Senato della Repubblica

Camera dei Deputati

UNDER THE AUSPICES OF

Senato della Repubblica
Camera dei Deputati
Presidenza del Consiglio dei Ministri
Ministero degli Affari Esteri

COM.IT.ES
Comitato degli Italiani all'Estero
Committee for Italians Abroad

In cooperation with

CONSULATE GENERAL OF ITALY IN HOUSTON

Present: The 5th Conference of Italian Researchers

"The contribution of Italian Researchers in the World"

Chairman: Vincenzo Arcobelli, President Comites
Director: Andrea Duchini, M.D, FACP

DECEMBER 5, 2009
ITALIAN CONSULATE
AUDITORIUM
1330 POST OAK BOULEVARD
HOUSTON, TEXAS 77056

Messaggio del Chairman

A nome del Comitato per gli Italiani all` estero della circoscrizione consolare di Houston che comprende gli Stati dell`Arkansas,Louisiana, Oklahoma e Texas, desidero dare il benvenuto a tutti i partecipanti alla quinta conferenza dei ricercatori Italiani.

Anche quest`anno la manifestazione ha ricevuto il riconoscimento ufficiale attraverso i patrocini del Senato della Repubblica, della Camera dei Deputati , dalla Presidenza del Consiglio dei Ministri ,dal Ministero degli Affari Esteri , assieme ai messaggi di apprezzamento per l`iniziativa e gli Auguri della Presidenza della Repubblica,dal Presidente dell`Istituto Superiore di Sanita` Prof.Garaci , in aggiunta a quelli dell'Ambasciatore Italiano a Washington Giulio Terzi di Sant`Agata e dal Primo Consigliere Cristiano Maggipinto .

L`idea del Comitato nata 5 anni fa era quella di dare un riconoscimento e di poter presentare i ricercatori italiani alla comunita' locale ed internazionale successivamente, di incrementare il networking , di creare un anagrafe degli scienziati in generale in collaborazione con la rete diplomatica consolare , di poter essere propositivi e di stringere nuove collaborazioni.

Ultimamente si parla spesso della fuga dei cervelli dall'Italia , della modifica di alcune leggi, delle varie proposte da parte del Ministero dell' Istruzione riguardanti la scuola, l`Universita' e la Ricerca.

Uno degli obiettivi di questa conferenza e' quello di avvicinare i giovani studenti ricercatori residenti o in missione all'estero, aprire un dibattito tra le parti interessate, i rappresentanti delle Istituzioni e della comunita' ,di carattere costruttivo, con la presentazione di un documento finale da presentare alle autorita' competenti e che sono in linea e di supporto a quelle gia' evidenziate dall'ISSNAF (Italian Scientist and Scholars in North AmericaFoundation) ,per esempio, nel promuovere collaborazioni scientifiche fra l`Italia e gli Stati Uniti e Canada nei diversi settori come le Scienze ambientali,Ingegneria, Informatica, Medicina ,Biologia,Chimica, Matematica e Fisica,Scienze Economiche e Sociali , Umanistica, avere piu' collaborazioni concrete con Istituti Accademici e Scientifici ed Aerospaziali con le Industrie di riferimento ,nell'inviare al Ministero della Pubblica Istruzione delle idee e proposte che possono essere utili sulla riforma universitaria soprattutto per trasformare il sistema universitario in senso piu' meritocratico, efficiente , competitivo a livello internazionale sostenuta in termini di risorse e mezzi non solo dal Governo ma anche dalle grandi realta' industriali del Paese.

Ringrazio il Consolato Generale d'Italia a Houston per l`ospitalita` e la collaborazione prestata , il Dr.Duchini con il comitato organizzatore ,i membri del Comites e la commissione giovani per aver sostenuto in tutti questi anni questa manifestazione, la deputata parlamentare On.Elena Centemero membro della VII Commissione Istruzione e Cultura della Camera e tutti i Ricercatori che si sono presentati e provenienti da diverse localita` statunitensi.

Ai partecipanti auguro buon lavoro e i migliori successi di una brillante carriera .

Vincenzo Arcobelli
Presidente Comites
Circoscrizione Consolare di Houston

Director's Message

I want to welcome all the participants to the fifth edition of the "Conference of Italian Researchers in the World" and deeply thank everybody that made this event possible again in 2009.

This year's edition of our conference has been expanded to areas such as classics, bioengineering and business that were not previously represented. New and interesting presentations in medicine, bioscience, physics and technology have been included.

This year's round-table will focus on the development of scientific collaborations between Italy and other countries. The presence of the Italian Scientists and Scholars in North America Foundation (ISSNAF), RAI, NASA and the Italian Institutions together at the conference represents a unique opportunity for discussion and exchange of ideas.

We are proud of the work that so many Italians are producing all over the world and we want to make it possible for more and more scientists to share their research and experience in different fields.

We hope that our work will help Italian researchers abroad to come together in that spirit that made them so successful and appreciated all over the world.

Andrea Duchini, MD, FACP
Associate Professor of Medicine and Surgery
Director of Hepatology
Medical Director of Liver Transplantation
University of Texas Medical Branch
Galveston TX 77555

Responsabile Commissione Sanita` e Ricerca

Comites Circoscrizione Consolare di Houston

Il Presidente
del Senato della Repubblica

GENTILE PRESIDENTE, LA RINGRAZIO PER AVERMI PORTATO A CONOSCENZA DELLA QUINTA EDIZIONE DELLA CONFERENZA "RICERCATORI ITALIANI NEL MONDO: PASSATO, PRESENTE E FUTURO" CHE SI TERRÀ IL 5 DICEMBRE PROSSIMO A HOUSTON NEL TEXAS. DESIDERO ESPRIMERE IL MIO APPREZZAMENTO PER L'INIZIATIVA, CHE RAPPRESENTERÀ UN IMPORTANTE MOMENTO D'INCONTRO PER LA COMUNITÀ SCIENTIFICA ITALIANA RESIDENTE ALL'ESTERO E TUTTI I COLORO CHE HANNO NEL SANGUE UN PO' DELLA NOSTRA ITALIA. SONO SICURO CHE QUESTO EVENTO SARÀ PROFICUO NON SOLO PER LO SCAMBIO D'INFORMAZIONI SCIENTIFICHE MA ANCHE COME MOMENTO DI SCAMBIO CULTURALE FRA ITALIA E STATI UNITI LEGATI DA SEMPRE DA UNA PROFONDA AMICIZIA. AUGURANDO OGNI SUCCESSO ALLA MANIFESTAZIONE INVIO A LEI E A TUTTI I PARTECIPANTI I MIEI PIÙ CORDIALI SALUTI.

RENATO SCHIFANI

VINCENZO ARCOBELLI
PRESIDENTE COM.IT.ES

IL PRESIDENTE DELLA CAMERA DEI DEPUTATI

Segreteria del Presidente
PARTENZA 4 Dicembre 2009
Prot: 2009/0013023/PRES

Dott. Vincenzo Arcobelli
Presidente
COM.IT.ES.
Circoscrizione Consolare di Houston

MESSAGGIO

Sono lieto di inviare il mio più cordiale saluto a Lei, gentile Presidente, e a tutti i partecipanti alla V Conferenza "*Ricercatori Italiani nel Mondo; Passato, Presente e Futuro*", che si svolgerà il 5 dicembre prossimo a Houston in Texas.

Sono molte migliaia i nostri giovani laureati, i nostri ricercatori scientifici che, purtroppo, ogni anno lasciano l'Italia per proseguire i loro studi o per lavorare all'estero dimostrando così, in quei territori, le loro capacità e professionalità e dando lustro all'Italia per le loro competenze nei diversi campi del sapere.

E' dovere delle Istituzioni intensificare gli investimenti sull'istruzione e sulla ricerca scientifica, da cui, in larga misura, dipendono fattori essenziali e determinanti della produttività e della crescita dell'economia e, al contempo, promuovere un'effettiva valorizzazione dei ricercatori italiani all'estero, affinché essi sentano e mantengano forte il legame di appartenenza con la propria terra d'origine e possano mettere, in maniera più diretta, le loro conoscenze al servizio della nostra società e delle nostre imprese.

A Lei e a tutti gli intervenuti rivolgo il mio più fervido augurio per il miglior esito dell'iniziativa ed un sincero augurio di buon lavoro.

Gianfranco Fini

Il Consigliere Diplomatico
del Presidente della Repubblica

Roma, 24 novembre 2009

Gentile Presidente,

a nome del Presidente della Repubblica, desidero ringraziarLa per l'invito a partecipare alla quinta Conferenza "Ricercatori italiani nel mondo: passato, presente e futuro" in calendario presso il Consolato Generale di Houston il prossimo 5 dicembre.

Si tratta di un tema di assoluta attualità e sul quale il Capo dello Stato è intervenuto a più riprese. Di recente ha ribadito "la necessità di investire in ricerca e innovazione, perché su questo ci giochiamo il nostro futuro, anche per uscire dalla crisi in condizioni migliori di quelle in cui ci siamo entrati. Nessuno negherà che gli investimenti nella ricerca e nell'innovazione sono fondamentali. Poi, fra le parole e i fatti spesso c'è una differenza notevole e quindi bisogna insistere perché noi abbiamo bisogno che affluiscano risorse e iniziative sia pubbliche che private nel campo della ricerca e dell'innovazione".

Impegni istituzionali precedentemente assunti non consentono, tuttavia, al Presidente Napolitano di partecipare all'evento.

Nel formulare a nome del Capo dello Stato voti di successo per l'iniziativa, colgo l'occasione, gentile Presidente, per inviarLe i miei saluti più cordiali

un caro

Ambasciatore
Rocco Antonio Cangelosi

Dottor Vincenzo Arcobelli
Presidente del Comitato degli
Italiani all'Estero
3513 Hidden Forest Drive
Flower Mound, Texas 75028
USA

L'Ambasciatore

Ambasciata d'Italia
Washington

5 dicembre 2009

Caro Presidente Arcobelli,

è con profonda ammirazione che saluto organizzatori e partecipanti alla Quinta edizione della Conferenza dei ricercatori italiani a Houston.

Condivido pienamente gli obiettivi che la Conferenza si prefigge: far conoscere al grande pubblico degli italiani e degli amercani residenti in quella circoscrizione i risultati della ricerca italiana negli Stati Uniti; favorire l'incontro e gli scambi di ricerche fra ricercatori italiani e colleghi americani; valorizzare l'impatto innovativo dei loro progetti di ricerca; creare un ponte fra scienza italiana e scienza americana, con mutuo vantaggio per entrambi i nostri Paesi.

Sono gli stessi obiettivi che mi pongo all'inizio di questa mia missione negli Stati Uniti e che intendo perseguire promuovendo l'attività degli addetti scientifici, consolidando ed espandendo l'azione dell'ISSNAF, moltiplicando l'effetto di iniziative come quella da Voi promossa.

Una tale rete di ricercatori potrà così diventare parte integrante del "sistema Italia" e dare un contributo decisivo al progresso scientifico nei nostri due paesi, consolidando al tempo stesso le relazioni bilaterali.

Auguro agli organizzatori, ai relatori ed a tutti i partecipanti una proficua giornata di lavori.

Con i saluti più cordiali

Giulio Terzi

Dott. Vincenzo Arcobelli
Presidente del Comites
Houston

Istituto Superiore di Sanità

IL PRESIDENTE

00161 ROMA 09/11/09

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Com.te. Vincenzo ARCOBELLI
Presidente Comitato
Italiani Estero-Houston

Gentile Presidente,

ho molto gradito il Suo cortese invito alla quinta conferenza "Ricercatori Italiani nel Mondo – Passato, Presente e Futuro", che si svolgerà a Houston il 5 dicembre p.v. Mi dispiace però di informarLa che impegni istituzionali connessi alle attività di governo non mi consentiranno di essere presente.

Ritengo che l'evento abbia tra i suoi obiettivi non solo la celebrazione delle affermazioni e del successo dei ricercatori italiani nel mondo, ma anche lo stabilire interazioni e collaborazioni più efficaci tra di loro e con gli scienziati che operano in Italia. Infatti molteplici sono le attività congiunte che hanno portato a consolidare le ottime relazioni già instaurate anche attraverso lo scambio e la formazione di giovani ricercatori.

Sono certo che in futuro non mancheranno occasioni per poter approfondire insieme le tematiche suddette e, a tal fine, Le assicuro fin d'ora la mia disponibilità. Mi è gradita l'occasione per porgere a nome mio personale e dell'istituzione che rappresento i miei più sinceri auguri di un sereno e proficuo lavoro a Lei e a tutti i partecipanti all'evento.

Con molti cordiali saluti

Enrico Garaci

NEW YORK, 04 DICEMBRE 2009

CARI ED ILLUSTRI AMICI,

MI SCUSO CON TUTTI VOI PER NON POTER ESSERE PRESENTE AL VOSTRO QUINTO CONGRESSO.

PARTECIPARVI SAREBBE STATA PER ME UNA IMPORTANTE OCCASIONE PER CONOSCERE TUTTI VOI, LE VOSTRE PROBLEMATICHE, I VOSTRI PROGETTI. SPERO DI POTERVI INCONTRARE PRIMA POSSIBILE.

NON SONO SICURAMENTE ORIGINALE SE AFFERMO QUI IL MIO PENSIERO RIGUARDO IL FENOMENO, PERALTRO NUOVAMENTE IN ESPANSIONE, DELLA COSIDDETTA "FUGA DEI CERVELLI": NON E' PIU' AMMISSIBILE, ANCHE SECONDO ME, CHE MOLTI GIOVANI SIANO COSTRETTI A LASCIARE L'ITALIA PER TROVARE UN ADEGUATO SBOCCO LAVORATIVO.

CONDIVIDO PERCIO' LE PAROLE PRONUNICATE PROPRIO POCHE ORE FA DAL CAPO DELLO STATO.

INVESTIRE SUI GIOVANI E SULL'ISTRUZIONE SIGNIFICA SVECCHIARE I PROCESSI PRODUTTIVI, RENDERE LE IMPRESE PIU' MODERNE, E NON SOLO NEL MEZZOGIORNO, SIGNIFCA DARE VITA AD UN CIRCOLO VIRTUOSO CAPACE DI RILANCIARE L'ECONOMIA PER USCIRE DALLA CRISI.

QUESTE RIFLESSIONI, CHE SONO STATE RIBADITE SOLO DUE GIORNI FA ANCHE DAL PRESIDENTE DELLA CAMERA, NON VENGONO TRADOTTE IN INTERVENTI CONCRETI DA TROPPI ANNI. CIO' E' TANTO PIU' GRAVE QUANTO PIU' SI RICORDA CHE ESISTE UN QUADRO DI VALORI COSTITUZIONALI DI RIFERIMENTO CONTENUTI NELL'ARTICOLO 3 DELLA COSTITUZIONE E CHE PREVEDONO LA RIMOZIONE DEGLI OSTACOLI DI ORDINE ECONOMICO E SOCIALE CHE IMPEDISCONO IL PIENO SVILUPPO DELLA PERSONA UMANA E LA EFFETTIVA PARTECIPAZIONE DI TUTTI I LAVORATORI ALL'ORGANIZZAZIONE POLITICA, ECONOMICA E SOCIALE DEL PAESE.

AVREI VOLUTO DIRE QUESTE COSE E CON VOI DIALOGARE SU QUESTI ARGOMENTI.

MA SOPRATTUTTO AVREI VOLUTO COMUNICARVI LA TOTALE DISPONIBILITA' DI RAI CORPORATION A STARVI AL FIANCO NEI MODI CHE INSIEME RITERREMO PIU' OPPORTUNI.

RAI CORPORATION, CHE ESISTE DA QUARANTANOVE ANNI E CHE OPERA SUI TERRITORI DEL NORD, DEL CENTRO E DEL SUD AMERICA, HA LA POSSIBILITA', CHE IO HO TUTTA LA DETERMINAZIONE DI SFRUTTARE, DI PRODURRE PROGRAMMAZIONE TELEVISIVA DEDICATA AL "MERCATO" NEL QUALE VI TROVATE AD OPERARE ED A VIVERE. LO PUO' FARE CON LA PROGRAMMAZIONE PREVISTA DAGLI ACCORDI ITALIA – USA, DALLA STORIA DI QUESTA AZIENDA E DALLO STATUTO CHE NE REGOLA LE ATTIVITA' E LA VITA. SI TRATTA DI DUE ORE QUOTIDIANE (CHE DIVENTANO SEI LA DOMENICA) TRASMESSE VIA CAVO IN QUASI 18MILIONI DI FAMIGLIE SU TUTTO IL TERRITORIO STATUNITENSE. QUESTE ORE VANNO RIVITALIZZATE, RIPRENDENDO LA LORO PRODUZIONE AL PIU' PRESTO CON PROGRAMMI REALIZZATI QUI, QUI, APPUNTO, DISTRIBUITI E RILANCIATI IN ITALIA.

POSSIAMO TROVARE INSIEME, IO CREDO E VI PROPONGO, LA MANIERA PER METTERLE A VOSTRA DISPOSIZIONE SECONDO LA FILOSOFIA DEL SERVIZIO PUBBLICO DI CUI LA RAI E' CUSTODE ANCHE QUANDO OPERA LONTANO DALL'ITALIA.

LA RITENGO UNA PROPOSTA NON SOLTANTO DOVEROSA DA PARTE MIA MA UTILE ANCHE PER VOI.

AGLI ORGANIZZATORI DEL VOSTRO QUINTO CONGRESSO CHIEDO DI ATTIVARE UN COLLEGAMENTO CON ME PER POTER RAGIONARE SUL DA FARSI.

A TUTTI VOI LE MIE RINNOVATE SCUSE PER LA MIA ASSENZA E I MIEI PIU' SENTITI AUGURI DI BUON LAVORO.

MASSIMO MAGLIARO
PRESIDENTE DI RAI CORPORATION

Programma
Sabato 5 Dicembre, 2009

10;00- 11;15 Medicine and Bioscience
Moderators; Marco Marcelli, MD, Michele Sartori, MD,

Stefano Sdringola, MD, University of Texas Medical School, Houston TX
Randomized Trial of Comprehensive Lifestyle Modification, Optimal Pharmacological Treatment and PET (Positron emission Tomography) Imaging for Detection and Management of Stable Coronary Artery Disease: CENTURY Health Study
Cardiology

Paolo Fanti, MD University of Texas Health Science Center at San Antonio.
Antioxidants and Anti-Inflammatory Effects of Dietary Phytochemicals in Patients with Chronic Kidney Disease.
Nephrology

Dario Crosetto, Inventor of the 3D Complete Body Screening technology(3D-CBS) - Dallas TX
3D-CBS: A breakthrough technology, safe for screening and efficacious for early cancer detection
Diagnostics

Giovanbattista Presti, IULM University, Milan, Italy, Fulbright Scholar-in-Residence
California State University - Stanislaus, Turlock, CA (USA)
International cooperation to increase child consumption of vegetables and fruits: Replicating, extending and expanding the Food Dudes studies
Psychology

Andrea Ballabio, MD, Baylor College of Medicine, Houston TX
A gene network regulating cellular clearance
Genetics

Herve' Gentile, MD
Aesthetic Plastic Surgery Today
Plastic Surgery

11:15-11:30 Coffee Break

11:30-12:45 Technology Session
Moderators; Paolo Papi, Raffaella Montelli

Alessandro Piovaccari, Ph.D. Silicon Laboratories, Austin, TX
Low-cost low-power integrated circuits for environmentally-friendly small form-factor consumer products
Electronics Engineering

Raffaella Righetti, Ph.D. Texas A&M University, College Station, TX
New Emerging Ultrasound Imaging Techniques
Electronics Engineering

Marco Tedesco, Ph.D. City College of New York, CUNY, NY
2009 updated melting in Greenland from satellite measurements, ground observations and a regional climate model.
Geophysics

Angelo A. Camillo, Ph.D. Daniels College of Business, University of Denver, CO
Determinants of Wine Consumption in China: Strategies for hospitality operators in an emerging wine market
Business

12:45-13:30 Lunch Break

13;30-14:30 Brief Communications
Moderators; Dario Marchetti, Ph.D, Lorenzo Brancaleon, Ph.D.

Raffaele Ferrari, Texas Tech University Health Sciences Center, Lubbock TX
Molecular genetics of neurological disorders
Neurogenetics

Fabio Urbani, University of Texas at Brownsville, TX
Wireless Sensors for Ultrasound Gestural Interface
Engineering

Davide Cattano, M.D., Ph.D. UTHSC School of Medicine, Houston, TX
Paradoxical Effect of Xenon in Neonatal Anesthesia-Induced Neuroapoptosis.
Anesthesiology

Francesca D'Alessandro Behr, University of Houston, Houston TX
Ancient and New Tragedies: Recreating Phaedra
Classics

Luca Perotti, Texas Southern University
The J-Matrix formalism applied to noisy data series: universal properties of noise.
Physics

Luisa Franzini, Ph.D., University of Texas School of Public Health, Houston TX
Determinants of Health Disparities in Italian Regions
Public Health

14:30-16:15 Introduction to Plenary Session
Moderators; Andrea Duchini, MD, Luca Cicalese, MD,

Vincenzo Arcobelli,
Presidente Comitato Italiani all'Estero.

On. Elena Centemero
***Membro della VII Commissione Cultura e Istruzione e della XIV Commissione Politiche dell'Unione Europea della* Camera dei Deputati**

Prof. Alberto Devoto
Addetto Scientifico Ambasciata Italiana a Washington.

