

WORKING GROUP ON

Bread and Brain, Education and Poverty

Co-organizers

Antonio M. Battro

Ingo Potrykus

4-6 NOVEMBER 2013 • CASINA PIO IV



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VATICAN CITY 2013

Crouching Boy, sculpture
Michelangelo, c. 1530-1534



If the persons they encounter are living in poverty – said the Holy Father – it is necessary to help them, as the first Christian communities did, by practicing solidarity and making them feel truly loved. The poor living in the outskirts of the cities or the countryside need to feel that the Church is close to them, providing for their most urgent needs, defending their rights and working together with them to build a society founded on justice and peace. The Gospel is addressed in a special way to the poor, and the Bishop, modelled on the Good Shepherd, must be particularly concerned with offering them the divine consolation of the faith, without overlooking their need for “material bread”.

Aparecida Document, 550, Fifth General Conference of the Latin American and Caribbean Bishops’ Conferences, 13-31 May 2007
http://old.usccb.org/latinamerica/english/aparecida_Ingles.pdf



Si las personas encontradas están en una situación de pobreza – nos dice aún el Papa –, es necesario ayudarlas, como hacían las primeras comunidades cristianas, practicando la solidaridad, para que se sientan amadas de verdad. El pueblo pobre de las periferias urbanas o del campo necesita sentir la proximidad de la Iglesia, sea en el socorro de sus necesidades más urgentes, como también en la defensa de sus derechos y en la promoción común de una sociedad fundamentada en la justicia y en la paz. Los pobres son los destinatarios privilegiados del Evangelio y un Obispo, modelado según la imagen del Buen Pastor, debe estar particularmente atento en ofrecer el divino bálsamo de la fe, sin descuidar el ‘pan material’.

Documento conclusivo de Aparecida, 550, p. 273, V Conferencia general del episcopado latinoamericano y del Caribe, 13-31 mayo de 2007
http://www.celam.org/conferencias/Documento_Conclusivo_Aparecida.pdf

Bread and Brain, Education and Poverty

PREFACE

The Pontifical Academy of Sciences has a rich history of transdisciplinary meetings. Given the nature of the urgent and dramatic challenges regarding education and poverty and the broad spectrum of disciplines involved, this time we have decided to focus on some aspects that have been undergoing substantial improvements and may bring hope and practical solutions to the current situation. The pairing of “Bread and Brain” in the title of our Working Group refers to the new technologies to improve food and nutrition on the one hand and to the effects of poverty and malnutrition on neurocognitive development and education and how to overcome them, on the other. We have reached on both sides a high level of expertise that can guide policy makers in their decisions to bring solutions to the global emergency of millions of children of the new generations still deprived of food and nutrients and excluded from a most needed education, two conditions essential for human dignity.

In this spirit we have divided our meeting into four sessions to profit from the discussions

of experts on brain development and education, food security and nutrition security that may converge towards integrated solutions to improve the quality of human life. We fully agree with Blessed John Paul II who, already in 1982, in his address to the Study Week of the Pontifical Academy of Sciences on Modern Biological Experimentation, organized by Professor Jérôme Lejeune, had stated the following: “I wish to recall ... the important advantages that come from the increase of food products and from the formation of new edible plant species for the benefit of all, especially people most in need”. It’s clear that this moral challenge also applies to the best use of the new technologies in the field of neurocognitive development and education today.

Those of us who are Christian ask “our” Lord for “our” daily bread, to give it to us, not to me only, but to others in common with me, to my brothers and sisters, which means providing them with sustainable nutrition, healthy brain development, good education and, finally, the supersubstantial bread of Jesus Christ.

ANTONIO M. BATTRO

INGO POTRYKUS

✦ MARCELO SÁNCHEZ SORONDO



Bread and Brain, Education and Poverty

PREFACIO

La Pontificia Academia de las Ciencias tiene una rica historia de seminarios interdisciplinarios. Dada la naturaleza de los urgentes y dramáticos desafíos respecto de la pobreza y de la educación se impone focalizar este drama con la ayuda que la ciencia moderna puede brindar ofreciendo nuevas esperanzas. La pareja “Pan y Cerebro” – que en inglés suena más armoniosa como “Bread and Brain” – que da el título de nuestro seminario se refiere justamente a estos nuevos aportes. Se trata, por un lado, de mostrar como las nuevas tecnologías pueden mejorar los alimentos y la nutrición, y por otro, de como superar en el desarrollo neurocognitivo y la educación los efectos negativos de la miseria y de la malnutrición. No se puede negar que la ciencia hoy ha alcanzado un alto nivel de experiencia y saber que pueden ofrecer una orientación a los gobernantes para brindar soluciones a la creciente emergencia global de millones de niños que no tienen alimentos nutritivos y así quedan excluidos de un desarrollo cerebral y de la consecuente adecuada educación. Es claro que hoy la alimentación, el desarrollo cerebral y la educación son parte integral de la dignidad humana.

Con este espíritu hemos dividido nuestro seminario en cuatro sesiones para profundizar en las novedades científicas sobre el desarrollo cerebral y la educación, la seguridad alimentaria

y la seguridad nutricional. Entendemos así hacer converger estas contribuciones en una perspectiva interdisciplinaria a los efectos de ofrecer soluciones integradas para mejorar la calidad de la vida humana, especialmente de las nuevas generaciones. Nos inspiran las palabras del Beato Juan Pablo II quien, ya en 1982, en su discurso a la Semana de Estudio de la Pontificia Academia de las Ciencias sobre la *Moderna Experimentación Biológica*, organizada por el Profesor Jérôme Lejeune, afirma: “quisiera recordar ... las importantes ventajas que provienen del aumento de los productos alimenticios y de la formación de nuevas especies vegetales en beneficio de todos, especialmente de los pueblos más necesitados”. Respondiendo al Magisterio de los Papas a la Academia, este imperativo moral hoy vale también para el recto uso de las nuevas tecnologías en el campo del desarrollo neurocognitivo y de la educación.

Aquellos que entre nosotros somos cristianos pedimos a “nuestro” Señor “nuestro” pan cotidiano, no solo el personal sino también el social, es decir aquel de nuestro prójimo, de nuestros hermanos y hermanas. Pan cotidiano que simboliza y resume una alimentación sostenible, un desarrollo cerebral saludable, una buena educación y, finalmente, el pan supersubstancial de Jesucristo.

ANTONIO M. BATTRO

INGO POTRYKUS

✦ MARCELO SÁNCHEZ SORONDO



Bread and Brain, Education and Poverty

PROGRAMME

Monday 4 November 2013

AFTERNOON SESSION I

Chairperson: Antonio M. Battro

16:00 *Word of Welcome*
H.Em. Card. Peter Kodwo Appiah Turkson
Werner Arber

16:10 *Introduction*
Antonio M. Battro and Ingo Potrykus

Neurocognitive development and poverty

16:15 **Martha Farah**
Brain Development in Poverty

16:45 Discussion

17:05 Coffee break

17:35 **Juan Llach**
Long-Term Effects of Early Childhood Education

18:05 Discussion

18:25 **Sebastián Lipina**
Biological and Sociocultural Determinants of Neurocognitive Development: Central Aspects of the Current Scientific Agenda

18:55 Discussion

19:15 Dinner at the Casina Pio IV

Tuesday 5 November 2013

MORNING SESSION II

Chairperson: Ingo Potrykus

The effects of nutrient deficiencies, especially micro-nutrient deficiency on human development

9:00 **Joachim von Braun**
Food and Nutrition Security – The Concept and its Realization

9:30 Discussion

9:50 **Robert Zeigler**
The Continued Need for More Food - Contributions from the CGIAR

10:20 Discussion

10:40 Coffee break

11:10 **Konrad Biesalski**
The Tragedy of Hidden Hunger – Man Can Not Live on Bread Alone

11:40 Discussion

12:00 **Björn Lomborg**
The Importance of Micronutrients for Economic Development

12:30 Discussion

12:50 Lunch at the Casina Pio IV



AFTERNOON SESSION III

Chairperson: Martha Farah

Schooling and poverty: How education can enhance quality of life and equity in poor populations

