



BIOVISION 2009

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SESSIONS REPORTING

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FACING THE CHALLENGES OF EXPANDING CITIES

Plenary session

Moderator

- **Maria Livanos Cattai**, Member of the Board of Directors of Petroplus Holdings AG, Switzerland

Speakers

- **G rard Collomb**, Senator-Mayor of Lyon, President of the Greater Lyon urban community, France
- **Jean-Jack Queyranne**, President, Rh ne Alps Region
- **Ismail Serageldin**, Director, New Library of Alexandria, Egypt
- **Saskia Sassen**, Lynd Professor of Sociology, Columbia University, USA
- **Nicholas You**, Senior Policy and Planning Advisor to the Executive Director, UN-Habitat

Summary

- The aim of the panel discussion was to get answers to the following questions:
 1. What are the challenges of global city expansion?
 2. Which solutions to these challenges are expected from the life sciences?
- Answering the first question all panel members agreed on some well known problems like cities contribution to global emissions, pollution, efficient transportation, waste and sanitary problems which are linked to city expansion in to unpredicted proportions
- G rard Collomb insisted that these problems are further complicated by large scale migrations with the result of social antagonism
- Jean-Jack Queyranne stressed that we are facing an enormous transformation of the "anatomy of cities" forming huge metropolitan areas
- Saskia Sassen further developed her idea that cities show the problems of globalisation through a magnifying glass
- Regarding the second question, all panel members agreed on life sciences can potentially bring solutions to a lot of these challenges, e.g. health care provision, pollution and energy consumption

- Jean-Jack Queyranne specified his expectations that life sciences contribute to a rethinking of all the different aspects of life in the city
- Ismail Seregaldin gave six specific points he is expecting from life sciences:
 1. Reducing air pollution
 2. Provision of water supply
 3. Educate the poor
 4. Find solutions for solid waste recycling, essentially develop more biodegradable products
 5. Mobilise finance for implementation of life sciences, which will be less expensive than implementation of other new technologies in developing countries
 6. Getting the laws right, especially regarding ethics and an open eye on what is happening in the rest of the world, as life sciences can create bridges by collaboration with other groups all over the world
- But all panel speakers again agreed on science not being able to solve all the mentioned problems alone
- There is a strong call for a new governance of cities in the sense of recognising the level of the cities as a decision level
- However, as Nicholas You pointed out, the recognition of the cities as a decision level should not go too fast and too far, as it did in the cities' administration in China, but the cities should be integrated into decision making processes according to their global impact
- Essentially scientific advice for decision makers should be fully integrated into the cities' new governance structure.

Quotes

"Cities are very Fuzzy Logic Systems, which are not predictable at all. The question is, how do we manage the possible positive outcome of such systems."

Saskia Sassen

"Building tomorrow, it is trying to build the city within the city with limited consumption of space."

G rard Collomb

"Challenges for cities in the 21st century are effectiveness and maintaining social links."

Jean-Jack Queyranne

"It would have taken Rotterdam to find consensus with 20 regional authorities, and that would have taken 20 years, to stay the worlds No. 1 port. Therefore Rotterdam today is not capable of being the No. 1 port any more."

Nicholas You

"You can talk for ages on an international level about what solutions could be, but the city has to act on a regional level before the global discussion is finished."

Saskia Sassen

"There are cities in China which grow like asparagus in spring."

Maria Livanos Cattai

"The election of a mayor should not be based only on his future cabinet but also on his future scientific advisory board."

Saskia Sassen

"A major challenge is to reconcile science and ecology and the issue for scientists is to get the message to the public opinion."

G rard Collomb

"There are cities of the north today finding parts of cities of the south with all their specific problems, especially migration and separation of rich and poor, directly integrated within themselves."

Ismail Serageldin

PROGRESS IN LIFE SCIENCES: NEW DIRECTIONS AND HOPE FOR SOCIETY

Plenary session

Moderator

- **Liz Padmore**, Board member, Independent Consultant and Associate Fellow James Martin Institute, UK

Speakers

- **Peter C. Doherty**, Nobel Laureate, Medicine 1996, St Jude Children's Research Hospital in Memphis, USA and Department of Microbiology and Immunology at the University of Melbourne, Australia
- **Jean-Marie Lehn**, Nobel Laureate, Chemistry 1987, Collège de France in Paris and Université Louis Pasteur in Strasbourg, France
- **Richard J. Roberts**, Nobel Laureate, Medicine 1993, Chief Scientific Officer at New England Biolabs in Beverly, Massachusetts, USA
- **Kurt Wüthrich**, Nobel Laureate, Chemistry, 2002, Scripps Institute in La Jolla, California, USA and Institute of Molecular Biology and Biophysics, ETH Zurich, Switzerland
- **François Gros**, Permanent Honorary Secretary, Académie des Sciences, France

Summary

- This plenary session offered an initial overview of new orientations that have emerged recently in the field of life sciences and technology
- A panel of Nobel laureates shared their views of the theoretical significance of recent evolutions of basic research in life sciences and of the latest developments in their technological applications, and made the link with general theme of the conference 'Life Sciences' challenging role in our expanding cities
- **François Gros** opened the session giving an overview about recent achievements from life sciences since the breakthrough of uncoding the human genome by Craig Venter, Francis Crick and the human genome project who participated BioVision 2001

- He introduced the Nobel laureates by showing the importance of their work for the current science and beyond
- As milestone achievements he pointed out supra-molecular biology, high-resolving physics allowing for resolving the 3D structure of proteins, systems biology to predict cellular reactions, stem cell technology to presumably cure so far uncured diseases
- Furthermore, life sciences is providing solutions to existing problems like major diseases, to agriculture and food supply, and global warming
- **Jean-Marie Lehn** inspired with a short talk on supramolecular chemistry and how dynamic combinatorial chemistry will serve us to discover new drugs
- He claimed that biology and chemistry are the most complex information which is exchanged around
- Along the simple lock and key model he explained how chemistry technologies for drug discovery evolved from using the trial and error approach to adaptive evolutionary chemistry
- **Kurt Wüthrich** shared his vision of the expanding protein universe and therefore took off his belt to demonstrate that linear sequence information of protein is not enough to identify its 3D structure and function
- Indeed, only the 3D structure of the folded protein (shown with his belt) is the useful information for developing drugs
- The issue is that from over 6 million protein sequences we only know about 50,000 3D protein structures in current databases, but with increasing speed of knowledge gathering through the advances of resolution technologies and creative minds searching for the best resolving algorithms
- These algorithms allow to determine representative structures for large families of proteins in which unidentified structures could be included
- His hope that politicians should continue to invest in basic research and technologies was underpinned by several other panellists sharing his view that there will be no applied science without basic science
- **Peter Doherty** precisely described the global challenges of humanity and the impact of increasing population, urbanisation, and global warming
- Through increasing population density and changing lifestyles, humanity is more exposed to infectious diseases than ever, e.g. HIV, influenza, West Nile fever or dengue
- Life sciences are expected to cope with infectious diseases through development of vaccines against most serious diseases
- Sciences has achieved big progresses, e.g. against HIV/AIDS or influenza virus, however, the solution does not always lie in science, but also in behavioural changes and political work bringing drugs into developing countries
- He stated that the risk is not only present in third world countries, but can spread endemically in developed countries as recently seen with West Nile virus in the USA or dengue in South Asia and North Australia
- Peter Doherty prompted not to ignore the issues with infectious diseases and move forward in vaccination both in developed and developing countries

- Politicians need to open the dialogue with the different political systems and overcome believe barriers to find the best possible solutions to the issues
- **Richard Roberts** continued to show up new technologies from life sciences serving for current global issues like recombinant viruses or GMO (genetically modified organism) plants
- He stated that demand of some European politicians in direction to the third world countries not to cultivate GMO plants is dangerous; in his opinion the developing world absolutely needs the new technologies and GM food although Europe does not need so, because Europe does not suffer from food shortage
- Kurt Wüthrich encountered that we should not recommend things to the third world countries which we don't use ourselves
- In this further talk, Richard Roberts stressed out the impact of life sciences on future energy and health problems
- He sees great opportunities for developing countries using fuel cell fermenters to generate electricity and power households or hybrid cars although the problem of using cellulose material for fuels instead of food is not solved, yet
- Furthermore, he appealed that science should not be influenced by religious fundamentalism as in the stem cell discussion under the Bush administration in the US
- The knowledge from stem cell usage, derived from reprogrammed body cell, will be key for growing new tissues and new organs to get over the immune barrier.
- In a final round of statements, Nobel laureates were asked to state where they would invest money, if they were in a position like President Obama or President Sarkozy
- The Nobel laureates advised to invest the money into the best brains and into the young, creative scientists of the world
- They emphasised the importance of knowledge gathering and sharing to everyone and the value of basic research
- Finally, Peter Doherty request a strategic action plan from politicians in future key issue areas like the solving of energy problems

CONTRIBUTIONS OF LIFE SCIENCES TO SOLVING ECONOMIC & SOCIAL ISSUES IN EXPANDING CITIES

Plenary session

Moderator

- **Maria Livanos Cattai**, Member of the Board of Directors of Petroplus Holdings AG, Switzerland

Speakers

- **Koji Omi**, Member of the house of representatives, founder & chairman of the Science and technology in Society *forum*, former Minister of Finance, Japan
- **Feike Sijbesma**, CEO of Royal DSM, Netherlands
- **Jean-François Dehecq**, Chairman of the board, Sanofi-aventis, France
- **Christian Bréchet**, VP Scientific and Medical Affairs, Mérieux Alliance, France
- **Werner Cautreels**, CEO Solvay Pharmaceuticals, Belgium

Summary

- This plenary session aimed at giving some insight as to what life sciences could bring to the development of cities around the world.
- For southern countries, uncontrolled and uncontrollable city planning induces issues ranging from health concerns (worsened by promiscuity) to waste management and water sanitation.
- Due to migrant workers moving from the impoverished south to a promising north, multiple diseases are also reappearing in the northern countries.
- Urban life is also causing a number of mental pathologies such as stress which in turn is affecting the south, making all current problems global and no longer regional ones.
- These are worsened in an urban environment where the lack of social fabric hinders the amount of help elderly people can have access to, limiting their ability to heal.
- Such plights are worsened by the economic crisis; over 100 million more people are starving, raising the current estimated number to 1 billion worldwide.
- The amount required to tackle food problems are minute compared to what has been put forward to bail out the financial system.

- From a science point of view, biotechnologies will have a major role in providing solutions to energy, health, food and climate change issues.
- Such research has yet to be conducted outside of the USA, the only current country strongly investing in such areas.
- Education of the general population, children and adults alike will play a major part in ensuring the successful use of biotechnology.
- As such, scientists need also to learn on how to communicate the various advances in Science. Indeed, miscommunication can lead to refusals, making the acceptance journey all the more difficult (i.e. GMOs).
- Science alone cannot resolve all of the current issues, each person must change his or her social mindset. A strong and determined political willpower will also be required so that society can go back on a certain number of choices.
- For example, new partnerships have to be devised in order to maximise results when facing health issues such as tuberculosis (10M people killed each year).
- Japan also provides us with an interesting insight through massive investments in applied IPS, bio-matters, personalised medicine and drug delivery system based on nanotech
- However, it also appeared that big gains would be derived from simplifying the clinical research and go to market bureaucratic procedures.

