princeton Univ., SDB President 2007-2008), Pablo Wappner (Instituto Leloir) and Ida Chow (SDB). *Frontiers in Developmental Biology: Concepts, Techniques and Model Organisms* was designated a PASI course as it was primarily supported by this NSF-Dept of Energy (USA) program and it was followed by LASDB's 4th International Meeting. Additional support was provided by NICHD/NIH (USA), UNO-Biolac and Instituto Leloir. In 2010, SDB and LASDB jointly organized the sixth course (Fig. 4C), which took place just before the 5th International Meeting of LASDB and it was on *Concepts and Model Organisms in Regenerative Biology*. The organizers of the short course were: Richard Harland (UC Berkeley, SDB President 2009-2010), Juan Larrain (PUC), Ida Chow (SDB) and Miguel Allende (University of Chile). It was held at P. Universidad Católica de Chile, with zebrafish and fly lab ses-

TABLE 2

DESTINY OF FORMER LATIN AMERICAN STUDENTS OF THE PRACTICAL COURSE OF DEVELOPMENTAL BIOLOGY^a

Course	Place	Total students	Current developmental biologists (untracked)	% of developmental biologists
1999-2003	Santiago-Chile	49	45 ^d (2)	91 %
2005-2012 (LASDB-SDB)	Brazil, Argentina, Santiago, Uruguay	57 ^b (only LA students)	23 ^c (28)	40%
2010-2018	Quintay-Chile	72 ^c	51 ^e (9)	71%
Total		178	119 ^e	67%

^a This analysis is likely to underestimate the number of students dedicated to developmental biology as it was not possible to track all students. ^b For the LASDB-SDB (PASI) courses only the Latin American students were considered. 50% of the students that attended the PASI course came from USA, and they were not included in this analysis. ^c For the Quintay courses, the class of 2020 was not considered. ^d Working as PIs. ^e Working as PIs or postdocs.



Fig. 4. Practical developmental biology courses organized by the LASDB and SDB (PASI courses). (A) 2005 class plus the faculty. Course organized in Juquehy, Brazil. (B) 2008 class plus the faculty. Instituto Leloir in Buenos Aires, Argentina. (C) 2010 class plus the faculty. Course organized at P. Universidad Católica de Chile and Universidad de Chile, Santiago, Chile. (D) 2012 class plus the faculty. Course organized at Universidad de la República in Montevideo, Uruguay.

sions held at Universidad de Chile, Santiago, Chile. Major funding was provided by a PASI grant from NSF-DOE. Additional support was from CARE (Center for Aging and Regeneration-Chile), CGC (Center for Genomics of the Cell-Univ de Chile) and ICM (Iniciativa Científica Milenio-Chile). In 2012, the seventh course was held on the campus of Universidad de la República in Montevideo, Uruguay (Fig. 4D); preceding the 6th International meeting of the LASDB. This course was on *Systems Biology Approach to Understanding Mechanisms of Organismal Evolution* and it was co-organized by Mike Levine (Yale University, SDB president 2011-2012), Ida Chow (SDB), Flavio Zolessi (Universidad de la Republica, Uruguay, and former student of the 1999 course in Santiago, see Fig. 2B) and Nibia Berois (Universidad de la Republica, Uruguay).

The PASI program was instrumental not only in supporting the courses, but also provided means to bring speakers to the LASDB biennial meetings. However, the PASI director retired, and nobody replaced him, and the program was eliminated by the NSF. Thus, the successful collaboration between LASDB and SDB in organizing these courses came to an end, and new sources of funding were required to continue with the LASDB satellite course. This was not easy, and several LASDB meeting were held without a satellite course (e.g. 2007 and 2013). In spite of these difficulties, many excellent LASDB satellite courses have been organized after PASI, which has depended on the herculean work of the local organizers. Thus, in 2015 the satellite course of the 8th LASDB meeting was