- 15:00 **Marcelo Suárez-Orozco, Carola Suárez-Orozco**
Educating the Children of Immigrants for the 21st Century
- 15:30 Discussion
- 15:50 **Daniel P. Cardinali**
Sleep and Quality of Life in Urban Poverty
- 16:20 Discussion
- 16:40 Coffee break
- 17:10 **Maryanne Wolf**
The Reading Brain, Global Literacy, and Fighting Poverty. Child by Child
- 17:40 Discussion
- 18:00 **Antonio M. Battro**
A Digital Educational Environment in Poor Populations
- 18:30 Discussion
- 18:50 **Abel Albino**
Investing in Intelligence
- 19:20 Discussion
- 19:40 Dinner at the Casina Pio IV

Wednesday 6 November 2013

MORNING SESSION IV

Chairperson: Joachim von Braun

Interventions to achieve nutrition security

- 8:30 **Howarth Bouis**
Biofortification
- 9:00 Discussion
- 9:15 Departure by bus to the Domus Sanctae Marthae
- 9:30 Group photo with Pope Francis
- 10:00 **Klaus Kraemer**
Supplementation
- 10:30 Discussion
- 10:45 Coffee break
- 11:00 **C.S. Prakash**
Biotechnology for Developing Countries
- 11:30 Discussion
- 11:50 **Robert Paarlberg**
The Consequences of the Anti-GMO Campaigns
- 12:20 Discussion
- 12:40 **Ingo Potrykus**
Lessons from Golden Rice
- 13:10 Discussion
- 13:30 General discussion and Final Statement
- 14:20 Lunch at the Casina Pio IV

Bread and Brain, Education and Poverty

LIST OF PARTICIPANTS

| | | | |
|---|---|---|--|
|  | Dr. Abel Albino Fundación CONIN (Cooperadora de la Nutrición Infantil) Mendoza (Argentina) |  | Prof. Juan José Llach Director, GESE (Centro de Estudios de Gobierno, Empresa, Sociedad y Economía) IAE-universidad Austral Buenos Aires (Argentina) |
|  | Prof. Werner Arber President of the Pontifical Academy of Sciences; Biozentrum, Department of Microbiology, University of Basel Basel (Switzerland) |  | Dr. Björn Lomborg Copenhagen Consensus Center (Denmark) |
|  | Prof. Antonio M. Battro Academia Nacional de Educación Buenos Aires (Argentina) |  | Prof. Robert L. Paarlberg Wellesley College (USA) |
|  | Prof. Dr. med. Hans Konrad Biesalski University of Hohenheim, Department of Biological Chemistry and Nutrition Stuttgart (Germany) |  | Prof. Ingo Potrykus Professor em., ETH, Zürich (Switzerland) http://goldenrice.org/ |
|  | Dr. Howarth Bouis Program Director, HarvestPlus International Food Policy Research Institute (IFPRI) Washington, DC (USA) |  | Prof. C.S. Prakash Tuskegee University (USA) |
|  | Prof. Joachim von Braun Director, Center for Development Research (ZEF) University of Bonn; Professor, Economics and Technological Change Bonn (Germany) |  | H.E. Msgr. Marcelo Sánchez Sorondo Chancellor, Pontifical Academy of Sciences and Pontifical Academy of Social Sciences (Vatican City) |
|  | Dr. Daniel P. Cardinali Universidad Católica Argentina, School of Medicine (Argentina) |  | Prof. Marcelo Suárez-Orozco Dean, GSE&IS, Distinguished Professor of Education University of California Los Angeles, California (USA) |
|  | Prof. Martha J. Farah, PhD Annenberg Professor of Natural Sciences, Director, Center of Neurosciences and Society, University of Pennsylvania (USA) |  | H.Em. Card. Peter Kodwo Appiah Turkson President of the Pontifical Council for Justice and Peace (Vatican City) |
|  | Dr. Klaus Kraemer Sight and Life Basel (Switzerland) |  | Prof. Maryanne Wolf Tufts University, Center for Reading and Language Research (USA) |
|  | Prof. Sebastián Lipina CEMIC-CONICET, Buenos Aires, Unidad de Neurobiología Aplicada (Argentina) |  | Prof. Dr. Robert S. Zeigler Director General, International Rice Research Institute (IRRI) (The Philippines) |

Bread and Brain, Education and Poverty

BIOGRAPHIES OF PARTICIPANTS

Abel Albino nació en el año 1946 en Buenos Aires, Argentina. En el año 1972 se graduó con el título de médico en la Universidad de Tucumán. Al año siguiente viajó a la República de Chile, para especializarse en pediatría en el Hospital Luis Calvo Mackena; ahí tuvo el honor de conocer al Prof. Dr. Fernando Mönckeberg, donde se contactó por primera vez con la problemática de la desnutrición infantil. En el año 1987 se doctoró en medicina en la Universidad Nacional de Cuyo. Después de un tiempo, en el año 1992, se trasladó a España para estudiar Biología Molecular en la Universidad de Navarra. Le produjo profunda tristeza ver la brecha entre Europa y la Argentina; países tan pequeños y poderosos, frente al nuestro que, siendo infinitamente más rico, se encuentra tan empobrecido. Una tarde, encontró un diario tirado, el cual contenía una entrevista a la Madre Teresa de Calcuta, en la que le preguntaban qué era para ella la paz. La reflexión le encantó. Supo que tenía que servir, lo que le faltaba saber era a quién y cómo. Al día siguiente decidió abandonar España, pues se dio cuenta que estaba haciendo una especialidad del futuro, cuando en realidad es hijo de un país que no tiene solucionado su pasado. En mayo de 1992 regresó a Europa con grandes posibilidades de que lo contratasen. En esa oportunidad escuchó al Papa Juan Pablo Segundo, que pedía servir a los más pobres. De regreso a Mendoza organizó un congreso, en el que invitó al Prof. Dr. Fernando Mönckeberg, quien disertó sobre la única debilidad mental que se puede prevenir y revertir, la única creada por el hombre, la debilidad mental del desnutrido. Así, junto a un gran número de colaboradores, el 4 de septiembre del 1993 creó en Mendoza Argentina la Fundación CONIN (Cooperadora de la Nutrición Infantil).

Hans Konrad Biesalski is currently head of the department of Biological Chemistry and Nutrition at the University of Hohenheim in Stuttgart, Germany, a position he has held since 1995. He serves on the boards of several scientific journals, including *Nutrition*, *Nutrition and Metabolism*, the *International Journal of Vitamin and Nutrition Research*, *Aktuelle Ernährungsmedizin* and the *European Journal of Nutrition*. He is a member of the executive board of the German Society of Nutrition Medicine, the scientific advisory board of the U.S. Pharmacopeia, the FAO/WHO Joint Expert Group on nanotechnology and food, and the scientific board of the German Society for Vitamin Research, among other key organizations. Prof. Dr. Biesalski has published more than 350 scientific papers in peer-reviewed journals.

Howarth Bouis. Director of Harvest Plus. Dr. Bouis received his B.A. in economics from Stanford University and his M.A. and Ph.D. from Stanford University's Food Research Institute. Since 1993, he has sought to promote biofortification within the CGIAR, among national agricultural research centers, and in the human nutrition community. His past research focused on understanding how economic factors affect food demand and nutrition outcomes, particularly in Asia. He holds a joint appointment at the International Food Policy Research Institute (Washington, D.C.) and the International Center for Tropical Agriculture (CIAT) (Cali, Colombia). Expertise: Agricultural economics, biofortification