Quotes

"Biotechnology is not a problem, it is a real solution"
Feike Sijbesma

"We must change our mindsets, if not several revolutions will take care of it"
Jean-François Dehecq

"We (scientists and pharma company leaders) have been bad at explaining things"
Werner Cautreels

"Rules and regulations cut innovation"
Werner Cautreels

"We must show courage by being more ethical and showing more solidarity in all of our endeavors"
Jean-François Dehecq

"New partnerships must be devised dealing with intellectual property issues and conflicting interests"
Christian Bréchet

MANAGING URBAN EPIDEMICS

1. Biocrises – Managing public health emergencies in the megacities

Moderator

- **Guénaél Rodier**, Director of International Health Regulations Coordination, World Health Organisation, Switzerland

Speakers

- **Tim Brooks**, Director for Public Health Affairs, Health Protection Agency, UK
- **David L. Heymann**, Assistant Director-General for Health Security Environment and Representative of the Director-General for Polio eradication, World Health Organisation (WHO)
- **Abraham M. Palache**, Medical Director, Solvay Biologicals, Belgium
- **Jean-Louis Touraine**, Rhône French Member of Parliament, Senior Deputy Mayor of Lyon, Professor of Medicine, France
- **Isaac Weisfuse**, Deputy Health Commissioner, New York, USA

Summary

- Preparedness against urban epidemics poses a double challenge: limiting the impact of communicable diseases in urban settings, when they occur, and controlling the amplification environment that it provides.
- Exercise and simulations are needed to optimize coordination and communication between different local services.
- Epidemiological surveillance networks are critical in recognizing an issue; recent cases demonstrate that this step too often fails.
- Creating network of laboratories is essential to diagnose pathogens during outbreaks.
- New York City provides a case example of how emergency health preparedness is structured; the system is founded on an efficient surveillance network and a capacity to mobilize on all fronts multiple resources in a flexible way.
- Managing risk communication during the first 48 hours of a crisis is critical. This requires the prior understanding of local mechanisms for communication.
- Preparedness plans are the best way to address the uncertainty; these plans must cover the equitable availability and distribution of drugs and vaccines.
- WHO is providing guidelines on how to prepare for urban epidemics; however it remains up to local government bodies to implement these guidelines.
- Pandemic preparedness will rely heavily on political willingness.

- There are fears around alteration of germs with bio-terrorism, however preparing against naturally occurring outbreaks is already a first level response against deliberately caused diseases.
- In worst cases, quarantine is an option despite the ethical challenges and social distancing issues that it poses. This political and difficult decision requires consensus building beforehand.
- Leveraging the increased capacity of facilities producing seasonal influenza vaccine is a way to build a sustainable pandemic preparedness model for the industry.

Quotes

"Politicians are on the frontline of dealing with a crisis"
Guénaël Rodier

"Management of all city services requires a coordination which can't be optimal without frequent simulations"
Jean-Louis Touraine

"The first problem is actually recognizing if you have an outbreak with an unknown or an existing disease"
Tim Brooks

"Surveillance is the backbone of public health because it gives more time to react"
Isaac Weisfuse

"Any disease outbreak anywhere in the world could be in New York City in 24 hours"
Isaac Weisfuse

"We should not wait 'till the certainty, we should make decisions in an uncertain environment"
Abraham M. Palache

"Planning is one thing; we also need the tools, vaccines to control a pandemic"
Abraham M. Palache

MANAGING URBAN EPIDEMICS

2. Infectious Diseases – Strategies to combat infection

Moderator

- **Philippe Sansonetti**, Professor, Collège de France

Speakers

- **Giuseppe del Giudice**, Global Head Translational Medicine, Novartis Vaccines Research Center, Italy
- **Vincent Deubel**, Director, Institut Pasteur of Shanghai – Chinese Academy of Sciences (IPS-CAS), China
- **Peter C. Doherty**, Nobel Laureate, Medicine 1996, Australia
- **Benoît Miribel**, Director General, Fondation Mérieux

Summary

- The unwise use and anti-microbials in hospital environments poses a serious threat in the spread of infectious diseases.
- In addition, several uncertainties remain such as:
 - How will the human population behave in response to major epidemic outbreaks (population fluxes and mobility)?
 - How do molecular and cellular mechanisms of transmission between animal and human pathogens occur?
- Identifying future pathogens poses a challenge as there are many potential sources, although wildlife poses the greatest threat.
- Transmission capacity varies not only according to the age group but also to the individual status itself. This poses the question of the prevention strategy: who should be vaccinated first: the most susceptible to get the disease or those more likely to transmit?
- Pathogenesis of a virus is dependant both on the virus itself and the human recipient; furthermore, genetic reassortment, recombination, mutation or mixing of genes of two different viruses are areas where more research is needed.
- By any mean, education of the population, namely through children is critical but faces cultural issues.
- Besides the adaptive immunity, the innate immunity is a promising field of research that is being only understood recently.
- It has been recognized that this innate immunity can create a destructive response.

- There are diseases for which vaccine development should be straight forward. For others, such as AIDS or Malaria, the development is far more complex.
- Novel adjuvants in the field of vaccines are an example of new research fields and will be increasingly essential to vaccines efficacy.
- It is important to consider an infectious disease in the context of its environment, not just the virus and the host.
- Regulatory bodies tend to be more cautious with regards to vaccine safety; this can pose a problem to public health.
- Close collaboration between Academia, Industry and Policy Makers is needed; global health cannot rely on the good will of charities.
- Accepting that future vaccines only partially protect against certain diseases, namely in combination with other treatments, will require a change in paradigm.
- Health systems in developing countries are still far too weak and need to be strengthened.
- All components of the health systems need to be put in place, not just the treatment; working towards a more global "one health" system is a way forward.
- The development of rapid diagnostic tests is an opportunity for improvement.

Quotes

"The basis for the different susceptibilities are yet to be understood"
Philippe Sansonetti

"Most of infectious diseases which may be at the origin of epidemics are zoonotic"
Vincent Deubel

"We need to better use the existing vaccines"
Giuseppe del Giudice

HEALTH & TECHNOLOGIES: FROM HOSPITALS TO HOME

Moderator

- **Victor Rodwin**, Professor, New York University, USA

Speakers

- **Twalib Ngoma**, Director, Ocean Road Cancer Institute, Tanzania
- **Howard Berliner**, Professor and Chair, Health Policy and Management, SUNY Downstate School of Public Health, USA
- **Paul Corrigan**, Strategy and Commissioning Director, National Health Service, UK
- **Thierry Zylberberg**, Executive Vice President, Strategic Partnerships, General Manager Healthcare Division, France Telecom, France
- **Rick Harwig**, Chief Technology Officer, Philips Royal Electronics, The Netherlands

Summary

- Health technologies are used at every level of the healthcare system; advances in technology are seen as drivers to improve health outcomes and overall performance of a healthcare system.
- In his speech, **Thierry Zylberberg** named the three major challenges of future health services: ageing population, costs of managing of chronic diseases, and healthcare system organisation.
- To counter these challenges, he proposed three strategies: promotion of higher treatment efficiency, treatments at home and organisation of health provider networks.
- He also showed examples where e-health already adds value to health services or can be considered. In medical technologies, these can be implants, cameras, or remote surgery; in information and communication technology (ICT), these can be hospital information management, remote monitoring or therapeutic education.
- To improve healthcare through technology, all stakeholders in a healthcare system need to be addressed including patients and their families, providers, payers, hospitals, pharmaceutical companies, as well as public authorities.
- In a second overview, **Rick Harwig** presented examples of health technology applications and the progress that has been made over the recent past.
- The best strategy to reduce healthcare costs still lies in the prevention of severe diseases with subsequent hospitalization and follow-up treatments.

- Therefore, Rick Harwig stated that we need to pay more attention to health and prevention management, e.g. through activity monitoring or rehabilitation exercising.
- In the case of chronic diseases, some technology solutions are already in place, which are used for remote monitoring and patient management.
- **Paul Corrigan** then talked about how technology has already changed the healthcare system and patient behaviour over the past years, e.g. electronic health records bring data together to one place.
- He advised constructing interactive databases with 2-way communication allowing for those parts of the population who want to share their information.
- He sees several opportunities for getting information across although some people are not used to technology and even see it as a burden.
- **Howard Berliner** sees some issues concerning new ways of gathering and sharing information: the best technology does not help, if we lose individual contacts between a patient and a doctor or a nurse or a social worker and do not ensure that technology is adapted to individual needs and not vice versa.
- He raised some critical questions: Who will monitor the quality of technology when it is used outside the hospital in homes? What happens, if health information does not fit into a peer group? And in concluding, who will pay for the extensive costs of new technologies?
- **Twalib Ngoma** gave insights into medical services and the use of technologies in developing countries like Tanzania.
- Developing countries cannot afford expensive technologies, do not get maintenance support for old devices, struggle with continuous power shortages and insufficient fresh water supply, and people have different views on technologies in healthcare.
- Use of health technology is appreciated in developing countries, but technology comes with its price.
- He called for developing simpler and more robust technologies; otherwise he suggested that the evolution of technology would be too fast for developing countries to keep pace with.
- **Rick Harwig** and **Thierry Zylberberg** responded that the challenges of developing countries, adopting new technologies, are fully recognised; however much progress has been made in recent years in developing countries with simple technologies, e.g. filters for cleaning water, setup of power supply and light, introduction of mobile phone networks, etc.
- In the final discussion, the panellists shared their views on the responsibility for patient health.
- **Howard Berliner** stated that many people don't want to take responsibility for their own health; the 'old' relationship between one patient and his one doctor has been broken up; in a decentralised healthcare system the problem is that responsibility is also decentralised.
- Finally, **Rick Harwig** shared his dream that people will benefit from new health technologies as they did 20 years before when changing their behaviour using consumer electronics.

Quotes

"Some people believe that social change is driven by 'naked self interest'. Others believe that it is driven by ideas. And a third group believes that it is driven by technology."
Professor Victor Rodwin

"At Philips, we think that it is not all about technology. We think it is all about people."
Dr. Rick Harwig

"The driver of health information in the past was to provide for medical services only. Today it is a more consumer-oriented usage of information."
Dr. Paul Corrigan

"The issue is to what extent personal information is spread and who gets access."
Professor Howard Berliner

"Health technologies are not as available in developing countries as in Europe."
Dr. Twalib Ngoma

"In developing countries you face questions about whether or not to use new technologies. But the important issue is not whether the use of a certain technology is helpful to your patient, but whether it fits with the nation's priorities."
Dr. Twalib Ngoma

"The statement of a Californian student is still valid for health technologies: 'The future is already here, but unevenly disposed.'"
Thierry Zylberberg

AGING IN THE BIG CITY

Moderator

- **Claude Feuerstein**, Director, Grenoble Institut de Neurosciences, France

Speakers

- **Robert Butler**, President and CEO, International Longevity Center, USA
- **Jean-Claude Marian**, CEO, ORPEA, France
- **Miroslav Radman**, Professor, INSERM, France
- **Victor Rodwin**, Professor, University of New York, USA

Summary

- The purpose of this session is to discuss the challenges of managing health for an aging population.
- Two different views prevail when dealing about an aging world population:
- The first one talks of the burden of aging. Its strongest representative being Pete Peterson (writer of the Book Grey Dawn: The Global aging crisis) who sees aging as having a stronger detrimental effect than climate change or nuclear proliferation...
- The second view is a more optimistic one and sees aging as human mankind's greatest accomplishment.
- In both cases, cities will have to be reshaped to cater for a growing population of elderly people.
- Over the last 30 years, people have gained 3 months of life expectancy per year thanks to Medicine, Molecular Biology, Increased Literacy, and improved basic services such as Sanitation thanks to simple measures such as the separation of sewage from drinking water.
- Japan and France have seen the biggest gains in life expectancy. People are living longer as they are not dying too early.
- This does not occur across species. Several species experience rapid biological decline leading to death once they stop being able to reproduce. The mechanism of decay prevention is switched off making biologists wonder whether it is possible to cheat the body. Nature might have the answer by providing insight into the basic mechanisms determining life length.
- However, a distinction must be made between life expectancy, which could continue to increase (although it has stopped in some countries such as the Netherlands and the USA in particular for women), and life span.
- Higher life expectancy leads to an increase in cognitive disorders. Being a cognitively impaired person living in a city can result in depression which can be worsened by poverty.

- Such impairments increase exponentially the risk of death after the age of 65 (doubling every 8 years). By prolonging life, a higher percentage of the population will suffer from such impairments.
- Genetics and life style can delay the aging process as 25 % is inherited and 75% is left up to us and sensitive therefore to factors such as dieting, exercise, etc.
- The question being, as we are going to get old where should it happen?
- Census data in the US reveals that most people age where they have lived. Very few (around 3% in each case) go into nursing homes or assisted homes. Approximately 94% of the people grow old in the neighbourhoods where they have lived.
- It is more important to look at what is than what should be. Approaching the problem of aging in the cities mustn't be done in a utopian manner as people predominantly remain in their environments. Research must be encouraged to focus on all the facets of aging in a city.
- In major cities (London, Paris and New York), current studies show that life expectancy is higher (Tokyo being the only exception in this case). Aging gracefully generally depends on the neighbourhood and the disposable income
- However, research does not conclusively show whether old people should live in dedicated areas with better services or be spread in transgenerational neighbourhoods with richer interactions (being grouped might provide more local political clout but in can also lead to ghettos).
- In France, for example, the 15% of the over 85 years old go into a nursing facility. The age of becoming dependant has increased.
- Authorities want to promote as much as possible homecare to minimise costs. However, once disorientation pathologies set in people become dependent hence requiring increased care.
- By 2020, as 20% of the population will be over 65 years old there is a risk of having cities with a lot of disoriented people on the streets.
- Disorientation is not the only pathology observed amongst aging populations. Increases in chronic diseases such as diabetes, obesity also require special units.
- An important answer to the problem is better prevention for chronic diseases. Such prevention must start early on. Key ailments such as osteoporosis can be avoided through better prevention during childhood.