held at CEBIMAR – Instituto de Biociencias USP. Santos, Brazil on *Comparative embryology of marine invertebrates*. This course was organized by Federico Brown, a former student of the 2001 course in Santiago (see Fig. 2C), and supported by the University of Sao Paulo. In 2017, preceding the ninth LASDB meeting in Colombia, Natalia Pabón Mora (Universidad de Antioquia, Colombia), Jean Paul Delgado (Universidad de Antioquia, Colombia) and Favio González (Universidad Nacional de Colombia) organized the next LASDB satellite course on *Current Topics and Emerging Models in Developmental Biology and Comparative Genomics and Transcriptomics in non-model species*. More recently, in 2019 and before the 10th LASDB meeting a satellite course on *Control mechanisms of gene expression in eukaryotic model organisms* was organized in Rosario, Argentina, by Javier Palatnik (IBMCR, Argentina), Verónica Lombardo (CEI, IBR-UNR, Argentina), Ramiro Rodríguez (CEI, IBR-UNR, Argentina) and Carla Schommer (CEI, IBR-UNR, Argentina), supported by Conicet-Argentina and ICGEB.

Discovering Quintay as the current place for the course

I moved to the UK in 2004 when the courses were co-organized by the LASDB and SDB (PASI courses); however, as mentioned above some clouds were visible in the horizon that induced us to think that the fruitful collaboration between LASDB and SDB was going to end soon. In addition, the LASDB satellite courses

organized with huge effort by the locals, were on specific topics of developmental biology. In my opinion, a more general course that covers a wide range of metazoan phylogeny and explore the big questions and paradigms of Developmental Biology was missing in Latin America. Therefore, I started to explore possible places where such a course could be held. The natural choice for me was Chile as I was familiar with science there. However, the Chilean universities where I proposed to organize such a course were not interested. After many failed attempts, Mario Rosenblatt (Fundacion Ciencia & Vida, Chile) suggested that I propose the project to a private university called Universidad Andres Bello (UNAB). I had a meeting with the Dean of the Faculty of Science, Maria Ines Vera, who not only liked the idea, but has been one of the most enthusiastic supporters of this new version of the course. She immediately envisaged that CIMARQ (Centro de Investigaciones Marinas de Quintay), a Marine Biological Station that the UNAB had in a place called Quintay, could serve for the purpose of this course (Fig. 5A). We visited Quintay and in a matter of months we were organizing a first course in Quintay, and the last and current phase of the course started. Quintay has proven to be an excellent place for this course as we have been doing it there for 10 years (Fig. 5 B-H).

The first pilot course in Quintay was co-organized in 2010 (Fig. 6A)

with the help of Ariel Reyes (UNAB), John Ewer (U Valparaiso) and Katherine Whitlock (U Valparaiso). This first course was a complete success and showed the potential that a place like Quintay could have for this activity. After that we have organized the Practical course on Developmental Biology in 2012 (Fig. 6b), 2014 (Fig. 6C), 2018 (Fig. 6D) and 2020 (Fig. 6E), with a faculty including John Gurdon (Fig. 6F), Claudio Stern (Fig. 6G), Sally Moody (Fig. 6H), Eric Wieschaus (Fig. 6I), Charles Kimmel (Fig. 5G), Alejandro Sanchez-Alvarado (Fig. 5E), Olivier Porquie, Scott Gilbert, Nipam Patel (Fig. 5B), Mary Mullins, John Wallingford, Andrea Streit, Ray Keller (Fig. 5F), Maria Leptin, Alfonso Martinez-Arias, David McClay (Fig. 5H), Cecilia Moens, and Angela Nieto. Some co-organizers have transiently joined us, such as Carmen Gloria Feijoo (UNAB), Lorena Marchant (UNAB) and Alfredo Molina (UNAB) and more recently Fernando Faunes (UNAB). The resources have been provided mainly by the UNAB, with the occasional help of CINV-Chile, EMBO, MBL, Wellcome Trust and The Company of Biologists. Although the course is aimed to Latin American student we also want to promote a culture of international collaboration and we usually have a few places for non-Latin American students. Among these non-Latin American places, we normally selected two students from Canada or USA, which are supported by the SDB to attend the course.