Daniel P. Cardinali nació en Buenos Aires en 1943. Obtuvo su título de Médico y de Doctor en Ciencias Biológicas ("summa cum

laude") en la Universidad del Salvador. En 1971-72 completó su formación postdoctoral en el Department of Nutrition and Food Science, Massachusetts Institute of Technology, EE.UU. Desde 1973 es miembro de la Carrera del Investigador Científico del CONICET y desde entonces su labor científica y docente se ha desarrollado exclusivamente en el país. Desde 1992 el Dr Cardinali es Investigador Superior del CONICET y entre 1986 y 2008 fue Profesor Titular de Fisiología y Director del Laboratorio de Neurociencias, Facultad de Medicina, UBA. En 2010 fue nombrado Profesor Emérito de la Universidad de Buenos Aires. Desde 2009 se desempeña como Director del Departamento de Docencia e Investigación y Director de la Carrera de Doctorado de la Facultad de Ciencias Médicas, Pontificia Universidad Católica Argentina. Es Doctor "honoris causa" en Medicina de la Universidad Complutense de Madrid (1991) y de la Universidad de Salamanca (1998). Es Académico Correspondiente de la Real Academia de Medicina de España y de la Academia de Ciencias Médicas de Córdoba. Ha sido miembro de la Comisión Asesora de Ciencias Médicas y de la Junta de Calificación y Promoción del CONICET y actualmente es miembro de su Comité de Ética. El campo de interés científico del Dr. Cardinali ha sido la fisiología y farmacología de la melatonina, en particular sus aplicaciones terapéuticas en la Medicina del Sueño. Ha publicado 2 libros de texto en Fisiología y de Neurofisiología, de un libro de texto sobre Cronobiología y de un libro de divulgación sobre Cronobiología. Ha sido Editor Asociado de 9 volúmenes internacionales y autor de uno en formato digital. Es autor de 105 capítulos en libros de la especialidad. Fue Editor Jefe de diferentes revistas científicas. Entre otros premios y distinciones ha recibido la beca John Simon Guggenheim (1977), el Premio Curt P. Richter de la Sociedad Internacional de Psychoneuroendocrinology (1983) y el Diploma al Mérito, Ciencias Biomédicas Básicas, Fundación Konex (2003). En el año 2007 recibió el Premio "Bernardo A. Houssay" a la Trayectoria Científica. En el año 2008 recibió el "Aaron B. Lerner Pioneer Award" que otorga la Federación Norteamericana de Sociedades de Biología Experimental (FASEB) a la labor excepcional en el estudio de la melatonina. Como educador médico el Dr. Cardinali ha estado a cargo de diversas funciones curriculares en la UBA, Universidad Favaloro y actualmente en la UCA.

Martha J. Farah is a cognitive neuroscientist who works on problems at the interface of neuroscience and society, including: the effects of childhood poverty on brain development; the expanding use of neuropsychiatric medications by healthy people for brain enhancement; novel uses of brain imaging, in e.g. legal, diagnostic and educational contexts; the many ways in which neuroscience is changing the way we think of ourselves as physical, mental, moral and spiritual beings. In addition to research and writing on these issues, she also teaches, advises graduate students and postdoctoral fellows, and directs the Center for Neuroscience & Society at the University of Pennsylvania. Education: Massachusetts Institute of Technology, S.B., 1977, Metallurgy and Materials Science; S.B., 1977, Philosophy; Harvard University, Ph.D., 1983, Experimental Psychology; MIT and Boston University School of Medicine, Postdoctoral studies, 1983-85, Neuropsychology. Professional History: Carnegie Mellon University, Assistant Professor, Associate Professor and Professor of Psychology, 1985-92; University of Pennsylvania, Walter H. An-

enberg Professor in Natural Sciences, 2006-present; Professor of Psychology, 1992-present; Secondary appointments in Neurology (1992-present) and Graduate School of Education (2012-present); Director, Center for Cognitive Neuroscience, 1999-2010; Director, Center for Neuroscience & Society, 2009-present. Selected Honors, Fellow, American Academy of Arts and Sciences (2010), William James Fellow (Lifetime Achievement Award), Association for Psychological Science (2008), Highly Cited Researcher, Institute for Scientific Information (2004-present), John Simon Guggenheim Fellowship (1995), Distinguished Scientific Award for Early Career Contribution to Psychology, American Psychological Association (1992), Troland Award, National Academy of Sciences (1992).

Klaus Kraemer obtained his first degree and doctorate in nutritional sciences from the University of Giessen in Germany. He is currently Director of *Sight and Life*. *Sight and Life* is a not-for-profit nutrition think tank of DSM, which cares about the world's most vulnerable populations, and exists to help improve their nutritional status. Acting as their advocates, *Sight and Life* guides original nutrition research, disseminates its findings and facilitates dialog to bring about positive change. Klaus Kraemer has over 25 years of experience in research and advocacy in the field of health, bioavailability and safety of vitamins, minerals and carotenoids. Dr. Kraemer is editor of *Sight and Life* magazine, one of the most widely distributed scientific magazines on micronutrients and nutrition in the developing world. He serves on several professional societies dedicated to nutrition, vitamins, and antioxidants, is reviewer for a number of scientific journals, has published many peer-reviewed scientific articles, and co-edited 9 books. Dr. Kraemer was honoured for the dedication in the fight against micronutrient deficiencies in developing countries by the Micronutrient Forum and the Oxygen Club of California. Recently, he has been appointed member of the Flour Fortification Initiative Leaders Group and Steering Committees of the Micronutrient Forum, BOND (Biomarkers of Nutrition for Development) and the New York Academy of Sciences' Sackler Institute for Nutrition Science.

Sebastián J. Lipina (Buenos Aires, Argentina, 1968) is a cognitive neuroscientist and developmental psychologist who works in research projects aimed at analyzing processes of brain organization (development) and reorganization after injury, in an interdisciplinary context of experimental and applied research models with rodents, non-human primates and children. He coordinates an interdisciplinary research program that approach the study of the effects of childhood poverty on neurocognitive development, and the design of interventions to optimize children cognitive and emotional self-regulation through multimodal programs applied in several contexts of development involving parents, teachers and researchers. He is a Researcher of the National Council of Research (CONICET); Codirector of the Unit of Applied Neurobiology (UNA, CEMIC-CONICET); Professor of Social Vulnerability and Cognitive Development at the National University of San Martín (UNSAM); Member of the Interdisciplinary Committee of the Society for Research in Child Development (SRCD); and Consultant of the Panamerican Health Organization (PAHO). He was a Research Fellow of the Comparative Research Programme on Poverty (CROP) and taught classes, seminars and conferences at various universities (i.e., University of Oregon, University of Yale, Westminster College, University of Utah, University of Bergen, Harvard University, Pennsylvania State University, Universidad Internacional de Andalucía, Universidad de Buenos Aires, Universidad Nacional de Córdoba, Universidad de la República, Universidad Nacional de Chile).

Bjorn Lomborg was born January 6, 1965 and researches the smartest ways to improve the environment and the world. He is one of *TIME Magazine's* 100 most influential people in the world,

one of the 75 most influential people of the 21st century according to *Esquire* magazine, and one of the 50 people who could save the planet according to the UK *Guardian*. Lomborg has repeatedly been named one of Foreign Policy's Top 100 Global Thinkers. He is an adjunct professor at Copenhagen Business School and regularly works with many of the world's top economists, including 7 Nobel Laureates. His think tank, the Copenhagen Consensus Center, was ranked by the University of Pennsylvania as one of the world's "Top 25 Environmental Think Tanks". Lomborg is a frequent commentator in print and broadcast media, for outlets including the *New York Times*, *Wall Street Journal*, *the Guardian*, CNN, FOX, and the BBC. His monthly column is published in 19 languages, in 30+ newspapers with more than 30 million readers globally. Dr. Bjorn Lomborg is an academic and the author of the best-selling *The Skeptical Environmentalist* and *Cool It*. He challenges mainstream concerns about the environment and points out that we need to focus attention on the smartest solutions first. He is an adjunct professor at the Copenhagen Business School, and director of the Copenhagen Consensus Center (www.copenhagenconsensus.com) which brings together many of the world's top economists, including seven Nobel Laureates, to set priorities for the world. The Copenhagen Consensus Center is ranked by the University of Pennsylvania as one of the world's "Top 25 Environmental Think Tanks". *The Economist* said "Copenhagen Consensus is an outstanding, visionary idea and deserves global coverage." Lomborg is a frequent participant in public debates on policy issues. His analysis and commentaries have appeared regularly in such prestigious publications as the *New York Times*, *Wall Street Journal*, *USA Today*, *Economist*, *Globe & Mail*, *The Guardian*, *The Daily and Sunday Telegraph*, *The Times*, *The Australian*, the *Los Angeles Times* and *Boston Globe*. Lomborg's monthly column appears in around 40 papers in 19 languages, with more than 30 million readers. He is a television commentator on CNN, Fox, MSNBC and the BBC, among others, on shows such as "Newsnight", "20/20", "60 Minutes", "The Late Show with David Letterman", and "Larry King Live". He was featured in the movie "Cool it", by Sundance Award winning director Ondi Timoner. In 2011 and 2012, Lomborg was named Top 100 Global Thinker by Foreign Policy "for looking more right than ever on the politics of climate change". Professional areas of interest: Simulation of strategies in collective action dilemmas; simulation of party behavior in proportional voting systems; use of surveys in public administration; use of statistics in the environmental arena.

