

# Humboldt – Kolleg Digest

Limits and Interfaces in Science



São Paulo November 28-30, 2009

Humboldt-Kolleg Digest  
*Limits and Interfaces in Science*

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O conhecimento e a prática nesta área estão em constante mudança. Devem ser sempre adotadas medidas de segurança padronizadas e, à medida que novas pesquisas e experiências clínicas expandem nossos conhecimentos, pode haver necessidade de mudanças ou de adequação no protocolo terapêutico e no uso de medicamentos. Aconselha-se aos leitores pesquisar as mais recentes informações fornecidas pelo fabricante da droga a ser utilizada, a fim de verificar a dose recomendada, o método e a duração do tratamento e as contraindicações. É responsabilidade do médico, com base em sua experiência e no conhecimento do paciente, determinar a posologia e o melhor tratamento para cada paciente, individualmente. O editor e o autor não assumem qualquer responsabilidade em relação a qualquer dano e/ou prejuízo às pessoas, decorrente desta publicação.

*A Editora*

Humboldt-Kolleg Digest  
*Limits and Interfaces in Science*

**São Paulo – November, 28-30 2009**

To

A very special Humboldtian memory

Irany Novah Moraes

my father

ROCA

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# Presentation

*Culture – not space – is the biggest distance between peoples.*

Jamake Highwater

This publication resulted from the investments of Alexander von Humboldt Foundation in the Brazilian researchers.

The Humboldt Foundation sponsors people, not projects or institutions. This fact demonstrates respect to the human being. The freedom and independence of the researcher are valued in the free choice of the place and the study to be made. This includes choosing their host institutions themselves. This way, a worldwide network of excellence has been growing over the last five decades, comprising people who have a special relationship to the Humboldt Foundation, to Germany and to each other.

The Humboldt Kolleg is an international scientific event that takes place in many countries sponsored by the Alexander von Humboldt Foundation. It intends to congregate the Humboldtians, potential candidates to scholarships, and scientists from different parts of the host country and some researchers from Germany. The beneficiary countries of its research programs usually create a club to help keeping the Humboldtians in contact with the Foundation and spreading their opportunities.

The Brazilian Humboldt Club organized this event with the theme “Limits and Interfaces in Science” that was carefully chosen to arouse interest from the different scientific research areas.

As a physician, I propose comparing science to the Human Body. In medicine the illnesses manifest in different organs or segments of the body. Therefore many specialties and sub-specialties exist to deeply study each problem. Likewise, many scientific research fields are required to the researches. However, a localized symptom must be linked to the whole body, so that the physician doesn't forget to treat the full patient and not only an organ. Different systems are interconnected and dependent on each other, so that every system has its own importance to a global health. The same occurs in Science. When a research comes to an end, it is remarkable how much the results are linked with others fields. Science must also be seen through an integral perspective so that the researches are fully applied.

Any scientific development always modifies the course of others research fields, although researches are not always fully aware of that. Again using the medicine as an example, this relationship is clearly observable through the revolution caused by the early diagnosis of many diseases. Sophisticated and more

specific exams determine longevity with quality of life. As a consequence, the number of elderly people is increasing, as well as their healthy and useful life. Since people are getting older, diseases are becoming more usual and health in general is becoming more expensive, what affects social and economic issues. There is no reason to decrease or stop social and professional activities based on previous established ages, but some new laws have to be incorporated or adapted to the new needs of our contemporary society.

The world is advancing really fast. What we see as truth today may not be the same tomorrow or in a different place. That's why scientific interrelation is crucial and constant communication is the most important way to keep updated.

This work reflects our effort to contribute to communication in the scientific world.

Marisa Campos Moraes Amato

# Preface

## *Presentation of concepts at the meeting of the Brazilian Humboldt-Club.*

Diversity and even disagreement are implicit to the fruitful interchange of ideas and experiences in this scientific world of ours. The present Humboldt-Club conference brings together scientists engaged in the most heterogeneous researches and looks for effective communication, demanding strong personal engagement in order to promote an active interchange of ideas and a correct evaluation of results. The breadth of the subject, including conclusions of some of the most fascinating researches in various sciences will hopefully serve the purpose of enhancing the exchange of effective communication among exponents and listeners, thus advancing the existing contacts of the “Humboldt family” in Brazil, a purpose which is paramount to the realization of this gathering.

Erwin Theodor Rosenthal



# Contents

## *Part One:*

### *Humboldtians Lectures*

**Coordinator:** *Alexandre Campos Moraes Amato*

1. OPPORTUNITIES OFFERED BY ALEXANDER VON HUMBOLDT FOUNDATION
2. NANO-CHARACTERIZATION APPLIED TO TRIBOSURFACES: WHAT HAPPENS WHEN YOU HIT THE BRAKES
3. RHETORIK ALS METHODIK DER JURISPRUDENZ
4. WHAT ARTIFICIAL INTELLIGENCE HAS TO DO WITH TRAFFIC
5. TOPICAL HYPOTHERMIA PLUS ISCHEMIC PRECONDITIONING: LIVER INJURIES, HEPATIC FUNCTION AND OXIDANT DEFENSES AT INITIAL REPERFUSION IN RATS
6. A GERMAN VIEW OF BRAZIL IN THE EARLY NINETEENTH CENTURY
7. LAMININ AND STEM CELL THERAPY TO TREAT SPINAL CORD INJURY

## Social Rights:

8. SOCIAL RIGHTS: PROTECTION AT THE GLOBAL AND REGIONAL HUMAN RIGHTS SYSTEMS
9. DISORDER INDUCED DELOCALIZATION-LOCALIZATION TRANSITION OF PLASMONS
10. APPLICATION OF DIFFERENT MATERIALS IN BONE IMPLANTOLOGY
11. THE GLORIOUS HISTORY OF GEOMETRY
12. GENE DOPING: A TECHNOLOGY OF THE FUTURE?
13. CO-OPERATION IN SCIENCE AND TECHNOLOGY (S&T) BETWEEN BRAZIL AND GERMANY IN THE PAST 40 YEARS
14. THE CHALLENGE OF TRANSDISCIPLINARITY IN INFORMATION SYSTEMS RESEARCH: TOWARDS A SOCIOTECHNICAL APPROACH TO INFORMATION SYSTEMS
15. VIRTUAL SCREENING SEARCH FOR INHIBITORS OF CRUZAIN, A CYSTEINE PROTEASE OF *TRYPANOSOMA CRUZI*
16. BIOETHICS AND THE RIGHT TO LIVE
17. MATERIELLE GRENZEN DES STRAFRECHTS IN DER GEGENWART
18. MATERIALS SCIENCE

19. MULTIDISCIPLINARITY, INTERDISCIPLINARITY AND TRANSDISCIPLINARITY: A BRIEF REPORT ON LESSONS AND PERSPECTIVES LEARNED FROM CYBERNETICS AND CONTROL
20. A SENSORY SYSTEM AS AN EFFICIENT ANALOG TO DIGITAL CONVERTER
21. CONTROLLING THE INTERACTION BETWEEN LIGHT AND MATTER CONFINED IN NANOSCALE
22. LEBENSWELT AND REFLEXIVE DEMOCRACY IN HABERMAS AND HONNETH
23. MODELING THE EARTH SURFACE EVOLUTION USING PHYSICAL PARAMETERS REGISTERED ON ROCKS: TOLL FOR THE PROSPECTING OF DIFFERENT ORE TYPES
24. CAN HISTORY OF SCIENCE TEACH US HOW TO MAKE SCIENCE?
25. INCLUSION OF THE ENVIRONMENTAL DIMENSION IN THE EDUCATION OF CHEMISTRY PROFESSIONALS
26. THE BOUNDARIES OF TRANSDISCIPLINARITY
27. THEATRUM MUNDI ALS PARADIGM DES WISSENS IN CICEROS WERK
28. LOW ENVIRONMENTAL IMPACT PLASTICS
29. ANIMAL ETHICS – THE PHILOSOPHERS AND THE ANIMALS
30. COMPUTER ASSISTED SURGERY: THE FUTURE IS NOW
31. THE WHIRL NETWORK: ON-LINE RESOURCE ON BIOLOGY, HEALTH AND ENVIRONMENT INFORMATION FOR BRAZILIAN NORTHEAST UNIVERSITIES
32. DOCUMENTAL RESEARCH IN LITERATURE: LEGITIMATION AND VALIDATION IN THE SOCIAL AND ACADEMIC *DISKURS*
33. LATTICE QCD: SIMULATING QUARKS ON A COMPUTER
34. NANOSTRUCTURING FILMS AND INTERFACES FOR NANO- PHOTONICS AND ELECTRONICS

*Part Two:*

## *Not-Humboldtians Lectures*

## *Guests Research Lectures*

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Fernando Campos Moraes Amato

1. PEDIATRIC NEUROSURGERY: IN PURSUIT OF EXCELLENCE.
2. ABDOMINOPLASTY IN PERSPECTIVE
3. ECO-EVO-DEVO – DO WE NEED A NEW “MODERN SYNTHESIS” IN EVOLUTIONARY BIOLOGY?
4. BASILAR TIP ANEURYSMS: IS THE SURGICAL CLIPPING THE IDEAL MANAGEMENT? PERSONAL SERIES AND CRITICAL REVIEW OF THE LITERATURE
5. NORMAL LIMITS OF THE ECG
6. HORMONE REPLACEMENT THERAPY: DOES AGING LIMIT THERAPEUTIC BENEFITS?
7. ADVANCES AND PERSPECTIVES IN VASCULAR SURGERY AND ENDOVASCULAR THERAPY
8. THE GERMAN HOUSE OF SCIENCE AND INNOVATION SÃO PAULO
9. EVOLUTION OF VASCULAR SUBSTITUTES
10. PLASTIC SURGERY IN THE NEW WORLD
11. HISTORICAL NOVEL OF FANTASTIC REALISM
12. THE ENDOVASCULAR THERAPY IMPACT IN CORONARY DISEASE
13. INTEGRATING OPEN INNOVATION TO THE PRODUCT DEVELOPMENT PROCESS
14. SURVEY ABOUT SERVICE QUALITY MEASUREMENT IN SERVICE INCUBATORS SITED IN SAN PAULO STATE
15. VACUUM BAGGING AS A RAPID WAY TO OBTAIN PROTOTYPE PARTS TO APPLY IN STATIC TESTS OF RACKS FOR STORAGE AND TRANSPORTATION OF AUTOMOBILE PARTS
16. THE LIMITS OF BEAUTY
17. ETHICAL LIMITS IN THE ASSISTED HUMAN REPRODUCTION
18. BRAZIL AND RENAISSANCE: INTERFACES
19. NEWS IN MECHANICAL ENGINEERING
20. BRAIN MACHINE INTERFACE
21. FASTING AND PHYSICAL ACTIVITY ASSOCIATION: IMPLICATIONS ON THE SUBSTRATES OXIDATION
22. CYSTIC FIBROSIS IN BRAZIL
23. YOGA AND PHYSICAL EDUCATION
24. HOW DOES BRAZIL FACE THE GLOBAL CRISIS: SHORT-TERM AND MEDIUM-TERM CHALLENGES

25. HAMBURG AND THE INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA
26. IMPLANTABLE ELECTRONIC CARDIAC DEVICES FOR PREVENTION OF SUDDEN CARDIAC DEATH AND TREATMENT OF CARDIAC ARRHYTHMIAS. WHAT ARE THE LIMITS TO USE IT?
27. NEURONAVIGATION: PUSHING THE LIMITS OF NEUROSURGERY
28. EFFICIENT LIMIT OF THE ALIMENTARY SUPPLEMENTS
29. MOMA CEREBRAL PROTECTION SYSTEM
30. REVIEW OF THE ROLE OF NEUROTROPHINS IN BIPOLAR DISORDER
31. THE TREATMENT OF INTRACRANIAL MENINGIOMAS
32. LINGUISTIC CONTRIBUTIONS TOWARDS THE SELECTION OF RELEVANT INFORMATION IN CLINICAL INTERVIEWS
33. PERSPECTIVES IN INTERVENTIONAL RADIOLOGY
34. HUMAN GENE THERAPY AND THE FUTURE OF MODERN MEDICINE
35. A YOUNG SCIENCE ON THE WAY TO MATURITY: PSYCHOLOGY
36. MULTIMODALITY MEDICAL IMAGES POST-PROCESSING: ROLE OF OPEN-SOURCE SOFTWARES
37. GERMAN AT THE UNIVERSITY OF THE THIRD AGE: AN EXTENSION PROJECT
38. KNOWLEDGE CAN CHANGE PEOPLE
39. NEW PERSPECTIVES IN CANCER THERAPY
40. THE LIMIT OF LIFE: AN OVER VIEW OF A VASCULAR SURGEON
41. THE APPLICATION OF GAMES IN THE REASONING DEVELOPMENT

# Introduction

*Many people that deal with research agree that Medicine is an art.*

But Medicine is based in experience and scientific and technological knowledge and expertise, and so Medicine needs the help of exact sciences and technology in order to obtain data to be aggregated with its art.

Nowadays there has been a greater effort to establish a link with different areas of engineering, physics, chemistry and so on. There are graduates in a programmed content designed to develop professionals equipped with the knowledge and skills to understand the challenges to human health through an interdisciplinary engineering and medical approach to the development and delivery of novel therapies.

To transcend our physical limits, that place us in danger of swallowing pseudoscience is the human desire, because true science restricts us to that which is measurable (Carl Sagan). He argues that science's openness to new data and its willingness to be wrong separate it from the dogmatism of the anti-scientists.

In many places when we visit a bookstore, be it a scientific one, in the section of medicine and health we will encounter mostly books on alternative medicine, mind and body healing, natural remedies and nutrition guides that lean heavily toward anti-oxidants what is the dietary supplement "du jour". There will be a lack of even remotely scientific books.

In his book titled *Impossibility – The limits of science and the science of limits*, John D. Barrow mentions Kurt Gödel – *The meaning of the world is the separation of wish and fact.*

Science interfaces between policy and society with the Government participation are faded to be complicated, corrupted and will come to no pure scientific end.

Science also varies in its practice, according to the community one is considering. In one side there is mathematics, clean, tidy and a law unto itself and its results are immune to any culture and unaffected by human foibles and prejudice. In the other side there is the rest of science, hypothetical in various degrees, uncertain and open to interpretation and thus influenced by human psychology, sociology, politics and other corruptions. Of course all the sciences aspire to the condition of mathematics as observed by Santayana, but they rarely make it.

As a professional in the health area I am mostly informed in the field of Biology. For instance, to cope with the idea of science interfaces, the Burroughs Wellcome Fund (BWF) provides grants for biological research. The BWF is observing that biological sciences are changing. Advances in genomics, quantita-

tive structural biology, modeling of complex systems, and nanotechnology have opened new realms of research for investigators with backgrounds in physics, mathematics, computer science, and engineering who want to explore the new frontier of biology. The Alexander von Humboldt Foundation also provides this opportunity to all of researches interested, as was the case of our research group.

It is thus very important to establish linkages among all the studies and researches, and the realization of this Congress is a tiny element to be added to the structural building of these linkages.

Bruno König Júnior

# Fundamental Considerations

## *Opportunities offered by Alexander von Humboldt Foundation*

The Alexander von Humboldt (AvH) foundation promotes academic cooperation between excellent scientists and scholars from abroad and from Germany. As an intermediary organization for German foreign cultural and educational policy the AvH promote international cultural dialogue and academic exchange. The AvH is funded by the Federal Foreign Office, the Federal Ministry of Education and Research, the Federal Ministry for Economic Cooperation and Development as well as other national and international partners.

The AvH research fellowships and research awards allow to the researcher to come to Germany to work on a research project that have been chosen together with a host and collaborative partner. There are no quotas, neither for individual countries, nor for particular academic disciplines. The AvH support people, not projects.

The programmes for postdoctoral researchers that have completed their doctorate less than four years ago a **Humboldt Research Fellowship**: Sponsorship for a research stay at a research institution in Germany lasting from 6 to 24 months.

**Georg Forster Research Fellowship**: For scientists and scholars from developing countries to carry out a research project of relevance to development policy which, being undertaken in Germany, is particularly targeted to transferring knowledge and technologies to developing countries (duration: 6 to 24 months).

Outstanding academics that completed their doctorates less than twelve years ago and whose work demonstrates an independent academic profile can apply for these programmes, with the difference that the research stay period is from 6 to 18 months. The fellowship is flexible and can be divided up into a maximum of three blocks within three years. Analogous to the Humboldt Research Fellowship, the AvH has the **Feodor Lynen Research Fellowship** program that gives a sponsorship for a German researcher to stay abroad from Germany.

For internationally renowned academics the AvH gives the **Friedrich Wilhelm Bessel Research Award** and the **Humboldt Research Award**. The award winners are invited to spend a period of up to one year carrying out research projects of their own choice in cooperation with colleagues in Germany. Nominations are made by academics in Germany. It is not possible to apply directly.

The Alumni programmes include: further research stays in Germany, participation in international conferences in Germany, subsidies for books and equipment and Humboldt Kollegs.

The AvH offer others specific programmes that can be seen on the site [www.humboldt-foundation.de](http://www.humboldt-foundation.de).

#### REFERENCE

Alexander von Humboldt Foundation – Profile and Services, 2007.  
Paulo Carlos Kaminski

re:

# Part One:

## Humboldtians Lectures

Coordinator: Alexandre Campos Moraes Amato



# 1. Opportunities Offered By Alexander Von Humboldt Foundation

Paulo Carlos Kaminski

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## 2. Nano-Characterization Applied to Tribosurfaces: What Happens When You Hit The Brakes

Ruth Hinrichs, Marcos A.Z. Vasconcellos, Werner Oesterle, Claudia Prietzel

The methodology of nano-characterization has shed light on several aspects of everyday life that were taken for granted until recently. For instance the fact that your car stops whenever you hit the brakes has probably not bothered you for more than a few seconds, each time you perform this trivial task. On the other hand, one has to acknowledge that industry is making significant efforts to make better brakes, accompanying the development of more potent cars and higher demands of vehicle safety and avoiding the dreaded disc fading.

For several years researchers have been trying to characterize the friction layer, also denominated “third body” that is formed dynamically between the surfaces of disc and pad on braking. This layer controls the friction coefficient and determines brake efficiency. To develop better brakes it is of paramount importance to identify the constituent phases of this layer and to find their influence on macroscopic wear, friction coefficient, brake squeal, and fading. Many questions related to their origin and composition, their structure, thickness and spacial distribution are still open. The answers to these questions will help to elucidate the correlation between friction layer composition and macroscopic performance and can then be used to develop new brake pad formulations.

The most common brakes utilized in automotive braking are polymer matrix composite (PMC) pads that are rubbed against a cast iron disc. These PMC pads are composed of a complex mixture of organic fibers, metal fibers, rubber, solid lubricants, abrasives and mineral fillers bound together with a phenolic resin. During the temperature rise of the braking process organic components from the PMC pad are partially volatilized, reactions taking place between pad and disc. The residues, mixed with inorganic wear debris, adhere to the surfaces forming the third body. The presence of innumerable organic and inorganic reactants in a reactive atmosphere at high temperature provides the environment for multiple phase formation that requires several analytical techniques for a comprehensive characterization.

In this presentation results obtained with Energy Filtered Transmission Electron Microscopy (EFTEM) are shown, on samples that were tested in a dynamometer using an industrial AK-Master protocol. developed to test general

performance of friction materials. The samples were generated interrupting the test in three different situations: one after a partial test, where only maximum temperatures of 320°C had been reached, another after a complete run with maximum temperature of 650°C, the third one immediately after a fading cycle (650°C). Cross-sectional TEM specimens were prepared at the disc surface with a Focused Ion Beam (FIB) instrument, Selected regions of interest were prepared directly for EFTEM, where magnifications of five hundred thousand times and high resolution can easily be achieved, allowing to distinguish atomic structures in the material.

Chemical analysis on the nanometer scale with the aid of the energy filter in the TEM gave evidence of complex reactions that involve all components of the tribological system. Non-directional nano-machining of the cast iron disc with graphene layers was observed, giving rise to the formation of nanometer sized iron particles, that eventually oxidize to magnetite, a phase that is not present neither in the pad formulation nor in the disc. The graphite constituent from pad and disc is transformed to an amorphous or nanocrystalline structure during the friction test.

During fading an additional iron oxide was formed, with higher oxidation number. The presence of this additional hematite phase was confirmed with x-ray diffraction, micro Raman spectroscopy and Mössbauer spectroscopy, as was the presence of iron sulfides. The increase in the amount of these phases might be responsible for the brake failure (drop of friction force) after heavy duty usage that caused temperatures high enough to enable their formation.

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# 3. Rhetorik als Methodik der Jurisprudenz

João Maurício Adeodato

According to ontological philosophies, language is a mere instrument to the discovery of truth. In what ethics is concerned, truth equals correctness, justice. It is argued here that this is a highly functional illusion and that the precarious agreements of language not only constitute the maximum possible guarantees, they are the only ones. The thesis here confronts both metonymical reductions: it is against the adversaries of Rhetoric, which reduce it to its strategic and ornamental aspects, and against the rhetoricians themselves, who defend a still narrower conception and reduce Rhetoric to consent and persuasion, that constitute only a part of it, no matter how important.

Depending on the amplitude of the concept of philosophy, rhetoric can be placed inside or outside it. If philosophy is the quest for truth, rhetoric prescind of that concept and thus is not inside philosophy, as are not also skepticism, agnosticism, voluntarism, nominalism, positivism, pragmatism. But if philosophy does not have truth as a prerequisite of research, the rhetorical attitude opposes the ontological and both constitute a basic dichotomy in Western philosophical thought. This text considers rhetoric a kind of philosophy that takes language to be the common point of these “realities in which we live” (Blumenberg) and, as such, the single environment for this very peculiar knowledge that humans may have of the world (rhetorical knowledge).

All philosophical conceptions departing of a “poor” anthropology are rhetorical, while all those that are based on a “rich” anthropology are ontological. Following Arnold Gehlen, Hans Blumenberg summarizes into two opposing trends the anthropological bases of an evolution in the conceptions of knowledge which can be detected in Western tradition, a division that would here correspond to the dichotomy essentialism vs. rhetoric or to the dichotomy truth versus conjecture. A paradigm change in post-modern times would be ceasing to see humans as a triumphant species that dominates nature, builds its own world and represents the “crown of creation” – as proposed by the *Geschichtsphilosophien* and by evolutionary biologists -, to understand it as a delayed, metaphorical being, intermediated in its relationship with the environment, dominated by the need for compensation by virtue of its withdrawal from surrounding nature. In

Gehlen's terminology, humans are seen by philosophical anthropology as rich or plain (reiches Wesen) or as poor or needy beings (armes Wesen), according to its relations with the surrounding environment.

Jurisprudence can profit from rhetorical conceptions of law, because a healthy pirronical skepticism about ultimate truths could propitiate the tolerance that positive law is entitled to give.

## 4. What Artificial Intelligence has to do With Traffic

Ana Lúcia Cetertich Bazzan

Transportation systems are complex systems that have a huge impact in the economy of the nations. The second half of the last century has seen the beginning of the phenomenon of traffic congestion. This arose due to the fact that the demand for mobility in our society has increased constantly.

Traffic congestion is a phenomenon caused by too many vehicles trying to use the same infrastructure at the same time. The consequences are well-known: delays, air pollution, decrease in speed, driver unsatisfaction which may lead to risk manouvers thus reducing safety for pedestrians as well as for other drivers.

The increase in transportation demand can be met by providing additional capacity. However, this is no longer be economically or socially attainable or feasible. Thus, the emphasis has shifted to improving the existing infrastructure without increasing the overall nominal capacity, by means of an optimal utilization of the available capacity.

Among the measures that can be taken, perhaps the most important is to improve the management of the transportation and traffic systems by use of recent developments in the areas of communication and information technology. Here, Artificial Intelligence can provide a key contribution, especially if we consider the Brazilian scenario within the next years when the country hosts two important events (World Soccer Cup and Olympic Games).

Recent developments such as intelligent traffic information system can provide the user of the transportation system with a variety of informations regarding alternative routes, detours, load of the network, and even expected travel time. However information per se does not guarantee efficiency. It is necessary that a change in paradigm occur in order to fully profit from technological advances that we experience nowadays.

Target technologies for this change in paradigm are: vehicle automation (e.g. cruise control), road automation (e.g. smart highways), embedded components (e.g. GPS and mobile devices), car2car communication, control devices based on images and cameras, information totems, tracking for public transportation systems, podcars, etc.

Techniques from Artificial Intelligence in general and Multiagent Systems in particular fit these concepts very well given the need to reproduce human behavior in pedestrian and vehicular simulation, facilitate the distributed opti-

mization and control, regulate road pricing mechanisms, as well as manage the integration of diverse kinds of systems at various levels of decision-making.

Four paradigmatic examples are i) the autonomous guided vehicles (see <http://www.darpa.mil/grandchallenge/index.asp> and the recently launched Ultra PRT at Heathrow Airport – <http://www.atsltd.co.uk/>); ii) distributed control of traffic lights; iii) information for route choice; and iv) microscopic simulation of pedestrian and crowds.

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# 5. Topical Hypothermia Plus Ischemic Preconditioning: Liver Injuries, Hepatic Function and Oxidant Defenses at Initial Reperfusion in Rats

Tomaz de Jesus Maria Grezzana Filho, Tais Burmann de Mendonça, Norma Anair Possa Marroni, Graziella Rodrigues, Cleber Dario Pinto Kruehl, Carlos Otavio Corso

**Introduction:** The induction of Topical Hypothermia and the use of Ischemic Preconditioning (IPC) in hepatic resections can be useful to attenuate ischemia/reperfusion injuries. Both strategies share a reduction in oxidative stress and preservation of the energy metabolism as possible mechanisms of protection. However, until the present moment, the combination of both techniques was not evaluated. **Objectives:** Development of an experimental model to assess the initial ischemia/reperfusion injuries, liver function and the possible synergistic effects when mild topical hypothermia and IPC are applied concomitantly. **Methods:** Partial (70%) ischemia during ninety minutes followed by 120 minutes of reperfusion was applied to rat livers. Animals were divided into five groups: Control (C), Normothermic Ischemia (NI), Ischemic Preconditioning (IPC), Hypothermia 26°C (H) and Hypothermia 26°C plus IPC (H + IPC). Mean arterial pressure (MAP), body temperature and bile flow were assessed every 15 minutes whereas ALT, AST, TBARS, SOD, CAT and histopathologic injuries were evaluated at the end of reperfusion. **Results:** No differences were seen in MAP and body temperature throughout the experiment. Bile flow returned to values similar to C group in the H and H + IPC groups after 45 minutes of reperfusion and was significantly higher in the H and H + IPC groups after 105 minutes ( $P < 0.05$  and  $P < 0.05$ ) and 120 minutes ( $P < 0.05$  and  $P < 0.05$ ) of reperfusion in comparison to the NI and IPC groups. Plasmatic levels of AST and ALT were significantly higher in the NI ( $P < 0.05$  and  $P < 0.05$ ) and IPC ( $P < 0.05$  and  $P < 0.05$ ) groups in comparison to the C group. TBARS levels were significantly higher in the NI ( $P < 0.01$ ), IPC, and H ( $P < 0.05$  and  $P < 0.05$ ) groups in comparison to the H + IPC group and higher in the NI group in comparison to the C group ( $P < 0.05$ ). In the H group there was a negative correlation between ALT and AST to bile flow ( $P < 0.05$ ) and positive correlation between AST and ALT to TBARS ( $P < 0.05$  and  $P < 0.05$ ). CAT levels were significantly higher in the PCI group in comparison to the C

( $P < 0.01$ ), NI and H + IPC ( $P < 0.05$  and  $P < 0.05$ ) groups whereas SOD levels were significantly higher in the H group in comparison to the C ( $P = 0.01$ ), NI, PCI and H + IPC ( $P < 0.05$ , respectively) groups. Histopathologic injuries were mild and the NI group showed a significantly greater score in comparison to the C group ( $P < 0.05$ ). **Conclusions:** The induction of topical liver hypothermia at 26°C associated to IPC promoted a synergistic protective effect on hepatic lipid peroxidation. In addition, the induction of isolated topical hypothermia or hypothermia associated to IPC attenuated liver injuries and allowed an early recovery of the liver function after reperfusion, a mechanism related to an effect of hypothermia on oxidant stress and ATP preservation.