Quotes

"Aging is mankind's biggest accomplishment."

Robert Butler

"Before we were killed before our life reached its peak."

Robert Butler

"Problems in late life are generated early periods of life."

Robert Butler

"Some species die when they stop being able to reproduce. The mechanism of preservation is switched off. Can we cheat the body?"

Jean-Claude Marian

"The combination of increased longevity coupled with the decrease in fertility will result in population aging."

Victor Rodwin

"Most people age in place."

Victor Rodwin

"The quality of aging depends on the neighbourhood and the available income."

Victor Rodwin

"Aging is a continuum. It is better for people to stay at home. At a certain level of dependency, they have to go into an institution."

Jean-Claude Marian

THE NEW WORLD OF RNAS From micro RNA research to real world drugs

Co-organized with the French Academy of Science

Moderator

- **Peter Wrobel**, Editorial Director of Science Business Publishing, UK

Speakers

- **Frédéric Dardel**, Professor, Advisor to the Chairman and the CEO, National Center of Scientific Research (CNRS), France
- **Corey S. Goodman**, President, Biotherapeutics and Bioinnovation Center, Pfizer, USA
- **John Mattick**, Professor, Institute for Molecular Bioscience, University of Queensland, Australia
- **Richard J. Roberts**, Nobel Laureate, Medicine, 1993, USA
- **Eric Westhof**, Director, Institut de Biologie Moléculaire et Cellulaire, CNRS, France

Summary

- 8 years ago human genome sequence was published highlighting the fact that just a very little part of the sequence is coding
- Since then a major paradigm or even vision change has occurred moving away from the mechanistic approach on cell systems with a toolbox of structures with specific functions to dynamic cell systems with RNA in a central role
- In this aspect Eric Westhof stressed that just 30% of DNA is genes with just 1,5% coding regions but >90% is translated into RNA, these RNA transcripts are present in the cell, influencing the system
- John Mattick pointed out, that the number of genes for humans and for *C. elegans* (roundworm) is the same, therefore the information for the complexity of a human being lies anywhere else – in the RNA
- Speaking of the complexity of the dynamic systems regulated to a certain extend by RNA, the panel agreed on the need for a lot of academic basic research to be done on RNA
- Frédéric Dardel also emphasizes the need for bottom-up basic research; and at the same time an upcoming interest by the students, who hear the rumors of RNA research and are willing to work in this field
- All panel members agreed that such bottom-up approach is essential for implementing RNA research in academic organizations

- Richard J. Roberts in this aspect stressed the importance to continue to study bacteria
- At the same time researchers should concentrate on basic research and not look too often on how the next clinical candidate can be developed
- In this aspect Corey Goodman highlighted the importance of the breakdown of the silo thinking between academia, biotech and pharma
- Coming to the chances of RNAs as therapeutic candidates Corey Goodman pointed out that there is an enormous potential, the question is, when it will lead to new therapeutics
- The major challenges are:
 - You have to get the sequence right, which will easily be handled by the scientist
 - You have to cope with the delivery of the new substance class, which is a totally unresolved topic
- Corey Goodman also stressed, that there is actually no chance to estimate which class of RNA therapeutics will prevail, as the door is still wide open and everything might work, be it RNA-RNA interaction or RNA-small molecule interaction
- John Mattick agreed on future perspectives and emphasized that medicine is about to be transformed in all aspects, especially regarding the amount of information about personal genomic sequences available in future leading to personalized medicine

Quotes

"It will take some time until academic scientists will have done enough research on the systems."
Frédéric Dardel

"Just 30% of DNA is genes, and just 1,5% is coding regions, but >90% is transcribed into RNA – how can we explain this?"
Eric Westhof

"We have fundamentally misunderstood genetics for the last 50 years "
John Mattick

"Molecular machines are working as would a printer reacting to its environment with printing interesting text quick and slowing down while printing boring sections."
Eric Westhof

"For any of you young scientist interested in bioscience, this topic is a goldmine with at least one or two Nobel prizes in it."
Richard J. Roberts

" So please young guys, do not let your administrators tell you, you have to work on topics which go directly into the clinic."
Richard J. Roberts

"Great science is leading to good therapeutics, the question is when. Think of the first monoclonal antibody being described 1976 and the first MAB therapeutic came to the market in the late nineties."

Corey Godmann

"This shows, how much can be found out in a short time - science can move very quickly sometimes"

Peter Wrobel

CANCER: SMALL VICTORIES ARE STILL VICTORIES

Moderator

- **Lynn Faulds-Wood**, President, European Cancer Patient Coalition

Speakers

- **Hugues de Thé**, Professor of molecular biology, Hôpital St Louis / Univ. Denis Diderot, France
- **Thierry Philip**, Director, Regional Cancer Center (Centre Léon Bérard) of Lyon, France
- **Jean Marie-Lehn**, Nobel laureate, Chemistry 1987, France
- **Peter Boyle**, President, International Prevention Research Institute, France

Summary

- This session was aimed at offering an overview of some of the advances of these last years regarding cancer treatment and prevention.
- One of the main diagnostic roads to curing cancer are chemotherapies, which can be incredibly useful and efficient, but can also be extremely toxic for the patient and must not be used lightly.
- Other techniques are being developed such as biotherapies, gene therapies and anti-angiogenesis therapies so as to reduce the toxicity of the cure for the patient.
- These techniques are showing promises but are nevertheless far from benign.
- Some of the most promising advances in the recent years have been the development of targeted treatments, where specific drugs are used against specific types of cancer.
- Indeed, as research progresses, we are becoming more and more aware of the diversity of cancers such as leukaemia. The classification of these cancers has greatly evolved this last decade due to the advancement of science.
- Due to this better understanding, some cancers that once were deemed irrevocably fatal have now become partly curable.
- Nevertheless this progress takes time and in the case of one type of leukaemia took 10 years to go from mice to men.
- This comprehension of cancer specificities begs for additional research and patient tumour typing, which raises some serious health issues for states when typing and classification are done on an important scale.
- With these advances, we can all understand the importance of properly defining the patient's cancer, for fear of providing him or her with useless drugs in his or her condition.
- Although these breakthroughs bring hope to patients, they also make us realise that we will NEVER have a universal treatment for cancer.

- The panel and the audience also stressed the importance of cost based research as providing a drug that no one can afford is as useful as no drug at all.
- For instance, a recent patent on arsenic for the treatment of a specific cancer has lead to insane prices for the drug when arsenic has been around for 2000 years.
- However, having the proper drug is not enough as the doctors must then apply it properly. This is where evidence-based clinical practices can truly help all patients.
- Based on the evidence collected from numerous cases, national and international institutions are able to devise guidelines for proper patient handling and treating.
- This information is key in helping the patient in the decision making process.
- Nevertheless, having guidelines is not enough and these must be implemented properly.
- This was clearly explained by Thierry Philip who demonstrated how implementation of such guidelines actually saved lives when compared to control groups.
- Based on such results, it was decided between 11 countries & patient organisations that there would be a sharing of the main objectives and guidelines but that the translation into real operational guidelines would be left to each country, to fit with each state's healthcare system.
- Finally, Peter Boyle helped us understand the utmost importance of prevention and screening programs, which allowed countries such as Finland to get literally rid of deaths caused by cervix cancer.
- The panel nevertheless agreed that guidelines are for rich countries, and adapting the guidelines to fit the needs and capabilities of poorer countries is a necessary feat.
- This difference just illustrates once more the importance of correctly identifying the types of cancers and investing there instead of placing all funds in the purchase of potentially useless drugs.
- Biovision can really play a role here as policy makers, scientists and pharmaceutical companies can discuss the price and availability issues of drugs.
- Indeed drug prices can be incredibly diverse between countries.
- As with all major issues, problems cannot be solved without the definite will of politicians; populations preferring to talk about false issues such as pollution and cell phone masts instead of the real ones such as tobacco and alcohol as major cancer risks.
- Moreover, the panel and audience agreed that prevention was often neglected by state authorities which need to improve on these issues domestically as well as help developing countries fend off the threats of tobacco industries which prey on their citizens.
- As a conclusion, the take home messages were the necessary ongoing war with tobacco industries, the critical need to limit doctor smoking and the importance of prevention in the case of cancer.

Quotes

"Pharmaceutical companies do not define a price of a drug based on its effects but rather on how much the payer is willing to pay for it"

Peter Boyle

"In France, social security does not want to pay for prevention because they are a disease oriented system and a hospital system instead of a patient and GP oriented system"

Peter Boyle

"You try to kill the cancer before you kill the patient"

Jean Marie-Lehn

"Prevention is good once you know what to prevent"

Hugues de Thé

"Molecular typing is not easy but it is becoming more and more common in hospitals in France"

Hugues de Thé

"Implementation of evidence-based medicine saves people and helps the survival of the patient"

Thierry Philip

"30 to 40% of cancer patients do not receive treatment..."

Thierry Philip

FEEDING THE CITY

Moderator

- **Ioan Negrutiu**, Professor of Biology, Ecole Normale Supérieure (ENS) de Lyon, France

Speakers

- **Timothy Hall**, Acting Director: Biotechnologies, Agriculture and Food, DG Research, European Commission
- **Florence Egal**, Nutrition Officer, Food Security, Nutrition and Livelihoods, Co-Secretary Food for Cities (FCIT), Nutrition Programmes Service, FAO
- **Nathalie Ernoult**, Vice President, Action contre la Faim, France
- **Philipp T. James**, Chairman, International Obesity Task Force, USA
- **Ard Jan Vethman**, Innovation Leader for Manufacturing, Retail & Distribution at Capgemini, The Netherlands
- **Jérôme Péribère**, President and CEO, Dow AgroSciences, USA

Summary

Topic of the session: Discussing the endangered pillars of agriculture and civilization; agriculture should not be seen as a problem, but agriculture shall serve as a solution

We are facing a multifold challenge: An increasing healthier and wealthier World population

- Growth of population to be fed combined with a large movement of people leaving rural areas leading to increasing urbanization with 2/3 of the World population is expected to live in cities in the near future
- The wealthier tier adopting the current Western nutrition model (eating more meat, especially beef)

An unavoidable link between cities and agriculture meshing synergies and antagonisms

- Historically, successful cities have been backed by a rich agricultural environment
- On the other side, in a natural move the humans are seeking for the best land and the urbanization is "consuming" high quality soils

Urban agriculture is therefore required

- This has to be planned upfront in urban design and development plan
- However, it does not mean at all that the development of rural areas should be abandoned, if life in rural areas is improved, individuals would have no reason to migrate to the cities

Science and businesses will bring their share to the solution; however, virtuous policies are also mandatory

- Science and agro business have largely succeeded in the past
- Nevertheless politic virtue is required when one sees wealthier population adopting the current western nutrition model which has several back draws (cardiovascular disease, diabetes...). As an example, consider the recent decision of India of removing any importation duty on fat

In that sense, agriculture should be treated in all international policies by WTO as an exception:

- It can be seen as a driving force for the green economy rather than as a sector to be fully open to free global market
- Western agriculture have succeeded through subvention and protection and the agricultures of developing countries should be "given the same chance" to develop their agriculture now
- As a negative example, the local poultry industry in Cameroon has been literally destroyed by the free importation of frozen chickens

The approach for developing urban agriculture should be local, systemic and comprehensive

- The approach should mix agro and social science, moving from macro or per crop approaches
- The concerns of urban agriculture are well known, mastered and can be anticipated

The urgency is higher than generally thought

- The targets should be 2020 rather than 2050, i.e. 1 or 2 breeding generations
- The 7bn population tick-mark will be reached in Feb 2012 and the 8bn tickmark before 2020

Quotes

"We used to put our lights on 2050, that is too far in the future, by 2020 we will be 8bln citizens on the planet, we should concentrate on that."