Robert L. Paarlberg is the Betty Freyhof Johnson '44 Professor of Political Science at Wellesley College. He is a researcher on food and agricultural policy, with a focus on farming technologies and poverty in the developing world. I do most of my research and consulting in the area of international food and agricultural policy, especially in Africa and the developing world. This topic connects me both to my own family history (my father grew up on a farm in Indiana) and to an important current issues in international development: How to help farmers in Africa – most of whom are women – increase their productivity to better feed their families and escape poverty. In the past decade I have worked in more than a dozen countries in Africa, supported by the Bill and Melinda Gates Foundation, the International Food Policy Research Institute, and the United States Agency for International Development. My 2008 book from Harvard University Press (*Starved for Science: How Biotechnology is Being Kept Out of Africa*) has a foreword by two Nobel Peace Prize winners, Jimmy Carter and Norman Borlaug. My current research examines the impact of international trade on agricultural land use. In recent years, my students at Wellesley have taken an increased interest in issues of food and farming around the world. They want to know what kinds of food and farm systems can provide not just increased production, but social justice, improved nutrition, and environmental sustainability as well. I address these questions

in a senior seminar I teach every year, and in 2010 I published a book from Oxford University Press (*Food Politics: What Everybody Needs to Know*) based on the materials developed in this seminar. I also teach two large international relations courses every year, one on international economic policy and the other on “theories” of United States foreign policy. In addition, I teach the introductory course in our department, which showcases eight important books written by political scientists, from Machiavelli to the present. My work on international agriculture engages me with a wide variety of audiences beyond the academic world. In the past year I have given talks to the executive leadership of the Mars Candy Company (on cocoa, in Africa), to the Pontifical Academy of Sciences in Rome (on agricultural technology), and to a conference on African farming in Uganda. In addition, I gave testimony in 2009 to the Senate Foreign Relations Committee, on U.S. agricultural development assistance policy. Most interesting to me, however, are the visits I make to farms and farmers in the developing world, where a combination of bad history and bad current policy have held too many people in poverty for too long.

C.S. Prakash is a professor of plant genetics, biotechnology and genomics at Tuskegee University (USA) where he has been on faculty since 1989. He oversees the genetic improvement research on food crops of importance to developing countries and has trained dozens of scientists and students. He has also been actively involved in enhancing the societal awareness of food biotechnology issues around the world. He has funded projects on peanut genomic research from USAID/Zambia; serves in the USAID Agricultural Innovation Partnership project to enhance agricultural innovation in India in partnership with Cornell University; and, partners with UCLA in an innovative distance learning program on genetics through interactive live video including lecturing in an online course. Dr. Prakash also serves as Editor-in-chief of the journal *GM Crops*.

Marcelo Suárez-Orozco. Education: Ph.D., Department of Anthropology, University of California, Berkeley (1986); M.A., Department of Anthropology, University of California, Berkeley (1981); A.B., Department of Psychology, University of California, Berkeley (1980). Awards, Honors, Fellowships: Special Advisor to the Chief Prosecutor, The International Criminal Court, The Hague, The Netherlands, 2012; The Fisher Membership Fellow, Institute for Advanced Study, Princeton, NJ, 2009-2010; Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, 1992-1993; The Virginia and Warren Stone Prize, Awarded Annually by Harvard University Press for an Outstanding Book on Education and Society, 2007; Orden Mexicana del Águila Azteca. (The Mexican Order of the Aztec Eagle), 2006; Member of the National Academy of Education. (Elected April 2004); America's 100 Most Influential Hispanics. *Hispanic Business Magazine*, 2001. Master of Arts, Honoris Causa, Harvard University (1995). Select Publications: *Learning a New Land: Immigrant Students in American Society*. (Carola Suárez-Orozco, Marcelo Suárez-Orozco, and Irina Todorova). (2008) Cambridge MA: The Belknap Press of Harvard University Press; *Latinos: Remaking America*. Second Edition. (Marcelo M. Suárez-Orozco and Mariela Páez, Editors). (2009) Cambridge, MA and Berkeley, CA: David Rockefeller Center for Latin American Studies at Harvard University and University of California Press; *Making Migration Work*. (Marcelo Suárez-Orozco, Carola Suárez-Orozco, and Carolyn Sattin-Bajaj). *Peabody Journal of Education*, 2010, 85 (4): 535-551; *Migrations and Schooling*. (Marcelo Suárez-Orozco et al.) *Annual Reviews of Anthropology*. 2011, Vol. 40:311-28; *Writing Immigration: Scholars and Journalists in Dialogue*. (Marcelo M. Suárez-Orozco, Vivian Louie and Roberto Suro, Editors). (2011) Berkeley and Los Angeles: University of California Press.

Maryanne Wolf is the John DiBiaggio Professor of Citizenship and Public Service, Director of the Center for Reading and Lan-

guage Research, and Professor in the Eliot-Pearson Department of Child Development at Tufts University. She received her doctorate from Harvard University, where she began her work in cognitive neuroscience and developmental psycholinguistics on the reading brain, literacy's development, and dyslexia. Selected awards include Distinguished Professor of the Year (Massachusetts Psychological Association); the Teaching Excellence Award (American Psychological Association); the Distinguished Researcher Award; Fulbright Research Fellowship; Alice Ansara Award; the Norman Geschwind Lecture Award and Samuel Orton Award (International Dyslexia Association's highest honors); NICHHD Shannon Award for Innovative Research, resulting in the RAVE-O reading intervention program; and Christopher Columbus Discovery Award for groundbreaking work in new territories of scholarship. The latter award was for her most recent work in Ethiopia and South Africa on the development of a digital learning experience that will bring literacy to children in remote regions of the world who have no access to schools. This cross-disciplinary work is done in conjunction with the MIT Media Lab, Georgia State University, and the Dalai Lama Center for Ethics and Transformative Values. The author of over 140 scientific publications, Wolf wrote *Proust and the Squid: The Story and Science of the Reading Brain*, which has received numerous awards and is now translated into 13 languages. Within literacy areas, she serves on the Library of Congress Advisory Committee on Literacy Awards, and the Advisory Committee to the X Prize, whose new award will target Global Literacy, based in part on the recent work on literacy by her joint team in Ethiopia.

Robert “Bob” Zeigler is an internationally respected plant pathologist with more than 30 years of experience in agricultural research in the developing world. He is the director general of IRRI. As CEO and in close consultation with the IRRI Board of Trustees he sets the Institute's strategic direction. He is also a passionate spokesperson on a wide range of issues that affect rice growers and consumers worldwide. His professional life spanned Africa, Latin America, US, and Asia. He has had a productive research career on diseases of rice that focused on host-plant resistance, pathogen and vector population genetics, and their interactions to develop durable resistance and sustainable disease management practices. As Bob's career moved increasingly towards research management his interests expanded to include broader crop management issues, the social forces shaping the agricultural environment, and finally the economic and political arena that frames food security and poverty issues. He has published over 100 scientific works in these areas and often serves as an expert resource on rice security in the regional and global media. Bob is also the founding chairman of the board of the IRRI Fund Singapore, an incorporated nonprofit charitable organization established to raise the profile of international rice research and generate funding for it. He serves as the Chairman of the Board of Directors of the Association of International Agricultural Research Centers that manages a wide range of employee benefits for internationally recruited staff for the 15 CGIAR centers and several affiliated centers. He also serves on the Golden Rice Humanitarian Board. Bob previously worked at IRRI from 1992 to 1998 as a plant pathologist. During this period, he led the Rainfed Lowland Rice Research Program and then later the Irrigated Rice Research Program. After completing undergraduate work in 1972, he joined the Peace Corps and spent 2 years as a science teacher in the Democratic Republic of Congo in Africa. He later joined the International Center for Tropical Agriculture (CIAT) in Colombia as a visiting research associate to work on cassava diseases. Starting in 1982, he spent 3 years in Burundi to work as a technical adviser for that African nation's maize program at the Institut des Sciences Agronomiques du Burundi. He then returned to CIAT, eventually becoming head of the Rice Program. He became professor and head of the Department of Plant Pathology and director of the Plant Biotech-

nology Center at Kansas State University in the US in 1999. He was the founding director of the Generation Challenge Program (GCP) of the Consultative Group on International Agricultural Research (CGIAR) based in Mexico. The GCP supports research at many institutions around the world directed towards understanding and applying genetic diversity to crop improvement. He has completed corporate governance programs from Harvard Business School and Kellogg School of Management. Dr. Zeigler is an elected fellow of the American Association for the Advancement of Science and of the American Phytopathological Society and is a member of the honor societies Sigma Xi (The Scientific

Research Society) and Gamma Sigma Delta (agriculture). He is the chairman of the board of directors of the Association of International Agricultural Research Centers (AIARC). He has authored and co-authored well over 100 refereed international journal articles, reports, and scientific papers and has delivered numerous invited lectures worldwide.