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## 6. A German View of Brazil in the Early Nineteenth Century

Erwin Theodor Rosenthal

The purpose of the contribution is a brief presentation of the hitherto unpublished *Diaries*, written by Carl Friedrich Philipp von Martius (1794-1868), an outstanding scientist in his area of investigation (botany) during the nineteenth century, who at the same time was equally successful as anthropologist, musician, historian and linguist. Little attention, however, has been granted to him as a writer, though his and the zoologist's J.B. von Spix *Travels through Brazil*, published in three (and sometimes four) volumes have often been praised, printed in innumerable editions. Both German scientists visited large parts of the country between 1817 and 1820, but only in the year 1992 his *Frey Apollonio*, a novel placed in Brazil, was destined for publication, thanks to an allowance granted to the publishing house (Reimer-Verlag, Berlin) by the Alexander von Humboldt Foundation, whereas on the other hand the nine volumes of *Diaries* (containing about 1.200 pages) remain unpublished, though they might well deserve an even greater attention as the travel-books, because they amount to a precious source of information about Brazil, the country and Martius' research there, manifesting the author's talent both as a poet and a prose-writer. The examples presented of these hitherto unknown texts envisage to establish von Martius as a talented man of letters, of particular importance to Americanists and, especially, to Brazilianists.

Within the *Diaries*, which till now can be consulted only at the Bayerische Staatsbibliothek (Nachlassreferat, München), one finds very basic and objective observations, as, for instance, when Martius regrets, just after having arrived in Brazil, "the abnormal increase of the currency" (meaning the inflation) that even then, in July 1817, plagued the inhabitants of Rio de Janeiro, or lengthy descriptions, as when he is captivated by the stunning scenery of the bay of Rio de Janeiro or investigates and verifies the impact of *ipadu* on the health of Indians. I shall quote here, exemplifying his style, an entry from October, 2<sup>nd</sup>, 1818. Both scientists arriving at the borderline of the Provinces of *Pará* and *Rio Negro*, are doomed to endure the unceasing attacks of *carapanás*, specific Brazilian gadflies, black, small and poisonous: "A permanence of 24 hours was sufficient to cover us, as if we were Lazarus, with innumerable wounds, and even our thick-skinned Indians told us that to spend a fortnight here would be equivalent not to penance in purgatory but to punishment in hell." In this instance, as in many others throughout the text, Martius strikes the note, being witty, observant, touching. All this would justify the edition of the *Diaries*, an old plan of mine indeed, which I was never able to carry out.

# 7. Laminin and Stem Cell Therapy to Treat Spinal Cord Injury

Tatiana Coelho-Sampaio

Spinal cord injury (SCI) involves a complex pathophysiology, in which the primary injury is followed by a secondary reaction, where inflammation plays a major role. Research efforts to treat SCI have focused on developing strategies to either decelerate secondary damage or rebuilding the nervous tissue, overcoming the presence of growth-inhibitory molecules and the poor regenerative potential of adult central nervous system (Thuret et al., 2006). Here we report the positive outcomes of treating acute SCI either with a biomimetical polymer of the extracellular matrix protein laminin (HypLM) or with the injection of mesenchymal stem cells isolated from human adipose tissue (hAT-MSc).

Laminin has been largely implicated in neural development and regeneration in both peripheral and central nervous system. Curiously, there are no reports in the literature of exogenous laminin contributing to improve the outcome of experimental SCI. It is well established that in order to fully display its signaling properties laminin needs to be in the polymerized state. Our group has recently described that upon pH acidification laminin forms a stable biomimetical polymer, morphologically identical to natural laminin matrices (Freire and Coelho-Sampaio, 2000; Barroso et al., 2008). Such polymer was called hyperlaminin (HypLM). Subsequently, we showed that HypLM could reestablish axonal growth in neurons isolated from newborn animals, a phenomenon that does not occur in the presence of other laminin polymers (Freire et al., 2002). The latter result prompted us to investigate whether treatment with HypLM would improve recovery after experimental spinal cord injury. Local injection of HypLM largely improved motor function in the BBB test after thoracic compression or transection. The initial functional gain was due to an anti-inflammatory effect, which led to increased tissue preservation, reduced macrophage and neutrophil infiltration and to a decrease in the levels of systemic inflammatory markers such as TNF- $\alpha$ , IL-1 $\beta$  and C reactive protein. Fluorogold-labeled neurons were detected in the spinal cord, brain stem and motor cortex, indicating re-growth of short and long fibers across transection and confirming the previously observed effect of HypLM in inducing axonal regeneration.

In a parallel study we tested whether the injection of hAT-MSc would improve recovery after spinal cord injury in rats. Human MSc are known to

negatively modulate the immune system, which permits that human cells are grafted into rodents. Acute local injection of  $10^5$  cells per animal led to an increase of 200% of the score registered in the open-field locomotion test BBB at the eighth week after lesion. Functional improvement relative to control animals was observed only from the fourth week on, which is compatible with a regenerative effect. This was confirmed by the enhanced expression of the neuronal regeneration marker GAP-43 and of the number of fluorogold-labeled fibers above the site of transection. Human cells were identified after 1, 2, 7 or 14 days after injection by using an antibody that specifically labels the nuclear envelope of human cells. Clearly, hAT-MSC homed to perivascular niches, where most of them remain localized for at least 2 weeks. Selected cells were double positive for markers of human cells and oligodendrocytes, suggesting possible differentiation the glial lineage.

Results presented here indicate that both HypLM and hAT-MSC are promising therapeutic agents to treat human SCI. Complementary studies are currently being developed to determine if concomitant treatment with the two agents will lead to additive effects.

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# 8. Social Rights: Protection at the Global And Regional Human Rights Systems<sup>1</sup>

Flávia Piovesan

Human rights are not a given, but a social construct. They are fruit of a symbolic locus of struggle and social action to protect human dignity and to prevent human suffering.

The Universal Declaration of 1948 innovated the human rights grammar by introducing the contemporary human rights concept, whose hallmark is the universality and indivisibility of rights. Universality because it calls for the universal extension of human rights, based on the belief that human dignity is an intrinsic value of the human condition. Indivisibility because the enjoyment of civil and political rights is required for the fulfilment of social, economic and cultural rights, and vice-versa. This comprehensive perspective leads to two conclusions: 1) different categories of human rights are interrelated and interdependent; and 2) social rights, on one hand, and civil and political rights, on the other, share the same level of importance.

On a global level, the International Covenant on Economic, Social and Cultural Rights (ICESCR) was adopted in 1966 and has 160 States parties in 2009. It draws up an extensive list of rights, including the right to an adequate standard of living, right to education, to health, to social security, to work and to fair remuneration, right to housing, etc.

From the international jurisprudence produced by the Committee on Economic, Social and Cultural Rights 4 key principles concerning social rights can be derived: *a) principle of satisfaction of the minimum core obligation; b) principle of progressive realisation of economic, social and cultural rights; c) principle of reversal of the burden of proof; and d) principle of participation, transparency and accountability.*

Concerning monitoring of social rights, the ICESCR provides only reports that have to be submitted by the States parties, including legislative, admin-

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<sup>1</sup> This study is part of a post-doctoral research sponsored by the Alexander von Humboldt Foundation, which is gratefully acknowledged. I also would like to express my deep gratitude to Max Planck Institute for Comparative Public Law and International Law for providing such an extraordinary academic atmosphere.

istrative and judicial steps taken by the State to fulfill the rights recognized by the Covenant.

The Committee on ESCR warns: “The adoption of a rigid classification of economic, social and cultural rights which puts them, by definition, beyond the reach of the courts would thus be arbitrary and incompatible with the principle that the two sets of human rights are indivisible and interdependent. It would also drastically curtail the capacity of the courts to protect the rights of the most vulnerable and disadvantaged groups in society”.<sup>2</sup>

It was only on December 10<sup>th</sup>, 2008 that the Optional Protocol to the CESCR was finally adopted, introducing a system of individual complaints, interim measures, inter-state communications and inquiry procedures in case of grave and systematic social rights violations from a State party.

Civil and political rights have had an individual complaints mechanism since 1966, when the Optional Protocol to ICCPR was adopted. The justiciability of those rights has thus been strengthened at global, regional and local levels. Only in 2008 have social rights started to have the support of a similar system, which will definitely have a positive impact on their level of justiciability.

In addition to the Covenant, the Protocol of San Salvador (OAS) must also be mentioned, as it deals with economic, social and cultural rights. Whereas civil and political rights have been exhaustively enshrined by the American Convention on Human Rights of 1969 (which has 25 States Parties in 2009), social rights were enshrined more than 20 years later as late as in 1988 in the Protocol of San Salvador – which has only 14 States parties. In the European system the same ambivalence is seen, as the European Convention on Human Rights addresses civil and political rights only and has 47 States parties, whereas the European Social Charter has no more than 27 States parties (as of 2009).

Turning to the jurisprudence of the Inter-American Court of Human Rights in the field of social rights protection, one can outline a typology of cases based on decisions that reveal 3 different strategies and arguments: *a) positive dimension of the right to life; b) application of the principle of progressive realisation of social rights, particularly for the protection of socially vulnerable groups; and c) indirect protection of social rights (by the protection of civil rights).*

In a similar direction, one sees that the European Court on Human Rights has constructed affirmative duties as corollaries to more traditional negative rights, specially the right to life or the right to private and family life.

As a conclusion, on the global level, the insufficiency of the international normative framework for social rights protection have been compensated by

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<sup>2</sup> Committee on Economic, Social and Cultural Rights, General Comment n.09, 1998, UN Doc E/C.12/1998/24 (1998), para 10.

the development of creative jurisprudence as well as by the recent adoption of the Optional Protocol to the ICESCR.

On the inter-american level, growing justiciability of social rights has been seen in the developments of the Inter-American Court's jurisprudence which has been dynamic and evolutionary, inspired by the its expansive interpretation of the right to life and other civil rights.

It is imperative to strengthen the dialogue between the global, regional and local levels so that systems can mutually benefit each other with exchanges of experiences, arguments, concepts and principles aiming for social rights protection.

# 9. Disorder Induced Delocalization-Localization Transition of Plasmons

Yuri A. Pusep

As it was pointed out in Ref.[1], the problem of localization is fundamentally attributed to the wave nature of elementary excitations and therefore, may be equally studied by examination of properties of single-particle or collective excitations. Moreover, the probe of localization by Raman scattering of plasmons is even more desirable because it represents a direct measure of their wave functions (one-particle density of states), whereas conductivity measures two-electron properties. In our recent works [2,3] we investigated and compared the localization lengths of single-particle (electron) and collective (plasmon) excitations in disordered GaAs/AlGaAs superlattices (SLs), determined by means of quantum interference and Raman scattering respectively. It was shown that the same random potential causes the localization of both plasmons and electrons and that plasmons are much stronger affected by disorder. However, only the weak localization regime was examined because of the complexity of the analysis of interference effects in the case of the strong localization. To the best of our knowledge the strong localization of any collective excitations was not yet studied. Therefore, the investigation of the strong plasmon localization may shed some light on the problem of the localization of collective excitations in general. An evident advantage of SLs is the quantitative control of the disorder strength managed by random variation of as grown SL potential. Besides, a much bigger absolute value of the disorder strength may be achieved in SLs due to the large disorder scale as compared to the atomic size disorder caused by impurities. As demonstrated in this work, in order to achieve the strong plasmon localization the last statement is particularly essential.

Contrary to electrical measurements, where the localization of electrons may be simply detected, for instance, by the temperature dependence of conductivity, no such an evident criterion of the localization exists for plasmons. Therefore, in order to detect the delocalization-localization transition we analyzed the behavior of the plasmon linewidth as a function of the disorder strength.

The spatial localization of collective excitations was achieved along the growth direction of the artificially disordered GaAs/AlGaAs SLs. The damping and the spatial extents of the plasmons propagated along the growth direction were measured at  $T = 10$  K by Raman back-scattering. Two different regimes of

the plasmon localization were achieved: (i) the regime of the weak localization caused by the ionized impurities in the periodic differently doped SLs and (ii) the regime of the strong localization in the intentionally disordered SLs with a fixed doping.

We demonstrated that the regime of weak localization is characterized by the plasmon linewidth increasing with the increasing disorder. On the contrary, in the case of strong plasmon localization the disorder does not affect their linewidth. The transition between these two regimes is attributed to the delocalization-localization transition.

Furthermore, as any localized quasiparticles, plasmons can be delocalized when increasing the temperature. Indeed, the plasmon localization length increased with the increasing temperature in the regime of strong plasmon localization. While, in the regime of weak plasmon localization the plasmon localization length was found decreasing with the increasing temperature. Thus, the plasmons demonstrate the same tendencies as the electrons when increasing the disorder and the temperature: the temperature induced scattering increases the localization of weakly localized plasmons, while the increasing temperature activates strongly localized plasmons. Consequently, a certain association of the localization of plasmons with that of electrons may be established.

In conclusion, the delocalization-localization transition of plasmons, analogous to the metal-to-insulator transition of electrons was demonstrated. The considerable influence of the disorder on the plasmon linewidth was detected for weak plasmon perturbation by ionized impurities. While, insignificant effect of the disorder on the plasmon linewidth was found in the random SLs, where the SL disorder causes strong plasmon localization. As expected, the increasing temperature enhances the localization of the weakly localized plasmons, while it causes the delocalization of the strongly localized plasmons.

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# 10. Application of Different Materials in Bone Implantology

Bruno König Júnior, Sérgio Allegrini Junior

The structural and anatomic reconstruction of bone tissues in living beings is considered as a task of very difficult execution and the results are still unpredictable.

During the last two big world wars, with the aim to avoid amputations of members that had lost their functions, any kind of implantable material at hand, was employed and with a disastrous result. In the search of non harmful materials and that would not be rejected by the human body, in 1947, scientists came to an agreement dealing with the utilization of a steel base in a Ni-Cr alloy (Boschi, 1996). Since then researches were intensive looking for alternative materials to accomplish a great deal of functions. To these materials the name biomaterials is given.

The use of autogenous grafting is considered the best option in these situations since, effectively this is the one that presents the best osteogenic, osteoinductive and osteoconductive characteristics. However the technique of its removal is complicated, when compared with other methods.

Bone substitutes demonstrate to be real alternatives for the autogenous graftings, but in comparison, they do not provide the same repairing potential in the process of reposition as the one performed by biological tissues. The presence of these repairing difficulties took researches of many specialties to develop new compounds and composites that were able to easy the cellular activity. Synthetic or of natural origin hydroxyapatite is a calcium phosphate compound, largely used in reconstructive surgical procedures, being the human body hard tissues main component. The total of biological properties are very difficult to be obtained through a synthetic material but an osteoconductive matrix may be added with ceramics (hydroxyapatite or tricalcium phosphate) and bioactive agents (growth factors) that may provide the remaining characteristics in order to substitute the autogenous grafts. The activity and quality of these ceramics are awakening new ideas and procedures and creating a major interest in the research of new or better bioactivities. Based in this directrix we are continuously probing our researches in the “*in vivo*” area.

In order to obtain a clinical success with the tissue substitute, in the bone, a good osteointegration and a sufficient mechanical resistance of the material to support the functions of the tissue are necessary. It is also possible to increase

and adapt the potential of this substitute in its mechanic and physicochemical properties by combining different kinds of materials that interact among themselves. Because of this objective many professionals use composites for bone reconstruction aiming a rapid and more efficient cellular recovery.

In our scientific researches using laboratory animals it has been shown that the biomaterials had a similar behavior among different ceramic compounds, enhancing their osteoconductive properties, however due to various processes of industrial production these ceramics are obtained as materials with differentiated reabsorption periods, promoting different immediate or long term results. The control of the initial inflammatory process aided by the action of anti-oxidants, added to the compounds to be grafted, is demonstrating a great efficiency. The action of these may favor the repositioning of weakened cells due to a mechanical trauma. The clinical attendance of patients, with bone defects or necessity of oral implants for a posterior prosthetic rehabilitation, is being performed with the use of various grafting materials.

As for the development of metallic implants we are researching with a different titanium alloy. The most evident alloy in orthopedic applications is the Ti-6Al-4V ELI (Extra Low Interstitial). This fact is associated to economic questions since this alloy has been used in the Aérospatiale Industry, for which it was developed. This produces shreds that are being used in the metallurgic industry. The presence of Aluminum (Al) or Vanadium (V) provides some cell toxicity in a concentration superior to 0,2 ppm (part per million). The alloy that is being probed and showed to be as efficient as this alloy is the Ti-13Nb-13Zr (Schneider SC, 2001).

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# 11. The Glorious History of Geometry

Claudio Gorodski

At about the year 300 before the common era, Euclid wrote the "Elements", a work which compiled all known geometry at his time, organized according to the logical-deductive method, and which would become the most successful textbook in the history of science. Nevertheless, perhaps on account of the complexity of its formulation and insufficient intuitive appeal, the fifth postulate aroused controversy among geometers generation after generation, who unsuccessfully tried to deduce it from the other postulates and thus prove it as a theorem. The result of this combined effort, which lasted around two millennia, culminated with the discovery of the non-Euclidean geometries by Gauss, Bolyai and Lobachevsky in the nineteenth century. In another development, the analytical geometry of Fermat and Descartes and the infinitesimal calculus of Newton and Leibniz supplied the tools required for the birth of differential geometry, remarkably in the hands of Euler and Gauss. The next step was taken by Riemann, who unified the Euclidean and non-Euclidean geometries in the context of differential geometry under the aegis of a new concept of space. The influence of this work on the physical sciences resulted in the celebrated theory of relativity by Einstein. Since then, the field of geometry has experienced enormous development in many directions, and continues to affect deeply our vision of physical space and the universe.

## 12. Gene Doping: A Technology Of The Future?

Eduardo Henrique De Rose

The doping of the future of is considered by World Anti-Doping Agency (WADA) to be the gene doping. As a matter of fact, it is mentioned already in the List of Prohibited substances and methods since 2000, and the gene manipulation is defined by the Agency as “the non-therapeutic use of cells, genes, genetic elements, or modulation of the gene expression, having the capacity to enhance athletic performance”.

Since the discovering of the human genome, which will permit to treat many diseases, it is evident that the Gene Doping could be used, as the common medications are, to try to increase the athlete’s performance. The concerns of the Agency are also expressed by its chairman RICHARD POUND in a recent publication: “gene doping may represent a new frontier in athletic performance enhancement, but we are working hard to ensure that these emerging medical techniques are not used to create super athletes”.

If one considers that the genetic potential was one of the most important factors of performance of the athletes, until now we could only try detecting early talents because we could not alter this potential. Until recently, these characteristics was studied by the Kinanthropometry and the Physiology of Exercise, but it is not very far the possibility of a genetic screening at early ages, comparing the human genome and the better conditions of genetic potential in each sport, what will permit to select and train better the athlete, according to their abilities.

The use of viral factors to deliver a gene to the athlete is the most effective and also most expensive method to be used, although if compared against non-viral factors, have a higher toxicity and can produce an immune reaction, what may cause sometime a rejection. The non-viral factors are only effective locally, and in consequence have less general effects. They are easy to be prepared and have less risk of contamination.

Today, we consider that gene doping may be a reality in athletes. Examples of that could be the production of the red cell through a genetically modified Erythropoietin (DynEPO) that may not be detectable by the urine test, the muscle hypertrophy in healthy subjects using the IGF-1, the blocking of Myostatin, and also the production of new vessels which should be useful as a methods to increase oxygen transfer in the tissues by athletes.

It is possible to find in the literature three studies that clearly show this tendency. The Belgian Blue is a cattle race known to have a bigger muscle mass when compared to conventional cattle. Examining the expression pattern and sequence of the gene in normal and double-muscling cattle it was found a mutation within the myostatin gene and seems that myostatin is a negative regulator of muscle growth in cattle as well as mice.

Viral expression of IGF-I without resistance training produced a 14.8% increase in mass. Combined with training of the will produced a 31.8% increase in muscle mass in mice. These results suggest that a combination of resistance training and over expression of IGF-I could be an effective measure for attenuating the loss of training-induced adaptations.

Scientists from South-Korea and USA developed together a Marathon Mouse, an engineered mouse that can run 1,800 meters before quitting and stayed on the treadmill longer than the normal mice, that could run only 900 meters. The genetically engineered animal has been given an enhanced protein that turns it into an "endurance athlete" and makes it resistant to weight gain.

Today, gene doping is still a question mark. Could it be stopped or the cells can multiply it selves causing diseases and later dead? May the immunological risk be uncontrolled and complicated the response of the body? The cell mutations can be or not transferred to the following generations? The medical, ethical and legal implications should, no doubt of that, still be previously evaluated by the physician and scientist that are dealing with such techniques.

The Medical and Science Committee of the World Anti-doping Agency established a Gene Doping Panel in 2005, chaired by Prof. THEODORE FRIEDMAN, a pediatrician that is the director of the gene therapy program at the University of San Diego, USA. He believes that this technology is evolving very rapidly, considering that the science involved is not very difficult and can be performed by well-trained people in thousands of laboratories all over the world. Many scientists of the field believed that already in the Olympics of London it will be possible to have some degree of gene doping.

Will be possible to detect gene doping? In my opinion, and in the opinion of many scientist of the area, the answer should be yes. If we revise the story of doping, the same question was made many times, and the answer was always yes. Anabolic were detected, testosterone included. Masking agency and hormones were also detected, as well as manufacture of synthetic of the anabolic steroids. If we invest enough grants in research, and WADA is supporting many projects by now, I am sure that we will have detection when this kind of doping will reach our athletes.

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# 13. Co-Operation in Science and Technology (S&T) Between Brazil and Germany in The Past 40 Years

Gerhard Jacob

The present note is an updated, abridged, English version of two previously published papers in German<sup>1</sup> and Portuguese<sup>2</sup>. Scientific German interest in Brazil can be traced back to the 16<sup>th</sup> century (adventurer Hans Staden), through the 19<sup>th</sup> (geologist von Eschwege, botanist von Martius, zoologist von Spix) down to the year 1934, when the University of São Paulo was established, having German scientists in its faculty; the stream was of a one-way nature (Germany → Brazil).

The purpose of the present note is to analyse **co-operation** (← →), in particular the one within the agreements described below, which in general started through personal contacts, followed by institutional relationships and evolving eventually to formal instruments between Brazil and Germany. The first such one involves Technical Assistance (TZ), established in 1963; Scientific and Technological Collaboration (WTZ) is the purpose of a frame agreement signed in 1969; the latter one will be the main object of what follows. Within the special agreements established therein and in which CNPq and later on also CAPES were the Brazilian partners, several collaborative projects were started, from Manaus to Rio Grande, ranging from Topology to Welding Technologies; this very productive phase went on until about 1980. After that, a slow down took place, without new ideas, up to 1995, when, lead mainly by CAPES, the co-operation was revitalized, till about 2005. Thereafter, due to the fact that it was felt by some Brazilian administrators that the Country was self-sufficient in S&T, less attention has been given to international co-operation with industrialized countries (North-South), in particular with Germany, the emphasis being shifted to collaboration with less developed countries (South-South)<sup>3</sup>.

**1969-1995 (CNPq):** Successes, failures, problems and shortcomings of the co-operative projects in the framework of WTZ, as well as a description of the areas in which they were developed, can be found in<sup>1,2</sup>. In the area of Geosciences practically everything (good and bad) happened and a detailed account of it has been published<sup>4</sup>; an uncommented list of events, which are typical for projects in all areas, follows. Field work has always been problematic; infrastructure often lacked; “purely” German projects occurred; seniority of

scientists frequently constituted a problem; “double financing” (so characterized by Germany) delayed projects; changing of German priorities almost turned unviable good projects; export of research samples from as well as import of equipment and supplies to Brazil were difficult (and are so still today); environmental problems often occurred; even a bad case of plagiarism was detected. Nevertheless, making an overall balance, the result of the co-operation is highly positive: a large number of projects in many scientific and technological areas have been concluded successfully, many of them supported by fellowships from AvH, CAPES, CNPq and DAAD. Three “mega”-projects were started: SHIFT and WAVES, directed to major environmental problems and involving several institutions in both countries, the first one successful and the second one with some interesting results; the third one was the attempt to establish, for political reasons, a large Institute of Biotechnology – CDB, in Joinville, scientifically supported by GBF, Braunschweig; the project failed due to lack of adequate support from the Brazilian side.

**1995-2005 (CAPES):** To overcome the slow down, new programmes were started, fostering intensive scientific exchange, including undergraduate students, and supporting strongly co-operative projects. A large part of the activities go on up to today, but a more detailed analysis would, on one hand, be premature and, on the other, inappropriate, as the present author has not been involved in them. It suffices to say that the projects have been largely successful, bringing a new impulse to the co-operation (WTZ) between Brazil and Germany.

**2005-2009:** Although extensive funding was available, no new ideas came up, problems and misunderstandings occurred, but the existing programmes were not discontinued; due to the above-mentioned self-sufficiency in S&T, no real progress took place. Therefore, the proposals contained in<sup>3</sup> should be carefully looked at by those responsible for the co-operation both in Brazil and in Germany: A re-evaluation of the Brazilian defensive position as far as brain drain and autonomy in S&T are concerned is advisable; a more aggressive attitude from the German side, both providing information on the real extent of the Bologna process and offering new possibilities of more audacious and even non-conventional initiatives, should occur. Examples given in<sup>3</sup> are worthwhile mentioning: University consortia, bi-national institutes (MPG and FhG are strong candidates from the German side) and other similar initiatives. These suggestions should be preceded by intensive high level scientific discussions and also by fact finding missions. Only in this way the Brazilian-German co-operation in S&T, which acquired worldwide recognition and is considered a model for other international collaborations, may be re-established on the same desirable high level.

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# 14. The Challenge of Transdisciplinarity in Information Systems Research: Towards a Sociotechnical Approach to Information Systems

João Porto de Albuquerque

Research in the Information Systems (IS) field has been characterised by the use of a variety of methods and theoretical underpinnings. We can distinguish two diametrically different approaches: on the one hand, disciplines such as Computer Science and Engineering adopt a technical perspective on IS as a formal artefact, which emphasizes the design of models, tools, frameworks and methodologies, with very few empirical studies on the practical application of those artefacts (Tichy, 1998). On the other hand, Management and Social Sciences employ a socially-oriented view that deals mainly with management or social aspects of the context in which ISs are used, but often paying few attention to the specificities of the technological artefacts (Orlikowski & Iacono 2001). In this manner, the main challenge in the IS field lies in the convergence of these two parallel research streams, i.e. it consists of developing an integrated transdisciplinary perspective that considers both technical and social aspects of IS without resorting to old determinisms and taken for granted disciplinary boundaries.

In this talk I will briefly contrast the epistemological and methodological assumptions of both technical- and social-oriented approaches, and compare them with a sociotechnical perspective on IS based on recent works on Science and Technology Studies (STS), and on concepts originating from theoretical debates around transdisciplinarity. Several works of the last decades in the field of STS have turned the attention to the contexts in which ISs are developed and employed (e.g. Latour, 1993; Berg, 1997; Bowker & Star, 1999; Suchman, 2007), such that I would like to revisit some of these works that address the relation between formal artefacts and social practices, in order to recover a shift in the focus of analysis from the *formalisation of practices* to a detailed examination of the *practices of formalisation*. I propose that this

movement must be not understood only as a change of object of study but rather as implying a new ontology for formal artefacts/objects. This movement also entails a shift from a view of formalisation as the generation of representations of “social objects” to considering both the formalisation process and its resulting artefacts as the enactment of sociomaterial practices within which artefacts are deeply entangled (Porto de Albuquerque, 2009). I contend that this performative ontology of formal artefacts implies a new perspective on IS that can be profitably used as a basis for a more comprehensive perspective that is able to tackle the intertwining of purportedly social and technical aspects of ISs. Examining this new ontology of IS opens up fresh questions to discuss issues such as: What are the consequences of the different discourses on the ontology of IS? What questions arise when taking into account the new ontology of IS and formal artefacts to examine the specificities of organisational forms and formalisation practices in developing countries (like Brazil) in comparison with advanced economies such as Germany? What research methods and approaches are better suited for this task, and how can they be embraced by current mostly disciplinary-oriented university departments, funding agencies, and research communities?