Ioan Negrutiu

"You need to look at the poor, because if you do not look at them, the market will not anyway."

Florence Egal

"After Florence Egal gave you this very miserable story, I am going to make you even more depressive."

Philip James

"When people have access to land, people do engage in urban agriculture "

Nathalie Ernoult

"Accept that we have done a good job so far, but the job is far from being over. Science is going to make it happen or it will never happen."

Jérôme Péribaldi

"People are not doing, what they want, but what they are forced to do by the way, we organize our economy "

Philip James

"As long as a Chinese farmer earns 30\$/month and his son can earn 200\$/month in a industrial production plant, he will do so "

Jérôme Péribaldi

"We must find a way of getting out of the black and white, organic vs. GMO, thinking; there is a major fear of new technologies in Europe, but biotech is one of the technologies (next to other new technologies like nanotechnology) which can help us finding solutions."

Timothy Hall

"There is no good in doing research for developing countries; research needs to be done with developing countries. Funding for joint research that is needed has to be available."

Timothy Hall

"For improving living conditions in rural areas you will have to build cinemas and shopping malls there, because that is what people want as long as they watch TV."

Florence Egal

THE UNRESOLVED ISSUE OF MALARIA

Moderator

- **Declan Butler**, journalist, Nature

Speakers

- **Jean-Claude Berthélemy**, Professor, University Paris I, France
- **Hiroshi Chimura**, Director, Research and Development Division, Health Policy Bureau, Ministry of Health, Welfare and Labour, Japan
- **Djiba Kané Diallo**, Coordinator, Voices of Mali Programme, Mali
- **Ogobara Doumbo**, Director, Malaria Research and Training Center, Mali
- **James A. Geraghty**, Senior Vice President, Genzyme Corporation, USA
- **Pascal Housset**, Chief Executive Officer, Bayer Environmental Science, France
- **Robert Sebbag**, Vice President Access to Medicines, Sanofi Aventis, France
- **Thomas Teuscher**, Senior Advisor Policy, Strategy and Governance Roll Back Malaria Partnership

Summary

- The aim of this session was to provide information on the current progress on the disease and the following required steps that need to be taken.
- Malaria is an ongoing plague, especially in sub-Saharan Africa, where it represents the equivalent of 3 tsunamis each year. More than 1 million people, mostly children under five die every year due to the disease, making it a real war waged against the parasite.
- The actual progress is hard to measure as one of the main challenges is to have recent data.
- The talk started with the underlining of the importance of the scaling up to universal coverage of a combined approach of prevention, and drug treatment. This could reduce or eradicate malaria in many countries with low transmission rates. Eradicating from higher transmission countries will require new tools.
- Nevertheless, research must be increased to provide new tools, and to replace existing ones as these succumb to parasite and mosquito resistance.
- We should never forget that malaria is not only a parasite issue but has also geographic and sociological factors.
- These last years have seen a major change in malaria, as prevention tools such as mosquito nets and artemisinin drugs have been sent in great numbers to developing countries, amongst which Mali.
- In addition, field operatives have seen a change in patient mentality, going from a push to a pull culture from the people.

- NGOs in such countries say they can feel a change in mentality, though changing is not the priority, acting, through universal health and prevention coverage, is.
- Throughout the session, one of the main topics to arise was the difficulty for patients in African countries to get access to the drugs.
- On average, tools exist to help fight the parasite but need to be scaled up if they are to be efficient.
- To limit this issue, NGOs from Mali have argued in favor of medical student recruitment who would help with the distribution of drugs in isolated places. That's because Mali only has 1000 doctors; it would need 14000 to distribute universal coverage. However, progress is being made, particularly through billions in new funding by the Global Fund to fight AIDS Tuberculosis and Malaria. There are also some free drug programs set up by pharmaceutical companies and the World Bank for pregnant women and children between 0 and 5 years.
- One of the main requirements, if eradicating malaria is to be done successfully, is understanding the malaria environment, education populations (for instance changing their fatalistic approach to malaria) and improving healthcare systems, especially regarding data.
- The importance of networking between industries, institutions and local policy makers (such as traditional healers) has been shared by the entire panel as well as the need to tell heads of state to stand up to their obligations.
- Pharmaceutical companies have a responsibility to play a role, as they have innovation and DDS capabilities fundamental in fighting malaria.
- Nevertheless, we must not forget that pharmaceutical laboratories also have a responsibility to their stakeholders and cannot give substantial sums of money away.
- The eradication is technically feasible but in a long time, however local elimination of malaria is a much more accessible goal on the short term.
- Whatever solutions are chosen, these need to be ramped up compared to their current state.
- One major specificity of malaria is that it is a disease for which money is no longer scarce, compared to just a decade ago
- This is due to a major awareness of all stakeholders of the need to do something for such plagues.
- One of the major issues, say pharma companies, with diseases such as malaria that affect developing countries is the quality aspect (counterfeiting...).

Quotes

"Treatment will continue to be very important, but prevention is key."
Hiroshi Chimura

"You cannot prevent the brain drain out of Africa."
Jean-Claude Berthélemy

"Only drug companies can make drugs."
James A. Geraghty

"Nature hates a vacuum, so what will happen if we were to eradicate all anopheleses?"
Pascal Housset

"Thank you AIDS for allowing NGOs and pharmaceutical industries to come together."
Robert Sebbag

*"The time of big pharma is over, so our development will come from emerging countries
as weel."*
Robert Sebbag

"Money is not a problem, we must change mindsets and that takes a long time to do."
Djiba Kané Diallo

"We must multiply investment sources and not just the Bill & Melinda gates foundation."
Thomas Teuscher

"There is no choice, malaria must be fought!"
Ogobara Doumbo

CITIES AND CLIMATE CHANGE

Moderator

- **Cemil Giray Alyanak**, President of mondogragilis Group, France

Speakers

- **Jean-François Bach**, Permanent Secretary, Académie des Sciences, France
- **Claude Lorius**, Expert in Glaciology, Laboratoire de Glaciologie et Géophysique de l'Environnement, France
- **Rajendra Kumar Pachauri**, Chairman, Intergovernmental Panel on Climate Change (IPCC-GIEC), 2007 Nobel Prize

Summary

- The purpose of this session is to discuss the challenges of tackling climate change in an urban environment.
- Ever since industrialisation has started over a hundred years ago, mankind has been consuming an ever increasing amount of fossil fuels and producing more and more goods. This has led to higher man made emissions such as green house gases and pollution.
- Human development is based on an urban centric model which has spread all over the world. The poorer watch the western way of life whilst starving in front of their televisions (as seen in Bangladesh).
- Such development has increased the average temperature by 0,7 °c during the 20th century (an increase similar to what occurred during the previous 12 000 years).
- This will lead to more precipitations, floods, cyclones, heat waves... The most affected cities will be those close to sea level specifically in Asia and the Mediterranean.
- Such climate changes will have medical consequences. The risks will vary according to countries mainly because of differences in social economic levels. Increased chronic pathologies will be more prominent in the northern richer countries whereas infectious diseases will spread in the poorer southern ones.
- Understanding climate change also requires more basic research. Exploration in Antarctica 20 years ago led to the linking of greenhouse gases to increased warming. Basic research must be carried out in Polar regions as they hold the history of past atmospheric changes.
- Up to now, very little has been done. Since the 1970's, green house gases have increased by over 70%. No efforts have been made. The battle for mitigating the risk of global warming must be won before 2015. If not, the increase in sea level will be significant (several meters) especially if the ice sheets melt at a higher than predicted rate.

- Preparation, infrastructure and information can help us deal with effects of moderate global warming such as infectious diseases. The real threat will arise more from unpredictable extreme weather disasters which will become more frequent.
- Cities can play a key role in mitigating the effects of climate change as 80% of emissions are associated with city activities. Changing people's lifestyles play an important role in mitigating strategies.
- Governments need reinforce these shifts in habits by :
 - Pushing towards a consumption model sensitive to climate impact (i.e. carbon taxes).
 - Changing the way activity is measured (i.e. GDP) as they are increasingly false measure of progress. Issues such as quality of life and impact on the environment must be taken into account.
- The global bailout is estimated at 2,7 trillion dollars. One wonders why governments cannot be found to shift ourselves towards a low carbon society.
- To kick start this revolution, it is important to rapidly focus first on the developed countries. Efforts must be placed on educating children, investing in public transport and making homes more efficient.

Quotes

"Climate change is about us. Think about your lives as city dwellers. Think of yourselves as the guilty ones"

Cemil Giray Alyanak

"The world is enough for everyone's needs not for everyone's greed."

Gandhi mentioned by Rajendra Kumar Pachauri

"Be the change you want to see in the world."

Gandhi mentioned by Rajendra Kumar Pachauri

"I feel pessimistic about the future."

Claude Lorius

"Polar ice sheets are the guardian of the future."

Claude Lorius

"I am more worried about unpredictable extreme weather accidents than infectious diseases."

Jean-François Bach

"Do it quickly"

Claude Lorius

"We need a price on carbon so that consumers and industries move towards lower carbon products and services."

Cemil Giray Alyanak

STEM CELLS: EVEN MORE PROMISING? Advances in Life Sciences

Moderator

- **Peter Wrobel**, Editorial Director of Science Business Publishing, UK

Speakers

- **Laurence Dahéron**, Head, HSCI, iPS Core Facility, Harvard University, Boston, USA
- **Corey S. Goodman**, President, Biotherapeutics and Bioinnovation Center, Pfizer, USA
- **Alastair Kent**, Director, Genetic Interest Group, UK
- **Alan J. Lewis**, President and CEO, Juvenile Diabetes Research Foundation, USA
- **Marc Peschanski**, Director, I-STEM, France

Summary

- Stem cell research remains one of the most exciting and promising fields in Life Sciences. Important results make the media headlines almost every week.
- In the last couple of years there have been remarkable major breakthroughs on human embryonic stem cells (hESC) and with the discovery of iPS (human induced pluripotent stem cells).
- First of all this session gave an overview of recent breakthroughs and the status of stem cell basic research.
- The subsequent discussions included their significance for developing regenerative medicine, their impact on other domains, such as toxicology, new drug targets discovery, the very recent revoke of the Bush administration restrictions on federal funding of embryonic stem cell research by President Obama, as well as their implications within the ethical dimension.
- **Laurence Dahéron** and **Alan Lewis** gave a short presentation on recent developments in stem cell research and the challenges which scientists are facing currently.
- The first hESC were derived in 1998. In 2007, the first human iPS were generated, in 2008, researches derivated the first disease-specific iPS cell lines, and in early 2009, the biotech company Geron requested FDA to test hESC-derived cells in patients with spinal cord injury in a first clinical trial.
- Though, iPS are hoped to replace hESC research at least in some areas. It remains unclear so far, to what extent iPS are truly pluripotent and still many questions need to be resolved, in particular their potential toxic effects and safety

issues. The key problem being the massive genetic changes in the cells and many artefacts which could be observed.

- **Marc Peschanski** presented a high throughput screening approach for using hESC in a drug development program at the iSTEM institute in Paris. Furthermore he showed a biomarkers discovery strategy for in vitro predictive toxicology using hESC.
- The discussions among the panellists developed three key messages:
- At first, stem cell research is about serious life-threatening diseases. People with these diseases would have no prospects, if it was left to classical pharmacology approaches.
- Basic research on hESC showed the clear potential for new interventions or therapies. Therefore, for people with severe genetic disorders research on hESC is their only hope.
- **Corey Goodman** pointed out that iPS might not keep its promise to fully replace hESC research. The uncertainties of iPS stability and artefacts so far known are too unsecure for a drug development plan. Hence, Pfizer is committed to work with both, eHSC and iPS.
- Secondly, the ethical dimension is well recognised. The audience expressed its uncertainty whether or not to work with hESC.
- **Alastair Kent** agreed that it is a challenging individual decision to use hESC or not. However, he stated that not using hESC for research on severe life-threatening diseases is unethical for those who hope to cure these diseases with the help of stem cell research.
- Therefore, he called for the creation of a regulative framework, transparent to the public domain, clear about rules, a system that respects the source of material, and a realistic time scale for fulfilling high expectations.
- He said that we need a rational and calm public discussion to solve the issues and we need to segregate the hypes from the hopes and build trust.
- Thirdly, all panellists called on young researchers to involve themselves in one of the most attractable research fields of regenerative medicine – not necessarily, but in particular stem cells.
- There is plenty of research work to be done. Research needs the most creative and proactive minds.
- **Marc Peschanski** mentioned that France is currently recruiting in this field.