For the biographies of the Academicians of the PAS and PASS see www.pas.va and www.pass.va

Observer: Prof. Hideaki Koizumi • Hitachi Ltd., Japan

ABSTRACTS

INVERTIR EN INTELIGENCIA

ABEL PASCUAL ALBINO

El cerebro es el órgano que más rápidamente crece. Cuando el niño nace, pesa de 1 al 2% de su peso corporal, alrededor de 35 a 70 gr. A los 14 meses, cuando camina 900 gr., el 80% del peso definitivo, ya que en el adulto llega a 1.200 gr. Por lo tanto el crecimiento gigantesco lo hace en el primer año de vida. El primer año marca la suerte del individuo, de un pueblo, de una Nación, el daño es individual y social. Este vertiginoso crecimiento, no sólo depende de una buena alimentación, sino también de la buena estimulación afectiva que el niño reciba. En este punto es donde la metodología de CONIN se convierte en referente para la prevención y recuperación de la desnutrición infantil, ya que realizamos un abordaje integral e interdisciplinario de la problemática social que da origen a la extrema pobreza.

A DIGITAL EDUCATIONAL ENVIRONMENT IN POOR POPULATIONS

ANTONIO M. BAITRO

We are facing an education emergency and we need to take urgent measures to ensure the right to education. Millions of children around the world are excluded from a proper education as a result of dramatic conditions of poverty and social inequity but for the first time in history we have the tools to bridge this intolerable gap. In fact the formidable expansion of the digital environment is covering the whole world and can be used in benefit of education. And education is the way to overcome poverty. We need to proceed as epidemiologists and cover very large populations, close or remote, to prevent ignorance and to unfold in the child the required neurocognitive skills to become an educated person in our century. In this sense digital tools are rapidly scalable and may reach millions in a short time. Recent digital deployments that cover marginal communities are showing ways to improve education even in extreme situations without schools or teachers. I will offer several successful examples of a large spectrum of digital deployments and educational interventions in poor communities, based in eight years of international experience by OLPC, The One Laptop per Child Foundation and Association.

THE TRAGEDY OF HIDDEN HUNGER – MAN CAN NOT LIVE ON BREAD ALONE

HANS K. BIESALSKI

Hidden hunger is hidden in two ways: 1. because this type of hunger, even despite a full stomach, develops without typical clinical signs or symptoms and 2. due to missing public and political awareness. Hidden Hunger is responsible for impaired

childhood development, high maternal mortality and at least for millions of death in children before the age of five. Hidden hunger describes chronic inadequate supply with essential micronutrients through the diet. In particular vitamin A, iron, zinc, iodine and folate. Further essential micronutrients might be absent in the diet but those mentioned above contribute to the majority of cases worldwide: 2 Billion worldwide suffer from iron deficiency, one billion from iodine- and zinc- and 0.2-05 billion from vitamin A deficiency. Young females, pregnant women and children aged 1-5 years are primarily affected from hidden hunger. They are placed on a hunger carousel, which they cannot leave, by their own. Hidden hunger during pregnancy results in inadequate supply of the growing child and has a negative impact on early development. Iodine deficiency during pregnancy may result in severe cognitive impairment and deafness. Folate deficiency results in neural tube defects and vitamin A deficiency in different malformations and impaired lung function. Malnutrition during the 1000 days, from conception to the end of the second year of life results in stunting (reduced height for age) with physical and cognitive impairment. Stunting however, is irreversible! Up to 50% of the children in Sub-Sahara Africa and Asia are stunted. These children however, are the human capital and consequently the basis for future development of these countries. The major reasons for hidden hunger are missing food sources e.g. fruits, vegetables, meat. One third of the human population lives in poverty and needs to cover up to 85% of their daily energy need with grains. However, grain (maize, rice, wheat) is a good source for energy and protein and creates satiety but a rather poor source for micronutrients. These staple food are globally available and, compared to higher quality food, less expensive. Poverty results in a poor food pattern with low diversity and consequently in a poor supply of essential micronutrients. The reasons for poverty are manifold but they all interact finally with food prices and at least promote hidden hunger. Even short price shocks independent from what reason will have deadly consequences. Children living on a long lasting malnutrition are too weak to compensate a further reduction of the existing marginal supply with essential nutrients. Chronic diarrhea due to zinc deficiency, chronic infectious diseases of the upper respiratory tract due to vitamin A deficiency and chronic impairment of the immune system due to iron, zinc and vitamin A deficiency make them extremely susceptible against any kind of infections and will lead to immediate severe and deadly consequences. A program with different steps from acute intervention to an intermediate approach and at least a sustainable solution needs to be urgently designed to liberate the mothers and their children from the hunger carousel.

BIOFORTIFICATION

HOWARTH BOUIS

Biofortification, the process of breeding nutrients into food crops, provides a sustainable, cost-effective strategy for delivering micronutrients to rural populations in developing countries. Crops are being bred for higher levels of micronutrients using both conventional and transgenic breeding methods; several conventional varieties have been released, while additional conventional and transgenic varieties are in the breeding pipeline. The results of efficacy and effectiveness studies, as well as recent successes in delivery, provide evidence that biofortification is a promising strategy for combatting hidden hunger. This presentation will highlight progress to date and identifies challenges faced in delivering biofortified crops. Biofortification provides a feasible means of reaching malnourished rural populations who may have limited access to commercially marketed fortified foods and supplements. Unlike the continual financial outlays required for traditional supplementation and fortification programs, a one-time investment in plant breeding can yield micronutrient-rich plants for farmers to grow around the world for years to come. It is this multiplier aspect of biofortification across time and distance that makes it so cost-effective. Poor farmers grow modern varieties of crops developed by agricultural research centers supported by the Consultative Group on International Agricultural Research (CGIAR) and by national agricultural research and extension systems (NARES), and disseminated by nongovernmental organizations (NGOs) and government extension agencies. The biofortification strategy seeks to put the micronutrient-dense trait in the most profitable, highest-yielding varieties targeted to farmers and to place these traits in as many released varieties as is feasible. Moreover, marketed surpluses of these crops make their way into retail outlets, reaching consumers in both rural and urban areas.

Implementing biofortification

For biofortification to be successful, three broad questions must be addressed: 1) Can breeding increase the micronutrient density in food staples in high-yielding backgrounds to reach target levels that will have a measurable and significant impact on nutritional status? The following conventionally-bred biofortified varieties have met agronomic requirements and have been released since 2011:

- High provitamin A cassava, Nigeria and DR Congo (2011)
- High provitamin A maize, Zambia (2012)
- High iron beans, Rwanda and DR Congo (2012)
- High iron pearl millet, India (2012)
- High zinc rice, Bangladesh (expected 2013)
- High zinc wheat, India (expected 2013)

2) When consumed under controlled conditions, will the extra nutrients bred into the food staples be bioavailable and absorbed at sufficient levels to improve micronutrient status? Results of feeding trials have been published establishing the efficacy of high provitamin A sweetpotato. Positive results (as yet unpublished) for high iron beans and high iron pearl millet have been presented at conferences. Several efficacy trials are in process. By the end of 2014, it is expected that eleven additional efficacy studies will have published for beans, pearl millet, cassava, maize, and wheat. Bioavailability studies for cassava, maize, and rice have shown provitamin A to be much more bioavailable in staple foods than in fruits and vegetables. 3) Will farmers grow the biofortified varieties and will consumers buy and eat them in sufficient quantities? High provitamin A orange sweetpotato has been promoted among African farmers since 2007. Pilot delivery programs in Mozambique and Uganda have shown that high percentages of target farm households will adopt and consume the orange varieties, improving the serum retinol levels of children.

Experience with Transgenic Biofortified Crops

Golden Rice was first developed at the Swiss Federal Institute of Technology, and research was furthered by Syngenta as part of

their then-commercial pipeline. Transgenic events with higher levels of provitamin A, up to 37 ppm in a U.S. variety (the GR2 events), were produced and were then donated for use by the Golden Rice Network when Syngenta decided not to pursue the trait as a commercial product. Research on Golden Rice is currently led by the International Rice Research Institute (IRRI). Starting in 2006, the GR2 events were backcrossed into varieties for the Philippines, Indonesia, India, and Bangladesh. Field testing is currently ongoing. Other transgenic products under development for Africa include a high provitamin A cassava, banana, and sorghum. Unfortunately, development and release have been greatly hampered by special regulations applied to transgenics due to political pressures.

