100th International Conference of Applied Econometrics Association
jointly with
UNAM – Institute of Materials Science and Nanotechnology, Bilkent University
DSEE – Institute of World Systems, Economies and Strategic Research

Nanotechnology, Informatics and New Economic Paradigms

A Transdisciplinary Approach

Contents

Nano Science & Technology - a Key to Sustainability

by

Heinrich ROHRER, Nobel Laureate

In 1981, Heinrich Rohrer and Gerd Binnig invented the scanning tunneling microscope (STM), which provided the first images of individual atoms on the surfaces of materials. Rohrer and Binnig were awarded 1986 Nobel Prize in physics.

Rohrer was born in Buchs, Switzerland on June 6, 1933. Dr. Rohrer received his B.S. degree in 1955 and Ph.D. in 1960 from the Swiss Federal Institute of Technology in Zurich. After post-doctoral work at the same institute and later at Rutgers University in the United States, Dr. Rohrer joined IBM's newly formed Zurich Research Laboratory. Among other things, he studied Kondo materials and antiferromagnetism before turning his attention to scanning tunneling microscopy. Dr. Rohrer was appointed an IBM Fellow in 1986 and was manager of the physical sciences department at the Zurich Research Laboratory from 1986 to 1988. He retired from IBM in July 1997. Dr Rohrer's works on scanning tunneling microscopy have contributed substantially to the initiation of nanoscience and -technology.

Dr. Rohrer is one of the worldwide leaders in nanotechnology.

Nanobiotechnology: Biology Enabled Nanotechnology

Candan TAMERLER

MOBGAM-Molecular Biology-Genetics and Biotechnology Research Center & Molecular Biology and Genetics Department, Istanbul Technical University, Maslak, Istanbul 06800, Turkey
GEMSEC, Genetically Engineered Materials Science and Engineering Center, and Materials Science and Engineering, University of Washington, Seattle, WA 98195, USA
tamerler@itu.edu.tr or candan@u.washington.edu
www.GEMSEC.washington.edu and www.MOBGAM.itu.edu.tr

Nature provides inspiration for the design of engineering structures and protocols for processing towards fabrication of the practical materials. During the last two decades, the realization that materials have interesting physical characteristics based on their nanometer scale properties has driven new potentials in both engineering and medical systems. The highly organized structures observed at the molecular-, nano-, micro and macro scales in biological materials ultimately result in myriad of different soft and hard tissues. There is an increasing awareness and proof-of-principle demonstrations that following the biological routes it may be possible to create controlled structures for practical everyday systems. To achieve the goal of efficiently producing materials using the biological approaches on a routine bases requires the adaptation of bold, transformative approaches that will reshape technology and medicine. These approaches require the development of novel platforms where the genes, biological components, synthetic and hybrid systems will be in the forefront necessitating a combination of integrated interdisciplinary expertise in a wide range of diverse fields. To demonstrate these points, I will present examples of novel bionanotechnological systems, mainly towards regenerative medicine implementations.

Personal WebPage: www.bio.itu.edu.tr/tamerler/

Nanotechnology Investments in Turkey
National Nanotechnology Research Center Project

Mehmet BAYINDIR

UNAM, Bilkent University, Ankara, Turkey
mb@bilkent.edu.tr

In the last decade nanotechnology research attracted great interest due to its expected critical and potential applications. Globally, governments and companies are investing billions of US dollars each year to establish and promote nanotechnology related research. Currently there are over 320 nanotechnology centers in the world. Starting in 2006, Turkish Government has also been active in nanotechnology investments, through which a number of research centers are already established. UNAM is the first national institute for dedicated nanotechnology research in Turkey, established by Bilkent University with government funding through The State Planning Organization of Turkey. UNAM has quickly become one of the most sophisticated research centers in the Mediterranean and Middle East Region, and attracted over 150 full time researchers from local universities, over 400 users from academia and industry nationally, and also from regional countries. In the first part of my talk, I discuss nanotechnology investments in Turkey and UNAM. In the second part, I will introduce an actual nanotechnology research project developed recently in my research group at UNAM. This novel technique involves reducing the size of semiconductor or polymer rods/tubes into sub 100 nm nanowires and nanotubes with indefinitely-long length scales while preserving the shape of the initial structures.