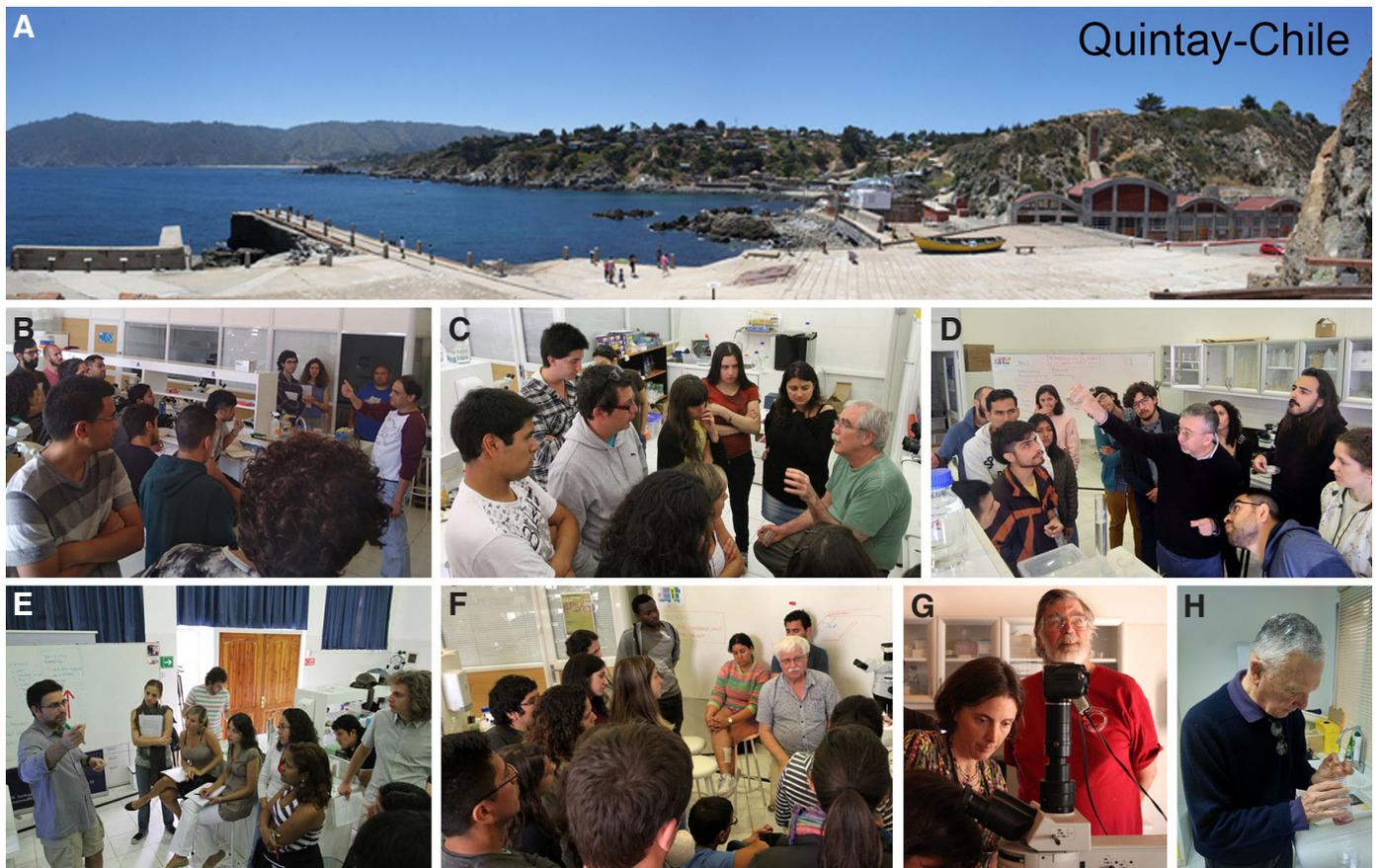


Fig. 5. Quintay (CIMARQ, UNAB) the current place for the Practical Course in Developmental Biology, near Valparaiso, Chile. **(A)** Panoramic view of CIMARQ in Quintay. The laboratories at CIMARQ (right side) were built on the ruins of an old whaling station (foreground). **(B-H)** Different scenes during the development of the course between 2010 and 2020. **(B)** Nipam Patel is teaching the *Drosophila* module. **(C)** Eric Wieschaus talks with the students. **(D)** Roberto Mayor is showing how to fertilize *Xenopus* eggs. **(E)** Alejandro Sanchez-Alvarado explains the experiments during the planarian module. **(F)** Ray Keller discusses amphibian gastrulation with the students. **(G)** Katherine Whitlock and Charles Kimmel prepare the microscope to show zebrafish embryos. **(H)** David McClay performs sea urchin fertilization.



Fig. 6. Different versions of the Practical Course on Developmental Biology in its current location, Quintay, Chile. (A) 2010 class plus some of the faculty. **(B)** 2012 class plus some of the faculty. **(C)** 2014 class plus some of the faculty. **(D)** 2018 class plus some of the faculty. **(E)** 2020 class plus some of the faculty. **(F-I)** Some of the faculty teaching at the course. **(F)** John Gurdon. **(G)** Claudio Stern. **(H)** Sally Moody and **(I)** Eric Wieschaus.

More recently, we have established important links with the MBL (USA) in general, and with the MBL-Embryology course in particular. Nipam Patel (MBL director, USA) has participated as faculty in many versions of the course and in 2020 the course was developed in partnership with the MBL, and consequently called “MBL Practical course on Developmental Biology”. In addition, at the end of our course we select the two best students that are sent to the MBL-Embryology course. This program, that started inspired by Alejandro Sanchez-Alvarado (Stower Institute for Medical Research, USA) when he was the director of the MBL-Embryology

course, has been very successful and offers a complementary opportunity for the selected Latin American students.

The future?