SLEEP, SLUMS AND SHELTER

DANIEL P. CARDINALI, GUIDO SIMONELLI,

DANIEL PÉREZ CHADA, DANIEL E. VIGO

The unprecedented urban growth in face of increasing poverty and social inequity in developing countries is posing an immense challenge at all levels. Urbanization of poverty is shown mainly by the proliferation and expansion of slums. Over one billion people, approximately 14 percent of the global population, are slum dwellers. According to UN-HABITAT predictions, the number of slum dwellers could double by the year 2030, due to the increase in poverty and social inequality in the context of an extraordinary urban growth. Slums can vary substantially in their structure, composition and culture but slum dwellers do share the fact that they live in the most adverse of circumstances. In this context poor sleep conditions could amplify other health related problems typical of the slum environment, such as psychological distress, poor diet, a sedentary lifestyle and cardiovascular disease, demonstrating its important role in chronic illness and health. In a first part of our study we applied a brief version of the Pittsburgh sleep quality index (PSQI) to the sample population examined by the Barómetro de la Deuda Social Argentina, Pontificia Universidad Católica Argentina (N= 5766). The aim of this program is the identification, monitoring and evaluation of the dynamics and scope of the social debt understood as deficit in human development capabilities and social integration of the population. It also assesses the effect of policies and public-private actions affecting its state and evolution. Analysis of the distribution of sleep disorders as a function of socioeconomic status, residential status and place of residence indicated that the very low socio-economic stratum had a higher percentage of subjects with poor quality of sleep ($X^2 = 23.2$, $p < 0.001$) and daytime sleepiness ($X^2 = 83.0$, $p < 0.001$). The residence in slums was associated with a higher percentage of subjects with poor sleep quality ($X^2 = 13.2$, $p < 0.001$). In a second part of our study we evaluated the impact of a housing transition on sleep quality and quality of life in slum dwellers, participating in a slum-housing upgrading program in 5 slums located in Buenos Aires' Metropolitan Area. A total of 150 slum dwellers benefited by a housing program of a non-profit organization ("TECHO") moving from their very low quality house to a basic prefabricated 18 m² modular house. This was an observational before-and-after study with a convergent-parallel mixed method design. The PSQI and WHO quality of life (QOL) brief scales were administered before and after housing upgrading. Semi-structured interviews were used to expand and nuance quantitative data obtained from a poorly educated sample. Results showed that sleep quality significantly increased after the housing program ($z = -6.57$, $p < 0.001$). Overall QOL ($z = -6.85$, $p < 0.001$), physical health domain ($z = -4.35$, $p < 0.001$), psychological well-being domain ($z = -3.72$, $p < 0.001$) and environmental domain ($z = -7.10$, $p < 0.001$) of QOL were also improved. Therefore a minimal improvement of basic housing can significantly increase sleep quality and quality of life among slum dwellers.

TAKING NUTRITION TO SCALE: MOVING FROM TALK TO IMPLEMENTATION

KLAUS KRAEMER

Globally, 165 million children under the age of five (one in four children) are stunted (short height for age). There is little doubt about the consequences of malnutrition, particularly during the first 1,000 days from pregnancy to the child's second birthday: stunted physical, brain, and mental development. Failure to obtain optimum nutrition during this critical window of opportunity not only negatively affects the life chances of children, but also prevents them, their communities, and their countries from achieving their full economic potential. Malnutrition is responsible for the loss of billions of dollars in productivity – in effect, malnutrition stunts not only individuals, but also economies. It is estimated that 11% of GDP in Africa and Asia is lost to malnutrition every year, with productivity losses to individuals estimated at more than 10% of lifetime earnings. The acknowledgement that, without improved nutrition, many countries will remain unable to reach the Millennium Development Goals (MDGs) and their 2015 successors, the Sustainability Development Goals (SDGs), highlights the need to scale up innovative approaches to attaining both food (sufficient energy to survive) and nutrition (sufficient nutrients for optimal development and health) security. Nutrition has never been higher on the global agenda, and the proven nutrition-specific and nutrition-sensitive interventions required to address the problem have been widely accepted by scientists, programmers, and politicians. We know where to focus – the first 1,000 days – and we know that scaling up requires commitment and capacity, most importantly at a country level. There is much talk about the need for everyone to be involved, and cross sectorial engagement (health, agriculture, business, finance, education, and social protection), yet we often see that silos remain. This is a major challenge. However, perhaps the greatest challenge we face, going forward at a societal level, is how best to deliver these interventions within existing infrastructures and programs, where the delivery of nutrition-specific and sensitive intervention relies on staff motivation, training, work-load, cost, eating habits, and the food system of the target population. The nutrition community is becoming aware that the new frontier in nutrition is implementation (delivery) to scale up sustainable and efficacious nutrition interventions. This paper will focus on this emerging area of implementation research. This is critical, both if we are to show that nutrition interventions can and do make a measurable difference when taken to scale, and to ensure on-going commitments from all stakeholders to nutrition programs.

BIOLOGICAL AND SOCIOCULTURAL DETERMINANTS OF NEUROCOGNITIVE DEVELOPMENT: CENTRAL ASPECTS OF THE CURRENT SCIENTIFIC AGENDA

SEBASTIÁN J. LIPINA

Since both child poverty and development are characterized by their multidimensional nature, the study of the underlying mechanisms involved in their interactions, as well as the design of interventions aimed at modifying them, require the incorporation of multidisciplinary frameworks that consider different epistemological, conceptual, historic, sociocultural, ethical and ideological issues. Effects of poverty on child development involve multiple alterations and impacts physical growth, as well as cognitive and psychosocial development throughout lifespan. Many of these effects may be mediated by the impact of multiple environmental risk factors, present in nearly all the developmental contexts where children grow up -home, school, and community. As it is possible that policies that involve implementation of interventions that directly target the factors that mediate the harmful effect of poverty on human development, basic and applied experimental research may make important contributions to understanding the mediating factors by which poverty nega-

tively affect neurocognitive development, and may help to design and evaluate interventions. Cognitive Neuroscience research revealed that development of the neurocognitive systems related to control, numeracy and literacy competences show plasticity during brain organization and reorganization processes. Considering the neurobiological mechanisms that underlie the relationship between cognition and achievement, allow to open new avenues to investigating and understanding the socioeconomic gaps in several cognitive and learning competences. In addition, neurocognitive analysis may reveal different socioeconomic-related factors playing several mediating roles across neurocognitive systems. Over the last fifteen years, increasingly neuroscientists and developmental psychologists have begun to join collaborative efforts with other social scientists to contribute, both conceptually and methodologically, in the study of poverty effects on basic neurocognitive processes. This paper seeks to outline the contributions and potential of these cognitive neuroscience collaborations on the current scientific agenda on poverty and neurocognitive development.

LONG TERM EFFECTS OF EARLY CHILDHOOD EDUCATION

JUAN J. LLACH

A new literature has emerged during the last twenty years written mostly by economists, and also some sociologists, who analyze the long term effects of early childhood nutrition, stimulation and education, frequently through random or natural experiments. As it happens there is not much contact between literatures studying the same field but coming from different perspectives or sciences. This happens with or without incommensurability between them. Reviewing this literature the paper aims to put it in contact with colleagues from other fields as well as to shed light on the issues dealt with, particularly those referred to educational policies regarding kindergarten and related issues.

