

CONFERENCIA INTERNACIONAL PARA EL MEJORAMIENTO DEL APRENDIZAJE DE LA BIOLOGÍA Y OTRAS CIENCIAS EXPERIMENTALES RELACIONADAS EN LOS NIVELES ESCOLARES DE PARVULARIOS A EDUCACIÓN MEDIA

INTERNATIONAL CONFERENCE FOR IMPROVING THE LEARNING OF BIOLOGY AND RELATED EXPERIMENTAL SCIENCES AT THE K-12 SCHOOL LEVELS



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AND RELATED EXPERIMENTAL
SCIENCES AT THE K-12 SCHOOL LEVELS

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WELCOME

TO ALL PARTICIPANTS IN THE INTERNATIONAL CONFERENCE ON IMPROVEMENT OF LEARNING OF BIOLOGY AND OTHER RELATED EXPERIMENTAL SCIENCES IN THE K-12 SCHOOL LEVELS

Santiago, Chile, April 14-15, 2016

Professor Jorge E. Allende

On behalf of the Organizing Committee of this International Conference, it is a great honor to welcome all the participants and also representing the Institutions that have organized this meeting which are the University of Chile and the Latin American Network of Biological Sciences (RELAB) to thank the generous support that we received from international and Chilean institutions which are sponsoring this meeting which are: The Inter Academy Panel and its Global Council of the Science Education Program of the 105 National Academies of Science in the World, UNESCO and the Regional Office for Education in Latin America and the Caribbean, the International Union of Biochemistry and Molecular Biology (IUBMB) and the International Center of Genetic Engineering and Biotechnology (ICGEB) at the National Level, The Ministry of Education of Chile, The Ministry of Foreign Affairs of Chile, Our National Research Council on Science and Technology (CONICYT), our National Council for Innovation for Development (CNID) and the Allende Connelly Foundation.

We are extremely grateful to the 40 experts to come from 24 different countries and all the continents of planet earth. It is great privilege for us to have you here in Chile. You bring us your knowledge and your ideas about one of the most fascinating aspects of human society – the process of education – which brings together the acts of teaching and learning in a process in which the donor (the teacher) and the recipient (the student) are constantly interchanging their roles. All of us, who have ever taught, can testify how much we have learned from our students. The great stoic Roman philosopher Seneca said something that is profoundly true “a great part of the joy that we feel when we learn something that is new to us is that we

realize that we can now teach this new knowledge to someone else.” To teach is an act of love to our fellow human beings

What do we expect to accomplish in these two days densely packed with lectures, reports, round tables and discussions? We should have a panoramic view of the way in which different countries and regions of our world are confronting the huge task of teaching our new generations some fundamental concepts of the experimental sciences. Why is this task so important? The short answer is that the 21st Century is the age of knowledge and science is the way our civilization has created to gain new knowledge about the Universe and about ourselves.

The longer answer is that in that in the 21st century human kind on planet earth will face very critical questions that can only be confronted by new knowledge that will require huge amounts of research in all areas of the sciences and what is even more difficult, we will require to integrate that knowledge to generate comprehensive projects that can cope with multidimensional challenges such as the impact created by climate change, the need to feed properly 9 or 10 billion people, the rapid aging of human populations and the spread of violence, hatred and fundamentalism that divide humanity into warring camps.

Science can teach some key values to our children such as love of truth, the importance of team work, the rejection of dogmas, and tolerance and respect for different ideas.

Looking at the abstracts of the work that will be presented here by very qualified experts from all parts of the world is possible to see that internationally we

are reaching a consensus that indicates that Inquiry Based Sciences Education (IBSE) in which children learn sciences by doing science, in which they actively re-discover scientific concepts by testing them with experiments has been accepted in many countries as a way of improving the learning and teaching of experimental sciences. This consensus is important but there are still many problems that confront us with the challenges of scaling –up IBSE projects. For this reason we have made a topic of one of our Round Tables.

We are all convinced of the necessity for international collaboration to improve our learning and teaching of science, but the sad truth is that there is a dearth of financial resources to support this collaboration. This is another topic that will be discussed in another round table. (RT B)

The French Project of “La Main a la Patê” is a wonderful example of what we can achieve by international collaboration supported by strong national project. The lecture of Prof. Pierre Léna will present us the great achievements of this program both at the national and international level

Professor Léna has been constantly supporting us in Chile in our efforts to establish our Chilean IBSE project and “La Main a la Patê” has been the source of much valuable information and guidance in the long process of introducing this approach for the benefit of our children. Obviously as a famous astronomer, his love for Chile started with the stars.

The Interacademy Panel (IAP), which brings together 105 National Academies of Sciences have undertaken the task of international collaboration and has created a Global Council to guide the efforts in four regions of the world: The Americas represented by the Inter American Network of Academies of Science (IANAS), the African Network of Science Academies, The Asia Pacific Network of Science Academies and the European Science Academies which, of course, are highly advanced in their integration due to the existence of the European Union. We must thank Professor Dato Lee Yee Cheong of the Malaysia the present Coordinator of the Global Council of the IAP Science Education Program for the excellent idea of sponsoring this International Conference by programming the mee-

ting of the Global Council of the IAP Program here in Santiago on April 16. In this Conference in the morning of April 15th Dr. Yee Cheong will deliver a lecture on the future of this Global Council and we will also hear reports about the function of different networks of academies that are collaborating in that network

The design of the teaching-learning modules and the testing of those materials is a big effort that needs the joint participation of scientists and educators but also requires time and money. Round Table C would like to discuss how we can work together and make a pool of those educational resources and make them available to all interested parties. Round Table C is specifically focused on the topic of environmental protection and mitigation of the impacts of climate change: This is due to the urgency of the need to advance as rapidly as possible in this subject, but what we can propose in this topic could be extrapolated to other areas of the experimental sciences.

But there are other important problems in the implementation of IBSE internationally. One of the great questions is that of assessment. How can one measure the real impact of IBSE on student learning? We don't have a Round Table on this but we have included two lectures one by Carol O'Donnell, Director of the Smithsonian Center for Science Education. She has some very interesting results of the impact of IBSE in the learning of science by the students in the United States. The second lecture is the closing lecture that will be delivered by Professor Wynne Harlen which will explore the types of assessment that can be used and how they can help the learning process. Dr. Harlen has also be a constant source of knowledge and inspiration for our efforts.

Another key point in extrapolating IBSE educational projects at the national level is sustainability. Obviously national governments and their Ministries of Education have to be involved in national types of projects (In Federal countries this is extrapolated to State Governments). However, in many countries, especially in the developing world, education ministers change rather frequently and new authorities have different priorities. This may cause serious interruption in the IBSE projects. For that reason it is important for the educational projects to diversify their sources of support to include non-government organization or

Foundations and local governments (municipalities) to be able to have sustainability which is an important requirement for educational programs. The lecture of Dr. Nathalie Von Siemens in our Conference will give us a striking example of a private Foundation that is supporting this type of educational projects in several countries together with local institutions. In Chile the Siemens Foundation has been very active in collaboration with our University and other institutions

Finally, another great problem that we face is the fact that in general the scientific community and the educational communities that include the science teachers of K-12 grades have very little interaction. This is very negative situation since both communities need each other to be able to carry out their mission of achieving science literacy in all countries whose societies value what science can do for them. The Inaugural lecture by Dr. Bruce Alberts deals with this from the side of the commitment that Sciences Academies, Universities and Scientific Societies should demonstrate by working together with the teachers in order to improve science education at all levels.

Dr. Alberts is an inspiring person who is a great scientist but has demonstrated by his deeds this commitment dedicating himself to science education at all levels with tremendous energy and perseverance. In his position as President of the U.S. NAS and as Editor in Chief of Science, he has also directed those key institutions to increase their efforts in this direction. He has been a constant supporter of our efforts in Chile and his presence here demonstrates this to us once again.

We are very optimistic that this Conference will help us to build working partnerships between scientists and science teachers. What provides us with this stimulus is the fact that since we opened the Registration for the Conference only three weeks ago, we have received more than 200 requests to register here and 80% or more of those registered are either science teachers or university students studying to be future teachers. This makes us very happy because we are attracting the people that can play the key role in improving science education and that can work together with the scientists to achieve this ambitious goal.

ORGANIZING COMMITTEE

- 1.- Ambassador Gabriel Rodriguez
Director of Energy, Science Technology and Innovation of the Ministry of Foreign Affairs of Chile
- 2.- Prof. María Alicia González
Institute of Cell Physiology of UNAM, México
Regional Coordinator of RELAB
- 3.- Rosa Devés
Vice President for Academic Affairs University of Chile
- 4.- Prof. Mary Kalin
Director of the Millenium Institute of Ecology and Biodiversity University of Chile
- 5.- Professor Jorge E. Allende
President of Corporación RELAB and President of Organizing Committee

BIENVENIDA

A TODOS LOS PARTICIPANTES EN LA CONFERENCIA INTERNACIONAL PARA EL MEJORAMIENTO DEL APRENDIZAJE DE LA BIOLOGÍA Y OTRAS CIENCIAS EXPERIMENTALES RELACIONADAS EN LOS NIVELES ESCOLARES DE PARVULARIOS A EDUCACIÓN MEDIA

Santiago, Chile Abril 14-15, 2016

Profesor Jorge E. Allende a nombre del Comité Organizador

Es para mí un gran honor saludarlos y darles la bienvenida, a nombre del Comité Organizador de la Conferencia a todos los participantes. También a nombre de las dos instituciones organizadoras que son la Universidad de Chile y la Red Latinoamericana de Ciencias Biológicas (RELAB) queremos agradecer el generoso apoyo que nos han otorgado instituciones internacionales y chilenas que nos han dado su patrocinio y que incluyen al : Panel Inter Academias (IAP) y su Consejo Global para el Programa de Educación en Ciencias de las 105 Academias Nacionales de Ciencias del mundo del IAP; también está la Oficina Regional de Educación para la América Latina y el Caribe de la UNESCO, con sede en Santiago; la Unión Internacional de Bioquímica y Biología Molecular (IUBMB) y el Centro Internacional de Ingeniería Genética y Biotecnología (ICGEB). A nivel nacional nuestros patrocinantes son el Ministerio de Educación en Chile, el Ministerio de Relaciones Exteriores de Chile, nuestra Comisión Nacional de Investigación Científica y Tecnológica (CONICYT-Chile), el Consejo Nacional de Innovación para el Desarrollo (CNID) y la Fundación Allende Connelly.

También estamos profundamente agradecidos con los 40 expertos internacionales que han aceptado venir a Chile a participar en esta Conferencia provenientes de 24 países diferentes en 4 grandes continentes. Es un gran privilegio para nosotros tenerlos aquí en Chile. Uds. nos traen sus conocimientos y sus ideas relacionadas con uno de los aspectos más fascinantes de la sociedad humana – el proceso de educación que incluye los actos de enseñar y aprender en los cuales el donante (el profesor) y el receptor (el estudiante) están constantemente intercambiando sus papeles. Todos nosotros que hemos alguna vez enseñado podemos dar testimonio sobre lo mucho que hemos aprendido de nuestros estudiantes. El

gran filósofo romano de la Escuela de los Estoicos, Seneca, ha expresado en una de sus cartas algo que es profundamente verdadero. “Gran parte del gozo que sentimos cuando aprendemos algo que es nuevo para nosotros es un anticipo de la alegría que sentiremos cuando podamos transmitirle ese nuevo conocimiento a otra persona” Enseñar es en realidad un acto de amor hacia nuestros semejantes

¿Qué esperamos lograr en estos dos días atiborrados de conferencias, informes, mesas redondas y discusiones? Espero que al final de la Conferencia hayamos logrado tener una vista panorámica de la manera como los diferentes países y regiones geográficas están enfrentando la enorme tarea de enseñarle a las nuevas generaciones algunos de los conceptos fundamentales de las ciencias experimentales ¿Por qué es esa tarea tan importante? La respuesta rápida es que el siglo XXI es la era del conocimiento y la ciencia es la manera que nuestra civilización ha creado para generar nuevos conocimientos sobre el universo y sobre nosotros mismos.

Una respuesta más larga es que en este siglo XXI la raza humana en el planeta tierra va a enfrentar temas muy críticos que van a necesitar nuevos conocimientos que van a requerir enormes cantidades de investigación en todas las áreas de las ciencias incluyendo ciencias sociales y humanidades y lo que es aún más difícil, va a requerir la integración de todos estos conocimientos en amplios proyectos que sean capaces de lidiar con desafíos multidimensionales como el impacto causado por el Cambio Climático en nuestro Medio Ambiente, la necesidad de adecuadamente alimentar entre 9 y 10 billones de seres humanos, el rápido envejecimiento de nuestras poblaciones y la expansión de la violencia, el odio y de los fundamen-

talismos que dividen a la humanidad en grupos que se enfrentan en una horrible guerra.

La ciencia sirve para enseñar algunos grandes valores a nuestros niños como el amor a la verdad, la importancia del trabajo en equipo, el rechazo a los dogmas y la tolerancia y el respeto a las ideas y creencias diferentes.

Mirando los resúmenes de las propuestas que van a ser presentadas en esta conferencia por expertos altamente calificados de todas partes del mundo, es posible concluir que internacionalmente estamos llegando a un consenso que nos indica que la metódica de educación en Ciencias Basada en la Indagación (ECBI) en la que los niños aprenden ciencia haciendo ciencias, en la que re-descubren conceptos científicos comprobándolos por medio de Experimentos, ha sido aceptada en la mayoría de los países como una metódica que mejora el aprendizaje y la enseñanza de las ciencias experimentales.

Este consenso es importante pero todavía hay muchos problemas con temas que nos surgen, por ejemplo, los desafíos de hacer un escalamiento de proyectos que usan la metódica ECBI. Por esa razón hemos tomado ese tema que sea discutido en la Mesa Redonda A en el segundo día de la conferencia.

Todos nosotros estamos convencidos de que necesitamos la colaboración internacional para lograr mejorar la enseñanza y aprendizaje de las ciencias experimentales, pero la triste realidad es que hay una seria escasez de recursos financieros disponible para apoyar esta colaboración internacional. Este es otro de los temas que discutiremos en la Mesa Redonda B.

También el Programa Francés, llamado "la Main a la Patê" es un magnífico ejemplo de un programa nacional que ha sabido alcanzar una dimensión internacional. La Conferencia que dictará el Profesor Pierre Léna en la tarde del 14 de Abril nos mostrara los grandes logros de este programa tanto a nivel nacional como internacional.

El profesor Pierre Léna ha sido un magnífico apoyador en todo lo que hemos hecho en Chile para introducir la metódica ECBI en las escuelas de nuestro país. El Programa La Main a la Patê también ha sido una

fFuente de información y de asesoría para resolver los problemas que hemos encontrado. Obviamente que, como astrónomo, su amor por Chile llegó siguiendo a las estrellas en nuestros diáfanos cielos.

El Panel Inter Academias (IAP), que reúne a 105 Academias Nacionales de Ciencias de todo el mundo han asumido la colaboración internacional y ha creado un Consejo Global Internacional para coordinar los esfuerzos de las academias reunidas en cuatro regiones geográficas: Las Américas representada por el Inter American Network of Academies of Sciences (IANAS) o la Red Interamericana de Academias de Ciencias; La Red de Academias de Ciencias de África; La Red de Academias de Asia-Pacífico y la Red de Academias de Europa la que, obviamente, está mucho más avanzada en su integración por contar con el respaldo de la Unión Europea.

Debemos agradecer mucho al Profesor Dato Lee Yee Cheong de Malasia, quién es el presente coordinador del Consejo Global del programa de educación en ciencias del IAP por la excelente idea de patrocinar esta Conferencia y por programar la reunión de este Consejo Global aquí en Santiago el sábado 16 de abril. Esto nos ha permitido contar con todos sus miembros. En la mañana del 15 el Dr. Yee Cheong va a dictar una Conferencia sobre su visión del futuro del Consejo Global y también en esa sesión escucharemos breves informes sobre el funcionamiento de las diferentes redes regionales de academias que están armando proyectos conjuntos.

Otro tema clave es el diseño de módulos de enseñanza aprendizaje y la validación de su idoneidad probándolos en las salas de clases. Esto es una tarea que requiere el trabajo conjunto de científicos y educadores expertos en el currículum. Esto también requiere tiempo y financiamiento.

La Mesa Redonda C del día viernes 15 estará dedicada a discutir cómo se puede trabajar en conjunto y cómo podríamos recolectar esos recursos pedagógicos para ponerlos a la disposición de todos los interesados. Pero esa Mesa Redonda tiene una tarea específica que está focalizada en el tema de la protección del medio ambiente y la mitigación del impacto negativo del cambio climático. Esto se debe a la urgencia que tenemos de avanzar en este campo en

las próximas décadas. De todas maneras las conclusiones que se pueden sacar de esta Mesa Redonda son posibles de extrapolar, para generar módulos teórico-prácticos para otras áreas de las ciencias experimentales.

Pero también hay otros problemas importantes que es necesario resolver cuando queremos implementar la metódica ECBI en una dimensión internacional. ¿Cómo es posible evaluar el impacto de esta metódica en lo que realmente nos importa como es el aprendizaje de los niños y jóvenes estudiantes? No tenemos una Mesa Redonda para discutir esto, pero si tenemos dos conferencistas excelentes que se referirán a esto: Una de ellas es Carol O'Donnell, Directora del Centro del Smithsonian Institution para la Educación en Ciencias. Ella va a relatar unos resultados muy interesantes que recientemente han obtenido sobre el impacto que ha tenido la metódica ECBI en el aprendizaje en ciencias de un gran número de estudiantes en varios estados de los Estados Unidos. La segunda conferencia es la Conferencia de Clausura que va a ser dictada por una de las expertas más connotadas en el campo de la Educación en Ciencias, la Dra. Wynne Harlen del Reino Unido. Ella hablará de los diferentes tipos de evaluación y como estos pueden ser usados para potenciar el proceso de aprendizaje. La Dra. Harlen atmbién ha sido una constante fuente de conocimientos y de inspiración en nuestros proyectos de educación e Chile.

Otro punto relevante sobre la instalación de proyectos tipo ECBI en una dimensión nacional o internacional es el de la sustentabilidad. Obviamente, los gobiernos nacionales y sus Ministerios de Educación debieran ser partícipes muy destacados en proyectos a nivel de países (en Estados Federales este involucramiento pudiera hacerse a nivel de los gobiernos estatales). Sin embargo, especialmente en países en desarrollo, los Ministros de Educación son frecuentemente cambiados y con frecuencia las nuevas autoridades tienen diferentes prioridades lo que puede afectar la continuidad de los proyectos educacionales que requieren de largos años de implementación para mostrar efectos medibles. Por esta razón es muy importante que los proyectos educacionales diversifiquen sus fuentes de financiamiento, incluyendo organizaciones no gubernamentales, Fundaciones

o gobiernos municipales. Esta diversidad de apoyo le otorga a los proyectos sustentabilidad que es fundamental para todos los proyectos educacionales. La Conferencia de la Dra. Nathalie Von Siemens en nuestra reunión nos va a presentar un estimulante ejemplo de una Fundación privada que está apoyando este tipo de proyectos educacionales en varios países de América Latina y África y que está colaborando con las instituciones en los diferentes países. En Chile la Fundación Siemens está activamente trabajando con nuestra Universidad y otras instituciones.

Finalmente hay otro problema bastante básico que consiste en el hecho que, en general, hay poca comunicación entre la comunidad científica y las comunidades de educadores que trabajan en la educación en ciencias de los niños entre parvularios y educación media y por ende colaboran poco. Esta es una situación muy negativa pues las dos comunidades necesitan de la otra para lograr el objetivo de conseguir que todos los países haya una valoración de las ciencias y de lo que el conocimiento científico puede aportar a su desarrollo cultural y socio-económico.

La Conferencia Inaugural del Profesor Bruce Alberts precisamente consiste en un llamado a la comunidad científica incluyendo a las instituciones que las congregan: Academias, Universidades y Sociedades Científicas a comprometerse a trabajar con los profesores y docentes para que en conjunto podamos avanzar en el mejoramiento de la calidad de la educación en ciencias.

El Dr. Alberts demuestra con su vida que él es congruente con su predica pues ha llegado a los más altos lugares con su ciencia, la biología molecular ganando la Medalla Nacional de Ciencias de Estados Unidos el año 2014 pero habiendo hecho una labor notable a favor de la educación en ciencias. Siendo autor principal del texto de biología molecular más usado en el mundo y como Presidente de la Academia Nacional de Ciencias de ese país por 12 años ha involucrando a esa institución en la propuesta de Estándares Nacionales en Ciencias que identificaron los conocimientos científicos que los estudiantes de los diferentes niveles debieran manejar y después como Editor en Jefe de la Revista Science otorgando prioridad a la educación científica en esa revista. Por más

de 15 años el Dr. Alberts ha también sido un valiosísimo apoyador de los esfuerzos que las Universidades y la Academia Chilena de Ciencias han hecho para introducir la metódica ECBI en Chile. Su presencia en Chile en nuestra reunión es una muestra de su constante apoyo.

Finalmente quiero transmitirles el optimismo que sentimos que la Conferencia que hemos organizado será útil para establecer un fecundo diálogo entre las comunidades científicas y educacionales en nuestro país. La razón de este optimismo que en las pocas semanas que hemos abierto la inscripción para esta Conferencia ya hemos inscrito a cerca de 200 personas y el 80% de ellas son o profesores o estudiantes de pedagogías en ciencias - precisamente el público que queremos atraer.