Dr. Massimo Magliaro,
Presidente RAI Corporation

Robert M. Genta, M.D. University of Texas Southwestern Medical School, Dallas, Texas
Some insights into Napoleon's death: the poisoning myth deconstructed.
Pathology

Emilio Ghilardi, AMD, Austin TX
The Industry-Changing Impact of Accelerated Computing
Informatics

Alessandro Carrera, University of Houston, Houston TX
Dante's Hypersphere. The non-Euclidean Geometry of Paradise
Literature

Mauro Ferrari, Ph.D. University of Texas Health Science Center, Houston TX
Alliance for NanoHealth
Bioengineering

Ing. Orazio Chiarenza
Italy in space: the italian participation in the international space station
NASA-JSC

Astronaut Paolo Nespoli
NASA- ESA

16:15-16:30 Coffee Break

16:30- Dibattito Aperto tra il pubblico e I rappresentanti accademici-scientifici e istituzionali
Italian Research in the World
Moderators; Matteo Vatta, MD, Cristiana Rastellini, MD,

Prof. Giorgio Einaudi, Scientific Director ISSNAF
Prof. Giorgio Bellettini, Universita’ di Pisa, Italy, Membro Fondatore ISSNAF

Alberto Pimpinelli, Ph.D.
Attache' for Science and Technology, French Embassy- Consulate General of France

17:30 Final remarks – Documento Finale
Andrea Duchini, MD, Vincenzo Arcobelli
Comites, Houston TX


V Conferenza dei Ricercatori
Houston, Texas
5 Dicembre 2009

Abstracts

Randomized Trial of Comprehensive Lifestyle Modification, Optimal Pharmacological Treatment and PET (Positron emission Tomography) Imaging for Detection and Management of Stable Coronary Artery Disease: CENTURY Health Study by Stefano Sdringola

Background information:

Advances in diagnostic imaging with expensive technologies and reimbursement policies that favor illness intervention rather than primary and secondary prevention have resulted in rising costs of health care and more people being deprived of its benefits. Clinical outcome correlates with clinical management or treatment that in turn results from interpretation of the stress test, particularly for deciding on invasive coronary procedures. Therefore when analyzing the clinical outcomes associated with a specific imaging technique, this interaction among diagnostic imaging, consequent treatment and outcomes must be addressed by randomized trials.

Methods:

The CENTURY trial is a randomized single center clinical trial based at the University of Texas Medical School of Houston. Eligible patients must have been referred for a clinically indicated stress SPECT. Study population: 1300 men and women age > 40 with documented known or suspected atherosclerotic coronary artery disease referred for nuclear stress myocardial perfusion imaging (SPECT). At time of randomization patients will be assigned to "PET guided + comprehensive" versus "SPECT guided + standard" medical management. Following confirmation of eligibility and provision of signed informed consent, patients will be assigned to one of the two possible imaging-treatment strategies. Follow-up 5 years.

Primary Study endpoints:

1) To evaluate the impact of stress perfusion imaging with SPECT or PET on post-test resource utilization and on risk stratification.

2) To assess whether a comprehensive program of lifestyle modification and lipid management, compared with standard therapy, reduces cardiovascular risk in patients with known disease or at high risk for CAD

Stefano Sdringola, MD
Weatherhead Distinguished University Chair
Associate Professor of Medicine and
Associate Director Weatherhead P.E.T. Center for
Preventing and Reversing Atherosclerosis,
University of Texas Medical School, Houston, TX

Graduated in Medicine with honors at the University of Perugia, Italy (1990). Since June 1993 in the USA to be trained in internal medicine, general cardiology and interventional cardiology at the University of Texas Medical School at Houston. He has joined the division of cardiology at the same University after his graduation (2000) and has been promoted Associate Professor of Medicine in 2005. He has received many teaching awards from students, residents and cardiology fellows. He is a practicing academic interventional cardiologist with specific interest in acute coronary syndromes, chronic coronary atherosclerosis and positron emission tomography imaging. He is board certified in Internal Medicine, General Cardiology, Interventional Cardiology and Nuclear Cardiology. He is author of more than 100 publications.

Antioxidants and Anti-Inflammatory Effects of Dietary Phytochemicals in Patients with Chronic Kidney Disease.

Paolo Fanti, M.D., Division of Nephrology, Univ. of Texas Health Science Center San Antonio, San Antonio TX.

The medical care of chronic kidney disease patients has been marked by major advances over the last several decades, including the ever more common use of the artificial kidney treatment, kidney transplantation and targeted new medications. Despite this progress, patients with all stages of chronic kidney disease continue to experience markedly increased morbidity and mortality as compared to the general population. The realization that new modalities of treatment are urgently needed has coincided with the observations that chronic kidney disease is burdened by unusually high levels of oxidative stress and chronic systemic inflammation, and that certain chemicals that are unique to edible plants (a.k.a. phytochemicals) have potent antioxidant and anti-inflammatory properties. The scope of my research over the last decade has been to characterize the antioxidant and anti-inflammatory effects of dietary phytochemicals in patients with chronic kidney disease. I have conducted studies on the soy isoflavones, small molecules unique to the soybeans that are capable of blocking specific inflammatory cell pathways in virtually all human organs and cells. These studies led me to conclude that dietary intake of isoflavone-containing soy products reduces systemic inflammation in renal failure patients receiving chronic artificial kidney treatment. More recently, I have started studies on the flavonolignans, a class of phytochemicals with claimed antioxidant and anti-inflammatory properties that is present in high concentration in milk thistle (*Carduus Marianum*), a weed endemic to the Mediterranean area. The observations collected so far suggest that exposure to the milk thistle flavonolignans may slow down the progression of chronic kidney disease in humans.

Studies supported by the National Institutes of Health.

Paolo Fanti, MD

Paolo Fanti, MD, is Associate Professor of Medicine in the Division of Nephrology at the University of Texas Health Science Center at San Antonio (UTHSCSA). Dr. Fanti is an attending physician and nephrology consultant and the Medical Director of the Pre-End Stage Renal Disease Nephrology Clinic at UTHSCSA. In addition, Dr. Fanti is Chief of the Nephrology Section and Medical Director of the Dialysis Service at the UTHSCSA-affiliated Audie Murphy Veterans Administration Hospital in San Antonio.

After earning a medical degree at the University of Bologna, College of Medicine in Italy, Dr. Fanti completed US clinical and research training at the University of Southern California, School of Medicine in Los Angeles and at the University of Kentucky Medical Center in Lexington.

Dr. Fanti is a principal investigator of ongoing studies on the use of phytochemicals for prevention of renal disease and cardiovascular outcomes in diabetic subjects. Dr. Fanti has written book chapters, and has published abstracts and articles in medical journals, including *Journal of the American Society of Nephrology* and *Nephrology, Dialysis, Transplantation*. He is a consultant for the National Institutes of Health, a reviewer for several medical journals and serves on the editorial board of *Clinical Nephrology*.

International cooperation to increase child consumption of Vegetables and fruits: Replicating, extending and expanding the Food Dudes studies

G. Presti
on behalf of the Italian and the International Food Dudes Research Groups
Institute of Behavior, Consumers, Communication
IULM University, Milan, Italy
Fulbright Scholar-in-Residence
California State University - Stanislaus, Turlock, CA (USA)

Child obesity prevention is a major focus of worldwide health plans. Following previous researches in Anglo-Saxon countries showed that the Food Dudes program substantially increases long-term children's fruit and vegetable consumption. We evaluated it in Italy in 6- to 10-year-old children attending three schools randomly assigned to experimental or control conditions (n=375 and n=350 respectively). During intervention phase (16 days) children watched videos of peers eating fruit and vegetables, and received small rewards for eating 1 portion of them. In the control school only fruits and vegetables were provided for the same period and no intervention. Parental provision and children consumption was assessed at baseline, at 17 days and 1 month after intervention. Relative to baseline, at 17 days and 1 month follow-ups a statistically significant ($p < 0,0001$) difference in consumption of provided food was observed in the experimental, but not in the control, schools, with a 50 fold change observed in poor eaters. Food eating patterns at break time changed from junk food to more healthy choices. Confirming the results in other countries, the program was effective in changing children's consumption in Italy too. A 1 year follow-up is ongoing to evaluate long-term results.
The Food Dudes program was originally developed by the Food Unit at the Department of Psychology of North Wales University at Bangor (UK) and is now under investigation at California State University - Stanislaus at Turlock (CA).

Submission contact information:
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Giovambattista Presti got his degree in Medicine at the University of Catania (Italy), and his specialization in Clinical Psychology at the University of Milan. He has taught General Psychology at European University in Rome, and Psychology and Complex Systems at IULM University in Milan. He is teaching Applied Behavior Analysis Research Seminar and Analyzing Changing Human Behavior at California State University - Stanislaus in Turlock (CA, USA) where he is consulting also for the local Food Dudes research group. He teaches Applied Behavior Analysis and Verbal Behavior at various Specialization Courses in Cognitive-Behavioral Clinical Therapy. He is the treasurer of the European Association for Behavior Analysis, and the co-founder and vice-president of IESCUM (Istituto Italiano per lo Studio del Comportamento Umano) a non-profit research organization. He is member of the Board of Advisors of the Cambridge Center for Behavioral Studies in Boston (MA, USA). His researches focus on obesity, experimental analysis of verbal behavior and its clinical applications,

special education, application of computer science to clinical and educational psychology and medicine, application of behavioral techniques to medicine, theoretical analysis of complex human behavior. He authored two books on Internet and Psychology and co-authored a book on Verbal Behavior. He has published more that 40 papers and chapters, and more than one hundred communications at national and international conferences.

A gene network regulating cellular clearance by Andrea Ballabio

Telethon Institute of Genetics and Medicine (TIGEM), Naples, Italy and Department of Molecular and Human Genetics, Baylor College of Medicine, Houston, Texas.

We identified a gene network that controls the operation of the cell garbage disposals, the lysosomes. These organelles break down harmful molecules, including those that build up in the cells of patients with Alzheimer's, Huntington's and Parkinson's diseases, as well as a number of so-called "lysosomal storage disorders". These findings may therefore point the way to new targets for therapies for these diseases. We found that most lysosomal genes are expressed in a coordinated way, controlled by the transcription factor TFEB, which acts as a "master switch". TFEB, which itself can be activated by abnormal lysosomal storage of undegraded material, can regulate both the abundance of lysosomes in the cell and the ability to degrade complex molecules. We also demonstrated that enhancing TFEB's activity helps the lysosomes degrade the protein responsible for Huntington's disease, suggesting that this strategy may be used for the therapy of neurodegenerative diseases (Sardiello et al. *Science* 325: 473-477, 2009).

Prof. Andrea Ballabio's short biography and research interests

Andrea Ballabio was born in Naples, Italy on January 27th, 1957. After his graduation in Medicine in 1981 at the University of Naples, Italy, he took residency training in Pediatrics at the same university. He has spent several years working in the field of genetic diseases, first in Italy, then in the UK and subsequently in the USA where he held the positions of Associate Professor of Molecular Genetics and of Co-director of the Human Genome Center at the Baylor College of Medicine, Houston, Texas. He is the founder and director of the Telethon Institute of Genetics and Medicine (TIGEM) in Naples, Italy, He is also Director of the Biology For Medicine (BioForMe) foundation and Full Professor of Medical Genetics at the Faculty of Medicine of the University of Naples "Federico II".

Prof. Ballabio's research interests are the elucidation of the biological mechanisms underlying genetic diseases, using both traditional and state of the art genomic approaches, and the development of innovative therapeutic approaches. Prof. Ballabio's team identified numerous genes whose mutations cause human inherited diseases, leading to the unraveling of their pathogenetic mechanisms. Among his recent discoveries is the identification of a gene network regulating cellular clearance (Sardiello et al., *Science*, 2009). He has published approximately 250 papers in prestigious, international scientific journals. Prof. Ballabio was the President of the European Society of Human Genetics and is a Council member of the European Molecular Biology Organization (EMBO). He has received numerous national and international awards for research and culture, among which the 2007 International Award of the European Society of Human Genetics. In 2007 he was appointed "Commendatore of the Italian Republic" by the President of Italy Giorgio Napolitano.

Aesthetic Plastic Surgery: the past...what is current and what is the latest.

Herve` Gentile, MD, FACS

Abstract: The past Italian contribution to plastic surgery is presented together with what is still current and what is the latest. Breast reconstruction is briefly reviewed with its present options as well as new techniques in facelift and autologous fat transfer. Focus will also be on autologous adult fat stem cells and the possible roles it will play in the future treatment of diseases.

Herve F. Gentile, M.D.. FACS

-GRADUATE EDUCATION:

University of Padova (Padua), School of Medicine, Italy
M.D. degree, July 20, 1976

-POST GRADUATE EDUCATION:

1. University Hospital, Padova, Italy; rotating Internship Ob/Gyn, General Surgery, Internal Medicine.
2. St. Joseph Hospital, Baltimore, Maryland; Externship in General Surgery .
3. St. Agnes Hospital, Baltimore, Maryland; Residency in General Surgery.
4. University of Maryland Hospital, Baltimore Maryland; Residency in Otolaryngology – Head and Neck Surgery.
5. Fellowship Facial Plastic and Reconstructive Surgery; Graduate Fellow.
6. Medical College of Georgia, University of Georgia Systems; Residency in Plastic Surgery

-LICENSES

1. Texas, North Carolina Maryland, Georgia, Italy, December 1976, valid in all Common Market Countries

-RESEARCH FELLOWSHIP:

Armed Forces Institute of Pathology, Dept. of ENT – Pathology. Washington, D.C. (March 1 – June 30, 1982).

-MILITARY SERVICE:

USAF, 23rd TFS Flying F-4D, Captain (July 1978 – July 1981).

-CERTIFICATIONS:

1. Diplomat of American Board of Plastic Surgery – November 1996, recertified April 2004
2. Diplomat of American Board of Otolaryngology-Head and Neck Surgery – March 1987
3. Diplomat of American Board of Facial Plastic and Reconstructive Surgery – February 1991

-FACULTY APPOINMENTS:

1. Clinical Assistant Professor, Dept. of Surgery (Plastic Surgery) Medical College of Georgia, University of Georgia Systems.

-TEACHING APPOINTMENTS:

1. Lecturer Plastic Surgery Review Courses, The Osler Institute, 1998-present.
2. Lecturer University of Maryland, Dept. of Surgery.
3. Course Director and Instructor EMT 101 / EMT 102 Emergency Medical Technicians (Paramedics) City College of Chicago, 1978-1981.

-STAFF APPOINTMENTS:

1. Chief of Plastic Surgery Section, Christus Spohn Hospitals, Corpus Christi, Texas, 1995-1997 and 2006-2010
2. Attending Driscoll Children's Hospital, Corpus Christi, Texas

-HONORS:

1. Elected by his peers for inclusion in Best Doctors in America® 2009 in the subspecialty of Body Cosmetic Surgery

-MEMBERSHIPS:

1. Fellow American College of Surgeons.
2. Fellow American Academy of Facial Plastic and Reconstructive Surgery.
3. The American Society of Plastic Surgery.
4. International Society of Aesthetic Plastic Surgery .
5. American Society of Aesthetic Plastic Surgery.
6. Texas Society of Plastic Surgeons.
7. The University of Georgia (Medical College of Georgia) Alumni Association.
8. The University of Maryland Surgical Society.
9. Texas Medical Association.

Low-cost low-power integrated circuits
for environmentally-friendly small form-factor consumer products

Alessandro Piovaccari, Ph.D.
Sr. Design Manager, Broadcast Division
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Austin, TX

Abstract

The last few decades have been characterized but what is known as the mobile telecommunication revolution. Anybody can notice how cell phone, personal digital assistants, MP3 players and portable computers have become an important, if not fundamental, tool of practically everybody's life. As the use of these tools assume more widespread use our reliance in them become of critical importance. Few examples that we see in everyday life could include the disappearance of public phones and the fact that most people, among several other things, do banking and pay bills on-line. And, who doesn't want to be able to reach the teenage kids when they are out in the evening? And, who cannot understand the value of calling for help in case of an emergency? In other words we cannot live anymore without them!

To rely in these electronic tools means that we want to be able to carry them in our pocket all the time and we need to be sure that they work when we need them. So we want them small and we want their battery to last a very long time. In parallel, other aspects have become progressively more important and have influenced their design. First of all, environment consciousness and energy conservation issues which requires devices to consume low power, an aspect that goes along very well with the life of the battery. Second, the fashion and design aspects that besides color and material they had a compelling action in determining the form factor of these devices. These aspects have been so revolutionary that their influence extended to other products that are not portable in nature, like televisions and electronic devices in car and trucks.

In this context, during the last decade, Silicon Laboratories developed several integrated circuits that have proven to be key enablers in the development of such products. The company's main goal has always been to reduce the bill of materials (BOM) providing single-chip solutions manufactured in low-cost bare-bone CMOS technology. This approach besides having the big advantage to reduce the overall cost for product manufactures has the big advantage to reduce the size of the complete application and reduce the power consumption while maintaining or improving performances. Several successful products have been developed using this philosophy. Among them could be cited, computer modem chips, single-chip cell phone transceivers, FM radio tuners, FM radio transmitters, satellite tuners, application-specific microcontrollers and lately single-chip TV tuners. Most of them have been used in many commercially available consumer electronics products from major manufacturers. As a remarkable example the FM tuners sold more than 500 million pieces.

Biography:

Alessandro Piovaccari received his Laurea and Ph.D. EECS degrees from the University of Bologna in 1993 and 1998 respectively. He also received a EECS post-master degree from the Johns Hopkins University in Baltimore, MD in 2002. In the early years, his research focused on the design of low-voltage low-power integrated circuits for analog and mixed-signal applications. Among them a car small form factor antennas preamplifier, an interface for X-rays diagnostic electronic sensors and a bi-dimensional optical sensor for surveillance applications.

After spending a sabbatical in 1997 working for Tanner Research in Pasadena, CA, in 1998 he moved permanently to the US joining Cadence Design Systems in Columbia, MD. Here he worked on the design of integrated circuits for cellular and cordless phones. In 2001 he become the manager for the analog and mixed-signal group in the company's RTP design center located in Cary, NC, Here he worked on high-speed serial links for network and chip-to-chip communication.

Since late 2003 he works for Silicon Laboratories in Austin, TX where he currently hold an engineering manager position in the video products line of the broadcast division. After working on the single-chip solutions for FM receptions and transmission in mobile devices, since 2006 he has been leading the single-chip TV tuner/receiver project, recently announced by the company.

Most of the products he worked on are part of commercially available consumer products, including the FM tuner chip that as today sold more than 500 million units.

He is a senior member of the Institute of Electrical and Electronics Engineers and of the Audio Engineering Society. Is he is reviewer for the Microwave Theory and Techniques society and he is part of the Technical Program Committee of Custom Integrated Circuits Conference.

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New Emerging Ultrasound Imaging Techniques
Raffaella Righetti

Diagnostic ultrasound imaging is currently one of the most widely utilized medical imaging modalities. According to the World Health Organization, next to X-ray, ultrasound is also the most effective medical imaging modality. Ultrasound imaging techniques are fast thus providing physicians real-time clinical feedback, mostly non-invasive and generate high-resolution images without the use of ionizing radiations. Ultrasound techniques are implementable in small, portable devices that can be used for tissue assessment ‘in the field’ where other techniques cannot be readily available, such as space-related, sports and military medicine applications. In addition to diagnostics, ultrasound is also a primary modality for therapy. For example, high intensity focused ultrasound has gained acceptance clinically and throughout the world as a new, minimally-invasive and effective cancer ablation technique. In recent years, the deployment of new technologies, efficient transducer materials, and advanced signal and image processing techniques have lead to diagnostic ultrasound systems capable of producing ultrasound images of significantly improved image quality, 3D and 4D high resolution visualization of tissue structures and accurate estimation of new tissue properties related to the tissue mechanical behavior.

Currently, research efforts in this field converge on the development of new ultrasound imaging opportunities that tackle difficult, yet critical, issues of clinical importance. The research in our laboratory focuses on new, specialized emerging ultrasound technologies. These include elasticity imaging, ultrasound tomography, signal processing strategies for efficient implementations, and the development of new multi-modality imaging approaches.

While ultrasound remains the preferred imaging modality in a variety of clinical situations, future advancements in this field that continue to be innovative and clinically significant are both exciting and challenging.

BIO

Raffaella Righetti received her Doctor of Electronics Engineering degree from the University of Florence (1999) and a M.S. degree (2001) and a Ph.D. degree (2005) in Electrical Engineering from the University of Houston. From 1999 to 2007, she worked in the Department of Diagnostic and Interventional Imaging at The University of Texas Health Science Center at Houston where she has served as a Research Assistant and Post Doctoral Fellow. Since fall 2007, she has been working in the Department of Electrical and Computer Engineering at Texas A&M University as an Assistant Professor. Dr. Righetti’s formal training is in ultrasound imaging with special emphasis in cancer imaging applications. Dr. Righetti was on the team that first developed ultrasound elastography, a non-invasive technique that translates phased array technology and real-time DSP to enable the measurement of minute mechanical changes in tissue that foretell the development of diseases from lymphedema to cancers and allow quantification of the efficacy of tissue therapies. She has published over 20 articles in leading journals in the area of ultrasound and elasticity imaging. She serves as a reviewer of several major journals in the field of ultrasound and biomedical imaging and for the National Institute of Health.

2009 updated melting in Greenland from satellite measurements, ground observations and a regional climate model.

M. Tedesco
City College of New York, CUNY, NYC, NY

I report results regarding melting in Greenland from satellite measurements, ground observations and a regional climate model since 1979 through 2009. In particular, passive microwave observations are used to derived melt extent and duration over the entire Greenland ice sheet on a daily basis and are then compared with those obtained with a regional model (MAR), with the modeled net surface energy fluxes and with the trends of surface temperature collected along the coast at selected locations. Surface mass balance data of the Greenland ice sheet is also derived from the MAR model and compared with those from ground measurements performed on the ablation zone of the west Greenland ice sheet along the 67° N latitude circle, at distances of 6, 38 and 88 km from the ice sheet margin at elevations of 490, 1020 and 1520 m a.s.l.

Results are updated through the 2009 melting season and evaluated in the context of the 1979 – 2009 period.

Bio:
Marco Tedesco, received his 'Laurea' degree in Electronic Engineering from the University of Napoli 'Federico II' (Italy). He obtained his PhD from the Institute of Applied Physics 'Carrara', Firenze, Italy with the thesis titled 'Microwave Remote Sensing of Snow'. He was visiting student at the Chinese Academy of Science (Beijing), the Fudan University (Shanghai) and at the Space Laboratory of the Helsinki University of Technology. In 2003 Dr. Tedesco joined the GEST Department of the University of Maryland, Baltimore County at the NASA's Goddard Space Flight Center, Hydrospheric & Biospheric Sciences Laboratory. Since 2008 he is Assistant Professor at the City College of New York, City University of New York and Fellow of the Joint Center for Earth Systems Technology at the NASA Goddard Space Flight Center. Dr. Tedesco's research interests include electromagnetic modeling, remote sensing of the cryosphere, cryosphere/climate interactions, high latitude field measurements and arctic climate change. He is the founder and director of the Cryospheric Processes and Remote Sensing Laboratory at the City College of New York and he is currently the PI of the NASA AMSR-E SWE product. Dr. Tedesco has more than 35 peer reviewed papers and more than 90 conference proceedings. He serves as a reviewer for several journals and has served as guest editor for various journals. He is member of the American Geophysical Union Society and ISSNAF.