Mehmet Bayındır received his B.S., M. S., and Ph.D. degrees in physics from Bilkent University, Ankara, Turkey in 1995, 1997, and 2002, respectively. During his M. S. thesis work, he focused on several problems in theoretical condensed physics such as impurity effects in high-temperature superconductivity, localization in quantum Hall systems, persistent current in mesoscopic rings, and Bose-Einstein condensation in low-dimensional systems. He and his co-worker predicted the possibility of two-dimensional BEC in interacting, trapped Bose gases. Dr. Bayındır's Ph. D. thesis concentrated on the physics and applications of photonic band gap materials. His pioneering work on coupled-cavity structures in photonic crystals has drawn a considerable amount of interest in recent years (cited over 600 times in citation-index journals).

As a research scientist at the Massachusetts Institute of Technology, he worked on the design, fabrication, and characterization of various types of fibers, made of conducting, semiconducting and insulating materials in intimate contact and in a variety of geometries that will pave the way for the future development of fibers, and woven fabrics with novel optical and electrical properties.

Currently, he is assistant professor in Department of Physics, Bilkent University, Turkey. He is also the assistant director of National Nanotechnology Research Center project funded by State Planning Organization of Turkey. Together with Prof. Salim Çıracı, he has also started the Material Science and Nanotechnology Program within the Science Faculty of Bilkent University as a graduate program aiming to educate top notch Ph.D.'s for technologically hungry Turkish industry.

He is the author of a book (in Turkish), over 45 citation-index journal papers, and more than 35 refereed conference papers. He also holds 3 issued US patents. He serves as a reviewer for several scientific journals including Physical Review Letters, Optics Letters, Physical Review B, Physical Review E, Optics Express, Journal of Optical Society of America B, Physics Letters A, and IEEE Journals.

He won the young scientist prize of the Turkish Scientific and Technical Research Council (TUBITAK) in 2006 and The Young Scientists Award of Turkish Academy of Sciences (TUBA). He was the winner of the Optical Society of America's 2001 New Focus Award and 2005 MIT best poster award.

Towards a Micro-Economic Theory of Networked Auctions

Erol GELENBE

Department of Electrical and Electronic Engineering
Imperial College, London SW72BT, UK
e.gelenbe@imperial.ac.uk

The Internet has become a primary vehicle for trade among individuals and organisations, in addition to its well established role as a key tool in currency and commodity markets. The structure offered by information technology can therefore allow us to examine issues of interest to economists, such as price formation, using probabilistic methods that are commonly used in the theory of telecommunications and performance evaluation of computer systems and networks. Assuming that auctions are used as the rules for buying and selling, this lecture will present our recent mathematical results on measures of interest such as the sale price of goods, the income per unit time achieved by sellers, and the time spent by a buyer to purchase an item.

Erol is a Member of the Turkish Academy of Sciences (TUBA) the French National Academy of Engineering (Académie des Technologies), Foreign Member of the Hungarian Academy of Sciences, and Member of Academia Europaea. He is the Professor in the "Dennis Gabor Chair" at Imperial College. A highly cited (h=43) researcher, his work is currently funded by UK EPSRC, the UK Technology Strategy Board, and EU FP7. He consults for industry and serves as Editor-in-Chief of The Computer Journal (British Computer Society), and is on the editorial board of the Proceedings of the Royal Society. A graduate of METU, Ankara, he received the MS and PhD degrees from The Polytechnic Institute of New York University (Brooklyn Poly), and a Doctorat d'Etat ès Sciences degree from the Université Pierre et Marie Curie (Paris). A Fellow of IEEE, ACM and IEE, he won the ACM SIGMETRICS Award in the USA in 2008 for work on computer and network performance modelling and analysis. In 1996 he was the first computer scientist to receive the Grand Prix France Telecom of the French Academy of Sciences. He was awarded Brooklyn Poly's Distinguished Alumnus Award in 2010. He received the Italian honours of Commander of Merit (2005), and Grand Officer of the Order of the Star (2007), and the French honour of Officer of Merit (2001). He has received Honoris Causa doctorates from the Universities of Liege (Belgium), Roma II (Italy), and Bogazici (Istanbul). Erol has graduated numerous PhD's who are academics and leaders in France, the USA, Greece, Turkey, China, UK, Venezuela, etc.