Afectuosamente,
Jorge E. Allende

COMITÉ ORGANIZADOR

- 1.- **Embajador Gabriel Rodríguez**
Director Dirección de Energía, Ciencia y Tecnología e Innovación
Ministerio de Relaciones Exteriores CHILE
- 2.- **Prof. María Alicia González**
Instituto de Fisiología Celular de la Universidad Autónoma de México
Coordinadora Regional de RELAB
- 3.- **Rosa Devés**
Vicerrectora de Asuntos Académicos
Universidad de Chile
- 4.- **Prof. Mary Kalin**
Directora del Instituto Millenium de Ecología y Biodiversidad
Universidad de Chile
- 5.- **Professor Jorge E. Allende**
Presidente de la Corporación RELAB and
Presidente del Comité Organizador

PROGRAMA

CONFERENCIA INTERNACIONAL SOBRE EL MEJORAMIENTO DEL APRENDIZAJE DE BIOLOGÍA Y OTRAS ÁREAS DE LAS CIENCIAS EXPERIMENTALES DE LOS NIVELES ESCOLARES DE PARVULARIOS A EDUCACIÓN MEDIA

INSTITUCIONES ORGANIZADORAS:

- Corporación de Apoyo a la Red Latinoamericana de Ciencias Biológicas (RELAB)-Chile
- Universidad de Chile

INSTITUCIONES PATROCINANTES

- Programa de Educación en Ciencias del Panel de Academias (IAP), la Red Mundial de la Academia de Ciencias
- UNESCO/OREALC
- Unión Internacional de Bioquímica y Biología Molecular (IUBMB)
- Centro Internacional de Ingeniería Genética y Biotecnología (ICGEG) Trieste, Italy
- Ministerio de Educación de Chile
- Ministerio de Relaciones Exteriores (MINRE)-Chile
- Consejo de Innovación para el Desarrollo (CNID)-Chile
- Comisión Nacional de Investigación Científica y Tecnológica (CONICYT) -Chile
- Fundación Allende Connelly

PROGRAMA

CONFERENCIA INTERNACIONAL SOBRE EL MEJORAMIENTO DEL APRENDIZAJE DE BIOLOGÍA Y OTRAS ÁREAS DE LAS CIENCIAS EXPERIMENTALES DE LOS NIVELES ESCOLARES DE PARVULARIOS A EDUCACIÓN MEDIA

14 DE ABRIL	Inauguración – Salón de Honor – Auditorio Principal de la Universidad de Chile
09:00	<ul style="list-style-type: none">• 10' Bienvenida y Objetivos de la Reunión y Agradecimiento a Instituciones Patrocinantes –Prof. Jorge E. Allende - Chile• 5' Palabras del Presidente de IUBMB – Dr. Joan Guinovart - España• 5' Video del Director General del Centro Internacional de Ingeniería Genética y Biotecnología – Dr. Mauro Giacca - Italia• 5' Palabras del Representante de UNESCO-OREALC - Chile• 5' Palabras de Coordinara Regional de RELAB – Dra. María Alicia González – México• 5' Palabras del Representante del IAP Global Council of the Science Education Program – Prof. Dato Lee Yee Cheong - Malasia• 5' Palabras del Presidente del Consejo Nacional de Innovación para el Desarrollo (CNID) – Sr. Gonzalo Rivas - Chile• 5' Palabras del Presidente de CONICYT – Dr. Mario Hamuy – Chile• 5' Palabras del Rector de la Universidad de Chile – Prof. Ennio Vivaldi – Chile• 10' Sra. Adriana Delpiano – Ministra de Educación de Chile - Chile
10:00	<p>Coordinadora Prof. Cecilia Hidalgo, Vice-Presidenta de la Academia Chilena de Ciencias</p> <p>Conferencia Inaugural: Profesor Bruce Alberts (Profesor de Liderazgo en Bioquímica y Biofísica para las Ciencias y la Educación, Universidad de California, San Francisco, U.S.A.)</p> <p>La responsabilidad de las Academias de Ciencias, las Universidades y Sociedades Científicas en el Mejoramiento del Aprendizaje de Ciencias al nivel Escolar de Parvularia a Educación Media(45')</p>
10:45	Coffee Break

11:15	<p>Sesión 1: La Experiencia de la RELAB en el uso del Laboratorio Portátil de Biología Molecular y Genómica en el Aprendizaje de Biología Molecular por alumnos de enseñanza media.</p> <p>Coordinadores: Dra. Ana Victoria Lizano (Costa Rica) y Dr. Oscar Grau (Argentina)</p> <p>Jorge E. Allende – Chile (25)'</p> <p>Gustavo Gutiérrez – Costa Rica (15)'</p> <p>Alicia González – Claudia Segal – México (15)'</p> <p>Juan Cristina – Uruguay (5)'</p> <p>Fabio Pedrosa – Brazil (5)'</p> <p>Mariela Batista – Panamá (5)'</p> <p>Jorge Tenorio – Perú (5)'</p> <p>Discusión</p>
13:00	Almuerzo
Sesión 2	
14:30	<p>Coordinadora – Profesora Rosa Devés, Vice Rectora de Asuntos Académicos de la Universidad de Chile</p> <p>Presentaciones cortas sobre el uso de ECBI y el aprendizaje tipo “manos en la masa” en escuelas primarias y secundarias en diferentes países.</p> <p>Participantes:</p> <p>Dr. Joan Guinovart –(España) “Loco por la Ciencia” (10)'</p> <p>Dr. Petra Skiebe-Corrette (Alemania) “La Experiencia de la Universidad de Berlin”(10)'</p> <p>Ing. Guillermo Fernández (México) “El Proyecto FUMEC” (10)'</p> <p>Dr. Norma Nudelman (Argentina)” La Experiencia de Enseñar la Química Verde” (10)'</p> <p>Dr. Pilar Reyes (Chile) “El Programa ECBI de la Universidad de Chile” (10)'</p> <p>Dr. Anna Pascucci (Italia) “La Experiencia de ECBI en Italia” (10)'</p> <p>Dr. Shelley Peers (Australia)” La Iniciativa de las Conexiones Primarias” (10)'</p> <p>Mr. Edgard Hernández (Chile) “El Nuevo Proyecto ICEC – Ministerio de Educación de Chile” (15)'</p>

15:50	Discusión
Sesión 3	Presentaciones Detalladas de Mega Proyectos en Educación en Ciencias
Parte 1	Coordinadora – Dra. Natalia Mackenzie, Directora de EXPLORA Programa de CONICYT-Chile
16:00	Conferencia Dra. Carol O'Donnell, Directora del Centro de Smithsonian para la Educación en Ciencias (SSEC), U.S.A "Evaluación de la Educación en Ciencias Basada en la Indagación en el Aprendizaje de las Ciencias en U.S.A." (30)'
16:30	Coffee Break
Sesión 3	
Parte 2	Coordinadora - Diputada Cristina Girardi, Miembro de la Comisión de Educación de la Cámara de Diputados del Congreso de Chile
17:00	Conferencia Profesor Pierre Léna, Academia de Ciencias de Francia "La Experiencia de la Main a la Patê en Francia y en el mundo : pasado y futuro " 40'
17:40 – 18:00	Discusión General

15 DE ABRIL	
Session 3	
Part 3	Coordinador Professor Juan Asenjo, (Chile) Co-Presidente de la Red Interamericana de las Academias de Ciencia (IANAS) ; El Programa Global de Educación en Ciencias de la Red Mundial de Academias de Ciencias (IAP)
09:00 09:30	<p>Conferencia Profesor Dato Lee Yee Cheong, (Malaysia) Coordinador del Consejo Global del Programa de Educación en Ciencias de IAP.</p> <p>“La Gruesa Estrategia del Programa de Educación en Ciencias de IAP en los próximos años” (30)’</p>
09:30	<p>Programa de Educación en Ciencias IAP - Presentaciones de diferentes Regiones</p> <ol style="list-style-type: none"> 1. Profesor Juan Asenjo (Chile) “Las Actividades de Educación en Ciencias de la Red Interamericana de Academias de Ciencias (IANAS)” (10)’ 2. Profesor Manzoor H. Soomro (Pakistán) Presidente de la Fundación ECO-Science “Las Actividades de Educación en Ciencias de las naciones de ECO” (10)’ 3. Dr. Zhu He (China) “Una Cinta – Un Camino como la Historia de la antigua Ruta de la Seda está promoviendo nuevas colaboraciones en Educación en Ciencias” (10)’ 4. Profesor Giancarlo Vecchio (Italia) “La Iniciativa AEMASE” y Profesor Elly Sabiiti (Uganda) “Países de Africa – Europa y el Mediterráneo trabajan juntos en Educación en Ciencias” (15)’ 5. Dr. Indarjani (Indonesia) – Subdirectora del Programa SEAMEO del Centro Regional de QITEP en Ciencias “Actividades Conjuntas en Educación en Ciencias de 10 Países de ASEAN y Timor Oriental” (10)’
10:40	<ol style="list-style-type: none"> 6. Dr. Orakanoke Phanraksa (Tailandia) Co-Presidenta de la Academia de los Jóvenes, “Academia de los Jóvenes y la Educación en Ciencias” (10)’ <p>Discussion</p>

Session 3	
Part 4	Coordinadora Dra. Pilar Reyes (Chile) Directora Ejecutiva del Programa ECBI de la Universidad de Chile
10:45	Conferencia Dra. Nathalie Von Siemens, Presidenta de la Fundación Siemens "El Proyecto Experimento de la Fundación Siemens" (30)'
11:15	Coffee Break
11:45 – 13:45	Visita a Escuelas Primarias y Secundarias que usan la Metodica Basada en la Indagación y trabajos experimentales para el Aprendizaje en Ciencias
13:45 – 15:00	Almuerzo
Sesión 4	Sesiones Paralelas de 3 Mesas Redondas
15:00	<p>Discusión Mesas Redondas en Sesiones Paralelas</p> <p>Mesa Redonda A – Preside y Coordina –Dra. Amy D’Amico, Smithsonian Science Education Center (U.S.A.)</p> <p>Tema: Los Desafíos y Estrategias para lograr el Escalamiento de un Exitoso, pequeño Proyecto Piloto a una Dimensión Nacional o Internacional</p> <p>Participantes Pre-Inscritos</p> <p>Henry Caballero (Universidad Simón Bolívar) (Venezuela); Juan Cristina (Universidad de la República) (Uruguay); Guillermo Fernández (FUMEC)(México); Gustavo Gutiérrez (Universidad de Costa Rica) (Costa Rica); Wynne Harlen (Consultora Independiente)(Reino Unido); Fabio Pedrosa (Universidad Federal de Paraná) (Brasil); Shelley Peers (Directora de Conexiones Primarias de la Academia de Ciencias de Australia) (Australia); Daniel Rouan (Presidente LAMAP Foundation)(Francia); Claudia Segal (Facultad de Ciencias UNAM) (México); Jorge Tenorio (CONCYTEC) (Perú); XX (MINEDUC) (Chile);</p>

15:00	<p>Mesa Redonda B – Preside y Coordina Embajador Gabriel Rodríguez, Director de la Dirección de Energía, Ciencia, Tecnología e Innovación del Ministerio de Relaciones Exteriores de Chile.</p> <p>Tema: ¿Cómo puede la Colaboración Internacional Apoyar el Desarrollo de los Proyectos de Educación en Ciencias de los Diferentes Países?</p> <p>Participantes Pre-Inscritos</p> <p>Bruce Alberts (Universidad de California, San Francisco) (U.S.A); Pablo Angelleli (Banco Interamericano de Desarrollo) (Chile); Daniel Caffi (Ministerio de Educación) (Chile); Julio Celis (Comisión Europea RISE HLAB) (Dinamarca); Paula Cramer (MINCYT) (Argentina); Ricardo Ehrlich (Universidad de la República) (Uruguay); María Alicia González (Profesora Universidad Autónoma de México) (México); Joan Guinovart (Director del Instituto de Investigación en Biomedicina) (España); Hazami Habib (Academia de Ciencias) (Malasia); Aphiya Hathayatham (Vicepresidenta del Museo Nacional de Ciencias) (Tailandia); Zhu He (Asociación de Instructores de Niños de Ciencia) (China); Indar Jani (Directora del Programa SEAMEO Centro Regional para QITEP en ciencias) (Indonesia); Peter McGrath (Coordinador IAP/TWAS) (Italia); Norma Nudelman (Universidad de Buenos Aires) (Argentina); Phanraksa Orakaroke (Agencia Nacional de Ciencia y Desarrollo Tecnológico) (Tailandia); Petra Skiebe-Corrette (Freie Universität de Berlín); Maanzor Hussain Soomro (ECO Science Foundation) (Pakistán); Giancarlo Vecchio (Universidad de Nápoles Federico II) (Italia); Nathalie Von Siemens (Fundación Siemens) (Alemania); Park Won Hoon (Gyeonggi Instituto de Ciencia y Promoción Tecnológica; Academia Coreana de Ciencias y Tecnología; IAP SEP) (Corea); Representante de UNESCO (Chile).</p>
15:00	<p>Mesa Redonda C – Preside y Coordina Dra.Mary Kalin, Directora del Instituto Milenio de Ecología y Biodiversidad de la Universidad de Chile</p> <p>Tema: La Generación de Módulos para Enseñar a Estudiantes de todos los niveles de la educación Pre-Universitaria a como preservar el Medio Ambiente y a mitigar el impacto del Cambio Climático que Experimenta Nuestro Planeta.</p> <p>Participantes Pre-Inscritos</p> <p>Miguel Allende, (Profesor Universidad de Chile) (Chile); Martín Bascopé, (Pontificia Universidad Católica, Campus Villarrica) (Chile); Mariela Batista (SENACYT) (Panamá); Patricio Bernal (Pontificia Universidad Católica) (Chile); Marcela Colombres (Fundación Ecoscience) (Chile); Lee Yee Cheong (Centro Internacional de Ciencia Tecnología e Innovación) -ISTIC) (Malasia); Pierre Léna (LAMAP-Francia) (Francia); Ana Victoria Lizano (Universidad def Costa Rica) (Costa Rica);); Kena Mills Shaw (Instituto Médico Anderson para Terapias Personalizadas en Cáncer), (U.S.A); Carol O'Donell (Directora del Centro de Educación en Ciencias Smithsonian) (U.S.A) .</p>

17:00 Salón de Honor	<p>Preside y Coordina Profesor Flavio Salazar, Vicerrector de Investigación y Desarrollo de la Universidad de Chile</p> <p>Conferencia de Clausura Profesora Wynne Harlen, (OBE – Reino Unido) Consultora Edu- cacional</p> <p>“Usando la Evaluación para Apoyar el Aprendizaje en las Ciencias” (45)’</p>
17:45	<i>Presentación y Conclusiones de la Mesas Redondas</i> <i>Discusiones</i>
18:30	<i>Cierre</i>
APRIL 16TH	
09:00 – 12:00	<i>Reunión Cerrada del Consejo Global de IAP-SEP</i>

PROGRAM

INTERNATIONAL CONFERENCE FOR IMPROVING THE LEARNING OF BIOLOGY AND RELATED EXPERIMENTAL SCIENCES AT THE K-12 SCHOOL LEVELS

ORGANIZING INSTITUTIONS:

- Latin American Network of Biological Sciences (RELAB)
- University of Chile

SPONSORSHIP INSTITUTIONS

- • The Science Education Program of the Inter Academy Panel (IAP) – The Global Network of Science Academies
- • UNESCO/OREALC
- • IUBMB International Union of Biochemistry and Molecular Biology
- • International Center of Genetic Engineering and Biotechnology (ICGEB) –Trieste, Italy
- • Ministry of Education of Chile
- • Ministry of Foreign Relations -Chile
- • Consejo Nacional de Innovación para el Desarrollo (CNID)-Chile
- • National Commission for Research & Science and Technology (CONICYT)-Chile
- • Fundación Allende Connelly

PROGRAM

CONFERENCE FOR IMPROVING THE LEARNING OF BIOLOGY AND RELATED SCIENCES AT THE PRE-UNIVERSITY LEVEL

APRIL 14TH	Inauguration – Salon de Honor – Main Auditorium of the University of Chile
09:00	<p>Welcome and brief review of the objectives of the International Conference</p> <ul style="list-style-type: none">• 10' Prof. Jorge E. Allende – Chile – President of the Organizing Committee• 5' Prof. Joan Guinovart – Spain – President of the International Union of Biochemistry and Molecular Biology• 5' Video Prof. Mauro Giacca –Italy – Director General of the International Center of Genetic Engineering and Biotechnology• 5' The Representation of UNESCO Regional Office for Education in Latin America and the Caribbean-UNESCO- Chile• 5' Dra. María Alicia González – México –The Regional Coordinator of the Latin American Network of Biological Sciences (RELAB)• 5' Prof. Dato Lee Yee Cheong – Malaysia –The Coordinator of Global Council for the Science Education Program of the Inter Academy Panel• 5' Mr. Gonzalo Rivas – Chile – President of the National Council for Innovation for Development (CNID)• 5' Prof. Mario Hamuy – CONICYT – The President of the National Research Council of Chile• 5' Prof. Ennio Vivaldi – Chile –The Rector of the University of Chile• 10' Mrs. Adriana Delpiano – Chile –The Minister of Education of Chile
10:00	<p>Chair Prof. Cecilia Hidalgo, Vice- President of the Chilean Academy of Sciences.</p> <p>Inaugural Lecture : Professor Bruce Alberts (Leadership Chair in Biochemistry and Biophysics for Science and Education of the University of California, San Francisco, U.S.A)</p> <p>The responsibility of Science Academies, Universities and Scientific Societies in improving the Learning of Science at the K-12 school levels (45')</p>
10:45	Coffee Break

11:15	<p>Session 1: The Experience of the RELAB Portable Lab. of Molecular Biology and Genomics in Learning Molecular Biology by Secondary School Students - Chair persons, Ana Victoria Lizano (Costa Rica) and Oscar Grau (Argentina).</p> <p>Jorge E. Allende – Chile 25’</p> <p>Gustavo Gutiérrez – Costa Rica 15’</p> <p>Alicia González – Claudia Segal – México 15’</p> <p>Juan Cristina – Uruguay 5’</p> <p>Fabio Pedrosa – Brazil 5’</p> <p>Mariela Batista – Panamá 5’</p> <p>Jorge Tenorio – Perú 5’</p> <p>Discussion</p>
13:00	Lunch Break
14:30	<p>Session 2 – Chair – Professor Rosa Devés, Vice Rector for Academic Affairs, University of Chile</p> <p>Short presentations on the use of IBSE and hands on learning at primary and secondary school levels in different countries.</p> <p>Dr. Joan Guinovart –(Spain) “Crazy about science” (10)’</p> <p>Dr. Petra Skiebe-Corrette (Germany) Univ. of Berlin experience(10)’</p> <p>Ing. Guillermo Fernández (Mexico) The FUMEC project (10)’</p> <p>Dr. Norma Nudelman (Argentina) The Green Chemistry Experience (10)’</p> <p>Dr. Pilar Reyes (Chile) The ECBI program of the U. of Chile (10)’</p> <p>Dr. Anna Pascucci (Italy) The IBSE experience in Italy (10)’</p> <p>Dr. Shelley Peers (Australia) The Primary Connections Initiative (10)’</p> <p>Mr. Edgard Hernández (Chile) the New ICEC Project – Ministry of Education of Chile (15)’</p>
15:50	Discussion

Session 3	Extended Presentations about Large Projects in Science Education
Part 1	Chair – Ms. Natalia Mackenzie, Director of the EXPLORA Program of CONICYT-Chile
16:00	Lecture by Carol O'Donnell, Director of the Smithsonian Science Education Center (SSEC), U.S.A Assessment of the Inquiry Based Science Education Method in science learning in U.S.A. 30'
16:30	Coffee Break
Session 3	
Part 2	Chair Diputada Cristina Girardi, Member of the Education Committee of the Chamber of Deputies in the Chilean Congress
17:00	Lecture by Professor Pierre Léna, French Academy of Sciences "La Main a la Patê in France and beyond : past and future " 40'
17:40 – 18:00	General Discussion

APRIL 15 TH	
Session 3	
Part 3	Chair Professor Juan Asenjo, Co-Chair of the Interamerican Network of Sciences Academies; The Global Programme of Science Education of the World Network of National Academies of Sciences (IAP)
09:00 09:30	Lecture by Professor Dato Lee Yee Cheong, (Malaysia)Coordinator of Global Council of the Science Education Program of IAP. The Broad Strategy of the IAP SEP for the coming years (30)'
09:30	IAP Science Education Program Presentations from different regions <ol style="list-style-type: none"> 1. Professor Juan Asenjo (Chile) The Science Education Activities of IANAS Professor Juan Asenjo (10)' 2. Professor Manzoor H. Soomro (Pakistan) Science Education Activities of ECO Member Nations (10)' 3. Dr. Zhu He (China) "One Belt One Road": Historic relations help new partnerships in Science Education (10)' 4. Professor Giancarlo Vecchio (Italy)"The AEMASE Initiative" and Professor Elly Sabiiti (Uganda) African –European-Mediterranean Countries working together for science (15)' 5. Dr. Indarjani (Indonesia) – Joint Science Education initiatives in ten ASEAN Countries plus Timur Leste. (10)' 6. Dr. Orakanoke Phanraksa (Thailand)(Co-chair of Young Academies) Global Young Academies and Science Education.(10)'
10:40	Discussion

Session 3	
Part 4	Chair Pilar Reyes, Coordinator of the ECBI Program of the University of Chile
10:45	Lecture by Dr. Nathalie Von Siemens, President of the Siemens Foundation The Experimento Project of the Siemens Foundation (30)'
11:15	Coffee Break
11:45 – 13:45	Visit to Primary and Secondary Schools that use IBSE and hands-on learning
13:45 – 15:00	Lunch Break
Session 4	Parallel Meeting of Round Table Discussion on 3 different topics
15:00	<p>Round Table Discussion in 3 Parallel Sessions</p> <p>Round Table A - Chair – Dr. Amy d’Amico, Smithsonian Science Education Center (U.S.A.)</p> <p>Topic: The Challenges of Scaling Up small successful projects to a national or international dimension.</p> <p>Henry Caballero (Universidad Simón Bolívar)(Venezuela); Juan Cristina (University of La República) (Uruguay); Guillermo Fernández (FUMEC) (México); Gustavo Gutiérrez (University of Costa Rica) (Costa Rica); Wynne Harlen (Independent Consultant) (United Kingdom); Fabio Pedrosa (Federal University of Paraná) (Brazil); Shelley Peers, Australian Academy of Science, Director - Primary Connections Development, Asia-Pacific region Coordinator IAP SEP Global Council, (Australia); Daniel Rouan (President LAMAP-Foundation) (France); Claudia Segal (Facultad de Ciencias UNAM)(México); Jorge Tenorio (CONCYTEC)(Perú); XX MINEDUC (Chile);</p>

15:00	<p>Round Table B – Chair Ambassador Gabriel Rodríguez, Director of the Division of Energy, Science, Technology and Innovation of the Ministry of Foreign Affairs of Chile.</p> <p>Topic: The International Collaboration to support Science Education Projects</p> <p>Bruce Alberts, (University Of California, San Francisco) (USA); Pablo Angelleli (Interamerican Bank of Development)(Chile); Daniel Caffi (Ministry of Education) (Chile); Julio Celis (European Commission RISE HLAB)(Denmark); Paula Cramer (MINCYT) (Argentina); Ricardo Ehrlich (University of La República) (Uruguay); María Alicia González, (Professor Universidad Autónoma de México) (México); Joan Guinovart (Director of the Institute for Research in Biomedicine) (Spain); Hazami Habib (Academy of Sciences) (Malaysia); Aphiya Hathayatham (Vice-President National Science Museum)(Thailand); Zhu He (China Association of Children’s Science Instructor)(China); Indar Jani (Deputy Director for Programme SEAMEO Regional Center for QITEP in Science) (Indonesia); Peter McGrath (IAP/TWAS) (Italy); Norma Nudelman (University of Buenos Aires) (ANCEFN) (Argentina); Phanraksa Orakaroke (National Science and Technology Development Agency) (Thailand); Petra Skiebe –Corrette (Freie Universität Berlin); Manzoor Hussain Soomro (ECO Science Foundation) (Pakistan); Giancarlo Vecchio (University of Naples Federico II) (Italy); Nathalie Von Siemens (Foundation Siemens) (Germany); Park Won Hoon (Gyeonggi Institute of Science and Technology Promotion, Korean Academy of Science and Technology & IAP SEP (Korea); XX UNESCO (Chile); XX (México); XX (Brazil)</p>
15:00	<p>Round Table C – Chair – Mary Kalin, Director of the Millenium Institute of Ecology and Biodiversity, University of Chile</p> <p>Topic: Generating Modules to teach pre-University Students about environmental preservation and mitigating the impact of Global Climate Change.</p> <p>Miguel Allende, (Professor University of Chile) (Chile); Martín Bascopé, (Pontificia Universidad Católica, Campus Villarrica) (Chile); Mariela Batista (SENACYT) (Panamá); Patricio Bernal (Pontificia Universidad Católica) (Chile); Marcela Colombres (Fundación Ecoscience)(Chile), Lee Yee Cheong (International Science, Technology & Innovation Centre) (ISTIC) (Malaysia); Pierre Léna (LAMAP-France) (France); Ana Victoria Lizano (University of Costa Rica) (Costa Rica); Kena Mills Shaw (MD. Anderson Institute for Personalized Cancer Therapies), U.S.A); Carol O’Donell (Director Smithsonian Science Education Center) (U.S.A) .</p>
	<p>Chair Professor Flavio Salazar, Research and Development Vice Rector University of Chile</p> <p>Closing Lecture Professor Wynne Harlen, (OBE), Visiting Professor – University of Bristol, U.K</p> <p>Using Assessment to help learning in Science</p>
17:45	Presentation of the Conclusions of the Round Table – Discussions
18:30	Closure
APRIL 16TH	
09:00 – 12:00	Closed Meeting of the Global Council of IAP SEP

OBJECTIVES

GENERAL OBJECTIVE

To gather information about the different initiatives that are being implemented in the different countries and regions of the world in the area of pre-university education in the experimental sciences for the purpose of promoting international collaboration and synergy and to achieve a higher degree of science literacy in all countries.

SPECIFIC OBJECTIVES

1. To stimulate the design and performance of experiments that are relevant to some fundamental concepts in biology and other experimental sciences in all the levels of K-12 education.
2. To request international experts in science education to provide their suggestions, evaluations and criticisms of the activities in science education being carried out in Chile and other Latin American countries.
3. To stimulate the generation and introduction of teaching modules in the sciences that are relevant to the problems generated by climate change and deterioration of the environment. A collection of these modules that is open to all interested parties should be encouraged.
4. To demonstrate to the science and education communities the importance of working together to improve the quality of science education in the K-12 Levels.