The Industry-Changing Impact of Accelerated Computing.

Emilio Ghilardi

Computer processing has reached a crossroads where the relationship between hardware and software must change to support the increased processing needs of modern computing workloads, including virtualized environments and media-rich applications.

Accelerated computing uses specialized hardware to increase the speed of certain processing tasks, offering commercial and consumer users simultaneous energy efficiency, high performance, and low cost.

From a hardware perspective, accelerated computing provides a general platform that supports the addition of specialized processing units, or accelerators, to a multicore computer. These accelerators may take the form of off-core chips such as media or network packet accelerators, or they may be additional cores designed for specific types of processing tasks.

From a software perspective, the accelerated computing framework will simplify writing parallel applications: developers will have high-level tools that support parallel programming, and applications will not have to specify which hardware should be used for a given processing task.

AMD has been building expertise and capability in general- and specific-purpose computing for the last several years, including how to effectively couple general- and specific-purpose processors. This activity has built a solid foundation for further research and development in accelerated computing. We are actively collaborating with large research institutions, independent software vendors, the open source community, and other organizations to develop an open ecosystem around accelerated computing.

Our commitment to accelerated computing includes designing hardware accelerators, building developer tools, and driving thought leadership by participating in standards development bodies.

We believe that accelerated computing embodies a rapidly approaching paradigm shift, and we intend to offer commercial and consumer users flexible computing solutions that meet their needs based on the components available in the growing ecosystem.

This discussion explores the accelerated computing framework. It provides examples of accelerated computing in action today, describes potential uses of accelerators in the near- to mid-term, and makes a clear case that accelerated computing is the natural outcome of the computer industry's current integration trend.

It further illustrates that, in full bloom, accelerated computing will create many opportunities to customize computer systems by providing targeted, precise solutions for different kinds of workloads to satisfy the need for application performance, energy efficiency, and low cost.

Emilio Ghilardi

Senior Vice President and Chief Sales Officer, AMD

Emilio Ghilardi is senior vice president and chief sales officer of AMD. He is responsible for leading the company’s global sales organization, which manages AMD’s customer relationships to drive worldwide revenue and profitability growth.

Ghilardi joined AMD in 2008, bringing more than 25 years of sales and marketing experience in the IT industry. He was previously senior vice president and general manager for AMD EMEA, responsible for driving revenue and profit growth in the EMEA region, while managing all regional sales and marketing activities. He assumed his current position in January 2009.

Prior to joining AMD, Ghilardi was vice president and general manager of HP’s EMEA Consumer Go-to-Market Business Unit, managing a multi-billion dollar consumer PC and imaging and printing business. Prior to that position, Ghilardi was vice president and general manager responsible for HP’s EMEA Commercial Printing and Imaging categories as well as the vice president and general manager responsible for HP’s EMEA Consumer PC Product categories. Ghilardi, who joined HP in 1982, served as chairman of HP Italy’s Board of Directors from 2001 through 2008 in addition to holding several other management positions during his 25-year tenure at HP.

Ghilardi holds a master’s degree in electronic engineering from Italy’s Politecnico di Torino. He resides in Austin, Texas

Determinants of Wine Consumption in China:

Strategies for hospitality operators in an emerging wine market

Abstract

A large number of factors both, intrinsic and extrinsic affect the wine choice, buying and consumption of wine consumers. This study researches empirically the determinants of wine consumption in China through the study of consumer behavior, and offers a perspective on consumption behavior of Chinese wine consumers. The study analyzes econometrically 126 survey responses and determines that knowledge, wine related activities and profession are significantly related and are the leading influential factors in the decision making process of wine purchase and consumption of Chinese wine consumers. This implies that there is a need for the players in the wine supply chain to develop and incorporate an “educational strategy” in their marketing plan, to better connect with the consumers, to educate and inform them in a way that is compatible with their needs and expectations. Wine produces one of the highest profits among all perishable inventory products. This study offers all stakeholders and especially the end-resellers such as hospitality operators, valuable tools and directions to gain consumer confidence and to build loyalty. Hospitality operators should pay special attention to wine revenue which, in terms of profit, is the core of the total beverage revenue and a vital part of the aggregate revenues.

Key words: wine consumption, consumer behavior, wine marketing, influential factors, beverage management, beverage revenue

BIOGRAPHY

Prof. Camillo was born in 1954 in Santa Croce di Magliano, a small town in the province of Campobasso in the region of Molise, Italy. Prof. Camillo received an associate degree in accounting and hotel business administration from the Italian State School in Sorrento, Italy in 1971 and in 1981 received the State Certified Hotel Economist degree, and a life time teacher’s certification from the School of Hotel Economics in Heidelberg, Germany. Prof. Camillo holds an MBA degree from San Francisco State University and a Ph.D. degree in Human Environmental Sciences with concentration on Hospitality Strategic Management from Oklahoma State University and holds several professional certifications. He is Fluent in English, German, French, and Italian with basic knowledge of Spanish. His international career has encompassed positions ranging from middle to top management with multinational companies such as Intercontinental Hotels, Holiday Inn International, and Sheraton International in 11 countries and 5 continents. He has consulted multinational companies such as Hamilton Beach – Proctor Silex, Samsung International, and various independent businesses. He has been teaching since 1996 and has owned, leased and operated several businesses including a 200 room hotel dining facilities. He has held several honorary positions: Government Appointed Member of the Board of Trustees at the Ontario Ministry of Education in Canada, Advisory Committee Member at the Niagara Falls NY Community College, and The Niagara Falls NY High School. Prof. Camillo is recipient of many achievement awards including the 2007 Herman Breithaput International Teachers of the Year Award. He has taken part in live radio and television shows and has been written up in many news papers and magazines around the world. Prof. Camillo teaches capstone classes in Strategic Management, Business Policy and Globalization and Entrepreneurship. He has taught in the Executive MBA program at the College of Business at San Francisco State University and as of September 1st of 2006 he joined the Daniel’s College of Business, University of Denver: http://www.daniels.du.edu as an Assistant Professor teaching hospitality related courses and business related courses in the Department of Management. During the past winter and summer breaks Prof. Camillo has been visiting professor in Italy and China and has made invited presentations in South Korea and Germany. H is a proud member of the faculty of a top business school in America.

Molecular genetics of neurological disorders

Where and who we are

I, Raffaele Ferrari, work as a Research Assistant in the laboratory of Neurogenetics located in the Department of Internal Medicine at the Texas Tech University Health Sciences Center (TTUHSC) in Lubbock, TX under supervision of Dr. Parastoo Momeni. I am also enrolled as a part-time/non-resident PhD student at the University College London (UCL) since September 2008 under supervision of Professor John Hardy and Dr. Rohan de Silva. Before establishing her own laboratory of Neurogenetics at TTUHSC Dr. Momeni concluded five years of postdoctoral research at the Institute of Aging at the National Institute of Health (NIH) under guidance of Professor John Hardy. She has also collaborated with Dr. de Silva for the past seven years.

Research focus

Our research focus is molecular genetics of neurological disorders. Specifically we try to give novel definitions to neurodegenerative dementias such as

- Frontotemporal dementia (FTD),
- Alzheimer's disease (AD),
- Corticobasal syndrome/degeneration (CBS/CBD) and
- Progressive supranuclear palsy (PSP)

combining their clinical and pathological characteristics together with the analysis of their genetics. We actively collect blood, DNA, serum and brain samples from patients diagnosed with neurological and psychiatric disorders from all over the world.

In our laboratory we screen candidate target genes related to the above mentioned neurological disorders. We perform sequencing of microtubule associated protein-TAU (*MAPT*), progranulin (*PGRN*), amyloid precursor protein (*APP*), presinilin-1 and 2 (*PSEN-1/2*), charged multivescicular body 2B (*CHMP2B*), fused in sarcoma (*FUS*), TAR DNA binding protein 43 (*TDP-43*) and corticotropin releasing hormone receptor 1 (*CRHR1*) and the recently genes identified for AD such as clusterin (*CLU*), complement component (3b/4b) receptor 1 (*CR1*) and phosphatidylinositol binding clathrin assembly protein (*PICALM*); also we investigate disease haplotypes such as angiotensin I converting enzyme (ACE) and MAPT haplotype and perform apolipoprotein E (ApoE) genotyping.

In detail, we extract DNA from patients' blood and prepare it for polymerase chain reaction (PCR), sequencing, gene dosage, single nuclear polymorphisms (SNPs) and copy number variation (CNV) studies. Our laboratory is equipped with 3730 DNA analyzer for sequencing (Applied Biosystems) and 7900 Fast Real Time PCR System (Applied Biosystems) for gene dosage, real time PCR and Taqman assays for SNPs and CNV studies.

Projects

Our efforts brought to the development of international and national collaborations.

1. We collect and perform genetic screening on FTD and CBS/CBD samples that we receive from our collaborators at the National Institute of Health/National Institute of Neurological Disorders and Stroke (NIH/NINDS);

2. we collect and perform genetic screening on samples of patients diagnosed with different types of neurological disorders (main focus are patients with Schizophrenia) from the University of Monterrey, Mexico;
3. we are collecting samples of patients diagnosed with both amnestic and non amnestic mild cognitive impairment (a/naMCI) and Alzheimer's disease (AD), together with normal controls, from the University of Genova, Italy; the strength of this collaboration is given by the choice of samples (geographical specific area) and by the fact that we are going to develop a repository for collection, storage and analysis of clinical, imaging and genetic data. The ultimate goal of this project is 1) to describe patients and controls by the clinical, neurophysiological/imaging and genetic point of view and 2) to screen and analyze the concentration and distribution of biomarkers isolated from patients' and controls' serum to develop algorithms for early detection or prediction of AD;
4. we are participating to an international effort of whole genome association (WGA) study in FTD for which we are sharing some of our FTD samples. I am coordinating with other colleagues the collection of the samples and the initial phases of the study. This is my main project within the PhD program that I am attending at UCL. Genotyping for the project will be performed partly at NIH and partly at University College London (UCL); follow up study implying sequencing and presumably gene dosage will be performed partly in our lab at TTUHSC;
5. we are participating to an international effort of WGA study in PSP. Genotyping for the project has been performed at the University of Pennsylvania (UPenn); follow up study implying sequencing and presumably gene dosage will be performed at UCL and partly in our lab at TTUHSC;
6. we are going to perform a familial linkage study of a familial case of FTD from South Africa at UCL (for which we have already performed all the sequencing and genotyping screening);
7. we are running a project for cardiovascular disease. Main goal is to uncover a link between cardiovascular diseases and neurodegenerative disorders; in this specific study we are not only comparing cases to controls (within the same ethnicity) but we are also comparing different ethnicities such as the Caucasians vs. Hispanics. This project needs to be considered as a huge genetic and statistical effort;
8. we have received a local Grant to initiate a study focused on the pathogenesis of AD in peri-menopausal women;
9. we are investigating the genetic and pathological overlap between FTD and alcoholism;
10. during my visits to UCL (2 to 3 times per year for 3 to 4 weeks each time) I have had and I have the opportunity to be involved in ongoing projects of different research groups: I have participated 1) in screening of target genes in British cohorts of patients diagnosed with FTD (collaboration with Dr. S. Mead's group at the PRION Unit, Institute of Neurology, UCL) that led to a recent publication (please see CV, J Rohrer et al., 2009 ahead of print), 2) in *in vitro* functional studies performed to explore the effect of for several SNPs mutations in CHMP2B with the group led by Dr. Adrian Isaacs at the PRION Unit, Institute of Neurology, UCL and 3) in genetic screening of cohorts of patients diagnosed with PSP in the laboratory of Dr. Rohan de Silva at the Reta Lila Weston Institute of Neurological Studies, Institute of Neurology, UCL.

Wireless Sensors for Ultrasound Gestural Interface

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Abstract— the localization of remote sensors using ultrasound wireless transducers must be reliable, fast, and accurate. This paper addresses the design of a wireless system composed by a fast response voltage controlled oscillator (vco) and a printed inverted-f antenna (pifa) on ro4350 to be integrated with ultrasound sensors for gestural interface. The vco response time is kept below 10ns and the antenna is compact, easy to manufacture and efficient with an omnidirectional pattern. Both vco and pifa performance were simulated using commercial software such as awr® and hfss™, respectively.

Keywords— Wireless sensor network; Localization; System-on-Chip (SOC); Voltage Controlled Oscillator (VCO), Printed Inverted-F Antenna (PIFA).

I. INTRODUCTION

Distributed sensing and computing along with dense wireless networks connecting and disseminating territorial data is getting more and more ubiquitous due to their enormous impacts on public health, social life etc. The emerging field of wireless sensor networks combines sensing, computation, and communication into a single small device usually referred as System-on-Chip (SOC). While the capabilities of any single device are minimal, the composition of hundreds of devices offers drastic new technological promises. The power of wireless sensor networks relies on the ability to position large numbers of miniature nodes that assemble and configure themselves. Usage scenarios for these devices range from realtime tracking, to ubiquitous computing environments, to in situ monitoring of the health of structures or equipment. The rapid growth of wireless sensor market calls for a continuous improvement in design techniques to facilitate a fast and inexpensive realization of new circuits. In the proposed localization system, a set of beacons emits a sequence of acoustic pulses in the space region containing the sensors equipped with microphones. The single sensor device is composed by three main parts: the ultrasound transducer, the signal conditioner, and the wireless front end transmitter. The ultrasound transducer is based on miniaturized ultrasound devices that can be realized in thick-film or micro-machined silicon (Capacitive Micromachined Ultrasound Transducers or CMUT) with integrated electronics. The wireless component will require a RF front end transmitter and antenna which will allow the single sensor to communicate with the central information processor (CIP). The paper addresses the applications of unobtrusive, wearable wireless acoustic sensor device to perform accurate localization and tracking of objects in the 3D-space. When impinged by the acoustic wave front, each sensor responds with a radio frequency (RF) acknowledge signal that will be sent to a common CIP unit. All the sensors respond independently from each other. The radio base, knowing the positions of the acoustic beacons and the time of arrival of the acknowledge signals, computes the positions of the sensors with a suitable algorithm. The radio base must receive the reception signal with the minimum time delay, so that the RF path time can be assumed negligible in respect to the acoustic path time, or at least sufficiently constant and known. The transmitting interval must allow the oscillator to reach its steady state and avoid interference due to collisions associated to other sensors transmitting in the vicinity. The proposed technology allows identifying and tracking the absolute position of many identical objects in the 3D space with a spatial resolution ranging from centimeters down to millimeters. At the present time no techniques are available to localize a multitude of identical targets with such a detailed spatial

resolution; such a technique could dramatically reduce costs through industrial mass-production of identical remote devices and be applied to a broad range of applications. The proposed topic is part of the vaster research project

Wireless Sensors for Environmental NETwork (WISENET) sponsored by the European Commission under the Marie Curie Actions. The paper aims to explore all the challenges related to the design and integration of different systems from the choice of the right components to the interface between acoustic and microwave signals.

FUNDING 3D-CBS: A BREAKTHROUGH TECHNOLOGY, SAFE FOR SCREENING AND EFFICACIOUS FOR EARLY CANCER DETECTION

DARIO B. CROSETTO
(www.crosettofoundation.org)

BIOGRAPHY

Dario Crosetto has twenty-five years' experience in international collaboration in the field of high energy physics. He has participated on research teams and presented numerous seminars and articles at conferences at universities and at the most prestigious research laboratories in several countries: CERN (European Center for Particle Physics) Geneva, Switzerland; the Superconducting Super Collier (SSC), Texas, FERMILAB, BNL, SLAC, NEVIS Columbia University, BERKLEY, USA; DESY, University of Heidelberg, Germany; SACLAY, CPPM, France; KEK, Japan, etc. He lectured at CERN School of Computing. He has published several books and articles and owns a number of patents. He has spent most of the past twenty years designing and improving apparatuses to detect high-energy particles and during the last years designing, simulating, building and testing components for his cancer screening machine Three-dimensional Complete Body Screening (3D-CBS). Crosetto overseeing the design, construction, and financing of the cancer screening machine. Among the over 100 articles he published, the basis of his innovations is described in the peer-reviewed Elsevier Journal Nuclear Instruments and Methods in Physics Research, NIM (Vol. 436, pp. 341-385, 1999).

In 1992 the author, in one month, presented his innovation at three international conferences in Europe at Annecy, France [Computing in High Energy Physics '92. Annecy, France. 21-25 September 1992. CERN-92-07. pp. 803-806.], in the United States at Corpus Christi, Texas [Calorimetry in High Energy Physics. Corpus Christy, Texas, September 29 – October 2, 1992. World Scientific. pp. 553-566] and IEEE-NSS-MIC in Orlando, Florida [SSCL-Preprint-164, IEEE, Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC), Orlando, Florida, October 25-31. 1992] and two of his articles were published in the peer reviewed scientific journal *Nuclear Instruments and Methods in Physics Research (NIM)* [NIM A311:49-56,1992 and NIM A315, (1992), 487-490], while the following year he passed a major international scientific review on December 14, 1993 at FERMIlab and emeritus scientists in the field wrote letters of recognition (see testimonials at www.crosettofoundation.org/uploads/167.pdf).

His innovation was recognized valuable and adopted by large collaborations of hundreds of scientists (GEM at SSC in 1993 and LHCb at CERN in 1995) and was included in their respective Technical Design Reports [15, 18]. Unfortunately, in both cases the U.S. Department of Energy suddenly stopped funding the overall projects for reasons unrelated to science and consequently funding for the author's project was no longer available. The solution to the inefficiency in particle detection is much more critical for Medical Imaging than for Particle Physics, because it allows to lower the radiation dose to the patients and it provides a tool efficacious for early cancer detection

FUNDING 3D-CBS: A BREAKTHROUGH TECHNOLOGY, SAFE FOR SCREENING AND EFFICACIOUS FOR EARLY CANCER DETECTION

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The role of Positron Emission Technology (PET) should be changed with use of the 3D-CBS (Three Dimensional Complete Body Screening) for maximizing the capture of signals that will detect minimum abnormal metabolism (or other biological processes), achievable by capturing simultaneously and accurately as many signals as possible from the tumor markers from all organs of the body in order to identify the smallest anomaly, at the lowest cost per signal captured and requiring the minimum radiation to the patient. This paper provides scientific arguments for setting new parameters for industry to establish the correct relation between the goal of obtaining substantial reduction in cancer deaths and the implementation of innovations and technology that will provide the expected results through early cancer detection.

1 Introduction

1.1 Facts & Figures - dimensions of the problem

In the 38 industrialized countries, listed as those with "Very High Human Development" [1] with a total population of 989 million,

the total cost of cancer is $741 billion/year.

This cost has been calculated as the total cost of cancer[a] in the U.S. in 2008 at $228.1 billion divided by U.S. population as of July 1st, 2008 of 304 million [2]

equals $750/per-capita annually.

While estimates indicate that the total cost of cancer[b] in Texas in 2007 was $21.9 billion. This cost divided by a Texas population of 24 million is

***$912/per-capita annually (Texas), which is even higher than the $750 for the rest of the nation* [3].**

Despite such high costs, every year among this population of 989 million of the 38 most industrialized countries[c], cancer takes the highest toll of

***one million/year premature deaths* just considering the group 50 to 75 years of age,**

more than any other disease, war or calamity (see National Vital Statistics Report NVSS-nchs showing the constant death rate of 300,000 deaths/year among the group 50 to 75 years of age, among a population of 300 million [4]). The $741 billion/year spent seems not to be very effective because

***during the past 50 years* reduction in cancer death was recorded as merely 5%**

(as reported by *The New York Times*, April 24, 2009 [5]), while for the same period a **64% death reduction was recorded for cardiovascular diseases** although less investment in research was allocated.

There is too little return of investment, costs are far too high!

Direct medical cancer cost in the U.S. was $1.2 billion in 1963* [6] *and jumped to $93.2 billion in 2008* [7]. *This is equivalent to 100 times cost increase in 50 years

[a] $228.1 billion total, split as $93.2 billion for direct medical costs (total of all health expenditures); $18.8 billion for indirect morbidity costs (cost of lost productivity due to illness); and $116.1 billion for indirect mortality costs (cost of lost productivity due to premature death).

[b] The total cost of cancer in Texas in 2007 was $21.9 billion. Direct cost was $10.0 billion, with $7.7 billion for cancer health care. The indirect cost of cancer due to morbidity and mortality was estimated at $11.8 billion. Cost of cancer-related programs in Texas from State agencies, non-profits and foundations was approximately $78.5 million

[c] The 38 most industrialized countries listed by the Human Development Index (HDI) are: 1. Norway, 2. Australia, 3. Iceland, 4. Canada, 5. Ireland, 6. The Netherlands, 7. Sweden, 8. France, 9. Switzerland, 10. Japan, 11. Luxemburg, 12. Finland, 13. United States, 14. Austria, 15. Spain, 16. Denmark, 17. Belgium, 18. Italy, 19. Liechtenstein, 20. New Zealand, 21. United Kingdom, 22. Germany, 23.Singapore, 24. Hong Kong, 25. Greece, 26. South Korea, 27. Israel, 28. Andorra, 29. Slovenia, 30. Brunei, 31. Kuwait, 32. Cyprus, 33. Qatar, 34. Portugal, 35. United Arab Emirates, 36. Czech Republic, 37. Barbados, 38. Malta

(in comparison: bacon went from $0.79/lb to $2.99/lb; eggs from $0.55 dozen to $1.29/dozen; bananas from $0.10/lb to $0.39/lb, etc.).