CONSEQUENCES OF THE ANTI-GMO CAMPAIGNS

ROBERT PAARLBERG

The global campaign against GMO crops and foods has been highly successful. Mark Lynas, a former environmental activist leader, from the UK, said in 2013, "This was the most successful campaign I have ever been involved in." In Europe, that campaign has effectively blocked both the planting of nearly all GMO crops and the import of GMO foods for direct human consumption. Importing of GMO feed for animals is as far as Europe will go. In the developing countries of Asia, anti-GMO campaigners have effectively blocked the planting of all GMO food and feed crops, except for the Philippines where maize is planted for feed use. In tropical Africa (excluding the RSA), the anti-GMO campaign has blocked not only the production of GMO food and feed crops, but also – in all but one country – the planting of a GMO industrial crop, Bt cotton. In Latin America, GMO feed crops such as maize and soy are widely grown, but GMO food crops are not. Even in the United States, by far the largest producer of GMO crops in the world, the campaign against GMOs has tightly restricted the technology for human food use. Roughly 70 percent of foods in the United States contain some ingredients from GMOs, but most of those ingredients are derivative products from soy, maize, or sugar beets (e.g., oil, meal, starch, or sweeteners). Currently there is no GMO wheat or rice being grown commercially in the United States, and the only GMO fruits or vegetables grown commercially in the United States are papaya, summer squash, and small quantities of sweet corn. GMO potatoes were grown on 25,000 acres in the United States between 1999 and 2001, but cultivation was then voluntarily suspended when food service chains such as McDonald's and Burger King told suppliers they did not want to be accused by activists of serving

GMO french fries. GMO tomatoes were also cultivated commercially in the United States between 1998 and 2002, but when consumer anxieties increased they were voluntarily withdrawn. GMO salmon has been available for regulatory approval in the United States for years, but that approval has not yet been given, nor have food products from any other GMO animals been approved to date. This pattern of non-adoption of GMOs challenges the frequently heard assertion that private biotechnology companies are forcing the technology down our throat. In fact, the private companies have been losing at nearly every turn. GMO foods developed not by transnational corporations but instead by governments and private philanthropic foundations have also been blocked. The world's supply of food for direct human consumption is nearly as GMO-free today as it was 20 years ago. What explains the success of this campaign? Science academies around the world have reached a consensus that the products brought to the market so far present no new risks either to human health or the environment, so we can rule out risk as the reason. We can also rule out "uncertainties," since there has been no comparable campaign against the uncertain long-term effects of new applications of medical drugs developed using the same rDNA science. Biologic drugs have been widely accepted in Europe as well as the United States, despite the fact that they bring both new uncertainties and measured risks – documented in clinical trials. Many of these biologic drugs have also been developed by American transnational corporations and protected by patents, yet nobody campaigns against them, so that can't be the reason either. The success of the anti-GMO campaign can be attributed to the fact that in rich countries (where nearly all transnational advocacy campaigns originate) the benefits of the new technology go primarily to intermediate users – such as farmers, seed companies, and patent holders – rather than to the final food consumer. Food consumers in rich countries can be (nearly as) prosperous and well fed even without GMOs. Since these final consumers in Europe (or even the United States) see little benefit from GMOs, they can easily be turned against the technology by advocacy groups. A different calculus applies in poor developing country regions, such as Africa, where more than half of all consumers are also food producers, engaged in farming or herding animals for most of their income and employment. The benefits to farmers from GMO crops would thus be widely shared in poor countries rather than narrowly concentrated. Unfortunately, when political elites in poor countries see rich country consumers turning away from GMO foods, they draw the mistaken conclusion that there must be something wrong with the technology. Anti-GMO campaigners bombard these political elites with unsubstantiated scare stories that reinforce this conclusion. The result is an extension to the developing world of a social and political preference against GMOs that only makes sense – if at all – for the rich. The anti-GMO campaigners are imposing a rich country taste on the world's poor.

LESSONS FROM GOLDEN RICE

INGO POTRYKUS

The contributions of the speakers from the sessions on the effects of nutrient deficiencies on human development have indicated the importance of „sufficient nutritious food at all times to live a healthy and productive life“ for both the development of the individual person as well as for the well-being of societies. We have also learned, how far we are away from securing this human right for a billion of poor. We have further learned that investment in the improvement of the micro-nutrient status of poor societies is the most effective way for economic development, and we have heard about the „tragedy of „hidden hunger“ – the widespread deficiency in those micronutrients, with all its dramatic consequences for brain development, education, and continuing poverty. Therefore, there are very strong ethical and economic arguments for interventions to improve food security.

On these lines of interventions we have learned about the efforts the Consultative Group for International Agricultural Research is undertaking to approach food security for the people in developing countries. With regards to micronutrients we have also learned about the novel concept of “biofortification” and seen the first success cases based on plant breeding approaches. And we have learned about efforts to improve the nutritious quality of food by established supplementation programs with vitamins and minerals. We have further heard about the successful commercial exploitation of the new technologies, also in developing countries, and we have been informed about the obstacles preventing the full exploitation of the potential for and in many developing countries. The exploitation of the new biotechnologies by the public sector and for public good is, however, badly lagging behind that of the private sector. Food security for the billion poor is clearly a responsibility of the public, not the private sector. Why then, with so much potential in the new biotechnologies, do we see so little progress – not in science but in application – within the public sector. Is there more than just “promise” for public good? The lessons from “Golden Rice”, engineered to provide sufficient provitamin A to substantially reduce vitamin A-deficiency in rice-dependent poor societies, is best suited to illustrate, why, despite the enormous potential of genetic engineering technology, and despite widespread interest in academia to exploit this potential for public good, we see so little product, so far. Proof-of-concept for vitamin A rice was completed in 1999, but deployment of vitamin A-rice will not occur before 2014 – 15 years after the science had been completed. Several factors are responsible for this long delay: (1) Regulation of transgenic plants is so extreme, that it took twelve extra years to develop and deregulate a variety. (2) The regulation-based GMO-specific costs for variety development are so high, that they are prohibitive for the public sector. (3) A world-wide operating, politically very influential anti-GMO lobby is fighting GMOs, against every rational argument, „by principle“, irrespective of the damage to public good. This combination of factors is effectively preventing the public sector from following the „moral imperative to make the benefits of the technology available to the poor“, as requested by the participants of the Study Week of the Pontifical Academy of Sciences on Transgenic Plants for Food Security in the Context of Development (NewBiotechnology 27 (5), p.648 para 15 (2010).

AGRICULTURAL BIOTECHNOLOGY IN THE DEVELOPING WORLD: CAN GMOs HELP TO ENHANCE FOOD SECURITY?

C.S. PRAKASH

Despite its success so far, agricultural biotechnology has vast untapped potential to further enhance food security by developing crops with broad adaptation, improved productivity and enhanced dietary nutrition. Last year, nearly 17 million farmers planted genetically modified (GM) or bioengineered crops on 170 million hectares – nearly one tenth of the arable land across the globe in nearly 28 countries – 20 of them in the developing world. There is scientific consensus that wider adoption of molecular crop breeding tools including transgenics and genomics in agricultural research can foster greater food security in the developing world. Potential benefits include developing hardier crops with greater resiliency to changing climate; mitigating global warming through reduced emission of greenhouse gases; conserving biodiversity; nutritionally enhanced food products including foods with improved flavor, better taste and longer shelf life; developing hypoallergenic foods; smaller environmental footprint of farming (through reduced consumption of pesticides, fertilizers and fuel); make food more affordable; and, developing greener energy alternatives. While the emerging economies are embracing biotechnology in an increasing manner, there are various hurdles towards greater use of this technology in agricultural research: financial, technical, political, intellectual property, burdensome regulation, public policy, public perception

and trade-related issues. It is critical that we strive to ensure that policy makers, media and the public understand and appreciate the vast benefits from this technology while recognizing that any risks are minuscule, and can be easily addressed through testing and scientific regulation. Increased societal understanding of this technology's benefits and safety is thus critical to ensure its acceptance. Scientific community can help foster this through proactive knowledge sharing with various stakeholders, increased interaction with the media and impacting policy makers through science-based information sharing on the food and environmental safety aspects of this technology.