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# 15. Virtual Screening Search for Inhibitors of Cruzain, a Cysteine Protease of *Trypanosoma Cruzi*

Alberto Malvezzi, Leandro de Rezende, Mario Augusto Izidoro, Maria Helena Sedenho Cezari, Luiz Juliano, Antonia Tavares do Amaral

Chagas disease, caused by the protozoan *Trypanosoma cruzi*, is one of the most serious amongst the so-called neglected diseases in Latin America, especially in Brazil. So far there has been no effective treatment for the chronic phase of this disease. Cruzain is a major cysteine protease of *T. cruzi* and it is recognized as a valid target for Chagas disease chemotherapy. The mechanism of cruzain action is associated with the nucleophilic attack of an activated sulfur atom towards electrophilic groups. In the attempt to find specific inhibitors for cruzain, some unexpected promiscuous inhibitors were observed in a virtual screening (VS) protocol applied to the ZINC database. In this report we describe both the VS procedures applied to select potential cruzain inhibitors as well as the methods used for identification and confirmation of promiscuous inhibitory activity. Firstly, different physicochemical and structural filters were applied, in order to reduce the database size, followed by filters based on a pharmacophore model, built from common features of some of the known cruzain inhibitors. The selected compounds were docked into the cruzain active site and the best poses were visually inspected. Six hit compounds were then tested as inhibitors. Although the compounds were designed to be nucleophilically attacked by the catalytic cysteine of cruzain, three of them showed typically promiscuous mechanism inhibitory activity behavior. This high proportion (50%) of promiscuous acting compounds shows that this kind of artifact can be highly prevalent in *in vitro* assays and present a real concern in both HTS and VS programs. Additionally, applying the same VS protocol. using however a better pharmacophore model, one micromolar range cruzain inhibitor was identified

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# 16. Bioethics and The Right to Live

Débora Gozzo

One of the most interesting subjects in the field of law nowadays – as surprising as it can be – are the so-called bioethics and their ramifications, especially as regards the fundamental right to live, laid down in article 5 of the Brazilian Constitution of October 5, 1988. This, however, does not constitute a recent problem. Nevertheless it gained an ever growing importance since medicine and its new technologies have developed so fast over the last decades. Thus seemingly unrealistic scenarios (as, e.g., described by Aldous Huxley in his well-known bestseller “Brave New World”) have become reality. Suffice it to name the creation of “design-babies”, the purpose of which is meant to save the life of a relative, especially the life of the baby’s siblings. This is just an aspect that can arise when the right to live under the perspective of bioethics is being analyzed.

The first question that has to be answered is: what is bioethics? This subject is relatively new, and the name “bioethics” was coined less than 40 years ago, in 1971, by an American cancerologist by the name of Van Rensselaer Potter, in his book entitled: *Bioethics: Bridge to the future*. His vision of the world combined ethics and biological facts as something essential for the development of the environment. This is exactly what is happening today, also in the field of law. While “biolaw” is gaining more and more consideration by the doctrine, legislators, most unfortunately, are not fully aware of the consequences of the lack of legislation in this area.

The second important question is: what are fundamental rights? In a few words one can say that these are the inalienable rights a human being has to be guaranteed, such as the right to live, the right to freedom and the right to dignity, just to mention a few of them. These rights being inalienable, they define the limits of every act a government agency might apply against the human beings living on the territory of the state involved. Thus fundamental rights are also, and quite rightly, called human rights.

It also seems to be surprising to reserve such an unexpected prominence to fundamental rights in a field that deals, after all, with health law in the broadest sense. Suffice it to say that constitutional law influences all other fields of law and that, vice versa, all other fields of law are void without such considerations (“Drittwirkung der Grundrechte” in the German constitutional terminology).

After these brief explanations it is clear that the right to live is an essential part of the studies of bioethics, for one can not deal with *life* without being ethic. This is the reason why the genetic diagnosis of embryos – either before their

implantation or during the pregnancy -, and the dignity of the involved ones, raise a lot of questions. The Brazilian law does not answer any of these. The time has come, therefore, for the Brazilian lawmakers to realize that especially the preimplantation diagnosis of an embryo can lead to a new way of eugenics: embryos (and eventually humans) carrying the risk of being presumably disabled run the risk of not being accepted in a society formed by “perfect” people. Furthermore the genetic manipulation of an embryo can end up in an obligation for the person thus created to save the live of a relative, usually a sister or a brother through the donation of organs. This, in turn, can be dangerous for the life of the donator. How far can medicine go, and where are its limits? My contribution attempts to deal with these questions.

# 17. Materielle Grenzen Des Strafrechts in Der Gegenwart

Fabio Roberto D'Avila

In Zeiten der Zunahme der Kriminalpolitik im Bereich der Strafrechtswissenschaft und des exponentiellen Zuwachses an Komplexität der sozialen Beziehungen, legt die vorliegende Untersuchung die Bekräftigung der normativen Strafrechtswissenschaft, die verfassungsrechtlich verankert ist, gegenüber den kriminalpolitischen Interessen, als unverzichtbare Aufgabe für die Bewahrung der Rationalität der Strafrechtswissenschaft der Gegenwart nahe. Es geht nicht um den Rückschritt zu einer faden formalistischen Normativität, in der der Jurist ein einfacher Silogismus-Macher ist, sondern vielmehr um die Bekräftigung der normativen Strafrechtswissenschaft als ein exzellenter Ort der Konvergenz und Bestätigung der Grundrechte und fundamentalen Garantien. Das heißt, es geht um die Bekräftigung einer verfassungsrechtlich orientierten normativen Wissenschaft, die Elemente formaler und materieller Legitimität beachtet, und deren Erkenntnisse dem Leben dienen sollen. Hierfür drängt sich die Erkenntnis auf, dass diese Frage, was materiell als kriminelles Verhalten eingestuft werden kann oder, genauer, welche materiellen Voraussetzungen ein Verhalten aufweisen muss, damit dieses Gegenstand eines Kriminalverbots sein kann, das wichtigste Problem des Strafrechts ist und immer sein wird. Und dies aus dem einfachen Grund, dass davon nicht nur die Rechtmäßigkeit der Bestrafung, sondern bereits die des Strafverbots selbst abhängt, des rechtlich-kriminellen „NEIN“, der Existenzbedingung des strafrechtlichen Denkens selbst. Es handelt sich also nicht, um eine Untersuchung darüber, wann zu strafen ist oder über die Bedingungen der Strafwürdigkeit, sondern um die bevorzugte Untersuchung der Legitimität des Strafverbotes, des „NEIN“ im Strafrecht, als Ausgangspunkt des strafrechtlichen Denkens. Und wenn das so ist, wird das Strafverbot in einem Kreuzpunkt verschiedenster Ausprägungen des Wissens, und so in einem komplexen Netz aus Beziehungen und Interessen, dessen Reflektionsbereich diese Untersuchung ist, natürlich übertreten. Was demnach von solch einer Aussage ausgehend zu tun ist, ist demgegenüber, anerkannterweise, viel bescheidener, nicht mehr, als das simple fokussieren auf einen Quasibeweis, wie er schon von Romagnosi vorgeschlagen worden ist. Als Romagnosi, in seiner *Genesi del Diritto Penale* (1791), sich auf die Notwendigkeit eines più forte Rechtes zu einem Podestá punitrice bezieht, um zuzulassen, durch die Strafe, die Opferung von Rechten des Menschen, da “ogni pena involge nella sua nozione la

sottrazione o totale, o parziale del bem essere di colui che la soffre”<sup>1</sup>, wird hier ohne Umschweif das volle Bewusstsein festgehalten, dass damit enorme Kosten für die individuellen Freiheiten einhergehen, das Strafrecht an der dauerhaften und unausweichlichen Notwendigkeit der Rechtfertigung leidet, die in der materiellen Wertigkeit dem Rechtlichen zugrunde liegen sollte. Die Einstimmigkeit des hier aufgeführten offenbart das einfache Vorhaben, einen Ausgangspunkt festzulegen. Wenn man auch die zahllosen formulierten Versuche einer Lösung durch so viele unterschiedliche Wege bestreiten kann, erscheint es auf der anderen Seite, festzustehen, dass das strafbewährte Verbot, als schärfste staatliche rechtsbeschränkende Manifestation, einer besonderen Rechtfertigung bedarf, einer Rechtfertigung, die nicht einfach vorausgesetzt sein kann durch die demokratische Legitimation des Gesetzgebers oder durch den staatlichen “guten Willen” bei der Verfolgung seiner Aufgaben, oder darüber hinaus, in zirkelschlüssigen und leeren formalistischen Argumentationen gefunden werden kann. Und wenn, für einige, die Geschichte nicht genug ist um eine solche Vorsicht der materiellen Wertigkeit zu rechtfertigen, sollten hierfür zumindest die staatlichen Existenzbedingungen im Rahmen eines demokratischen Rechtsstaates ausreichend sein. Denn hier, aus prinzipiellen Gründen, darf der Staat keine Grundfreiheiten beschränken, die von ihm selbst anerkannt sind, ohne einen ausreichenden Grund, materieller Natur. Und, in diesem Problembereich machen die Linien, die heute das Verständnis der Straftat als Angriff auf ein Rechtsgut zeichnen, es überzeugend zu glauben, dass die Zeiten in denen wir leben nicht Zeiten des Verzichts, sondern der lebhaften Wiedergeburt sind. Die Theorie des exklusiven Schutzes von Rechtsgütern ist weit davon entfernt ihren Bereich auf eine beliebige Idee der Argumentation zu beschränken. Korrekt nachvollzogen, bietet diese nicht nur einen unbezahlbaren, sondern wahrhaftig unersetzbaren Beitrag für das Verständnis des strafbewährten Verbotes selbst, ausgehend von den gesetzgeberischen Grenzen, die eine unbestrittene Kraft haben.

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# 18. Materials Science

Carlos Frederico de Oliveira Graeff

Materials Science (MS) is an interdisciplinary field that involves the knowledge of materials properties and its use in various fields of science and engineering. In the World, MS is evolving constantly, constituting today a field of intense scientific, technologic and innovation activity that involves researchers with different ground back like; engineers, physicists, chemists, mathematicians, biologists, physicians. This development has basically two intrinsically associated factors. The first is the development in the last century of techniques that permit the manipulation of the matter in the atomic scale. The second was the concomitant development of characterization techniques in the nanoscale as well as realistic computational modeling also in this scale. As a consequence, nowadays it is common that particular characteristics or functionalities are chosen and afterwards the material is synthesized.

It is hard to define when the field started, however as a significant mark the creation of the Materials Research Society (MRS) may be used. Until mid sixties interdisciplinary projects in the funding agencies had difficulties in being accessed, since there was no mechanism or structure for proper evaluation. In the seventies several research groups realized this difficulty and funded MRS in 1973. It has today approximately 14.000 members. In Brazil our equivalent society, *Sociedade Brasileira de Pesquisa em Materiais* (SBPMat) was created in 2001. The first graduate course on Materials Engineering in Brazil started in 1970 at UFSCar. Today there are 21 ME courses all over the country. In 2006, at least 120 groups in 80 different Institutions were actively doing research in Materials Science/Engineering.

In the end of 2007 the Evaluation Directory (Diretoria de Avaliação) and the High Council (Conselho Superior) decide to create a new evaluation area called Materials (Materiais). In 2008 14 Graduate colleges from different Brazilian Universities decide to move to this new area of evaluation. In our contribution we will discuss and other issues concerning Materials Science.

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# 19. Multidisciplinarity, Interdisciplinarity and Transdisciplinarity: a Brief Report on Lessons and Perspectives Learned From Cybernetics and Control

Karl Heinz Kienitz

The university is a multidisciplinary institution where faculty and students use common infrastructure, traditions and values to pursue specific, often unrelated objectives in their respective disciplines.

Throughout engineering, either inside or outside universities, it is now common to find projects advancing objectives which are attainable only through coordinated professional efforts from several disciplines. The development of hybrid vehicles is an almost classical example of interdisciplinary interaction of mechanical engineers, electrical engineers, chemical engineers and designers, as well as other specialists. In more novel projects a still greater diversity of disciplines is needed to reach project goals. One may look at modern hospital, aerospace, communication or research laboratory systems, to just mention four broad system categories where efforts from a variety of disciplines outside the field of engineering are indispensable.

There exists, however, a further, different type of interactions among disciplines, which go beyond those interactions observed in multidisciplinary and interdisciplinary undertakings. In such interactions the intention of the envisioned result surpasses disciplines and their established domains. One may label those undertakings as transdisciplinary. An example is the development of SIVAM (“Sistema de Vigilância da Amazônia”, or Surveillance System for the Amazon), starting from an initial concept advanced by the Brazilian government after the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro from June 3-14, 1992. The SIVAM undertaking intended to yield a tool of dimensions and scope unknown to any civil society, with the objective to preserve a sensitive and irreplaceable common resource system, the Amazon. Dimension and scope exceed those of any particular discipline or set of disciplines envisioned as necessary to properly focus, mature and achieve the initially vague objectives (or better even, intentions) of the venture. The initial vagueness was also later involuntarily documented in the change of name from SIVAM to SIPAM (“Sistema de Proteção da Amazônia”, or System for the

Protection of the Amazon). This transdisciplinary effort engaged geographers, geologists, engineers of many disciplines, epidemiologists, military scientists, criminologists, environmental scientists, etc.

A brief inspection of technical and scientific publications (whose number has grown explosively) discloses a trend to superspecialization in the research shared with a more and more specialized very specific community of readers. This seems to be a movement contrary to the ever more frequent demand for coordinated multidisciplinary, interdisciplinary and transdisciplinary efforts in providing solutions such as SIPAM. A related phenomenon is the sprouting of new disciplines out of interdisciplinary efforts, the best examples known in the area of engineering being biomedical engineering and mechatronics. Such new disciplines have become individual disciplines in their own right, with their own journals, conferences, laboratories and even undergraduate degrees, not bequeathing special abilities or techniques explicitly targeted at the advancement of multidisciplinary, interdisciplinary and transdisciplinary efforts. Thus one may ask if there is, after all, something that could help the more and more specialized scientist to appropriate such abilities or techniques.

For some time now, an answer to this question has been available from a (meta)discipline known as systems engineering, which is based on systems theory and has been providing concepts that facilitated large and complex solution efforts, such as SIVAM. Systems engineering deals with work processes and the tools to manage these efforts. It has overlaps with technical and social sciences, mainly cybernetics and management. Its proven success in undertakings such as SIVAM advances the point that, at least from a practical perspective it indeed offers an appropriate framework for solution oriented multidisciplinary, interdisciplinary and transdisciplinary work. Systems engineering advances a collection of best practices applicable to all types of solution oriented efforts as long as systems – in their broadest possible definition – are concerned. Best systems engineering practices are concerned with the organization and guidance of the solution effort as a whole. Special attention also is given to communication and documentation aspects. Discipline domain particularities are left untouched, while there is strong concern with establishing open and customizable interfaces between the various disciplines.

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## 20. A Sensory System as an Efficient Analog to Digital Converter

Roland Köberle

Sensory nervous system need to extract information about a varying external environment quickly and reliably. Sensory neurons take a continuously varying stimulus as their input and encode features relevant for the organism's survival into a sequence of action potentials – spikes.

The full dynamic range of continuous signals has to be compressed into a set of discrete spike times.

Here we show how this works for the two H1 neurons in the optical tract of the fly. They constitute an efficient visual detector for rotations around a vertical axis, allowing the fly to assess the amount of maneuvering that might be necessary to stay on course.

We find that almost all of the visual information available to the fly resides in very simple properties of the stimulus: going either left or right.

If this simplified “skeleton” stimulus is shown the fly, its responses to it and to the full stimulus are virtually identical.

The everpresent undersampling problems in computing the information can now be tamed to a considerable extent.

# 21. Controlling the Interaction Between Light and Matter Confined in Nanoscale

Leonardo de Souza Menezes

In this contribution, the peculiar optical properties of a microsphere resonator as a confining structure for the electromagnetic field in the optical region are studied and exploited. Such kind of microresonators can confine light in a volume  $V = 300 \times \lambda^3$ , which in our case ( $\lambda = 680$  nm) corresponds to  $\sim 90 \mu\text{m}^3$ . A scanning near-field optical microscope (SNOM) probe was used to manipulate the interaction between single nanoparticles doped with organic dye molecules and the so-called whispering-gallery modes (WGMs) [1], which are eigenmodes of microspherical cavities presenting ultrahigh Q factors ( $\sim 10^9$ ), corresponding to photon lifetimes of some  $\mu\text{s}$  [2]. These enhanced photon lifetimes give rise to the observation of nonlinear optical effects even with extremely low ( $\sim \mu\text{W}$ ) pump powers coupled into the microcavity, among other interesting effects.

In our experiment, we have attached a 200 nm bead containing  $\sim 10^5$  organic dye molecules (donor bead) to the tip of a SNOM probe and positioned it at will in the evanescent field of a WGM. The properties of the coupling between these molecules with the WGMs through their fluorescence (when they are optically excited) were studied and characterized in detail. Additionally, we have dip coated a microsphere in a diluted solution of 200 nm beads containing other kind of dye molecules (acceptor bead), different from those which were inside the donor bead, so that after this process one could find at most 10 beads on the sphere surface.

While pumping the donor bead via the optical fiber from which the SNOM probe was fabricated with a laser emitting at 532 nm, the SNOM probe was approached to the sphere surface and kept at a distance of  $\sim 10$  nm from it using a shear-force feedback loop. The fluorescence of the donor beads coupled into the WGM and started circulating inside the microsphere. A home-made laser scanning confocal optical microscope was used to collect light coming from the acceptor bead, exclusively [3], which was then sent to a spectrometer. The results show that the acceptor particle has efficiently absorbed the fluorescence of the donor one, which coupled to the WGM. It is verified that this incoherent photon transfer mechanism is about  $10^6$  times more efficient than that via propagation in the free space [4].

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## 22. Lebenswelt and Reflexive Democracy in Habermas and Honneth

Nythamar de Oliveira

This paper reexamines Habermas's conception of lifeworld (*Lebenswelt*) in dialogue with Rawls's procedural device of reflective equilibrium so as to recast Honneth's theory of recognition in terms of a reflexive, democratic ethos. Honneth's conception of reflexive democracy turns out to be an alternative to substantive models of liberation and participation (such as Arendt's republican conception of democracy) and to procedural models of deliberative democracy, because of their restrictive views of the public, political arenas (Rawls and Habermas). The idea of a "reflexive democracy" is also found in Olson and related to Giddens's conception of "reflexive modernity." I should like to propose a pragmatic perspectivism as a reconstructive, social phenomenology of the *Lebenswelt* by resorting to Habermas's tripartite, intersubjective aspects of the lifeworld oriented toward socially, linguistically shared understanding of everyday practices (*verständigungsorientiert handelnden Aspekte: Kultur, Gesellschaft, Persönlichkeit*) and to Rawls's method of reflective equilibrium, understood in hermeneutic terms, so as to deal with the moral, legal, and political contexts of signification, the problem of a normative conception of the person, and the challenge of perspectivism inherent in reasonable pluralism. A grammar of fairness must thus go beyond the procedural, fair distribution of material goods, and must be correlated to the fundamental principle of recognition (doing justice to the other) and its implicit moral grammar of social conflicts, as Honneth has brilliantly argued, in order to avoid equating cultural relativism with moral relativism and the postmodernist dissolution of the aesthetic and normative substance of the social lifeworld. I assume that the *Lebenswelt* stands overall for the horizon of socially, culturally sedimented linguistic meanings that make up the background environment of competences, practices, and attitudes shared by social actors. The problematic relationship between systems and lifeworld lies, therefore, at the bottom of the normative grounds of social criticism, just as the basic ideas of cooperation and competition have determined social philosophical approaches to political theory. Following Habermas and Honneth's criticisms of systemic, instrumentalized power, I propose to recast reflexive self-formations in a democratic political culture through intersubjective recognition and redistributive justice, so that they cannot ultimately be separated from their correlated lifeworldly techniques of self-esteem, self-care,

and self-understanding. Honneth's theory of recognition successfully revisits the critique of power so as to address what I have dubbed "the phenomenological deficit of critical theory" (*das phänomenologische Defizit der Kritischen Theorie*), inherent in the Frankfurt School's attempt at a dialectic of enlightenment that breaks away from the demonization of the technological, instrumental domination of nature. The ongoing democratization of emerging societies and developing countries is a complex process that has engaged diverse segments of civil society and still has a long way to go, as a reflexive model of radical democracy is to be accomplished not only by social movements from below, let alone by governors, the elites or intellectuals, as it were, from above, but ultimately by civil society as a whole and its deliberative, reflective commitments to solidarity and networks of social cooperation. What is at stake, after all, is the institutionalization of the social world, beyond traditional accounts of society and state. Honneth has convincingly shown, however, the impossibility of maintaining communicative reason immune from the instrumentalization of social action in the very attempt to tackle the paradox of the rationalization of lifeworldly relations, as anticipated by Habermas's own account of socialization. Honneth seeks thus to rescue the lifeworldly, civil society's locus of the democratic ethos, which tends to be eclipsed by Rawls's idea of public reason and Habermas's public sphere.

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# 23. Modeling the Earth Surface Evolution Using Physical Parameters Registered on Rocks: Toll For The Prospecting of Different ore Types

Peter Hackspacher

The need of new natural resources (iron ore, bauxite, etc) is increasing in all industrial branches. The rich ore deposits are being consumed and new, poor ores, occurrences need to be transformed in strategic reserves. For the geologists it is an important research field, but the direct and objective recognition of ores, in the nature, is more and more difficult in reason of the missing of simple mineralogical criteria.

New research procedures, or instruments, need to be involved, adapting to a new reality. Some geophysical equipments are presented for indirect prospecting using physical parameters of the different rocks, as density, wavy characteristics as amplitude and velocity through this materials, etc.

Otherwise the ore prospecting are introducing, ever more, models with the use of different geophysical properties, measured in a region with economic interest.

Our proposal is to model the earth surface evolution using physical parameters registered on rocks, for the prospecting of different ores. For the modeling of the earth surface evolution following physical parameters should be considered: Fission-track thermochronology on apatite and zircon, apatite (U-Th)/He thermochronology, thermal gradient, geothermal flux, rock density, uplift and exhumation history, geomorphological aspects as surfaces, geological concepts related to primary and/or supergene ore formation, tectonic boundaries, relative movements, etc. For this proposal we use the routine Pecube (Braun, 2003) for the region of Poços de Caldas, South Minas Gerais, Brazil. Poços de Caldas is famous for its volcanic caldera of 80 million years, thermal water and bauxite mines (Aluminium-ore).

Different layer or maps were constructed for the region, along geological time, starting at 80 Ma (age of the caldera) until now. Geological and geomorphological features stand out as possible remarks, in these layers, and should be confirmed through geological works. For that case it can be concluded that the Aluminium-ore were formed in two steps; i) as a first primary

hydrothermal process, during the emplacement of the volcanic body and ii) secondarily during the Eocen (40 Ma) through enrichment of Aluminium at a geomorphologic surface.

Certainly the modeling of physical properties is and will have a large application in different sciences.

# 24. Can History of Science Teach Us How to Make Science?

Sílvio R. Dahmen

History of science has long been plagued by a few misconceptions as to what regards its subject matter and the tools of its trade. Many still think of it as being the history of individual scientists, albeit it is the history of scientific ideas; and a rather large number of science practitioners regard it as a subject for dilettantes or those which are no longer active in “hard-core” research, when it is actually an area of intense scholarly research conducted by people with solid scientific backgrounds. In this short essay I would like to discuss the views of a theoretical physicist who has been active in historical research (the “B” side of his research) while still doing “hard-core” physics (the “A” side).

First of all, history of science is mostly the history of scientific ideas, from their inception to their full blossoming. Therefore, if one wants to understand, say, the birth of Statistical Mechanics, one has to know Statistical Mechanics inside out: no superficial knowledge, but a profound understanding of what the problems were and (most of the times) still are. This is not something to be wished for, but a must: original works (primary sources) are commonly riddled with misconceptions or half-backed ideas, or depended on knowledge which was not available at the time – for instance J.C. Maxwell did not know the essence of electricity when he wrote down his equations, as elementary particles would be discovered only decades later. So in order to separate the wheat from the chaff one has to know what is wheat and what is chaff. Moreover, one may adopt two approaches to the subject matter: the internal approach – the view of a lonely scientist working with little or no contact whatsoever to his surroundings – or the external approach, the one which in my opinion makes more sense: the scientist is influence by and influences his surroundings and the choice of field of research is sometimes dictated by trends (nanotechnology), politics (war research or genetics in the Soviet Union), economics (biofuels) or simply scientific challenges (dark energy and dark matter). The external approach requires a good knowledge of the *Zeitgeist* and regards science always as contextualized undertaking.

Second, secondary sources (those which were written by other scholars about primary sources) are as important as original works. The problem of access to primary sources has been greatly reduced with the advent of the internet and large international initiatives to grant free access to digital ver-

sions of originals. Secondary sources are still a problem if one does not have a good library at hand, since these are mostly printed in the form of books or in scientific journals.

Finally what can we learn from the history of Science? I believe a few lessons may be drawn from dealing with the way scientific ideas are born and fully blossom (or die, in many cases). First, a continuous investment in education pays off: great scientific ideas were born in places where education was given top priority. Even though I think the word “tradition” is sometimes used as an excuse for not changing things that must be changed, it may also confer a meaning to the idea of a decade-long investment in institutions, ones which are continuously looking at the future without forgetting their past. This idea is intimately connected with my second point I want to make: people make a difference when it comes to working with Science. In 99% of the cases, scientific work is the undertaking of a *collectivum*. One may argue that science is full of examples of single individuals who made a difference – and there is no denying this fact – but it is mostly the work of legions of “lesser” scientists who show hidden corners and help seal the foundations of an area (so there is still hope!). Third, the free exchange of ideas and criticism is essential: the struggle between different scientific conceptions help us get rid of misleading ones and pave the way to the “correct” idea. And finally, sometimes courage is asked for. Courage to face a whole scientific establishment (or a government) and stand for ideas we think right when most think it wrong, as Ludwig Boltzmann did when he took the cause of Aeronautics when everybody thought it to be a delusion [Dahmen 2009].

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# 25. Inclusion of the Environmental Dimension in the Education of Chemistry Professionals

Vânia Gomes Zuin

There is a consensus today that Institutions of Higher Learning (IHL) should promote a process of curricular environmentalization to encourage students to ponder about Earth's sustainability by means of knowledge integration projects. However, few studies have focused on the education of professionals of the area of Chemistry concerned with the discussion about raising environmental awareness. The general understanding in this area is that the environmental dimension corresponds mostly to the practices and the development and use of materials considered environmentally correct or friendly, often associated with Green Chemistry. According to its main founders (Anastas; Warner, 1998), Green Chemistry can be defined as the "creation, development and application of chemical products and processes to reduce or eliminate the use and generation of substances that are harmful to human health and the environment" (p.11). In other words, the goal is to reduce risks by minimizing or even eliminating the harmfulness of toxic substances by restricting exposure to them. In Brazil, the concepts of Green Chemistry began to be disseminated in the academic, governmental and industrial spheres about five years ago. The few research groups that have championed Green Chemistry, connected mainly to universities, have generally held meetings destined for undergraduates, graduates and professors of Chemistry and correlated areas (Correa; Zuin, 2009).

In this sense, understanding the curriculum as a field where disputes for symbolic power in an area occur, as well as the perspective of critical theory in the analysis of the writings and discourse of subjects involved in a course for the initial education of Chemistry professors of a Brazilian public university, have proved to be highly pertinent in studies focusing on curricular environmentalization (Bourdieu, 2003; Marcuse, 1999; Adorno, 1995).