> *The fact that the **premature cancer death rate is not much different in less developed countries** that do not have a cost of $741 billion/year proves that the direction in cancer research needs to be changed to make it more efficacious.*

1.2 The beginning of a breakthrough technology

> ***In 1993 a major scientific review of a breakthrough technology***

invented by the author in 1992, the basis for a substantial reduction in premature cancer deaths, (at least a reduction of 33%, at a lower cost for each life saved compared to current costs) that would already have been achieved if funded,

> ***was recognized valuable by an inter-national review panel of scientists***

from major research centers (FERMIlab, CERN, etc.), from the most prestigious universities (Chicago, Michigan, Irvine, etc.) and from leading industry (Digital Equipment Corp).

The review requested by the Director of the Superconducting Super Collider –SSC- (also Director of FERMIlab) held at FERMI National Laboratory (Batavia, IL) on December 14, 1993, started with a presentation of the innovation by the author at the auditorium of FERMIlab before all scientists and continued for the entire day before the review panel.

A final report compiled on January 31, 1994 recognized the value of the author's invention stating: "*The committee finds this project an interesting and unique concept…*" The review panel, therefore recommended **assignment of all funds available** during the SSC closeout phase ($150,000) to support the author and his research for six months, "*to complete the current development and leave the project in a state where it could be continued…*"

Since the author's invention passed the review and the project was brought to a state "where it could be continued"' the responsibility from that point on was that of decision makers who manage taxpayer money by awarding grants.

Surprisingly, 17 years after the invention was recognized and approved, and during the past 12 years, during which the author submitted proposals to implement ALL his inventions related to medical imaging for early cancer detection, no funds were awarded. Not even 0.0002%[d] of the cancer cost of 12 years in the 38 industrialized countries.

> ***If only 0.0002% of those $8 trillion cancer cost during the past 12 years had been diverted to such an award, it would have resulted in over 33% reduction in cancer deaths instead of the 2% realized.***

Here is the untold story of how the benefits of many lives and costs that could have been saved continue to be missed. Included are descriptions of the inventor's claims, the supporting logic, the rationale, initial denial and even admissions that the author's claims were correct as reported in testimonials by academia and industry.

The rationale for the invention that contributes to progress to the benefit of mankind [8] as already explained, recognized and approved elsewhere [9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30] will be highlighted. In 1992 the author, in one month, presented his innovation at three international conferences in Europe and the U.S. and two of his articles were published in the peer reviewed scientific journal *Nuclear Instrument and Methods in Physics Research*, while the following year he passed a major international scientific review on December 14, 1993 at FERMIlab. His innovation was recognized valuable and adopted by large collaborations of hundreds of scientists (GEM at SSC in 1993 and LHCb at CERN in 1995) and was included in their respective Technical Design Reports [15, 18]. Unfortunately, in

[d] It would have been sufficient to divert 0.0002% (approx. $15 million) from the $8 trillion cancer cost in 12 years calculated as the average cost of $690 billion/year times 12 years. The inventor prepared a detailed business plan showing that with $15 million, three 3D-CBS devices could be built in 36 months, proving in health care facilities in three independent locations that his claimed reduction of premature cancer deaths by 33% at a lower cost per each life saved could be achieved in less than six years. In comparison, $8 trillion cancer cost in 12 years achieved less than 2% cancer deaths reduction at a very high cost per life saved compared to the 33% achievable had the inventions been funded.

both cases the U.S. Department of Energy suddenly stopped funding the overall projects for reasons unrelated to science and consequently funding for the author's project was no longer available.

Finally, with respect to the medical imaging application, the obstacles that need to be removed in order to bring the benefits of ALL the author's innovations to the bed of the patient will also be made clear.

1.3 What is Cancer?

Cancer is a disease characterized by the **mutation of normal body cells** into cancerous cells whose main characteristic is out of control reproduction, increasing in volume to the detriment of neighboring tissues, also invading other distant tissue, transported through the blood vessels (metastasis).

Normal cells become cancer cells due to DNA damage. Instead of dying, cancer cells outlive normal cells and keep forming new abnormal cells with the same DNA damage as the first cells. Their shape is different due to a different ratio between nucleus and cytoplasm and their structure is irregular. Because they grow faster, **cancer cells need more nutrient** (up to 70 times more than normal) thus showing abnormal metabolism.

1.4 What causes cancer?

We know many causes of cancer. The main ones are: heritage, chemical products (smoke), virus, bacteria, radiation, etc. However, we do not know all of them and most importantly **we cannot know when cancer starts developing,** therefore the most effective way to fight it is to be vigilant, by monitoring through screening people at high risk of cancer because of their age, heavy smoking, heritage, environmental conditions, etc.

1.5 How has the cancer calamity been addressed?

Cancer is a serious calamity affecting over 40% of the world population during their lifetime and over 10% will die prematurely due to that disease.

In the face of such a calamity that causes more premature deaths annually than any war, and therefore which should be enemy number one, we (the world) are still losing this battle perhaps because a gigantic strategic error is being made.

During the past half century, although enormous investments have been made (in the United States alone, $8 billion/year for research and $64 billion/year, mainly for the cure of late stage cancer [7]), the cancer calamity has been almost exclusively addressed through the study and development of new drugs and therapies targeted to the cure of cancer diagnosed at a late stage. As has been noted, these investments have yielded meager results in terms of a reduction in recent years in cancer deaths of less than 2%.

1.6 How should the cancer calamity be addressed?

Experimental data [31] confirm that **cancer diagnosed at an early stage has 90% to 98% probability of resulting in a life saved**. (Diagnosis at a late stage for lung cancer, the number one killer, shows a survival rate of less than 10%).

These data refer to cancer incidence and survival in the United States recorded between 1960-2004, compiled by Surveillance Epidemiology, and End Results (SEER), a program of the National Cancer Institute (NCI). Reference tables [31] for Lung, Colon, Breast and Prostate cancers, summarized on the final page indicate that for prostate cancer, 91% were detected at an early stage and 100% of these survived, but for lung cancer, only 16% were detected at an early stage and of those 49.5% survived.

These figures for lung cancer clearly show that no early efficacious detection is available. But when, in those 16% of cases, it is detected early, there is a good chance for survival of 49.5%. Unfortunately, for the 51% of cases when lung cancer is detected at a late stage, only 2.8% survive for a 5 year period. For breast and colon cancer, data from those SEER tables show that early detection provide 98.1% and 89.7% survival rates respectively.

Clearly these data demonstrate that early detection saves lives.

The general public is informed about these results without the necessity to study raw data from SEER table reports or scientific journals, but are able to review comprehensible graphs published in magazines such as FORTUNE [32] and WIRED [33]. Therefore, it is puzzling that they do not

demand greater investment of their tax dollars in early cancer detection which is shown to be effective

while the cure for cancer detected at a late stage does not work in most cases.

These experimental data show that it is necessary to realign research toward early cancer detection to achieve the capability of capturing the first signals that show the start of a mutation of normal body cells into cancerous cells rather than to focus almost exclusively on the development of drugs and therapies targeted to the cure of cancer at an advanced stage.

In order to understand **which signals are important to be detected**, it is necessary to know how cancer initially manifests itself.

2 How does cancer manifest itself?

Cancerous cells, can be differentiated from normal cells through detection of signals that provide information about cell mutation.

Such signals are related to changes in: odor, temperature, tissue density, fluorescence, metabolism, perfusion, etc.

Although it is important to use the information provided from several of these signals (obtained from several individual instruments such as Ultrasound, X-ray, CT or in multimodality such as: PET/CT, PET/MRI, etc.) and not rely only on one of them, some signals provide more reliable information than others. The agreement in indicating the presence of cancer cells by several of them will contribute, together with the experience of the physician, to a correct diagnosis that will ultimately be confirmed by biopsy.

Among all these signals, the one most reliable and useful for early detection and for reduction of "false positives" and "false negatives" is the change in metabolism (up to 70 times higher in cancerous cells) and other biological processes, **those that provide information at the molecular level**, even before symptoms or morphological changes (change in tissue density) occur.

The other signals are less reliable for the following reasons:

1. change in odor is unreliable and is not related just to development of cancerous cells
2. it poses a technical problem to create temperature and fluorescence maps of the body for areas deeper than about 5-mm from skin surface
3. some cancers develop without changing density. Therefore even a perfect CT, MRI, Ultrasound, X-ray, etc. measuring changes in tissue density cannot detect cancer in those cases. Current diagnostic devices mentioned above (including mammography) based on tissue density measurement require the presence of many cancerous cells in order to detect them (there are about 1 billion cells in 1 cm^3), at a stage of development that cannot be called "early detection."

3 What is the technological limit in current diagnostic equipment to identify the very first cell mutation (early detection)?

Among all techniques to detect signals generated by body cell mutation (odor, temp., etc.), **the technique that provides the best signals is the one showing abnormal biological processes at the molecular level.**

This technique called 'positron emission technology' needs to capture, accurately measure and count all possible signals emitted from the decay of a radioisotope integrated in the molecule of a tracer.

All other techniques not based on direct measurement at the molecular level (although some are used for functional imaging with indirect measurement of biological processes, such as fMRI and CT with contrast agents) such as X-ray, CT, Ultrasound, Mammogram, etc., are **limited** by not being able to show cancer development which does not involve tissue density changes, and, in the event there is a change in tissue density, are unable to provide early detection because several million (or billion) cancerous cells need to be present before these devices can detect them.

One important application of positron emission technology is **measuring changes in metabolism** at the molecular level by capturing, measuring the property of, and counting in a unit of time the signals emitted from the radioactive tracer integrated in the molecule of the nutrient to the body cells (see Figure 1).

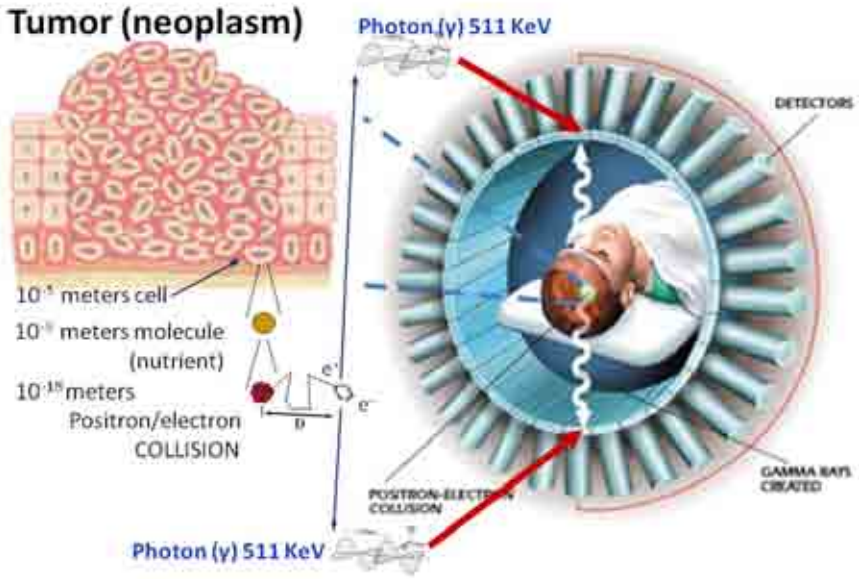

Figure 1 Representation of the principle of operation of Positron Emission Technology. Cancerous tissue (neoplasm) is identified by its natural nutrient uptake (for example: glucose molecules) labeled with a radionuclide. The positron e^+ emitted by the radionuclide, after traveling for a distance D, annihilates (collides with) an electron generating two photons that are emitted in opposite directions. These pairs of photons (or gamma rays) hit two locations on the detector almost at the same time (called in-time coincidence). The task is to capture and accurately measure (energy, arrival time and x, y, z coordinates) as many as possible of the emitted 511 KeV photon pairs in-time coincidence that reveal the concentration quantity of the radioisotopes (or nutrient in the body cells). The goal is not just to capture as many as possible of the 511 KeV photons emitted from the patient's body, which provides the benefits of early detection and lowering the amount of radiation needed to be administered to the patient, but also does this at the lowest possible cost per each 511 KeV photon captured.

The technique works by injecting into the bloodstream, swallowing or inhaling as a gas a nutrient compound (molecules of glucose, oxygen, carbon, etc.) tagged with a radioisotope (tracer) to be taken up by the body cells and monitoring its path and where it accumulates within the patient's body by means of a device that can capture signals emitted (photon pairs) by the decay of the radioisotope. Because cancerous cells take up to 70 times more nutrient than normal cells, positron emission technology allows identification of those cells (or group of cells) that take up more nutrient than normal, thus a suspected cancer site.

Having verified that positron emission technology provides the best signals, one should also realize that the current over 5,000 Positron Emission Tomography (PET) devices that make use of the principle of operation of positron emission technology, cannot provide early detection because they capture and inaccurately measure only one signal out of 10,000 from the tumor markers (and they require administration of a radioactive dose that is over ten times higher than the level recommended as safe for screening asymptomatic people by the International Commission for Radiation Protection, ICRP).

In order to achieve true safe early detection, it is therefore necessary to focus on greatly increasing the efficiency of current PET.

This will change the current role of PET from that of measuring the dimension of tumors mainly detected at an advanced stage using other procedures, with the limited goal of helping the physician with a prognosis and justifying the use of expensive cures that in most cases will not save lives, to that of a safe screening device for efficacious early detection of the start of cancer development in asymptomatic patients at high risk (or in the restart of activity in cancer survivors). It is this early detection that has been shown to save lives.

The fundamental problem to be solved in order to obtain such improvements is the same as the one already faced in High Energy Physics (HEP) experiments

3.1 Description of the fundamental problem relative to the increase in efficiency

The fundamental problem, relative to the possibility of increasing efficiency, to be solved in Particle Physics was the **impossibility of making accurate measurements on ALL data received from radiation (called events) that arrive at very high data rates from the detector** as the result of millions of collisions between particles generated by accelerators such as the LHC collider, at CERN.

Accurate measurements are necessary in order to distinguish "good events" from those carrying no useful information that are considered as background noise. For example, LHC detectors can have something like 600 billion events per second. If all that data were saved for study at a later time, it would fill up every hard drive on the planet in only one day.

Hence, because of the need to analyze all events in real-time, a sophisticated trigger system was created to analyze, select and save in real-time about one hundred of the highest quality collision events per second (this number of events to be saved is related in HEP to a parameter called "occupancy" for a specific experiment that is estimated by theoretical physicists, whereas in Medical Imaging it is determined by the maximum radiation dose that can safely be given to a patient).

A similar problem also exists in Medical Imaging. In positron emission technology, it is also necessary to sustain a high input data rate of a million events per second arriving from the patient's body to which a radiation dose was administered. It is necessary to analyze all of them in real-time, selecting accurately only the good events generated by the tumor markers and excluding the "scattered events", "randoms", "multiple events" and the so called background noise.

In summary the problem to be solved has the two aspects of being able to:

1. cope with a high input data rate in order to fully use all information carried by the radiation, and
2. accurately analyze all signals in order to identify all good events

The two aspects are related to the efficiency of the system in particle detection. **The solution is much more critical for Medical Imaging than for Particle Physics.** In Particle Physics, inefficiency only causes a delay and a higher cost in discovering new particles.

Much more serious and damaging is inefficiency in Medical Imaging devices because not only is there a **higher cost for health care**, but it also **requires administering a higher radiation dose, dangerous to the patient, does not provide the necessary sensitivity to diagnose cancer at an early stage, and is not accurate enough to be able to reduce "false positives" and "false negatives."**

4 Solution of the fundamental problem: the author's invention relative to the increase in efficiency

The author presented his innovation of a high-performance 3D-Flow [34, 35] programmable, technology independent parallel-processing system to the scientific community in Sept. and Oct. 1992 at three international conferences in Europe at Annecy, France [9], in the United States at Corpus Christi, Texas [10] and IEEE-NSS-MIC in Orlando, Florida [11] where different ideas [36], [37], [38], [39] and approaches to the implementation of trigger [see Glossary of ref. 30] systems were discussed. The value of the author's innovation was recognized and approved at the 1993 FERMIlab international scientific review (see Section 1.1), and emeritus scientists in the field wrote letters of recognition (see testimonials at [40]). The 3D-Flow [19, 23] is a parallel-processing system capable of neighboring data correlation with no boundary and of real-time execution of complex algorithms for a time longer than the interval between two consecutive input data. In addition to solving the problem for different HEP experiments, achieving higher performance at a lower cost when compared to the traditional approach, this innovation can detect very accurately all characteristics of 511 KeV pairs of photons in PET Medical Imaging.

Figure 2 shows how how the 3D-Flow parallel-processing system allows a processing time for each set of data in a pipeline stage for a time longer than the time interval between two consecutive input sets of data.

In the example, an identical circuit (the 3D-Flow processor) is replicated five times in the 3D-Flow parallel-processing system. (The number of times the circuit is copied is equal to the ratio between the maximum algorithm execution time and the time interval between two consecutive sets of input data).

Table 1. Sequence of the packages of data in different time as they flow in one 3D-Flow channel.

Time	Proc (1d)	Reg. (1d)	Proc (2d)	Reg. (2d)	Proc (3d)	Reg. (3d)	Proc (4d)	Reg. (4d)	Proc (5d)	Reg. (5d)
1t	1									
2t	1	i2								
3t	1	i3	2							
4t	1	i4	2	i3						
5t	1	i5	2	i4	3					
6t	6	r1	2	i5	3	i4				
7t	6	i7	2	r1	3	i5	4			
8t	6	i8	7	r2	3	r1	4	i5		
9t	6	i9	7	i8	3	r2	4	r1	5	
10t	6	i10	7	i9	8	r3	4	r2	5	r1
11t	11	r6	7	i10	8	i9	4	r3	5	r2
12t	11	i12	7	r6	8	i10	9	r4	5	r3

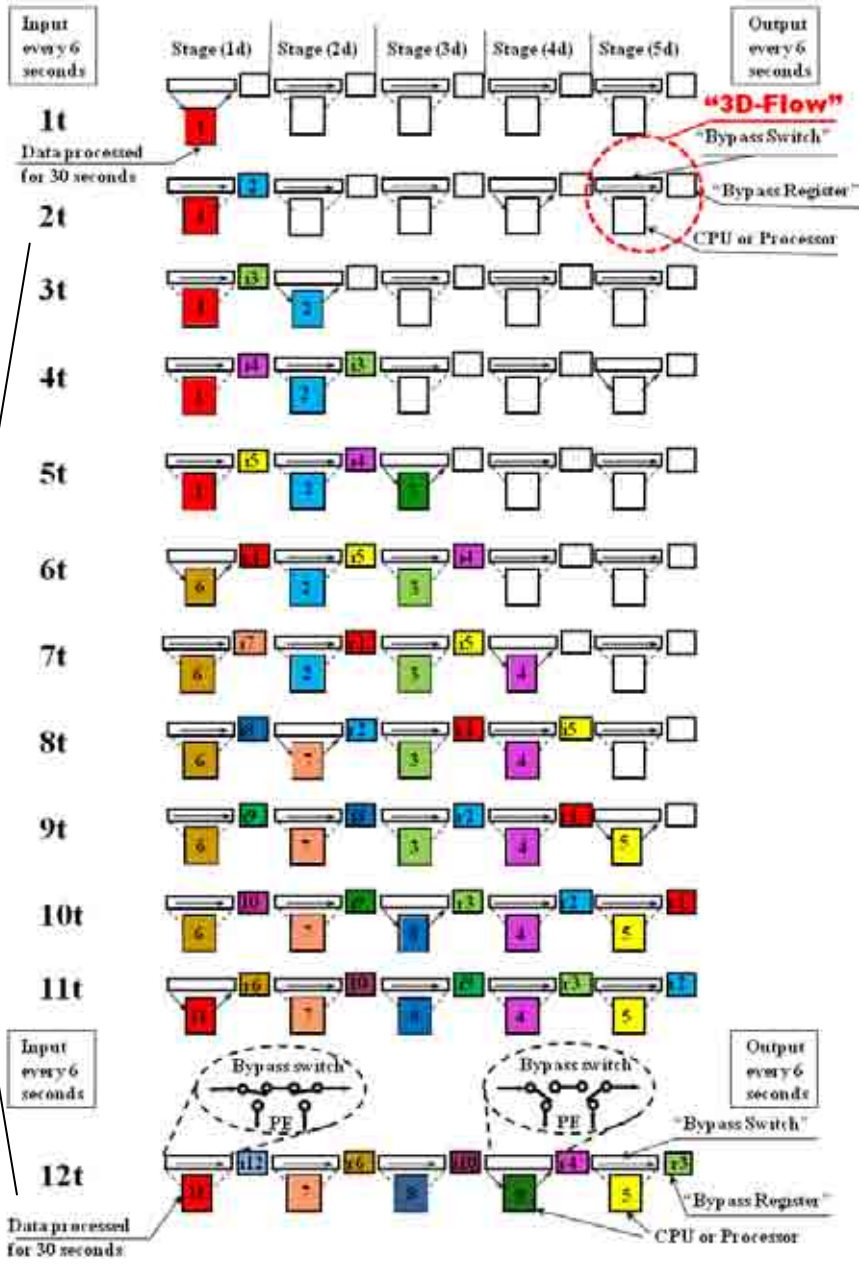

Figure 2. Data flow in one electronic channel of the 3D-Flow parallel-processing system that enables acquiring data at a very high input data rate while simultaneously allowing necessary time to accurately analyze the information.

The figure shows an example where the maximum algorithm execution time is 30 seconds and the time interval between two consecutive sets of input data is 6 seconds. (30/6 = 5).

A 3D-Flow Logical Unit is represented in the figure with three functions: a) a "bypass switch" to move data past occupied stages, represented as a long arrow in a rectangular box; b) a "bypass register", an output register represented as a rectangle to the right of the arrow, and; c) a CPU or Central Processing Unit, represented as a rectangle below the arrow.

A "bypass switch" sends a package of data to its CPU and transfers ("bypasses") four packages of data to the next stages to the right in the figure

Table 1 shows the sequence of the packages of data in different times in one 3D-Flow electronic channel. A package of data contains information received at a given time from a "detector channel" of the 3D-CBS (Three-Dimensional Complete Body Screening) detector.

In the first column (on the left side of the table) the time "t" is shown. Values below the columns labeled (Proc (1d), Proc (2d), Proc (3d), Proc (4d) and Proc (5d)) represent the packages of data that are processed by the 3D-Flow processor in the specific time "t".