OBJETIVOS

OBJETIVO GENERAL

Reunir información sobre las iniciativas que se están implementando en diferentes países y regiones del mundo en el área de educación pre-universitaria de las ciencias experimentales, con el propósito de promocionar la colaboración y sinergia internacional y además elevar el nivel de los conocimientos científicos en todos los países y la valoración de la ciencia.

OBJETIVOS ESPECÍFICOS

1. Estimular en todos los niveles de la educación pre-universitaria el diseño y práctica de experimentos que son relevantes para la comprensión de ciertos conceptos fundamentales de la biología y otras áreas de las ciencias experimentales.
2. Solicitar que expertos internacionales de educación en las ciencias contribuyan con recomendaciones, evaluaciones y críticas constructivas sobre las actividades que están en marcha en programas de educación científica en Chile y otros países latinoamericanos.
3. Estimular la generación y la introducción de módulos de enseñanza de las ciencias que son relevantes a los problemas generados por los cambios climáticos y el deterioro del medio ambiente. Se podría generar una colección de este tipo de módulos, abiertos y disponibles a todos los educadores interesados.
4. Demostrar a las comunidades científicas y pedagógicas la importancia de trabajar en conjunto para mejorar la calidad de educación en ciencias del Nivel de parvularios a Educación Media.

BRUCE ALBERTS

Alberts Bruce
University of California, San Francisco
Mobile Number: (415) 341-4968
bruce.alberts@ucsf.edu
U.S.A.

BIOSKETCH

Bruce Alberts, a prominent biochemist with a strong commitment to the improvement of science and mathematics education, was awarded the National Medal of Science by President Barack Obama in 2014. Dr. Alberts served as Editor-in-Chief of *Science* (2008-2013) and as one of President Obama's first three Science Envoys (2009-2011). He is now the Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education at the University of California, San Francisco, to which he returned in 2005 after serving two six-year terms as the president of the National Academy of Sciences (NAS).

During his tenure at the NAS, Alberts was instrumental in developing the landmark National Science Education standards. The type of "science as inquiry" teaching we need, says Alberts, emphasizes "logical, hands-on problem solving, and it insists on having evidence for claims that can be confirmed by others. It requires work in cooperative groups, where those with different types of talents can discover them – developing

self confidence and an ability to communicate effectively with others."

Alberts is also noted as one of the original authors of *The Molecular Biology of the Cell*, a preeminent textbook in the field now in its sixth edition. For the period 2000 to 2009, he served as the co-chair of the InterAcademy Council, an organization in Amsterdam governed by the presidents of 15 national academies of sciences and that was established to provide scientific advice to the world.

Committed in his international work to the promotion of the "creativity, openness and tolerance that are inherent to science," Alberts believes that "scientists all around the world must now band together to help create more rational, scientifically-based societies that find dogmatism intolerable."

Widely recognized for his work in the fields of biochemistry and molecular biology, Alberts has earned many honors and awards, including 16 honorary degrees.

THE RESPONSIBILITY OF SCIENTISTS -- AND THEIR SCIENCE ACADEMIES, UNIVERSITIES, AND SCIENTIFIC SOCIETIES -- IN IMPROVING THE LEARNING OF SCIENCE AT THE K-12 SCHOOL LEVELS

Bruce Alberts, Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education, University of California, San Francisco

The internationally accepted, modern view of science education calls for much less emphasis on the memorization of science facts and terms. Instead, the focus is on providing empowering experiences in problem-solving that increase both students sense-making abilities and their understanding of the world. This type of hands-on, inquiry based science education can serve as a core from which meaningful math, writing and reading lessons are also generated.

Teachers at the K-12 level can only be expected to teach science as inquiry if they have experienced scientific inquiry themselves. And all adults need to experience and appreciate science as a special way of knowing about the world. The introductory science courses in college must therefore emphasize this type of science learning – moving away from the traditional lecture in which students have only passive roles.

The type of improvements in science education that we need will take decades to accomplish, and they will require that scientists and their institutions become deeply and permanently engaged in catalyzing change.

ABSTRACT PRESENTATION

ANA VICTORIA LIZANO

Lizano Umana Ana Victoria
Muséum National d'Histoire Naturelle, Paris
Universidad de Costa Rica
Telephone numbers +33 (0)6 3000 5886
+ 33(0) 1 4566 8639
anavictorializano@gmail.com
Costa Rica

BIOSKETCH

Doctorate in Natural Sciences from the University Paris 11 (Orsay), France. 1975

Professor and researcher at the Department of Biology of the University of Costa Rica since 1976 to 2012.

Had taught Botany, Introduction to Mycology for undergraduates and Mycology, Fungal Physiology and Mushroom Physiogenetics for graduate students.

Has been working on the Project "Strategy for linking and promoting the Environmental Microbiology Area with society", achieving the planning and development of experimental models addressed to high school teachers to foster, through talks, demonstrations, and hand-on experiences, the basic principles of scientific logical thinking regarding the importance of the environment, and teachers' involvement as agents of social change. The model has been successfully applied on 15 rural high schools.

Has participated in the preparation and organization of three international courses:

"Central American refresher courses on Molecular Genetics, Biotechnology and Genomics" addressed to High School teachers, in San José, Costa Rica (August 7 - 11, 2006, July 9-13, 2012 and July 21-24, 2014). Courses organized by the Department of Biology and the Department of Teacher Education, University of Costa Rica under the auspices of the Latin American Network of Biological Sciences (RELAB), the Inter American Network of Academies of Science (IANAS) and the Ministry of Education of Costa Rica.

Organizadora del proyecto "Portable Laboratories of Molecular Biology and Genomics in Learning Molecular Biology by Secondary School Students" que se desarrolla actualmente y en forma exitosa en la Escuela de Biología de la Universidad de Costa Rica

Honors: Ordre du Merite, condecoración otorgada por el Gobierno Francés, 2004

MESA REDONDA C: GENERATING MODULES TO TEACH PRE-UNIVERSITY STUDENTS ABOUT ENVIRONMENTAL PRESERVATION AND MITIGATING THE IMPACT OF GLOBAL CLIMATE CHANGES "INCLUSIÓN DE LA BIODIVERSIDAD Y CAMBIO CLIMÁTICO EN LA EDUCACIÓN FORMAL COSTARRICENSE"

Dr. Gustavo Gutiérrez Espeleta

Dra. Ana Victoria Lizano Umaña

Escuela de Biología, Universidad de Costa Rica

Antecedentes en Costa Rica:

Al ser Costa Rica un país en el que la biodiversidad es parte de la vida cotidiana, este tema siempre se ha incluido dentro de los conceptos de enseñanza en escuelas y colegios. Sin embargo, acciones más con-

cretas y estructuradas se vienen implementando más recientemente.

Por ejemplo, desde 2005 se incorporó el eje transversal "Cultura Ambiental para el Desarrollo Sostenible" en el currículo formal de la educación general básica.

- En primaria, mediante ejes temáticos específicos como "Los seres humanos somos parte integrante de la naturaleza".
- En secundaria, introduciendo ejes temáticos más amplios, como "La Biodiversidad y los inventarios de las formas de vida".

ABSTRACT PRESENTATION

Para cada tema se definen objetivos, valores y actitudes que permitan la formación de competencias.

También se ha propuesto la visión de Educación Científica para una nueva ciudadanía, en el contexto del desarrollo sostenible.

En consecuencia, la incidencia ciudadana que debe estimular el centro educativo, respalda la prosperidad y bienestar social, mediante procesos de:

- Participación activa
- Compromiso y negociación entre los diferentes autores inmersos en cada centro y comunidad.
- Cambio de actitud de las personas para transformar la idea de una institución educativa aislada.

Y una organización que contemple el aporte de grupos colaboradores, tanto dentro como fuera de ella.

En general, se ha venido realizando una reformulación de los programas de estudio de Ciencias, con el componente de la Educación para el Desarrollo Sostenible y se ha ambientalizado el calendario escolar con las fechas importantes a través del año en que se celebran eventos relacionados con la biodiversidad y el desarrollo sostenible.

Aparte de la temática que se incluye formalmente en las aulas, el Ministerio de Educación Pública ha desarrollado diferentes actividades específicas para estimular a los estudiante mediante proyectos ecológicos, homenajes, concursos etc. que estimulan la participación y la concientización en temas de cambio climático y conservación. Ejemplos:

1. El proyecto Eco Cultura 2015, realizado en ocho centros educativos en San José, para la recuperación de envases valorizables de plástico y aluminio mediante el uso de dispositivos de alta tecnología en las instituciones, conocidos como Sistema de Depósito Inteligente (SDI).
2. Los estudiantes de secundaria del país ya pueden encaminar sus colegios hacia la carbono neutralidad inscribiendo sus proyectos ambientales en concursos promovidos por el Ministerio de Educación Pública (MEP) y el Ministerio de Ambien-

te y Energía, especialmente para junio, mes del Ambiente.

3. Se realizó un homenaje a más de 250 estudiantes de 12 centros educativos del país, que participaron del Proyecto YUNGA Costa Rica, una iniciativa que promovió la formación de agentes de cambio dentro de la sociedad costarricense en temas como biodiversidad, el cambio climático y la seguridad alimentaria.
4. El MEP participa en el proyecto Bandera Azul Ecológica. Cuenta con una categoría particular para centros educativos. Hay asesores de todos los circuitos escolares que guían el proceso de postulación de las instituciones, generan además alianzas de trabajo con ONG's y otros centros de la comunidad. Se forman clubs en las escuelas, como "Guardianes del Agua" . El MEP también trabaja con otros organismos como la UNESCO y la Fundación Omar Dengo en implementar acciones que favorezcan el conocimiento y la enseñanza de temas relacionados con la biodiversidad , el desarrollo sostenible y el cambio climático.

Aparte de las acciones propias del MEP, existen asociaciones con organismos nacionales e internacionales que trabajan estrechamente en actividades sobre los temas de desarrollo sostenible y conocimiento y protección de la biodiversidad. Entre estos organismos están la UNESCO y la Fundación Omar Dengo

Sobre el tema del Desarrollo Sostenible, la Comisión Costarricense de Cooperación con la UNESCO, a través de las Escuelas Asociadas a la RED-PEA se han venido implementando acciones que por su contenido, se han constituido en un significativo aporte, no solo para las escuelas y colegios asociados a la RED-PEA, sino para las familias y comunidades de donde procede la población estudiantil.

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- Con motivo del fenómeno del cambio climático, sus consecuencias y por estar vinculado al tema

de la Acción del Ser Humano sobre el Ambiente, se capacitó sobre la Prevención de Riesgos y Resiliencia en situaciones de desastre.

- Al ser la Sostenibilidad un tema prioritario de la Carta de la Tierra, se capacitó a docentes en esta materia, con el objetivo de:

1. Propiciar un espacio en el que los participantes profundizaran y fortalecieran sus conocimientos sobre dicha temática.
2. Integrar el contenido de la sostenibilidad en el proceso de aprendizaje de los niños y adolescentes, de manera que interioricen el contenido de la Carta de la Tierra, como marco ético rector en temas de biodiversidad, reconocido por la UNESCO en la Educación para el Desarrollo Sostenible.
3. Incorporar del tema sobre Patrimonio en Manos de los Jóvenes, integrando diversas materias entre ellas Turismo y Medio Ambiente, como tema prioritario. Para su abordaje se capacitó a 62 docentes que participan de la RED-PEA. El objetivo fue dotarlos de información y desarrollar destrezas con ellos que puedan a su vez reproducir en las aulas, utilizando los contenidos vistos en las materias de clase.

Además, el Despacho Académico del MEP efectuó el año pasado un trabajo conjunto con la oficina Multi-país de la UNESCO- Costa Rica. En acciones coordinadas con los asesores de la Dirección de Desarrollo Curricular, se elaboró un mapeo relacionado con el tema de la biodiversidad en los programas de estudio vigentes.

Con la Fundación Omar Dengo, el MEP trabaja en estrecha colaboración en diferentes ámbitos. Está por ejemplo la participación en la iniciativa GLOBE

- GLOBE es un programa educativo internacional de ciencias para primaria y secundaria. Su propósito es apoyar a estudiantes y maestros para que colaboren en investigaciones científicas y desarrollen el pensamiento científico por indagación. Se imparte en forma de clubes

científicos en varios colegios públicos integrados al Programa Nacional de Informática Educativa MEP-FOD.

- En materia de módulos educativos, la Fundación Omar Dengo se destaca, con programas como Gestores Ambientales **

** El proyecto se desarrolla en escuelas públicas que integran el Programa Nacional de Informática Educativa MEP-FOD, y busca que los estudiantes realicen procesos de investigación que les ayuden a comprender las posibles consecuencias ambientales de algunas prácticas cotidianas y a emprender acciones para mejorar el medio ambiente. Se trabaja por medio de la narración digital utilizando el lenguaje SCRATCH.

Propuesta para crear módulos educativos para la enseñanza de conductas pro-ambientales hacia el cuidado de la biodiversidad y el medio ambiente.

El concepto clave de Módulo educativo nace del modelo educativo constructivista, una estrategia de enseñanza-aprendizaje. Es un material didáctico interactivo que contiene todos los elementos necesarios para el aprendizaje de conceptos y destrezas al ritmo del estudiante, sin el elemento presencial continuo del docente o instructor.

Partes del módulo educativo:

- Introducción (conocimientos previos, objetivos, esquema de contenido, secuencia de aprendizaje)
- Desarrollo de contenido
- Actividad práctica
- Resumen
- Evaluación

Para diseñar un módulo adecuado al objetivo:

Al diseñar el módulo se tienen en cuenta los objetivos

del milenio, pues debe armonizar con los objetivos del desarrollo sostenible y ayudar a justificar la necesidad de desarrollar módulos que fortalezcan competencias en el área.

El objetivo a lograr es: Garantizar una educación inclusiva, equitativa y de calidad y promover oportunidades de aprendizaje durante toda la vida para todos.

Meta:

- Para 2030, garantizar que todos los alumnos adquieran los conocimientos teóricos y prácticos necesarios para promover el desarrollo sostenible, mediante la educación para el desarrollo sostenible y la adopción de estilos de vida sostenibles, los derechos humanos, la igualdad entre los

géneros, la promoción de una cultura de paz y no violencia, la ciudadanía mundial y la valoración de la diversidad cultural y de la contribución de la cultura al desarrollo sostenible.

Conclusión

Costa Rica ha asumido con mucho interés y responsabilidad el reto de introducir los temas de conocimiento de la biodiversidad, sostenibilidad y consecuencias del cambio climático en la educación formal, desde los jardines de infantes hasta la educación secundaria. Para esto ha capacitado a sus docentes, ha desarrollado diversas actividades extracurriculares y ha realizado alianzas estratégicas con diferentes organizaciones, de manera que se tome conciencia de la importancia de los retos a asumir para lograr el respeto a la naturaleza.

OSCAR GRAU

Grau Oscar
Profesor Emérito
Telephone numbers + 54 114252 8432
grau001@yahoo.com.ar
Argentina

BIOSKETCH

Born in Caseros (Buenos Aires, Argentina), October 2nd, 1939

Married, Four Children

Address : 25 de Mayo No 74 (1876) Bernal

Telephone: 54 114252 8432, Email: grau001@ yahoo.com.ar

Retired from University of La Plata (UNLP) as Profesor Emérito and from Comisión de Investigaciones Científicas de la Provincia de Buenos Aires as Investigador Superior

Member of Latin American academy of Science

Emeritus member of RELAB

Graduated and obtained PhD in Biochemistry from UNLP, Argentina in 1967.

Post doctorate in Molecular Biology of Transcription at Department of Biophysics University of Chicago 1968- 70

Returned to UNLP and created a group in the Instituto de Bioquímica y Biología Molecular devoted to the study of molecular biology and genetic engineering of bacterial, animal and plant viruses.

In that group, 19 graduated students obtained their PhD, one a Master degree and 5 their graduate final work . Seventeen of those PhDs are doing research work in positions of responsibility.

Total Publications: 55

Most significant:

Transcription Specificity in Bacteriophage SPO1 Development

Grau, O.; Ohlsson-Wilhelm, B.M., Geiduschek, E.P. Cold Spring Harbor Symposium 35, 221-226 (1970).

First description of a sigma controller of transcription

Novobiocin Blocks the Shut off of SPO1 Early Transcription

Sarachu, A.N.; Alonso, J.C., Grau, O. Virology 105, 13-18 (1980).

First description that a DNA gyrase is necessary to open a

Genus Ophiovirus

Milne, R.G., Garcia, M.L., Grau, O.

7th Report of the International Committee on Taxonomy of Viruses (M.H.V. van Regenmortel, C.M.

Fauquet, D.H.L. Bishop, E.B. Carstens, M.K. Estes, S.M. Lemon, J. Maniliff, M.A. Mayo, D.J. McGeoch, C.R. Pringle, R.B. Wickner, eds.), pp. 627-631, Academic Press, San Diego, 2000.

Description of a new virus genus

JORGE E. ALLENDE

Allende Jorge E.
Profesor University of Chile
Telephone number + (562) 2 978 6255
jallende@uchile.cl
Chile

BIOSKETCH

Born 11/11/1934 Costa Rica (Chilean father). Studied in Louisiana State University (USA) with B.S. in Chemistry in 1957. Obtained a Ph. D. in Biochemistry from Yale University in 1961 – postdoctoral work with Professor Lipmann at Rockefeller University 1961-1962, Academic appointment at Faculty of Medicine, University of Chile since 1962 to present. Guggenheim Fellowships in the laboratory of Marshall Nirenberg 1966-1967 at the NIH and in the laboratory of Professor Gordon Sato at UCSD 1973-1974. Research Protein Synthesis and the genetic code, the mechanism of aminoacyl – tRNA synthetases, the action of progesterone in the induction of amphibian oocyte maturation and the structure and function of the casein protein kinases. Approximately 145 publications in international journals. One text book monograph and an autobiography. Together with his wife, Dr. Catherine C. Allende has guided 25 Ph. D. thesis and had post docs from U.S.A., Belgium, Argentina, Perú, and Costa Rica.

Academies – Chilean Academy of Sciences, Honorary Member of Chilean Academy of Medicine, U.S. National Academy of Sciences (foreign Associate); U.S. National Academy of Medicine (foreign Associate); Indian National Academy of Sciences; Mexican Academy of Sciences; Argentina National Academy of Exact and Natural Sciences, TWAS, Latin American Academy of Sciences.

Prizes: National Prize of Natural Sciences of Chile in 1992, Doctor Honoris Causa, University of Buenos Aires, Purkwa Prize of French Academy of Sciences 2008 on Science Education, Prize to the Scientific Merit from President of Brazil, Luis Leloir Prize from Ministry of Science and Technology of Argentina, KO-NEX Mercosur Prize in Science 2014.

PORTABLE LABORATORIES THAT ALLOW SECONDARY SCHOOL STUDENTS TO CARRY OUT SOPHISTICATED EXPERIMENTS TO LEARN MOLECULAR BIOLOGY -PROFESSOR JORGE E. ALLENDE, ICBM, FACULTAD DE MEDICINA UNIVERSIDAD DE CHILE- CO-PRESIDENT OF CORPORACIÓN RELAB

ABSTRACT PRESENTATION

Our laboratory has a long history of organizing theoretical and practical courses for doctoral and postdoctoral students in the techniques of molecular biology (1968-1993 – 15 courses). In the 1990's the field of molecular biology was introduced in the secondary school curriculum and there was a great need to teach this new chapter to the secondary school teachers. With the important help of Kenna Mills Shaw, a Fulbright Scholar and Héctor Díaz and Valeria Sabaj from the ICBM, we ran the first course for secondary school teachers in 1998. This was followed by courses in Chile, Argentina, and Costa Rica with the support of RELAB and UNESCO. These courses were well received by the teachers detected a problem. The teachers could not reproduce in their school the

most interesting and most effective part of the learning which was the experimental part. We had the idea in 2001 of solving this problem by the use of portable laboratories that could visit the schools but it took us 10 years to implement this solution.

In 2011, RELAB applied to a Program of the Wellcome Trust which supported the transfer to society of the advances of the life sciences. Our project involved 3 countries with their respective Universities : México with the UNAM, Costa Rica with the University of Costa Rica and Chile with the University of Chile. This project proposed to organize in these countries a one week training course in molecular biology and genomics for secondary school biology teacher. The

innovation consisted in the fact that the teachers that passed the course could request from their respective Universities a visit of a portable laboratory so that the students could do in their school the experiments. The majority of the funds of the Wellcome Trust were used to purchase the three portable laboratories. The equipment in each laboratory was able to handle 30 students simultaneously and the experiments required 4 sessions of 3 to 4 hours. We, the molecular biologists of the three countries agreed on 4 fundamental concepts that would be covered by the course. The course would then explain the history of how those concepts came to light and included experiments that could be done to demonstrate the validity of those concepts. We first ran a pilot course in Santiago with Secondary school teachers and with the help of observers from México and Costa Rica who helped to re-structure the activities.

In the pilot period in Chile during 2013, 2014, 2015 we have organized 3 courses that trained approximately 80 teachers and have so far visited 27 secondary schools with approximately 750 students doing the four experiments in the portable laboratory. If one divides the cost of the equipment (US\$ 10.000) by the number of students that have used it the expense is very low – per student that is around \$ 13 dollars which is much less than the price of a molecular biology text book. e www.laboratoriosportatiles.cl we have collected the opinions of the teachers, secondary school students and doctoral students that accompany the portable laboratories to the school and help the teachers in setting up the experiments and discussing the results with the secondary school students. The overwhelming majority of the opinions from all three groups are very positive about the experience of being able to do experiments that clearly validate one of the fundamental concepts that the students are supposed to learn. You will see that in the two other countries that started with the project the results are also very promising. These results confirm something that is well known in the educational literature, the fact that to do experiments greatly facilitates comprehension of scientific principles by students. For this reason we have decided to try to sca-

le-up this project in Chile and fortunately our Ministry of Education has agreed to work with us this year in the increased coverage.

We have the agreement of 8 other Universities that are joining the University of Chile in this project. There are 2 Universities in the Santiago Region (USACH and UMCE), and 6 other Universities in 6 other Regions of the Country (U. Antofagasta, U. La Serena, U. Católica de Valparaíso U. de Talca, U. de Concepción y U. Austral de Chile). We expect that in the second semester of this year we will be organizing 8 courses for about 200 biology teachers and we should be able to visit 40 secondary schools and expose around 1200 secondary school boys and girls to the experience of the portable laboratories. In addition, 8 of the 9 Universities have undergraduate programs that train secondary school biology teachers. These students will receive training using the molecular biology module as part of their undergraduate course. This means that when they graduate and have a position as a teacher, they will be able to request visits of the portable laboratory to their schools without taking the course.

As can be seen in the following presentations, the project is also spreading to other countries in Latin America, Uruguay, Brazil, Panamá and possibly Perú. But the scaling up is not only geographical, RELAB with the support of UNESCO and CONICYT has generated two more modules in other important chapters of Secondary School Biology: Proteins and Enzymes and Fertilization and Early Animal Embryo Development. These modules have been tested through courses for biology teachers offered in January 2016 by the University of Chile and we are planning that by the end of 2016, we will have 5 or 6 modules and possibly by the end of 2017 we can reach 8 modules which we think can give our secondary school student a fair representation of the Biology of the 21st Century. Our dream is to use this approach to cover not only biology but also all the other experimental sciences: chemistry, physics, Earth Sciences and Astronomy. For what we need a lot more work and more funding.

GUSTAVO GUTIÉRREZ

Gutiérrez Espeleta Gustavo A.
Universidad de Costa Rica
Telephone numbers: 506-2511-8651 y 506-8389-2176
gustavo.gutierrez@ucr.ac.cr
Costa Rica

Curriculum vitae (Febrero, 2016)

Grados académicos

1983 - 1988

B. Sc. Universidad de Costa Rica – Biología

1988 - 1992

M. Sc. Universidad de Costa Rica - Genética

1995 - 1999

Ph. D. Arizona State University – Genética

Unidad Base: Escuela de Biología, Universidad de Costa Rica (UCR)

Especialidad o área de estudios: Genética humana y genética de la conservación.