Ongoing research indicates that there are no major differences between the understanding of the environmental dimension contained in analyzed documents and the discourse of subjects linked to the licentiate course in Chemistry examined here. There is a noticeable resemblance between the proposed curriculum and practice, especially when visions of the environmental dimension of the course have a reductionist character, marked by instrumental reason, understood

as that which is related to environmental chemistry or Green Chemistry. In this course, research seems to be the quintessential educational element, specifically in the areas considered hard. The maximization of production assumes a conspicuous role, for knowledge is converted into patents or articles, preferentially of high impact, drawing attention to those who have more products while at the same time pointing out researchers who do not have a number of publications considered satisfactory. This mechanism of commercialization of teachers and students' work, exciting, addictive and highly competitive, is understood right from the beginning of the licentiate course in Chemistry. It should be noted that it is very easy for competitors to become adversaries to be fought. Obviously, this productive and educational model affects not only those who belong to the investigated group but, for these people, the *modus operandi* weighs heavily and its tradition seems unassailable.

There are glimmers indicating an educational process able to generate critique and enfranchisement, in a movement of resistance to that which is taught in semi-education (*Halbbildung*). University students sometimes feel that something is lacking, but that the course itself cannot or should not always fill this gap. However, in this search for improvement, both licentiates and the course coordinator advocate a modification of the curriculum, since they believe that the course requires a reformulation. To this end, they request the inclusion of more subjects in the technical and conceptual areas of chemistry.

However, what is the real potential for transformation of a new philosophy aimed at environmentally correct practices in the licentiate course in Chemistry? To what extent does the environmental dimension go beyond the educational 'slogan'? How can the semi-education of Chemistry professors be avoided, over and above the easy and simplistic denouncement that it is a product of technical and scientificist rationality? What routes should be constructed? In view of all this, it seems more productive to initiate a process of curricular environmentalization or the construction of an alternative rationality born within the course itself; in other words, a process that can and should take place slowly and inexorably.

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## 26. The Boundaries of Transdisciplinarity

Francisco Marshall

The contemporary transdisciplinarity has its birth certificate, and it is already 15 years old: the Letter of Transdisciplinarity, produced in the First World Congress of Transdisciplinarity, written by Basarab Nicolescu, Edgar Morin and Freitas Lima, and issued in the monastery of Arrábida, Portugal, November the 6<sup>th</sup>, 1994. Since then, the UNESCO has been supporting this epistemological program, which has been growing as an international ethical movement. This paper aims to remind some nuclear features of transdisciplinarity, and to explore its actual possibilities in terms of languages, objects and strategies.

The main target of the transdisciplinary movement is the heavy and widespread social and ethical consequences of the excessive specialization of the academic disciplines. This target, as a historical institution, has at least 200 years, and has been concentrating power along the times; nowadays, this epistemological ground embraces most of the sciences and its practices, and rules most of the relations between knowledge and society.

If we look into the cradle of disciplinary specialization, we see the shadows of a couple full of pride: the State and the idea of progress. Although culturally cherished, the idea of progress is also a convenient mask for the capital, which, as we know very well since Marx, is a self-feeding and ever growing monster. A first image of this monster was printed in January of 1818 by Mary Shelley, and keeps being one of the most telling avatars of our ages. Frankenstein, the modern Prometheus, the creation of Doctor Frankenstein, ever wondering by the world, not only in bookstores and cinemas, but especially in academic labs and classes. I hope you never meet him in a mirror.

Assuming the call for new social and ethical grounds prompted in the Letter of Transdisciplinarity, we have to plan how to move forward. As a good inheritance of the interdisciplinary tradition, we can start formulating a set of fundamental ethical and ontological questions:

1. Who am I, and who are we?
2. What are, in an immediate and fundamental sense, body, time, space, nature, and life?
3. Where do I am going, where are we going?
4. Who I am talking to? Who I am working for?

This ethical and philosophical questioning can evolve very quickly into historical and social categories. A sense of complexity as well as ideas of totality are in order, stressing the connection between knowledge, society, world, responsibility, action, and future.

The transdisciplinary letter, in its first article, condemns any definition of “man”. It is, indeed, easy and wise to perceive the risks of plastering an image of man. However, mankind has some properties that must be perceived and managed strategically. So, what are knowledge, perception, language, and power?

The road to transdisciplinarity depends mostly on ethical, and social movements performed by men and women of science, and its impact over the institutions. It means considering the Campus and the academic life as strategic meeting point, instead of as a battlefield or as a scenario for pride and power. It means opening doors and, also, accepting as true contributions the spontaneous and sometimes disturbing signals coming from the outside, even if they come from some normally despised fields, like the Arts, pop culture, freshmen, religion, or our colleague next door. At last, how can we get a true sense of being, without the help of artistic, poetic, and humanistic mirrors? How can we define what is body, time, space, nature, and life, without an open and advanced interpretation of culture? Transdisciplinarity can mean, in such conditions, a true source for the renovation of paradigms, as well as a good connection between knowledge, University, science, life, and future.

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# 27. Theatrum Mundi Als Paradigm Des Wissens in Ciceros Werk

Isabella Tardin Cardoso

## Theater as a Paradigm to Knowledge in Cicero

Anyone who wishes to discuss the “limits and interfaces of science” must consider, as an initial question, whether it is possible to talk about a science on the basis of the same science. To talk about any topic from the perspective of Classical Philology, the first limit one faces is that the discussion must be based on the *logos* of its object, i.e., on a text. As defended in a recent paper (Cardoso, 2009), constructing a text as an knowledge about a text leads to a radical use of some means and conditions of modern science: the imitation of an object (assumption of learning), understood as the simulation of conditions of reproducibility of the results (condition of scientific objectivity) (Granger, 1993). Even if not clearly specified or thematicized, the perception of such mimetic circumstances for scientific knowledge has certainly influenced for instance the use of *topos* of the *theatrum mundi* in reference to science in modern times (Blair, 1977). Returning to the initial question, the proximity between Philology (as a science) and the theater will be considered on the basis of how Classical Philology deals with passages from works of the Roman author Marcus Tullius Cicero (First century B.C.) concerned specifically with the question of theatricalization of knowledge (both ancient and modern). In the mentioned previous work the same question was considered from the point of view of imitation and methodology of science. The focus of the present discussion will be the, among other effects of the theatricalization of science, the notion of scientific illusion.

In the choice of the corpus for analysis (composed of ancient texts and philological approaches), special interest is given to Ciceronian passages in which the theater is presented as a parameter for knowledge, emphasizing those in which life itself is represented as an imitation of the theater (*theatrum mundi*). Researches on the Ciceronian use of the *topos* of *theatrum mundi* very often reduce it to a (superficial) effect of *ornatus*. Other philological approaches, however, dig deeper in relation to the disconcerting contradictory effect of the exuberant Ciceronian appeal to theatrical art and its artifices in the context of oratory art. In fact, this appeal seems to extend beyond the need for distance between the *imitatio* and *actio*, as pointed out elsewhere by Cicero himself. By

considering this question, I will not, however, stress the sociological implications of the status of actors *versus* orators in the Roman republic of that time, but rather epistemological aspects of the construction of the images of actor and orator in Ciceronian texts.

A correspondence between the illusion of Ciceronian oratory art and the illusion of theater, already suggested by Gottoff (1993), might explain, but not resolve, the apparent contradictions implicit in the theatricalization of juridical and political discourse. It can be assumed that theater and oratory both involve a certain kind of knowledge that does not pretend to be as universal as normally philosophy does. Such a solution, however, does not provide as simple an explanation to the certain passages of Cicero's philosophical dialogues in which the theater is presented as a means for the construction of his text (and of knowledge). The imprecise theatricalization of modern philological discourse about Ciceronian philosophy seems to reflect such concern: the scientific potential of this kind of *contaminatio* will be focused in the intended discussion of illusion and limits of science.

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# 28. Low Environmental Impact Plastics

Marco-Aurelio De Paoli

Eco-friendly, sustainable bio composites from vegetal (plant-derived) fibers and thermoplastics (either bio or oil based plastics) are gaining popularity in recent years, not only as a solution to growing environmental threat but also as a solution to the uncertainty of petroleum supply. These materials have already moved into mainstream use, and composites based on renewable “feed stock” are competing with engineering plastics. These bio-composites come from renewable sources that, in principle, are inexhaustible; they are lighter and emit less CO<sub>2</sub> than was consumed during plant growth, which is an important characteristic for components that must be disposed of at the end of their useful life; they are recyclable and can be easily converted into thermal energy through combustion without leaving residue, causing less pollution and may gain additional carbon credit.

The usage of natural fibers as plastic reinforcement is not new. At the beginning of 20<sup>th</sup> century, phenyl-formaldehyde and melamine-formaldehyde resins compounded with paper or cotton were used for electric insulation. Applications in the automotive industry could already be found in the 60s, when coconut fibers were used to manufacture car seats, and PP (polypropylene) composites with wood flour, molded by compression, were applied as substrates for car interiors. In the 90s, PE (polyethylene) composites with natural fibers appeared to substitute wood in deck boards, fencing and industrial flooring

Due to the many benefits that bio-based materials offer, automotive industry is seriously looking into these types of products. Today, European car manufacturers are applying natural fiber composites in internal parts such as door panels, trunk liners, instrumental panels etc [1]. DaimlerChrysler is looking into use of flax, coconut and abaca fibers in their Mercedes vehicles. Ford has been researching using biomaterials, such as soy-based foam for seating [2]. More recently, PVC (poly-vinyl chloride) composites with wood flour have been used for window and door frames, because of their balance of thermal resistance and stiffness.[3]

In our laboratory we are developing continuous methods for production of composites of several thermoplastics with vegetal fibers by processing in a twin-screw corotatory extruder. These materials can be molded into parts for the automotive and construction industry by injection molding.

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## 29. Animal Ethics – The Philosophers and the Animals

Jair Barboza

The established tradition of Western philosophy is certainly strongly marked by the rationalist orientation, which in mathematics has its model, something exemplary exposed by Plato in his philosophical work *The Republic*, in which mathematics gives access to the world of eternal ideas, archetypes of the sensible world. This world is a place of simulacra and shadows of the true things, the Ideas. The arithmetic and geometry guide us to the truth, because the numbers and figures point what is always and never perishes. The faculty of reason and the world are in harmony. From this point of view there is an unveiling of the metaphysical truth of things and we go beyond the transitory images of the cavern in which we live. The rational faculty, said Plato, is the good part of the soul and is opposed to feelings. The feelings must be governed by reason, and so there is the revelation of the meaning of existence and of the meaning of the world. In fact we have here a numerical-spatial order of nature that might well be thought of as a first draft of the Cartesian universal science of order and measure, ie, the so-called universal mathematics.

The reason is seen since Plato, and through the modern philosophy, not only as a faculty that says correctly the world, but also as a faculty that distinguishes man from animal. One difference that leads Descartes to assert in his *Discours de la méthode* that after the error of those who deny God, there is one worst, ie, to say that the soul of animals is similar to that ours. The author also makes explicit, in the fifth part of his cited work, that the study of science will make us masters and possessors of nature. Here we find a thought that in the extreme have contributed to the destruction of nature (and to the cruelty against animals) observed today and which leads Adorno and Horkheimer to warn that the Enlightenment only knows the things in the sense that they are manipulated.

Kant does not reject to follow these steps established by Platon and Descartes. In fact Kant makes a separation between an observer and a nature as his object. The very project of Enlightenment is the demystification of the world, with a concomitant instrumental domination of him. In this sense one of the most famous images of Kant in his work *Kritik der reinen Vernunft* is that the researcher goes to the nature not as a student to be instructed by it, but as a judge that requires from the nature answers to his questions. In the case of animals, these are for Kant “things”, differently from men, who are “persons”.

It is not common to traditional philosophy to focus on the theme of the dignity of animals and their rights. In general the philosophy separates in the one hand rational thinking person, and on the other hand the extended substance, ie, the external nature as an object. The nature is commonly seen as an object that can be used.

What here I intent, with Schopenhauer and Peter Singer, is to explain that there is a Western tradition in order to exercise dominatoin over the nature. This Western tradition goes back to the *Bible*. This book played a predominant role in the relationship between people and nature in the West: Nature would be created for us, so we could use the nature as we wanted, we could explore animals as mere things without dignity. This point of view influenced almost all Western philosophy. This point of view has also influenced the science and the mentality of Western culture as a whole. It is time, however, to criticize this mentality through the so-called animal ethics. This one considers the animals as “persons” with rights and thus under the full protection of law.

# 30. Computer Assisted Surgery: The Future is Now

Mauricio Kfuri Junior

Computer assisted surgery (CAS) represents a surgical concept and set of methods, that use computer technology for preoperative planning, and for guiding or performing surgical interventions. This technology has been developed to enhance accuracy and safety for a variety of procedures. There is no question that computers have become an integral part of continual advancements in medicine and science. Computer-based simulation empowers surgeons in visualizing anatomy. In the preoperative phase, most surgeons have a mental image of where the target lesion is and plan the route of exposure. Marking structures of interest on radiographic images that can be superimposed on live video camera images allows a surgeon to simultaneously visualize the surgical site and the overlaid graphic images. Technical adjustments of surgical instruments and the operating theatre enable surgeons to continuously monitor the position of instruments in relation to the patient's anatomy and the pre-operative plan. Intra-operatively, the position of the surgical instruments is superimposed in pre- or intra-operatively obtained images such as fluoroscopy, MRI- or CT-scan. This technology enables surgeon to perform "real time" navigation by a less invasive approach, less time consuming interventions because of better planning and simulation and finally reduction of radiation exposure for both patient and surgeon. There are many ways for performing research on computer assisted surgery. Image quality, image processing methods, registration of anatomy, matching of virtual reality and real anatomy, development of tools, modification of conventional surgical techniques, levels of radiation exposure, development of virtual surgical laboratories, preoperative simulators are fields suitable to research and improvement. Computers are precise for mechanical tasks and are not suitable to variations of feelings. Surgeons are involved with clinical perception and judgment as well as using machines for supporting their activities. Behind computer assisted surgery there is the intention of join the strengths of both surgeon and machine, in order to overcome eventual human limitations (geometric tridimensional precision, tireless, humor instability). For one and half year I've worked at Medizinische Hochschule Hannover as a Humboldt fellow. My area of research was accuracy of computer assisted orthopedic surgery. In this way I've taken part on, at least 15 different projects. These projects involved the analysis of image quality used for navigation, comparison

of different techniques of navigation for the same surgical purpose, development of strategies for facilitating usage of equipments in operation theatre, measure of radiation exposure during surgical procedures with and without navigation, development of tools for supporting navigation and robotic usage for fracture reduction. These projects resulted on 12 publications at peer-reviewed periodicals indexed on MEDLINE. Computer assisted surgery is a relatively new field of research, with no more than twenty years. However the number of publications in the last five years has grown exponentially. New surgical techniques not foreseen in the past are now reality in many centers, as implantation of custom made prosthesis for particular bone defects in craniomaxillofacial and orthopedic surgery. By now many surgical simulators are available and we expect that the so-called learning curve of medical students and residents will no longer occur during real medical practice but in virtual reality. Computer assisted surgery is, therefore, an impressive tool that can modify how we learn and execute medical acts. Thirty years ago one could not imagine that information could be delivered worldwide at the speed that occurs today. Nowadays, everywhere is possible to find one with laptops or smartphones making connections in real time with people around the world. Computers have changed the way we live and perceive reality. They invaded our hospitals where day-by-day analogical information as patient records and images are being converted into digital files. Surgery is a field where precision and safety are more than desirable. Computers are helping surgeons to understand and perform accurate diagnosis and treatments. Definitively the future is now.

# 31. The Whirl Network: On-Line Resource on Biology, Health and Environment Information for Brazilian Northeast Universities

Paulo Paes de Andrade, Marcia de Almeida Melo, Antônio Carlos da Silva Mendes

## Rationale

The Brazilian Northeast Region has not yet found its economic aptitude, except for its large sugar cane plantations, restricted to a narrow fringe of land near the coast. An incipient production of fruits, mainly for export, and of poultry, for the local market, points toward the difficulties in establishing a profitable agriculture in the region, due to climate reasons and to the distance of its potential market. Moreover, the region has no oil, valuable minerals or a thriving industry. In this prejudicial scenario the production of knowledge and subsequent implantation of industries producing highly valued goods could be the new path to overcome poverty and unemployment. To reach this goal the region has a expressive set of large federal universities, some of the with region *campi* and a assemblage of smaller, usually private universities. However, these smaller teaching institutions, with poor libraries, are isolated and its professors lack an effective interaction with their colleagues at the larger universities. As the most clear consequence, the teaching quality is rather low.

The isolation and the lack of libraries push professors to an increasing dependence on internet information and on other non reliable sources. In this search for information there is not an appropriate guidance from more skilled professors. Therefore, the teaching themes are frequently distorted and permeated by trash information coming from these unreliable sources. This is specially acute when the professor tries to innovate and to jump out of the regular subjects enlisted in didactic books.

Contents innovation is a critical issue in biology and, within this area, in genetics and biotechnology. Answer to many questions are frequently polarized due to ideological bias, without any concern to their fundamental scientific basis.

A support facility designed to help the isolated professors must take in account the low frequency of real meetings with large universities peers. The use

of internet resources, therefore, is wholly justified and may represent the most efficient and cost effective way to keep a constant information flux, simultaneously reducing the need for personal contacts. This is the aim of the present work.

## Website format and aims

Our proposal is not the construction of yet another distance learning website. Truly, there are many similar websites managed by large Brazilian universities, which are directly helping an increasing number of students within and outside the main *campi*. The Whirl Network, in contrast, is an interactive website and directed to professors as its main clients. One could still argue that such websites also exist, what is partially true. They are, however, paid services with a clear commercial objective. Moreover, the specialists attending the user demand are usually a small set of people. Moreover, peer-to-peers services are restricted and no publications come up from the information bulk generated. Again, the Whirl Network sharply contrasts, as it is a free service, with special emphasis on peer-to-peer services. It also envisages the periodical publication of data generated within the network, which will serve as an updated source of themes for classrooms. Its sustainability, as a non-profit service, will depend on its media visibility.

The website is divided in a framework of actions aimed at the isolated professor. Both clients and specialists, will have to register to gain full access to the website services. Specialists will be selected from volunteers, enlisted by special public calls or by personal indication. The website will offer many of the Moodle distance learning applications, keeping however its emphasis on the professor assistance.

## The basic actions are as follows:

**Text Trampoline** – A webpage aimed at the posting of texts related to learning, education and sciences (with the special focus of this network). It will also present comments and suggestions of new themes. Every two weeks a new text will be elected as the main study subject.

**Ask me now!** – A webpage to target questions and answers to specialists and users (professors). Some questions may remain initially confidential and be later released (with the corresponding answers) to the public, without a user identification. Others may enter the public area immediately, depending on the moderator decision.

**How did I do it?** – A webpage for experiments, success and frustrations, updated every month. For further discussion, questions can be posted to the

specialist responsible for the experiment. Questions and answers may be posted back on the webpage.

**Can you solve this quiz?** – A webpage with monthly updated challenges. The users can also suggest new challenges to the moderator.

**Face to face with the World** – The webpage will present themes for discussion and will operate in close similarity to a blog. Themes will be renewed every month and will be taken from burning issues on genetics, biotechnology, environment and health.

**And so it was** – A webpage with postings commenting on past activities, containing pictures, movies, text and papers related do early educational practices. It will be a space for an interactive thinking on learning practices, successes and failures.

**Maktub!** – Periodical publication (every one or two years) containing 50 most discussed texts form the Text Trampolin webpages, both in printed and in pdf format.

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# 32. Documental Research in Literature: Legitimation and Validation in the Social and Academic *Diskurs*

Paulo Astor Soethe

This paper comments the function and value of the documental research in literary archives to the understanding of Literature and the Literary Studies as relevant discursive voices in the multidisciplinary scientific community. The paper dialogues with the philosophy of Karl-Otto Apel, which states that the building of meanings and truth results from several assumed positions in a established communicative space, and discusses the relation between natural and human sciences as well as the importance of the aesthetic dimension of language in this socio-philosophical and epistemological field. Literary scholars as Ottmar Ette mean that literary texts contain a reserve of knowledge and can contribute to current discussions and reflections in central fields as Life-Sciences. Problematic in the reception of scientific studies about Literature is the understading of this artistical activity as a production of merely fictitious objects for entertainment. Indeed writers create objects of art, but in this way they participate in serious discussions through a specialy form of text (mimetic, aesthetic and fictional), and with them they take a stand on themes and questions of their epoch, that can be also received and validated in other times and contexts. Therefore writers make the language and the dynamics of communication their most important subject of discussion, but they don't relinquish the possibility of an own contribution to the debates – even in the scientific sphere.

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# 33. Lattice Qcd: Simulating Quarks on a Computer

Tereza Mendes

One of the challenges of the so-called Standard Model of Particle Physics is to explain the peculiar behavior of quarks, the elementary particles that make up the protons and neutrons in the atomic nucleus.

Among these peculiar properties is the fact that the total mass of quarks in a proton (or neutron) can account for only 1% of the proton mass, meaning that 99% of the mass of the visible universe is not due to masses of its constituent elementary particles, the quarks, but to effects of the interaction among them. Even more intriguing is the fact that this interaction, known as the strong force, does not decrease if the distance between quarks is increased. As a result, it is believed that quarks cannot be separated from each other, and an isolated quark has never been observed. This is the property of quark confinement, which determines that the strong interaction is completely different from the electric force that binds electrons to the nucleus.

These and other phenomena are expected to be fully described in the Standard Model by the quantum field theory of the strong interaction, called Quantum Chromodynamics, or QCD. However, even though precise calculations by usual field-theory methods can be made for QCD in the limit of very high energies (a discovery that was awarded the 2004 Nobel Prize in Physics), these methods fail when applied to QCD at the (lower) energies involved in the description of the phenomena mentioned above. A completely different approach, proposed by K. Wilson in 1974 [1], is to formulate the theory on a space-time lattice, where quarks can only exist on lattice points and the interaction is suitably defined along the links between points. In this approach, known as Lattice QCD, the problem with the energy scale is avoided; the theory is translated into a classical statistical mechanical model, and the desired quantities may in principle be calculated by known methods for such a system in thermal equilibrium. Using this formulation and a technique similar to a high-temperature expansion, Wilson could demonstrate the property of quark confinement directly from the theory, but only in the limit where lattice spacings are large, i.e. far from the physical limit.

It was soon realized that a suitable statistical mechanical technique in this study is Numerical Simulation by the so-called Monte Carlo method.

In the simulation, one follows a time evolution (implemented according to prescribed statistical rules) of the lattice system on a computer, and takes “measurements” of the desired quantities, which are then analyzed with usual methods of experimental data analysis. The approach may thus be thought of as a “theoretical” experiment, since these measurements are actually theoretical calculations. In this way one can consider the theory on finer lattices and the physical (continuum) limit may be approached, but at a very high computational cost. This motivated the design and construction of new machines for use in the field, combined with intensive development of more efficient simulation algorithms and formulation methods [2]. These resources and techniques are finally available today.

Lattice QCD simulations have recently produced very precise calculations for the mass of the proton and other particles composed of light quarks [3], in complete agreement with experiment. The approach is also used to understand the mechanism responsible for quark confinement, a problem that remains unsolved. At the same time, lattice simulations of heavy quarks are increasingly important, since they may help unveil the structure behind flavor changes of quarks (i.e. changes between different kinds of quarks) in the Standard Model. This structure is encoded in the so-called Cabibbo-Kobayashi-Maskawa (CKM) matrix, for whose proposal Kobayashi and Maskawa won the 2008 Nobel Prize in Physics. Precise knowledge of this matrix can establish if results from current and future experiments in particle accelerators (such as the LHC) are compatible with the predictions of the Standard Model or if they show evidence for New Physics, i.e. Physics beyond the Standard Model.

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# 34. Nanostructuring Films and Interfaces For Nano - Photonics and Electronics

F. Kremer, F. P. Luce, Z. Fabrim, S. Reboh, F. S. Silva, T. Engel, F.C. Zawislak, D. Babonneau, Paulo Fernando Papaleo Fichtner

In this contribution we report on the formation of nanocrystals (NCs) in thin films and interfaces via ion beam synthesis. The samples are investigated using Transmission Electron Microscopy (TEM), Rutherford Backscattering Spectrometry (RBS), Photo Luminescence Measurements (PL) and Grazing Incidence X-ray Scattering in order to provide atomic arrangements and structure, depth and size distribution of the NCs.

In contrast with the usual observations of the decrease of the melting point  $T_m$  with the decrease of the NC size, for very small clusters we demonstrate an increase in  $T_m$  of 300%. In addition, this specific thermal behavior allows the development of a self-ordering process where a inhomogeneous 3-D distribution of small NCs evolves to a homogeneous and relatively ordered 2-D arrangement of larger NCs located at SiO<sub>2</sub>/Si or SiO<sub>2</sub>/Si<sub>3</sub>N<sub>4</sub> interfaces.

The results obtained are discussed on the basis of new paradigms for the thermal stability of NC systems, and correlated with potential applications including single electron microelectronic devices, flash memories and plasmonic wave guides.



# Part Two:

## Not-Humboldtians Lectures

### Guests Research Lectures

Coordinator: Marcelo Campos Moraes Amato

### Juniors Research Lectures

Coordinator: Fernando Campos Moraes Amato



# 1. Pediatric Neurosurgery: in Pursuit Of Excellence

Ricardo Santos de Oliveira, Marcelo Campos Moraes Amato, Hélio Rubens Machado

The new millennium beckons for novel advances in the diagnosis and treatment of pediatric neurosurgical conditions. Almost every aspect of pediatric neurosurgery has changed over the last decade. Undoubtedly with the application of knowledge in molecular biology to human disease many aspects of neurosurgery, especially neuro-oncology and the field of neuro developmental anomalies, will change appreciably over the next decade. The neural tube anomalies have decrease after the introduction of acid folic supplement in many countries around the world. Overall, the trend in surgery in general and neurosurgery in particular is toward less invasive procedures and possibly non-surgical interventions.

The field of hydrocephalus treatment has continued to evolve. The publication of a randomized prospective trial looking at various shunt valve designs showed that there are no differences in outcome between them in regard to numbers of subsequent treatments required, complications, and infections. The third ventriculostomy has enjoyed a significant recurrence in popularity following the advances in neuroendoscopy. It is quickly becoming the initial procedure of choice for select cases of obstructive hydrocephalus. For the epilepsy surgery and neuro-oncology the progress in image-guided neurosurgery, and specifically in computer-assisted frameless navigation techniques and the application of robotic systems, has brought many changes in the way we approach and treat pathologies involving the adult and pediatric central nervous system.

In despite of new technologies, pediatric neurotrauma remains a significant cause of morbidity and mortality. Head injury remains the single largest cause of death amongst the pediatric population. The mainstay of treatment for these patients is the prevention of secondary neurological injury.

More recently, with the advent of treatment strategies developed from experimental work with stem and progenitor cells, there is hope that the final goal of reconstructing neuronal pathways may be achieved. The goals of this field can be summarized as replacement, release, and regeneration. That is, dead neurons have to be replaced, the grafts have to be able to release neurotransmitters, and circuits have to be rebuilt. Of course, these goals can be fulfilled only if scientists' understanding of the mechanisms of disease keeps up with the pace of development of new bioengineering strategies. Currently grafts

from fetal tissue, tumor lines and stem cells have been transplanted. Successes in animal models have led to transplant trials in the human population to treat Parkinson's disease, Huntington's disease, spinal cord injury and stroke. As research on animal models progresses, transplant trials may be initiated for the treatment of multiple sclerosis, traumatic brain injury, cerebral palsy, ALS, Alzheimer's disease, and other disorders. As technology advances, so will our ability to treat patients more effectively, with fewer complications. If current trends continue, our treatment armamentarium will evolve to include less invasive, less morbid and hopefully more effective, possibly curative, therapies from minimally invasive endoscopic procedures to gene therapy.