Values labeled "ix" and "rx" below columns (Reg (1d), (Reg (2d), (Reg (3d), (Reg (4d) and (Reg (5d)) are respectively input data and output results that flow from register to register in the pipeline chain toward the exit point.

One should note that data-package No. 1 stays in the first processor of the first stage for five cycles, while four data-packages (i2, i3, i4 and i5) are passed forward (via the "bypass switch") to the next stage.

For example at clock 12t (see Figure 2), while station 4d receives data package No. 9, at the same time, it outputs results r4 relative to the data processed previously. This result "r4" is then transferred to the output of the 3D-Flow system without being processed by other stages.

Each package of input data stays in a 3D-Flow processor for a time equal to about five times the time interval between one data package and the next.

Unlike a standard pipeline system, the result of a calculation from one processor can never become the input data of another processor located in a subsequent station, but will be transferred to the next stage without being processed further.

4.1 Validation of the concepts

The new concepts are proven by logical arguments in articles, [10, 19, 20, 22 23], **by simulation** (see Sections 11, 12 of [19], Appendix of [23], Chapter 13 of [20])**, by construction of the innovative parts in working hardware [26] and by experimental results by third parties (i.e. Siemens [41]) that confirm the author's claims**.

Despite the fact that the author did not receive additional funding after DOE general funding for SSC (1993) and LHCb (1999) was cut for the overall projects, consequently for the author's project, he was able to build his innovative idea in hardware with personal funding and the support of friends.

The first demonstration of the proof of concept was made at the IEEE-NSS-MIC Industrial Exhibition (San Diego, CA) in 2001. At the Industrial Exhibition booth, the author set up the hardware demonstration of circuits and input/output test boards to show the execution of real-time photon detection algorithms, centered on each electronic channel of the processor array (3x3 "local maxima" with no boundary, Depth Of Interaction, DOI, etc.) on the 3D-Flow architecture.

This system was built using two prototype boards from Altera (each accommodating a Field Programmable Gate Array circuit FPGA EP20K1000) interfaced with two other prototype boards, one to input data from switches and another to display results on LED.

Each FPGA accommodated four 3D-Flow processors running at 32 MHz internal clock for the core and at 256 MHz for the I/O. The two FPGA-Altera boards made a two layer 3D-Flow system. The first FPGA board was connected to the input board where the user could select two sets of input pattern of data (configuration of the input switches) that would simulate two subsequent events received from the detector.

External connections (North-South and East-West) to both FPGA chips were made to be able to simulate a 3x3 centroid algorithm. The second FPGA board was connected to the output board where results were displayed on LED showing if a "local maxima" was detected, while signal waveform on the oscilloscope proved the algorithm execution in a given number of steps and at the expected speed.

The proof of concept allowed extraction of the parameters (power consumption, number of processors

per board, etc.) to build an industrialized modular system based on IBM PC boards as described in Section 15 at page 156 of [20] and shown in hardware construction in [26].

A 3D-Flow system made of two modular boards with 136 processors that allows expansion using many of the similar modular boards, into a system of infinite dimensions, performed according to expectations at the first version built. Each 3D-Flow DAQ board consists of 2,211 components, over 20,000 contact pins connected through only 8 layers of printed circuit board for signals and 6 layers for power and ground.

5 The 3D-CBS Solution: the author's additional inventions related to early cancer detection

The first milestone leading to the 3D-CBS technology for early cancer detection was the author's basic invention in 1992 of the 3D-Flow system: **a parallel-processing architecture that allows executing complex real-time algorithms with neighboring data correlation for a time longer than the time interval between two consecutive input data without the need to use expensive ultra-fast electronics.**

This invention overcame three stunning obstacles: limits in sustaining high-input data rate, limits in accurately analyzing all input data and limits of high cost electronics. These advantages that allow the capturing of 1 out of every 25 signals from the tumor markers instead of 1 out of every 10,000 that current PET devices detect (400 times more efficient) are described in simple terms with analogies, on page 26 of the article on Planetary Emergencies [29] and also in the video containing an analogy implemented by high school students [42].

The analogy in the video points out that no matter how complex the problem to be solved is in the envelope (consequently how much time is required), or at how high a rate the envelopes arrived from the corridor, the students have all the time necessary to solve any complex problem contained in the envelope without the need to rush or take short cuts. The focus is not on the **content** of the envelope at that time. In other words, only the solution for get-ting more time to address the content of the envelope is explained at that point.

Proof of the benefit of this invention in HEP and PET derives from the fact that after this discovery, approaching the solution of extracting more useful information from radiation (in HEP experiments or PET), filtered from what is called "background noise" using expensive fast GaAs, ECL, 40 nm technology, etc., cabled logic, is no longer justified. Again recently, this scientific truth could not be disputed by scientists at forums on the 3D-CBS innovative technology held September 24, 2009 at Brookhaven National Laboratory, New York, and on September 30, 2009, at the Policlinic San Matteo in Pavia, Italy.

Besides overcoming obstacles and reducing costs, **this first invention opened the door to other inventions, both in HEP and in Medical Imaging** in the geometry of the detector, assembly of the crystals and their coupling with transducers, coupling of the detector channels with the electronic channels, using new real-time algorithms, etc., which before could not even be envisioned.

The second milestone of the 3D-CBS technology for early cancer detection, **was the solution that allowed improvement at a lower cost** of the analysis of the parameters to **measure the energy, arrival time and x, y, z coordinates** of the incident photons in the crystal detector and also greatly improved the **signal to noise ratio** that allowed efficacious filtering of noise, in this case, radiation not useful for the diagnosis.

Figure 3 summarizes the author's additional inventions described in more detail in the references [20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30].

This second milestone is not merely an invention of a new real-time algorithm or electronics, but several unusual, innovative ideas underlying this system that **require thorough, careful study of the 3D-CBS system as a whole and each of its parts separately**. One cannot just skim over any part and hope to achieve a knowledgeable understanding of a single part, let alone an assessment of the synergy of the entire system.

In the analogy, it is not what deals with the analysis of the problem contained inside the envelope that needs to be solved (not merely a calculation), but, as explained in a second analogy on page 26 in the Erice paper [29], it deals with solving problems of communication among offices, geometry, etc.

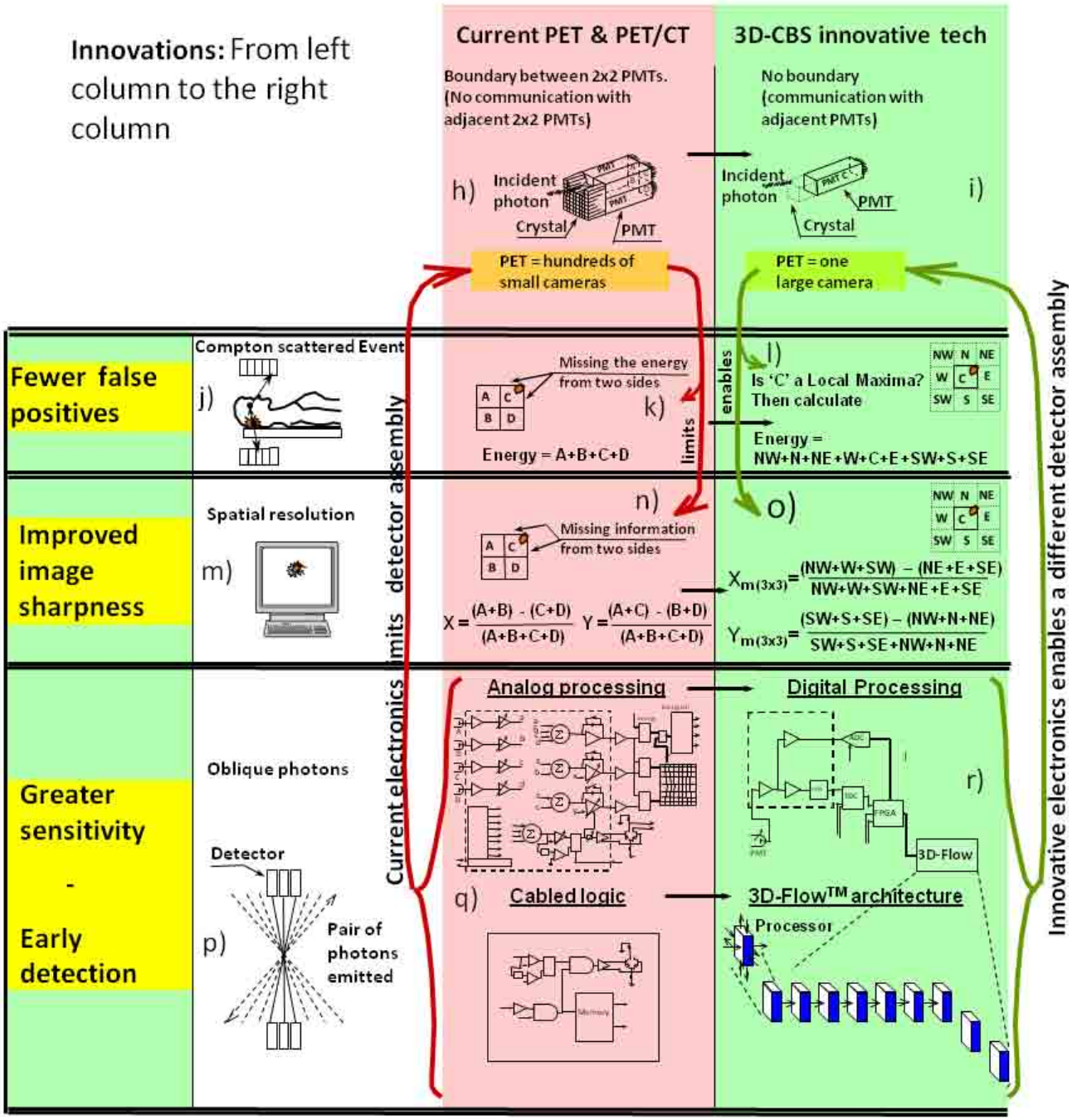

Figure 3 Key innovations of the 3D-CBS technology. The three titles in the left column summarize the advantages of the 3D-CBS with respect to current PET in a language addressed to the doctor/radiologist. In the second column, supporting the statement to the doctor/radiologist is illustrated the corresponding physical phenomenon that make it possible to obtain such advantages. The third column shows the limits of current PET and the last column to the right how such limits are overcome with the 3D-CBS technology. Boxes "j", "k", and "I" concern the energy resolution; "m", "n", and "o" the spatial resolution; and "p", "q", and "r" the sensitivity. The key innovations start from the feature in box "r," which enables the innovation in box "i", which in turn enables the innovations in box "l" and "o." Additional innovations are achieved as a result of synergy of all three, allowing to greatly improve in a cost-effective manner the five parameters listed in Section 6providing more accurate measurements at a lower cost for each photon captured.

In 2000, the author published scientific articles and books describing the advantages of his innovations in Medical Imaging [19, 20, 21]. These publications first analyze the inefficiency of current PET (Positron Emission Tomography) in Figure 3-4 page 23, [19] (or Figure 3, [24], both showing the ideal vs. actual time coincidence detection of current PET), then analyze the area where photons are lost in current PET in Figure 14-1 on page 136, [19] (or Figure 1, [23]) and provide the solution for capturing more accurately and more cost-efficiently over 400 times the number of positron-electron annihilation photons**.**

Further reviews not only of the innovative electronics but of the entire Three-Dimensional Complete Body Screening (3D-CBS) system took place on several occasions one in 2003, in Dallas, TX (see video at www.3d-computing.com), with the final report by the review panel available at [26]. In 2008 an international review was also conducted in Rome, Italy.

6 How claimed objectives are achieved with the author's innovations

By implementing these two milestone inventions, it is possible to achieve substantial reduction in premature cancer deaths due to significant results in early cancer detection. This is obtainable through screening with a device that is safe for the patient, provides the most accurate information on minimal abnormal metabolism and/or biological process indicating suspected development of cancer (augmented by information from other less reliable techniques combined with the extensive experience of the physician and ultimately by verification with a biopsy).

The author's invention, related to the Trigger, has finally solved two aspects of an enormous fundamental problem relative to the increase in efficiency. Until this invention, these two aspects were considered unsolvable in HEP and in Medical Imaging. Now it is possible to make use of ALL information received from the radiation.

These innovations makes possible building very efficient 3D-CBS devices, capable of distinguishing, very accurately, at the molecular level, cells growing at a regular speed (or not growing) from cells growing at an abnormal speed (the typical behavior of cancerous cells) throughout the body, and recognizing them even when there are a relatively small number (early detection).

The characteristics of the 3D-CBS device permit using a very low radiation dose to perform an examination in a short time at a low cost. Compared to the widely approved mammogram screening based on tissue density measurements requiring the presence of many cancerous cells to be detectable as a tumor, the characteristics of the 3D-CBS technology, sensitive to changes in biological processes of fewer cells at the molecular level is far more superior. Therefore, 3D-CBS screening of a population at high risk for cancer is greatly justified by the higher number of lives that can be saved as well as for the fewer false positives and false negatives due to more accurate measurements.

Progress is achieved by improving accuracy in measurements and its impact is greater if done at a lower cost. The combined innovations of 1992 and the ones announced in 2000 prove achievement of both because each electronic channel that receives information from an area of the detector correlates data with the neighboring element and any complex algorithm can be performed with no limit on time or requiring expensive electronics. For example, the energy calculation summing nine (or 25) elements is more accurate than summing four elements as performed in current PET. Similarly the improved accuracy at a lower cost of each measurement performed with the 3D-CBS technology with respect to current PET can be demonstrated.

In summary, the key elements of the author's innovative technology that allows building a device of the 3D-CBS type relate to five main areas:

1. Increased detector length – longer Field of View (FOV) made possible because of the other innovations that allow the use of more economical crystals without a large increase in cost.
2. Improved and simplified detector assembly.
3. Innovative electronics providing a means of:
   a. accurate identification of the impact point of all photons including the oblique photons and accurate measurement of their total energy;
   b. reduction of the initial number of the electronic channels;
   c. simplification of the method for identifying in-time coincidences.
4. Capability of executing complex algorithms for photon identification.

5. Innovations in the visualization of the information obtained.

The synergy of all these inventions allows capturing more accurately all possible signals from tumor markers at a lower cost for each signal captured, providing the physician more accurate measurements of five parameters that allow reduction of "false positives", "false negatives", lower examination cost and enables early diagnosis.

These five parameters are:

1. Accurate measurement of total photon energy, using the signals received from 9 electronic channels (rather than 4 as used in current PET), that allows discrimination of "good events" from "scatter events".
2. Accurate measurement of the photon arrival time (Time-of-Flight -TOF-) that allows discrimination of "good events" from "randoms" and "multiple" events.
3. Accurate measurement of the spatial resolution referred to the 'x' and 'y' coordinates (distance in the axial and 90° with respect to the axial direction of the impact of the photon into the surface of the crystal. Centroid calculated based on 3x3 array rather than a 2x2 array as used in current PET)
4. Accurate measurement of the photon Depth Of Interaction (DOI) which allows elimination of the parallax error.
5. The improved signal-to-noise ratio makes it possible because of the capability to execute complex algorithms in real-time, while sustaining at the same time a high input data rate.

7 Summary of the advantages of the innovative 3D-CBS technology compared to current over 5,000 PET

Figure 4 defines "efficiency" used throughout this document and summarizes the advantages of 3D-CBS technology compared to current over 5,000 PET.

$$\text{Efficiency} = \frac{\text{Pairs of photons in time coincidence detected by the instrument}}{\text{Radiation activity in the patient during the scanning time}}$$

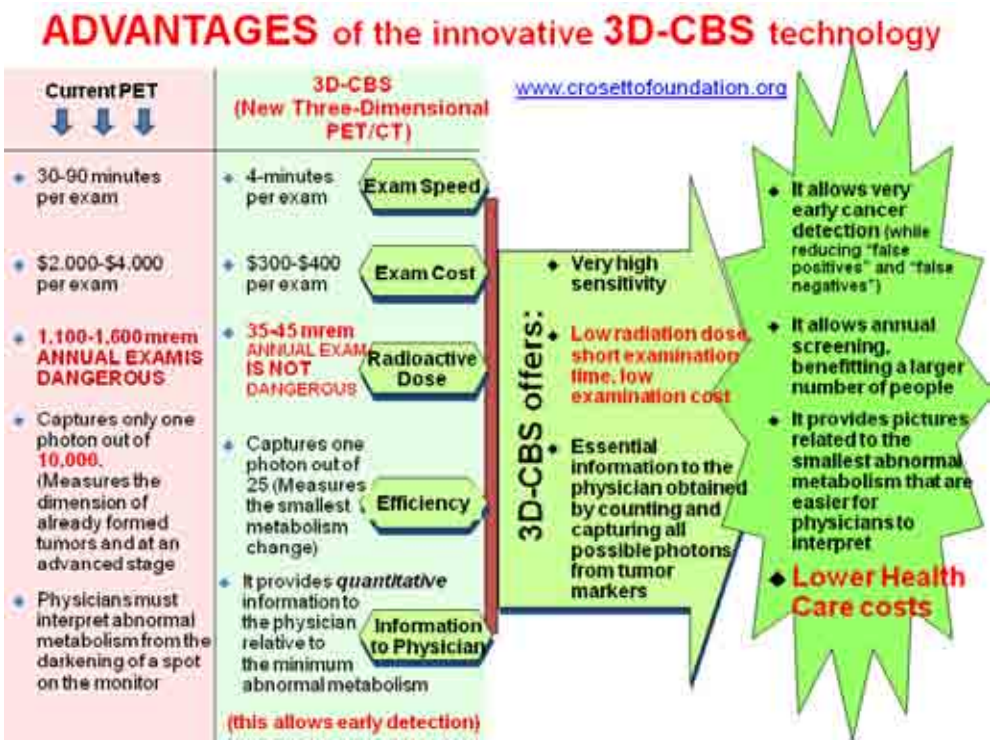

Figure 4 Comparison between the approach used in current PET to measure tumor dimensions at an advanced stage and the new 3D-CBS approach to measure the minimum abnormality in biological processes targeted to early cancer detection.

8 Research Strategy

The research strategy is to build a very efficient, cost-effective 3D-CBS device over 1.5 meters in length, according to the basic specification reported in Section 17.1.2, page 176 in the book published in 2000: "400+ times improved PET efficiency for lower-dose radiation, lower-cost cancer screening" [20], just for the PET/CT application (no SPECT section will be considered) modified according to the updates in successive publications [21, 22, 23, 24, 25, 26, 27, 28, 29, 30], for maximum optimization of low cost and high performance.

In order to avoid delay of FDA approval of the CT section that transmits radiation to the patient, a commercial 16-slice CT will be leased or purchased. The CT will operate at very low dose radiation, just to acquire the attenuation coefficient for the correction of the PET data and also to provide the tissue density information that will help to localize the tumor (shown by the PET section of the 3D-CBS device as a hot spot for any abnormal biological activity) within the organs and/or body tissues.

With this initial strategy, there will be no need for FDA approval (ethical approval with consent of the patient should be sufficient) because the 3D-CBS device will just observe the radiation activity emitted by the radioisotope from the patient's body that for the first tests uses the residual radiation from immediately previous tests requested and approved for examinations by other traditional PET/CT commercially installed devices in hospitals. Subsequent tests for a screening study will require administering a dose of FDG (or any new radioisotope considered more suitable for signaling to the physician the start of the development of a tumor) 1/30 of the 10 mCi used in current PET examinations, bringing the radiation dose to a level lower than the 1 mSv recommended by the safe ICRP for screening examinations.

The sequence of the tests on the new 3D-CBS device will be:

1. on phantoms to measure its efficiency, sensitivity, spatial resolution, etc.;
2. on patients (who underwent examination by traditional PET/CT) using the residual radiation of the radioisotope administered for that exam and quantitatively comparing the results relative to minimum abnormal metabolism - or other abnormal biological processes - in any area of the body acquired by the 3D-CBS with those acquired by the traditional PET/CT;
3. a study will be organized and conducted on a sample of asymptomatic high-risk patients following the procedure that has been used in the past for CT screening study. However, in this case, the total amount of radiation that the patient will receive from CT and the PET tracer should be lower than 1 mSv in order to comply with ICRP regulations.

Because the efficiency of the 3D-CBS is over 400 times that of the over 5,000 PET and PET/CT installed in hospitals around the world, it is expected that besides lowering the cost and providing more accurate information to the physician and to the patient, **the role of PET will be changed** from confirming the presence of an existing tumor (detected in most cases with other procedures, at an advanced stage) to that of benefitting asymptomatic patients and cancer survivors with early detection of the minimum abnormal metabolism (or other abnormal biological processes), that will offer a much higher chance for effectively curing their cancer and to be statistically among those with a 90% to 98% survival rate.

9 Rationale on how this innovations will reduce health care costs while saving more lives

The U.S. alone in 2003 spent $64.2 billion [7] mainly on drugs for treating cancer at an advanced stage (this expenditure increased in 2008 to $93.2 billion). Even with a much reduced budget for early detection, a better result in number of lives saved from premature death is guaranteed. When early detection is achieved, drug use drops and the cost for post-surgical treatment decreases because it is needed for a shorter period of time, particularly when early stage cancer is removed with surgery.