55 Publicaciones en revistas indexadas internacionales

69 Cursos, congresos y seminarios nacionales e internacionales

Experiencia en docencia

Grado:

Escuela de Biología, UCR

Escuela de Agricultura de la Región del Trópico Húmedo, Costa Rica

Arizona State University, Tempe, Arizona. USA.

Profesor de los cursos de Biología General, Introducción a la Biología, Genética

General, Genética Humana, Genética Aplicada y Genética de la Conservación.

Posgrado

Maestría en Biología. Sistema de Estudios de Postgrado (SEP), UCR

Maestría en Medicina de la Conservación, Universidad Nacional, CR

Maestría profesional en paisajismo y diseño de sitio. Escuela de Arquitectura, SEP, UCR

Maestría en Derecho Ambiental, Facultad de Derecho, SEP, UCR

Maestría en Desarrollo Sostenible, Sede de Occidente SEP, UCR.

Sistema de Estudios de Postgrado, UNED.

Profesor de los cursos Biología y Genética de la Conservación, Gestión Ambiental Integral con Enfoque Ecosistémico, Ecología y Derecho y Criminología Biológica

Cursos en educación secundaria

Organizador y profesor del curso “Innovaciones Tecnológicas: La célula, microcosmos de vida, para asesores y profesores de secundaria del área de las ciencias con énfasis en Biología”, Costa Rica.

Coordinador del curso: Genética y Biotecnología para Profesores de Tercer Ciclo y Educación Diversificada (Ciencias). Ministerio de Educación Pública y Universidad de Costa Rica.

Cursos para todo público

Organizadores y profesor de los cursos libres: Marcadores Moleculares en Ciencias Forenses y Paternidad y Proyecto Genoma Humano.

MESA REDONDA C: GENERATING MODULES TO TEACH PRE-UNIVERSITY STUDENTS ABOUT ENVIRONMENTAL PRESERVATION AND MITIGATING THE IMPACT OF GLOBAL CLIMATE CHANGES “INCLUSIÓN DE LA BIODIVERSIDAD Y CAMBIO CLIMÁTICO EN LA EDUCACIÓN FORMAL COSTARRICENSE”

Dr. Gustavo Gutiérrez Espeleta

Dra. Ana Victoria Lizano Umaña

Escuela de Biología, Universidad de Costa Rica

Antecedentes en Costa Rica:

Al ser Costa Rica un país en el que la biodiversidad es parte de la vida cotidiana, este tema siempre se ha incluido dentro de los conceptos de enseñanza en escuelas y colegios. Sin embargo, acciones más concretas y estructuradas se vienen implementando más recientemente.

Por ejemplo, desde 2005 se incorporó el eje transversal “Cultura Ambiental para el Desarrollo Sostenible” en el currículo formal de la educación general básica.

- En primaria, mediante ejes temáticos específicos como “Los seres humanos somos parte integrante de la naturaleza”.
- En secundaria, introduciendo ejes temáticos más amplios, como “La Biodiversidad y los inventarios de las formas de vida”.

Para cada tema se definen objetivos, valores y actitudes que permitan la formación de competencias.

También se ha propuesto la visión de Educación Científica para una nueva ciudadanía, en el contexto del desarrollo sostenible.

En consecuencia, la incidencia ciudadana que debe estimular el centro educativo, respalda la prosperidad y bienestar social, mediante procesos de:

- Participación activa
- Compromiso y negociación entre los diferentes autores inmersos en cada centro y comunidad.

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3. Se realizó un homenaje a más de 250 estudiantes de 12 centros educativos del país, que participaron del Proyecto YUNGA Costa Rica, una iniciativa que promovió la formación de agentes de cambio dentro de la sociedad costarricense en temas

como biodiversidad, el cambio climático y la seguridad alimentaria.

4. El MEP participa en el proyecto Bandera Azul Ecológica. Cuenta con una categoría particular para centros educativos. Hay asesores de todos los circuitos escolares que guían el proceso de postulación de las instituciones, generan además alianzas de trabajo con ONG's y otros centros de la comunidad. Se forman clubs en las escuelas, como "Guardianes del Agua". El MEP también trabaja con otros organismos como la UNESCO y la Fundación Omar Dengo en implementar acciones que favorezcan el conocimiento y la enseñanza de temas relacionados con la biodiversidad, el desarrollo sostenible y el cambio climático.

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- Con motivo del fenómeno del cambio climático, sus consecuencias y por estar vinculado al tema de la Acción del Ser Humano sobre el Ambiente, se capacitó sobre la Prevención de Riesgos y Resiliencia en situaciones de desastre.
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1. Propiciar un espacio en el que los participantes profundizaran y fortalecieran sus conocimientos sobre dicha temática.
2. Integrar el contenido de la sostenibilidad en el proceso de aprendizaje de los niños y adolescentes, de manera que interioricen el contenido de la Carta de la Tierra, como marco ético rector en temas de biodiversidad, reconocido por la UNESCO en la Educación para el Desarrollo Sostenible.
3. Incorporar del tema sobre Patrimonio en Manos de los Jóvenes, integrando diversas materias entre ellas Turismo y Medio Ambiente, como tema prioritario. Para su abordaje se capacitó a 62 docentes que participan de la RED-PEA. El objetivo fue dotarlos de información y desarrollar destrezas con ellos que puedan a su vez reproducir en las aulas, utilizando los contenidos vistos en las materias de clase.

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Al diseñar el módulo se tienen en cuenta los objetivos del milenio, pues debe armonizar con los objetivos del desarrollo sostenible y ayudar a justificar la necesidad de desarrollar módulos que fortalezcan competencias en el área.

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- Para 2030, garantizar que todos los alumnos adquieran los conocimientos teóricos y prácticos necesarios para promover el desarrollo sostenible, mediante la educación para el desarrollo sostenible y la adopción de estilos de vida sostenibles, los derechos humanos, la igualdad entre los géneros, la promoción de una cultura de paz y no violencia, la ciudadanía mundial y la valoración de la diversidad cultural y de la contribución de la cultura al desarrollo sostenible.

Conclusión

Costa Rica ha asumido con mucho interés y responsabilidad el reto de introducir los temas de conocimiento de la biodiversidad, sostenibilidad y consecuencias del cambio climático en la educación formal, desde los jardines de infantes hasta la educación secundaria. Para esto ha capacitado a sus docentes, ha desarrollado diversas actividades extracurriculares y ha realizado alianzas estratégicas con diferentes organizaciones, de manera que se tome conciencia de la importancia de los retos a asumir para lograr el respeto a la naturaleza.

ALICIA GONZÁLEZ

Gonzalez Manjarrez Maria Alicia
Instituto de Fisiología Celular Universidad Nacional
Autónoma de México
Telephone numbers 0052 55 56225631 LAB,
5554336585 Movil
amanjarr@ifc.unam.mx
México

La Dra. María Alicia González Manjarrez es Bióloga de la Facultad de Ciencias UNAM. Realizo sus estudios de Maestría y Doctorado dentro del Programa de Investigación Biomédica Básica. Actualmente es Investigador Titular C del Instituto de Fisiología, Celular Nivel 3 del SNI.

Su grupo se ha dedicado al estudio de la diversificación funcional de genes parálogos de *Saccharomyces cerevisiae*, a partir de genes tipo ancestral y las implicaciones evolutivas de este proceso.

El trabajo del grupo ha quedado plasmado en 55 publicaciones, en revistas de circulación internacional y 10 mas en capítulos de libro. En su laboratorio se han graduado 13 Licenciados, 14 Maestros y 14 Doctores. La Dra. González ha impartido una multitud de cursos de Genética, Bioquímica y Biología Molecular en diferentes Facultades e Institutos de la UNAM. Así mismo, ha organizado en México 10 Cursos-Talleres internacionales procurando abordar temas novedosos, poniendo al alcance de estudiantes Latinoamericanos temas de frontera, facilitando así el acerca-

miento de los alumnos y de jóvenes investigadores a las nuevas herramientas de análisis que se han desarrollado a raíz de la secuenciación de genomas. En particular, resalta su papel como generadora de la Rama de Biología Molecular y Celular de Hongos de la Sociedad Mexicana de Bioquímica. La creación de esta Rama ha jugado un papel importante en el desarrollo de la Biología Molecular en modelos fúngicos y ha propiciado la organización de cursos internacionales de genética o genómica fúngica. Actualmente, la Dra. González es Presidenta de la Sociedad Mexicana de Bioquímica para el periodo 2013-2015. La Dra. González es la representante de México en la Red Latinoamericana de Biología (RELAB) y desde 2013, Coordinadora General de RELAB de la Región. Como miembro de la mesa directiva de la RELAB, ha participado en la organización de tres simposios Latinoamericanos sobre Biodiversidad, Bioremediación, Educación de Biología y Bioética. Así mismo, la Dra. González ha sido Miembro del Scientific Board del International Basic Sciences Programme de la UNESCO de 2009-2014, esto la ha puesto en contacto con numerosas asociaciones científicas.

INQUIRY BASED SCIENCE EDUCATION (IBSE) AS A TOOL FOR LEARNING MOLECULAR BIOLOGY. THE EXPERIENCE IN MEXICO.

Claudia Segal-Kischinevzky¹, Viviana Escobar-Sánchez¹, Angeles Cancino-Rodezno¹, Issis Alvarado-Sánchez² and Alicia González-Manjarrez³

claudiasegal@ciencias.unam.mx

¹Departamento de Biología Celular, Facultad de Ciencias.

²High School Teacher

³Departamento de Genética Molecular, Instituto de Fisiología Celular

UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO. Cd. Mx. C.P. 04510, MÉXICO.

In Mexico, only 44% of the population between 15 and 24 years attends school (2015, INEGI), but less than 10% of the young people that get into the University level will enroll in a scientific career. Promoting the interest for scientific inquiry is then a challenge of enormous dimensions. The National Autonomous University of Mexico (UNAM) has a great interest in the reinforcement of teaching at high school level and great efforts are made by the institution to improve the teaching-learning process by updating their teachers.

The challenge is huge. In order to address this issue, we have participated in the Project of portable labora-

tories. Thanks to the grant provided by the Wellcome Trust through the draft submitted by the Latin American Network of Biological Sciences (RELAB), we acquired a Molecular Biology portable laboratory in order to make available exciting laboratory experiences to high school students. Among the various experimental activities, students perform the identify suspects through DNA footprinting analysis, extraction and amplification of their own DNA for genotyping, genetic modification of bacteria using green fluorescent protein from a jellyfish protein, and protein electrophoresis.

We have already taught five courses to secondary school teachers, who have been very excited and interested in delivering the courses in their schools. To

date, the portable laboratory has been implemented in two high schools at UNAM, involving around 200 teenagers with spectacular results.

The project has an enormous potential, since we have both the equipment and the human resources, the teachers who have taken the courses, to develop it. Currently, we have an \$11,000 USD/year UNAM-grant approved for 3 years in order to propose and develop new actualization courses and the workshops that educators will teach to their own high school students. We consider that encouraging young people to appropriate the scientific method will provide them with better tools to face the challenges they will meet, regardless of the study area in which they specialize.

CLAUDIA SEGAL

Segal Kischinevzky Claudia A.
Facultad de Ciencias, UNAM
Universidad Nacional Autónoma de México
Telephone numbers: 5255 56224831 (lab)
claudia.segal@gmail.com
México

BIOSKETCH

Biosketch (short one paragraph with a highlight of your work in science education)

Claudia Segal-Kishinevzky, PhD. Full-time Titular Professor in the Molecular Biology & Genomics Laboratory at Facultad de Ciencias in the Universidad Nacional Autónoma de México (UNAM). Her research area is the oxidative stress in non-conventional yeast; she has published various research and divulgation articles, books, interactive CDs and laboratory manuals. She has directed 8 bachelor's thesis and is currently directing one bachelor's and three master's thesis. She is Faculty member from the Molecular Biology and Biotechnology Academies of the Biology undergraduate program at Facultad de Ciencias, as well as at the Biological and Biomedical Science Graduate

Programs at UNAM. She has been concerned and involved in the improvement of the academic level of pre-University science teachers since she started her academic carrier, actively imparting actualization courses to high school teachers. Since 2011, she collaborates with RELAB being in charge of the molecular biology portable laboratory in Mexico, from the planning, the acquisition and distribution of equipment and supplies, to the organization and teaching of courses both to high school teachers and high school students. Until now she has taught seven Molecular Biology and Genomics courses within the portable laboratories program in Costa Rica, Guatemala and Mexico. In addition she has shared the experiences participating at various RELAB meetings and forums in Chile, Argentina and Mexico.

INQUIRY BASED SCIENCE EDUCATION (IBSE) AS A TOOL FOR LEARNING MOLECULAR BIOLOGY. THE EXPERIENCE IN MEXICO.

Claudia Segal-Kischinevzky¹, Viviana Escobar-Sánchez¹, Angeles Cancino-Rodezno¹, Issis Alvarado-Sánchez² and Alicia González-Manjarrez³

claudiassegal@ciencias.unam.mx

¹Departamento de Biología Celular. Facultad de Ciencias.

²High School Teacher

³Departamento de Genética Molecular, Instituto de Fisiología Celular

UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO. Cd. Mx. C.P. 04510, MÉXICO.

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the reinforcement of teaching at high school level and great efforts are made by the institution to improve the teaching-learning process by updating their teachers.

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JUAN CRISTINA

Cristina Gheraldi Juan
Facultad de Ciencias – Universidad de la República
Telephone numbers: +598 2525 03 78
decanato @ fcien.edu.uy; juan.cristinag@gmail.com
Uruguay

BIOSKETCH

Licenciado en Ciencias Biológicas de la Facultad de Ciencias, Universidad de la República. Doctor en Ciencias Biológicas por la Universidad Autónoma de Madrid, España. Realizó estudios postdoctorales en el National Institutes of Health, EE.UU. Se desempeña como Profesor Titular del Laboratorio de Virología Molecular del Centro de Investigaciones Nucleares de la Facultad de Ciencias, e Investigador Grado 5 del área Biología del Programa del Desarrollo de las Ciencias Básicas (PEDECIBA), Nivel III del Sistema Nacional de Investigadores.

En 2010 es electo Decano de la Facultad de Ciencias y reelecto para el período 2014-2018. Ha impulsado y liderado la realización de múltiples iniciativas de promoción de la educación científica como la Feria de Ciencias Latitud Ciencias, Laboratorio Móvil para Escuelas Rurales, Escuela de Verano de Introducción a la Investigación Antártica, Programas Conjuntos de Formación para Profesores de Enseñanza Media y Egresados de la U de la R, Laboratorio Móvil de Biología Molecular para Enseñanza pre- universitaria, entre otras. Es representante del Ministerio de Educación en el Consejo Directivo de la Red Latinoamericana de Ciencias Biológicas. En 2015 se incorporó como Miembro de Número de la Academia Nacional de Ciencias.

“DESAFÍOS PARA MULTIPLICAR Y REPLICAR LA EXPERIENCIA DE ESTUDIANTES DE CIENCIAS EN LA ESCUELA DE VERANO EN LA ANTÁRTIDA”

Juan Cristina

Las Escuelas de Verano de Introducción a la Investigación Antártica se idearon como un proceso de formación que contribuya a construir aprendizajes individuales y colectivos, que acerquen tempranamente al estudiante a la investigación antártica y que fomenten la curiosidad e interés por la ciencia en esta área.

Se promovió que estudiantes de grado tuvieran un primer acercamiento a la investigación científica antártica en diferentes áreas del conocimiento. Hemos comenzado a estructurar un programa educativo universitario en la temática antártica, y generado experiencias concretas para estimular el interés en jóvenes estudiantes.

La Escuela constituyó la primera actividad de docencia curricular universitaria a gran escala realizada en la Base Científica Antártica Artigas (BCAA). Significó un cambio cultural en las BCAA, así como una importante contribución a un re-lanzamiento de la investigación antártica por parte de nuestro país, de fundamental importancia para la calidad de la actuación de Uruguay en el contexto del Tratado Antártico.

Las interacciones múltiples con distintos actores para la concreción de este proyecto, representa un desafío no menor, que deberá afrontarse a futuro en la consolidación de estas y otras iniciativas de la Facultad de Ciencias en pro de la motivación de jóvenes investigadores.

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“LA EXPERIENCIA DEL LABORATORIO MÓVIL DE BIOLOGÍA MOLECULAR EN URUGUAY”

Prof. Dr. Juan Cristina

El objetivo general de este proyecto, es contribuir desde etapas tempranas a la educación en ciencias a través de prácticas de enseñanza activa con protagonismo de los que aprenden.

El desarrollo de esta iniciativa implicó una serie de instancias de coordinación con actores relevantes del Sistema Educativo uruguayo para obtener su respaldo y colaboración. A la vez, se realizó la capacitación

para trabajar con el Laboratorio, de grupos de profesores de enseñanza media nacionales y extranjeros y de formadores de profesores con una clara intención de multiplicar el impacto de la formación.

El equipamiento del Laboratorio Móvil de Biología Molecular fue adquirido y puesto a disposición del sistema educativo. Se prevén nuevas instancias de actualización y capacitación y la planificación de actividades del Laboratorio Móvil de Biología Molecular en centros educativos de enseñanza media y formación de profesores por todo el país durante el corriente año.

FABIO PEDROSA

Pedrosa Fabio de Oliveira
Professor

Federal University of Paraná, Curitiba, Paraná, Brazil

Telephone numbers: +55 41 33529313 - +55 41
87002069

pedrosa.fabio@gmail.com / fpedrosa@ufpr.br
Brazil

BIOSKETCH

Full Professor in the Department of Biochemistry and Molecular Biology of the Federal University of Paraná (UFPR), Brazil. Advisor of Graduate Program in Biochemistry and Molecular Biology – MSc and PhD. Professor of undergraduate courses of Biochemistry since 1977. Principal Scientific Researcher of the Brazilian Research Council (CNPq) I-A. Coordinator of the Graduate Course (MSc and PhD) in Biochemistry of the Federal University of Paraná, Brazil, from October 1989 to May 1994. Coordinator of the Nucleus of Excellence in Research (Pronex) in Nitrogen Fixation of the Federal University of Paraná, supported by the Brazilian from 1996 to 2003. Head of the Department of Biochemistry and Molecular Biology - UFPR (07/1999-07/2003). Brazilian National Director (11/2001 - 11/2005) and Binational Director (11/2005 11/2007) of the Brazilian-Argentinian Center of Biotechnology.

Coordinator of the Nucleus of Excellence in Nitrogen Fixation (Pronex / MCT / FINEP / CNPq (1996-2001). Coordinator of the Genome Program of Paraná (GENOPAR) from May 2001. Coordinator of Proteomics Network of Paraná (September 2004-2008). Coordinator of the Millennium Institute on Biological Nitrogen Fixation. Member and coordinator of the Advisory Committee CA / BF of the Brazilian Research Council - CNPq (07/2004 to 06/2007 and 07/2011 to 06/2014). Coordinator of the National Institute of Science and Technology on Biological Fixation of Nitrogen (2008-2015). Research interests in Physiology, Molecular Biology and Genomics of nitrogen fixing bacteria. Recipient of the XVIth Prize of Science and Technology (year 2002) of the State of Paraná, Brazil. Member of the Brazilian Academy of Sciences since 2012. Scientific papers published: 211.

FIRST PORTABLE LABORATORY RELAB COURSE IN MOLECULAR BIOLOGY AND GENOMICS FOR SECONDARY SCHOOL TEACHERS IN CURITIBA, BRAZIL.

ABSTRACT PRESENTATION

This course had as target teachers of the Secondary Schools of Curitiba City Paraná State. The aim was to upgrade teachers that would request a portable laboratory of Molecular Biology and Genomics to visit their schools in order to stimulate young students to pursue a carrier in Biological Sciences. The course was advertised through printed material and via the Internet site of our Federal University of Paraná. Only in Curitiba there are 198 Secondary Schools. On the whole the course had 195 registrations with 83 from Curitiba. Teachers from 28 cities of the interior of the State of Paraná and from 13 other Brazilian State also applied for the course. Forty candidates from Paraná State were selected according to pre-established criteria, and 26 attended the course. The course took

place in the Department of Biochemistry and Molecular Biology of our University in the week of 25 to 29 of January -2016, and was taught by 10 Professors and 10 Pos Docs. The course was very well evaluated by the students and they were indeed very pleased with the opportunity to have an upgrade in the subject and to do practical lab work. Five School have already applied for a visit of the Portable Laboratory. The course received full support from the higher administration of our University and another course is planned for the second semester. This was a fulfilling experience for all involved. The Pos-docs were very excited with the perspective of teaching and are available for the visits to the schools and the next course.

MARIELA BATISTA

Batista Mariela / SENACYT
Coordinadora de Desarrollo de la Secretaría Nacional
de Ciencia, Tecnología e Innovación (Senacyt)
Telephone numbers +(507) 517-0149
(507) 6028-6800
mbatista@senacyt.gob.pa / batistamariel@yahoo.es
Panamá

BIOSKETCH

Superior Education:

Specialization in Higher Education, University of Panama, 2009.

Specialization in Methodologies for teaching Science Through Indagatory Strategies, Technological University of Panama, 2007.

Master in Environmental Science, concentration in Impact Studies, UNAP, 2012

Coordinator of Professional Development, Department of Learning Innovation, National Secretariat of Science, Technology and Innovation

Works in Science Education:

- Since 2006, I have been working with a teaching program that utilizes an indagatory strategy, de-

veloped by SENACYT for elementary schools within the Ministry of Education. The goal of this program is to support children in learning science and help them develop their scientific skills. We provide low cost materials for the students to work with. The program also includes a teacher mentoring during their science classes so that teachers can get feedback and improve their performance in class.

- Scientific Education Program focused on environmental sciences for high school students developed by the Smithsonian Tropical Research Institute (Panama), 2005.
- Los Bosques un Laboratorio Natural (Forest: a natural laboratory), Educational Program developed by SENACYT for high school students in rural and indigenous areas. 2010.

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Panama organized the first seminar and workshop for nine teachers from three schools of the Province of Chiriquí, which included topics on molecular biology and genetics. The teachers who were trained will complement their theoretical courses in their schools with experiments using the portable molecular biology lab.

The National Secretariat of Science, Technology and Innovation (SENACYT) made a partnership with the Universidad Autónoma de Chiriquí (UNACHI), who showed a special interest in the development of this program since this region has a great biodiversity and agricultural production. This partnership will allow stu-

dents to get to know and value scientific careers that the university offers, and thus, awake their interest in studying these disciplines.

In the first phase of the Project, which will begin in the second trimester of the school year, the students will visit the university with the teachers, and will be coached by UNACHI's specialists in molecular biology and genetics to develop experiments. Student's hands on experientia will begin during the second trimester of the school year.

Once the Project is finished, the results will be analyzed, looking forward to extending it to other regions.

JORGE TENORIO

Tenorio Mora Jorge
CONCYTEC
Telephone numbers +51 1 399-0030 Anexo 1910
jtenorio@concytec.gob.pe
Perú

BIOSKETCH

Biologist, is The National Program Manager of biotechnology (CONCYTEC: Concejo Nacional de Ciencia y tecnología)

He worked for Internacional Potato Center (CIP) as Associate Researcher since April4, 1988 until February 28, 2015

During these years, Joreg Tenorio managed, developed, and executed national and international research

projects in the area of breeding, biotechnology and virology. Jorge has contributed to various research Departments during his stay in CIP, such as (i) Breeding and Genetics (ii) Genetics Research (iii) Virology and Entomology

Jorge has also supervised and advised research thesis of pre-grado and post-graduate students

BIOTECHNOLOGY IN SECONDARY SCHOOLS : AN INTENSIVE COURSE FOR TEACHERS AND PORTABLE LABORATORIES

(Jorge Tenorio) Dr. Daniel Guerra

The new standards in secondary education as well as the current scientific and technological development , demand a solid preparation of teachers to cultivate skills related to science and technology in schools. The teaching of biotechnology is a medium capable of consolidating fundamental scientific understandings of physics, chemistry and biology at the same time that empowers the student in their ability to make informed decisions about their environment, food and health. Practical experience of directly manipulating the molecules of life using advanced technological tools and mobilizing scientific principles applied in the everyday world , has the ability to produce the sense of wonder it takes to value science as something close , powerfully useful and attractive. The practical experience of directly manipulate the molecules of life using advanced technological tools and mobilizing scientific principles that apply in the everyday world, has the capacity to produce the sense of wonder that is needed to assess the science as something close, powerfully useful and attractive.