Quotes

"Yesterday, President Obama lifted the cover of unmeanted federal funding of a mystified stem cell research by the Bush administration."

Peter Wrobel

"Human embryonic stem cells remain the gold standard and powerhouse for cell therapies and drug discovery."

Alan Lewis

"For us as Pfizer, iPS are too unsecure to plan their therapeutic use so far."

Corey Goodman

"There is no alternative to human embryonic stem cells."

Alastair Kent

"The key issue is a publicly available transparent control of technology."

Alastair Kent

"It will take ten to twelve years of development before a stem cell therapy or a derived product is approved. FDA requests very extensive safety studies."

Alan Lewis

"At Pfizer no one is forced to work with human embryonic stem cells. We ask employees, if they feel comfortable to work with hESC."

Corey Goodman

"Mostly all research work which has been conducted with stem cells so far, is on a small scale level with only a few cells. For drug discovery we will need billions of cells."

Marc Peschanski

PUBLIC PRIVATE PARTNERSHIP: A DRIVING FORCE FOR THE FUTURE?

Moderator

- **Elizabeth J. Padmore**, Board member, Independent Consultant and Associate Fellow James Martin Institute, UK

Speakers

- **Amir A. Dossal**, Executive Director, UN Office for Partnerships
- **Koichi Kitazawa**, President, Japan Science and Technology Agency
- **Alain Mérieux**, President, Mérieux Alliance, France
- **Wayne F. Pisano**, President and CEO, Sanofi Pasteur, France

Summary

Public action is required for projects that are socially valuable but not economically viable

- E.g.: in Western countries, citizens do not pay attention anymore to nearly-eradicated infectious diseases. Therefore, the 'natural' market demand for vaccination fades away and the public health authorities must jump in to sustain immunization efforts.

In addressing health issues, large PPPs have led to noticeable successes:

- One of the most famous is the GAVI initiative leveraging public funds as well as funds from private foundations and coordinating several public and private organizations for delivery of vaccine immunization
- Another example is the A2I/OSEO French agency which elected a €400mio "theranostic" program for public funding, in which the French government is funding 23% with the approval of the EU – an example of research that a public listed company could not do on its own

On the other end, field focused PPPs are also applicable:

- E.g. development of veterinarian vaccines against foot mouth disease required a field approach – due to high strain variations – and a close cooperation with local authorities in charge of animal health, regulatory approval, farmer funding, etc.
- The same applied when a specific country faced a genuine health issues - as was the case for Brazil with a meningitis outbreak: a swift partnership enabled the health authorities to get 6 mio doses of Men AC vaccines produced within six months using local strains

Hurdles to overcome:

- IP – need to look at the circumstances and how you provide the access – example, in the case of pre-pandemic vaccines, the private industry has the capacity to manufacture the antigen but not the capacity to fill, package and distribute the vaccine which can be done locally
- Corruption – be very careful with who you work with – work with the local citizens – you find fantastic people that are motivated and fighting for the case
- The distrust that multinational are only in it for money
- The need for fast return can be a barrier – a long term sustainable view is needed – when you save a child he will eventually become a consumer
- The public need to look into how the private can benefit from investing in the poor

Receipts for successful Public Private Partnerships:

- Understand where we are coming from and where we want to go – a common goal
- Focusing on transparency and delivery of results
- Leveraging the expertise from each of the partners
- Each partner has its share of voice - example is where UN created GAVI as a partnership with its own ad-hoc governance

Quotes

"A lot of this is about trust. The "polio vaccine story" shows how misinterpretation can have fatal consequences."
Elizabeth Padmore

"Japan has a long experience and tradition of successful collaboration between the technocracy and private industry."
Koichi Kitazawa

"Financial analysts do not like research and without the partnership we would disappear and get no solutions to the complex issues."
Alain Mérieux

"When all the constituents are harmonized on the goal, we can have powerful results."
Wayne Pisano

"When it came to distribution network, the private sector brought the market rigor."
Amir Dossal

REDUCING CITIES' ECOLOGICAL FOOTPRINT: SUSTAINABLE CITIES

Moderator

- **Bruno Giussani**, European Director, TED Conferences, Switzerland

Speakers

- **Catherine Gaillochet**, Cercle Cyclope, France
- **Tom Rufty**, Bayer CropScience Professor of Sustainable Development, Departments of Crop Science and Plant Biology, North Carolina State University, USA
- **Gordon Shepherd**, Director Global and Regional Policy, WWF, Switzerland
- **Karsten Voss**, Professor, Wuppertal University, Germany

Summary

- The purpose of this session is to discuss how we can make cities more sustainable by reducing their ecological footprint.
- The rise of the Megalopolis illustrates how the world has tilted to cities. Today, half of the world's population, according to UN statisticians, lives in cities, and cities represent 70 to 80% of greenhouse emissions. This leads to an interesting paradox: efficient cities could play a key role in mitigating the effects of global warming. However, cities as they are designed and managed today are a major source of hazards and pollution.
- Reducing cities' impact on pollution can be achieved through better planning, designing and building.
- The world total biocapacity is estimated at 12 bn ha for 6.5 bn human beings (providing 1.8 ha per individual if biocapacity was spread fairly). The footprint for industrialised countries is much higher (USA and UK's footprints are respectively 5.3 planets and 3.1 planets). Therefore, the world has been indulging in unsustainable consumption since the early 1980's at least.
- Sustainable living, as detailed by the WWF in its "One planet living" concept, will require:
 - Zero carbon
 - Zero waste
 - Sustainable transport
 - Local and sustainable materials
 - Local and sustainable foods
 - Sustainable water use

- Natural habitat and wildlife
 - Cultural and heritage preservation
 - Equity and fair trade
 - Health and happiness
- One planet living is a blueprint on how we can reduce the ecological footprint of mankind. Examples of its application are currently being applied in new property development in Portugal, the UAE (Masdar) and elsewhere.
 - Building sustainable new cities is an important step forward but the real challenge lies in retrofitting the existing ones.
 - When setting zero emission goals, it is important to measure results.
 - Examples exist of zero emission buildings. Experiments on autonomous houses were conducted in Freiburg/Germany as early as 1991.
 - The number of zero emission buildings is rising as companies have identified the marketing/communication potential for building up their green credentials.
 - It is essential to adopt a net zero energy approach where you look at the overall picture: what is consumed from the outside must be provided back at a later stage.
 - Results show that passive house design features can play an important role. Nevertheless, the ever increasing number of electrical appliances however efficient they are becoming can only be fully compensated by on-site electricity generation (for example by using solar panels).
 - This works well in individual houses and small buildings but becomes problematic in multi-storey ones as a limited generation capacity (roof size) is shared by a larger number of inhabitants/workers.
 - With net zero energy, efficiency comes first. A low mismatch between consumption and needs induces low transportation costs and storage losses. To do so, all sectors of energy consumption need to be taken into account.
 - Another way of achieving the goal of sustainable cities is by increasing the number of green spaces.
 - When asked why people need green spaces several answers are provided: beauty, spiritual connection, leisure, gathering spaces, etc.
 - Green spaces can play a key role in sequestering carbon, minimising environmental impacts and the dispersal of effluents.
 - When it comes to carbon sequestration, forests can trap 4 tons of carbon per ha per year. Turf grass is also an interesting means for sequestering carbon as it can absorb 1 ton of carbon per ha per year but research also shows that it can reduce the amount of nitrates released into the environment.
 - Turfgrass can therefore play a key role in reducing the ecological footprint of a city. Its efficiency depends on the climate and the soil.
 - Last but not least, waste management is a key factor to take into account when attempting to reduce the ecological footprint of a city. Waste management varies according to countries. In developed countries, different approaches exist such as landfills or incinerations. Recycling rates also vary (up to 49% in South Korea and in the 40s % in Scandinavia). Whereas, in poorer countries, the battle often lies in eliminating illegal dumping.

Quotes

"One planet living is a concept for living without destroying the planet"
Gordon Shepherd

*"It is time to convert the Net Zero energy concept from a slogan into a convincing reality
for all building types: new and existing ones."*
Karsten Voss

"Green spaces have tremendous potential to contribute to the sustainability of cities."
Tom Rufty

"Waste management constitutes a challenge!"
Catherine Gaillochet

URBAN STRESS AND MENTAL HEALTH

Moderator

- **Maria Cattai**, Member of the Board of Directors of Petroplus Holdings AG, Switzerland

Speakers

- **Paul Corrigan**, Strategy and Commissioning Director, National Health Service, UK
- **Viviane Kovess-Masfety**, Professor, McGill University, Canada, Université Paris 5 Descartes, France
- **Ludo Lauwers**, Sr. Vice President, Vice Chairman Management Board Janssen Pharmaceutica NV, Belgium
- **Benedetto Saraceno**, Director Mental Health and Substance Abuse, World Health Organization, Switzerland

Challenger

- **Lou Marinoff**, Philosopher and professor at City College, New York, USA

Summary

GOAL

- The session's aim was to offer a debate on the presence of a link between urbanisation, stress and mental disorders. This talk was also trying to uncover what are the causes behind mental health disorders in relation with urbanisation.

THE COMPLEXITY OF THE PHENOMENA

- The main difficulty in finding a clear link between mental health and urbanisation is in properly defining what cities and what disorders will be taken into account.
- Indeed, the WHO will typically consider subjects of their studies as poor citizens of poor to middle-income towns, as these are the people that WHO traditionally help.
- However, psychologists, psychiatrists and pharmaceutical industries have difficulties obtaining good quality epidemiologic data in these parts of the world and tend to concentrate their efforts in industrialized countries, where such data is available.
- Finally, cities are highly heterogeneous between and amongst themselves and the panel warned against considering all cities are a unique entity.
- Cities of today are constantly renewing their population through national and international immigration which in turn results in dislocation of the urban inhabitants.
- This forces people to cope with great new changes in the environment in a solitary way, without their cultural and familial environment to support them.

TENTATIVE CAUSES BEHIND MENTAL HEALTH DISORDERS IN CITIES

- Regarding the actual mental health “troubles”, it can be admitted that there is no agreement on the direct influence of urbanisation. However, the second hit theory exposed by Ludo Lauwers (where a favourable background is triggered by an event such as a geographic dislocation) is seen as highly interesting and requires in depth study.
- Indeed, a general consensus was found on the predisposition of a person regarding mental disorders, which Lou Marinoff linked to the Darwinian Theory where above a certain population density, members need to migrate or start braking down.
- This Theory was shared by Ludo Lauwers when he explained that this population density issue was responsible for triggering an inflammatory response, the second hit.
- Nevertheless Dutch cases show that density is not an automatic link towards mental disorders.
- This reason was recognized by the panel that noted that although genetic predispositions exist, studies show that the time one stays as a child in a city is much more influential in the buildup of a mental health issue.
- Urbanization can also be an indirect factor as substance abuse (licit and illicit) is higher in the cities than in rural environments, which in turn has a direct link to mental illnesses.
- In order to effectively reintroduce such people in urban life, it is crucial not only to treat the symptoms but also to reinstate a bond between them and the city with the help of local authorities.
- Such reinstating is more easily achieved if the society keeps some form of social tissue such as medical and economical safety nets.
- This double treatment (symptom and patient treatment) can only be achieved if the stigma of such illnesses can be removed and patients only considered as requiring assistance.
- During the debate, the panel of experts stressed that the context can be as important as the fact, such as in the perception of population Diaspora which can be perceived positively (Canada, USA) or not (Europe), leading to greatly divergent acceptance attitudes.

GENERAL CONSENSUS ON MENTAL HEALTH IN CITIES

- The dissatisfaction of donors who are bombarded on multiple diseases, for multiple demands (sometimes even contradictory ones) and without clear success data for these funding demands must be addressed and changed.
- The lack of hard biology and a highly imperfect DSM (*Diagnostic and Statistical Manual*) mental disorders classification method which suffers from multiple lobbies hinders the study of such fields.
- The poverty of means and resources is critical and needs improvement.
- Scientific data are needed to successfully study these diseases and their factors.
- Finally, the importance of citizenship and reintegration of the patient into the urban society as a recovery prerogative.