In spite of the changes that the course has undergone, we can recognize some continuity in the courses that we started in Santiago in 1999, followed by the LASDB-SDB courses held in different Latin American countries and ended up in Quintay-Chile in 2010 (Fig 7). The spirit of the course has been the same during these 20



Fig. 7. Timeline of the practical courses on developmental biology associated with the LASDB. 1999 and 2001 courses end up in the creation of the LASDB that had its first meeting and a satellite course in 2003. The courses that started in Santiago and continued in Quintay are shown in two shades of grey. PASI courses in blue and the rest of the LASDB satellite courses in pale blue. Asterisk: LASDB meetings.

years: to offer the opportunity to Latin American students to learn about the big questions in Developmental Biology from the world leaders. The top-notch scientists that we have invited throughout the years are not only the best in their disciplines, but they can do experiments as well and directly teach the students at the bench. This opens a unique opportunity of interactions between students and faculty that would be impossible with only formal lectures. It is not rare in our course to see a Nobel Prize awardee like Eric Wieschaus (Princeton University, USA) showing students how to sharpen the forceps for *Drosophila* embryos, or having Nipam Patel (MBL, USA) teaching a group of students how to take perfect pictures in the confocal until 2 or 3 am.

Twenty years is adequate time to evaluate the course, and the balance is – in my opinion – positive. The success of this course has been due to the dedication of faculties and the excellence of students. We cannot anticipate what the future holds for the course; we can only hope that it will continue for new generations of students to come. Our ambition is to open the minds of young students to the wonders of embryo development.

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References

- HOLMGREN, M and SCHNITZER, SA (2004). Science on the Rise in Developing Countries. *PLoS Biology* 2: 10-13.
- GOLDEMBERG J (1998). What Is the Role of Science in Developing Countries? *Science* 279: 1140-114.

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