References

E. Gelenbe "Analysis of single and networked auctions", ACM Trans. Internet Technology, 9(2), 2009.
E. Gelenbe "Steps toward self-aware networks", Communications ACM, 52(7):66-75, 2009.

A CRISIS CAN HIDE ANOTHER

This text is a selected part of « Une crise peut en cacher une autre » published by the French revue « Le Débat », n° 157, 2009 November-December, translated by SMM

The financial crisis monopolizes attention. It is explained by the behaviour of financiers, but this behaviour, how to explain it?

We develop the following thesis: Computerization has since 1975 transformed economy, but this transformation is neither understood nor clearly seen. The resulting unbalance creates a more deeper and global crisis than what appears on the occasion of the "financial" crisis.

* *

One can see in computerizing the cause of the financial crisis. Certainly not the proximate cause, because it is the behaviour of financiers, but the material cause that made this behaviour possible.

Once possible it was made inevitable by the conjunction of an illusion of security and competitive pressure. Indeed, computer science and network have unified the global market and established between banks such a solidarity that if one fell the other must fall so as climbers from the same rope.

But the probability of a systemic disaster seemed negligible: each knows that Earth cannot stop turning! The systematicity of risk being perceived as a safety factor when the risk was apparently deleted - and it looks that appearance drives behaviour.

The whole business of finance is the trade-off between return and risk. The risk (apparently) removed, one of the pillars of the trade collapsed, nothing could stop the race performance, even it was illusory. One who was cautious, was ejected from the market because his customers were leaving him for others, offering higher returns, seemed "smarter" and "more effective".

* *

But let us leave the company to consider the economic balance as a whole. It appears that computerization with automation it provides, has transformed its parameters.

For software, for integrated circuits, the cost of production comes down to cost of product design: the cost of a CD more, of a smart addition is negligible. It will be the same for all production computerized, automated: the quasi-totality of the production cost is spent during the initial phase of product design by including the organization of its production, and the scheduling of the engineering business process The digital economy is an "economy of design, or if one wants of" design "much more than an information or knowledge economy.

The marginal cost is negligible, this economy is experiencing increasing returns to scale (the average cost of a product decreases when the produced quantity increases). It can be shown ([24]) then that the market equilibrium is established under monopolistic competition, which was in the 30s is a curiosity in the theory (Robinson [16], Chamberlin [4]), and which became the regime's economy. It is not appropriate here to develop this model: say only that the corollary is the segmentation of customers (including segmentation tariff which allows the company to capture the consumer surplus) and product diversification.

When the marginal cost is negligible, the value of the product escapes from the quantity for joining quality: the satisfaction that comes from an iPod (like that which gives a book) results from quality design and not from number of copies that you hold. This affects the imagination of consumers and, ultimately the demand. The recent emergence of "environmental needs", of a "need for traceability of food products", signals a development that we can judge slow but that moving towards less quantity, and more quality.

When the company spends most of production costs during the product design, so before receiving the first response of the market, it must bases its decisions on an anticipation of customer demand and initiative of competitors. The risk is then pushed up and is even higher than the competition, pushing the quality up, increases the cost of the design. The digital economy is thus an economy that requires maximum risk among the entrepreneur, who must have the talents of a good poker player.

The result of design work is a work stored, a "dead labour" and therefore, in the strict sense of the term, of capital: the digital economy is ultra-capitalistic. But a capital, it is stolen, it is copied itself, it is looted weapons to hand: an economy is potentially even more violent if it is more capitalistic, and the temptation of violence is much stronger because competition became global is more intense and the risk higher: our ultra-capitalistic economy is potentially ultra-violent.

Certainly, the industrial economy had not been peaceful: monopolies have abused their position of power, competition has used violent methods. But it was based on peaceful principle, the exchange in which neither partner can force the other to enter into transaction. In addition ,the need for labour gave him a balance endogenous consumption is linked to income, itself dependent on the employment that was based on production.