Quotes

"Children are currently suffering from being over-drugged by ADD medicine, a TV culture and the deconstruction of the male social figure."

Lou Marinoff

"Mental Health is broader than psychiatry."

Benedetto Saraceno

"Nobody believes we are going to discover the schizophrenia gene."

Viviane Kovess-Masfety

"We need to dive deep in the biology of mental health, not just use soft diagnostic tools such as DSM-IV."

Ludo Lauwers

"If the dislocation goes well, fine, if not, the person could expose himself to serious mental conditions."

Paul Corrigan

CITY AIR WE CAN BREATHE

(Co-organised with TWAS)

Moderator

- **Peter Wrobel**, Editorial Director of Science Business Publishing, UK

Speakers

- **Claudia Sheinbaum-Pardo**, Researcher at the Institute of Engineering National Autonomous University of Mexico, former Mexico City's Environment Minister, Mexico
- **Robert Vautard**, Director, Laboratoire des Sciences du climat et de l'environnement, France
- **Sarath Guttikunda**, Founder, Urban Emissions.Info, India

Summary

- A century ago 10% of global population lived in cities. The figure is now 50%. By 2050, 75% of population will be in cities. 95% of global population growth will be in developing country cities.
- Measurement of air pollutant particles as small as pm10 is now standard in most cities, both in the developing and developed worlds.
- Measurement of air pollution in developing world cities faces two major challenges: how to maintain laboratory standards and how to ensure accuracy of the measurements.
- Where and how many measuring instruments are used can have significant political and technical implications.
- A promising way forward may lie in using a combination of observed data points and data assimilation models.
- Despite all of the research that has been done, problems remain on how to measure the true health and economic effects of pollution. Additional studies are needed.
- By most measures, in Asia, asthma rises to the top of air pollution health-related issues.
- Although air pollution is a global problem, solutions can actually be dealt with on a city scale level, providing tangible and measurable effects.
- A major issue for developing country cities resides in the speed of change that they face. Delhi is an excellent example of how difficult it is to sustain the benefits

of reform measures in the face of unprecedented increases in the use of automobiles.

- As is true for other issues, scientific exchange and cooperation in air pollution research and policies has made a big difference in affecting beneficial policy changes. Cities, both in the North and the South, are learning from one another on how best to deal with this issue.
- Science is critical to success. But so too is long-term institutional planning and political will. Bureaucracy and, in some cases, corruption can make it difficult to implement and sustain the needed reform measures.
- Having substantially reduced air pollutant levels, Europe now faces the risk of unpredictable extreme weather events such as the historic heat wave that struck the continent in 2003 and which had direct effect on ozone levels.

Quotes

"No city's atmosphere has been studied more than that of Mexico City."
Claudia Sheinbaum-Pardo

"Air pollution mitigation efforts during the Beijing Olympics provide a good lesson on how to measure the footprint of industry and human activity on air pollution."
Sarath Guttikunda

"We still do not know all we need to know about air pollution's impact on human health."
Robert Vautard

"Dealing with air pollution should rise above political party concerns."
Claudia Sheinbaum-Pardo

"Public awareness campaigns are necessary; people need to see and understand the benefits of reducing air pollution, otherwise all other efforts are useless."
Sarath Guttikunda

CROPS OF THE FUTURE

Moderator

- **Ioan Negrutiu**, Professor of Biology, Ecole Normale Supérieure (ENS) de Lyon, France

Speakers

- **Janet Cotter**, Senior Scientist, Greenpeace International, Science Unit, University of Exeter, UK
- **Willy de Greef**, Secretary General, Europabio, Belgium
- **Marion Guillou**, Chairman and CEO, Institut National de Recherche Agronomique (INRA), France
- **Piet Van Der Meer**, Executive Secretary, Public Research and Regulation Initiative, PRRI, Belgium
- **Michiel van Lookeren Campagne**, Vice President of Research, Bayer CropScience, France

Summary

- Agriculture is the main issue, if we want to know, where our civilization is going
- Actual ongoing economic crisis shows, that there are very complex issues, which can be simplified, if we would start with agriculture
- We are actually counting on four major crops (maize, rice, soy and wheat); is this a sustainable basis for the challenges of the future?
- In recent years the agricultural productivity increased significantly and it has to increase in the future facing
 - Climate change, which can already be seen influencing yields
 - Reduced soil quality, which has to be protected, as former productivity increase came at the cost of environmental burden
 - Unpredictable growing conditions, whereas farmers in the globalised economic network need stability and predictability to take part on the market and leave poverty cycles
 - Complex economic and social environment
- To increase agricultural productivity a number of different approaches are necessary as none of them can solve the problems alone
 - Correct balance of organic agriculture and industrial agriculture
 - Balance of transgenics, genetically assisted breeding and crops developed by classical cross breeding, whereas biotechnology plays a vital role in all approaches
 - There are now contradiction between low impact agriculture and biotechnologically based plants
- The major need is in using the potential of crop traits nature is providing us with

- New genomic approaches analyzing the nature of polygenic traits are to be used extensively
- More funding is needed to explore the globally available seed collections for traits beneficial for future crops, as we are currently just scratching the surface
- Discussing crops of the future we must not forget the non-food use of plants with high potential on optimization
 - More land is being used for growing wool fiber on than for growing maize
 - Often very little of the usable energy potential of plants is explored when using them as energy source
- There is a lot of effort needed to boost the innovations needed for developing crops of the future allowing sustainable agriculture
 - As a strong message to politicians the panel agreed on the need of substantial funding for the thousands of researchers in public organizations, especially in developing countries
 - IP-protection is essential for new innovations, when at the same time basic research is not contradicted

Quotes

"Tell me what the crops of the future are and I will tell you what the world will look like."
Ioan Negrutiu

"Will the plants that we are going to use in future be suitable for the changing climate conditions?"
Marion Guillou

"The successful crops of today are already of multiple uses and widely accepted, they are of proven productivity and we know their unused potential as well as their weaknesses."
Willy de Greef

"Over the last hundreds and thousands of years we changed the environment to the needs of the crops, but it would be better to change the Crops to the need of the environment."
Piet Van Der Meer

"There is actually enough food to feed the population, but we do not have the right food at the right place for the right people"
Janet Cotter

"I grew up on a farm and I cannot remember a year which has been normal. It was either too hot or too cold, either too wet or too dry."
Willy de Greef

"Industry will only invest in R&D, if there is a financial benefit, therefore there is a lack of innovation in countries with little IP-protection."
Michiel van Lookeren Campagne

"Biotechnology is not the silver bullet. It is just one of a number of technologies to solve our problems."
Piet Van Der Meer

"Transgenic is only one aspect of biotechnology in crop development."
Marion Guillou

IGNORED ASPECTS OF BIODIVERSITY

Moderator

- **Ismail Serageldin**, Director, Bibliotheca Alexandrina, Egypt

Speakers

- **Neville Ash**, Head of IUCN's Ecosystem Management Program (International Union for Conservation of Nature), Switzerland
- **Léon C. Braat**, Senior Researcher International Nature Policy, Alterra, The Netherlands
- **Guillermo Castilleja**, Executive Director, Conservation of WWF International, Switzerland
- **Jean Weissenbach**, Director, Centre National de Séquençage, France

Summary

- We haven't explored the whole biodiversity yet. Many species are still to be discovered.
- New bacteria communities can be studied using different very innovative techniques such as molecular approach, 16S rDNA, FISH and metagenomics.
- Marine metagenomics enabled to identify 1800 new families of proteins including viral proteins and some eukaryote-specific. When sequencing metagenomes we can also identify which species are abundant and which are rare.
- Among all species, the corals are those decreasing the most compared to birds, amphibians and mammals. This can be partially explained by conservation actions towards those latter species.
- Out of 45,000 species assessed, 17,000 species are threatened today. 1,8 M species have been described and 15,000 to 20,000 new species are described each year
- World protected areas are one way of reducing rate of biodiversity loss. It increased from 7M km² in 1980 to 18M km² in 2006 (from 40,000 to 100,000 areas).
- Biodiversity and services it provides need to be valued. As long as society does not see this value it will not be induced to protect it.
- Acting to reduce the rate of biodiversity loss is not an easy challenge but what is even more challenging is dealing with the cost of inaction. Indeed doing nothing would impact food security, fresh water supply, human health and severity of climate related disasters.
- For instance, bees currently disappear and we still don't know why. If bees ever disappear, the consequences for the human kind would be dramatic.
- The economic value of the loss of biodiversity is so far estimated at 14 Billion euros in 2050 only.
- Ecosystem and poverty are linked since ecosystem services represent 57% of "GDP of the poor" whereas it amounts to 7% of "classical GDP".

- Biotechnology and organic farming can be part of the solution but we have to take a precautionary approach: understand benefits, downsides and mitigate the risks. We should not fall into the fallacy that biotechnology will bring us more food, it is also about how food is produced and distributed.
- Efforts to identify new species continue in particular with the Tara Oceans Plankton exploratory expedition, which will last three years. The main purposes of this expedition are to collect samples and data and explore sites of special interests.
- The scientific community has decided to go towards a science policy platform on biodiversity and ecosystem services called IPBES (Intergovernmental Platform on Biodiversity and Ecosystem).
- Building on IMoSEB (International Mechanism of Scientific Expertise on Biodiversity), IPBES proposes to address four themes:
 1. General knowledge through targeted assessment
 2. Horizon scanning
 3. Providing policy support
 4. Capacity building for integration science into policy
- As a leading species, we are responsible for what we are going to do not just for our children but also for all the other species that we are ignoring or accelerating the extinction.

Quotes

"Progress in biotechnology will depend on the identification of new enzymes catalyzing additional reactions both for chemical production and biodegradation"
 Jean Weissenbach

"The challenge is to do a better job, improving measurement of biodiversity. Other measures are required: variety, abundance, distribution and processes"
 Neville Ash

"Losing biodiversity means a lot of things for everybody but a lot for community in terms of reducing our ability to secure human kind future"
 Guillermo Castilleja

"There is no price tag associated to every aspect of biodiversity but if we don't act now it will have a major cost to society"
 Guillermo Castilleja

"A lot of people in this world, maybe more than half a billion, are directly dependant on fish for their protein. The children will not grow very well, not very intelligent if they don't get those proteins. It is very close form of genocide."
 Léon C. Braat

"We have acquired the means to master the earth, the question is can we turn our minds around [...] and recognize we have the responsibility to nurture the earth as she nurtured us"
 Ismail Serageldin

WATER IN THE CITY

Moderator

- **Alexander Zehnder**, Scientific Director, Alberta Water Research Institute, Canada

Speakers

- **Asit K. Biswas**, President, Third World Center for Water Management (TWCWM), Mexico
- **Ek Sonn Chan**, General Director, Phnom Penh Water Supply Authority (PPWSA), Cambodia
- **Patricia Burkhardt-Holm**, Professor, MGU Programme (Man, Society, Environment), University of Basel, Switzerland
- **Jean Lapègue**, Manager Water and Hygiene Programmes, Action contre la Faim, France
- **Peng Kah Poh**, Director (Info Comm) and Deputy Director, PUB Singapore
- **Cecilia Tortajada**, President, International Water Resources Association, Mexico

Summary

- The purpose of this session is to provide insight into supplying good quality water and sanitation to the poorest cities even though it is difficult to generalise water problems as cities vary.
- It is criminal that people do not have access to clean drinking water taking into account current knowledge and technology. The world is not facing a water crisis. Even in the most arid places, people should have access to clean drinking water if resources were adequately managed.
- Since the 1960's, an increasing number of countries have scarcer access to water. It is falsely assumed that such a trend will continue as people do not understand that water is a reusable resource. For example, in Colorado USA every drop of water is used 7 times. The problem is due to poor management and not to physical scarcity.
- Success comes with good policies and management. Managing water situations in mega cities is a complex affair which requires skilled dedicated people. Generally, the manager of a utility in a developing country will be an administrator who will remain in place for a period of 2,5 years. He/she will not have the competencies or the time to make and follow through the necessary changes.
- This is surprising as clean drinking water is essential for economic growth. Sick people are not productive.
- Access to such clean drinking water has a price which is estimated to cost between 2 to 5% of disposable income.
- Examples of successful management of water exist in developing countries.