EDUCATING THE CHILDREN OF IMMIGRANTS FOR THE 21ST CENTURY

MARCELO M. SUAREZ-OROZCO, CAROLA SUAREZ-OROZCO

Mass migration is reshaping economies and societies the world over, yet many facets of immigration remain overlooked, misunderstood, or neglected. Scholarly approaches to the study of mass migration have tended to privilege labor factors (Piore 1980); economic variables (Borjas 1999); demographic forces (Passel & Cohn 2009); and, in recent years, border controls (Andreas 2009), undocumented immigration (Chavez 1997), and immigration qua security (Suárez-Orozco *et al.* 2005). Though these approaches have generated some scholarly consensus, important aspects of mass migration remain unexplored. Viewed anthropologically the basic unit of migration is the family. At the manifest level, immigration is driven by labor, demographic, economic, and environmental variables. However, below the surface, immigration's enduring root is the family structured by distinct and culturally coded religious, legislative, economic, reproductive, and symbolic forms. Immigration is an ethical act of, and for, the family. Immigration typically starts with the family and family bonds sustain it. Immigration will profoundly change families as well as the societies in which immigrants settle (Foner 2009, Suárez-Orozco & Suárez-Orozco 2011). The children of immigrants are the fruit borne of immigration (Suárez-Orozco & Suárez-Orozco 2001). Immigrant-origin children are a fast-growing sector of the youth population in diverse countries the world over including Australia, Canada, Germany, Italy, New Zealand, the Netherlands, Spain, and Sweden (Meir & Morehouse 2008). In the United States, the country with the largest number of immigrants in the world, approximately one-quarter of all youth are of immigrant origin (more than 16 million under age 18), and it is projected that by 2020 a third of all children will be growing up in immigrant households (American Psychological Association, 2012). The transition of immigrant-origin children to new societies is a topic of scholarly interest, policy relevance, and practical urgency. In this paper we nest immigration within the family and examine the adaptations of the children of immigrants in a variety of contexts with a special attention to: 1) the effects of poverty; 2) segregation, and 3) unauthorized status; and 4) language acquisition. We consider immigrant "resilience," the so-called "immigrant paradox," and take note of promising practices from throughout the world.

FOOD AND NUTRITION SECURITY – THE CONCEPT AND ITS REALIZATION

JOACHIM VON BRAUN

The complexity of food and nutrition security is illustrated by the common definition that lists its four dimensions: • *Food availability*: the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports. • *Stability*: To be food secure, a population, household or individual must have access to adequate food at all times. • *Food access*: access by individuals to adequate resources for acquiring appropriate foods for a nutritious diet. • *Utilization*: Utilization of food through adequate diet, clean water, sanitation

and health care to reach a state of nutritional well-being where all physiological needs are met. This presentation will review the state of the art and progress in research and in policy actions in each of the four areas and the interactions among them. Needed further developments of the concept are explored, especially related to short- and long-term food and nutrition security, incl. intergenerational well being. Special attention is drawn to a more comprehensive understanding of human resources improvement through food and nutrition security actions. Related technological and institutional innovations are analyzed for this purpose.

THE CONTINUED NEED FOR MORE FOOD—CONTRIBUTIONS FROM THE CGIAR

ROBERT S. ZEIGLER

As the global population increases to a predicted nine billion by 2050, pressure mounts to produce more food without destroying the planet. Research to empower poor rural communities and raise the productivity of crops and agricultural systems—including livestock, fish and agroforestry—will be essential to alleviate poverty and ensure food security. CGIAR Research Programs are designed to address these interrelated issues. CGIAR is a global partnership that unites organizations engaged in research for a food secure future. The name CGIAR comes from the acronym for the Consultative Group on International Agricultural Research. CGIAR research is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources. It is carried out by 15 Centers that are members of the CGIAR Consortium, in close collaboration with hundreds of partner organizations, including national and regional research institutes, civil society organizations, academia, and the private sector. The 15 Research Centers generate and disseminate knowledge, technologies, and policies for agricultural development through the CGIAR Research Programs. The CGIAR Fund provides reliable and predictable multi-year funding to enable research planning over the long term, resource allocation based on agreed priorities, and the timely and predictable disbursement of funds. The multi-donor trust fund finances research carried out by the Centers through the CGIAR Research Programs. Almost 10,000 scientists and staff, unparalleled research infrastructure and dynamic networks across the globe are engaged in CGIAR center research. Collections of genetic resources are the most comprehensive in the world. The centers comprising the CGIAR Consortium have a solid reputation for acting in the interest of the world's poor with a track record spanning four decades of research. Center research accounted for US\$673 million or just over 10 percent of the US\$5.1 billion spent on agricultural research for development in 2010. The economic benefits run to billions of dollars. In Asia, the overall benefits of CGIAR research are estimated at US\$10.8 billion a year for rice, US\$2.5 billion for wheat and US\$0.8 billion for maize. Political, financial, technological and environmental changes reverberating around the globe mean that there are many opportunities to rejuvenate the shaky global food system. Developments in agricultural and environmental science, progress in government policies, and advances in our understanding of gender dynamics and nutrition open new avenues for producing more food and for making entrenched hunger and poverty history. CGIAR has embraced a new approach that brings together its strengths around the world and spurs new thinking about agricultural research for development, including innovative ways to pursue scientific work and the funding it requires. CGIAR is bringing donors together for better results and enabling scientists to focus more on the research through which they develop and deliver big ideas for big impact. CGIAR Centers collaborate with research and development partners to solve development problems.

MEMORANDUM

1) **From 4 to 6 November 2013** a bus will leave the Domus Sanctae Marthae for the Academy 15 minutes before the beginning of the first session, (4 November at 3.45 p.m., 5 November at 8.45 a.m., 6 November at 8.15 a.m.) and will take the participants back to the Domus after dinner.

2) **On 6 November** a bus will leave the Academy at 9.15 a.m. for the Domus Sanctae Marthae for a group photograph with Pope Francis and will then bring the participants back to the Academy.

3) **Lunch and dinner** will be served at the Academy. If you are a vegetarian, please let us know as soon as possible.

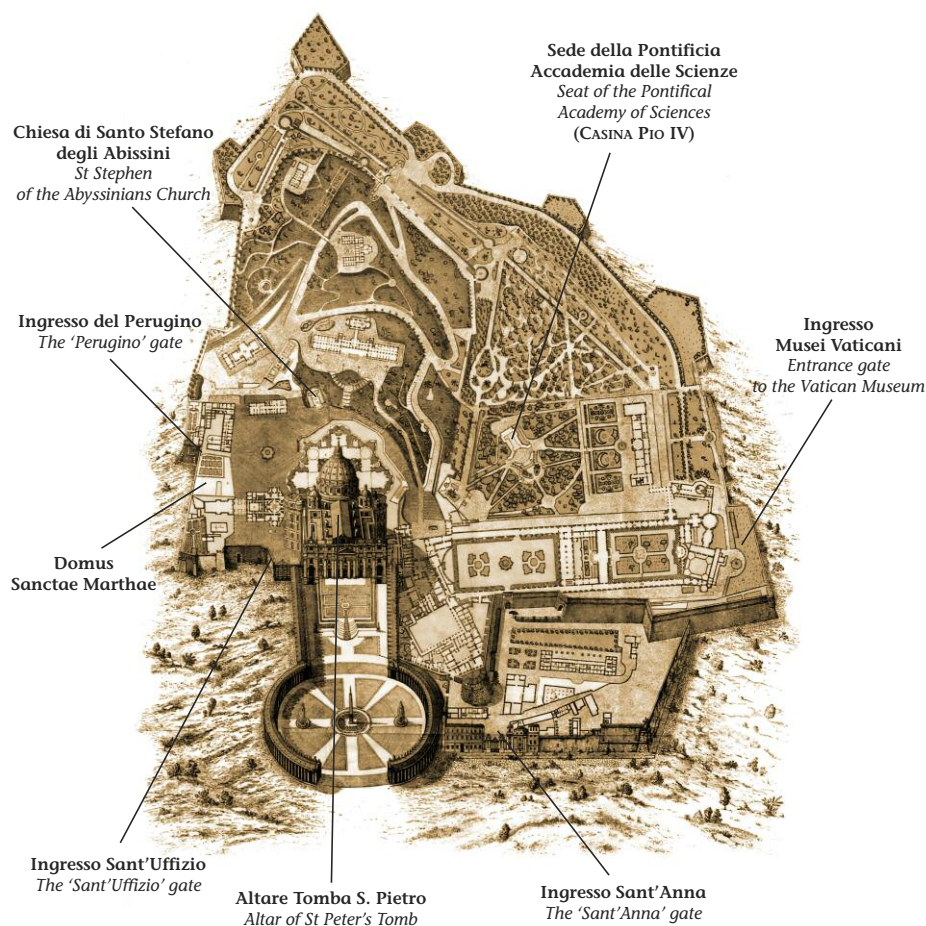
5) **Wifi** is available in the Casina Pio IV's Conference Hall. Please log in to the network called WLAN_PADS using "guest" as the username and "password" as the password.

6) **Cable internet access** is available at the Domus Sanctae Marthae for 7.50 Euros per day.

7) **A guided visit to the Vatican Museums** has been arranged for participants and accompanying persons on 6 November at 3.00 p.m. Please give your name to the Secretariat in order to form a group.

Note

Please give your form for the refunding of expenses to the Secretariat as soon as possible so that you can be refunded immediately.



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