In the economy of design, automated, these two balances are broken and the spring of violence stretches with the same power than in the feudal period (Bloch [2]). The most modern, and the most efficient economy, reconnecting with archaic attitudes.

If computerization provides effective tools for the entrepreneur, it also gives these tools to the predator. The lower cost of transportation permitted by the computerized management of containers has attracted a unified market that responds physically to the removal of geographical distance in the logical space: it is as if the world had reduced to a point in a space of dimension zero.

This facilitates the off shoring of jobs, call centres etc..., detrimental to the cohesion of the company and to the quality of its products. It also helps the mafia to "launder" profits of crime to take control of legitimate businesses (Saviano [17], p. 315).

Some conflicts with ethnic or religious pretexts hide and reveal at the same time, the eruptions of this potential for violence: could they take place if they do not allow predators to accumulate wealth as they can, through 'computers and networks, and recycle it in "normal" economy to find comfort and respectability (Verschave [22])?

* *

Future 3D Broadcast and Communications over the Internet

Murat TEKALP

Dean, Faculty of Engineering
Koc University
mtekalp@ku.edu.tr

With wider availability of low cost multi-view cameras, 3D displays, and broadband communication options, 3D media is destined to move from the movie theater to home and mobile platforms. The Internet has evolved into a flexible media transport platform. Flexible transport refers to transmission of media with different spatial and temporal resolutions, number of views, and at different bitrates to users with different display requirements including standard definition 2D, high definition 2D, stereo 3D, or multi-view 3D displays. This opens the way to introduce 3D broadcast and communications services to users with different bandwidth and display systems which are interoperable with standard 2D broadcast and videophone services and solutions. In the near term, popular 3D media will most likely be in the form of stereoscopic video with associated spatial audio. Recent trials indicate that consumers are willing to watch stereoscopic 3D media on their TVs, laptops, and mobile phones. In the intermediate term, free-view 3D video and 3DTV with multi-view capture are the next natural steps in the evolution of 3D media technology. Recent free-view 3D auto-stereoscopic displays can display multi-view video, ranging from 5 to 200 views. In this talk, first I will briefly review the state of the art in 3D video formats, coding methods, IP streaming protocols and streaming architectures. I will then take a look at 3D video transport options. There are two main platforms for 3D broadcasting: standard digital television (DTV) platforms and the IP platform. I will summarize the approach of the European FP7 project DIOMEDES which is developing novel methods for adaptive streaming of multi-view video over a combination of DVB and IP platforms. I will also summarize additional challenges associated with real-time interactive 3D video communications for applications such as 3D telepresence. Finally, open research challenges for the long term vision of haptic video and holographic 3D video will be discussed.

Website http://home.ku.edu.tr/~mtekalp/

On the Macroeconomic Effects of New Technologies

Mehmet YÖRÜKOĞLU

Central Bank of Turkey, Vice-President

Invention and adoption of new technologies have significant country specific and global macroeconomic effects.
These effects are usually observed in income inequality, productivity, price dynamics and inflation which in turn have significant impacts on fiscal and monetary policies.
In his talk, Dr. YÖRÜKOĞLU will focus on the influence of the recent new technologies on global macroeconomic developments.

WebSite: www.tcmb.gov.tr/yeni/banka/bsk/cvtur-myorukoglu.html

Global Optimization: State-of-the-Art and Selected Applications

Janos D. PİNTER

Professor, Faculty of Enginering, Özyeğin University, Turkey
www.ozyegin.edu.tr; janos.pinter@ozyegin.edu.tr
President, PCS Inc., Canada
www.pinterconsulting.com; janos.d.pinter@gmail.com

The objective of global optimization (GO) is to find the absolutely best solution of nonlinear optimization models that [could] have a number of locally optimal solutions. After a concise introduction to the key GO model types and solution strategies, a selection of GO applications is presented that include

* "Black box" systems optimization
* Experimental design
* Data classification
* Nonlinear model fitting (calibration, regression)

János Pintér is a researcher and practitioner with over three decades of experience. His professional interests are primarily related to nonlinear optimization and its applications, including algorithm and software development. He holds M.Sc. (Eötvös University of Sciences, Budapest), Ph.D. (Lomonosow University, Moscow), and D.Sc. (Hungarian Academy of Sciences) degrees in Mathematics, with specializations in Operations Research, Stochastic and Global Optimization.