- In Cambodia, the supply of water in Phnom Penh covers 375 km² and concerns 1,7 million inhabitants. In 1993, the water system was in a dire state. Politicians granted financial and operational autonomy to the water works. This combined with external financial assistance and better management led to a complete turnaround.
- Efforts were concentrated on:
 - Restructuring management
 - Changing the culture
 - Promoting self reliance
 - Training and exchanging best practices
- This helped :
 - Reducing losses thanks to replacing the old pipes and quickly repairing leaks
 - Maximising revenues thanks to better metering, billing, collection and fighting illegal connections
 - Providing the right level of service through service contracts and realistic pricing according to costs
- The gains were measured:
 - Water loss went from 72% in 1993 to 6,2% in 2008
 - Collection improved from 48% to 99,9%
 - 1000 connections were served by 20 employees in 1993 and only 4 in 2008
- Countries such as Singapore show how in over forty years it is possible to create a world class operation from nothing. The nation state of Singapore covers 704 km² and has a population of 4.6 million inhabitants. It experiences high levels of rainfall.
- Singapore manages the supply and demand aspects. A portfolio of water supply is managed from different sources and according to uses. Water is provided by rainfall trapped in water encatchments, by pumping, by desalination and importation. Reused water is directed to non drinking usages. Through education, people are more likely to better manage the demand side.
- Mexico highlights the difficulty supply water when there is weak management. Mexico city covers 4925 km² (0,3% of the country's surface) and concerns 20 to 25% of the population and 32% of GDP.
- In Mexico City, 40% of the water is wasted. Excessive pumping of water has led to the subsiding of certain areas of Mexico City. Gravity driven sewage is now impossible making it very vulnerable to flooding leading to extreme sanitation problems. The need also to pump in water and pump out sewage water is becoming increasingly expensive as it consumes 20% of the country's energy.
- The challenge of water sanitation in poor situations is not a challenge of money but one of priorities. Problems are numerous and cover such different aspects as:
 - Lack of proper housing
 - Lack of public services
 - Difficulty in accessing certain geographical areas
 - Pollution problems
 - Low level of education and skilled people

- Malnutrition
- Insecurity
- Poor social cohesion
- This requires a constant effort in education and ensuring that the poorer people are considered as citizen with rights.
- When it comes to sanitation, it is also important to consider the long term impact of emergent pollutants on eco systems. Pollutants such as oestrogen from birth control pills can be found in surface, ground, drinking and bottled water. The man made pollutants are far more concentrated and durable than there natural counterparts. Dealing with this pollution constitutes the next big technical challenge for water supply.

Quotes

"Problems lie in poor policy, management and corruption. It should be possible to better situation in the next 10 or 15 years."
Asit K. Biswas

"When it comes to supplying clean drinking water: Do or die!"
Ek Sonn Chan

"When promoting reuse water, it is important to take into account the public's perception. In Singapore, we call it New Water!"
Peng Kah Poh

"It is easy to blame governments. But governments represent people. The apathy of people compounded by the apathy of governments is the main excuse!"
Asit K. Biswas

"The answer is: education, education, education!"
Asit K. Biswas

"Putting good infrastructure is lost, if people aren't educated to take care of the resources they have."
Alexander Zehnder

"It is a qualitative problem and not a quantitative one. We need the right governments and management. The technology is here!"
Alexander Zehnder

"The future water problem will be in small and medium sized cities which lack the political and financial clout and technical expertise."
Asit K. Biswas

"Make the link between governments, utilities and citizens."
Cecilia Tortajada

"Serve the poorest first as they are dying. Promote the right to have access to clean drinking water."
Jean Lapègue

"Be open to see the problems as challenges. Be responsible and be creative!"
Patricia Burkhardt-Holm

BIOROBOTICS ON THE MOVE: IS ROBOSAPIENS AROUND THE CORNER?

Moderator

- **Ismail Serageldin**, Director, New Library of Alexandria, Egypt

Speakers

- **Paolo Dario**, Professor, Scuola Superior Sant'Anna, Italy
- **Hiroshi Ishiguro**, Professor, Dept. of Adaptive Machine Systems, Graduate School of Engineering, Osaka University, Japan
- **Bruno Maisonnier**, Chairman and CEO, Aldebaran Robotics, France

Summary

- The creation of an artificial intelligence has been engaging mankind since a long time. Scientists together with engineers are working on a new generation of robotics which are neither for pure scientific nor for pure entertainment purposes.
- Biorobotics lie somewhere in between. They are getting closer to human. They interact like human, they imitate human and they are getting socialised in our daily lives.
- For one half this sounds like science-fiction, for the other half it is fulfilment of a mankind dream that robots will serve humans in many aspects of life.
- This session showed the directions and status of current development and shed light on the potential benefits for our future.
- **Paolo Dario** gave an overview of recent developments in robotic 'evolution' and showed that nature is a role model of robotic movements.
- In several case examples he showed how role models are transferred to specific applications in life sciences, such as the worm model for painless colonoscopy or the legged capsule for painless gastroscopy.
- Furthermore, we are already able to connect prostheses to the nervous system and the brain or control biological systems by artificial simulations.
- Concerning ethical issues, Paolo Dario pointed out that roboethics should find answers to the question what we want to do with robots and not vice versa.
- **Bruno Maisonnier** stated that the key driver for future robotic development will be derivated from the benefits of robotics' use. He created a new world where robots will help humans wherever meaningful.
- Recent significant advances have been possible due to a bio-inspiring and bionic research strategy. Through the use of genetic algorithms robots could evolve and learn reactions inspired by nature.

- In a lively demonstration of his robotic Nao he showed how close the robotics' behaviour is to human. For acceptance reasons Nao has a friendly and cued looking face.
- From the point of view of **Hiroshi Ishiguro** robots are getting closer to humans due to combining biology and engineering for robotic development, but also including cognitive science, psychology and social science.
- This leads to the creation of bio-mimetic humanoid which are able to interact and mimic with humans and human's behaviour up to a strong entertaining conversation.
- Upon the question of ethical issues the panellists agreed that differences between biological and artificial systems are getting smaller. However, robots act on humans with the knowledge of humans.
- Robots are developed to serve humans not to substitute them. They called on society to see robots as useful tools.
- In conclusion, the panellists bring out three key messages:
 1. The age of biorobotics has already started.
 2. Further collaboration between humans and robots is needed to drive acceptance and further development. Development of biorobotics comes with purpose of their use.
 3. Humans should see robots as tools, which won't be perfect as human beings, but are helpful in various situation of life.

Quotes

"Robots are tools, they won't be perfect human."
Bruno Maisonnier

"Nobody dreams of substituting surgeons, but robots can be used for telesurgery. They support the surgeon to execute the surgery."
Paolo Dario

"Robots are getting closer to humans. They are interactive, they are social and they even show emotions."
Hiroshi Ishiguro

"It takes you only 5 minutes to adapt to a conversation with robots."
Hiroshi Ishiguro

"Robots have to be adapted to our environment which has been designed for humans."
Bruno Maisonnier

"Further collaboration of humans and robots is needed."
Ismail Serageldin

"The development of robots will be successful if they are perfectly well accepted by users – by each and every, not only geeks."
Bruno Maisonnier

"We Japanese regard robots as friends."
Hiroshi Ishiguro

"The question was, if robosapiens is already around the corner? Maybe not yet, but maybe in some years."
Paolo Dario

"Biorobotics will in any case influence our lives."
Ismail Serageldin

SEE THE BRAIN, CURE THE BRAIN?

Moderator

- **Gaëll Mainguy**, Director Scientific Publications, Institut Veolia Environnement, France

Speakers

- **Richard Frackowiak**, Professor, Institute of Neurology, University College of London, UK
- **Marc Jeannerod**, Professor, Institut des Sciences Cognitives, France
- **Bernd Montag**, CEO Imaging, Siemens AG, Germany
- **Les Turski**, Senior Vice President Research, Solvay Pharmaceuticals, Belgium
- **Elias Zerhouni**, former Director, National Health Institutes (NIH), USA

Summary

- There are many new possibilities provided with state of the art technology on brain imaging; however there is still a major gap in its wide spread usage.
- Challenges for this wider usage are due to re-imburement, change of habits and education of medical staff as well as staff shortages in hospitals.
- In recent research, brain imaging has provided new insights on how epileptic seizures occur in the brain; this will open the search for more targeted molecules in treating epilepsy.
- In other research, brain imaging indicates how brain activity occurs whether actual or mentally simulated. It is showing how mental training can modify and correct brain activity.
- Brain imaging has opened new ways of approaching neuro-degenerative diseases such as Parkinson or Alzheimer's by visualizing atrophies caused in the brain.
- By detecting in advance the disease, we are opening new ways for early treatment or patient enrolment in clinical trials.
- Ultimately, creating reference databases of brain scans in all of its dimensions will enable to more accurately diagnose neuro-degenerative diseases.
- The impact of CNS and mental health disorders will have heavy impact on disease burden in general and much remains to be discovered in the area.
- Capturing the brain's biomarker activity with imaging will require enormous computing capability and also require a fundamental transformation in the way we accumulate and record biological data of the brain.

Quotes

"The new imaging techniques are giving us a dynamic view of what is in the brain"

Richard Frackowiak

"We need to scale up our abilities to study complex and dynamic biological mechanisms in the brain."

Elias Zerhouni

"There is still a long process to go before we all actually benefit from the existing technology"

Bernd Montag

"Imaging is opening new ways to treat epilepsy and the search for more appropriate molecules"

Les Turski

BIOFUELS FOR THE CITY

Co-organized with the US-EC Task Force
on biotechnology research

Moderator

- **Cemil Giray Alyanak**, President, monodragilis group, France

Speakers

- **Bernard Bigot**, Chairman, French Atomic Energy Commission (CEA), France
- **Michael Casler**, Professor, US Department of Agriculture, Agricultural Research Service, USA
- **Volkert Claassen**, Director, Royal DSM White Biotechnology, The Netherlands
- **Bärbel Hahn-Hägerdal**, Professor of Applied Microbiology, LTH/Lund University, Sweden
- **Kenji Kurata**, Director, Bio-Industry Division, Ministry of Trade, Economy and Industry, Japan
- **Steen Riisgard**, CEO Novozymes A/S, Denmark, Chairman, Europabio, Belgium
- **Annie Sugrue**, Coordinator, Citizens United for Renewable Energy and Sustainability (CURES), South Africa

Summary

- The aim of this session was to give an overview on the broad topic of biofuels, which hardly can be separated from other topics, mainly bioenergy and biorefinery, and to get an experts overview on how to move forward
- There are many different types of biofuels; each one comes with different strengths and weaknesses, opportunities and threats and each one has to be evaluated individually depending on the situation the use is planned for
 - Bioethanol of the first generation made from sugar is actually produced mainly in Brazil (from sugar cane) and the USA (from corn); bioethanol from sugar cane is the only technology so far which can compete with fossil fuels
 - Technology for bioethanol production from cellulose (second generation) will be available next year; plants will have to be constructed soon to use this potential
 - Biodiesel production from whole plants via gasification is actually being developed, few pilot plants available
 - Biodiesel production from plant oil goes along with the drawback of just a little part (seeds, fruits) of the plant being used for the purpose
 - Other possibilities to use the energy from biological resources are anaerobic digestion with methane production and total combustion of the plant material
 - There are many different sources of raw material available in future (mainly lignocellulose from whole plants, plant waste parts, other waste)

- and it will be a matter of finding the proper mix for every individual use; raw material from algae will not be a topic in the near future
- There are many different scales in which bioenergy will be used in future from industrial level (biorefinery) to individual household level
 - Evaluating biofuel technologies it is essential to calculate the energy balance first
 - The energy efficiency of a bioenergy process is essential
 - One must not forget the transport of the raw material in that calculation; transportation is a crucial part also from a logistical aspect
 - Regarding the cities, electricity is the best idea for transportation to reduce transport of material, the drawback is lacking technology to store electricity
 - Policy makers shall commit themselves to biofuel/bioenergy regardless of the actual oil price, there is a strong need for researchers and developers on stability
 - Mandates in the US for 36bn gallons of ethanol and alternatives around 25% of the predicted total gasoline consumption by 2022
 - Brazil is fostering the biofuel production substantially
 - Europe is lacking an energy strategy, there are regional commitments which are not in line, this can lead to Europe staying behind in the use of European deriving technology
 - In developing countries there is a strong concern on food competition
 - By no means will we be able to replace the energy coming from fossil sources by biofuels; therefore we have to save energy!