A higher return in lives saved is supported by the following:

- **Efficacy of early detection:** Experimental data [31] show that when cancer is diagnosed at an early stage it is curable and life is saved in 90% to 98% of the cases ("Early-stage ovarian cancer is more than 90% curable; late stage is 75% deadly" [32])
- **Approved screening based on the measurement of tissue density which has low efficacy:** Despite

the fact that cancer grows without always showing a change in tissue density, there is widespread screening with techniques such as mammogram which are based on measuring differences in tissue density

- **Higher efficacy obtained from measurements of metabolism** (or other abnormal biological processes) **compared to to measurements of tissue density:** Knowing that there is a better chance to detect cancer by a change in a normal biological process, rather than a change in tissue density or other signals, "safe radiation dose" PET should be preferred over mammogram, CT, etc.
- **Validation by results obtained by a third party (Siemens) of the author's discovery made a decade ago - the possibility to increase efficiency of current PET by 400 times by improving the electronics and other sections of PET.** Third party validation of the author's discovery confirms the claim that current PET efficiency can be increased by 400 times by extending the FOV and improving other sections of PET.
- **Certainty of obtaining at least 33% efficacy from screening with highly reliable and enormously more efficient technology.** A conservative estimate of 33% lives saved using this technology as compared with a lower percentage of cancer detected at an early stage by other techniques which are considerably less efficacious in early detection such as those which measure tissue density (e.g. mammography). From a given sample, the new technology will detect far more patients with early stage cancer that existing technologies. Since we know from experimental data that early detection results in 90-98% of lives saved regardless of method of early detection, it is obvious that more lives will be saved per sample tested using **the new 3D-CBS device**, which is far superior in technology (based on measurements at the molecular level rather than density) and with an efficiency 400 times superior compared to current PET.

National Cancer Institute (NCI) claims a reduction in cancer death of 2% per year (although this result is likely mainly due to smoking cessation or diet change, and a very small percentage due to research results).

However, when analyzing data obtained from the U.S. Census and U.S. CDC, and National Vital Statistics reported, it shows that from 2000 to 2003 the reduction ranges from 0.5% to 1.04% (see [19]). Even if 6,000 additional lives saved every year are included, considering the annual expenditures for cancer treatment of $64 billion for the year 2003 [7], the cost for each additional life saved is approximately $10.5 million ($64 billion/6,000. See details in Section 10, Table I of [29]).

Having established that the cost per each additional life saved has been approximately $10.5 million per person, one can compare that with the author's innovative solution targeted to early cancer detection, making it possible to reduce such expense by approximately 40 times.

The claimed health care cost reduction for cancer is supported by the following:

1. **Conservative estimate of the percentage of cancer death reduction through early detection:** Although experimental data show that early detection saves lives in 90% to 98% of detected cases [31], in order to assure certainty that goals will be reached, only a conservative estimate of 33% reduction in cancer rate for a given population is assumed even though screening with a technology that is 400 times more efficient than current 5,000 PET devices.
2. **Cancer death rate for the age group 50-75:** Statistical data show an annual percentage for cancer death rate of 0.5% in the age group 50-75 [4].
3. **Number of annual examinations required to achieve the same 6,000 lives saved result based on mortality rates (item 2) and estimate of lives saved currently in the U.S. (item 1):** In order to save the same 6,000 lives through early detection as accomplished now using current technology, it is necessary to examine about 3,640,000 people annually. [0.5% * 3,640,000 = 18,200; 18,200 * 33% = ~ 6,000]
4. **Cost to examine 3,640,000 people:** Because the cost of the examination performed with the author's innovative 3D-CBS technology is $400, to examine 3,640,000 people will cost $1.5 billion (plus the cost of surgery and post-surgical procedures). [$400 * 3,640,000 = ~$1.5 billion]
5. **Cost for each life saved:** Dividing the total cost of $1.5 billion by the number of lives saved, the cost per life saved is only $0.25 million (plus the cost of surgery and post-surgical procedures) using this new technology. [$1.5 billion / 6,000 = $.25 million]
6. **Possibility to save over 100,000 additional lives per year at a cost less than half compared to the current annual expense for cancer treatment:** With the author's discovery it is possible to greatly

surpass the current limit of saving only 6,000 lives using current technology. By screening a larger sample of 60,000,000 people, it will be possible to save an additional 100,000 lives per year from premature cancer death at a cost of $24 billion (plus the cost of surgery and post-surgical procedures).

Of great impact will be the fourth and fifth achievement in the fight against cancer started ten years ago by the author. Most astonishing is the fourth achievement that can be reached for only $0.25 million (plus the cost of surgery and post-surgical procedures). Because currently the cost for each additional life saved is approximately $10.5 million, the cost enabled by this new discovery will be only one/fortieth (1/40) the current cost.

The fifth achievement examines the possibility to save not only 6,000 people annually, but over 100,000 at a cost of $24 billion. That is still nine times less than the current annual cost for cancer to the U.S. of $228 billion [7]. Furthermore, there is an additional gain to the economy from people age 50-75 brought back to productivity instead of incurring high expenses for treatment of late stage cancer.

10 Measuring Results

Annual 3D-CBS examination will be performed on a representative sample of 10,000 people age 50-75, selected from a population in a location with a constant cancer death rate of 50 deaths per year recorded over the previous 20 years.

The examination should be safe for the patient requiring administration of a total radiation dose of 1 mSv, complying with ICRP regulations for screening, as for example has been done in the past for CT screening studies for cancer.

Results will be measured in terms of cost/benefits similar to other reports (for example the study made in Japan when in 2005, 50,000 people underwent PET screening in 46 hospitals [43]). Results should be published. Any reduction from the steady 50 deaths per year recorded during the previous 20 years will show success of the project.

Once the target of at least 33% premature cancer death reduction is achieved after 6 years, the project should be strongly supported and expanded with large investments.

11 Conclusions

These accurate measurements provided by the 3D-CBS innovative technology allow extraction of a maximum amount of useful information from each photon emitted, providing the **highest possible spatial resolution** and **highest sensitivity** using any type of crystal one chooses. This allows **precise pinpointing of the tumor** (as permitted by the intrinsic limitation of the radioisotope) at its **earliest possible stage**.

Higher efficiency and accuracy of 3D-CBS technology greatly **improves sensitivity and specificity** and reduces false positives and false negatives.

This innovative 3D-CBS technology passed several international scientific reviews extended to world participation in real-time via webcast (2003 in Dallas [27], 2008 in Rome [44]), and was presented recently by the author during over 100 hours presentation/discussion (most are available on video) with professionals at hospitals, universities, research centers (including Nobel Laureates at Erice on August 23, 2008 [30] and at CERN, via web EVO meeting on August 26 2008), to decision makers and citizens at city halls, province meetings with government representatives, cancer organizations, etc.

No professional has provided any valid criticism supported by scientific arguments to invalidate the author's claims. 50,000 scientists affiliated with CERN recently **received the author's key explanation [45] of the fundamental innovation** that had been misinterpreted by a reviewer, sent by cancer patient representatives. No one sustained the reviewer's misinterpretation, nor provided additional objections to invalidate the author's claims.

The anonymous reviewer's misinterpretations were clarified for him at a seminar/discussion by the author on September 24, 2009 at Brookhaven National Laboratory (BNL). Once again, **in a face-to-face discussion, the author was able to overcome a scientist's misinterpretation** which could have lead to a recommendation not to fund the author's innovations. In fact, as **witnessed on the video, scientists at BNL expressed their opinion that the project should be funded [44].**

On September 30, 2009, a forum was held in Pavia with participation of the President of the Association of Medical Physics in Italy and a U.S. scientist via webcast. On that occasion the author proved that the

direction of research in the field is incorrect by pointing out that in the article by the Presidents of Medical Physics and Nuclear Medicine [[46]], which references 184 papers, and describes the traditional PET technology with the limitations in efficiency and cost-effectiveness. For example the attempt to increase PET FOV to 2 meters using RPC, low-efficiency detectors or a crystal thickness 4.5 mm instead of 25 mm, reduces detector sensitivity for a source point in the FOV to 20% from 95%. The author's innovative solution allows instead achieving high efficiency at any point of the FOV at low cost.

The rationale for the claimed reduction in premature cancer deaths of 33% (including tests to be performed to verify the claims) and the 40 times reduction in cost per life saved compared to current costs is described in [29].

Because the Japanese Health Care System in 2005 obtained better results by screening over 50,000 people in 46 hospitals using current inefficient PET/CT [43], compared to results obtained using other devices, surely they will obtain even better results using a device hundreds of times more efficient like 3D-CBS.

The reason why mammogram screening is approved by many countries is because it is claimed to save lives while using a safe radiation dose. PET molecular imaging is much more sensitive than mammography which measures tissue density. 3D-CBS is, in turn, over 400 times more efficient than current 5,000 PET and is suitable for screening examinations because it requires administration of a radiation dose equivalent to mammogram.

It begs the question, "how many more lives could be saved using the 3D-CBS technology?" And a second question: **"How long does it take to open the door to progress and fund the inventor to implement innovations that were recognized and approved as early as 1993 by Fermilab** (and no one has invalidated any of the additional innovations in all this time)**?**

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Phaedra's Love by Dr. Francesca Behr

This paper intends to explore the relationship between classical and modern tragedy by focusing on one specific play, Sarah Kane's *Phaedra's Love*. In 1996 Kane was commissioned by the Gate Theater of London a play inspired by a classical text and she chose Seneca's *Phaedra*, the Roman version of Euripides' tragedy *Hippolytus*, featuring Phaedra's helpless love for her chaste step-son Hippolytus. While in the beginning Kane was not particularly excited at the idea of having to work with a classical piece, eventually she read *Phaedra* and found herself quite attracted to it. Kane's drama shows to have strong affinities with Seneca's play and temper.

While I will highlight common ideas and overlappings between Kane's and Seneca's texts, I will also point out and try to make sense of glaring differences. An underlying concern of this paper will be the nature and purpose of modern adaptations of the classics. In the last forty years Classical texts seem to have become more widely and sometimes radically used by individuals and communities in their work. Such rewritings and re-imaginings of classical material are often employed to tackle, explore, and evaluate ideas and situations quite different from those found in the original text. Sometimes a modern author, in order to remain faithful to the spirit of an ancient text, cannot remain faithful to its letter, that is to its form and style. Sometimes fidelity to the original is obtained by drastic alteration. This may be the case with Kane's play.

Francesca D'Alessandro Behr has studied Classical Philology and Archaeology at the University of Rome, La Sapienza. In the USA she has continued her training and obtained an MA as well as a Ph.D in Classics at the State University of New York at Buffalo. She is now an Associate Professor of Classics and Italian Studies at the University of Houston. Her book *Feeling History: Lucan, Stoicism, and the Poetics of Passion* came out in 2007 with Ohio State University Press. She is now working on a new book on the reception of Classical texts.

The J-Matrix formalism applied to noisy data series: universal properties of noise LUCA PEROTTI, DANIEL BESSIS, DANIEL VRINCEANU, Texas Southern University

We developed a new method in the spectral analysis of noisy time-series. From the Jacobi recursive relation for the denominators of the Pade'Approximants of the Z-transform of an infinite time-series, we build a J-Operator where each bound state (inside the unit circle) is associated to one damped oscillator while the essential spectrum, which lies on the unit circle, represents noise. Damped signal and noise are thus clearly separated in the complex plane. For a finite time series, the J-operator is replaced by a finite order J-Matrix J*N*. Eigen values (poles of the Pade'Approximant) corresponding to noise are each correlated to one of the zeros of the Pade Approximant and can be cleaned, thus exposing constant amplitude signals. Different classes of noise are analyzed, our formalism allowing efficient calculation of hundreds of poles of the Z-transform. Evidence of universal behavior in the statistical distribution of poles and zeros of the Z-transform was found: poles and zeros tend, when the time series goes to infinity, to a uniform angular distribution on the unit circle. The roots of unity thus appear to be noise attractors. We show that the Z-transform allows lossless under sampling and that this property can be Used to increase signal detection. We give examples to suggest the power of our method, and discuss the relative importance of (uncorrelated) noise and background signals in practical applications.

Biographical Sketch

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Professional Preparation

Universitá degli studi di Milano Physics Laurea, February 1986.
University of Pittsburgh Physics Masters of Science, April 1992.
University of Pittsburgh Physics Doctorate of Philosophy , December 1996.
Max Planck Institut Fuer Quantenoptik Atomic Phyics June 1997-September 1999
Clark Atlanta University Solid State December 2000-November 2001

DETERMINANTS OF HEALTH DISPARITIES IN ITALIAN REGIONS

Luisa Franzini and Margherita Giannoni

Introduction: There is an extensive literature on regional disparities in health, but much of this literature focuses on the United States. Among European countries, Italy is the country where regional health disparities contribute the most to socioeconomic health disparities. In this paper, we report on regional differences in self-reported poor health and explore possible determinants at the individual and regional levels in Italy.

Methods: We use data from the “Indagine Multiscopo sulle Famiglie”, a survey of aspects of everyday life in the Italian population, to estimate multilevel logistic regressions that model poor self-reported health as a function of individual and regional socioeconomic factors. Next we use the causal step approach to test if living conditions, healthcare characteristics, social isolation, and health behaviors at the regional level mediate the relationship between regional socioeconomic factors and self-rated health.

Results: We find that residents living in regions with more poverty, more unemployment, and more income inequality are more likely to report poor health and that poor living conditions and private share of healthcare expenditures at the regional level mediate socioeconomic disparities in self-rated health among Italian regions.

Conclusion: The implications are that regional contexts matter and that regional policies in Italy have the potential to reduce health disparities by implementing interventions aimed at improving living conditions and access to quality healthcare.

Some insights into Napoleon's death: the poisoning myth deconstructed.
By Robert M. Genta, M.D

Background: Numerous hypotheses on the cause of Napoleon Bonaparte's death have been proposed, including hereditary gastric cancer, arsenic poisoning, and inappropriate medical treatment. We aimed to determine the etiology and pathogenesis of Napoleon's illness by a comparison of historical information with current clinicopathologic knowledge.

Investigations: Evaluation of Napoleon's clinical history, original autopsy reports, and of historical documents. The clinicopathologic data from 135 gastric cancer patients were used for comparison with the data available on Napoleon.

Diagnosis: At least T3N1M0 (stage IIIA) gastric cancer. Napoleon's tumor extended from the cardia to the pylorus (>10 cm) without infiltration of adjacent structures, which provides strong evidence for at least stage T3. The N1 stage was determined by the presence of several enlarged and hardened regional (perigastric) lymph nodes, and the M0 stage by the absence of distant metastasis.

Conclusions: Analysis of the available historical documents indicates that Napoleon's main risk factor might have been *Helicobacter pylori* infection rather than a familial predisposition. Our analysis suggests that Napoleon's illness was a sporadic gastric carcinoma of advanced stage. Patients with such tumors have a notoriously poor prognosis.

Robert M. Genta, M.D., currently serves as Chief of Academic Affairs, Caris Pathology, Irving, Texas; Clinical Professor of Pathology and Internal Medicine (Gastroenterology) at the University of Texas Southwestern Medical School, Dallas, Texas; Staff Pathologist, Pathology Service, Dallas Veterans Affairs Medical Center; and Professor of Pathology (Joint), Université de Genève, Geneva, Switzerland. He received his medical degree from the University of Turin Medical School in Italy.

Dr. Genta is a world renowned gastrointestinal pathologist and researcher. His research has included studies on gastritis caused by *Helicobacter pylori*, evolution of atrophy and intestinal metaplasia and carcinogenesis; dynamics of gastro-esophageal reflux and relationship with junctional adenocarcinoma; the aging stomach: age-related changes occurring in the gastric mucosa; and the relationship between histopathology and endoscopy, particularly high-magnification endoscopic imaging. Dr. Genta is widely published and lectures internationally.

He is a member of the International Academy of Pathology, American Gastroenterological Association, American College of Gastroenterology (Fellow), Swiss Society of Pathology, European Society of

Pathology, Brazilian Society for Endoscopy (Honorary member), and currently serves as the President of the North Texas Society of Pathology. He also sits on several editorial boards including *Nature Clinical Practice – Gastroenterology* (Advisory Board Member), *Advances in Anatomic Pathology*, *Digestive Diseases and Science*, *Human Pathology*, *Helicobacter*, *Italian Journal of Gastroenterology*, *Pathologica*, and *Gastric Cancer*. He is also a journal reviewer for several other publications including the *New England Journal of Medicine*, *Gastroenterology* and *Archives of Pathology*.

Dr. Genta is fluent in English, Italian, French, Spanish, Portuguese and Finnish and is also knowledgeable of Swedish, German and Hebrew.

Dante's Hypersphere. The non-Euclidean Geometry of Paradise

By Dr. Alessandro Carrera

The Cantos 27-29 of Paradise outline Dante's vision of the angelical hierarchy, the istantaneous creation of the world and the geometry of Paradise, which is distinctively non-Euclidean. The sphere of the universe and the sphere of the Empyrean, God's primary dwelling, seem to be exclusive and concentric at the same time. In the last thirty years, a few scientists and historians of ideas have taken interest in Dante's description of Paradise, approaching it as a forerunner to the mathematical model of Georg Riemann or the notion of hypershpere.

Alessandro Carrera is Professor of Italian Literature at the University of Houston. He has published extensively in the fields of Italian and Comparative Literature, Critical and Literary Theory, and Music Critcism. Recently he has edited a collection of essays of Italian philosopher Massimo Cacciari, "The Unpolitical: On the Radical Critique of Political Reason" (Fordham University Press) and has published his second novel, "Skyline" (Manni Editori). His new book, "La consistenza della luce. Il pensiero della natura da Goethe a Calvino," will be published by Feltrinelli in January 2010. Carrera has been the recipient of the Eugenio Montale Prize for poetry (1993), the Arturo Loria Prize for short fiction (1998) and the Attilio Bertolucci Prize for literary criticism (2006).

ITALY IN SPACE: THE ITALIAN PARTICIPATION IN THE INTERNATIONAL SPACE STATION.

By Orazio Chiarenza and Laura Zanardini, ASI-ALTEC Liaison Office at NASA’s JSC, Houston.

SUMMARY:

Italian researchers and engineers are giving an important contribution to the assembly and operations of the International Space Station. The presentation gives a short description of the orbital outpost and outlines the elements built by the Italian industry. The framework for the utilization of the Station’s resources by the participating World Space Agencies is explained, and the flight opportunities available to Italy through the agreements between NASA and the Italian Space Agency are mentioned, both in terms of scientific payloads and participation of astronauts of Italian nationality in Shuttle and Space Station missions. Some examples of ASI-sponsored space experiments currently on the Station or planned to be uploaded soon, are given. An overview of the operational and scientific goals accomplished by the “Esperia” mission, flown in 2006 with the participation of astronaut Paolo Nespoli, concludes the presentation.

Ing. Orazio Chiarenza

Mr. Chiarenza is a former staff member of the European Space Agency (ESA), who was based at ESA’s European Astronaut Center (EAC) in Cologne, Germany, and assigned from 1999 to 2008 to NASA’s Johnson Space Center in Houston, as manager of the EAC Liaison Office, with the function of providing support to the European astronauts training at JSC and to the preparation of their Shuttle and International Space Station (ISS) missions. From 2009, Mr. Chiarenza has been a Human Space Flight Operations consultant, supporting the Italian Space Agency’s liaison office at JSC (ASI-ALTEC resident office), and providing assistance in the relations with NASA and in the preparation of Shuttle and ISS missions with participation of Italian astronauts and space science experiments sponsored by the Italian Space Agency.

Ing. Paolo Nespoli

Mr. Nespoli is an Italian astronauts belonging to the European Astronaut Center of ESA. Mr. Nespoli was selected as an astronaut in 1998 and assigned to JSC, Houston, where he has been training until now. In June 2006 Mr. Nespoli was selected as a crew member of the Shuttle flight STS-120. The mission, which took place from 23 October to 7 November 2007, had as main goals to attach an Italian-built module (Node 2) to the International Space Station and to relocate one of its solar panel. During the mission Mr. Nespoli performed important on-board functions, such as flying the Shuttle's robotic arm, coordinating the astronauts' Extra Vehicular Activities (EVA) and executing some experiments. In November 2008, Paolo Nespoli has been assigned as a crew member of ISS Expedition 26/27. This is a long duration mission to the International Space Station that will take place from November 2010 to May 2011 and will include science and Station maintenance activities . Mr. Nespoli is presently training for this mission in the US, Russia, Europe, Canada and Japan.

Phase 1 dose escalation trial (ARQ 197-111) evaluating combination of selective c-Met inhibitor ARQ 197 and erlotinib

Dr. Giovanni Abadessa

ARQ197 (A) is a selective, non-ATP competitive inhibitor of c-Met, a receptor tyrosine kinase implicated in tumor cell migration, invasion, and proliferation, also promoting resistance to EGFR-inhibition by driving ERBB3 (HER3)–dependent PI3K activation. Dual EGFR-Met inhibition is now proposed as a strategy for overcoming resistance to EGFR-inhibition.

Patients (pts) were enrolled in a sequential-cohort dose-escalation trial seeking to define safety, tolerability, pharmacokinetics (PK), and preliminary anti-tumor activity of A in combination with 150 mg daily oral erlotinib (E). Oral A was administered at escalating doses of 120, 240, and 360 mg bid.

25 pts (10 F/15 M; mean 60.5 yrs) received EA combination with starting A dose of 120 (8 pts), 240 (4 pts), and 360 (13 pts) mg bid. PK data reveal linear kinetics through 360 bid and no evidence of drug-drug interaction. Adverse events (AEs) considered related to combination therapy were reported in 13 (52%) of pts incl. (≥ 10% of patients) sinus bradycardia (5 pts), fatigue (5 pts), rash (4 pts), itching (3 pts), and diarrhea (3 pts). 2 pts experienced related serious AEs incl. neutropenia (360 bid) and sinus bradycardia (240 bid). 1 death on-study was unrelated to study drug. 9/10 evaluable pts demonstrated disease stabilization (SD) as their best RECIST response (5.9-27.1+ wks). Tumor regressions (2.3%-19.4%) were observed in 4/10 evaluable pts. Of note, 3/3 evaluable pts with NSCLC achieved SD for durations (14-32 wks) exceeding median PFS in BR.21 (9.7 wks).

Continuous therapy with EA combination appears well tolerated and without drug-drug interaction. While no formal MTD was identified, the dose of 360 mg bid A + 150 mg daily E is currently being investigated in a randomized trial comparing EA to E monotherapy in $2^{nd}/3^{rd}$ line NSCLC.