The gap between the classroom and the few Peruvian institutions that develop national biotechnology may seem insurmountable. This project proposes the

high school teacher as the main mediator between the scientific world and the student tip. The teacher will be trained in an intensive course given by a select group of researchers among the best specialists in the country, expecting a sustained over time multiplier effect. We also propose a program of support for teachers to be able to replicate their experience in their respective schools.

In the course will encourage the curiosity of the master will be reviewed fundamental concepts of molecular biology and will practices in which directly will make use of the concepts to solve real-world problems. The laboratory practices may be transferred to the schools of the participating teachers through the use of portable laboratories and the support of staff of the universities.

This project includes three phases. The first comprises the preparation of the course, which includes the consolidation of the syllabus , enlisting scientists who teach teachers and standardization of laboratory practices . The second phase is the implementation of the course for teachers, that includes from the convening of these, until the evaluation. The third phase is the transfer of the course to students of secondary schools; in this pilot project is intended to reach two colleges and measure the impact of the activity of the students.

ABSTRACT PRESENTATION

JOAN GUINOVART

Guinovart Joan J.
Director of the Institute for Research in Biomedicine (IRB Barcelona) and Professor, University of Barcelona, Spain
President of the International Union of Biochemistry and Molecular Biology
guinovart@irbbarcelona.org
Telephone numbers +34 636981959 // +34 934037111
IRB Barcelona and University of Barcelona
Spain

Joan J. Guinovart (Tarragona, 1947) is a Professor of Biochemistry and Molecular Biology at the University of Barcelona (UB) and Director of the Institute for Research in Biomedicine (IRB Barcelona). He is the current President of the International Union of Biochemistry & Molecular Biology (IUBMB).

Dr. Guinovart's research focuses on glycogen metabolism, with special attention to the alterations in diabetes and Lafora disease. He is particularly interested in science education. He pioneered a series of courses called "I love Biochemistry" for secondary school stu-

dents, which have been given uninterruptedly at the UB ever since 1997. He also started the "Crazy about Biomedicine" series and is now involved in a project called TAMDEM, which is a partnership between IRB Barcelona and a primary school in the neighbourhood.

Dr. Guinovart is a member of the Catalan Academy (*Institut d'Estudis Catalans*) and the Spanish Royal Academy of Pharmacy. He has been recognized with the Federation of European Biochemical Societies (FEBS) *Diplôme d'honneur* and the St. George's Cross of the Government of Catalonia, among other distinctions.

CRAZY ABOUT SCIENCE: IGNITING PASSION FOR SCIENCE THROUGH A MODEL MENTORING PROGRAMME IN CATALONIA

Joan J. Guinovart

Institute for Research in Biomedicine (IRB Barcelona). The Barcelona Institute of Science and Technology. Barcelona, Spain

In the autumn of 2012, the Institute for Research in Biomedicine extended a special invitation to students across Catalonia in the final two years of their high-school studies to apply to a new programme, *Crazy About Biomedicine*, that would allow them to spend their Saturdays in our research laboratories and learn about our science directly from PhD students themselves. More than 400 students applied and 24 were selected to participate. They spent the next year learning about the research projects underway in the labs and doing hands-on practical work, using the latest cutting-edge equipment available at IRB Barcelona.

Now in its fourth year, *Crazy About Biomedicine* has proven to be a great success for students and scientists alike. It has allowed students interested in scien-

ce to explore innovative projects, get a taste of what research in a real lab is like, and ignite their passion for the biomedical sciences. Our PhD students, who serve as mentors, have a valuable opportunity to develop their communication and teaching skills and help set their students well on their way to a career in the biomedical sciences. Participants from the first year of *Crazy About Biomedicine* are now enrolled in science degrees at universities across Catalonia and beyond and they provide advice and guidance to students joining the programme, with the aim to establish a solid network that will accompany those who have participated in *Crazy About Biomedicine* throughout their scientific careers.

The *Fundació Catalunya-La Pedrera*, a local foundation committed to supporting science education and which supported the pilot phase of the project, has now extended the programme, now called *Crazy About Science*, to cover eight research fields, including biochemistry, economy, physics, mathematics, nature, new technologies and chemistry, at research institutes and universities across Catalonia, thus providing opportunities for nearly 200 students each year.

PETRA SKIEBE

Skiebe-Corrette Petra
Freie Universität Berlin
p.skiebe@fu-berlin.de

Telephone numbers: +49 30 773 950 99, +49 (0)176
54401 456
Germany

BIOSKETCH

Petra Skiebe-Corrette holds a doctorate in neurobiology and completed her habilitation (German equivalent of associate professor) in 2002. She is director of NatLab, an informal science laboratory (*Schülerlabor*) at the Freie Universität Berlin which offers both primary school pupils and high school students the opportunity to perform up-to-date inquiry-based experiments in biology and chemistry. She also initiated a network *Schülerlabore* in the German states Berlin and Brandenburg ("GenaU"). She serves on the board of the *LernortLabor Bundesverband der Schülerlabore e.V.*, an association supporting *Schülerlabore* within Germany.

Petra Skiebe-Corrette has been the German representative for four European Union grants: "SciencEduc" in 2004-2006, "POLLEN" in 2006 -2009, "Fibonacci" in 2009-2013 and "Sustain" (2013-2016), all of which with the goal to promote inquiry-based science education within Europe. In order to support inquiry-based science education within primary schools on a long term basis, "TuWaS!" (Technik

und Naturwissenschaften an Schulen, Technology and Science in Schools) was founded in 2007 as a cooperation between the Freie Universität Berlin and the Berlin Brandenburg Academy of Sciences and Humanities. Currently, TuWaS! is serving over 250 schools in four different German states (Berlin, North Rhine-Westphalia, Brandenburg, Hamburg). In North Rhine-Westphalia, TuWaS! was developed with and financed by the Chambers of Commerce of Cologne and Bonn Rhein-Sieg. Petra Skiebe-Corrette also served on the advisory board of the National Science Resources Center (now the Smithsonian Science Education Center) in Washington DC (2009-2012) and has been invited as an expert into the IAP/Science Education Global Council (2013- present) and into the Working Group on Science Education of ALLEA (2013- present). In 2015 Petra Skiebe-Corrette has been invited to serve on the German national forum concerning the topic "Informal and non-formal education" related to the UNESCO Global Action Programme on Education for Sustainable Development.

SCHÜLERLABORE (NON-FORMAL LABORATORIES) – A GERMAN INVENTION

Prof. Dr. Petra Skiebe-Corrette
Head of the Schülerlabor Natlab
Head of TuWaS! an inquiry-based science education
program in schools
Department of Biology, Chemistry and Pharmacy
Freie Universität Berlin, Germany

Schülerlabore (German) are non-formal out-of-school laboratories where school students perform experiments themselves. These laboratories were founded as a result of Germany's ranking in the PISA and OECD studies and in response to the declining number of students electing to study the "hard" sciences

such as chemistry, physics and mathematics. They are not limited to science but also include technology, engineering and business knowledge. The first of these laboratories were founded in the beginning of the 90s; today there are about 320 within Germany. The aim of these laboratories is to increase children's interest in science and also technology by providing hands-on activities in an authentic environment thus giving a realistic and modern view of science and technology. The children that visit can be primary or middle school pupils or high school students. Often *Schülerlabore* cater to multiple grades, seldom to all grades. Entire classes are able to visit most science laboratories. In addition to pupils and school students, *Schülerlabore* also target student teachers and tea-

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chers by being involved in pre- and post-service professional development. These laboratories are mainly located at universities and research institutions, but they can also be found in science centres, museums or industry. In order to learn from each other and to better lobby, local networks of *Schülerlabore* were formed, as well a national association (LernortLabor - Bundesverband der Schülerlabore e.V.). One of the first regional networks that was founded is called Ge-naU (Gemeinsam für naturwissenschaftlich-technischen Unterricht, Together for science and technology education), which includes 15 different *Schülerlabore* from Berlin and Brandenburg (two of the 16 states in Germany). A substantial number of *Schülerlabore* are also integrating education for sustainable development into their programs to demonstrate the power science and technology have to shape the future.

GUILLERMO FERNÁNDEZ

Fernández de la Garza Guillermo
Executive Director of the US-Mexico
Foundation for Science, A.C.
Telephone numbers Of: +52 (55) 5200 0561,
Movil: +52 (55) 9185 4851
gfernandez@fumec.org
México

Guillermo Fernández de la Garza is President and Chief Executive Officer of the United States - Mexico Foundation for Science (FUMEC), an endowed non-profit organization sponsored by the United States and the Mexican Governments. In FUMEC he has worked to develop binational regional innovation clusters in areas such as aerospace, automotive, ICT and advanced manufacturing, as well as facilitating innovation in medium and small businesses. He has bachelor's degrees in Engineering and in Physics from Mexico's National Autonomous University, a master's degree in Engineering Economics from Stanford University and completed advanced studies in Nuclear Engineering and Business Administration of IPN and IPADE.

Fernández de la Garza has worked in the development of Science Education Innovation programs, in Mexican Public-Private Partnerships linking industry, universities and government in the definition of strategies, in the development of technical and educational infrastructure, in the organization of business – university consortia related to advanced products and in the interaction with similar networks in other countries. Before, he was advisor to UNIDO, UNESCO, UNDP and the IAEA as well as to the governments of Chile, Brazil and Argentina in innovation strategies.

Guillermo has made notable contributions to the popularization of science and to science education. He was a founding member of the Mexican Society for Science and Technology Popularization (SOMEDICYT) and convener of a team of scientists, educators and business leaders which founded CHISPA - a science

magazine for children that was published monthly in Mexico from 1978 to 1998. CHISPA won Mexican and international awards and selections of articles from the Magazine are still distributed by the Mexican Ministry of Education. The meetings of children and scientist that CHISPA organised evolved to become the "Saturdays and Sundays in Science" programme that has been operated by the Mexican Academy of Sciences.

In 2002, with the support FUMEC, he initiated the setting up of INNOVEC, Innovation in Science Education, a non-profit organization that has been instrumental in the application of the Inquiry-Based Science Education systems in Mexican public schools. He organized jointly with the Ministry of Education and the Mexican Academy of Science the initial trial of activities in Mexico of the Science and Technology for Children curriculum.

Guillermo was awarded the 2008 PuRkwa Prize offered by the French Academy of Science and the Saint Etienne Mining School for innovative practices in science education.

He was founder and first Chairman of the Mexican Associations of Industrial Research (ADIAT) and of High Tech Business Incubators and Technology Parks (AMIEPAT). He served also as Adjoin Director at the Mexican National Council of Science and Technology (CONACYT), as General Director of the Mexican Electric Power Research Institute and as CEO of the Mexican National Commission for Energy Efficiency (CONAE).

EL PROGRAMA DE ENSEÑANZA VIVENCIAL E INDAGATORIA QUE APOYA FUMEC EN MÉXICO.

FUMEC, la Fundación México - Estados Unidos para la Ciencia, apoya la colaboración de Innovación en la Enseñanza de la Ciencia (INNOVEC) con el Smithsonian Science Education Center (SSEC) y con organizaciones semejantes de otros países para desarrollar y aplicar modelos como el LASER del SSEC en México.

El reto inicial de FUMEC fue organizar INNOVEC como una ONG con liderazgos académicos y empresariales que le dieran presencia en el sector educativo y de investigación y apoyo público y privado. Posteriormente ha colaborado para lograr y mantener el apoyo de la Secretaría de Educación Pública Nacional y de los Gobiernos Estatales.

El gran reto de INNOVEC ha sido el asegurar que en los programas estatales se tiene el apoyo y el seguimiento adecuado para que se trabaje adecuadamente, tanto en la preparación de los maestros, asesores

y autoridades; el suministro de los materiales, y en general en todo lo que se requiere en los salones de clase para que el maestro pueda trabajar eficazmente con estos programas.

INNOVEC ayuda a desarrollar bases para la evaluación de estos sistemas, aprovechando las mejores experiencias internacionales y colaborando con grupos especializados de México.

La experiencia de INNOVEC para apoyar el trabajo indagatorio de los maestros le ha convertido en un referente y en apoyo para programas de enseñanza de la ciencia promovidos por empresas en escuelas públicas mexicanas y de otros países.

Guillermo Fernández de la Garza

Director Ejecutivo de FUMEC,
Consejero de INNOVEC

NORMA NUDELMAN

Nudelman Norma
University of Buenos Aires
Telephone numbers 5411 68345221
sbarbati_04@hotmail.com nudelman@qo.fcen.uba.ar
Argentina

Current Positions. Full Professor, University of Buenos Aires. Superior Researcher, National Scientific Research Council (CONICET). Titular Member of the Argentine Academy of Science (ANCEFN), Focal Point for IANAS SEP since 2004. Executive Member of the Argentine Chemical Society (AQA). Director of the "Inquired Based Science Education HaCE" Program (ANCEFN). Chair of IANAS SEP (2008-2015), member of the GC of IAP SEP since 2010. Member of CRC (Committee for the Revision of Chemicals, 2016-2020) from the United Nations Environmental Program (UNEP).

Previous positions in education. Associate Member of the IUPAC Committee on CHEMISTRY EDUCATION (2000-7) Titular Member of the IUPAC CHEMRAWN (Committee on CHEMical Research Applied to the World Needs) (2001-9). Founder of the Society of Organic Chemistry Research (SAIQO, 1981), Founder and director of the Argentine Chemistry Olympiads (1991-2000); and founder of the Ibero-American Chemistry Olympiad (1995), both continuing at present. Member of the INT. CHEM OLYMPIADS Steering Committee (1996-2000) Director of the Master in "ENVIRONMENTAL SCIENCES" FCEN, Univ of Buenos Aires (2000-8).

Awards in Education. Have received several distinctions and awards. Some of the most recent are: Award in »Organometallic Chemistry« from the Argentine Academy of Sciences (2006) "Distinguish Researcher" from UNEP (2010); Award from the Argentine Chemical Society (AQA), for her "Trajectory in Chemistry Education" (2010); Clarin-Zurich Award for her work on Science Education 2012; "Rebeca Gersch-

bam, Distinguish Researcher" Award from the Ministry of Sci. & Technology, 2012. (given to a women for the first time). "Excellence in Science Education" FUNPRECIT, (Found for Research in Sci&Techn), Nov 2015.

Working in **Green Chem (GC)** both in research (more than 20 years) and in education. (since 2003).

Editor of the first book on GC in Spanish (Química Sustentable, 2004, UNL 335 pp), the coordinator of the annual Latin American Courses on QS for secondary schools teachers since 2005- (organized by the National Academy of Sciences and co-sponsored by the Ministries of Ed. and IANAS; the author of "Química Verde" (INET) a textbook for secondary schools teachers; director of the Latin American Workshop on Inquired Based Science Education at the secondary level (September 2009. Organizer of the Latin American Seminar on Science Education Strategic Planning (2011) and the Symposium on Science, Technology, Engineering and mathematical Education (Buenos Aires, 2014) co-sponsored by the Ministries of Ed. the Ministry of Science and Techn., OEIA and IANAS Several theoretical-practical workshops and seminars on Green Chemistry for secondary school teachers have been offered in Argentine and other Latin American countries, since 2004.

Scientific Research Author of 6 books, (3 in English) 250 publications in international scientific journals, more than 400 communications in scientific international meetings and director of 25 PhD thesis. Plenary Lecturer in many Scientific international meetings and Visiting Professor in several American, European, Japanese and Australian universities.

THE GREEN CHEMISTRY EXPERIENCE

N.Sbarbati Nudelman (University of Buenos Aires, Argentina)

Green chemistry was defined as a set of principles to design a safer product, with a process preventing the use of toxic reagents and producing the smaller amounts of waste materials. But, at present, sustainable chemistry goes beyond those goals including other issues, such as: the energy economy, the emission's reduction, the atom economy, the use of renewable energies, the reduction in fossil fuels and organic solvents, the use natural products as alternative sources, the E-factor greenish of an industrial process, the sustainable use of agrochemicals, biofuels and biocatalysts, etc. The experience of the Argentine Academy of Sciences in offering theoretical-practical courses on these subjects, for secondary school teachers goes back to more than 10 years ago, the

first one at a Latin American scale took place in 2004, since then more than 30 courses/workshops have been offered. Teachers and students like this kind of environmentally friendly chemistry, that also includes visits to local industrial plants.

The letter from the Academies to the WS of Rio+20; several of the UN SDGs for the 2016-2030 period; the FAO's Program for Food Security to all by 2030; the "Laudato Sii" P. Francis encyclical; the 2015 CCC Paris's agreement, and the "Children as agent of change" initiative in the 2015 Workshop in the Vatican Pontificia Academy of Science; show that the Sustainable development is not only a matter of science; it is a catalyst for change, an innovative approach to problem-solving and a long-term solution to global sustainability challenges. This requires a radical redesign of our social behavior. and "bottom-up" voluntary actions, education is essential for achieving both!.

PILAR REYES

Reyes Pilar
Directora Programa ECBI
Universidad de Chile
Telephone number + (562) 2681 2378
preyesj@u.uchile.cl
Chile

BIOSKETCH

Pilar Reyes is Executive Director of the Inquiry Based Science Education Program of University of Chile in Santiago from 2007 to date. She graduated as a Biology teacher in 1989 at the University of Concepción. She is Master in Science Education, and was awarded the Ph.D in Education from the University of Warwick, England in 2001. She received the President of the Republic of Chile Scholarship grant from MIDEPLAN. Her line of research is dedicated both to teaching and learning inquiry science for general education and professional development of teachers; which is performed through the process of appropriation of the inquiry approach for science education in order to establish professional learning communities. Currently, she is leading the process of improving the quality of education in different Chilean districts and schools. A big operation is going on with Catemu and Panquehue district areas in the fifth region. This task started in the second half of 2010 with two schools and 300 children. Since then, the program has expanded to 100% of public schools in both districts, which include 150 teachers and 2,000 children. This has not been done in isolation but with the cooperation of scientists from the University of Chile, executives

from Anglo American Company and two local leaders from the community to provide high quality science education for all children. Since 2009, she has been mentoring the team of Toconao school teachers, in order to promote the quality of science education. From these experiences, she has been able to see changes in children, from rote memory learning (with traditional teaching methods) to effectively enjoy learning. She has observed children asking questions, proposing explanations and predictions, conducting investigations, making observations, and interpreting and communicating their ideas based on evidence. In addition, children recognize their emotions and motivations that allow them to improve through active participative learning. She has also been able to see changes in teachers which include constructing a teaching and learning model, and applying it with consistency. At the present she is working to sustain school improvement by articulating and communicating among different levels of leadership the importance to promote critical thinking in children, professional development to teachers and building strong network with stakeholders.

INQUIRY BASED SCIENCE EDUCATION (ECBI) AND ITS IMPACT IN SCHOOL IMPROVEMENT. THE CASE OF TOCONAO – ALMA & CATEMU, PANQUEHUE – ANGLO AMERICAN - CHILE

Pilar Reyes, Ph.D. in Education.
preyesj@u.uchile.cl

There is consensus at different levels that the achievement of a more equitable access to scientific knowledge requires improving the quality of science education in schools. This new deal between science and schools has a great potential to promote the changes that are required to improve the quality and equity of education.

The community from Toconao School supported by ALMA Observatory, as well as the public schools from Catemu & Panquehue supported by Anglo American Chagres Sur, has encouraged the implementation of the "Inquiry-Based Science Education Program (ECBI, Spanish acronym)", from the Faculty of Medicine of the University of Chile, to ensure our children get high quality science education.

Chilean Inquiry Based Science Education Program (ECBI), is fully motivated by the challenge of contributing and making progress in primary science by implementing the systemic approach. In this context of

ABSTRACT PRESENTATION

inquiry science education, the belief is that children in Chile will be able to experience an education that is focused on learning, by respecting their individuality, by offering them developing spaces and by helping them to work with their classmates and adults in order to prepare them for lifelong learning. We are convinced that primary schools need teachers that are able to offer learning opportunities to children in a collaborative atmosphere, that can foster communication, creativity, critical thinking and develop their capacity to solve problems. This requires to re-think how children currently learn, to prepare teachers consistently, and to face the responsibility with commitment. The program is inspired by the belief that high quality science education is important for all children. Effective science education is expected not only to expand children's understanding of the natural and material world, but also to stimulate their curiosity, introduce them to the practice of scientific inquiry and prepare them for total participation in society. It is anticipated that effective science education will contribute to the full expression of children's creative potential, improving their quality of life and that of their community.

The process of working in Toconao School, and in all the public schools from Catemu and Panquehue, has given us evidence of the changes that have been taking place. Children are more autonomous, they have developed their scientific skills, such as questioning, predicting, observing, interpreting, and communicat-

ing both oral and written arguments. They have said that "all Chilean children have the right to learn good quality of science".

The team acknowledges the need to connect teacher's professional development to students learning. In this sense, we have been able to observe that 52% of teachers from schools are conducting inquiry lessons, 36% of teachers conduct pre-inquiry lessons and 12% of teachers are reluctant to change. With the first group we are promoting to share their experiences to the second group and work collaboratively, meanwhile with reluctant teachers we are offering them direct help from a member of ECBI program who has been specially trained to facilitate the adoption of this methodology. Parents are welcomed to participate in public lessons, where children show their parents what they have been learning. Parents feel excited with these results. Consequently, the ECBI mission in Toconao, Catemu & Panquehue schools is inspiring. Teachers are cultivating their motivations to teach inquiry science; and they are being helped with new professional skills to teach science. This is not an easy task, but it is challenging. Schools are progressively becoming learning communities; teachers are working with the focus on children's learning, and understanding that collaboration is a key aspect to improve. Teachers are developing more positive relationships with other members, and leadership is being developed at all levels in order to facilitate interaction between people and institutions.

ANNA PASCUCCI

Pascucci Anna
ANISN –National Association of Natural Sciences
Teachers
Telephone numbers +39 3333181128
anna.pascucci@anispn.it; anna.pascucci@gmail.com
Italy

Anna Pascucci Biologist. PhD in Cellular and Molecular Genetics. Science Teacher in High School. Supervisor trainer at SISS - School of Specialization for Initial Teaching at the University Federico II, Naples. Senior Trainer INVALSI MIUR-awareness programs for OECD-PISA. Italian coordinator of the European project Volvox (FP6 2005-2008), Fibonacci (FP7 2010-2013), SUSTAIN (Supporting Science Teaching Advancement through Inquiry) (2013-2016), AMGEN Teach (2014-2017). Italian responsible of the Scientiam Inquirendo Discere Programme (SID) with 10 pilot centers for the dissemination of IBSE. Member of the National Scientific Committee of the Science Education PON INDIRE (National Institute for Innovation and Educational Research). Member of the National Interministerial Group for Scientific Culture coordinated by prof. L. Berlinguer. Italian responsible of the IBO - International Biology Olympiad and member of the international jury. Deputy ambassador of Scientix. President of the National Association of Natural Science Teachers (ANISN) (2007-2013). Member of the Scientific Committee and the Steering Group of the National Plan ISS - Teaching Experimental Sciences (2007-2010). Coordinator of the biological area of CODIS Master of Communication and Scientific Dissemination at the University "Federico II" (2007-2009). Coordinator of the Group of "Spreading Scientific Culture" at the 'Institute of Genetics and Biophysics, CNR, Naples (2001-2007). She has twenty years of experience in coordination of National and International projects, science exhibitions, conferences and training courses on Science Education especially focused on IBSE and Molecular Biology. She spent several periods abroad for educational cooperation. She has a strong cooperation with Italian and International Universities, Educational Institutes, Teachers Associations, school networks and International bodies such as Science Education Group of ALLEA (ALL European Academies) and IAP (Inter Academy Panel). She published over 50 scientific and didactic articles on national and international journals and contributions in Educational books.