Quotes

"Many of us are making mistakes, even when they think they are into that topic, as the broad field of biofuels is a bit confusing."
 Cemil Giray Alyanak

"Biofuels in general will not develop, if we do not save energy."
 Bernard Bigot

"We did not see any effect new president Obama's commitment on "bio" in our daily business, but all scientists I talk to are very optimistic; and if the economical crisis would not be here, they would be even more optimistic."
 Michael D. Casler

"There is not one route, the demand will be very large and we have to go all routes, biochemically, thermochemically, anaerobic etc., and we will see them all materialized in the coming five years."
 Bärbel Hahn-Hägerdal

"Many solutions will come to work and it is important to realize that."
 Volkert Claasen

"The bigger the facility, the cheaper is the technology. But biofuels are limited as the transportation of the biomass to the plant might eat up all the energy. So you really have to do your maths."
 Bärbel Hahn-Hägerdal

"Regarding biorefineries size is limited as well by logistics; raw material supply and the assurance of reasonably used side streams are essential."
 Volkert Claasen

"We will see a wave of cellulose based biofuel production plants between 2010 and 2015."

Steen Riisgard

"I am in charge of industry thinking about how to use energy like biofuels; my first question is always about efficiency, so far it is very confusing, what is being answered"

Kenji Kurata

"One problem of biotechnologists is that we are talking about opportunities much earlier than they materialize."

Steen Riisgard

"We are at the point that we have a good technology but no one is able to buy it."

Volkert Claasen

"I do not want people in BMWs to benefit from these new technologies, but I want the poor to get out of the dark."

Annie Sugrue

SYSTEMS BIOLOGY, A NEW STEP FOR MEDICINE?

Moderator

- **Gaëll Mainguy**, Director, Scientific Publications, Institut Veolia Environnement, France

Speakers

- **Patrick Johnson**, Vice President Research & Technology Strategy, Dassault Systèmes, France
- **Philippe Kourilsky**, Professor, Collège de France
- **Denis Noble**, Professor, Oxford University, UK
- **François Taddei**, Professor, Necker-Enfants Malades Hospital, Research Scientist National Institute for Health and Medical Research (INSERM), France

Summary

- The session's objective was to "unravel the mysteries" of systems biology and try to understand how complex systems in biology should be approached as well as their implication in current issues.
- Systems biology, which can be applied to man-made and natural systems, deals with high number of distinct interactive elements.
- Although considered a relatively new field, systems biology is already an applied science which provides good new replies to unanswered questions such as the elaboration of drugs for heart disorders.
- The extension of the reductionist approach involves a heuristic change in the time at which hypothesis driven approaches are undertaken. Indeed, systems biology forces scientists to emit hypotheses after they get the data, not before.
- Although systems biology can be applied to living organisms of any scale (from cell to entire ecosystems), current usable data is mainly if not only derived from cell models.
- Indeed, massive parallel acquisition of data is only focused on cells and not yet on bigger systems.
- Such complex systems have such highly interacting elements that trying to properly define signalling pathways become arbitrary.
- The main issues surrounding this field are the issues on data quality and the ability to compare data between the different research facilities.

- But systems biology does not apply only to living organisms but also to complex industrial processes such as building planes or factories...
- In such cases, classic mathematical tools are insufficient to integrate all the proper interactions between the parts, due to the extreme complexity of the products as well as the physical impossibility to test all potential states.
- As such, systems biology is used for the elaboration of models, simulations and formal proving where companies proceed to a virtual test of all the potential states of the construct.
- However, this is not a totally predictive simulation method, only a "simplified one" which nevertheless allows companies to streamline the processes between each department.
- During the session, industrialists recognized the importance of biology but they equally stated that they could bring their know-how to scientists in order to build better hybrid approaches which mix classic and new tools.
- This knowledge sharing can be optimized at the Biovision congress where industrialists and scientists meet.
- Man-made entities are actually becoming so complex that the one of the main distinguishing factor between them and living organisms is that biological entities integrate their own maintenance tools, whereas industrial ones have an outside repair team which limits the amplification (or self replication) of defects.
- Another distinguishing figure is that man-made constructs have direct interactions whereas proteins for example can interact with other unrelated proteins, thus complexifying the already dense studied model.
- Thus, using today's knowledge, systems biology is a necessary and existing step for the evolution of medicine, a step where biologists must more than ever use their insight to select the likeliest probabilities as testing all interactions is becoming virtually impossible.

Quotes

"Systems Biology is necessarily multi-level integration of data."
Denis Noble

"System Biology aims at speeding up the interactions between the observation, modelling and experiment processes."
François Taddei

"To successfully understand a model, you must look at the simplest of complex systems that has the trend you are looking for."
François Taddei

"After a certain stage, there can be so many interactions between the different elements that defining pathways soon becomes arbitrary."
Philippe Kourilsky

RESEARCH INSTITUTES FACING 21ST CENTURY SCIENTIFIC CHALLENGES

Moderator

- **Elizabeth J. Padmore**, Board member, Independent Consultant and Associate Fellow James Martin Institute, UK

Speakers

- **André Syrota**, General Director, INSERM, France
- **Alice Dautry**, Director, Pasteur Institute, France
- **Daniel Zajfman**, President, Weizmann Institute, Israel
- **Philippe Kourilsky**, Chairman A*STAR, Singapore Immunology Network (SIgN)
- **Elias Zerhouni**, former Director, National Institutes of Health (NIH), USA

Summary

- André Syrota presents the major trends, research institutions are facing.
 - In terms of science: changes in researchers mobility at all levels, redistribution of world scientific productivity, improvement and homogenization of the global level of research competence, construction of highly sophisticated research infrastructure and increasing importance of interdisciplinary
 - In terms of society: Extreme competition between researchers (race for investment and the maintenance of integrity), hopes for the world economy from advances in the biomedical sciences, increased awareness by the population and the risk of over-regulation of the research environment
- These trends lead to the need of attracting young researchers for a scientific career in life sciences, which can mainly be done by:
 - Integrate life sciences into the society
 - Give researchers the environment they need
- Regarding the first point, Alice Dautry stressed, that it must be of main interest to give a human face to science; not just from the topics point of view (e.g. dealing with human health) but also from the individual researchers view (scientists are human beings)
- Philippe Kourilsky showed an example of how a research institute can be directly integrated into a city to foster communication
- Looking at the little ratio of scientists and engineers in parliaments of Europe and America, integration of science into politics is obviously lacking, looking e.g. at

China, the situation is different and Philippe Kourilsky in that respect stressed, that Asian societies do much more rely on science

- Regarding the second point, Daniel Zajfman stressed the importance of independency and empowerment for young researchers and he insisted on two key traits of good scientists: curiosity and passion
- He pointed out, that to successfully run a life science research institute, you have to invest in people striving for solutions not in topics or disciplines
- Interdisciplinary is the key to address the scientific and social challenges
- Regarding the responsiveness of publicly funded research, Elias Zerhouni pointed out, that the benefit of basic research is not easy to see and sometimes can take years, but the example of the quick identification of the SARS virus was one situation where the benefit became clear. He insisted on two forces: observation – countries have realized that science and technologies are sources of well being and benefits and second force: convergence within disciplines
- He said also that when exploring the unknown, there are different types of profiles: the pioneers in science (new insights), the explorers (no breakthrough science) and the settlers (continuum). The most important areas to fund in research institution are pioneering as no one else will do it otherwise.

Quotes

"What you can do with what you know is never written on a CV."
Daniel Zajfman

"Disciplines and methods converge, and this convergence is a force which institutions cannot ignore; destroy barriers between disciplines, provide maximum flexibility"
Elias Zerhouni

"I am funding the promises of research"
Elias Zerhouni

"Integrate science into the life of a city!"
Philippe Kourilsky

"The richest countries today are the ones with the most investment in education and the least natural resources; the real treasures are not in the ground but about 1.5m over the ground in the brains of the people."
Daniel Zajfman

"Scientists are considered as criminals."
André Syrota

"We must be present in the public debate about the science of the future and give a human face to science. Science is part of humanity and is made by human individuals."
Alice Dautry

"Science has to be done where the problems are"
Alice Dautry

DECISIONMAKERS, OVER TO YOU...

Moderator

- **Maria Cattai**, Member of the Board of Directors of Petroplus Holdings AG, Switzerland

Speakers

- **Christian Béchon**, Chairman, Laboratoire Français du Fractionnement et des Biotechnologies (LFB), France
- **Roch Doliveux**, CEO and Chairman of the Executive Committee, UCB, Belgium
- **Clara Gaymard**, Regional Executive for North West Europe, GE
- **Federico Mayor**, President, Fundación Cultura de Paz, Spain
- **Elmar Schnee**, President, Merck Serono, Switzerland

Summary

These last three days, the 6th edition of BioVision highlighted the challenging role of life sciences in the world's expanding cities. More than 2000 participants attended 30 sessions where they interacted with 140 speakers, most of them chief executives, directors and presidents of global acting organizations from the policy, research and industry worlds, exchanging their ideas on former and future achievements to solve some of the world's major problems.

In those sessions, issues like major diseases, agriculture and sufficient food supply, as well as global warming were addressed. Attention was obviously given to the current state of the world economic situation and impacted the short- and long-term visions of each theme. A special focus was given on cities and their recent and strong growths as they amplify most of today's challenges as if seen through a magnifying glass. Intense debates about the future role life sciences in solving city-specific (water, pollution, energy) and medical issues (infectious diseases, malaria, neurodegenerative diseases) were shared by the international audiences.

In conclusion it became clear that life sciences can massively contribute in bringing more wealth and health to the world. However, they must not progress on their own, as they are only one part of a whole orchestra of technologies and policy transformations needed to be successful.

Critical outcomes of the 2009 BioVision conference

1. Life Sciences and governance

- As they grow in size and importance, cities equally grow in power.
- Cities require more recognition in the decision making processes at a national and international level.
- This empowerment of cities is a key element in better integrating scientific research into society so as to maximise its benefits to the community and optimise the correlation between scientific advances and the citizens' needs.
- Thus, a new governance system must be put in place, where the city has a major role to play.
- In order to achieve such a goal, communities must work towards developing better integrated mechanisms using reflection groups, reinforcing the roles and responsibilities of existing ones such as C40, and obtaining commitments from existing bodies.
- The successful of tomorrow's cities can only be achieved through the reinstatement, or sometimes the integration of a strong bond between the citizen and his or her city.

2. Singling out priority domains: health and ageing populations

- Life sciences were obviously identified as having a major impact on progresses in medicine to face the diseases of tomorrow, more specifically illnesses linked to old age, a critical issue in tomorrow's ever aging urban population.
- New developments in science can lead to the betterment of citizens' lives all the more successfully as private public partnerships are set up.
- Neurodegenerative diseases were clearly identified as a major issue of the future and might even equal the place cancer holds today in our society.
- Breakthroughs in other critical other diseases (infectious diseases, malaria, cancer, etc.) are imminent which emphasises the importance of current funding of such projects.

3. Educating the urban citizens of tomorrow

- Maximising the potential of Life Sciences for the emerging urban world requires the enhancement of scientific education in the population's curriculum.
- As a general rule the nations must aim at providing higher education to all their constituents.
- A specific effort must be made regarding the education of women as not only are they left out, but they also are the cohesive tissue of most developing countries.
- This education improvements will benefit urban citizens in the following ways:
 - The ability to use science on a day to day basis so as to simplify their lives.
 - Informed education grants citizens the ability to act responsibly and preventively when faced with potentially harmful decisions.
 - An increase in the number of citizens choosing a scientific career, which is the main factor in successful research and innovation.
 - An informed population has a better understanding of new developments and thus will not fear them unnecessarily.

- Better education leads to an innovation-oriented society, which in turn is better prepared when having to adapt to change. This all the more so true in urban societies where the day-to-day pace of evolution can be extremely high.