ARQ 197 / Erlotinib Combination: Biologic Profiles in 8 NSCLC Patients

Patient ID	Prior Erlotinib	Time on Treatment (Weeks)	c-MET Amplified (by FISH)	EGFR Mutation Status	K-Ras Mutation Status
01	No	26.3	Yes	wt	wt
03	Yes	31.9	No	n/a	n/a
04	Yes	14.6	n/a	n/a	n/a
05	No	1.9	n/a	n/a	n/a
18	Yes	47+	Yes	wt	wt
21	Yes	46+	Yes	wt	Mutant
27	Yes	7.7	No	wt	wt
32	Yes	31+	No	wt	wt

Part of this work is published in:

I. Laux et al. Phase I dose escalation trial (ARQ 197-111) evaluating combination of selective c-Met inhibitor ARQ 197 and erlotinib. 2009 ASCO - American Society of Clinical Oncology Annual Meeting . J Clin Oncol 27:15s, 2009 (suppl; abstr 3549)

J. Goldman et al. Phase I dose escalation trial (ARQ 197-111) evaluating combination of selective c-Met inhibitor ARQ 197 and erlotinib. 2009 IASLC – International Association for the Study of Lung Cancer Annual Meeting, San Francisco, Ca

"EEEE: Educate, Entertain, Enlighten and Enthrall"

By Dr. Fiorella Terenzi

Abstract:

Education is key for success in life and when learning becomes a fun and active experience, it finds an emotional home and it is remembered forever. The 4Es of **Educate, Enlighten, Entertain and Enthrall** will show how to engage students on multiple levels, how to capture their attention by individualizing and customizing the learning process, how to use imaginations to fuel student's exploration, how to infuse art into the classroom and how to elevate lectures to an energetic, focused, and contemporary style in teaching physics and astronomy.

Bio:

Dr. Fiorella Terenzi has a doctorate in physics with specialization in astrophysics from the University of Milan and is presently teaching physics and astronomy at Brevard Community College, Florida. In research at the Computer Audio Research Laboratory, University of California, San Diego, she pioneered techniques to convert radio waves from galaxies into sound - released by Island Records on her CD "Music from the Galaxies". Her acclaimed best-selling CD-ROM "Invisible Universe" and books "Heavenly Knowledge", "Musica Dalle Stelle", "Der Kosmos ist weiblich" weaves astronomy and music, science and art. She has appeared on CNN, The Wall Street Journal, People, Time, Glamour and lectured at UCSD, Stanford, MIT. Her groundbreaking teaching technique called EEEE was recently presented at Community College for International Development conference. She is the host and event director of ‘BCC Space&Astronomy Lecture Series’.

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The photophysical characterization, stability and interactions of novel perylene analogues

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The photophysical properties of perylenes have been thoroughly investigated in the past and have elevated perylenes as a novel contender in organic photovoltaic systems. More specifically, it has been shown that the photoemission of perylene and its derivatives make them ideal as organic solar cell photoacceptors, molecular sensors, and fluorescent labels for analytical applications. Recently our collaborators have developed a series of novel 3,9-dialkyloxy- and diacyloxyperylenes perylene analogues (3,9-dimethoxyperylene, DMOP, 3,9-bis(1-octyloxy)perylene, DOOP, and novel 3,9-bis(1-octanoyloxy)perylene, PDO) which need to be extensively characterized.

This study involved examining the stability of the three perylenes compounds within a range of solvents after exposure to varying intensities and time periods of monochromatic visible laser irradiation. To accomplish this, the photophysical properties of the perylene compounds in solvent were documented using a combination of absorption spectroscopy, fluorescence spectroscopy, and fluorescence lifetime decay using time-correlated single photon counting (TCSPC).

Preliminary results indicate that DMOP, DOOP, and PDO are highly stable in pyridine, slightly less stable in THF, more unstable in chloroform, and least stable in CCl_4 , though further analysis in still necessary. The stability of these compounds suggests that they may successfully be incorporated into organic solar cells and other photovoltaic systems.

This research was partially funded by a grant from NIH/NIGMS MBRS-RISE GM6065, and also by NIH/NIGMS MBRS-RISE GM6065.

A Multidisciplinary Approach in Treatment of Major Depressive Disorder With Psychotic Features and Mild Intellectual Disability

Anna Fernandez, M.A., LMFT, Soleng Tom, M.D., Mary Stadler, M.A., Heather Cain, B.A. &. Susan Knudsen, Ph.D., LMFT

A multidisciplinary approach was developed to treat an individual (Ms. A) with a dual diagnosis of severe Major Depressive Disorder, with Psychotic Features and Mild Intellectual Disability. Ms. A was aggressive, suicidal, and experiencing command hallucinations to kill self and others. The treatment included medications, weekly psychotherapy, case management and therapeutic behavioral modification at home and school for eight months. Ms. A internalized coping mechanisms, and showed improvement in self-care, impulse control, and peer relationships. At a follow-up after one year from the termination of the treatment, Ms. A continued to show improvement and was employed in a sheltered workshop setting

Anna Fernandez, MA, LMFT

Anna Fernandez, Manager of Behavioral Services at Hope Counseling Center (San Jose, CA) is a licensed Marriage and Family Therapist (LMFT) in the State of California. She holds a BA in Religious Science from the Pontificia Universita’ Lateranense and a MA in Counseling Psychology from Santa Clara University. She has been working for the last 11 years in an outpatient clinic specialized in treating individuals with developmental disabilities and mental illness. As Manager of Behavioral Services, Ms. Fernandez manages and supervises the Therapeutic Behavioral Services program for children and a Day Program for adults with Autism, providing clinical work for adults, families and children as well. She has given addresses on the treatment of developmental disabilities and mental illness at national conferences in Canada, Spain, Italy and USA. For the past ten years, Ms. Fernandez has been an Instructor at the Bechtel International Center, Stanford University, developing programs to help international students and their families to ease the adjustment to their new lives in the U.S. Her workshop “Life Changes and Life Transitions” is featured in the 2008 documentary “Women in a New Land”.

Restricted feeding time resets *Per1* expression in the liver peripheral oscillator but not in the brain in zebrafish

Erica Victoria Tartaglione
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Minor in Italian Studies
Mary Gates Research Scholar, Howard Hughes Scholar

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Circadian rhythms are oscillations of physiology and behavior driven by a biological clock with a period of around 24 hr. The circadian system of animals is organized hierarchically with one or more master pacemakers and "slave" oscillators in the rest of the brain and periphery. Both master and peripheral oscillators are constituted by single-cell oscillators that exhibit transcription-translation feedback loops of clock genes. In rodents, the light-dark (LD) cycle *entrains* the master circadian clock located within the hypothalamic suprachiasmatic nucleus (SCN), which synchronizes peripheral oscillators. When animals are exposed to daily restricted food access (RFA), however, this hierarchy is altered and the rhythms of clock gene expression in peripheral organs entrain to food availability, leaving unaffected the phase of clock gene expression in the SCN. The molecular pathways by which RFA entrains peripheral oscillators are unknown. We conducted similar RFA experiments in zebrafish under both LD and constant light (LL) conditions to determine whether this stimulus is equally effective in synchronizing peripheral oscillators as it is in rodents. By using zebrafish, we can capitalize on genome-wide approaches and induced mutagenesis to identify molecular pathways specifically involved in the synchronization of peripheral clocks by food. Under LD conditions animals with RFA during the night show a phase shift in the rhythm of clock gene *Period1* (*Per1*) within the liver but not within the brain. Under LL conditions, preliminary data show no phase shifts in *Per1* oscillations in the brain or liver of the randomly fed animals and in the brain of the scheduled fed group. In contrast, the liver of the scheduled fed group appears to have a similar *Per1* acrophase to the LD mid light fed group. Thus, clock gene expression in the liver suggests food availability in the absence of light cues can entrain the liver in a brain-independent manner.

Biography

Erica Victoria Tartaglione graduated with College Honors from the University of Washington in June 2009 with a Bachelor of Science in Biology (Physiology) and with a minor in Italian Studies. For her first undergraduate research project, she characterized genes implicated in *Drosophila* cell regeneration with Dr. Gerold Schubiger of the Department of Biology in the fall of 2006. Erica then moved on to work with Dr. Benjamin Kerr, as a Howard Hughes Scholar, on an evolutionary ecology project involving *Daphnia* to

study the evolution of plastic traits, like protective melanin pigmentation in 2007. She presented her study at the Howard Hughes Medical Institute Integrative Research Symposium at the University of Washington in October of 2007. As a two time recipient of the Mary Gates Endowment for Student Research Scholarship, she worked in Dr. Horacio de la Iglesia’s circadian rhythms laboratory from 2008 until the spring of 2009. Her Honors thesis project focused on resetting the liver’s biological clock by restricting food access in zebrafish. She presented her work at the Undergraduate Research Symposium at the University of Washington in May 2008 and in May 2009. A manuscript containing the study’s findings has been submitted and is presently under review for publication. She is currently working as a Research Health Science Specialist at the Department of Veterans Affairs Puget Sound Health Care System in Seattle, Washington. She is the coordinator of a human study on chronic liver disease whose purpose is to study the mechanisms, risk factors, and molecular markers underlying fatty liver disease, hepatitis C, and other alcohol related liver diseases. She is also participating in a mouse study which involves the administration of different oxysterols containing diets to see if these compounds promote the progression from simple steatosis to steatohepatitis (NASH) in the liver. Thanks to her Italian parents Erica is a dual citizen, she was born in Newport Beach, California and lived in Naples, Italy for ten years before moving to Seattle, Washington at the age of twelve. Both returning to Naples annually and completing a minor in Italian Studies has helped Erica stay in touch with Italian family, friends, and with her Italian heritage. Erica’s bicultural background made learning a variety of languages including Italian, English, French, and Spanish, natural for her.

Materials for the Nanoelectronics Era

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At the heart of the semiconductor industry are materials that have enabled scientists and engineers to scale devices, reduce the physical size, and this has resulted in a continuous increase in functionality of devices and systems. The scaling of these devices has brought us not only powerful large scale computers but hand held devices such as cell phones, computers, medical electronics, and thousands more that we are now taking for granted. However, we are at a stage where the traditional scaling is becoming more and more difficult because of fundamental materials limitations. One of the major issues that we face in addition to the traditional physical scaling is the increase in power density; power is a problem for both portable and non-portable devices. Whereas in the case of portable devices we have the obvious problem of battery charge life, in the case of all electronic devices energy consumption is a problem as well. To date electronic devices have used electronic charge as the computational variable. The industry is now in search of new computational state variables with the objective of reducing device power density.

The introduction of new state variables will require new materials and physical effects up to now not used by the semiconductor industry. One of the many materials being investigated for these new devices is graphene. Graphene is a one atom thick, monolayer, of sp^2-bonded carbon atoms that are densely packed in a honeycomb lattice as shown by the transmission electron micrograph (TEM) in Figure 1. This material has been studied for many years but it wasn't until its isolation on silicon dioxide (SiO_2) in 2004 that interest in electronic devices began.[1] In addition to the creation of new devices that use a new state variable to reduce power and potentially increase performance, one of the major problems with the introduction of any new materials is the synthesis or growth. Because of the weak van der Walls forces that hold layers of graphite together, researchers have been able to delaminate or exfoliate graphite to form graphene layers. These films are being used to fabricate the initial devices, however the films have very small areas, 10-20 microns on the side. The development of graphene based devices at the industrial level will require synthesis of very large area. We have developed a new process that uses copper (Cu) substrates to grow single layers of graphite or graphene directly. The growth process we developed is a self limited process and can be scaled to any size, the size being limited only by the size of the Cu substrate. Figure 2 shows graphene grown on Cu and transferred onto a quartz surface with a corresponding Raman spectrum. The Raman spectrum shows characteristics typical of single layer graphite or graphene. The results achieved in this research will pave the way to the synthesis of very large area graphene not only for electronic devices but also for transparent conductive electrodes for display and photovoltaic device applications.

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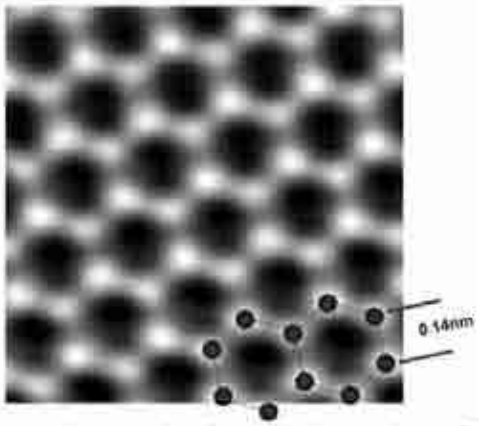

Figure 1. Transmission electron micrograph of synthetic graphene.[4]

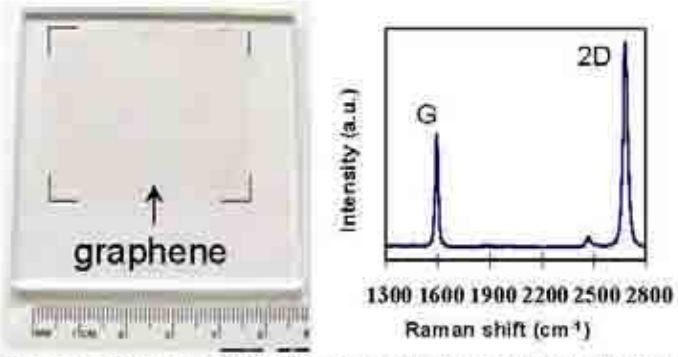

Figure 2. Graphene (monolayer graphite) film on a quartz surface with a corresponding Raman spectrum.

Biography:

Dr. Luigi Colombo is a Texas Instruments Fellow currently working on the Nanoelectronic Research Initiative (NRI) program collaborating with researchers at the Universities of Texas at Austin and Dallas. Up until 2007 Luigi was responsible for the development of the 45nm gate stack using SiON/poly Si and high-k/metal gate electrodes. He is a leading expert infrared materials single crystal growth, high-k gate dielectric/metal gate materials growth and characterization, integration of materials in CMOS devices, and graphene synthesis. Dr. Colombo joined Texas Instruments in 1982 after getting his PhD in Materials Science from the University of Rochester. He is the holder of over 85 US and international patents, author and co-author of over 120 refereed publications, 3 book chapters, over 35 invited presentations and over 95 contributed presentations.

DETECTION OF THE MERKEL CELL POLYOMAVIRUS DNA IN LYMPHOID TISSUES

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Merkel cell polyomavirus (MCV) is a newly discovered human virus linked to Merkel cell carcinoma (MCC), a rare but aggressive skin cancer. A recent report found MCV DNA in 2% of hematolymphoid malignancies. Here, we addressed the hypothesis that MCV infects cells of the lymphoid system and persists in lymphoid tissues. We investigated the presence of MCV in a series of 196 lymphoma samples, including 152 non-Hodgkin lymphoma (NHL) and 44 Hodgkin lymphoma (HL) samples, from patients in Canada. Lymphoid tissues (n=117) from healthy normal subjects and from patients with inflammatory disease, as well as nonlymphoid tumors (n=40) from cancer patients, were also included in the study. DNAs extracted from frozen samples were characterized by real-time quantitative polymerase chain reaction (RQ-PCR) for the cellular *RNase P* gene and for MCV sequences. MCV DNA was detected in 13 of 196 (6.6%) lymphomas and in 11 of 117 (9.4%) lymphoid tissues. None of the nonlymphoid tumor samples was positive for MCV. Among the lymphomas, there was no difference in the overall frequency of MCV between NHL and HL cases. However, MCV was found most frequently in chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) cases (21%). Among the nonmalignant lymphoid tissue samples, MCV was identified most frequently in reactive hyperplasia (8/61, 13%). All positive samples showed low viral copy number. Conventional PCR and sequencing were performed to confirm the RQ-PCR results. Sequence analysis of PCR products from 9 tumors confirmed the presence of viral DNA and showed high nucleotide sequence conservation compared with published sequences. These results indicate an association between MCV infection and the lymphoid system, show a possible link with CLL/SLL, and suggest that the lymphoid system may be a site for MCV persistence.

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RESEARCH INTERESTS

1. Human polyomavirus and cancer.
2. *Helicobacter pylori* and gastric cancer.
3. *Helicobacter pylori* eradication therapies.
4. Antibiotic resistance in *Helicobacter pylori*.

PUBLICATIONS

Articles in peer-reviewed journals:

1. **Toracchio S**, Kozinetz CA, Killen DE, Sheehan AM, Banez EI, Ittmann MM, Sroller V, Butel JS. Variable frequency of polyomavirus SV40 and herpesvirus EBV in lymphomas from two different urban population groups in Houston, Texas. J Clin Virol 2009;46:154-60.
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The bile acid, taurocholate, prevents biliary damage induced by in vitro hypoxia by changes in the expression of angiogenic factors in cholangiocytes.

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ABSTRACT BODY:
The function of the biliary tree is linked to the vascular supply sustained by the peribiliary vascular plexus, and its circulating angiogenic factors such as VEGF and angiopoietin (Ang). VEGF regulates the recovery phase of reperfusion injury. We have shown that: (i) taurocholic acid (TC) prevents bile duct damage by changing VEGF expression; and (ii) enhanced expression of cholangiocyte angiogenic factors regulates biliary functions in an *in vivo* model of ischemia/reperfusion injury. Using an *in vitro* system, weaimed: (i) to elucidate if reoxygenation of ischemic cholangiocytes regulate changes in the expression of angiogenic factors; and (ii) if TC protects cholangiocytes against ischemic damage. Methods: Rat cultured cholangiocytes (NRICC) were maintained under standard conditions in normoxic atmosphere of 21% O2, 74% N2 and 5% CO2 or under a hypoxic environment of 5% O2, 90% N2 and 5% CO2 for 4 hours and transferred to normal conditions for different times (1-4 hours) in the absence/presence of TC (40 µM). Then, we collected NRICC protein, mRNA and supernatants to measure changes in: (i) proliferation by PCNA immunoblots, (ii) apoptosis by Bax immunoblots, (iii) expression of VEGF-A/-C, VEGFR-2/-3, Ang1/2 and Tie1/2 by immunoblots and real-time PCR, and (iv) VEGF secretion. Results: Under hypoxic conditions, there was decreased NRICC growth, and increased cholangiocyte apoptosis and expression of VEGF-A/-C,VEGFR-2/-3, Ang1/2 and Tie1/2 coupled with enhanced NRICC VEGF secretion. Recovery of the normoxic conditions led to restoration of cholangiocyte proliferation and the expression of cholangiocyte angiogenic factors in a time-dependent manner. TC protected against biliary damage and upregulation of angiogenic protein expression under the hypoxic conditions. Conclusion: We demonstrated that: (i) hypoxia increases damage of cholangiocytes and alters the expression of biliary angiogenic factors and VEGF secretion in NRICC likely due to an autocrine compensatory mechanism; and (ii) TC prevents biliary damage in pathological conditions of lowered oxygen supply. Altered expression of biliary angiogenic factors through modulation of oxygen content may be important in the management of liver diseases.

Heparanase: A critical determinant of breast cancer metastasis to brain

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Due to the increasing incidence of breast cancer brain metastasis (BCBM), the identification of mechanisms responsible for brain metastasis formation is imperative to develop novel therapies. The correlation between Her-2 overexpression and high brain metastatic incidence begs for analyses to elucidate mechanistic links between Her-2 and BCBM determinants.

Heparanase (HPSE) is the only known mammalian endoglycosidase degrading heparan sulfate (HS), the main polysaccharide of basement membranes and tumor-surrounding extracellular matrix. HPSE relevance in cancer progression has been established: HPSE overexpression correlates with metastasis, tumor vascularity, and with shorter post-operative patient survival, making it a promising target for anti-cancer therapeutics.

We hypothesized that Her-2 augments BCBM by inducing HPSE via Her-2/epidermal growth factor receptor (EGFR) signaling. We examined HPSE levels, intracellular trafficking, and activity in human Her-2 - expressing BCBM cells (MDA231Br systems). We demonstrate that: 1) HPSE is present and functional according to their brain metastatic propensities (231Br3 > 231Br2 > 231Br1 > 231Parental) and Her-2 content; 2) EGF induces HPSE expression and nucleolar localization in a dose/time-dependent manner; 3) DNA Topoisomerase I is a HPSE target in nucleoli of BCBM cells.

Equally relevant, to determine whether microRNAs play roles in HPSE regulation, we used microRNA bioinformatic programs and identified miR-1258 as a *bona fide* microRNA targeting *hpse* 3'-UTR region. Second, to determine miR-1258 contributions modulating HPSE expression and activity in BCBM, we performed gain-/loss-of-function studies using miR-1258 mimics and inhibitors, and discovered that miR-1258 affects HPSE abilities to promote in vitro cell invasion and BCBM in xenografts.

These investigations provide first-time evidence showing that: 1) HPSE is relevant in BCBM via Her-2 – dependent modalities; 2) *hpse* is a gene target of microRNA regulation; 3) MiR-1258 is a primary *hpse* microRNA candidate; 4) MiR-1258 regulates HPSE affecting BCBM in vitro and in vivo.

A study on influence of temperature and other parameters on ceramic tiles inkjet printing

By Roberto Di Gregorio - Dal-Tile R&D – Dallas TX – October 2009

Abstract: The influence of printing temperature and other traditional ceramic parameters on the color of the final tile is investigated. An experiment is conducted by printing single colors in shapes that allow for measurement at the spectrophotometer. Several parameters are intentionally changed during the experiment. The resulting color is measured and the results statistically analyzed. Conclusions provide indications to establish process controls.

ACKNOWLEDGMENTS

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The Author desires to extend special thanks to all the R&D and Plant team that helped in the execution of the experiment and especially to:

Rob Wilson, Carlos Prieto of the R&D mobile team, Octavio Suarez and the Muskogee, OK Plant team, that helped with the execution of the tests on the line, and to

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12 BACKGROUND INFORMATION

Ceramic tiles have been produced and used for centuries, but their production evolved rapidly in the last few decades.

Tiles are still produced using natural raw materials, and with basically the same process of forming, decorating and firing, but the decoration phase underwent profound evolutions, both in glazed and un-glazed processes, and even if still exist products that are fired just after forming, either maintaining the natural aspect of the clays used, or introducing some decorating techniques before forming, a modern tile production line contains several decorating stations where different effects and colors are applied with nozzles, silk screens, laser engraved rollers to reproduce an aesthetic target that the designer desires, many times inspired by natural materials such as marble or stone.

The latest evolution in this technology is the use of inkjet printers to apply digital decoration, with all the advantages of digital processing well known in other types of applications.