Synthesis of the National Association of Natural Science Teachers (ANISN) activities

ANISN is a recognized Italian association with legal entity, founded in 1979 recognized by MIUR – Ministry of Education and Research - both as qualified institution for the training of teachers (DM. 177/00 Article 4 - Directive 90/03 art. 6, 7) credited with prot. N° 1877 (DD / 5) / RU / U of 27/02/2009) authorized to set up institutional training courses for Natural Science teachers and as a MIUR external entity able to organize and conduct initiatives for the identification and promotion of excellence in Italian schools.

ANISN is a non-profit Association with more than 2000 members (science teachers, trainers, scientists, didactic researchers) organized in 26 local sections distributed in all Italian regions. ANISN activities are many (designing, supporting, implementing didactic resources; organizing working groups, national and local teacher training courses, seminars and meetings), all based on strongly motivated members that aim to improve and support continuously the quality and dissemination of Scientific Education in Italy, with the awareness of the crucial role that teachers and science teaching in school play in scientific culture and in the process of development of the students as science active citizens. In more details, ANISN organizes National and International (*International Biology Olympiad - IBO; International Earth Science Olympiad - IESO*) Science Olympiad for students of lower and higher secondary schools with the involvement of hundreds teachers and thirty thousands of students. ANISN continually collaborates in projects and plans for Science Education with many institutions (MIUR and peripheral organs, INDIRE, INVALSI, Accademia dei Lincei, Accademia dei XL, Universities, Museums, Science Centers, EMBL – ELLS), public and private entities that have a significant interest in Science Education. ANISN has been involved in many European Projects (FP6; FP7; Comenius) Edu – Geo; Evolution Megalab, Volvox Project, OIKOS, Science on Stage, Fibonacci, SUSTAIN, AMGEN Teach.

In 2010 ANISN was awarded with a presidential medal by the Italian Republic President, *Giorgio Napolitano*, for the high level quality of its activities and the strong and continuous engagement in improving

teachers CPD and dissemination of scientific culture in Italy. The know-how transfer is implemented also by an updating web site www.anisn.it, the individual web sites of the local sections, the publication of three magazines (“Natural Sciences in the school”; the “Il Bollettino Campano” and “NATURALMENTE”) and the electronic matrix newsletter ANISN NEWS.

To improve IBSE in Italy, in 2011 in cooperation with the Accademia dei Lincei and Ministry of Education, ANISN started the successful Programme “*Scientiam Inquirendo Discere* - SID” devoted to IBSE CPD teachers from primary to secondary school. ANISN was selected in the framework of the project AMGEN Teach <http://www.amgenteach.eu/> (2013 -2017) by the European Schoolnet and AMGEN Foundation,

as Italian National Provider for in service courses focus on IBSE and life sciences for secondary school teachers. ANISN is partner in SUSTAIN (Supporting Science Teaching Advancement through Inquiry) project (2013 -2016) which aims to develop resources to train trainers and teachers on the subject of Education for Sustainable Development (ESD) through Inquiry-Based Science Education (IBSE).

Anna Pascucci has been the President of ANISN for six years (2007-2013). Now I am responsible of the International Biology Olympiad (IBO); the Programme *Scientiam Inquirendo Discere* – SID; the AMGEN Teach and the SUSTAIN project and I am member of the ANISN National Council.

A SYSTEMIC APPROACH FOR IBSE IMPLEMENTATION IN ITALY

Anna Pascucci

ANISN – National Association of Natural Science Teachers

*I will present the key elements, strategies and results of the system architecture of the Programme *Scientiam Inquirendo Discere* – SID.*

The programme *Scientiam Inquirendo Discere* (SID) has created a systemic model for IBSE implementation in Italy via Continuing Professional Development (CPD) of Science teachers. It started in 2011 as a collaborative National Programme between the Accademia Nazionale dei Lincei and the National Association of Natural Science Teachers (ANISN). It is supported by the Ministry of Education and some local Foundations. SID was developed profiting from previous Italian experiences and initiatives, but its roots stem

from the experiences and results of the participation of ANISN in the Fibonacci Project (FP7) and from a continuous cooperation with the French Académie des sciences and the Foundation La main à la pâte.

The programme has a multilevel organization with local operational nuclei called “SID pilot centres” to provide partnerships with networks of schools and promotion of community practices in Science. In five years ten pilot centres have been created in the main Italian regions/cities (Milan, Turin, Venice, Pisa, Rome, Naples, Bari, Potenza, Messina, Sassari). They are hosted by Universities, Research Institutions or local Academies and represent reference centers for multilevel IBSE training courses for teachers and trainers from primary to secondary school. SID main activities concerns: 1. periodic in presence training courses for teachers both at local, National and International level; 2. peer to peer supporting actions in presence and online; 3. development of resources and kit boxes for classroom activities; 4. Twinning between pilot centers to support the implementation.

After five years the SID programme has achieved important strategic objectives. It has created an effective model of cooperation aimed for IBSE implementation in Italy, strengthened international collaboration and produced innovative training model, a huge

amount of resources and materials (kit-boxes), the active involvement of over 1500 teachers and 70.000 students and it has created a solid system with 10 pilot centers, 14 local responsible of pilot centers and 70 trainers.

A SYSTEMIC APPROACH FOR IBSE IMPLEMENTATION IN ITALY OR THE IBSE EXPERIENCE IN ITALY

Anna Pascucci

ANISN – National Association of Natural Science Teachers

How has been developed *Scientiam Inquirendo Discere (SID)*, a systemic CPD National Programme to improve IBSE at school in Italy. Which have been the key strategies to set up and develop its architecture. Which have been the models created at different scale. Which is the impact of the programme after five years.

or

Architecture, key strategies and results of *Scientiam Inquirendo Discere (SID)*. A systemic CPD Programme aimed to improve IBSE at school (students' age 4 -16). It started in 2011 thanks to the cooperation with *La main à la pâte* and the partnership of ANISN in the Fibonacci Project (FP7). At present ten *SID pilot centres* are active in the main Italian regions.

SHELLEY PEERS

Peers Shelley
AM Director - Primary Connections Development
Australian Academy of Science
Telephone numbers - +61 (0)2 8095 6558 Mobile
0467 900 779
Shelley.Peers@science.org.au
Australia

BIOSKETCH

Director - *Primary Connections* Development

Australian Academy of Science

Asia-Pacific Region Co-ordinator IAP SEP Global Council

Shelley taught in primary schools for seven years. She has been on the Council of state and national Science Teacher Associations in Australia. She was a regional and state co-ordinator of science education programs from pre-school to Year 12 in Government and Catholic school systems. She was a writer of the Queensland Science Syllabus (1999) and was on the Working Group and Reference Group to develop the

Australian Curriculum: Science, published in 2010. Since 2005 Shelley has been a Director of *Primary Connections* at the Australian Academy of Science, and lead the development of the design and publication of the original suite of 31 *Primary Connections* curriculum resources and a professional learning program that is now in use in one way or another in 79% of Australian primary schools. This potentially impacts on up to 1.5 million students and up to 100,000 teachers. Her Master of Education (Research) explored teacher professional growth during implementation of a science curriculum innovation (2000). Shelley is also a qualified medical biochemist.

ABSTRACT PRESENTATION

'SHORT PRESENTATIONS ON THE USE OF IBSE AND HANDS-ON LEARNING AT PRIMARY AND SECONDARY LEVELS IN DIFFERENT COUNTRIES.'

Shelley Peers (Australia)
The Primary Connections initiative

This presentation will provide an overview of the *Primary Connections: linking science with literacy* program of the Australian Academy of Science. This is an inquiry-based approach that has developed curriculum materials and a professional learning program to improve teacher confidence and build teacher competence to teach science. This focus is used because

it has been shown that teachers are the single most important school-based factor affecting student learning outcomes. Some of the key features of the program will be explored as well as the main learnings from over 10 years of work.

Shelley Peers, AM
Director - *Primary Connections* Development
Australian Academy of Science

EDGARD HERNÁNDEZ

Hernández Edgard
Equipo Coordinación Nacional Escuela División de
Educación General
Ministerio de Educación
Telephone numbers + (562) 2406 5880 / 2406 5893
edgard.hernandez@mineduc.cl
Chile

BIOSKETCH

Edgard Hernández was trained as a biologist, and has received a Master's degree in education and has a specialty in government and public administration. His initial employment was as a teacher in rural and city schools in the North Region of Chile. After this, he entered an academic career joining several initiatives that involved science education. He participated in the implementation of the ECBI Program in Southern Chile. This was the first initiative in IBSE in Chile. In parallel with this he joined academic work in the professional development and in the design of specialization exercises connected with careers in science education. Afterwards, he joined the public service participations in initiatives linked with the Agency for

International Cooperation (AGCI) of the Chilean government. This was a Program for Education and Social Cohesion co-financed by the European Union and the Chilean Government that had the objective of achieving scientific literacy and citizenship among the students .

Presently in addition to his academic work, he is part of the team of natural sciences in the national coordination of basic education in the Ministry of Education. This is the team that is managing, among other things, the implementation of the Program of Investigación Científica para la Educación en Ciencias, of which he is the academic coordinator.

ABSTRACT PRESENTATION

The ICEC is an initiative of the Ministry of Education of Chile that has the objective to improve the quality of the teaching and learning of the Natural Sciences in Public Primary School through the implementation of Scientific inquiry as an educational approach. The ICEC Program is being implemented in collaboration with 13 Chilean Universities that are located in 11 Regions of the country and is centered on a model of professional development of teachers that aims at the improvement of the quality of the science education in a local context that strengthens the role of the teachers and aims to the attainment of autonomy in deci-

sions dealing with the teaching and learning of sciences. The model includes, for the first time in Chile, a process of capacity building in the didactics of sciences in which of pre-kinder teachers together with teachers that work in primary and secondary education. It is hoped that this approach will foster the formation of Regional Learning communities which with the support of the University of that Region will generate a systematic, space of reflection collaboration and professional development that has the objective of improving the science education in that Region

CAROL O'DONNELL

O'Donnell Carol
Director, Smithsonian Science Education Center
Smithsonian Institution
Telephone numbers Main: 202-633-2972 / Blackberry: 202-322-5855 /
Fax: (202) 287-7309 (Executive Office)
ODonnellC@si.edu
U.S.A.

BIOSKETCH

Biosketch (short one paragraph with a highlight of your work in science education)

Dr. Carol O'Donnell is the Executive Director of the Smithsonian Science Education Center (SSEC), a unit of the Smithsonian Institution that is dedicated to transforming the learning and teaching of science throughout the nation and world. In this role, Carol is responsible for all operational activities and planning for the unit, including building awareness for K-12 science education reform among State and district leaders; conducting programs that support the pro-

fessional growth of K-12 science teachers and school leaders; and, overseeing all research and curricular resource development, philanthropic development, and administration. Previously, Carol was a leader in the Office of State Support at the US Department of Education, supporting States and districts as they build their capacity to implement and sustain education reforms and achieve continued improvement in student outcomes. A former K-12 teacher and curriculum developer, Dr. O'Donnell is still in the classroom today, serving on the part-time faculty of the Physics Department at The George Washington University.

SMITHSONIAN SCIENCE EDUCATION CENTER'S ASSESSMENT OF THE INQUIRY BASED SCIENCE EDUCATION METHOD IN SCIENCE LEARNING: THE ROLE OF ISBE IN DEVELOPING GLOBAL TALENT

ABSTRACT PRESENTATION

The challenges of the 21st Century require global talent educated to think critically, acquire new knowledge, and produce and apply creative solutions. As the only formal education unit of the Smithsonian Institution, the Smithsonian Science Education Center has been transforming the teaching and learning of science for all students for more than 30 years. Our world class science curriculum (*Science and Technology Concepts™*) brings the science, history, art, and culture of the Smithsonian into science classrooms all over the world. In this talk, I will share with you the results of a recent 5-year randomized control trial (RCT) longitudinal study completed in 2015 that stress tested the Smithsonian's curriculum and Leadership and Assistance for Science Education Reform (LASER) model in rural North Carolina, Houston Texas and Northern New Mexico of the United States. Unlike other programs that focus exclusively on one aspect

of reform, such as curriculum or teacher professional development, the LASER model takes an integrated systemic approach to teaching science that includes five elements: (1) Professional Development, (2) Inquiry-Based Science Education (ISBE) Curriculum, (3) Assessment, (4) Materials Support, and (5) Administrative and Community Support. This rigorous study involving 60,000 students demonstrated the efficacy of STC and the LASER model in increasing student achievement across diverse regions. Results show increases in student achievement in science, math and reading, including gains by students who are economically-disadvantaged, English Language Learners, and students with special needs. With these results, the Smithsonian Science Education Center is ideally positioned to apply proven strategies that increase student achievement worldwide.

See more here: <https://ssec.si.edu/our-results>

PIERRE LÉNA

Léna Pierre
Fondation La main à la pâte
Telephone numbers +33 (0)6 08 21 44 48
pierre.lena@obsspm.fr
France

BIOSKETCH

Biosketch (short one paragraph with a highlight of your work in science education)

Pierre Léna, Emeritus professor, Université Paris-Diderot, is an astrophysicist, who was deeply involved in the conception of the European Very Large Telescope in Chile. With Georges Charpak and Yves Quéré, he was one of the three co-founders of *La main à la*

pâte in France (1996), an action of the French Academy of sciences aimed at renovating science education in primary, then in middle schools. He became the first president of the Fondation *La main à la pâte* (2012), and succeeded (2008) J. Allende as Chair of the InterAcademyPartnership, Science Education Program. He has extensively published on these actions.

Home page: <https://perso.lesia.obspm.fr/pierre-lena/>

ABSTRACT PRESENTATION

LA MAIN À LA PÂTE IN FRANCE AND BEYOND : PAST AND FUTURE.

I. *La main à la pâte* began in 1996, at the initiative of Georges Charpak and the Académie des sciences in France, aiming at primary school science education. Lessons from 20 years of activity, in France and beyond, will be presented. First, the principles. Second, the strategy of successive ruptures in primary school teaching, at the beginning of middle school (Gr. 6 & 7), at the in-service teacher training. These ruptures were carried as prototypes, to be evaluated, proposed and relayed by institutional generalizations. Third, the numerous collaborations beyond France, leading to exchanges and dissemination of IBSE practices. Positive assessment of these steps provided a strong impact on the national policy, as well as inspiring international cooperations.

II. The world is changing, *school as usual* is no longer possible in front of the challenges affecting the youth : poverty, migrations, wars and refugees, climate change and sustainable development issues, but also digital revolution and ethical questions to science. IBSE principles remain entirely valid, but have to be deepened and possibly expanded to cope with these new challenges, on line with the development of *big ideas*. How can teachers be better prepared, especially at distance ? How can youngsters be better associated ? How can the scientific community continue to contribute ? Some examples of new domains or actions explored by *La main à la pâte* will be given.

If you are not a speaker in the tentative program, but have been invited to participate and you plan to intervene in one of the parallel Round Table Discussions, also give us a biographical sketch and a brief summary of your presentations.

P. Léna was initially planned in Round Table B, at his wish. But at the moment, (March 9th), there is no other *Lamap* person able to attend Table C, at which we have informations to communicate. Hence Pléna will go to Table C, unless an additional person is found.

Summary : Since several years, *La main à la pâte* has developed, for primary school teachers, modules contributing to environmental issues, based on IBSE principles : Oceans, Climate, Natural disasters, Eco-mobility, Eco-housing, Biodiversity, while some others are related to health issues. The contents and method to implement and disseminate these modules shall be presented.

DATO LEE YEE CHEONG

Lee Yee Cheong
President International Science,
Technology & Innovation Centre (ISTIC)
Telephone numbers : +6012 2873909
dlyeec@gmail.com / dlyeec@yahoo.com
Malaysia

BIOSKETCH

Academician Dato' Ir. (Dr.) Lee Yee Cheong, BE Hons (University of Adelaide), Hon Doc Eng (UNITEN), DPMP, KMN, AO.

Dato' Lee is the Malaysian Chairman, Governing Council, International Science Technology and Innovation Centre for South-South Cooperation under the auspices of UNESCO (ISTIC), Kuala Lumpur.

He is a member of the National Science and Research Council, Malaysia; Member of the Malaysian Global Science Innovation Advisory Council (GSIAC) at the New York Academy of Sciences; Chairman of Governing Board, the Institute of Energy Policy and Research (IEPR), National Energy University Malaysia (UNITEN); Adjunct Professor of UNITEN; Pro Chancellor, Infrastructure University Malaysia; Patron of the International Young Professionals Foundation; and Member of the International Advisory Board of "Engineers Without Borders" Canada. He is a member of Board of Trustees, Future University, Sudan and Advisor, Pro-Tem Committee, African Academy of Engineering and Technology.

He was a Member of the National Economic and Social Council Kenya 2005-2011; Member of the International Advisory Board, Grand Challenges Canada 2008-2011. He was President and now Distinguished Honorary Fellow of the Institution of Engineers Malaysia. He was Member of the Board of Engineers Malaysia and the Board of Architects Malaysia and President of the World Federation of Engineering Organisations (WFEO) 2003-2005. He is an Honorary Fellow of the Institution of Engineering and Technology, UK; the Institution of Civil Engineers, UK; Engineers Australia; and Institution of Engineers, Mauritius. He is Honorary President of Commonwealth Engineers Council (CEC). He was Co-Chair of Task Force "Science, Technology and Innovation" of the United Nations Millennium Project 2002-2005; Member of the Board of Trustees of Engineers Against Poverty, U.K and Member of the International Commission for Education for Sustainable Development Practice, Earth Institute, Columbia University 2006-2008. He represented WFEO in UNCSD Civil Society

Major Group "International Science and Technology Community" 2001-2006, in that capacity, he attended World Summit on Sustainable Development (WSSD), Johannesburg 2002 and the World Summit on Information Societies (WSIS), Tunis 2005.

He served with the National Electricity Board Malaysia, 1961-1979. He founded and was CEO of Tenaga Ewbank Preece and later KTA Tenaga 1980-2002. He became a Partner of Ewbank Preece Consulting Group, UK; He was Board Director of UMW Holdings Berhad 2000-2008; Commissioner of the Energy Commission of Malaysia 2005-2009; Advisor to the Minister of Science, Technology and Innovation Malaysia 2006-2007; and Council Member of Badan Warisan Malaysia (Heritage Organisation Malaysia), 2005-2009.

He is founding Secretary General and Senior Fellow of the Academy of Sciences Malaysia; the founder President of the ASEAN Academy of Engineering and Technology; Foreign Fellow of the Australian Academy of Technological Sciences and Engineering; Corresponding Member of the Pan-American Academy of Engineering; Board Member of the InterAcademy Council (IAC) of the world's scientific academies 2001-2004; Special Advisor to IAC Co-Chairs on Sustainable Energy 2008-2009.

He was co-author of the UN Millennium Project Science Technology and Innovation Task Force Study Report "Innovation: Applying Knowledge in Development", 2005. He published his autobiography "Think Malaysian, Act Global" September 2010.

Dato' Ir. Lee was conferred the Malaysian state awards of DPMP and KMN; the Honorary Officer of the Order of Australia (AO); In 2011 He was awarded the Korean Jang Yeong-sil Grand International Science and Cultural Prize and the Hon. Doctor of Engineering by UNITEN.

“INTERACADEMY PARTNERSHIP (IAP) SCIENCE EDUCATION PROGRAMME (SEP) AND THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGS) 2016-2030”

By Academician
Dato Ir. (Dr) Lee Yee Cheong, Malaysia

Chair, IAP SEP Global Council/Chair, Governing Board, UNESCO International Science Technology and Innovation Centre for South-South Cooperation

The speaker will outline the strategy and action plan of the IAP SEP in relation to the UN Sustainable Development Goals (SDGs), especially the Education SDG No. 4 “Ensure inclusive and equitable quality education and promote life-long learning opportunities for all”. Although Science and Technology are not mentioned in any SDG, the speaker will demonstrate that without S&T, most SDGs will not be achieved by

2030. It is therefore important that science education should vertically start from pre-school through school and college to life-long learning. It should horizontally cover all the subject matters and targets of all the SDGs. Evidence based approach is key. To get the world community to adopt evidence based life-long education, IAP SEP must get the most powerful international and regional organisations on board. Such organisations are UNESCO, Asian Infrastructure Investment Bank with China’s “One Belt One Road” programme as core and hopefully the Trans Pacific Partnership (TPP).

See you
Yee Cheong

MANZOOR H. SOOMRO

Soomro Manzoor Hussain
President ECO Science Foundation (ECOSF)
Telephone: +92 51 921 5496
Facsimile: +92 51 921 5497
president.ecosf@eco4science.org
registry.ecosf@eco4science.org
Pakistan

BIOSKETCH

Prof. Dr. Manzoor Hussain Soomro is President of ECO Science Foundation (ECOSF) since June 2013 which consists of 10 member countries of ECO Region. The main goal of ECOSF is the promotion of Science and Technology in ECO Region. Dr. Soomro has previously served Pakistan Science Foundation (PSF) as Chief Scientific Officer, Member Science, Director General Pakistan Museum of Natural History (PMNH), Director General of Pakistan Scientific and Technological Information Centre (PASTIC) and finally as the Chairman of Pakistan Science Foundation, from March 2010 till Oct 2013. Earlier he served FAO of the United Nations as National Coordinator/Country Officer and implemented the non formal adult education programme through an innovative Farmer Field School (FFS) approach.

Dr. Soomro launched Inquiry Based Science Education (IBSE) program La main à la pâte for schools in collaboration with Academy of Science France in Pakistan in 2010, which is continuing in recognition of his contributions for promotion of science education in Pakistan and cooperation with France, the French Republic bestowed upon him their erstwhile Award "Order of Academic Palms" and appointed him as "Officier (Officer)" in 2013. It was in recognition of his contributions for promotion of science, technology and education in Pakistan that the University of Sindh-Pakistan

awarded him a Gold Medal in Dec 2013. Dr. Soomro is a Member of Governing Board of International Science, Technology and innovation Centre under the auspices of UNESCO (ISTIC), Kuala Lumpur- Malaysia and member of Global Council of Science Education Programme (SEP) of the Inter-Academy Panel (IAP). He has also been member of Governing Boards of 13 National Centres of Excellence under the Ministry of Education of Pakistan. Prof. Soomro has also been promoting education, awareness and policy support for Bio-Safety and Bio-Security as well as Biodiversity conservation in Pakistan and ECO Region. He so far, has to his credit, 6 industrial patents, 9 gene sequences, and numerous science documentaries and over 100 publications including books & book chapters being taught in the Universities of Pakistan.

Website: www.eco4science.org

Email: president.ecosf@eco4science.org
manzoorhsoomro@gmail.com

Facebook: <https://www.facebook.com/pages/ECOScienceFoundation>

<https://www.facebook.com/manzoor.soomro.7>

ABSTRACT PRESENTATION

PROF. SOOMRO WOULD LIKE TO DELIVER A PRESENTATION OF IBSE IN ECONOMIC COOPERATION ORGANIZATION (ECO)

The presentation/intervention would share the launching of IBSE by the ECO Science Foundation (ECOSF) in the 10 countries of ECO in South West

and Central Asia. The presentation will also share the strategic partnership of institutions including LAMAP, ISTIC and IAP SEP.

ZHU HE

He Zhu
China Association of Children's Science Instructors
Telephone numbers +86 13901019417
zhuhe@cast.org.cn
China

Ms. He ZHU is the Deputy Secretary General of the China Association of Children's Science Instructors (CACSI) and also the Editor-in-Chief of China Science and Technology Education Journal which is published by CACSI. She started her career in Science Education as a project manager in Children and Youth Science Center of China Association for Science and Technology (CAST) and in charge of many national science education programs of CAST. In 2003, she joined the Leading Group for Drafting the *National Scheme for Scientific Literacy* as the chief coordinator of the research program for making the State policy document. The *Outline of the Scheme* was issued by

the China State Council in 2006 which set the objectives to the improvement of scientific literacy for all Chinese citizens. In 2010, she joined the CACSI and has been devoting herself to the field of vocational training and development of science education teaching resources. She has been a member of the Global Council of IAP Science Education Programme (IAP SEP) since 2013. She got Master Degree in Law from Peking University and MSc. in Political Sociology of London School of Economics and Political Science. And she is studying for her doctorate in Neural Information Engineering in Southeast University.