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## 2. Abdominoplasty in Perspective

Fabio Nahas

Aspects of the diagnosis and treatment of the abdominal wall deformities and the prevention of the complications of abdominoplasty are the main points to be addressed in this summary.

The diagnosis will depend on the excess skin, fat and musculoaponeurotic deformities. An objective classification for abdominoplasty based on subcutaneous and skin deformities is described<sup>1</sup>. Type 0 patients are those who present excess fat with very little excess skin or without surplus skin, on which liposuction is indicated. Types I, II, III are patients that demonstrate various degrees of excess skin and three basic patterns of skin resection are described. Type I patients present mild excess skin with a high positioned umbilicus. Type II patients are those with mild excess skin and a well positioned umbilicus as well as patients with moderate excess skin. Type III patients present severe excessive skin. A specific skin removal is indicated for each group. Another classification based on musculo-aponeurotic deformities is described<sup>2</sup>. Type A display rectus diastasis secondary to pregnancy and plication of the anterior rectus sheath is indicated. Type B patients present laxity of the lateral and inferior areas of the abdominal wall after approximation of the anterior *recti* sheaths. An “L” shaped plication of the external oblique aponeurosis is performed in addition to the correction of rectus diastasis. Type C patients are those whose *recti* muscles are laterally inserted on the costal margins. Release and undermining of the *recti* muscles from their posterior sheath and advancement of these muscles, attached to the anterior sheath, is the procedure of choice in these cases. Type D patients display a poor waistline definition; external oblique muscle rotation associated with plication of the anterior rectus sheath is the procedure used to correct this deformity. Each one of these techniques is supported by previous researches of the author<sup>3,4,5</sup>.

Prevention of complications such as recurrence of rectus diastasis, seroma and loss of skin sensibility can be achieved using specific surgical techniques. The advancement of the *recti* muscles as opposed to the simple plication of the anterior rectus sheath may be indicated in patients that present a lateral congenital insertion of the *recti* muscles in the costal grid. This deformity is usually diagnosed in the intraoperative and prevents recurrence of the diastasis as show in our previous study<sup>6</sup>. The use of quilting sutures prevents seroma formation, as demonstrated in our study of 23 patients with high risk to develop this complication<sup>7</sup>. This technique also distributes evenly the tension on the skin edges. These sutures decrease dead space and avoid the shearing forces

caused by the natural movement between the abdominal flap and the musculo-aponeurotic layer. Skin sensibility after abdominoplasty was also measured when two different techniques of correction of abdominal deformities were employed: abdominoplasty and lipoabdominoplasty<sup>8</sup>. It was found that the abdominal skin presented more sensibility in patients who were undergone lipoabdominoplasty.

In cases of associated incisional hernias, the “components separation” technique can be considered for abdominal wall reconstruction<sup>9</sup>. Two other alternative techniques of dissection of musculo-aponeurotic components for the correction of specific defects were also described by our group<sup>10,11</sup>.

The quality of life, self-esteem and self-image showed the benefits achieved by the abdominoplasty after a 6-month follow-up study<sup>12</sup>.

Also, the risk of medical litigation after abdominoplasty was demonstrated by our group when the cases of the Brazilian state of Rio Grande do Sul were analyzed<sup>13</sup>.

Correction of abdominal deformities can be considered not a single operation, but a group of techniques which experienced an important development along the last few years. Most importantly, this technical progress allowed applying a specific technique for the individual deformity.

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# 3. Eco-Evo-Devo – Do We Need a New “Modern Synthesis” in Evolutionary Biology?

Klaus Hartfelder

In the Darwin year 2009 several publications asked questions alike the one posted in the title of this presentation. It is essentially a question on whether current knowledge obtained from advanced developmental biology and ecology research programs is in line with the postulates of the “Modern Synthesis” of evolutionary biology. This was a major research program that unified evolutionary biology in the 1940s by setting it on the firm foundations of population genetics based on mathematical models. The founders of the Modern Synthesis then integrated these models with contemporary knowledge from paleontology and taxonomy of extant organisms. In line with Darwinian theory, the proponents of the Modern Synthesis were unanimous in the assumption that Natural Selection is the major player in evolution, selecting from mutation-generated allelic variation within populations. Some of the biological assumptions implicit in the mathematical models were, however, soon seen to be violated, as shown by results emerging in the 1970s from biochemical genetics and subsequently by analyses of whole genomes. These indicated that many mutations could be selectively neutral. Furthermore, population genetic studies on islands (especially Hawaii) showed that effective population size can be small and, thus, genetic drift can play a major role in the genetic composition of populations. Nevertheless, speciation continued to be seen as a result of genetic differentiation of populations driven by natural selection, this resulting in reproductively isolated units (species). Whether species differed in their morphologies (phenotype) or were similar was a secondary problem, and major changes in shape were seen as a gradual accumulation of microevolutionary steps.

Practically untouched by “Modern Synthesis”, developmental genetics gradually reached maturity in the 1980s disclosing astounding similarities in the “genetic toolkit” that different groups of organisms use to build widely divergent body plans from simple structures, the eggs. The dramatic changes in morphology seen in mutants of the fruit fly, *Drosophila melanogaster*, where minor mutational changes in a single gene could turn an antenna into a leg (homeotic mutant), or where a complete eye could be induced ectopically, in place of a wing, caused a major impact in biological thinking, even more

so because in some of these experiments the fly's genes could be substituted by their equivalents (homologs) from other organisms, e.g. the mouse. These findings essentially led to the surge of a research program called *evolutionary developmental biology*, or tenderly just "evo-devo". The fact that minor mutations within the coding regions of a gene, or even mutations within the regulatory regions of a small number of genes, could have such major phenotypic effects was seen as evidence that similar mutational changes, in the past, could have driven the divergence of the body plans of the major groups of animals. In effect, this brings us back to the controversy of microevolution versus macroevolution, never really settled, but, in the 1940s, at least temporarily won by the Modern Synthesis proponents.

These results from developmental biology, which showed how major gene effects can dramatically affect the morphology of animal groups, soon caught the attention of ecologists working on major phenotypic variation within species, such as seasonal morphs of butterflies, exaggerated horns of dung beetles, castes of social insects, wing polymorphism in aphids and locusts, and others. In these species, morphological variation can either have a genetic basis, or even be simply driven by environmental parameters, such as temperature, photoperiod, nutrition or population density. This means that environmental effects acting on gene regulatory networks within a single genotype can generate major phenotypic differences within a species and, consequently, there now are strong voices calling for a need for a new research program on unifying principles in evolutionary biology. Tenderly calling this new field "eco-evo-devo" would, however, not be of much use if its three legs continued to march merely in parallel.

Clearly, I would be overestimating my insights and sound foolish if promising to provide unifying principles at this workshop, but reviewing the essentials of the Modern Synthesis and, especially trying to grasp as to what is the meaning of micro- and macroevolution in terms of functional genomics in a population context may be a step towards this goal.

# 4. Basilar Tip Aneurysms: is The Surgical Clipping The Ideal Management? Personal Series and Critical Review of the Literature

Paulo Henrique Pires Aguiar, Adriana Tahara, Alexandros Theodoros Panagopoulos, Gustavo Rassier Isolan,

## Abstract

### Objective and Importance

The approach and technique for surgical occlusion of the aneurysms from vertebrobasilar artery system are mainly based on angiographic features. Many authors emphasize that planning the surgical procedure should also include preoperative evaluation of the individual skull base configuration, as well as of the relationship between aneurysm site and surrounding bony structures. These characteristics are evaluated on thin slice CT scans using bone tissue algorithms and are particularly important for adequate exposure of distal vertebral artery (VA) or midline aneurysms, because these cases require drilling of the jugular tubercle. To be able to use lateral approaches for accessing these posterior circulation aneurysms, the neurosurgeon should be familiar with the extradural and intradural microsurgical anatomy of the foramen magnum region and may rely on at least five anatomical landmarks for orientation during surgery: 1) the dural entry of the vertebral artery; 2) the posterior condylar emissary vein; 3) the medial rim of the distal sigmoid sinus; 4) the hypoglossal canal; 5) the jugular tubercle. To increase the safety of the procedure, the authors recommend an individualized tailoring of the surgical approach according to the variable morphological situation of each patient.

The authors presented their series concerning to basilar tip aneurysms and present a critical review of the main approaches to basilar aneurysms; adjuvant options are also discussed.

### Material and Methods

Eight patients harboring of basilar tip aneurysms submitted a surgical clipping are analyzed in this paper. They were surgically treated from June 1995 to

December 2008 in a poll of 15 posterior circulation aneurysms and 121 anterior circulation aneurysms in 110 patients treated personally by the main author.

The average age was 55.5 year old (ranged from 19 years old to 68 years old) and seven patients were female. Five patients have arterial blood hypertension, five were smokers, no familial history of subarachnoid hemorrhage or brain aneurysms, 2 patients have Diabetes and 1 with Diabetes and Beceht disease, 1 patient drug abuser. of cocaine. Four presented subarachnoid hemorrhage and 4 were diagnosed incidentally during neurological investigation for chronic cephalalgia.

## Results

Four patients were approached by temporo polar access, and 2 by pterional approach 1 by subtemporal and 1 by presigmoid approach (lower basilar tip aneurysm). The eldest patient died on the fourth post operative day after 12 days of SAH, and 1 patient was discharged in the 30<sup>th</sup> postoperative day with severe sequelae. All patients with aneurysms diagnosed incidentally were alive without morbidity.

## Conclusion

There is a strong tendency in the literature to picture surgery for aneurysms as an outdated method, and some enthusiasts state that it will be dead in few years, however, the technology of new methods of brain protection, new surgical techniques and clips are indispensable for angry brain in aneurysms after SAH. Will endovascular procedures treat hydrocephalus? Will endovascular procedures remove the clots from cisterns to avoid vasospasm or even fenestrate the terminalis lamina to the same purpose? Therefore, which endovascular procedure will guarantee the occlusion of the aneurysmal necks in a long follow up even with the new techniques of endovascular treatment?. The neurosurgeon has to be able to dominate the two options of treatment and be able to differentiate the exact indications

# 5. Normal Limits of the Ecg

Augusto Uchida

Electrocardiogram (ECG) is an expression of the electrical activity of the heart over time captured and externally recorded by skin electrodes.

ECG is the best way to measure and diagnose abnormal rhythms of the heart particularly abnormal rhythms caused by damage to the conductive tissue that carries electrical signals but, it cannot reliably measure the pumping ability of the heart.

In electrocardiography, the word lead refers to the signals transmitted and received between two electrodes. In standard ECG, there are 12 leads in total, each recording the electrical activity of the heart from a different perspective, which also correlate to different anatomical areas of the heart for the purpose of identifying acute myocardial infarction.

ECG interpretation requires knowledge of normal limits, which in infants and children are strongly age-dependent. Diagnostic ECG criteria are dependent on the availability of appropriate normal limits and normal standards have been published for many population groups in several studies.

The differences in recording devices, such as sampling rate and frequency response can impact the waveform amplitudes. Aside from the technical factors, amplitude differences in normal limits may be associated with the demographic differences, particularly in body weight.

The key to ECG interpretation is pattern recognition, and ECGs can be as variable as fingerprints to a trained observer. Patterns may be appreciated and computational analysis may illuminate the process of heterogeneity detection and to augment the clinical evidence supporting the validity of ECG heterogeneity as a predictor of cardiac arrhythmias.

Physicians of all specialties and levels of training, as well as computer software for interpreting ECGs, frequently made errors in interpreting ECGs when compared to expert electrocardiographers and misinterpretation of the ECG can lead to inappropriate diagnoses and clinical decisions.

Interpretation of ECGs varies greatly, even among expert electrocardiographers. Noncardiologists seem to be more influenced by patient history in interpreting ECGs than are cardiologists. Cardiologists also perform better than other specialists on standardized ECG examinations when minimal patient history is provided. Additional experience or training in ECG interpretation when the patient's clinical condition is unknown may be useful to minimize misinterpretations.

## 6. Hormone Replacement Therapy: does Aging Limit Therapeutic Benefits?

Ceci Mendes Carvalho Lopes

Menopause is a physiologic event, present in normal lives of women. Sometimes, it is uneventful, but sometimes there are many discomforts, symptoms and metabolic alterations following it. Seeking to obtain welfare, women ask for treatment.

The first and best recommendations are to observe nutritional care, exercise and mental hygiene. But sometimes it is necessary to prescribe medicines. Because its main characteristic is a very low estrogen dosage, the obvious idea about treatment is to replace this hormone. But, if the woman has an intact uterus, it is necessary to give her some progestogen, also, to protect endometrium, avoiding endometrial hyperplasia and even endometrial cancer.

Hormonal therapy promotes a better quality of life, diminishing climacteric symptoms, specially hot sweats, but also acting positively on lipids, bone mass, skin, etc. Nevertheless, there are some questions about adverse effects as breast pain, thromboembolism, cancer, and other. They must be considered, aiming health and welfare of each patient.

The randomized placebo-controlled Heart and Estrogen/progestin Replacement Studies (HERS-1 and HERS-2) and Women's Health Initiative (WHI) failed to show the main objective of prevention of cardiovascular disease of postmenopausal women under HRT. And showed risk of breast cancer, as well as thromboembolic problems, but less colon cancer and osteoporosis. These studies were reviewed and several biases were discussed. Cardioprotection is indeed a controversial theme, yet, but there are indications that early prescriptions, in the first years of postmenopause, are beneficial. Unquestionably, hormonal therapy is the best choice for vasomotor symptoms, prevent genitourinary atrophy and osteoporosis development, and preserves skin appearance.

The duration of this treatment is a permanent question. The idea is to use the minimum dose, for the minimum time it is necessary. But to establish this minimum time, sometimes, is very difficult, because, if the medication is suppressed, the patient returns with the same symptoms, and re-starts the metabolic alterations.

The studies mentioned above used conjugated equine estrogens and medroxyprogesterone. The first doubt to solve is: changing the estrogen, or the progestogen, the therapeutic answer will be different? It seems the answer is yes! But there are not, at the moment, long-term studies with new schemes. There are some evidences that medroxyprogesterone, in HERS and WHI trials, used to prevent estrogen-induced endometrial hyperplasia, also attenuates beneficial estrogen actions on the coronary circulation and atherosclerosis, and also promoted increase in breast cancer.

Other estrogens, specially 17- $\beta$ -estradiol (because it is natural, or physiologic), and other progestins could be better. So, it is evident that depending on whether they are progesterone or 19-nortestosterone derivatives, progestins differ in their potency and their ability to exert an estrogenic, antiestrogenic or androgenic effect. Here were described unique characteristics in drospirenone, an analogue of espironolactone, or didrogestosterone, a retroprogesterone. The choice of the progestin cause different results over important features, as blood pressure. Hypertention represents a major risk for cardiovascular disease, and often it is inadequately treated. Hormonal treatment may act on aldosterone metabolism. The use of drospirenone, trimegestone or didrogestosterone may promote benefits on hypertensive women, even reducing blood pressure. Estrogens by non-oral administration would be better to hypertensive patients, because avoiding passing through the liver first of going to the rest of circulation, do not stimulate the same way the aldosterone-renin-angiotensin system.

Other questions, as lipid metabolism (better with hormonal treatment), coagulation (controversial, but if the estrogen chosen is estradiol, the natural estrogen, it seems the risk is alike the risk during reproductive years), skin aspect (acne, hirsutism), or weight gain (sometimes diminishing weight), breast pain, headache, and genital bleeding, must be considered and studied individually.

Indeed, hormonal treatment promotes a best quality of life. There are other therapeutic schemes, without hormones, but sometimes they need two or more different medications, each one for treat a different problem. Or the treatments are unsatisfactory because do not promote the desired relief.

So, each patient is unique, and must be considered individually. The therapeutic scheme, and the duration of it, must be decided one by one, aiming the best for each one. And, if the treatment is beneficial, the time it will be a good choice is undefined.

# 7. Advances and Perspectives in Vascular Surgery and Endovascular Therapy

Ibrahim Akin, Stephan Kische, Hüseyin Ince

Diseases of the thoracic aorta remain among the most lethal and difficult to treat conditions. Endovascular repair of thoracic aortic pathology is emerging as the preferred treatment strategy in certain patients, as increasing data suggest that endovascular repair may be performed with lower peri-operative morbidity and mortality rates and similar midterm survival, when compared with standard open repair. However, because of anatomic constraints related to required endograft seal zones, a significant number of patients are excluded from standard endovascular repair. Hybrid techniques, including open aortic arch and thoracoabdominal debranching procedures, have been described to allow creation of proximal and/or distal landing zones for the stent graft seal. Hybrid techniques may be performed with lower rates of morbidity and mortality than conventional open repair, and they appear to be a safe alternative to open repair for thoracoabdominal and aortic arch aneurysms in properly selected patients with significant comorbidity or prior open aortic surgery. My talk will touch considerations relevant to thoracic endografting, with an emphasis on hybrid procedures used to treat more complex thoracic aortic pathology.

The second part of my talk will focus on advances in aortic stenosis. With improved life expectancy, the incidence of aortic stenosis is rising. However, up to one-third of patients who require lifesaving surgical aortic valve replacement are denied surgery due to a high operative mortality rate. Such patients can only be treated with medical therapy or percutaneous aortic valvuloplasty, neither of which has been shown to improve mortality. With advances in interventional cardiology, transcatheter methods have been developed for aortic valve replacement. Clinical trials are investigating these devices in patients with severe aortic stenosis that have been denied surgery. Preliminary results from these trials suggest that transcatheter aortic valve replacement is not only feasible, but an effective way to improve symptoms. My talk will describe the current technology and display available outcome data.

## 8. The German House of Science and Innovation São Paulo

Bertram Heinze

In 2009 the **German Foreign Ministry** and the **Federal Ministry of Education and Research of Germany** started an initiative to establish German Houses of Science and Innovation in five strategic partner countries worldwide. The German Houses of Science and Innovation are part of the Science and Internationalization policies of the two ministries. The German Houses of Science and Innovation shall guarantee the collaborative appearance of the German Science and Research Institutions abroad, in order to jointly inform about Germany as an excellent and highly competitive partner for science and innovation.

The **German research and science-funding organizations** together with selected **German Chambers of Commerce and Industry** are responsible for the foundation of the five Houses. The Houses are located in Tokyo, New Delhi, Moscow, New York and São Paulo. The Houses should increase the visibility of the German science landscape abroad and create synergies and exchange between German and foreign scientific institutions around the world.

The German House of Science and Innovation in São Paulo celebrated its kick-off in March 2009 in the presence of the Federal Minister of Research and Education, Prof. Dr. Annette Schavan, during the Ecogerma 2009 – a major exhibition and congress on sustainable technologies from Germany in São Paulo. The foundation of The German House of Science and Innovation is coordinated by the German Chamber of Industry and Commerce in Brazil (AHK Brazil). Being close to the AHK helps to open up Brazil's **potential for innovation for all German research institutions and companies** at the biggest German business hub outside of Germany – São Paulo.

Next to a strongly growing economy, the scientific publication rates and numbers of students, masters and PhD-students increased during the last decades. Based on this sustainable development the **importance of Brazil in the world market of science and innovation** will increase considerably in the coming years.

The German House of Science and Innovation São Paulo offers: **information – network – service – innovation** for German and Brazilian partners. This includes distribute existing information about funding instruments and scientific institutions in Germany, organization of delegation trips, symposia or workshops, matchmaking of scientists and innovative entrepreneurs, support and services for the efficient management of bi-lateral scientific projects.

## 9. Evolution of Vascular Substitutes

Bonno van Bellen

One of the most astonishing chapters in human surgical history is the development of methods to restore arterial blood flow through the greater vessels of the body. Vessel transplantation started with Alexis Carrel, a French surgeon who performed vessel and organ transplantation in dogs. He found that the best thread to suture the vessels was silk, discovered thousand of years ago in China. In the early years of the 1900's he decided to live in. In 1904 he started to work at the University of Chicago where he obtained the Nobel Prize for Medicine and Physiology in 1912. Although his work settled the fundamental techniques of vascular surgery, it was almost abandoned because of two crucial facts: first, there was no way to visualize the arterial occlusive disease in the living person; second blood has a persistent tendency to clot when temporarily impeded to flow. Röntgen discovered his rays in 1895 and in few years hospitals around the world were equipped with xRay for diagnostic use in humans. Roentgen got the Nobel Prize in Physics in 1901. Another step had to be made to mix a contrast media to flowing blood in order to visualize the ongoing disease of arterial blood vessels. This happened in 1943 when Egas Moniz, in Lisbon, Portugal, was the first to inject an artery under an x-ray beam and saw how blood did flow inside the brain. Reynaldo dos Santos, using this technique, diagnosed occlusive disease of a renal artery due to deposition of cholesterol. After these enormous steps in medical science, the doors were opened and better knowledge of the atherosclerotic occlusive disease brought with it the intention to replace diseased vessels by healthy ones. Heparin, the needed anticoagulant, necessary to avoid clotting of the blood during surgery was discovered in 1916 by Jay McLean, a medical student, and his teacher William Howell, at the John Hopkins. Human use became only possible in 1935. So, Carrel's teachings were unraveled and the first attempts to replace a diseased aorta with a specimen obtained from a formerly healthy individual, were a spectacular success. But only for a few weeks, however. The immunologic issues played a devastating role by rejecting of the transplanted aorta and, consequently, the death of the patient. This happened in the late 1940's. Almost 35 years after Carrel. Attempts with glass and metal tubes were made, but no success was obtained. Dr A.B.Voorhees observed that a silk suture inside the cardiac chamber of a dog became covered with a very thin layer of host cells, as to integrating it with the body. World War II brought a variety of new, synthetic, filaments used in parachutes and in war devices, as Vynion and Nylon. And there was no need for very much creativity to hand making a tubular structure to replace an artery. So, in 1951

Dr. C. Dubost, a French surgeon, as Carrel, announced the first replacement of the aorta by an artificial artery. This artery was soon replaced by a knitted or woven tube of Dacron, another artificial tissue developed for use in military equipment and garments. Knitting or weaving made quite of a difference in host cell behavior: the woven tissue allowed less blood to pass through it. So the operation was less prone to big blood losses. On the other hand, the cells of the host did cover the fibrous content of the tissue very precariously leading to a bad integration of the graft. The knitted tube, although more prone to bleeding, had a better integration since the cells of the body could enter the interstices and integrate the graft much better. The knitted graft was also easier to suture. So, techniques were developed to hold the pores open and make it less hemorrhagic: first impregnation of the patients own blood and later absorbable polysaccharides turned the knitted graft the universal substitute for occluded or aneurysmal great vessels. In the beginning, although the tube did good work, it used to kink when not aligned. An ingenious crimping technique was developed to avoid the kinking problem. Although Dacron tubes behaved very well as a substitute for the aorta and iliac arteries, they used to clot down when used to by-pass an obstructed femoral artery. Mr Gore invented an expanded form of polytetrafluorethylene. This is a superb isolative garment for extreme temperatures and can be used as garments or as isolating tissue for tents. It is very often used in the army and for polar expedition. Dr. C.D. Campbell took advantage of its microporous structure, made a small tube of it and used it as a vascular substitute in smaller arteries, publishing his first results in 1976. All these technological advances in arterial grafting were put together with nitinol or steel to develop the intra-arterial grafts amenable to be delivered in a diseased artery to treat aneurismal disease by intravascular procedures, a procedure developed by Juan Parodi in 1990.

Four thousand years and least three Nobel Prizes participated in the development of arterial substitutes, as a demonstration that nothing goes by itself and depends on the intersection of human mental power!

# 10. Plastic Surgery in the New World

“The youth of America is their oldest tradition. it is going on for more than 300 years.”

Oscar Wilde

Something that really intrigues people is the amount of Aesthetic Plastic Surgery performed in the New World. To understand it we shall analyze our Culture. In spite of being colonized by Europeans, Immigrants (either pilgrim or banished) usually arrive with a sense of rebirth, leaving the past in their original countries, beginning a new life. A new beginning even at 40 or 50, will maintain the sense of rebirth, restlessness, the need to accomplish, produce, explore and several other characteristics of a young adult or adolescent. “Just do it”, “Plug and Play”, “Keep walking”, etc are good examples of our way of being, and we should look young and healthy to achieve success. In spite of being more than 500 years old, we can be considered quite young when compared to Europe, therefore as well described by Clotaire Rapaille in his *The Cultural Code*, an Adolescent Culture. What can be more unpleasant for an “adolescent” than the Ageing Process, the perception of a nose, ear or breast out of the current Aesthetics???

## Aesthetics

The most important philosophers in the Western World tried unsuccessfully to define Aesthetics. We should not be naïve, and simply refer to Aesthetics as the “Science of Beauty”. Aristotle divided Aesthetics in what is in Harmony and what is in Disharmony. Afterwards he subdivided Harmony in Gracious, Beautiful, Sublime and Tragic. On the other hand Disharmony was subdivided in Laughable, Ugliness, Horrible, and finally what was Comic. Kant was more comprehensive and divided Aesthetics in Beauty and Sublime, leaving to the observer the definition of what was pleasant to him. Or as we may say: “Beauty lies in the eye of the beholder”. Roughly other Philosophers resumed Aesthetics in “The sensation or feeling that something (Art- Nature) or someone causes in the observer” which sounds more realistic and practical.

## The Deformity

The comprehension of a deformity includes several categories of data such as familial, social, Cultural, and an adequate evaluation of each one. All levels of data

should be carefully interpreted since a deformity affects the individual, the group, and the behavior of the group will influence the final behavior of the individual. When something is not Harmonious to the observer (ugly) it maybe associated to evilness, as we often see in Classic Childhood Literature where most villains are sinister see Captain Hook, Captain Ahab, Long John Silver for instance, to understand the idea. Prejudice begins at schools when the child around 4 years old starts to form his self image, noticing that he has a different ear for example and his colleagues remind him of that. Then it rests until 10 years old time in which parents think the problem was gone. From 5 to 10 years of age children are focused in discover skills and performance. When puberty begins they are not able to verbalize precisely his feelings about his deformity and tend to isolation and maybe depression. Girls with prominent ears do not like to jump in the swimming pool because wet hairs cannot disguise the ears as well as boys with gynecomastia do not change in front of the colleagues or always use a loose T-shirt to hide his nipples.

## The Surgery

Gaspare Tagliacozzi in Bologna 1597 stated that the purpose of Plastic Surgery was not to please the eyes of the observer, but “to buoy up the spirits and help the mind of the afflicted.” This may sound vaguely nowadays because afflictions may vary from subject to subject and it varies to the observer from “you do not need any surgery, you look perfect to me, down to “nobody is doing anything to help this poor soul.” Unfortunately what we are seeing in America and Brazil is what Max Horkheimer in his “The Eclipse of Reason”, calls the Alienated Consumption, when the Desire for the New (neophylia) impels people to buy things that they don’t really need, after all Consumption is the basis of Capitalism. That is fine for a pair of shoes, dresses, laptops, even cars. You can always trade or sell them. Increase your lips or breasts just because your neighbour did or a face-lift because the hair dresser said that a costumer that you know did and looks great after a couple of weeks (but he will not tell you her name), is at least dangerous. Surgeons cannot undo their operations neither the resultant scars. Worst of all, we leave permanent scars in surgeries that offer temporary results. What happens when patients are not satisfied or want a “little bit more or a little bit bigger”??? In Brazil we do not have a nickname for overdone Plastic Surgery but in America they call them Beauty Junkies or Frankenstein Barbies.

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# 11. Historical Novel of Fantastic Realism

Horst Domdey

Uwe Tellkamp's novel *The Tower* (2008 by Suhrkamp) is about life in the last eight years of the GDR. The plot opens in 1982 and closes on October the seventh 1989, the date of the national celebration of the fortieth anniversary of the GDR, giving us a hint at the upcoming fall of the wall. It is a historical novel in which Tellkamp combines realistic and fantastic depiction. Especially the diary entries of the central figure *Meno*, an editor in a publishing house, definitely have a fantastic quality: the torpor of the political system is described using the metaphors *thornhedge*, *sleep* and *standstill* of time – conjuring up a castle-world (*Kastalia*), an allusion to the Sleeping Beauty-motif; the decline of Soviet Union and the GDR become a apparition of an *Atlantis*-realm sinking in a *maelstrom* and the sea, and the escape from submission is pictured as a metamorphosis: the imago tears the cocoon. These symbols do not merely repeat the real world in a figurative manner, they work in combination with the reality as a inseparable literary unit. In *Meno's* entries the GDR is really is an island that goes under.