Dr. Pintér wrote and edited several books, and authored nearly 200 articles, book chapters, and other technical materials. His monograph titled Global Optimization in Action received the 2000 INFORMS Computing Society Prize. He also received grants and awards from a number of countries including Australia, Canada, Hungary, Netherlands, and the United States. Among other professional affiliations, he serves (served) on the editorial board of the Journal of Global Optimization, Journal of Applied
Mathematics and Decision Sciences, Algorithmic Operations Research, and the International Journal of Modeling, Identification and Control (from 2005 to 2009). Dr. Pintér is past or present member/officer of the Canadian and Hungarian Operations Research Societies, INFORMS, the Mathematical Programming Society, and SIAM. Among numerous other professional activities, he served as a member of the Operations Research Committee of the Hungarian Academy of Sciences (1984-1994); between 2002 and 2004 he served as Global Optimization ViceAChair of the INFORMS Optimization Society. In 2010, he has been elected to the Managing Board of EUROPT, the Continuous Optimization Working Group of EURO (the latter is the Association of European Operational Research Societies).

Dr. Pintér has worked and presented lectures in some 40 countries of the Americas, Europe, the Middle East, and the Pacific Region. He is also the principal developer of several professional nonlinear optimization software products for compiler platforms, optimization modeling languages, and integrated scientific-technical computing systems.

For further details, please visit http://www.pinterconsulting.com.

Science, Technology, Innovation and Economic Paradigms

John DRYDEN
Consultant in Science and Technology
dryden01@hotmail.com

The current global financial and economic crisis has left the world economy confronting some very delicate challenges. To name but a few; budgetary deficits and fiscal consolidation in times of weak growth, spending cuts while unemployment is already at historically high levels, striving to reactivate industry while seeking to cut down emissions of CO2, promoting world trade and investment flows while trying to keep jobs at home. At the same time, scientific and technological achievement have continued to advance rapidly, notably in general purpose technologies (ICTs, bio- and nano-technologies), relatively unchecked despite weakening of the investment climate, cutbacks in public sector expenditure and some fiscal tightening.
Innovation, in its broadest sense, is an efficient way to develop new sources of growth. So we need to foster innovation and its corollary, promotion of scientific and technological advance. The interplay of innovation and economic recovery and sustainable growth implies paradigm change as well as implications for measurement and applied econometric analysis.
This presentation draws heavily upon the OECD Innovation Strategy[1], an intergovernmental initiative to develop a broad based policy framework to foster new sources of economic growth and social benefit through innovation, released early in 2010. The presentation highlights the rationale and thinking behind the policy framework and sets out its main lines, highlighting those domains that draw on advances in science and technology, imply significant paradigm change or have implications for applied econometrics, models or data.

John Dryden is an independent consultant in the domains of economics, statistics, public policy and international relations, particularly in the areas of science, technology and innovation.
Between 1980 and 2008 he was a senior official of the Organisation for Economic Co-operation and Development, in Paris, notably as Deputy Director for Science, Technology and Industry. His responsibilities covered economics, statistics, public policy analysis and co-operation in the areas of S&T, knowledge-based economy, information and communications technologies including telecommunications, electronic commerce and the Internet as well as other new technologies, notably bio- and nanotechnology, in addition to issues related to industry, innovation and entrepreneurship and the impacts of technology, globalisation and structural change on the economy and society. Before that he held several other positions in the Directorate for Science, Technology and Industry and the Economics and Statistics Department of the OECD. Between 1968 and 1980 he worked in the Cabinet Office of the U.K. government. He is British and was educated at Oxford University and the University of Wales.

[1] Ministerial report on the OECD Innovation Strategy: "Innovation to strengthen growth and address global and social challenges -- Key Findings", OECD, 2010.