GIANCARLO VECCHIO

Vecchio Giancarlo
Professor

University of Naples Federico II, ALLEA and Accademia Nazionale dei Lincei, Italy
cell phone n°:+39-320-04-10-833
vecchio@unina.it
Italy

BIOSKETCH

Giancarlo Vecchio has been Director of the Department of Molecular and Cellular Biology and Pathology at the University of Naples Federico II. He has devoted much of his scientific life to Oncology

The work in his lab has been centered upon the role exerted by oncogenes in thyroid carcinogenesis and his laboratory has identified a novel rearranged gene (RET/PTC) responsible of a high percentage of papillary thyroid cancers, the most frequent type of endocrine cancer and a very frequent event in thyroid papillary carcinomas of children of the Chernobyl area. These types of new findings have brought fundamental insights into the molecular pathogenesis of human neoplasias and are now leading to new therapeutic treatments for these diseases.

In 1995, for his contributions to cancer research, Giancarlo Vecchio has received the Fogarty Scholar in Residence award of the National Institutes of Health (U.S.A.) and in 2001 the Feltrinelli prize for Medicine from the Accademia Nazionale dei Lincei, the National Science Academy in Italy. He is currently Emeritus Professor of Oncology at the University of Naples Federico II and a member of the Accademia Nazionale dei Lincei. More recently, Giancarlo Vecchio has devoted much of his efforts to the problem of renewal of Science Education in Italy and Europe. He has been

the promoter, within the Accademia dei Lincei, for signing an agreement with the French Academie des Sciences for the introduction in Italy of a program of renewal of science education in Italian Schools. Following that agreement and an agreement between the Accademia dei Lincei and the Italian Ministry of Education, several pilot centers for science, mathematics and Italian education in schools have been created in Italy, one of which, in Naples, is coordinated by him. Since January 2011 he represents the Accademia Nazionale dei Lincei in the All European Academies (ALLEA) Working Group on Science Education and since December 2014 he is the Chairperson of this working group.

The ALLEA Working Group is one of the Regional sections of the Science Education Program of the Global IAP Council (IAP-SEP).

In 2014 and in 2015 he has been Co-Chair, as representative of the Accademia Nazionale dei Lincei and of ALLEA, together with the French Academie des Sciences, the National Academy of Sciences of Senegal, the Bibliotheca Alexandrina and the Moroccan Hassad II Academy of Sciences, of two International Conferences for the cooperation among European, African and Mediterranean Academies for Science Education (AEMASE Conferences).

THE AEMASE INITIATIVE (GIANCARLO VECCHIO, ALLEA SE WG CHAIR AND ACCADEMIA NAZIONALE DEI LINCEI, ITALY)

AEMASE is an intercontinental initiative of Science Academies in the geographical African-European-Mediterranean (AEM) area, a region that shares strong and ancient political and scientific links. At the origin of the idea of the AEMASE Conferences is the strong desire of some national Academies to help improve formal and informal science education (SE) as part of their mission: the partner Institutions involved in this initiative have been the French, Italian, Moroccan and Senegalese Academies and the Egyptian Bibliotheca Alexandrina. The primary goal of the Conference was to bring together key players that share an interest in promoting science education, specifically the renewal of SE founded on the inquiry-based science education methodology (IBSE). In the long term, the AEMASE partner institutions, which come from all three geographical areas, seek to contribute to the steady development of quality science and innovation systems by focusing on stimulating and supporting the future generations of researchers and innovators. The first AEMASE Conference was held on 19 - 20 May 2014 in Rome at the Accademia Nazionale dei Lincei. The Conference gathered 75 representatives from 32 countries, some also from countries not pertaining to the geographical African-European-Mediterranean (AEM) region. One of the main objectives of the Conference was also that of bringing to the attention of

political and educational authorities the importance of improving science teaching and learning in developed and developing countries, as a means for sustainable development. The same AEMASE partner Institutions, which organized the 1st AEMASE Conference in Rome in May 2014 at the Accademia dei Lincei, had decided to hold alternate Conferences in Europe and in Africa. The second AEMASE Conference was held in Dakar, Senegal, from the 12 to the 13 of October 2015, by the courtesy of the Academie des Sciences et Techniques du Sénégal (ANSTS). The Conference has gathered scientists expert on science education from different countries: Senegal, Benin, Burkina, Cameroun, Morocco, Nigeria, Tanzania, South Africa, Tunisia, Italy, France, UK, Germany, Hungary, Belgium, Argentina and Sri Lanka. The Conference ended with the approval, by all participants, of a Dakar Declaration which called on all countries in the AEM Region to urgently implement and consolidate IBSE/STEM/SBC Education programs and on Academies and the Ministries of Education to rethink science education programs to include new ways of teaching and learning. Both Conferences were sponsored by three international networks of academies: IAP (the global network of science academies), ALLEA (All European Academies) and NASAC (Network of African Science Academies).

SABIITI ELLY

Professor Sabiiti born on 12th Novemeber 1951 has a Bsc Agric, MSc Agric and PhD and has got over 37 years of working experience in agricultural research, University teaching, graduate supervision and outreach including administrative experiences at national, regional and international levels. He has mentored 26 graduate students at Masters and PhD levels. He has on record over 100 scientific publications that have been of value to Government and many public/private and communities. He has leadership skills in University as the Head of Crop Science Dept and as the Dean, Faculty of Agriculture and outside University by formulating policies on various boards/committees for agricultural development. **He belongs to over 22 professional bodies and served** as an International expert on agricultural sciences of an International think Tank forum on Agenda for new millennium:

Sabiiti Elly
Professor FTWAS, UNAS, AAS Department of Agricultural Production, School of Agricultural Sciences, Makerere University, P O Box 7062, Kampala, Uganda
Tel +256 414 533580
elly.sabiiti@gmail.com
Uganda

He has been coordinator for research projects since 1999 to date and has gained skills in team building and collaboration. He is a Fellow of TWAS, AAS and UNAS and former Vice President of Uganda National Academy of Sciences (UNAS) a body of eminent Scientists in Uganda who promote science and technology for prosperity for all Ugandans. He was a member of the TWAS Prizes Committee on Agricultural Sciences. He has served on various committees of Science education in TWAS, AAS and UNAS.

He has coordinated IAP/SEP since 2010 and now is a member of the Global Council of IAP/SEP and a Regional Coordinator for Anglophone Countries of NASAC. He also represents AAS in IAP/SEP.

He has attended nearly all the science education meetings /conferences since 2005 to date and has successfully established an IBSE programme in Uganda.

Currently he is a Professor at Makerere University where he has served for over 33 years.

INDARJANI

Indar Jani
Deputy Director for Programme
SEAMEO Regional Center for QITEP in Science
Telephone numbers 62-22-4228739 Fax : 62-22-
4218749
indarjani61@gmail.com
Indonesia

BIOSKETCH

R. Indarjani (Doctor of Philosophy in Marine Biology from the Adelaide University, South Australia) is Deputy Director for Program of SEAMEO Regional Center for Quality Improvement of Teacher and Education Personnel (QITEP) in Science, Bandung Indonesia. This institution has committed to promote Inquiry Based Science Education (IBSE) through various and innovative trainings and workshops, producing learning resources, conducting education seminars and conferences and establishment of professional community learning in region. Her effort to promote the IBSE was also touch the policy level by defining IBSE as niche areas of the center and also conducting High Level Policy Forum on IBSE in 2015 that officially opened by the Minister of Education and Culture of Republic of Indonesia, request commitment to implement proper IBSE in a science teaching and learning process in national level. Through her role as Deputy Director of Program, she successfully conducted PRAISE in 2013, a joint project with Australian Government, run

international innovative science teaching and learning training workshop on IBSE for teacher trainers of Asia Pacific that supported by ISTIC-Unesco, Malaysia and Foundation of La main ala pate Foundation (LAMAP), France since 2013 and also introduce STEM through STELR Training Workshop on Renewable Energy with supported by Australian Technological and Science Education (ATSE), since 2013. Currently (2015), she is conducting the multi years project on ICT-Based Program on Adopting 21st Curriculum through Science and Mathematics as mandated by SEAMEO Secretariat, Bangkok. For her long experience in education, more than 20 years as Biology lecturer, and her dedication in promoting science in region has been acknowledged by the Chairman of Global Council of Inter Academy Panel on Science Education Program (IAP-SEP) and endorsed by the President of Indonesian Academy of Sciences (AIPI), to be a member of Global Council of IAP-SEP 2015-2018 as Indonesian representative.

CREATING DIGITAL CLASS FOR ADOPTING 21ST CENTURY CURRICULUM WITHIN SOUTHEAST ASIA CONTEXT

ABSTRACT PRESENTATION

Records of achievements in Asian region countries in the subjects of Science and Mathematics have shown uneven and irregular trend, on the other hand these two subjects have own characteristics to cater a curriculum that truly addresses the realities and requirements of the 21st Century. For this reason, an action research on adopting on 21st Century Curriculum in the Context of Southeast Asia has been proposed. The research will involve the use of ICT that will allow speedy and efficient transmission of Science and Mathematics contents and teaching-learning materials in the form of 'Open Educational Resources' (OER)

The focus of the research was on identifying learning domains in Science and Mathematics to formulate regional standard of teaching and learning that are generic to all Southeast Asian countries, and are re-

presentative of the realities of the region considering technology, national policies, learning contexts and conditions as well as accommodate the regional vision of becoming a fully-integrated community.

Base-line study was conducted in form of Diagnostic Test for mapping student readiness in Mathematics and Science learning. The study was conducted during September-October 2015, targeted student year 5 and year 8 in Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Thailand, Timor Leste, and Vietnam. The Ministry of Education from each participated country assigned their respective schools and students to take part in the diagnostic test. The test items (High Order Thinking questions), the platforms and also implementation of the tests were collaboratively prepared and executed by SEA-

MEO SEAMOLEC, SEAMEO QITEP in Mathematics and SEAMEO QITEP in Science.

The result showed that in general the cognitive level of students both year 5 and year 8, was dominated by C1 and C2 (refer to Revised Blooms Taxonomy) in which reflected to the ability for simple problems and communication. They were relatively lack of capacity in analysis and drawing conclusion, difficult to apply the principal of science and maths into the real world (innovation). However in term of readiness, students year 8 much better in preparation of learning science and maths compare with student year 5.

The result of Diagnostic test was presented during SEAMEO High Official Meeting (HOM) in November 2015 and seeking support and consistent commitment from Ministry of Education of SEAMEO member countries to conduct further step that were intervention study and validation study.

The data of the Diagnostic Test, can be seen as a starting point in which the country can be referred to enhance student's cognitive competency in Science and Mathematics, as one of fundamental aspects in 21st Century Curriculum beside intrapersonal competency and interpersonal competency domain. Adopting 21st Century Curriculum is one of the priority areas of SEAMEO Education Agenda 2015-2035 that has been agreed by the MoE of member countries to adopt in their national education framework.

This Action Research will cater not only the Priority Area number 7 but also Priority Area number 2 for establishment a borderless education in which ICT as platform usage in this program and Priority Area number 5 for Teacher Education Reform as this will integrate with the teacher continuing development program. Having said that, the continuous supports and consistent commitment from Ministry of Education of SEAMEO Member countries is necessity to conduct further phases on this program and to conceptualize the philosophy of the 21st Century Curriculum that education for life and work.

ORAKONE PHANRAKSA

Phanraksa Orakanoke
National Science and Technology
Development Agency
Telephone numbers 6687-912-7877
orakanoke.gya@gmail.com
Thailand

Intellectual Property Policy Manager

Technology Licensing Office, Technology Management Center,

National Science and Technology Development Agency (NSTDA)

Dr. Phanraksa is a policy specialist in the field of intellectual property laws. Currently, she is with the Technology Licensing Office, Technology Management Center at the National Science and Technology Development Agency, Pathumthani, Thailand, as a manager of the Intellectual Property Policy group. Since

2010, she has been serving the working committee for the University-Business Incubation (UBI) Project and the University Technology Licensing Office Promotion Project of the Higher Education Commission. Recently, she has engaged the national and regional projects which aim to develop a policy framework to promote capacity building of technology transfer professionals in Thailand, and early career researchers in ASEAN respectively. In 2016, based on the findings of the research project she is running with the team from the Global Young Academy (GYA), she is leading the ASEAN Science Leadership Program to be hosted in Thailand this June.

GLOBAL YOUNG ACADEMY AND SCIENCE GAME FOR SCHOOL CHILDREN

Orakanoke Phanraksa, Co-Chair, Global Young Academy

There are many tools and a number of ways to promote science and science education. To promote greater science, top young scientists went ahead and founded the Global Young Academy in 2010 with an aim to be the voice of young scientists from around the globe. Currently, there are 200 GYA members from all disciplines working under three different research themes, one of which is called the "outreach program". Under this theme, the GYA has been running a number of outreach activities to promote science and technology for young scientists and school children. Among others, the science game called "Ex-

pedition Mundus" is one of the key programs that has been introduced by the Dutch Young Academy since 2011 and currently is available in English language. The game shows the children that science is not about knowing a lot but rather about curiosity, creativity, and logical thinking. The game starts with a story about three scientists who discover the planet Mundus and get to know its inhabitants, the Mundians. With that, the children would have an opportunity to try to answer all types of questions about Mundus by investigating pictures, texts, and other sources. The game is being distributed online and through "science nodes" at universities. More than 1,200 primary schools have received their copy and enjoy the journey of learning science.

NATHALIE VON SIEMENS

Von Siemens Nathalie
President Siemens Stiftung
Telephone numbers +49 89 54 04 87 100
49 174 1551105
nathalie.siemens@siemens-stiftung.org
Germany

BIOSKETCH

Managing Director / Spokesperson

“Together with our partners, we strive to promote confidence and self-reliance as catalysts for driving positive social change in societies.”

Dr. Nathalie von Siemens has been Managing Director and spokesperson of the Board of Siemens Stiftung since January 2013. Together with her board colleagues Rolf Huber and Georg Bernwieser, she is responsible for the operative implementation of the goals defined by the Foundation.

Siemens Stiftung operates in the fields of basic services, education, and culture. As a hands-on foundation, Siemens Stiftung develops its own projects and implements them with a focus on the long term. In collaboration with its partner organizations, the aim is to help people improve their living conditions. In her role as a member of the board, Nathalie von Siemens is also responsible for matters related to education

and culture. As part of her operational responsibility, she also serves as spokesperson for the National STEM Forum.

Before joining the Siemens Stiftung Board of Directors, Nathalie von Siemens worked at Siemens AG in the areas of leadership development, corporate strategy, investor relations and corporate communications. In these positions, she focused on the issue of value-based sustainable corporate development.

Earlier, Nathalie von Siemens worked in the academic sector. Her research covered, among other things, moral philosophy and business ethics. She earned her doctorate in 2004 with a dissertation about the meaning of friendship in the Nicomachean Ethics of Aristotle.

Dr. Nathalie von Siemens is a member of the supervisory boards of Siemens AG, Siemens Healthcare GmbH and Messer Group GmbH.

ABSTRACT PRESENTATION

SUMMARY OF THE ADDRESS BY DR. NATHALIE VON SIEMENS EXPERIMENTO - STEM EDUCATION FOR A BETTER LIFE

By combining agenda setting with operative educational activities, the Siemens Stiftung is generating global momentum and developing programs that promote the teaching of natural sciences and technical subjects. The educational program Experimento links discovery-based learning with values development in an age-appropriate manner. Personal initiative, judgment, social behavior and a sense of responsibility are strengthened, and media skills are enhanced. The

comprehensive teaching and learning materials used in the program are provided to educators free of charge on the online media portal of the Siemens Stiftung. They are offered under an open license. In conducting its programs, the Siemens Stiftung always works closely with local partners.

The global challenges arising from the exponential growth of modern technology can be successfully met only if we succeed in taking a focused international approach especially in the area of education. Global alliances are indispensable.

AMY D'AMICO

D'Amico, Amy
Division Director of Professional Services
Smithsonian Science Education Center
Phone: 202-633-3002 / Blackberry: 202-538-2973
Fax: 202-287-7309
DAmicoA@si.edu
U.S.A.

Division Director of Professional Services

Amy D'Amico, Ph.D. joined the Smithsonian Science Education Center (SSEC) in 2013 as the Division Director of Professional Services. She oversees Professional Development and Leadership Development initiatives at SSEC. Prior to joining SSEC, Dr. D'Amico was a member of the faculty in the Biology Department at Georgetown University. At Georgetown, she taught a variety of biology courses and co-directed the RISE & Teach program for biology undergraduates who complete a thesis while teaching in the DC Public Schools. In addition, Dr. D'Amico spent the last three summers as a full-time consultant at the SSEC to assist in the program development and execution of the K-12 Science Education Institutes for Leadership Development and Strategic Planning.

Dr. D'Amico has 18 years of experience as an educator that began by teaching middle school for the Cambridge Public Schools in Massachusetts. Dr. D'Amico quickly became a Middle Grade Science Teacher Leader and worked to implement the district's five-year strategic plan based on the SSEC's model of science education reform. While in Cambridge, she also worked on various educational and consulting projects with the Massachusetts Institute of Technology, Harvard-Smithsonian Center for Astrophysics and the American Museum of Natural History. Dr. D'Amico earned her BA in Biology with a minor in Education for Certification from New York University and received an MS and a Ph.D. in Biology from Northeastern University in Boston, MA.

OUTLINE OF SCALING UP ROUND TABLE DISCUSSION

Topic 1: Key stakeholders that are important to the sustainability and scaling of a project. Who are they and what are their importance to the project?

- Teachers
- Administrators
- Community partners
 - Scientific community
 - Business community
- Political and social leaders

Topic 2: Building Awareness and gaining advocates to scale your program. Who are the individuals that you need to gain support from in order to scale your project?

- Political leaders (centralized education system)
- Ministry of Education (centralized education system)
- State and district leaders (decentralized education system)
- Social leaders (important for all educational systems)

Topic 2: Building capacity to support the scale up of a program. What organizations can support the growth of a program and what need do they fill?

- Teacher preparation programs
- Scientific community
- Outside collaborators

Topic 3: Changes to a program that are sometimes necessary to scale a program. What are the considerations needed when evaluating the viability of scaling a program?

- Resources- both financial and human capital
- Interest for a broad audience- some small pilots are so narrowly focused and regionally contextualized that they are not of interest to others.
- Identification of non-negotiable elements of your program- when scaling a project some elements of it may need to change, but it is also important to identify the elements that can not change or the program could lose its efficacy.

HENRY CABALLERO

Caballero Henry
Universidad Simón Bolívar
Departamento de Biología Celular
Pabellón IVa
Teléfonos: Celular 0416-567-34-93
hencaballero@gmail.com
Venezuela

BIOSKETCH

I am Professor of Immunology and Cell Biology at the undergraduate and graduate levels. Now study the relationship between knowledge, society and curriculum design.

WYNNE HARLEN

Harlen Wynne
independent consultant
Telephone numbers + 44 (0)1361 884710
wynne@torphin.freearserve.co.uk
United Kingdom

BIOSKETCH

Professor Wynne Harlen has held several posts as teacher, teacher educator and researcher in science education and assessment since graduating from Oxford with a physics degree. She was one of the first evaluators of new curricula, undertaking a comparative evaluation of the impact of the Nuffield Junior Science project, followed by the longer evaluation of the Science 5/13 project (1967 – 73). She was then director of Progress in Learning Science (1973 – 77) and deputy director of the Assessment of Performance Unit, science project (1977 – 84). For the next five years she was Sidney Jones Professor of Science Education and Head of the Education Department at the University of Liverpool, before moving to Scotland to become Director of the Scottish Council for Research in Education, 1990 - 99. She now works as a consultant from her home in Scotland.

She was Chair of the science expert group for the OECD's PISA project during its first six years, 1998-2003. She has undertaken consultancy in assess-

ment in many different countries and is the author of several books, chapter and published papers in assessment and evaluation as well as science education. She served as a member of the Global Council of the IAP Science Education Programme from its inception for the maximum period of six years and is now a member of its International Advisory Board.

She has been a life-long, and now honorary, member of the UK Association for Science Education (ASE), edited Primary Science Review 1999-2004, and was its president in 2009. She was awarded the OBE by the Queen for services to education in 1991 and was given a special award for distinguished service to science education by ASE in 2001. In 2008 she was awarded the International Purkwa Prize and received special recognition of her contribution in promoting inquiry-based science education by the Mexican Ministry of Education and INNOVEC in 2011. She is the author or co-author of over 40 books and over 200 papers on science education.

USING ASSESSMENT TO HELP LEARNING IN SCIENCE

The key point of this presentation is that if we are to achieve the overall objective, of "achieving a higher degree of science literacy in all countries", then we need to make changes, not only in curriculum content and pedagogy but in how we conduct and use assessment of students' learning. The two main purposes of assessment – to help learning (formative) and to record and report learning outcomes (summative) – are often seen in opposition to each other. In some circumstances, this is indeed the case, with the formative purpose losing out to the pressure to measure outcomes for various reasons. But a close look at the nature of formative assessment shows that the actions and decisions involved are integral to inquiry-based education and consistent with what is known about how learning best takes place. Thus it is essential that summative assessment practice su-

ports rather than inhibits the practice of formative assessment. In this presentation it is proposed that this can be done if data for summative assessment are derived from evidence gathered during teaching and learning and used in the process of formative assessment. Not only does such an approach mean that formative assessment is required, but that summative assessment can encompass the full range of goals that are the aims of science education in the 21st century. These include the understanding and competencies needed for personal fulfillment, employment, citizenship and social responsibility that conventional tests and examinations are unable to address. The challenges of implementing such an approach to assessment are considerable, but need to be faced if we are to avoid science education reform from being held back by outmoded assessment policies and practices.

ABSTRACT PRESENTATION

DANIEL ROUAN

Rouan Daniel
President of the Fondation Lamap
Observatoire de Paris
Telephone numbers : +33 619520629
daniel.rouan@obspm.fr
France

BIOSKETCH

POSITION: Astrophysicist, Senior scientist, Directeur de Recherche emeritus at CNRS at Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA), Observatoire de Paris. Member of the Académie des Sciences de l'Institut de France since 2005, President of the Fondation La main à la pâte since april 2014.

EDUCATION: Ecole Normale Supérieure de Paris, Agrégation de Sciences Physiques, PhD

PRIZES: Medal Camille Flammarion, Sté Astronomique de France 1982; Prize Alexandre Joannidès from Académie des Sciences 2004

MAIN MEMBERSHIP IN INTERNATIONAL SCIENTIFIC COMITEES: Scientific Advisory Committee of Canada France Hawaii Telescope, Board of Canada France Hawaii Telescope (President during 2 years), Scientific and technical Committee of the European

Southern Observatory, Observation Program Committee of the European Southern Observatory, Advisory committee of the Canadian Foundation for Innovation.

MAIN PRESENT AND PASSED RESPONSIBILITIES :President of the foundation "La main à la pâte"; President of the astronomy section of the Conseil National des Astronomes et Physiciens; Director of the graduate school " Astrophysique et techniques spatiales Université Paris-7"; Director of the doctoral school " Astronomie et Astrophysique d'Île-de-France "; Vice-president international of SF2A, the French scientific society in Astronomy and Astrophysics; Vice-director of the LESIA laboratory

PUBLICATIONS: 193 articles in refereed journals, 247 communications, 9460 citations, 20 papers with more than 100 citations, H-index : 47; Co-author of several books, including L'observation en astrophysique (EDP Sciences) and Observational astrophysics (Springer)

ABSTRACT PRESENTATION

The fundation *La Main à la pâte*, created twenty years ago in France by the Academy of sciences, developed all along those years a strategy of dissemination of IBSE which is manifold: local pilot centers, regional centers, actions at national and international levels. I'll describe the various forms of this course of actions, especially the most recent one which is the creation of nine houses for science for the professional development of teachers.