The novel is not written from the point of view of the civil rights activist. The range of the development of the figures is therefore a lot wider. Despite being a scepticist *Meno* remains the observant intellectual, whereas the youthful protagonist *Christian* is even willing to sign up for three years military service (1983) in order to have the chance to study medicine. Both protagonists use calculated opportunism as a means of getting by. However their alienation with the political system grows with each conflict they have with the establishment. Living in an exclusive district of Dresden located above the banks of the river Elbe as if in an ivory tower (the *tower*), their family and culture are the field of force for the development of idiosyncrasy. The novel discusses the ambiguity this niche holds. The *sweet poison* of tradition, music and art works like a narcotic, assisting escapism.

Tellkamp's fantastic realism describes on the level of the plot the spontaneous, often subtle steps of emancipation leading towards the ultimate rebellion. His imaginative genius expresses the extensive feelings: anger at the arrogance of a functionary caste, sarcasm about the destruction of the country's environment, bitterness about the *lost time* – and the amazement at a part of German history in which there is a revolution that has a successful outcome.

# 12. The Endovascular Therapy Impact in Coronary Disease

Eulógio E. Martinez

Percutaneous coronary intervention is rapidly becoming the first choice for myocardial revascularization in all forms of presentation of significant coronary artery disease.

In the era of drug-eluting stents the combination of high success rate and very low acute and late events prompted cardiologists and interventionalists to extend the indications of percutaneous interventions for clinical and angiographic presentations that were considered limitations to the technique just a few years ago.

Of all medical specialties, interventional cardiology is perhaps the one in which evidence-based medicine has been more extensively applied, ever since its birth when Andreas Gruntzig did the first balloon angioplasty, about 30 years ago. Strategies for the prevention of complications (stent thrombosis, restenosis, access site bleeding, acute intraprocedural ischemic episodes), or for the improvement in success rate (stents, devices for atheroablation, intracoronary ultrasound, etc.) were all carefully evaluated by well- designed trials. This explains the constant changes in pharmacological adjunct therapy and in the rate of utilization of many devices in a relatively short time span.

New challenges represented by treatment of total chronic coronary occlusions, the identification of atherosclerotic plaques with increased risk of rupture and how to deal with them, treatment of bifurcation lesions, etc, are the subject of important ongoing investigations.

Local inhibition of cell proliferation made possible by drug eluting stents resulted in dramatic reductions in the rate of new obstructions caused by exaggerated cicatricial reactions at the site of stent implantation (intra stent reestenosis). In almost all currently available pharmacological stents the antiproliferative agent is stored in a polymeric platform adherent to the metallic structure of the stent. Late stent thrombosis is a rare but dangerous complication after drug eluting stent implantation. Strategies to reduce the risk of late thrombosis have included the development of biodegradable polymers and bioabsorbable stents. These new technologies are promising for the improvement of long term safety of drug eluting stents.

# 13. Integrating Open Innovation to The Product Development Process

Fabiano Armellini, Abstract

Innovation is more and more being recognized as a fundamental source of competitive advantage to firms. Governments from all over the industrialized world work to stimulate its entrepreneurs to invest in innovation as the only form for a nation to continue competitive in the globalized scenery.

Recent shifts in the technological and economical scenery have driven some changes in the way innovation must be dealt with. Within this context, Open Innovation (OI) arises as a new research theme which proposes to explain the world's current innovation panorama and to propose how companies should behave in this new panorama. Open innovation is a "new paradigm which considers that companies can and should use internal and external ideas, and also internal and external paths to market" (Chesbrough, 2003).

Open Innovation is the term adopted by Henry Chesbrough, an American professor and researcher from the University of California in Berkeley, to explain this phenomenon, which has been the central theme of his many recent publications. His studies have motivated studies on the behalf of other researchers from all over the world, in order to check the consistency of the model proposed by Chesbrough and to analyze the applicability and/or the extensibility of its concepts to different business sectors and/or different countries from those originally used by Chesbrough in the formulation of his concepts. The rising volume and impact of such publications generated within the last few years on OI allows one to consider it an emergent research topic of relevance to both academy and industry.

This exploratory study aims to show the relation and impact of OI within the Product Development Process (PDP), which is defined as the "set of activities involving almost all departments within a company, which aims to transform the needs of market into products or services that are economically viable" (Kaminski, 2000).

In order to explain and orient PDP, some reference models were created, such as the classic product development funnel proposed by Clark and Wheelwright in 1993, which is based on the concept of a linear sequence of activities from the conception of the idea to the introduction of products in the market. A similar approach is the well-known stage-gate development model proposed by Cooper in 1998, which shows how to implement a systematic discipline of

evaluation of ideas and transformation of the best ones into products, with the transition from one phase to the next integrated to the decision process of the strategic planning.

Although this kind of models are still valid and important references, much discussion has arisen in order to check whether these models are still fulfilling the need of the Development Engineer of nowadays, due to the changes in the technological development scenery. The final goal of this research study is to propose a reference model for development of innovative products suitable for the Brazilian industry reality.

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# 14. Survey About Service Quality Measurement in Service Incubators Sited in San Paulo State

Francesco Bordignon

## Abstract

The present survey aims to evaluate the state of the art in terms of service quality measurement in San Paulo State service incubators, “service entities for service”, representing the last boundary in terms of entrepreneurship and innovation promotion strictly connected to the academic research. It examines the incubators development, maps service incubators and, based on field research, evaluates the state of the art in terms of quality evaluation and control, identifying different practices applied and resuming possible consequences. The GDP (Gross Domestic Product) growing is based on competitiveness conditions of the national production system; Governments always look for stimulating the sustainable growing of competitiveness, creating development public policy. Developing countries are changing the competitive advantage from raw materials and cheap labor plenty, to innovation. Public policy also changed, supporting strategic sectors (‘60), multinational companies (‘70), oriented to medium-sized companies and holdings, to the creation of nowadays knowledge nets in science and technology, for innovator processes and products development, focusing micro and small-sized enterprises and warranting return for the social order. Contemporarily, the investment support changes from national to regional dimension; local communities are more dynamics in sustainable development, creating industrial parks, technology poles and incubators, jointing technological and social development. Objective of this survey, based in field research, is to verify the application of service quality measurement methods in technological and mixed incubators in San Paulo State.

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# 15. Vacuum Bagging as a Rapid Way to Obtain Prototype Parts to Apply in Static Tests of Racks for Storage and Transportation of Automobile Parts

Guilherme Canuto da Silva

## Abstract

Special packages for storage and transportation are important components for the efficiency of the automobile manufacturing process. The absence of these packages in the production flow causes an impact on productivity and, in extreme cases, production waste. Like any process facility, special packages must be planned, designed, built and tested to exclusively meet the requirements of the final product for which they are developed. For this reason, prototype parts are necessary to develop the internal systems of product storage in the package. The prototypes of the outer parts of the vehicle, such as front fenders, doors, front hood and back hood are usually obtained by stamping. This work proposes the application of the vacuum bagging rapid tooling (RT) technique to build the prototype parts used in the static tests of these packages. The main result is time reduction in the development of these packages in order to meet the vehicle production deadline. For most components there was also a reduction in costs. This research was implemented in an industrial plant of a European automaker in Brazil.

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# 16. The Limits of Beauty

Juarez M. Avelar

Nowadays the intensive and competitive rhythm of our life and the importance that is attributed to people's physical appearance, demands, of each human being, constant and persistent effort, in search for improvement of the shape and silhouette of the body.

Although the concepts of beauty vary according to the period of time, besides the ethnic, social, moral and cultural aspects, they are strongly influenced by the media and they delimit physical pattern values by the society to reach a point of harmonic balance.

However, it should be emphasized that it is not acceptable to impose a beauty pattern. Each person should have the right over his/her body in order to decide about the shape and body contour, since it is not an object of the society. Such concept was expressed by Lucy Stone, an American defender of the feminine vote who in 1855 declared: "it means very little for me, to have the right to vote or to have properties, if I cannot have full control on my own body".

To concept beauty is very difficult. To impose is not admissible, since it is composed by subjective factors, and it is submerged in the aesthetic sense, that is, in the real sense of the Greek word, "aesthesia", which is perception. The Aesthetic is a branch of the Philosophy that is in charge of the beauty as well as the beautiful, especially on the way it shows, providing criteria for its valorization. This term was used for the first time by Baumgarten in 1750, as the science of the sensorial knowledge, whose objective is the beautiful. Voltaire (1693-1778) once gave up on elaborating an agreement on what is the beautiful after contemplating how relative it is. He said: "if one asks to a male frog what is the beautiful, certainly he will answer saying that it is his female, with her two round and salient big eyes, located in the small head, a wide and flat snout, with yellow belly and her hard back".

Naomi Wolf, in her book "The Beauty Myth", paraphrases this reflection when affirming: "There, where I see the beauty, may be you don't see it. My perception doesn't have any authority on yours". Therefore, to define a beauty pattern becomes an incoherent act. In Brazil, for instance, considered by the Genetic Engineering, as a country of one of the largest ethnic miscegenation of the world, no pattern would get to reflect the countless beauty types. Otherwise, Pitanguy said: "it is easier to see, to feel and to recognize the beauty than to define it". However, without intending to impose a definition, I transcribe here my opinion (Avelar, 2000) based on my sensibility and perception: Beauty is a pleasant sensation coming from the several anatomical and physiognomic information, with good balance and harmony which fulfils the demand of the

observer. Therefore each person has his/her self judgment concerning beauty. Besides, the subjectivity and its limits are peculiar for each human being since it is not possible to create beauty where it does not exist (Pope Paul VI).

Physical integrity, especially the facial appearance, contributes significantly to provide the feeling of normality and a well balanced psychic to the individual. Nevertheless a plastic surgeon, doesn't create the beauty, but he corrects the imperfect angles of the face and body contour, trying to achieve the harmony between the anatomical segments.

All aesthetic and reconstructive procedures may repair some or many abnormalities of the human body in order to achieve a good balance between the segments and the regions of the body. Otherwise cosmetic approaches may repair some superficial abnormalities of the face without surgery.

As long as the final result is in consonance with the patient's expectations it means that its self image is in harmony with his/her intimate well being, since the subjectivity and expectation are unique for each person. I wrote (Avelar, 1989) that: an adequate surgical result is a superposition of the self image (real image) with the one which can possibly be achieved by a plastic surgeon considering the subjectivity of the individual physiognomic view (imaginary image).

The limits of the beauty are established by the anatomic aspects of each person. So far the final appearance depends basically of the organic conditions and how a patient sees his/her own body. That is the infidelity which can not be transferred from one individual to another. In fact, it is not possible "to copy" any physical aspect since each human tissue is unique for each one as well as the physiognomic and psychological aspects. Besides the peculiarity of anatomical characteristics, the facial expressions are even more individual for each human being. In reality, the accomplishment of the facial movements depend on the sophisticated musculature combined with the structural modifications of the body, while the human mind is constantly worried with creativity of corporal analysis, to reproduce, in his/her own body, anatomical details common to the people of the society. That is the constant need of the physical and mental balance, in harmony with the inside of each person.

Nevertheless, the beauty of a group of people or of the whole population has no limits since the appearance of a social group is the result of the accumulation of individual information with so many varieties.

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# 17. Ethical Limits in the Assisted Human Reproduction

Juliana Lelis Spirandeli Amato

Techniques of Human Reproduction seek the treatment of couple's infertility. It is considered a medical specialty that has developed a lot in a short period of time, so there are still no sufficient laws for its regulation. Political, economic and religious aspects create unprecedented ethical discussions about the many faces of treatment.

In Brazil, the most important resolution is the CFM number 1358/92 which sets the "Informed Consent" as required for the patient and his partner, the treatment should not be used in order to choose sex, eye color and other characteristics, unless there is a risk of sex-linked disease to the child, in cases of multiple pregnancy is prohibited methods of reducing embryo; number of oocytes to be transferred shall not exceed four. Prohibited fertilization of oocytes with purposes others than procreation. Also very important is the need of couples consent if they are married or in stable relationships.

It is clinical responsibility the registering of clinical pregnancies, births, malformations and laboratory procedures performed with the gametes, as well as archive diagnostic tests performed with biological material aiming prevent diseases transmission and archive clinical data relating to phenotypic characteristics and donors sample material cell. The program of donated gametes or embryos has non profit or non commercial end, confidentiality between donor and recipient must be maintained.

Genetic and hereditary diseases can be treated or detected by the Assisted Reproduction techniques, but only for therapeutic purposes and prior consent of couple.

Famous Surrogate ("abdominal rent") is acceptable only among relatives of at most, second degree, non-commercial and special cases with permission of the "Conselho Federal de Medicina".

In 2005 the Law 11.105/05, comprehending Biosafety, has been established, generating controversy by allowing the research of embryos to the blastocyst stage. Many believed that it contradicts Article 5 of the Constitution, namely the right to life. Organizational (ONG) and Parliamentary Institutions have filed an action of unconstitutionality, which collapsed in 2008 paving the way for advances in Assisted Human Reproduction.

Many guidelines are still needed for the ethics to be preserved in human reproduction, while we do not have those guidelines, a sharp common sense is required, see controversial cases that we see at any moment in the media and in all countries.

More than policies and laws some surveillance to enforce the rules is also required.

# 18. Brazil and Renaissance: Interfaces

Leonardo Ferreira Kaltner

Brazil was colonized in sixteenth century, the modern age of European Renaissance. Officially, the date of discovery of Brazil, April 22, 1500, is a reference derived from a letter of Pero Vaz de Caminha notary of Pedro Alvarez Cabral, Portuguese navigator and captain of the expedition which discovered Brazil. However, colonization of Brazil takes root just after the year 1549, when Tomé de Souza was sent by Portuguese Crown as Governor. In the same year, the first Jesuit priests had come to Brazil or the *Novus Mundus*, i.e. the New World.

The works of Manuel da Nóbrega one of the most important Jesuit priests who lived in Brazil during Sixteenth Century reveal the importance of Catechism instruction for indians to the establishment of the colony. Moreover, in sixteenth century, Jesuits founded schools in Brazil as the Colégio da Bahia. The city of São Paulo was originally a Jesuit school founded on January 25, 1554. These schools had reproduced the humanistic education of the Real Colégio das Artes de Coimbra one of the most important Portuguese centers of studies during sixteenth century. The study of classical Latin language and literature was diffused in the New World by Jesuit priests, and José de Anchieta, a young Jesuit, wrote in Latin the first Brazilian book, the epic poem *De Gestis Mendi de Saa*.

The epic poem *De Gestis Mendi de Saa* (The facts of Mem de Sá) was published in 1563 by João Álvaro, typographic, in the city of Coimbra. The cover of this book shows a dedication of José de Anchieta to Mem de Sá, third Governor of Brazil: *Excellentissimo, singularisque fidei ac pietatis Viro Mendo de Saa, australis, seu Brasillicae Indiae Praesidi praestantissimo* (To the most excellent hero Mem de Sá, man of singular faith and piety, most estimated Governor of Brazilic India, or South India).

José de Anchieta was the first Brazilian literary writer. His literary works were written in four languages: Latin, Spanish, Portuguese and Tupi, an Indian language. He wrote poems, letters, discourses and plays, and his works reveal that the origin of Brazil was linked with Renaissance education and aesthetic. The epic poem *De Gestis Mendi de Saa* (The facts of Mem de Sá) narrates some battles of the Governor Mem de Sá in Brazil. One of the most important battles of Brazil in sixteenth century is the combat between Portuguese colonizers and Frenchmen, on March 15, 1560 in Rio de Janeiro, and José de Anchieta narrates this combat in the book *De Gestis Mendi de Saa*.

The origin of Brazil was not only an economic enterprise, but also a cultural transition and a recontextualization of European values in the New World. The study of literary texts of this time would reveal us the thought and sentiments

of the first Brazilians, what would help us to understand the development of the contemporary Brazil as an Occidental nation. The description of indians, their customs, and language, which was made by José de Anchieta is a good way to discover how Brazilian civilization arose.

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# 19. News in Mechanical Engineering

Marcelo Augusto Leal Alves

Energy supply and transportation are some of the concerns of governments, citizens and businesses worldwide. Almost on a daily basis we read and hear about problems related to both and their impact on the environment. The immediate future of Mechanical Engineering will be related to energy supply and means of transportation as well as the means of manufacturing the new systems and products.

Energy – Average oil demand is about 84.6 million barrels per day [1]. It is the main source of energy for the mankind and there is growing pressure for its replacement. Several reasons can be enumerated: Strategic – since most of the oil is produced in politically unstable regions of the globe. Environmental – growing awareness in the societies regarding the environment and the need to reduce emission due to the burn of fossil fuel. Although still controversial, the idea that there is a man-made global warming has already taking the hearts and minds, specially in the developed western countries, the biggest consumers of oil and industrial products. This public is willing to change their source of energy as long as their life standard does not change. Economic – developing nations such as China and India are increasing their demand for oil and this trend will make prices to go up until and if new oil fields become available. During most of 2008 the oil prices reached records of about US\$130 giving a warning to the public that some of the comforts of modern life such as driving a car cannot be taken for granted. Replacements for oil as source of energy are being implemented – nuclear energy, bio-fuels, fuel cells, hydrogen can be pointed as some of the more promising or already feasible.

Transportation – To move people and goods is one of the main economic activities of the modern world. Driven not only by the necessity new energy sources but also for more safety, reliability, confort, capacity new vehicles (land, sea and air) are being developed. The most visible modification is in the automobile, an iconic product of mechanical engineering. We are witnessing the development and production of very effective hybrid vehicles, an intermediate step towards the electric car. Other competitive technologies have hydrogen as main power source. Air transport is also witnessing a fierce competition of two different concepts of aircraft – the “super jumbos”, such as the Airbus A380, versus the planes like the new Boeing 787. The first is based on the transportation of as many people as possible between the world’s biggest airports- reducing the number of flights. The second kind of aircrafts is aimed to direct long distance flights between medium sizes airports so more cities

would have a direct link and the passenger does not have to make connections in big and congested airports.

Manufacturing – Every new system or product, specially the ones related to the new energy sources, will lead the development of new manufacturing processes, techniques and equipment. To many people the way products are made are of secondary importance however to mechanical engineers one of the main concern is how parts will be made or if there is a more efficient way to manufacture a part or equipment. The need to save energy is also leading to the use of new materials such as polymers reinforced with carbon fibers that have production techniques completely different than traditional metalworking used in most of the industries.

Other interesting developments are on the design and production of machinery in microscopic scale – nanotechnology. Microscopic gears and mechanisms can be built to work as sensors and actuators in microscopic devices that can be used in many instances including as medical robots capable of working inside blood vessels.

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## 20. Brain Machine Interface

Marcelo Campos Moraes Amato

The goal of a brain-machine interface (BMI) is to create a link between the nervous system and the outside world through a mechanical device. Thus, it should provide a method for people with neurological dysfunctions to control machines using their brains, and as a result, restore lost abilities through these devices.

As an example of experiment conducted on monkeys, a square array of electrodes was implanted above the area of the brain that commands the monkey's arm. Wires connected the electrodes to a computer, which transmitted the neural electrical signals that were generated by the neurons near each electrode into the machine. As the plugged-in monkeys practiced uncomplicated tasks at a video game, the brain activity was picked up as an electro-encephalogram shape. Pattern recognition software matched the brain signals to the trajectories of the monkeys' arms as they moved. After a few repetitions the computer could build a model capable of predicting the monkey's arm movements before they really happened. In other words, when the monkey thought about making a move the cursor took that step right before the real movement. When the game was switched from the monkey having a joystick to it not having one and using only brain control to move the cursor, the monkey took slightly longer to perform the task, but still did it. Researches involving BMI basically study the brain as it coordinates motions and effort developing programs that are able to translate the thoughts into specific movements.

Remarkable progress has been made since those experiments with monkeys, including assessment of neural control signals, sensor testing in humans, signal decoding advances, and proof-of-concept validation. Signal-decoding advances show improvement in biomedical engineering, while the others reflect intriguing advances in the medical point-of-view.

For a long time most studies on the application of BMIs in humans explored non-invasive approaches like functional Magnetic Resonance Imaging (fMRI), Magnetoencephalography (MEG) and Electroencephalography (EEG). Besides EEG the other non-invasive techniques are currently not suitable for continuous, real-life application for technical reasons and experiments with them are only slowly developing. Considerable progress has been made with EEG-based BMIs, but it is remarkable the fact that humans using invasive techniques such electrocorticogram (ECoG) derived signals can learn to control and modulate some of them to acquire an intended movement within a single session, compared with the need for many months of training with EEG-derived field

potential signals. Those invasive techniques are already being used in volunteers that have neurological dysfunctions and also in epileptic patients that need invasive monitoring for treatment purposes. The optimal neural control signals to each particular reason are also being revealed or constantly reviewed and actualized, as well as being associated with signals from other regions of the brain or acquired from combined methods to let them all available so that the decodification can predict the exactly intended movement.

Although BMI are only now beginning to advance into clinically viable systems, it has already captured medical attention particularly by providing the possibility of returning lost function to paralyzed people and helping them better interact with their world, thereby improving their quality of life.

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# 21. Fasting and Physical Activity Association: Implications on the Substrates Oxidation

Marcelo Luis Marquezi

Although it's controversial effects on substrates oxidation, the association between fasting and low carbohydrate (CHO) diets has been used as strategy to increase the lipid (LIP) oxidation during exercise and promote body mass alterations in physical active individuals. However, several studies exhibit inconsistent results about fasting effects on substrates oxidation. While some authors observed higher LIP oxidation and lower CHO oxidation after different periods of fasting, others found that the CHO availability limits LIP oxidation and increases body protein degradation, as well as changes in body composition and weight obtained were related mostly to reduction of lean mass and water loss, respectively.

Apesar de não haver consenso a respeito dos efeitos do jejum sobre a oxidação de substratos, este tem sido utilizado, associado ou não a dietas de restrição de carboidratos (CHO), como estratégia para aumentar a oxidação de lipídeos (LIP) durante o exercício e promover alterações da composição corporal em praticantes de atividades físicas. Porém, a literatura apresenta resultados inconsistentes em relação aos seus efeitos. Enquanto alguns autores observaram aumento da oxidação de LIP e diminuição da oxidação de CHO após diferentes períodos de jejum, outros verificaram que a diminuição da disponibilidade de CHO limita a oxidação de ácidos graxos (AGLs) e aumenta a degradação de proteínas corporais, além da alteração da composição corporal e variações de peso obtidas estarem relacionadas, em sua maior parte, à redução da massa magra e perda de água, respectivamente.

## 22. Cystic Fibrosis in Brazil

Marco Antonio de Paula

### **What is APAM?**

APAM (Paulista Association of Assistance to the Mucoviscidosis) is a non-profit association consisting of parents and patients with Cystic Fibrosis (Mucoviscidosis).

### **Our Goals:**

To enforce state law 11,250 of 04 November 2002, which provides medicines and nutritional supplements to patients with CF;

The search for support of various levels of society;

-To educate the public through the provision of information;

To search for improvements in patient care.

05 de Setembro – National Day of Awareness and Dissemination CF

### **What is Cystic Fibrosis (CF)?**

Cystic Fibrosis is also known as “Mucoviscidosis “or” Salty Kiss Disease”.

It is a genetic disease (hereditary), very serious, progressive, non-contagious, caused by a alteration of the chromosome number 7, that makes all the secretion of the body to be very thick and sticky. That results in many alterations, specially on the following body systems:

#### ***Respiratory:***

This sticky and thick mucus clogs bronchios, that are the channels responsible to take air to the lungs, resulting in difficult of breathing, causing chronicle coughing and infections through bacteria living in the mucus.

#### ***Digestive:***

The mucus is very thick and sticky, clogging the pancreas channel ways preventing that

the digestive enzymes to get to the small intestines to make the digestion of the substances that is contained in the food.

The mucus can also block the conductive channels to the liver and intestines tract.

#### ***How is CF inherited?***

Both parents have to be carriers of the defective gene. For each pregnancy of this mother with this father, the chances do have a child that:

Has CF is of 25%;

Carrier of the gene with defect and doesn't have any symptoms (like the parents) is of 50%;

Without the CF gene is of 25%.

#### ***What are the simptoms of CF?***

Salty sweat (you can feel when you kiss the child);

Chronic cough with phlegm, rapid breathing, wheezing, recurrent pneumonia,  
Nasal polyps;  
Digital clubbing;  
Ileus;  
Chronic diarrhea with foul smelling feces and with excess fat;  
Deficiency in weight gain and height.  
How is CF diagnosed?  
Neonatal (newborn extended screening);  
Sweat Test;  
Examination of DNA.

***What is the treatment for CF?***

*At the Respiratory tract:*

Respiratory therapy: using several techniques, facilitates the expelling of phlegm (mucus) of the bronchi, allowing better cleaning of the lungs and consequently fewer infections;

Physical activity: exercises stimulate the cough, which removes secretion;

Inhalation: help refine and detach the mucus that is stuck, so the patient may have his airways free, some cases is used inhalations with antibiotics;

Antibiotics: to prevent and control respiratory infections.

*At the Digestive tract:*

Pancreatic Enzymes: To correct the digestive deficiencies, due to blockage between the pancreas and intestines;

Vitamins: Vitamins (A, D, E, K) to supply its loss by deficient absorption;

Proper Diet: Usually should be rich in fats and proteins. In periods of warm and dry weather, the extra salt may be recommended.

*Why is it important to know everything about the FC?*

Among hereditary diseases, CF is the one with the highest rate that causes death in children. It is little known in our country;

01 out of every 2,000 Caucasians is born with CF (according to statistics from the U.S.);

01 in 20 people carry the CF gene in the world. In Brazil there are over 8 million parents who are carriers of this gene;

No adult develops CF, because it is present from birth. But in a few cases where symptoms are mild, the CF go unnoticed for some time, or confused with other chronic respiratory or digestive disease;

With early diagnosis and appropriate treatment, patients may reach adulthood with good quality of life;

Constant improvements in therapies are increasing the quality and length of life each year.

**Note:** The treatment for patients with CF requires monitoring by a multidisciplinary team (pulmonologist, gastroenterologist, physiotherapist, nutritionist, psychologist etc.).

## 23. Yoga and Physical Education

Marcos Rojo Rodrigues

Yoga is one of the Indian philosophical systems that emphasizes the importance of the work with the body to develop healthy behaviors and thoughts. Among all its techniques the physical postures, called *asanas* in Sanskrit, are the ones that got best-known in the West. The requirement for practicing the *asanas* is that it be “steady and comfortable”. The body is held poised, and relaxed, with the practitioner experiencing no discomfort. The passive stretching proposed by Yoga intends to lead to an ideal muscle tone, relaxing the body in case of muscle hypertonicity and strengthening it in case of muscle hypotonicity.

The goal of Yoga is to reach a quiet and peaceful mental state, which in a deeper level is called meditation. This state of peace cannot be imposed to one’s mind. In order to reach it some favorable conditions should be established. It is necessary to intervene in the systems where the emotions act. In other words, our physical posture is a reflex of our mental state; our muscle tone is also influenced by our emotional state, and our breathing patterns change according to our mood.

It is possible to intervene in the breathing pattern by breathing out more slowly than breathing in, as it increases the activity of the parasympathetic nervous system.

The Yoga techniques intend to intervene in the mechanisms related with the limbic system (which controls our emotions and behaviors) in the attempt to set the appropriate conditions to reach a quieter and more peaceful mental state.

In our modern society the term Physical Education has been understood in different ways. Some say it is the “education of the body”, which is educating the body to achieve some skills and abilities as it is done, for example, in sports.

Others think it is the “education to the body”, which is working out only to improve one’s looks. Unfortunately, this is the main reason why people join gyms, especially before the summer.