Genetically Tailored and Molecularly Controlled Functional Materials and Systems for Technology and Medicine

Mehmet SARIKAYA

GEMSEC: Genetically Engineered Materials Science and Engineering Center, an NSF-MRSEC
University of Washington, Seattle, WA 98195, USA
sarikaya@u.washington.edu
www.GEMSEC.washington.edu

Harnessing the recent advances in genetics, nanotechnology and computational and information sciences, and integrating the tools of modern molecular biology with the state-of-the-art chemical synthesis, next generation science will have to be carried out at the confluence of diverse and multidisciplinary fields, and, most possibly, in cyberspace. In biological systems, the organic and inorganic materials, with genetically designed functions, self-assemble hierarchically from the molecular scale and up providing the incredible viability of single and multicellular organisms. Developments in physical sciences, on the other hand, are based on the singular and collective phenomena that can be predicted at the nano-meter scale. Added to these are vast amounts of information that have been gathering over many decades in diverse fields as biology, engineering, and environment. In the coming decades the fundamental principles of hybrid material will be interrogated in the formation of self-assembled systems that exhibit unique properties that cannot be achieved through traditional biological and chemical routes alone. Taken together, the developments in physical and biology, health, and engineering and the enormous power of computation and information technologies are leading the implementation of science in societal needs in extraordinary "made-to-order" pathways. Here we will discuss potential strategies and possible hybrid procedures, with examples, how molecularly designed and genetically controlled materials could be developed for nanotechnology, regenerative medicine, and molecular energy systems.
Supported mainly by NSf-MRSEC.

WebSite: http://depts.washington.edu/bionano2/MehmetShortCV.pdf

Digital convergence, and the information industries

Patrick-Yves BADILLO and Jean Baptiste LESOURD

Ecole de Journalisme et de Communication de Marseille (EJCM),
Institut de Recherche sur l'Information et la Communication (IRSIC),
Université de la Méditerranée, Aix-Marseille, France.
badillo@ejcm.univmed.fr and Jean-Baptiste.Lesourd@ejcm.univmed.fr

Our work aims at analyzing the dynamics of the long-term evolution of the information-related industry and its technological determinants, as related to the *global* evolution of these industries.

The occurrence of digitizing allows for a very general definition of information. In this general sense, information can be defined, with Varian and Shapiro (1999, p. 3), as: "*Anything that can be digitized – encoded as a stream of bits – is information*". Digital convergence, together with advances in the computer and telecom technologies, means that information can be very easily transferred, and exchanged, between industries that were previously distinct industries. In today's global world, due to *digital convergence*, the telecommunication, computer and software companies, publishers, movie studios and television networks, among other industries, all use the same information and communication technologies. Various media industries and neighboring industries tend to merge towards multi-activity groups.

Does all this evolution lead to a global information society, as described by a number of authors? This is perhaps a rather optimistic view. In particular, because of the so-called "digital divide", whereby many segments of the population of less advanced countries are deprived of access to computers, internet and digital technologies, the phenomenon in question is limited to the advanced industrial and emerging economies.

Bibliography

Badillo, P.Y., and Lesourd, J.B. The Media Industries and their Markets: Quantitative analyses. London: Palgrave-MacMillan, 2010.

Shapiro, C., and Varian, H. R. *Information Rules: A Strategic Guide for the Network Economy*. Cambridge, MA : Harvard Business School Press, 1999.

Theme of the Conference

A Transdisciplinary Approach in Science and New Economic Paradigms

Orhan GÜVENEN

Applied Econometrics Association President
and Bilkent University, Institute of World Systems, Economics and Strategic Research (DSEE)
gorhan@bilkent.edu.tr
www.dsee.bilkent.edu.tr

Theories, applications on econometrics, nanotechnology, informatics and there linkages to science, culture, ecology as well as measurement impacts to the society are the main topics of this Conference. In particular the following critical questions will be addressed: What can the contributions of transdisciplinarity, nanotechnology, informatics and new economic paradigms be to society, economics, scientific analysis and to their applications in 2010 and in the coming decades? What needs to be corrected? What are the initial signals, the driving structures of the decision systems concerning the society in this context?

In 21st century, it became a necessary condition to transform power driven systems to science, culture and endogenize ecology, ethics which aims human optimal welfare decision systems at the world level.