JULIO CELIS

Celis Julio E.
European Commission RISE HLAB
Danish Cancer Society
Telephone numbers +4520212017
jec@cancer.dk
Denmark

Julio E. Celis is Associated Scientific Director of the Danish Cancer Society Research Center in Copenhagen.

Prof Celis is member of the Royal Danish Academy of Sciences and Letters, the European Molecular Biology Organization (EMBO), the Academia Europaea, the European Academy of Cancer Sciences, and the Chilean Academy of Sciences.

He has been Chairman of the European Molecular Biology Laboratory (EMBL) Council

(1997-1999), Vice President of the Human Proteome Organization (HUPO; 2002), Chair of the Initiative for Science in Europe (ISE; 2005-2007), President of the European Molecular

Biology Conference (EMBC/EMBO; 2000-2003), Secretary General of the Federation of

European Biochemical Societies (FEBS; 1999-2007), President of the European Life Sciences

Forum (ELSF; 2001-2007), President of the European Association for Cancer Research (2012-2014), Chairman of the Policy Committee of the European Cancer Organisation (ECCO; 2008-2014), and Vice-President of the Alliance for Biomedical Research in Europe (2011-2014). He is currently

Advisor to the Scientific Panel for Health in Horizon 2020 (2015-), member of the European Commission Research, Innovation and Science Experts (RISE) High-Level Advisory Board (2015-), and Editor-in-Chief of Molecular Oncology (2007-).

Prof Celis has organized several international laboratory courses, Summer Schools, and Congresses and is generally recognized as one of the founding fathers of proteomics.

PAULA CRAMER

Cramer Paula
Ministerio de Ciencia, Tecnología e Innovación Productiva of Argentina
Telephone numbers +5411 4899 5000 extension 3731
(office)
cramer.paula@gmail.com
Argentina

BIOSKETCH

Paula Cramer, PhD. Biologist by training with extensive experience in research, teaching and science popularization. Researcher from the National Research Council of Argentina (CONICET). Currently coordinating the Science Club Network of Argentina from the Ministry of Science. Representative from Argentina in RELAB.

ABSTRACT PRESENTATION

The Science Club Network is an initiative from the Ministry of Science, Technology and Productive Innovation of Argentina which aims at stimulating STEM careers, promoting critical thinking in its community and improving the quality of science projects within science clubs.

RICARDO EHRLICH

Ehrlich Ricardo
Professor Ex Ministro de Educación Uruguay
Telephone numbers (598)25228618 ext 112,
(598)99626663 (cell phone)
ehrllichricardo@gmail.com
Uruguay

BIOSKETCH

Doctor in Physical Sciences, University Louis Pasteur, Strasbourg (1979). Full Professor of Biochemistry of the School of Sciences, University of the Republic, Uruguay; President of the Board of Directors of the Institut Pasteur of Montevideo. Former researcher of the National Scientific Research Center of France. Former Director of the Institute of Biology and Dean of the School of Sciences for two periods. He took

part in the creation of the School of Sciences and the Institut Pasteur of Montevideo. Director of numerous doctoral theses in the Universities of the Republic, Paris VI, VII and XI, and Buenos Aires. Author of numerous scientific publications on the regulation of the genetic expression and the in vivo protein folding. Former Mayor of Montevideo (2005-2010) and Minister of Education and Culture of Uruguay (2010-2015).

A NECESSARY CONVERGENCE

Ricardo Ehrlich
Facultad de Ciencias, Sección Bioquímica y
Biología Molecular
Institut Pasteur de Montevideo
URUGUAY

The preparation of the new generations to assume the future is one of the main responsibilities of communities and nations. Science is deeply related to this commitment. Each new stage requires renew, deepen and strengthen the links between science and society, as advances in knowledge cannot be dissociated from the construction of full citizenship.

Our societies and our international contexts present profound inequities in many different orders. The distances in access to knowledge and education of quality present very important asymmetries that compromise our common future. In this perspective, the scientific communities, considered as communities of knowledge without any barriers amongst them, are called to take on new responsibilities in relationship with the society and, particularly, to strengthen their commitment with education at all levels.

Remarkable and valuable efforts are currently in progress in different regions, countries and institutions,

linking science and education, oriented to learning and development of capacities and citizenship through increasing closeness with science. They have had diverse - in magnitude and continuity - governmental and/or international support. The coordination of the efforts of the various spaces and communities of knowledge in that direction appears as a key to strengthen and enhance the work. But, a crucial element is to increase and coordinate national and international support.

There is a redundancy of programs and specificities of international organizations and agencies concerned by this problem. As in living systems, redundancy may be necessary and beneficial if there is an adequate coordination and complementation to ensure that efforts converge, optimizing the use of resources.

The presentation will be focused - from a perspective from Latin America and the Caribbean - on the need and feasibility of the convergence of efforts, which appears - despite numerous initiatives - shy and elusive so far, and on the urgency to reinforce the investment in the link between science and education.

Our scientific communities have an enormous potential to contribute to assume the today's challenges in education. This contribution is also essential for the advancement of science and its applications.

ABSTRACT PRESENTATION

HAZAMI HABIB

Habib Hazami
Academy of Sciences Malaysia
Telephone numbers +6012-6932391
Telephone numbers Fax: (66) 02 5779987
hazami@akademisains.gov.my
Malaysia

BIOSKETCH

Hazami Habib is currently serving as the Acting Chief Executive Officer of Academy of Sciences Malaysia (ASM).

She graduated with a Bachelors Degree in Information Science from Institute Teknologi MARA, Malaysia (now University of Technology MARA) and was awarded a gold medal for her outstanding academic achievements.

Hazami ventured in the working world in 1990, with her first stint at the Institute for Policy Research as its Head of Publication Unit.

She joined ASM in 1996 as its Manager of Information Centre. In her years at the Academy, Hazami had organised several national and international level programmes such as the National Astronaut Programme, National Science Challenge, Science magazine "estidotmy," Scientific Excellence in Islamic Civilization Exhibition 2007, Nobel Centennial Exhibition and Conference 2004, S&T OIC Conference, ASEAN Academies of Sciences meeting, i-Inova13, Mahathir Science Award and others.

Hazami was also involved in a few studies anchored by the Academy such as the 1st Science and Technology (S&T) National Policy, 2nd S&T National Policy, Mega Science Framework Study, Science Education Policy Science Outlook and others.

Regionally, she had represented Malaysia for a few regional level talks and forums, which includes the China-ASEAN Technology Transfer and STI Cooperation Forum, Nanning China, ASEAN Talent Mobility Workshop, Thailand, IIASA Council Meeting.

She is the Secretary for Malaysia National Member Organisation in IIASA Council Science 2014 and Co-chair of Science, Technology and Innovation Committee in APEC (2015-2016).

Her areas of passion include the enculturation of science and technology, framework for science, technology and innovation (STI) and collaboration on commercialisation and foresight for STI.

APHIYA HATHAYATHAM

Hathayatham Aphiya
 Vice-President
 National Science Museum Thailand
 Telephone numbers (66) 02- 577 9989
 Mobile: (66)081 907 7155
 aphiya.h@nsm.or.th
 Thailand

NAME	POSITION TITLE
Aphiya Hathayatham, Ph.D.	Vice President National Science Museum, Thailand

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
EDUCATION			
The Australian National University, Canberra	Ph.D.	2005	Science Communication
Mississippi State University, USA	M.Sc.	1989	Seed Technology
Kasetsart University, Bangkok, Thailand	B.Sc.	1983	Horticulture
TRAINING			
The Government Executive Official Development Program, Damrong Rajanubhap Institute, Ministry of Internal Affair, Thailand.	Certificate	2013	Executive Management program
Museum Management Course, Deutsches Museum, Germany (May 2006)	Certificate	2006	Museum Management
Professional Development Program, Questacon – The National Centre of Science and Technology, Australia	Certificate	1999	Professional Development
Certificate of Mastery, Science Edutainment and Science Museum Management, Questacon and The Australian National University Australia	Certificate	1997	Science Museum management
The Group Training Course in Vegetable Seed Production Tsukuba International Agricultural Training Centre, Tsukuba, Japan (organized and supported by JICA under the International Cooperation Programme of the Government of Japan)	Certificate	1994	Seed production
Certificate, 5th International Course on Seed Production and Seed Technology, International Agricultural Centre, Wageningen, The Netherlands (The Netherlands Fellowship programme 1992)	Certificate	1992	Seed production and seed technology

CURRENT POSITION

2015 – present Vice-President of the National Science Museum (NSM), Thailand and Acting Director of the Information Technology Museum. Responsible for monitoring and supervising the operation of the Information Technology Museum and the Natural History Museum of NSM

PREVIOUS POSITIONS AND EMPLOYMENT

2005 - 2014 Director, Information technology Museum, NSM, Thailand

2004 Director, Strategic Planning Division, Office of the President, NSM, Thailand

2002 – 2004 Director, Exhibition Division, Science Museum, NSM, Thailand

1996 – 2001 Director, Foreign Affairs and Public Relations Division, Office of the President, NSM

1995 Secretary to the Foreign Affairs Standing Committee, House of Representatives, Thailand

1989 – 1994 Head of Seed Quality Control Division, Ratchaburi Seed Center, Department of Agricultural Extension, Ministry of Agriculture and Cooperative.

AWARD

Deepak Rathore International Award for Science Popularization 2015

NATIONAL AND INTERNATIONAL COMMITTEES

2016 – present Member in the General Council of the ASPAC Executive Council (2016-2017)

2015 - 2017 Member in the Global Network of Science Academies on Science Education Program (IAP SEP Global Council)

2015-present Vice Chair of the Association of Academies and Societies of Sciences in Asia (AASSA) Special Committee on SHER Communication (Science, Health, Environment, and Risk)

Co-opted Councillor of Asia-Pacific Network of Science and Technology Centres (ASPAC) Executive Council

Member in the organizing committee of the International Workshop on Science Communication supported by Korea Academy of Science and Technology (KAST), IAP (the Global network of science academies, AASSA (The Association of Academies and Societies of Science in Asia organizing the KAST-ASM-INSA-IAP International Symposium on “SHER Communication in Asia with a Special Focus on Science Festivals” in Seoul, South Korea (June 2014) and in New Delhi, India (October 2014)

Member and assistant to the secretariat of the National Sub-committee on Public Awareness of Science and Technology, Thailand

PETER McGRATH

McGrath Peter
Coordinator IAP - the global network of
science academies
Telephone numbers +39 040 2240 571
Fax: +39 040 224559
mcgrath@twas.org
Italy

BIOSKETCH

Dr. Peter McGrath obtained his BSc (honours) in Agricultural Zoology from the University of Glasgow, UK, and followed this with a PhD from the University of Leeds, UK, in 1989. His 10-year research career focused on the insect transmission of plant viruses and included postdoctoral positions at the Scottish Crop Research Institute (now the James Hutton Institute), Dundee, UK, as well as Purdue University and the University of Arizona in the USA.

Returning to the UK in 1997, he established his own business as a freelance journalist focusing on agricultural, environmental and scientific issues. The experience he gained in communicating scientific issues to non-specialist audiences made him an ideal fit for his first position at TWAS – as writer/editor in the Public Information Office. During this time he worked on the TWAS Newsletter, TWAS Annual Report, and edited seven volumes of the TWAS-UNDP case study series 'Sharing Innovative Experiences'.

From 2006, Peter began overseeing the implementation of TWAS's core programmes, including South-South fellowships and other exchange schemes, research grants and various prizes, as well as the activities of the Organization for Women in Science for the Developing World (OWSD). In 2011, he was also appointed Coordinator of the TWAS Science Policy/Science Diplomacy programme.

In November 2013 he took over as Coordinator of IAP – the global network of science academies, and the InterAcademy Medical Panel and has since overseen their integration under a new umbrella, the InterAcademy Partnership (formalized in March 2016). Among his duties at IAP, he acts as Secretary to the IAP Science Education Programme's Global Council.

He also retains his position as Coordinator of the TWAS Science Policy/Science Diplomacy programme.

ROUND TABLE B – INTERNATIONAL COLLABORATION TO SUPPORT SCIENCE EDUCATION PROJECTS

Peter McGrath, Coordinator, IAP for Science, InterAcademy Partnership

Email: mcgrath@twas.org

The IAP Science Education Programme

The IAP Science Education Programme (SEP) was established in 2003 by Jorge Allende (*Academia Chilena de Ciencias*, Chile). Allende served as the first chair of the SEP Global Council, and has since been succeeded by Pierre Lena (*Académie des sciences*, France) who served from 2010-2013, and the current chair, Dato Lee Yee Cheong (Academy of Sciences Malaysia).

The Global Council brings together science education experts and practitioners from around the globe, as

well as representatives (as observers) of IAP's regional affiliated networks in Europe, Africa, the Americas and the Asia/Pacific region.

Among its activities, the IAP SEP organizes biennial conferences, organizes regular national and regional workshops, publishes documents on science education and best practices, and releases declarations that call for greater efforts from national governments and the international community to improve STEM education, especially through the implementation of inquiry-based science education (IBSE).

Indeed, along with the sharing of experiences and success stories between nations and regions, the promotion of IBSE has been at the core of IAP SEP activities since its inception.

For more information on the IAP SEP, please visit <http://www.interacademies.net/ProjectsAndActivities/Projects/12250/18276.aspx> and <http://www.interacademies.net/10941.aspx?catGroupId=1&CFVTopics=8>.

ABSTRACT PRESENTATION

PARK WON HOON

Won Hoon Park
Gyeonggi Institute of Science and Technology Promotion
Korean Academy of Science and Technology & IAP SEP
Telephone numbers +82-10-5310-2015 (mobile)
parkwonhoon1@yahoo.com
Korea

BIOSKETCH

Since recruited by the Korea Institute of Science and Technology (KIST) in 1972, for which he eventually served as the president (1996-1999), he has played the leading role in enhancing Korea's R&D capabilities with his pioneering research activities especially in energy and environment. Along these lines he served as presidents of numerous academic and social societies such as the Korean Academy of Environmental Science and Technology, the Korean Institute of Chemical Engineers, the Korean Solar Energy Society, the Korean Society of Clean Technology, and the Korean Institute of Energy Engineering.

He served also as Chairman and CEO of the Korea Research Council for Industrial Science and Technology (2002-2005), which oversees nine Government Research Institutes. He has been also a perennial member of the Korea's Presidential Council on Science and

Technology and the National Science and Technology Council.

Internationally he served as Presidents of the International Union of Air Pollution Prevention Associations (IUAPPA) (1998-2001) and the Association of Academies and Societies of Sciences in Asia (AASSA) (2010-2014).

Recently, while serving as Vice President of the Korean Federation of Science and Technology Societies, he established the Sharing Community of Science and Technology which coordinates activities of science communication and "science for humanity" for developing countries.

He is now Chairman of the Gyeonggi Institute of Science and Technology Promotion.

ROUNDTABLE B DISCUSSION SUMMARY

ABSTRACT PRESENTATION

The role of science academies in fostering global cooperation and sharing knowledges of Science, Technology and Innovation, especially science education

Global challenges are well documented in 17 Sustainable Development Goals (SDGs) of the United Nations. Unlike MDGs, SDGs stress the importance of Economy and Society on top of Environment. It is quite true, without economic (green) growth, cleaner environment is hardly guaranteed. And, I believe, economic development depends mostly upon education (science education, in particular) of the people,

Of course, formal science education is very important, but it stands for only 25%. The remaining 75%

duty of enhancing science literacy relies on informal science education channels, namely science communications in a broader sense.

Science communications can be effectively achieved by sharing already existing science knowledges through good adaptation, transfer, diffusion, and optimization to local and/or regional conditions. This is why IAP (InterAcademy Partnership), the Global Network of Science Academies, can play a pivotal role with IANAS, AASSA, EASAC and NASAC. Global Agencies such as UN

have every reason to fund IAP SEP programs of bridging the knowledge gap of IAP member academies.

MIGUEL ALLENDE

Allende Miguel L.
Professor University of Chile
Center for Genome Regulation
Universidad de Chile
Telephone number + (56)2 2 978 7390
allende.miguel@gmail.com
Chile

Dr. Allende was trained as an undergraduate at the Catholic University in Santiago in the field of Biology. He carried out his thesis in Cell-Molecular Biology with Dr. Nivaldo Inestrosa performing studies on the role of intermediate filaments in neural development and disease and graduated in 1988. He then entered the PhD Program in Biomedical Sciences at the University of Pennsylvania and worked with Dr. Eric Weinberg, where he undertook a thesis project using a newly arrived model organism at that time, the zebrafish, and graduated in 1994. For the next stage in his career, he joined the group of Dr. Nancy Hopkins as a postdoc at the Center for Cancer Research of the Massachusetts Institute of Technology, MIT. He returned to Chile in 1998, took a position at the Faculty of Science, Universidad de Chile and began his independent career. Since that time, he has been a Professor in the Department of Biology and was promoted to Full Professor in 2010. In 2000, he was awarded a Millennium Nucleus grant that funded a young group of developmental biologists, funding that was renewed two times and lasted until 2010; he was the Director of the Nucleus during second and third periods (2003-2010). In 2010, he received a much more significant grant from the FONDAP program that funds Centers of Excellence. Dr. Allende, acting again as Director of the initiative, has led since 2010 the Center for Genome Regulation, that encompasses 15 scientists from three Chilean universities.

Scientifically, Dr. Allende has worked mainly on the development and regeneration of the fish mechanosensory system, a model that is analogous to the inner ear of mammals which allows hearing and balance. As fish can regenerate these cells, it became

interesting to Dr. Allende to examine how they differentiate from progenitor cells during peripheral nervous system development and, later, to look at how they regenerate when lost to external damage. The bulk of his productivity since 2006 is in this area, although more recently, he has begun to examine the role of the immune system in the regenerative process. He has published over 60 papers in ISI ranked, peer reviewed journals. Dr. Allende has made important contributions to Chilean science outside of his scientific output. He has been a productive mentor, directing 59 theses (21 undergraduate, 14 Master's and 24 PhD theses) and supervising 9 postdoctoral fellows. His students have gone on to excellent independent positions, both in Chile and abroad. He has organized numerous international training courses in developmental biology for Latin American students; at this moment, he is organizing a new course in Genome Editing Technologies for April 2016 which has already generated a high level of interest. Together with his lab, he has been involved in numerous activities aimed at promoting science to the public and to school teachers and children, including a recent workshop to implement a mobile lab in the area of developmental biology. At the University of Chile, he has been awarded for his undergraduate teaching in the molecular biology course. He has an important role in the University administration (he belongs to the Council for University Evaluation, that supervises all of the academic practices at the institution). He sits on the Board of the Fulbright Commission, that awards fellowships for PhDs in the United States. Finally, last year, he was elected to the Chilean Academy of Sciences, for his contributions to Chilean scientific development.

ABSTRACT THE USE OF ZEBRAFISH FOR EDUCATIONAL PURPOSES

The zebrafish is a vertebrate organism well suited for demonstrative experiments that are simple and quick in the areas of genetics, developmental biology and environmental science. Like the fruit fly, mating a pair of animals yields hundreds of offspring and phenotypes can be easily seen with the aid of a simple dissecting scope. Embryos develop rapidly and they are transparent, allowing the observation within a few hours of all of the events that shape the organism starting from a fertilised egg. The larvae are excellent biosensors as developmental defects induced by environmental contaminants or toxic compounds can be directly observed. For these reasons, numerous initiatives around the world are using the zebrafish as a model for K-12 science teaching. Our academic laboratory has developed specific modules for the teaching of environmental toxicology to school children by

incubating embryos in larvae in environmental samples or using household toxicants such as cigarette smoke. We demonstrate the biological consequences of exposure to different concentrations of contaminants as a way to illustrate their potential hazards and to highlight the increased sensitivity of the early life stages of animal life to these agents. The experiments are simple, take a few days to carry out and are highly appreciated by students and teachers. In addition, concepts in development and genetics are introduced as the larvae used are transgenic and express fluorescent proteins in different tissues and cell types.

Miguel L Allende
Director
FONDAP Center for Genome Regulation
Universidad de Chile

MARCELA COLOMBRES

Colombres Marcela
Dir. Ejecutiva de Fundación EcoScience Chile
Telephone number + (562) 2756 0300
colombresmarcela@gmail.com
Chile

Marcela Colombres, Ph.D. Fundación EcoScience Chile, Executive Director.

Biochemist and Ph.D. in Biological Sciences at Pontificia Universidad Católica de Chile.

Leader of the first Chilean science bus, initiative of both Fundación EcoScience and Fundación Ciencia & Vida. The Bus "ConCiencia" (With Science) brings science education to deprived rural schools, and the hands-on excitement of the lab to students to more than 10,000 students per year. All the experiments on board are aligned to the Chilean national science education curriculum using recycled low cost material in their workshops. Science teachers are free to choose what topic they want to reinforce during the one week

stay at their school. This initiative has been awarded with the National Prize for Science Education Innovation (formal education category), the Prize "Mujer Impacta" which outstands women that impact in a positive way our society and Leadership awards to our lead science teacher on board.

Author of "Animalario Chileno" from the recently launched Fundación Creando Curiosos where she collaborates as Scientific Director. This is an art based Project that teaches students how to recognize Chilean animals as a first step into animal conservation and their local habitats.

She is convinced that science education can act as a key transforming agent in our society.

KENA MILLS SHAW

Shaw Kenna R. Mills
Executive Director MD Anderson Cancer Center
Telephone numbers 713.792-1873
office; 713-792-6670 main; 713-792-6671 fax
KRShaw@mdanderson.org
U.S.A.

BIOSKETCH

Kenna R. Mills Shaw graduated Magna Cum Laude from the College of William and Mary with bachelor's degrees in Spanish and Biology. Before completing her PhD in Cell and Developmental Biology at Harvard University with Joan Brugge, Kenna spent a year in Chile as a Fulbright Scholar investigating the role of scientists in K-12 education. While in Chile, Kenna played a key role in the revision of the national biology curriculum and directed a professional development program for high school teachers on molecular biology. This program has now been extensively used throughout Latin America and is still in use today in Chile. Her interest in science education piqued, Kenna continued to volunteer and perform outreach in K-12 education while in graduate school. As an American Cancer Society-supported post-doctoral fellow at the National Institutes of Health, Kenna also served as a fellow at the National Science Resources Center where she worked on professional and curriculum development for K-8 science education. After her post-doctoral fellowship, Kenna served as Director of Education for the American Society of Human Genetics where she coordinated all educational outreach and training programs for the society. Dr. Shaw served the lead-Principal Investigator of the Geneticist-Edu-

cator Network of Alliances (GENA) Project, a project funded by the National Science Foundation and has done work on misconceptions about biology and genetics in students and the public. She previously served as the Executive Editor for a new science education venture at Nature Publishing Group called Nature Education (www.scitable.com), where she lead the development of the content and pedagogical tools for the community. Previously, Kenna served as the Director for the Cancer Genome Atlas (TCGA) program where she managed the team responsible for 'front-end operations' of the TCGA program including the collection and processing of tumor samples, development of disease-specific working groups, clinical data collection and auditing, sample processing and distribution and all strategic decisions related to program direction and policy development. Under her leadership the program grew more than 10 fold and promises to complete its work on time and under budget. Kenna joined the MD Anderson Cancer Center in 2013 as the Executive Director of the Institute for Personalized Cancer Therapy. In this role she is working to improve how molecular testing is informing patient care and outcomes in hopes of driving forward innovative trials where MD Anderson has unique capacity.

PAISES PARTICIPANTES



- ARGENTINA
- AUSTRALIA
- BRAZIL
- CHILE
- CHINA
- COSTA RICA
- DENMARK
- FRANCE
- GERMANY
- INDONESIA
- ITALY
- KOREA
- MALASYA
- MÉXICO
- PAKISTAN
- PANAMÁ
- PERÚ
- SPAIN
- THAILAND
- UGANDA
- UNITED KINGDOM
- URUGUAY
- U.S.A.
- VENEZUELA