In fact, the expression Physical Education originally means “education through the body”. It is using the work with the body as a strategy to reach the noblest goals of education: autonomy and ethics in our relationships with each other and the environment.

It is necessary to remember that sports and gymnastics belong to the scope of Physical Education. Once there was a time when people said “it is not the winning itself but the competing nobly that really matters”, when the place where competitions took place was sacred and the respect between competitors was essential.

Both Yoga and Physical Education in their origin use the body as a tool for developing attitudes and abilities that are important to achieve physical and mental health. Nowadays they can be considered complementary subjects. While the West developed the aerobic conditioning and the sports training and focused on its relationship with good health, the East pursued the same goals through concentration and relaxation.

Terms and concepts that belong to the scope of Physical Education are usually found in articles about Yoga in specialized magazines. It is very difficult to delimit a field of action that can tell professionals from both areas apart.

In fact, these areas do not conflict they complement each other.

# 24. How does Brazil Face the Global Crisis: Short-Term and Medium-Term Challenges

Josué Souto Maior Mussalem

## Abstract

The author presents the reasons in which Brazil has been doing much better than expected by confronting the international financial crisis.

Among the reasons given by the author, some of them may be considered significant, such as:

- A solid Financial System, both public and private;
- Public Accounts in order with high primary surplus past eight years;
- High Exchange Reserves;
- Relatively Low Foreign Economic Deregulation;
- GDP structured 65% in domestic consumption;
- High Import Capacity;
- Political Stability;

Key Words: Financial system, primary surplus, exchange reserves, Gross Domestic Product, monetary stability.

## Introduction

Brazil is getting out much better of the international financial crisis than we could expect. In fact, Brazilian macroeconomic performance has been acknowledged not only by G-20, but also by multilateral organizations such as International Monetary Fund – IMF, International Bank for Reconstruction and Development – IBRD, also known as the World Bank.

But, what reasons would enable Brazil to get out of this crisis more quickly and effectively than expected?

The answer to this question takes into account macroeconomic factors that already existed a long time ago and may be analyzed as follows, without taking into account a chronological order or importance among them. They are **Solid Financial System, both public and private**

Long before the current government, still during the President Fernando Henrique Cardoso's management, two big plans for recovery of Brazilian financial system were organized: PROER and PROES.

The first one (PROER) was for private banks and promoted banks mergers and acquisitions, the time when the monetary authority, in that case, Central Bank of Brazil intervened by closing private banks that did not have conditions to survive any longer a market where the monthly inflation rate was less than seven per cent.

The second one (PROES) was for state public banks and promoted a complete reorganization of a banking system which wouldn't have any chance to survive an inflationary scenario less than nineteen per cent (19%) a month.

Those two extremely hard interventions taken by Central Bank of Brazil strengthened all the national financial system, putting it on the route of a high profitability, without any need to use spurious mechanisms such as American subprime as a way to get more profits. This was really one of the main factors that would enable Brazil to move off the international banking crisis.

## b) Monetary Stability

Brazil was the only country in the world to live a systematic and long-term with hyper inflationary process. In order to survive this process, our country adopted the Institute restatement, utilized for both incomes policy and pricing.

The restatement fueled inflation rate. Beating inflation meant ending the indexation of the economy. This happened from July 1, 1994 on. In a gradual way Brazilian inflation became one of the lowest in the world.

Well, this stability can be considered a key factor in the defeat of the economic crisis in the short term, by Brazil.

## c) Public accounting with Primary surplus

For eight consecutive years, Brazil has managed to control public spending in such a way that created a strong primary surplus, which was used to pay part of the interest account of domestic public debt and reduced the need for primary issuance currency. In 2009, public spending increased again and the federal government has been warned of this policy future risks.

## d) High Foreign Exchange Reserves

Brazilian foreign exchange reserves are at very high levels, moreover, ever wondered. Currently such reserves shall be placed around US\$ 230 to US\$ 240 billion. Reservations at this level protect our country from any risk of speculative attack from abroad to Real.

## e) Domestic GDP

Estimates indicate that the Brazilian Gross National Product is sixty-five percent structured in the domestic market. As people's income has not decreased in Brazil during the crisis, the consumption industrial production was directed to our market, keeping a certain level of GDP, but much less than might be expected, if the crisis had not reached Brazil.

## Low Foreign Economic Deregulation

One negative point (low foreign economic deregulation) became positive in this crisis. For being less dependent on foreign trade and domestic industry producing a wide range of products, and rely on the domestic market, Brazil has not being that impacted by decreasing of our exports.

## High Import Capacity

The balances in the balance of trade, although smaller in the last two years, they still allow Brazil a good level regarding to import capacity. In addition, the dollar down, on one side it made a loss to the export sector it allowed to buy larger quantities of raw materials, and machinery and equipment at lower prices.

## Political stability

The strengthening of the Brazilian democratic process that has lasted twenty-five years, allowed our country a political stability that has direct impact on the economy. Government changes and ministers give up no longer has any effect on markets and economic activity in Brazil.

The eight factors above do not exhaust the issues involved in the process of facing the financial crisis by Brazil, by all means; they were fundamental so that the country overcame this crisis in a lighter and quicker way. These are noticing and no anti-cyclical policies and represent over the past fifteen years the short and medium term challenges for Brazilian society.

# 25. Hamburg and the International Tribunal for the Law of the Sea

Vicente Marotta Rangel

It is well known that need was felt, in the course of centuries, to establish precise and definitive rules concerning the sea and its use related either on navigation or on the exploitation of mineral and biological resources. In view of this purpose, tentative effort was made in 1930 by the League of Nations, and after the second war, by the United Nations, in 1958 and 1960. However, all these attempts have failed. Finally, a new conference, which lasted for nine years, from 1973 to 1982, succeeded in concluding at Montego Bay, Jamaica, on 10 December 1982, the United Nations Convention on the Law of the Sea, (UNCLOS) which remains up to now one of the most complex all-encompassing treaty in the history.

In the course of the last conference, general purpose was to establish rules on the settlement of disputes concerning for instance the navigation of warships, the protection and preservation of the marine environment, piracy, submarine cables, boundary delimitation. It is true that maritime disputes have traditionally been settled by negotiation and other political means, or by arbitration and judicial process. In this regard, it is well known the contribution made either by the International Court of Justice or its predecessor at the Hague. In any way, decision was taken in the course of the third United Nations Conference on the Law of the Sea to set up an additional tribunal, although not necessarily with exclusive jurisdiction.

3 Under the Montego Bay Convention (Part XV, section 1), parties to a dispute may agree to settle a dispute by any peaceful means of their choice. Where the “voluntary” procedures (section 1) fail to a resolution of the dispute, section 2 prescribes compulsory dispute settlement procedures that entail binding decisions. In this respect, parties may choose by means of a written declaration one or more of the following forum (Convention, article 287):

The International Tribunal for the Law of the Sea;

The International Court of Justice;

An arbitral tribunal (establish under Annex VII to the Convention); and

A special arbitral for certain categories of disputes established under Annex VIII to the Convention.

It has become established practice to make specific reference to Part XV dispute settlement in law of the sea-related international agreements, as for

instance the Convention on the Protection of the Underwater Cultural Heritage (UNESCO, 2 November 2001).

Approved and constituted the new tribunal questions arose on its location. States then presented candidatures. In 1986, Germany offered to provide premises for the Tribunal at the expense of the Federal Government, including a substantial contribution from the city of Hamburg. The German proposal was approved.

According to article 1, paragraph 2, of its Statute, “the seat of the Tribunal is in the Free and Hanseatic City of Hamburg in the Federal Republic of Germany”, although “the Tribunal may sit and exercise its functions elsewhere whenever it considers this desirable,” alternative indeed very difficult to occur. As a matter of fact, the Tribunal is now located in a magnificent site of 32,000 square kilometer, at a site on the Elbechaussee in Nienstedten, overlooking the river Elba. In this site, the Schröder’sche Villa, a protected historical building, has been integrated.

4. As aware, the Free and Hanseatic City of Hamburg has close relation with maritime interests and rules, not only because of its location but also because of historic, cultural and economic factors. State of the Federal Republic of Germany, it is composed mainly of the Free and Hanseatic City of Hamburg, on the Elbe near its entrance into the North Sea. The largest seaport and the second largest city of Germany, Hamburg has great shipyards, machinery plants, food processing factories, and chemical industries. Qualified as “the gateway to the world of knowledge”, it is also a free port with an important fishing fleet. It has numerous technical and medical institutes, a university founded just after the first world war. As professor at the University of Sao Paulo, I usually stay at the Gästehaus der Universität, located downtown, at Rottenbaumchaussée, near to the Alster. Hamburg is also known by its active cultural and musical life. Incidentally, Brahms and Mendelssohn were born there.

Hamburg originated in the Carolingian castle of Hammaburg. Since the Middle Age, it has been governed by a senate. It became (834) an archiepiscopal see and the missionary center for northern Europe. It quickly grew to commercial importance and in 1241 formed an alliance with Lübeck which later became the basis of the Hanseatic League. Other cities joined this association, and a strong league grew up. Ports and in land towns from Holland to Poland entered the league, but the north German cities remained the principal members. Hamburg accepted the Reformation in 1529. With the arrival of English cloth merchants (expelled from Antwerp), Dutch Protestant, and Portuguese Jews, it continued to prosper. In 1815 it joined the German Confederation as a separate state. It retained its statehood after joining the German Empire (1817) and the Weimar Republic (1919). In the Second World the city was heavily damage by air raids.

An architectural competition was held in 1989 to select the design of a suitable building to house the Tribunal. The first prize was awarded to the firm

of Baron Alexander and Baroness Emanuela von Branca. Pending construction of the headquarters, temporary premises were made available downtown to the Tribunal, which was convened for the first time at its seat on 1 October 1996. Its ceremonial inauguration took place a few days later at the City Hall of Hamburg on 18 October, the same day when the foundation stone of the permanent headquarter was laid by the UN Secretary-General on the time, M. Boutros-Gahli.

Thus began the life of the new international institution, whose Rules were elaborated and adopted by the Tribunal itself on 28 October 1997.

Meanwhile, the construction of headquarters followed without interruption. The keys to the newly-constructed building were handed over to Kofi Annan, UN Secretary General on the time, on 3 July 2000.

Incidentally, the City Hall (Rathaus) and the plaza in front of it are the heart of the city and should serve as a point of departure and orientation for stroll through town. With its huge size and magnificent 19<sup>th</sup> century furnishings, the City Hall is considered a symbol of the city's self-assurance. Behind an impressive late 19<sup>th</sup> northern Renaissance style façade reside both Hamburg's Senate and the Parliament. The major's offices are also there.

There is a close relation between the Tribunal and the United Nations. As we have mentioned, the Tribunal originates from a decision taken by Third United Nations Conference on the Law of the Sea, decision made now in a special treaty. A mechanism for cooperation between the two entities is established by the Agreement on Cooperation and Relationship signed by the President of the Tribunal 18 December 1997 in New York, entered into force on 8 September 1998. Otherwise, an agreement between the Secretary-General of the United Nations and the President of the Tribunal, dated 26 May 2000 and June 2001, respectively, was concluded to extend the competence of the United Nations Administrative Tribunal to the staff of the Tribunal.

At this point, we shall recall the observer status granted by the General Assembly of the United Nations to the Tribunal (resolution A/RES/51?204 of 12 December 1996). As we know, this status enables the Tribunal to participate in the meetings and the work of the General Assembly when matters of relevance to the Tribunal are being considered.

Under its Statute (Part VI of the Convention), the Tribunal is composed of 21 independent members, in representation of "the principal legal systems of the world" and in accordance with "equitable geographical distribution" (article 2). The judges are elected for nine years and may be re-elected (article 5). A quorum of eleven elected members is required to constitute the Tribunal.

The Tribunal is open to States Parties to the Convention and, eventually, to other entities (article 20). All questions are decided by a majority of the members", and "in the event of an equality of votes", the President of the Tribunal

has a casting vote (article 29). The President is elected by the judges “for three years and may be re-elected” (article 12).

“The jurisdiction of the Tribunal comprises all disputes and all applications submitted to it” in accordance with the Montego Bay Convention, and all matters specifically provided for in any other agreement which confers jurisdiction on the Tribunal” (Statute, article 21).

The Statute contains rules on special chambers, composed of three or more judges, “as it considers necessary for dealing with particular categories of disputes” (article 15). However, a special chamber is compulsory: the Seabed Disputes Chamber, which has jurisdiction “with respect to activities in the Area” and has its own President. “Area” means the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction” (Convention, article 1, 1, (1)). “The Area and its resources are the common heritage of mankind” (Convention, article 136). “No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or judicial person appropriate any part thereof” (article 137).

In relation with the Area, an organization was also established, the Authority, which is, according to the Convention (article 157), “the organization through which States Parties shall, in accordance with Part XI organize and control activities in the Area, particularly with a view to administering.

In the Tribunal German law no longer applies, and English and French are the official languages.

# 26. Implantable Electronic Cardiac Devices for Prevention of Sudden Cardiac Death and Treatment of Cardiac Arrhythmias. What are the Limits to Use it?

Roberto Costa

Permanent cardiac pacing is one of the most important medical innovations of the 20<sup>th</sup> century. Although originally designed for management of patients with complete heart block, indications of cardiac electronic devices have expanded beyond symptomatic bradycardia, and now include neurocardiogenic syncope, hypertrophic obstructive cardiomyopathy, cardiac resynchronization therapy (CRT, biventricular pacing) as a significant adjunctive therapy for refractory heart failure and implantable cardioverter defibrillator (ICD) as an important resource to prevent sudden cardiac death (SCD) in patients with ventricular tachyarrhythmia (VT).

## Implantable Cardioverter Defibrillator

The evidence base for the effectiveness of ICD therapy is expanding rapidly and becoming more convincing. SCD is a major public health challenge, effecting up to 100,000 British and 450,000 Americans each year. Survivors of SCD are at particular risk of a recurrence, and ICD therapy as “Secondary Prevention” in such patients is widely accepted as cost-effective and advocated by international guidelines. Multiple clinical trials have established that ICD use results in improved survival compared with antiarrhythmic agents for secondary prevention of SCD. Large prospective, randomized, multicenter studies have also established that ICD therapy is effective for “Primary Prevention” of SCD and improves total survival in selected patient populations who have not previously had a cardiac arrest or sustained VT. There is much debate about who should receive an ICD for primary prevention, i.e. those patients deemed to be at increased risk of SCD, but who have not yet suffered an episode. Left ventricular dysfunction (patients with poor LVEF) is a major risk factor for SCD

and was used for risk stratification in two recent trials of primary prevention with a prophylactic ICD. The MADIT II and SCD-HeFT trials looked specifically at patients with poor LVEF but no SCD, and demonstrated significant survival benefit both for patients with ischemic heart disease and those with dilated cardiomyopathy. MADIT II enrolled patients with LVEF < 30% measured 4 weeks after a myocardial infarction. This trial had a short follow-up period (20 months), but showed a significant benefit for ICD treatment vs. best medical therapy. The larger SCD-HeFT trial included only patients with NYHA class II and III heart failure and LVEF < 35%. SCD-HeFT had a longer follow up period (45 months) and showed that amiodarone gave patients no survival benefit compared to placebo and, in comparison, ICD therapy reduced overall mortality by 23%.

## Technology advances in cardiac pacing

Nowadays, due to developments in microelectronics, devices are smaller, programming options wider, and pacing leads thinner but longer lasting than before. All these developments, in both hardware and software, have aimed at the primary goal of appropriate electrical correction of pulse and conduction defects in such a way as to simulate the natural, inherent electrical function of the heart as closely as possible and to satisfy the patient's needs while minimizing side effects. In addition, increased device longevity and the elimination of major and minor complications resulting from treatment have also been the constant aims of both physicians and manufacturers.

Implantable cardiac devices offer multiple programmable features and can store large amounts of diagnostic information related to device function, arrhythmia frequency, hemodynamic or physiologic measurements, and patient activity. Traditional implantable cardiac devices follow-ups require direct device interrogation to view programmed parameters and stored diagnostic data, with the goal to identify and correct possible malfunctions, and optimize therapy by device reprogramming. Remote monitoring of implanted devices, systems now available from all manufacturers, are offering increasingly refined remote interrogation tools, providing free flow of information among multiple caregivers and the patient, and measurement of a wider array of physiologic parameters.

The current generation of implanted devices can store information on heart failure status, including heart rate variability, thoracic impedance, and right ventricular pressure. Thoracic impedance is measured by delivering low amplitude impulses from the right ventricular electrode and measuring impedance at the defibrillator. Accumulation of fluid within the lungs is associated with a decrease in impedance. In addition to the active measurement of ongoing parameters mentioned above, remote monitoring of implanted cardiac devices holds great

promise for earlier identification of real and potential clinical and device-related problems and thus for earlier physician intervention. This would be expected to improve clinical outcomes and also reduce utilization of healthcare resources, including hospitalizations. Looking to the future, the implications of remote monitoring are far-reaching, with application to a wider array of diseases and facilitating transition to a truly patient-centered model of medical care.

# 27. Neuronavigation: Pushing the Limits of Neurosurgery

Marcelo Volpon Santos

## Abstract

Amongst all medical sciences, neurosurgery is one of the most intricate and complex ones. Therefore, it is a specialty that is always searching for new instruments and techniques and pushing its limits in order to obtain a better understanding of the structure and functions of the nervous system and to develop therapeutic strategies that will provide an impact in patient outcome. Arguably neurosurgery relies on technology and its progress more than other surgical specialties, and it needs to be in constant communication with other areas of sciences, some of them very distinct, like bioengineering, physics, anatomy, and more. There are several sophisticated devices to assist the neurosurgeon, including microsurgical techniques and the operating microscope, radiosurgery, sensorimotor evoked potentials, endoscopic guided surgery, robotics, to name a few, but probably the most important one is neuronavigation, which is an emanation of the development of neuroradiology. It can be considered the ultimate headway in the aspiration to transfer image information in the operative field, a goal that neurosurgeons have tried to attain for over thirty years. Briefly, neuronavigation provides a three-dimensional model of the patient using modern neuroimaging studies (magnetic resonance imaging and computerized axial tomography), allowing pre-operative planning and identification of relevant structures in the surgical setting. In this presentation, we intend to discuss the birth and evolution of this revolutionary neurosurgical advancement, with an emphasis on its main historical milestones, to present its current concepts and achievements, to address its main limitations and point out ways to overcome them, and to stimulate the debate of the future trends of frameless stereotaxy.

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# 28. Efficient Limit of the Alimentary Supplements

André dos Santos Costa

## Abstract

The use of dietary supplements with the aim of improving performance in sports has grown every year, driven mainly by the supplement industry and consumers increasingly eager for new products. These products are composed of carbohydrates, proteins, lipids, vitamins, minerals, among others, all nutrients in food. Such substances are called ergogenic nutritional resources when consumption provides, for example, changes in physical abilities (strength, power), body composition (increased lean body mass, decrease body fat) and can lead the individual to raise his performance in physical training and achieve new results. However, many of these products need to be well-controlled scientific studies that provide reliable information about their real ergogenic effects or, even worse, if they offer any health risk when consumed above nutritional needs. Another question arises in this scenario: there is a limit for safe and efficient use of dietary supplements? To discuss these issues, creatine and amino acids aspartate and asparagine were highlighted, as in recent years, several studies have been published showing the effects associated with physical training. The compound creatine nitrogen (acid -methyl guanidine acetic acid), despite its proven effect of improved physical performance in sporting subjects and athletes, had its marketing is prohibited in Brazil and in some countries due to a potential nephrotoxic effect with prolonged use. However, in a recent study with chronic creatine supplementation in high doses in healthy subjects was not observed any change in renal function assessed by the production of Cystatin-C. Beyond this fact, therapeutic effects have been observed with the use of creatine supplementation on the metabolism of carbohydrates and lipids as well as in patients affected by conditions of atrophy, muscle weakness and metabolic disorders (muscle, bone, lung and brain). The amino acids aspartate and asparagine, classified as glycogen and responsible for generating intermediates of Krebs cycle oxidative metabolism, point to a possible ergogenic effect both moderate and intense activities, providing a higher resistance to effort. However, further studies investigating the possible detrimental effects to its use as an additional have highlighted changes in glucose metabolism and actions of

insulin in the body in sedentary animals. Nevertheless, these metabolic changes and are probably not observed with the use of amino acids aspartate and asparagine associated with training. Therefore, the establishment of limits for the consumption of food supplements becomes complex as the cellular environment is influenced by both the nutrient offered in additional quantity as the stimuli coming from the exercise. Thus, the academic and scientific research on the effects of food supplements is essential because, depending on your point of view, beneficial or harmful actions can be observed.

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# 29. Moma Cerebral Protection System

Gioacchino Coppi

The MOMA Catheter is a tool thought to protect the brain while treating internal carotid stenosis with PTA/Stenting (CAS) with at least similar results in Stroke prevention as surgical carotid endarterectomy (TEA) but with the added advantage of low invasivity.

Stroke is the second cause of death and the first cause of disability in the world with an extremely high cost in terms of pain and economic suffering for patients and their families.

While the good treatment of hypertension has heavily reduced the impact of hemorrhagic stroke, the level of ischemic lesions remains high, covering 2/3 of the brain damage and at least 1/3 of them are determined by arteriosclerotic plaques localized at the origin of internal carotid artery in the neck

With possible thrombosis or more frequently dangerous emboli toward the brain.

Until now, the classic surgical TEA has been the best treatment as demonstrated about 20 years ago by well conducted studies, while the less invasive and appealing PTA/Stenting proposed in the '90s has not been able to demonstrate similar capabilities even with progressive improvement of tools such as filters placed, first, distally to the plaque with the proposal of capturing particles moved during the placement and dilation of the stents.

The reason of the unsuccess has been 1) the difficulties of vessel access from the groin to the carotid arteries through the aortic arch 2) the risk of emboli mainly during the manipulation of the aortic arch and the tool (guide, filters, stents) passage through the carotid friable plaque 3) the risk of emboli during the phase of plaque dilation 4) the risk of post procedural emboli due to the plaque prolapsed into the stent scaffolding.

The problem of the access was resolved by us with the creation of a dedicated double guide catheter while the attempt to solve the other problems was addressed by the use of MOMA.

The Moma is a long catheter with an operative lumen and an extension. It has two balloons able to occlude the common and external carotid artery blocking the flow toward the brain during the PTA/Stenting procedure through an operative lumen. The debris produced by these maneuvers is aspirated from the dedicated port at the external extremity of the MOMA device.

In some ways we can say that MOMA imitates open surgery without the associated invasivity, using endoluminal clamping and endovascular flush.

The idea was born 11 years ago, but it took years to be perfected and submitted to the FDA approval with the Armour study. This was realized one month

ago and MOMA was recognized as the best protective device for carotid PTA/Stenting available today with a complication rate of 2.3%.

In the last 12 months we have modified the MOMA procedure with an adjunctive maneuver of twice plaque balloon dilation; the second one at low occlusive and remodeling pressure associated with a deflation of the occlusive MOMA balloon in order to restore common-external carotid flow and address residual debris toward the external carotid artery. After the reinflation of the MOMA occlusive balloon and a second final aspiration the internal carotid flow is restored. We are extremely satisfactory and proud to declare that 100 consecutive cases have been performed without stroke. We believe that these results give hope that a new era for the treatment of carotid arteries and stroke treatment is possible.

# 30. Review of the Role of Neurotrophins in Bipolar Disorder

Luis Felipe de Oliveira Costa

Bipolar disorder is a psychiatric illness with reasonable prevalence among the population worldwide and a major cause of socio-occupational dysfunction. However remains underdiagnosed, as most physicians are not experienced in the sub area of affective disorders. The search for biological markers is a rational measure to unify diagnosis, and the most studied today are the neurotrophins.

Several of them are involved in mood regulation, but few have been described in the literature as markers. Actually the most known of them is BDNF (brain derived neurotrophic factor), which seems to be a future marker of effective therapeutic response.

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# 31. The Treatment of Intracranial Meningiomas

Marcus Benigno Marques dos Santos

Meningiomas are the most common benign intracranial primary neoplastic disorders. They are slow growing tumors originating from the arachnoid cap cells but, by the time of the diagnosis, they have already infiltrated or invaded the dura mater or the bone. A lesion located in the supratentorial space (parasagittal, convexity or sphenoid wing) of a middle-aged woman is the most common clinical scenario. The only recognized factors associated with the genesis of a meningioma are the exposition to ionizing radiation and genetically-inherited diseases, as in individuals harboring neurofibromatosis. The World Health Organization (WHO) classified these tumors into grades I, II and III, according to the aggressiveness and recurrence potentials. Grade I lesions are the majority of the cases (80%).

In the last four decades, a huge improvement in technology has made their treatment of choice, the surgical one, such an elegant, safe and powerful procedure. The “next generation of neurological surgeons”, foreseen by Harvey W. Cushing in 1922, had conquered the surgical realm in terms of microanatomy, microsurgical techniques, better imaging diagnosis, cranial nerve and brain stem monitoring and intraoperative real-time imaging. Surgical removal could offer a cure to patients with WHO grade I meningiomas. In despite of that, the surgical treatment of more aggressive tumors (WHO grades II and III) or those affecting the skull base, even in the best skilled surgeon’s hands, remains challengeable.

It is a consensus that the recurrence is directly related to the amount of tumor removed surgically, as proposed by D. Simpson, in 1957. However, two important questions arise: (1) Do we understand the intriguing mechanism by which a meningioma invades the bone, much more frequently than it does to the brain, cranial nerves or the wall of blood vessels? (2) Can we predict the recurrence? Unfortunately, the answers are “no, we do not understand” and “no, we cannot”. Not yet. Thus, it is crucial to comprehend the biological behavior of these formidable lesions, in order to develop alternative therapeutic weapons, other than current types of radiation therapies and chemotherapy. These weapons are based on the so called “specific molecular targets” and their foundations are the continuous and progressive understanding of tumorigenesis, mainly, uncontrolled cell proliferation, angiogenesis and invasion. Such knowledge will lead, hopefully, to the “other next generation of neurological

surgeons”, or the ones who will disclose (1) the recurrence after documented complete surgical resection, (2) the indefinitely unchanged state of documented partially removed lesions, and (3) the rapidly and aggressive growth of some histologically benign tumors.

A great step for this relatively new branch of the “neurosurgical” apparatus, named the biological aspects of the meningioma, at a molecular level, was the identification of the role of metalloproteases on the extracellular matrix (ECM) remodeling, both in physiological (e.g., scar tissue) and pathological (e.g., neoplasms) situations. These proteases break down components of the ECM, mainly various types of collagen (the chief protein of the mammalian body), and uphold cell migration and invasion (including metastases). Invasion occurs in the tumor-host interface, supported by the imbalance of matrix metalloproteases (MMPs) and their natural inhibitors, the tissue inhibitors of metalloproteases (TIMPs). In the present era, samples of meningiomas can be obtained from banks of paraffin-embedded blocks or frozen as fresh tissues from patients who had undergone microsurgical treatment, and examined by immunochemistry, genetic analysis (DNA microarrays) or studies upon meningioma growth by intracranial injection of human meningioma cells in athymic mice.

The search for the optimum therapy for intracranial meningiomas endures. Maybe we are not that other next generation of neurological surgeons, the ones who will overcome the meningioma, but we are a little bit closer.

## 32. Linguistic Contributions Towards the Selection of Relevant Information in Clinical Interviews

Marcos Lopes, Alexandre Suzuki, Maria José Baraldi, Viviana Giampaoli, Elisete Aubin, Alfredo José Mansur

Recognizing and understanding patients' symptoms is a key step in medical practice. Relieving symptoms is a necessary therapeutic target. But are all contents in patients' speech equally relevant? If not, how to infer the "degree of relevance" in patients' speech?

We performed this investigation to evaluate expressions of breathlessness in a sample of 266 heart failure patients. Breathlessness is among common symptoms associated with heart failure. It may also be a prognostic marker [Ekman et al. 2005]. Patients were asked seven open questions that have been recorded and transcribed. One of those questions was specifically targeted on breathlessness: "Do you have any difficulties to breathe?" Transcriptions were analyzed by two linguists with the purpose of identifying thematic contents.

We aimed to test the hypothesis that there is an association of symptoms and thematic contents with the clinical characteristics of the patients, particularly prognosis. We were interested in verifying if the information gathered through the study of the symptoms could add relevant information to the clinical data collected from the evaluation of patients.

The contents of the interviews were categorized regarding the medium range thematization (MRT) of descriptions of breathlessness. This is a semantic evaluation of lexical terms, a classification of words according to semantical classes which are generally second-level hyperonyms.

Groups of MRT and clinical data were analyzed with the CLARA method [Kaufman and Rousseeuw 1990] to identify linguistic and clinical clusters. The comparison between linguistic and clinical clusters was carried out using the concepts of entropy (or self information) and mutual information (between two clusters) [Manning and Schütze 2003; Meilă, 2007].

*Clinical clusters* – Considering the 65 patients who are deceased, 42 (64.6%) were placed in group 1, 17 (26.2%) in group 2 and 6 (9.2%) in group 3. There were significant associations between clinical clusters and mortality (Pearson Chi-Square = 6.8; p-value = 0.03).

*Linguistic clusters* were formed upon classification of interviews into MRT classes.

*Relationship between linguistic and clinical clusters* – conditional entropy was estimated at  $H(C|L) = 0.39$ ,  $H(L|C) = 0.15$ , mutual information  $I(L,C) = I(C,L) = 0.02$  and variation of information  $VI(L,C) = VI(C,L) = 0.54$ . The mutual information between linguistic and clinical groups was low (0.02), which means that there is little information contained in both groups simultaneously. There was a significant gain of information in taking into account both groups, since the variation of the information presented was reasonably far from zero (0.54). This is to be considered the first important element of conclusion on this research: contents from patients' speech adds to information acquired from clinical and laboratorial exams.

We also studied the conditional entropy associated to subclasses of MRT in two clusters of patients, those who are deceased and those who outlived the research. Since the entropic calculus is conceived to evaluate the semantic contribution of lexical units, we have not taken into consideration "trivial" contents, i. e., those of very little informational contribution. For instance, regarding the MRT "body parts", some trivial subclasses are the "respiratory system" (since it is implicated by the question) and the "circulatory system" (since all patients are *a priori* being interviewed because of their heart failure). Furthermore, entropies associated with such trivial subclasses are commonly about 0.5, which points to a high level of previsibility of those answers (0.53 for "respiratory system" in MRT "body parts" and 0.54 for "respiration" in MRT "activities").

The association of some of the non-trivial MRT subclasses with patients' survival time reveals, on the other hand, low entropy values, i.e., with a certain predictive potential. In "body parts" MRT, such classes were "digestive system" (0.32) and "members" (0.24).

This brings forth our next conclusion: contents are not informationally homogeneous.

# 33. Perspectives in Interventional Radiology

Guilherme Seizem Nakiri, Thiago Giansante Abud, Daniel Giansante Abud

During the past years radiology has undergone profound changes, which have revolutionized not only diagnostic imaging but also the therapeutic field. With the advances in imaging methods, more accurate diagnoses are being provided at lower cost and risk than ever. Moreover, radiologists are no longer limited to the role of diagnostician, as new interventional techniques have been developed for performing therapeutic procedures.

In this context, with the growth of minimally invasive procedures using image guidance methods to gain access to vessels and organs, a new specialty called *interventional radiology* has emerged. Interventional radiologists have been responsible for much of the medical innovation and development of the minimally invasive procedures that are commonplace today, providing to the patient a faster recovery, a shorter hospital stay, lower infection rates and an alternative treatment when surgery is not possible or desirable.

Interventional radiology was born January 16, 1964, when an 82-year-old woman with painful leg ischemia, due to a localized stenosis of the superficial femoral artery, had a successful outcome after percutaneously dilatation of the stenosis with a guide wire and coaxial catheters. Charles Dotter, MD, the interventional radiologist who performed this procedure, is known as the “Father of Interventional Radiology,” and was nominated for the Nobel Prize in medicine in 1978<sup>1</sup>.

Since then, the ability of interventional radiology techniques to treat an ever-expanding list of conditions continues to grow. Interventional radiology is now used to treat blockages inside arteries and veins, to treat anomalous vessels (aneurysms, dissections, vascular malformations), to block off blood vessels that nourish tumors or that present bleeding, destroy malignant tumors by direct chemotherapy with arterial embolization or by producing local heat with radiofrequency, drain blocked organ systems such as the liver, gallbladder and kidney, and perform biopsies and fluid collection drainage that would otherwise require surgical exploration.

As the number of different kinds of conditions treated by interventional radiology is constantly increasing, it has become increasingly common to see it divided into two categories: Neurointerventional Radiology and Peripheral Interventional Radiology.

In the Peripheral Interventional Radiology, which includes all territories apart the central nervous system, the latest advances have been seen in the in the treatment of tumors and vascular diseases, which includes vascular malformations and vessels occlusions or stenosis.

The percutaneous treatment of primary malignancies and metastases for cure or palliation is a rapidly advancing field with a great diversity of therapies, including radiofrequency ablation (RFA), cryoablation, alcoholization, laser-induced thermotherapy, microwave coagulation therapy and endovascular chemoembolization. All modalities have varying degrees of effectiveness, with RFA and arterial chemoembolization currently predominating.

RFA is a thermoablative technique that induces heat with a high-frequency alternating current applied via an electrode probe. Its use has been well consolidated in the treatment of particularly hepatocellular carcinoma (HCC) and colorectal metastases. Answering to the demand for minimally invasive procedures, the use of RFA for ablation of tumors outside the liver has increased in the last years, achieving good results, especially for renal and pulmonary masses.

The transarterial chemoembolization consists in selectively catheterizing the tumor feeding arteries, infusing a combination of chemotherapeutic and embolic agents to confine the agents inside the tumor, potentiating its local effect and obstructing the tumors nourishing, while simultaneously limiting systemic toxicity. Its use has gained notoriety in the treatment of liver primary malignancies and metastasis. Studies are comparing the results of the use of microspheres loaded with chemotherapeutic agent as the embolic agent, comparing with the traditional transarterial chemoembolization. The association of transarterial chemoembolization and RFA is achieving good results in selective cases of patients with HCC.

Neurointerventional Radiology has seen the most innovations in the last years, especially due to the rapid evolution of new endovascular devices.

Since the first brain angiography performed by Egas Muniz, MD, in 1927, took 14 years until Werner and colleagues reported successful electrothermic thrombosis of a giant aneurysm through a transorbital approach, using a silver wire heated to 80°C for almost 1 minute. The first successful balloon embolization was performed by Serbinenko in 1973, establishing the way for modern cerebral aneurysm embolization. But it was only in 1991, that a new era in the treatment of aneurysms was inaugurated with Guido Guglielmi's preliminary experience with eletrolytically detachable platinum coils (Guglielmi Detachable Coils, GDC) <sup>2</sup>. The GDC technique became known worldwide as the main endovascular therapy up to date.

After the International Subarachnoid Aneurysm Trial (ISAT) study <sup>3</sup>, compelling evidence was provided that, if medically possible, all patients with ruptured brain aneurysms should receive an endovascular consultation as

part of the protocol for the treatment of brain aneurysms. The study found that endovascular coiling treatment produces substantially better patient outcomes than surgery in terms of survival free of disability or risk of death.

Retrospectively studies, analyzing the treatment of unruptured aneurysms have found that endovascular coiling is associated with less risk of bad outcomes, shorter hospital stays and shorter recovery times compared with surgery.

Today the interventional radiologist has the aid of many materials in the deployment of coils into the aneurismal sac, like balloon remodeling assistance or stent remodeling. Furthermore, different types and sizes of coils are also available for a better aneurysm filling.

Recent studies are analyzing the outcome of the use of flow diverters as an option for the treatment of brain aneurysms. Aneurysms treated by endovascular therapy, do have small chance of recurring, thus long term durability of this therapy remains to be determined.

Liquid embolic agents are also used to treat aneurysms endovascularly by some interventional radiologists, but its main use was applied in the treatment of brain arteriovenous malformations (AVM). The Onyx ®, a liquid embolic agent, is a non adhesive polymer of permanent action introduced in the market a few years ago. It is replacing the acrylic glue due to its better results in terms of complete cure of the AVM by embolization, secondary to its more effective intravascular filling.

Endovascular treatment of acute ischemic stroke has proved to be an effective and safe therapy. Many advances in mechanical and chemical recanalization techniques have been achieved in the treatment of this condition, as new thrombectomy devices and intracranial stents have been developed.

Interventional radiology has been established as a medical specialty, which overlaps with many other medical fields, thus depending on interdisciplinary accordance between the interventional radiologist and surgeon/clinician aiming always to provide minimally invasive treatments with proven safety and effectiveness for the patient.

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# 34. Human Gene Therapy and the Future Of Modern Medicine

Rozeane Luppino

Gene Therapy is the insertion of genes into an individual's cells and tissues to treat a disease, such as a hereditary disease in which a deleterious mutant allele is replaced with a functional one. Although controversial, Gene Therapy can also be used for human genetic enhancement changing one's genetic formula and function towards a desired goal of "enhancement". Genes are specific sequences of bases that encode instructions on how to make proteins. Although genes get a lot of attention, it's the proteins that perform most life functions and even make up the majority of cellular structures. When genes are altered so that the encoded proteins are unable to carry out their normal functions, genetic disorders can result. Both environmental and genetic factors have roles in the development of any disease. The four different types of genetic disorders are: single-gene, multi-factorial, chromosomal, and mitochondrial. Gene therapy is a technique for correcting defective genes responsible for disease development. Researchers may use one of several approaches for correcting faulty genes: a normal gene may be inserted into a nonspecific location within genome to replace a nonfunctional gene; an abnormal gene could be swapped for a normal gene through homologous recombination; the normal gene could be repaired selective mutation, which returns the gene to its normal function; the regulation (degree to which a gene is turned on or off) of a particular gene could be altered. Gene therapy may be classified into the following types: germ line gene therapy; somatic gene therapy. In most gene therapy studies, a "normal" gene is inserted into the genome to replace an "abnormal", disease-causing gene. A carrier molecule called a vector must be used to deliver the therapeutic gene to the patient's target cells. The most common vector is a virus that has been genetically altered to carry normal human DNA. All viruses bind to their hosts and introduce their genetic material into the host cell as part of their replication cycle. Besides virus-mediated gene-delivery systems, there are several non viral options for gene delivery: direct introduction of therapeutic DNA into target cells; an artificial lipid sphere with an aqueous core (liposome); chemically linking the DNA to a molecule that will bind to special cell receptors; introducing an artificial human chromosome. Gene therapy is a medical intervention that involves modifying the genetic material of living cells to fight diseases. Although much effort has been directed in the last decade toward improve-

ment of protocols in human gene therapy, and in spite of many considerable achievements in basic research, the gene therapy is still experimental, but, we have entered into a new era in medical care, the era of genomic medicine. In coming years, we will see an improve ability to diagnose a disease and even to predict diseases to comes later in life a much more accurate prognostication of what will happen as the disease progress and how it respond to medications will be offered, and treatment will improve. Drug therapy will chance so that new drugs will be wore effective and much safer. Physicians will be able to select a drug based upon on individual patient's personal way of responding to that drug, both in terms of greater effectiveness and in terms of reduced side effects.

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## 35. A Young Science on the Way to Maturity: Psychology

Samuel Pfromm Netto

The expansion and improvement of Psychology as an area of research, professional practice and teaching in the last decades has been extraordinary, in spite of its condition of a young science, with a little more than a century of history. The progress in its domain has been remarkable, but uneven. That state of affairs is particularly detectable in South America. It seems that it behaves accordingly to the typical characteristics of adolescence. A riotous adolescence, in which interrogations are much more than certainties, in which it is detectable a certain boldness, an immaturity that is so characteristic of teenagers. As well as the adolescents, the Psychology of today in South American countries has its alacrity, impetus, exuberance and vigor, but suffers of lack of stability and security those results from maturity. In Brazil's specific case, but perhaps in South America in general, Psychology suffers several other limitations. The first one maybe the worst of it: what is taught, learned and practiced in many institutions preparing psychologists seem not reflecting good patterns of quality, the current state of the art and the multiplicity of progresses occurred in the last decades that are producing better and more effective understanding of mind and behavior.

Besides that, it is necessary: (a) to invest heavily in authentic scientific knowledge and in practices supported by empirical validation (in the clinical area, empirically supported treatments, EST); (b) to offer to any student of Psychology a full, up-to-date, comprehensive and accurate understanding of scientific research and theory; (c) to overcome the worrying state of methodological poverty and naivety, reflected in poor laboratories, equipments, tests and other resources of psychological investigation and measurement, absence of bibliographical sources, limited use of computers and Internet resources; (d) to be tuned with the current panorama of the worldwide Psychology; (e) to spread reliable psychological information addressed to the general public as an antidote for charlatanism and superstition, often labeled, for example, as alternative therapies; (f) to expand opportunities of work for future psychologists; (g) to improve and expand in a significant way the psychological literature in the nation's language; (h) to stimulate, expand and strengthen interdisciplinary bonds with other fields of scientific knowledge more related with Psychology, e.g. Neuroscience, Psychiatry, Medicine, Genetics, Gerontology, Social Prob-

lems etc.; (i) to intensify the exploration of interfaces between Psychology with sciences, policies and practices related to the main challenges and perplexities of the world of today and near future. Several examples can be mentioned: air pollution, climate changes, environmental disasters, national and global financial crises, violence and organized crime, terrorism, significant changes in the personal, family and work life, and also in the society in general, effects of media and new technologies in the lives of persons and the society in general, discrimination against minorities and poor people, care of the exceptional and the old, challenges in the various levels and modalities of formal education and so on. It can be added that the triad Psychology, Media & Education, in which the Author is working since the sixties, reflects not only his personal concerns, but mainly a large area of theory, research and action that calls for an urgent mobilization of scientists and professionals from many areas of knowledge and social influence.

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# 36. Multimodality Medical Images

## Post-Processing: Role of Open-Source Softwares

Alexandre Campos Moraes Amato

Nowadays, a very interesting alternative to devoted medical imaging workstations and software are available: the open-source projects. Most of them are software based, but there are even some open-source hardware projects. However, the term is often misapplied to other areas. Open source is considered one of various design approaches, basically with relaxed or non-existent copyright restrictions. Most amazingly, they have evolved in such a way that they are very close or in some aspects even better than similar commercial solutions.

OsiriX is a very good example in the Medical field; it is a software developed only a few years ago for personal computers. This interactive navigation program, designed by Ratib and Rosset<sup>1-4</sup> from the Department of Medical Imaging and Information Science of the University Hospital of Geneva, Switzerland, allows rendering and analysis of several different advanced medical imaging modalities (i.e., CTA, MRA, etc.). This software can be freely downloaded and the source code is available under the GNU General Public License open-source licensing agreement for other institutions to enhance and improve the core of the software or even develop plugins. It runs on a regular laptop or desktop Mac OS X computer and allows accurate rendering and measuring of the aorta and its branches, allowing adequate planning for surgical and endovascular procedures.

The stigma that a free software is always worse than a paid one is not always true. Recently, we published a paper proving that OsiriX is capable of demonstrating the Adamkiewicz arteries as well as the devoted workstations<sup>5</sup>, and those arteries are as small as 0.8-1.33mm<sup>6</sup>.

This software has been proven capable, although is not legally validated by FDA (Foods and Drugs Administration) for decision-making, primary diagnostic, clinical workflow or patient care in medical field. Being a free open-source software (FOSS), is not certified as a commercial medical device for primary diagnosis. Hence, there are no FDA/CE-1 certifications. In US and Europe, OsiriX can only be used as a reviewing, research or teaching software. Thus, its use is limited for research in those countries until more validation papers are available. It shall not lower its importance, but remembers that traditional methods are still required; this way, use of both solutions together is recommended.

Open source software usually isn't one person or one group job; dozens or even hundreds of volunteer programmers often develop it together. That allows fast improvements, and even faster fix of bugs. This is called public collaboration. This myriad of different mind contributions also allows a different and open-minded vision for future releases of improvements.

The advance of personal computer hardware, mainly because of games, allows this technology to be applied in the medical field. OsiriX, for example, uses many third-party libraries developed for gaming applications. Those libraries are so advanced and fast that 3D rendering can be done in real-time, something impossible for personal computers few years ago.

OsiriX is an outstanding result of this new model of distribution, but there are many others that can be used in different areas of medical informatics. There are open source projects for health clinic management, decision support, and others. It is very important to notice that although they are FOSS, without commercial aims, and therefore no FDA certification, they have a significant role in new technologies and algorithms development; it is a live lab with constant updates. We should contribute with more validation papers.

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# 37. German at the University of the Third Age: an Extension Project

Antonio Walter Ribeiro de Barros Junior

The objective of this communication is to present a reflection on the contexts that involve the development of education programs and of foreign language for people above 55 years, in the so called Universidade Aberta à Terceira Idade (University of the Third Age), UATI.

In this communication we will be describing the implementation of the project “Ludic and cultural activities in German teaching-learning process” carried out in the extension project of German Language, Culture and Literature in the University of Sagrado Coração (USC) in Bauru-SP.

It aimed at observing the effectiveness of ludic activities in German teaching-learning as an attempt to reduce difficulties in the teaching-learning process such as lack of motivation, difficulties in acquiring the contents, interaction etc.

Therefore we will base this work on authors as Vygotsky (1994), Moser (2004), Almeida Filho (1998), among others. We will still also present, basing this work, the students reaction (acceptability, motivation, interaction, socialization), as well as the acquisition of the contents by the students during these activities.

We will perceive, trough the results, that the playful and cultural aspect is a valuable support for a successful work in the classroom of having its emphasis on the offered intercultural confrontation through general knowledge of the German traditions in thematic lessons (civic celebrations, commemorations etc.)

Keywords: German, third age, culture, ludicity, motivation, learning.

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# 38. Knowledge Can Change People

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## The patients can only change their bad habits if they understand how it could interfere with their own health.

The online health virtual check-up, freely available in the site [www.checkup.med.br](http://www.checkup.med.br) since 2000, is a self-evaluated questionnaire that offers a chart feedback to the users about their cardiovascular risk. It also presents some key information and hints to lower it.

We analyzed its health impact with another questionnaire (Survey Monkey). We studied 812 out of 10.664 questionnaires that were completely and correctly answered, and which granted permission to participate in this study.

The data analysis showed that:

1. The reasons that made the users access the site were:

Own health symptoms in 17.4%; family symptoms in 2.9%; acquaintance in 1.3%; worries about health in 46.1%; curiosity in 42.6%.

2. The users evaluation about the test online were:

95.3% believed that they learned about health; 7.5% believed that they improved their habits; 70.7% improved their diets; 36.7% started or increased to practice physical activities; 57.1% improved to deal with stress.

3. We compare stress, obesity, diet, and physical activities before and after the Internet check-up in 4 groups: smokers; former smokers; non-former smokers; never smokers and we notice that:

Gender and aging are not statistically significance in these groups

Stress is statistically higher in smokers group than in non-smokers ( $p = 0.0052$ )

Stress is not different in former smoker group and non-former smokers

Diet is worse in smokers group than in non-smokers ( $p < 0.0001$ )

Diet is worse in former smokers group and non-former smoker group ( $p = 0.0087$ )

Physical activities and obesity are not statistically different

Belief that their habits were improved is statistically different in smokers group and non-smokers ( $p = 0.0164$ ) and in former smokers and non-former smokers ( $p = 0.0094$ )

The smokers were more stressed than the others, together with worse habits and a predisposition to avoid practice of exercises. When they quit smoking, they increased in weight.

The Internet approach can be considered a light intervention in smokers, with a high social impact and a very important cost-benefit relation.

# 39. New Perspectives in Cancer Therapy

Óren Smaletz

Cancer represents a major health problem worldwide. It accounts for 13% of all cause-mortality. Despite screening programs, many patients continue to present with advanced disease at diagnosis and treatment for these patients is a foremost challenge. Main objectives during treatment for advanced cancer have been to improve overall survival, to improve progression-free survival, to improve response rates while minimizing side effects of conventional chemotherapy. The advances in the knowledge of molecular biology and carcinogenesis have yielded the discovery of new drugs that battle cancer through molecular-target agents, like the monoclonal antibodies and key-enzymes inhibitors.

In the past, conventional chemotherapy was applied to the majority of patients with metastatic disease and, with rare exceptions, with modest activity. Conventional chemotherapy attacks all body cells that have a high turnover and therefore has no specificity against cancer cells. Therefore, side effects like alopecia, nausea and vomiting, diarrhea are very common in patients receiving chemotherapy.

On the other hand, more recently, drug development evolved to a new era: molecular target therapy. Oncologists are targeting 1) the Her-2-neu pathway in breast cancer and gastric cancer, 2) the EGF-R (epidermal growth factor receptor) pathway in colon-rectal cancer, non-small lung cancer and in head and neck cancer, 3) the VEGF-R (vascular endothelial growth factor receptor) pathway in colon-rectal cancer, in kidney cancer, in breast cancer, in malignant gliomas of the central nervous system, in non-small lung cancer and in hepatocellular cancer and 4) the m-TOR (mammalian target of rapamycin) pathway in kidney cancer.

However, not every patient may benefit from these new drugs. The greatest challenge in clinical oncology is to define who is the patient that will most likely benefit from these new and costly medications. In the past years, much has been published about k-ras gene mutation in colon cancer and the predictive value of this test in patients treated with monoclonal antibodies against EGF-R, like cetuximab and panitumumab. K-ras is a key enzyme that is responsible for tumor growth, and is downstream to EGF-R. It has been shown that patients whose tumors harbor a k-ras mutation do not benefit at all from this type of therapy, while patients that have a wild k-ras will respond and have better outcomes.

Other example is for patients with metastatic non-small lung cancer and the use of tyrosine-kinase inhibitors like erlotinib and gefitinib. Patients that have tumors with an EGFR mutation are more likely to respond to this treatment and toxicities from chemotherapy can be avoided in these patients.

Immunohistochemistry help oncologists decide what is the best treatment for women with breast cancer. Her-2-neu is a transmembrane protein that is overexpressed in 20-25% of all breast cancers. In patients with breast cancer that overexpresses Her-2-neu, trastuzumab improves response rate and survival in patients with metastatic disease, and has shown to improve disease free survival in patients with localized disease in the adjuvant setting. On the other hand, women with metastatic breast cancer that do not have tumors with Her-2-neu overly expressed benefit from the anti-angiogenesis treatment with bevacizumab.

In conclusion, while cure rates have not improved, disease control outcomes increased in many cancers, leading to better overall survivals. In addition, side effects profile of these new treatments have improved and giving our patients a better quality of life.

# 40. The Limit of Life: an Over View of a Vascular Surgeon

Salvador José de Toledo Arruda Amato

Cardiovascular diseases are the main cause of death in world, accounting for 49% of all deaths in Europe and are actually increasing due to an ageing population. The prevalent etiology is atherosclerosis.

It is the condition in which an artery wall thickens as the result of a build-up of fatty materials such as cholesterol. It is a syndrome affecting arterial blood vessels, a chronic inflammatory response in the walls of arteries, in large part due to the accumulation of macrophage white blood cells and promoted by Low-Density Lipoproteins (LDL) without adequate removal of fats and cholesterol from the macrophages by functional High Density Lipoproteins (HDL). It is commonly referred to as a hardening or furring of the arteries. It is caused by the formation of multiple plaques within the arteries. It is relate with aging so, we say that the limit of the life is in the arteries.

Atherosclerosis has been asymptomatic for decades. These complications are chronic, slowly progressive and cumulative. Although it is a systemic disease, it can produce two main localization problems: First, the athermanous plaques, though long compensated for by artery enlargement, eventually lead to plaque ruptures and clots inside the artery lumen over the ruptures. The clots heal and usually narrowing the artery, or worse, complete closure, and, therefore, an insufficient blood supply to the tissues and organ it feeds. Second, if the compensating artery enlargement process is excessive, then a net aneurysm results. Most commonly, soft plaque suddenly ruptures, causing the formation of a thrombus that will rapidly slow or stop blood flow. If the artery is in the heart, it can cause a myocardial infarction, even worse is in an artery to the brain, called stroke. Another common scenario in very advanced disease is claudicating from insufficient blood supply to the legs, typically due to a combination of both stenosis and aneurysmal segments narrowed with clots. Since atherosclerosis is a body-wide process, similar events occur also in the arteries to the brain, intestines, kidneys, legs, etc.

Men, women in menopause and people with a family history of premature cardiovascular disease have an increased risk of atherosclerosis. These risk factors can't be controlled but research shows the benefits of reducing the others risk factors like: high blood cholesterol, especially LDL; cigarette smoking and exposure to tobacco smoke; high blood pressure; diabetes mellitus; obesity and physical inactivity.

The past 30 years have seen a reduction in the death rate from cardiovascular disease well in excess of the overall reduction in mortality, with even more dramatic decreases in mortality rates from coronary artery disease and stroke. These data are remarkable and should provide us with considerable comfort regardless of our future, it provides the best evidence of our determination and the greatest testimony to our eventual success. In despite of this fact, we observe increasing numbers in vascular and endovascular surgeries because we make more vascular diagnostics and the population is living more, consequently, the number of vascular patients is increasing.

Our predecessors in surgery overcame challenges that we can only imagine, but now we are in an era of technologic sophistication in which the level of understanding of vascular disease is increasing at an unprecedented pace. The challenge for our generation is to fine-tune the extraordinary engine that is our medicine; evaluating the best use of resources requires a new set of skills and involves substantial ethical conflicts that we should attempt to unravel to make it more responsive to the economic and social imperatives of our time.

The traditional opened surgery, in the short future, will not lose its place in vascular treatment but only few surgeons will be able to perform these procedures. The advance of endovascular surgery makes possible an odd position and can treat cases with a difficult access, as well as also, for being minimum invasive, makes possible the treatment of patients who have against clinical indication for the open surgery. This technique spread the possibilities of treatment, but even only in local manifestation yet.

I believe that the real challenge for our era is genetic engineering and molecular biology, that soon will be able to offer pharmacological treatments with promoters or inhibitors of the growth and the cellular multiplication and certainly will prevent and control the systemic atherosclerosis, and life will be extended with more quality.

# 41. The Application of Games in the Reasoning Development

João Tomas do Amaral

The game has been constituted a recurrent subject in the most circumstances along people life – from childhood to oldness. It has been boarded in a lot of ways, as: leisure, sport, education and health. There is quantity and variability of modalities of games, that tend to the most varied interests – also the world of the work. Nowadays, we have analogic or virtual games, collective or individual games, active or passive games, game of chance or educational games, children or adult games, and still psychological games. The game goes rep to the origins of the man, and it is used as a resource to increase concentration and relation between the people involved – as well as changing in one specific study area – Theory of Games. In general, the game is associated, mainly with reasoning development.

The game has its origin in the beginning of humanity intended to increase quality of life – food and shelter. Certainly, from that time to these days, we can analyse that all the scientific and technological advances are a result of knowledge, that the origin goes back to the game in the essence of the bases – goals, rules, strategy and time of action. By the way, we need to understand the game as one important activity for all the stager in people’s life – childhood to oldness, with application in the personal and professional way. It does not have to be understood as a useless activity, trivial, or as a waste of time, because it is very important to the social and cognitive development. Therefore, we confirm that the game is good to mental development as workout is good to physical development.

The game with educational potencial and cognitive and social aspects has been used as one important methodology of learning in mathematics in lots of levels of education. The utilization in mathematics education is materialized because mathematics is considered one science where reasoning and abstraction are really important. Nowadays, games are used as one important complement during mathematics classes, because it focus in attractive and challengers exercises, that stimulate the creativity, and also the strategies to solve the problem. By the way, we need to understand how to work with games in the mathematics classes, as one important way to the comprehension of content and fundamental concepts, and stimulate the reasoning development.

We are going to present the game named as “Tower of Hanoi” that is used in lots of levels of education. We can put this game into practice from Kindergarten to University, and even to professionals that work with Computation – studying algorithms recurrences, and even in Logistics – products distribution.