The challenge was to develop printers able to use ceramic pigments, which have traditionally particle size and physical features not friendly for the small nozzles required for a sharp print.

The best results were obtained by cooperation between hardware and pigment manufactures, and today a few units, mostly of Italian production, are available with industrially reliable performances.

The ceramic manufacturing world is now getting familiar with this new application technique, and several studies are in progress to determine its capability, limitations and establish process controls.

Most of these take place within the laboratories and Plants of several ceramic tiles manufacturers and their result is used to better run the business, rather than published.

The study subject of this paper is no exception; it was run in one of the plants of Dal Tile, on the first inkjet unit installed in the USA.

The results and data of this paper are reported courtesy of Dal Tile, a subsidiary of Mohawk carpet Corporation whose links with Italian design and know how are emphasized by a joint venture with a primary Italian Ceramic manufacturer, EmilCeramica of Fiorano Modenese, and by a small but creative group of Italian researchers directly employed in its R&D team, of which the Author is one.

All data reported are accurate, except where they are reported in generic terms to protect proprietary information.

13 PURPOSE AND SCOPE

The aesthetic result of ceramic tiles production is traditionally not completely predictable, given the use of natural raw materials, the presence of a process variation, and the fact that the final aspect is visible only after firing.

For this reason the business developed the concept of "shade". The term, translation of the Italian word "tono", reminds of the times when tiles were mostly solid color, so when a lot was slightly different from the previous lot of the same color, it was defined as a different "shade".

Today, tiles are most times decorated, with patterns on them so that it is not easy to define their "color", and products are designed to appear like natural materials, so that tiles in the same lot are intentionally different from each other.

Still, the concept of "shade" exists, today it can defined as:

"a group of tiles that, when installed together, form a good looking floor"

This definition contains a large degree of subjectivity, and because of this it is a challenge for all researchers and technicians working in the Ceramic business.

The business has a strong drive to reduce "shades", ideally to produce always the same "shade". The reason is that if tiles of different "shades" will not necessarily look good together, the lots need to be kept separated, with logistic disadvantages, inventory proliferation, difficulty to complete jobs in a second moment etc.

The introduction of the inkjet printing and its digital controls promises to reduce the process variation that is part of the shade proliferation.

Purpose of this study is to determine the intrinsic variation present in the process, investigate the presence of effect of measurable parameters and separate from random variation.

It applies to the standard application method for Dal Tile inkjet products (not completely disclosed in this paper due to proprietary information).

CONCLUSIONS

By the experiments ran and data collected, the inkjet printing process appears to be fairly stable to the parameters investigated, especially with regard to printing temperature. Traditional ceramic parameters are still important and have an impact on the final result. For best results, process controls needs to be put/left in place to maintain these parameters within strict tolerance. The overall process simplification operated by the inkjet technology can free up resources to improve the control of said parameters in manufacturing.

There is an intrinsic variation of the process, its entity appears to be compatible with the aesthetic features of the products being designed for, and produced with, the inkjet technology.

14 NEXT STEPS

Inkjet printing is rapidly expanding in ceramic tiles manufacturing, the Author believes that this expansion will continue in the next few years and ceramic technologists and researchers have interesting opportunities of investigation, in order to understand the capabilities of this new technique.

Interesting next steps will be repeating experiments as the one briefly described in this paper, including more variables such as different tile sizes and different printing units.

As in any cutting edge development, learning process takes place primarily within laboratories and plants of competing Companies, so the exchange of information is understandably somehow limited in this phase. This adds to the challenge per se already significant, to reconcile matters of aesthetics and “look” using scientific and statistic methods.

NEW EVIDENCE FOR THE SHALBATANA VALLIS PALEOLAKE, MARS, FROM THE HIGH RESOLUTION IMAGING SCIENCE EXPERIMENT (HiRISE). G. Di Achille[1], B. M. Hynek[1,2], and M. L. Searls, [1]Laboratory for Atmospheric and Space Physics, University of Colorado, 392 UCB, Boulder, CO 80309, United States, [2]Department of Geological Sciences, University of Colorado, 392 UCB, CO 80309, United States.

Introduction: A recent study has identified six possible fan-delta deposits, including a main Gilbert-type delta, at the mouths of the rare contributing channels of Shalbatana Vallis, Mars, and has suggested that a former intravalley lake could have been present within one of the topographic depressions along the main valley (Fig. 1) [1]. The lake would have formed in the Hesperian (about 3.4 Ga) during the terminal hydrological activity of the valley and stabilized its main standing level at 2800 m below the Martian datum [1] (**S1** in Fig. 1). However, no shorelines were identified on the deltas with the previous datasets, making the lacustrine interpretation questionable. Here, by using the analysis of a stereo pair of HiRISE images [2] coupled with morphometric observations from the Mars Orbiter Laser Altimeter (MOLA) topographic dataset [3], we report the discovery of lake strandlines along the main Gilbert-type delta whithin Shalbatana Vallis (Fig. 2).

Sub-meter scale observation of the Shalbatana Gilbert-type delta. The PSP_009683_1830 and PSP_010316_1830 HiRISE images [2] observed the central portion of Shalbatana Vallis at a resolution of about 64 and 67 cm/pixel, respectively. HiRISE images reveal a 200-m-wide band of closely spaced (few tens of meters) and sub-parallel sinuous lineations traversing the deposit for more than 5.5 km approximately at the same elevation of the putative shoreline (**S** in Fig. 2). Although the features are eroded and not all of them continuous, a well-preserved series of alternating ridges and troughs is visible in the central part of the delta (Fig. 3a-b). We interpret these features as relict beach ridges formed at the shoreline zone during the hypothesized prominent lake stands. The most pristine feeder channel of the delta is visible for about 5 km, entrenching the deposit from its apex up to the strandlines' zone (**D** in Fig. 2). Here, a sharp terminus, lack of further incision, and expanding blankets of bright materials characterize the downslope extension of the channel (Fig. 3a-b). These observations suggest its abrupt loss of energy related to the opening into a standing body of water and resulting sediment deposition. Additionally, the strandlines mark a morphometric (slope break) and textural dichotomy across the sedimentary feature. Albedo and roughness contrasts are visible between the eastern (subaerial) and western (subaqueous) portions of the delta with respect to the strandlines' location (Fig. 3a-b). Such a sharp variation

Figure 1. HRSC color combination of the sedimentary deposits (numbered from 1 to 6) along Shalbatana Vallis.

of surface properties within a few hundreds of meters is interpreted to be the results of different degrees of surficial alteration and sediment reworking between two regions affected by selective subaerial and subaqueous processes. Relatively fresh and well-preserved chutes extending downslope from the margins of the delta to the basin floor are also shown by HiRISE images (**C** in Fig. 2). Chutes represent the seaward extensions of distributary channels over the top of the submerged portions of deltas. They are distinctive submarine features of terrestrial deltas [4], originating in arcuate re-entrants on the steepest part of the deltas during rapid progradation phases when the sediment transportation from the upper slopes into deep water parts of deltas causes oversteepening of their margins, producing delta-front instability and submarine mass movements [4]. The central southern part of the Gilbert-delta front is affected by rotational sliding and mass movements with resultant lobate deposits on the basin floor (Fig. 3c). This indicates that the latest progradational activity of the fan-delta was concentrated in the central southern part of the deposit as a result of an overall southward avulsion of the feeder channel.

Discussion. At the time of the most recent hydrological configuration, as recorded by the former shore-

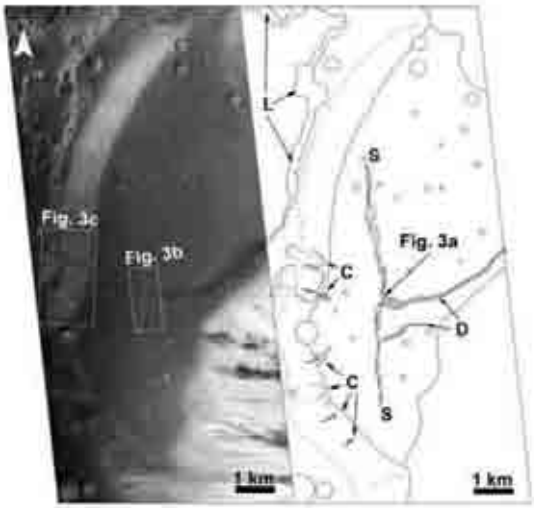

Figure 2. HiRISE image of the main sedimentary deposit and interpretative map. **S** indicate the strandlines; **D** the distributary channels; **C** the chutes; **L** the internal structure of the deposit. The white boxes show the locations of Fig. 3b and Fig. 3c.

lines, the lake water table covered an area of ~195 km^2 filling a total volume of ~29 km^3. Average discharges during the formation of the feeder channel on the delta plain can be estimated using the morphometric characteristics of the distributary channel as determined from imagery and topographic data (90 m for the width, 5 m for the depth, and 0.04 m/m for the slope) along with the Darcy-Weisbach formulas [5, 6]. Discharge values determined using both the D_{50} and D_{84} percentiles for the frictional factors range from $1.66x10^3$ to $4.67 x10^3$ m^3s^{-1} and are comparable to average-sized rivers on Earth. Assuming these inputs are continuous during the hydrological activity of the lake, the latter would have reached the inferred level after 0.19 or 0.55 yr. These values provide a minimum formation time for the lake and associated deltas since they assume uninterrupted discharge. Nevertheless, these calculations are broadly in agreement with minimum formation times obtained from sediment transport computations for Martian deltas with similar volume (e.g. Sabrina delta: 9.4 km^2; 0.54 yr in [6]). Finally, the ephemeral nature of the ponding is also consistent with the lack of major fluctuations of the Shalbatana lake, as inferred from the limited oscillation of the strandlines' level. In fact, the average slope of the delta plain (~3°) and the width of the strandlines' zone (200 m) indicate a maximum water level excursion of only about 10 m.

Conclusions. HiRISE images provide the first direct evidence of unambiguous strandlines and confirm the occurrence, although possibly short-lived, of the Shalbatana lake and fan-delta deposits during the Hesperian. These findings suggest that, at least regionally, clement conditions on Mars extended beyond the generally-accepted Noachian limit. Previously described older candidate deltas are highly eroded by aeolian deflation, which almost completely removed their fine and loose sedimentary fractions [7]. In contrast, the Shalbatana fluvio-lacustrine deposits preserve some of the youngest and unambiguous indicators of a past standing body of water and potentially any signatures from putative biological activity, making them a high priority for a future landed mission to Mars.

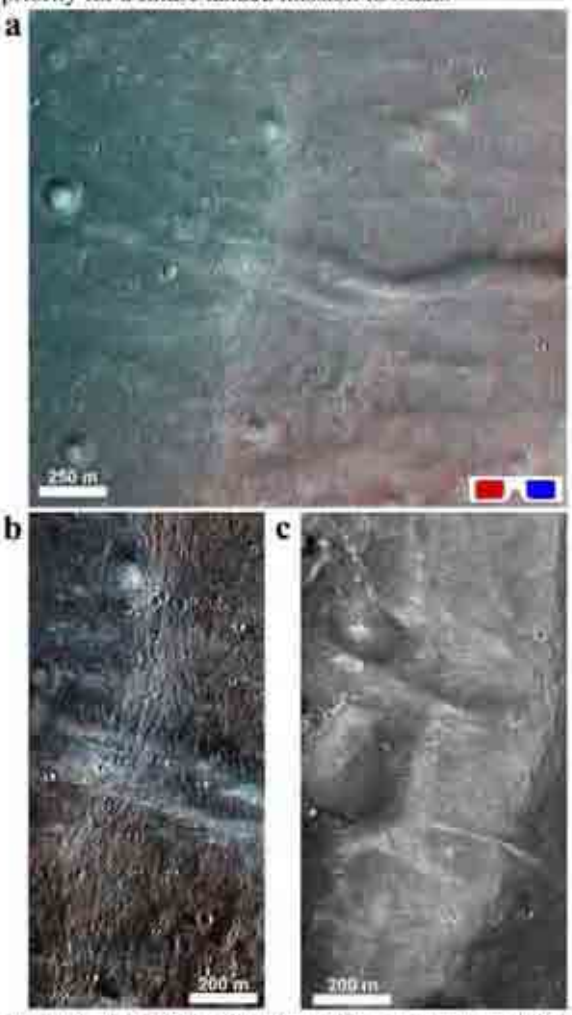

Figure 3. **a)** HiRISE stereo view of the strandlines and distributary channel terminus; **b)** HiRISE color combination showing the channel terminus and the strandlines; **c)** Close-up of the best-preserved chutes along the central southern portion of the Gilbert-type delta.

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Di Achille, G., L. Marinangeli, G. G. Ori, E. Hauber, K. Gwinner, D. Reiss, and G. Neukum (2006), Geological evolution of the Tyras Vallis paleolacustrine system, Mars, *J. Geophys. Res.*, 111, E04003, doi:10.1029/2005JE002561.

Di Achille, G., G. G. Ori, D. Reiss, E. Hauber, K. Gwinner, G. Michael, and G. Neukum (2006), A steep fan at Coprates Catena, Valles Marineris, Mars, as seen by HRSC data, *Geophys. Res. Lett.*, 33, L07204, doi:10.1029/2005GL025435.

Komatsu, G., Olsen, J.W., Ormö, J., **Di Achille, G.,** Kring, D.A. & Matsui, T. (2006), The Tsenkher structure in Gobi-Altai, Mongolia: Geomorphological hints of an impact origin. *Geomorphology*, 74, 164-180.

Software Performance & Scalability

Ing. Paolo Papi
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Software Group, IBM Corporation
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Abstract

In the last few years there is a growing number of performance related customer issues after a product is released.

Contributing factors include:

- Performance and scalability have been independent product initiatives
- Performance is addressed late in the delivery cycle
- Analysis and correction of Performance issues for any single product is very complex and involves multiple disciplines
- Systems workload behavior and performance goals are not well understood
- Best practices documentation, troubleshooting guides, configuration recommendations need to be expanded

This paper describes how to assemble a team of technical leaders into a performance team with a set of short and long term objectives to quickly remedy the situation and position the products for long term success.

What is expected to be different:

- Clear leadership for performance activities for all of the products.
- Clear understanding of the systems, the workload profiles and performance objectives
- Clear definition of platform performance criteria and testing processes
- Implementation teams that consider/accommodate performance implications of configuration and customization done onsite
- Joint team to assist vertical product performance diagnosis and recommendations for new releases as well as quick resolution of customer raised performance issues
- Forward thinking to future needs to manage cloud computing model

Biography

Paolo Papi was born in Rome, Italy. After obtaining the degree in Electronic Engineering at "La Sapienza" Rome University and completing the military service as Officer in the Italian Navy, he joined IBM in 1991. He started his career as software developer, to evolve in a few years into technical architectural leadership roles. In 1998 moved from Rome to Austin, TX, assuming managerial and project management responsibilities in different organizations in the IBM Software Group. He is currently managing a project management team involved in several projects across the globe, orchestrating teams in Unites States, Poland, Italy, Australia and Brazil. Paolo lives in Austin, TX, is married with Patrizia and has a 3 years old son, Piefrancesco.

INTRA-ARTICULAR INDUCTION OF μ-OPIOID-RECEPTOR AMELIORATES TEMPOROMANDIBULAR JOINT PAIN AND ARTHRITIS.

PM Fiorentino DMD PhD*#, JH Miller MS*, Y-C Lai DDS*, RH Tallents DDS*, S Kyrkanides DDS PhD*, Eastman Dental Center, Faculty of Medicine and Dentistry, University of Rochester, NY, USA* and Faculty of Medicine and Surgery, Turin University, Turin, Italy#.

Joint pain and arthritis may be associated with orofacial pain (OP), including temporomandibular joint disorders (TMJDs). Current treatments for OP produce variable and often inadequate pain relief. *Objectives*: To examine the anti-nociceptive (pain-killer) effect of local induction of human μ-opioid receptor (HUMOR) in the TMJ of the transgenic Col1-IL-1β^{xat} mouse model of arthritis. *Methods*: This model uses somatic mosaic analysis in a transgenic mouse with an inducible IL-1β gene. Transgene activation was induced by Cre recombinase in the TMJ, resulting in OP, as measured by increased orofacial grooming, and jaw dysfunction, as measured by decreased resistance to mouth opening (*Lai et al., 2006*). *Results*: Local pre-treatment with the feline immunodeficiency virus (FIV) vector encoding HUMOR attenuated the OP and associated jaw dysfunction and arthritis (ANOVA, $p<0.05$) via over-expression of HUMOR in the trigeminal neurons innervating TMJ tissues. In addition, it reversed the expression of c-fos and murine IL-1β as well as astroglia-induced activation in the trigeminal subnucleus caudalis. *Conclusions*: Over-expression of HUMOR may attenuate experimentally-induced OP, joint dysfunction and arthritis providing the base for the development of novel treatments for the management of TMJDs, pain and arthritis.

On. ELENA CENTEMERO

Membro della VII Commissione Cultura e Istruzione e della XIV Commissione Politiche dell'Unione Europea della Camera dei Deputati. Responsabile Scuola ed Università della provincia di Monza e Brianza per il Popolo della Libertà. Docente di latino e greco, si è laureata in Lettere Classiche presso l'Università Cattolica del Sacro Cuore di Milano ed ha conseguito il Master in Economia del Turismo presso l'Università Bocconi di Milano. Ha inoltre studiato Management dei distretti scolastici presso l'Hunter College di New York. Ha ricoperto incarichi nelle Commissioni Sport, Bilancio, Affari Sociali del Comune di Monza.

Thesis Proposal

Exploring cultural transmissions and socio-identitarian processes through memetic symbols

Richard Dawkins's definition of the meme concept in his 1976 classic *The Selfish Gene* proposes that human culture is composed of a multitude of particulate units, memes, which are analogous to the genes of biological transmission, arguing that replication also happens in culture, albeit in a different sense. These cultural replicators are transmitted by imitation between members of a community, either vertically or horizontally, and are subject to mutational-evolutionary pressures over time. My paper is an attempt to integrate the central ideas of socio-cultural evolution with a neo-Darwinian meme perspective. Using this paradigm the article develops a new perspective on the relationship between symbolic cultural transmission and social structure, and underlines the links among memetic elements of identity and how all this is related to social evolution.

How may arts help to unveil and integrate symbolic realities in order to facilitate shared meanings and understandings between peoples and thus generate the conditions for participatory, creative cultural diversity which may contribute to the construction of a social evolution? Through a cultural approach my study aims at investigating the ways in which the transmission of memetic symbols in arts, especially in murals and street art, can create a networked cultural public sphere constituting a society’s drive towards human development.

The holistic approach contextualizes social actors assertions in order to identify commonalities which may create and improve social identities. The thesis focus on the question of how memetic symbols construct, mediate and sustain meanings, social learning processes, exchange and integration in society, giving valuable insights into subjective as well as collective processes of identity construction.

This research is situated at the junction of critical, cultural and educational theories and it uses an interdisciplinary methodology comprising complementary empirical and theoretical approaches so as to investigate the art as memetic transcultural formative experiences.

Keywords: culture, memetics, transmission, symbols, identity, society, biological and socio-cultural evolution, mutant archetypes, replication, mural paintings, street art.

Part 1: Framework and approach

1.1. Delimiting the field of enquiry

1.2. Stating the general objective to orient and focus the research

1.3. The specifics: objectives and study proposals

Part 2: Theoretical construction

2.1. Meme: the Unit of Symbolic Information that provokes Culture's evolution

2.2. Meme as a social mutant archetype

2.3. Brains Selects Memes that Satisfy Biological and Cultural Needs

2.4. Cultural-Biological Socio-Evolution

2.5. Culture as a form of Identitarian Evolution: components of an Evolutionary System

2.6. The Trans-formative Potentiality of Culture-Making

Part 3: Study cases:

3.1. Arts in Society: an historical *excursus*

3.2. Landscapes and Mindscapes

3.3. Creativity: the sources of Cultural variation

3.4. Transmission studies in social sciences

3.5. A scenario of the Origin of cultural evolution

3.6. The Birth of creative ideas

3.7. Street Art Memes

References

PERSONAL DETAILS:

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EDUCATION AND QUALIFICATIONS:

 1994-1996: "Università degli Studi di Parma (Italy)" – **Law department**

 1996-2001: "Università degli Studi di Parma (Italy) – **Degree at Philosophy** – **Graduation paper in Sociology**, titled "Cities: communication spaces and their influence on different cultures" (graduation mark 107 over 110). During my University period I spent a 6-month period at Salamanca University (Spain) within the "**Erasmus Project**" of inter-European study exchanges, (10 exams in Spanish language)

 2001-2002: **Researcher**, Education Sociology Dept, Università degli Studi di Parma (Italy).

 2003-2004: **Master** in "Cultural Management" (Universitat de Barcelona- Spain)

 2004: "**Leonardo**" scholarship of Università degli Studi di Parma covering a 6-month **stage**

period at MACBA (Contemporary Art Museum, Barcelona) (Spain).

 2006-2007: **Joint scholarship** of the Italian Foreign Office and the Mexican Ministry of Foreign Affairs (SRE) covering a yearly assignment at the "Investigaciones Esteticas" of UNAM (Independent University of Mexico) and at the Ibero Americana University of Mexico.

 2008: I started my PhD at UC Merced in the World Culture Department.

LANGUAGE SKILLS:

 Italian: mother tongue

 English: advanced level (TOEFL)

 Spanish: advanced level, both written and spoken. Proficiency exam (D.E.L.E.) of Spanish, Universitat de Barcelona (Spain)

 French: beginner's level, both written and spoken.

COMPUTER SKILLS:

 I am familiar with all the most common office automation systems: Microsoft Word, Excel, Access, Corel Draw, Photoshop, PowerPoint, while I am a daily user of Internet.

PROFESSIONAL EXPERIENCES:

 6-month post-graduation stage at "Ambrosini e Associati", Milan (Italy) - an advertising and communication agency - as **assistant in the creative dept** (2000-2001).

 Ongoing cooperation as **translator and interpreter** (Italian-Spanish-English) with ItalServeis Ssp. Among my customers: Barcelona's Fair, particularly "Nautica" and "Alimentaria"-2001, the "Cirque du Soleil" (during the "Saltimbanco Show"-2002), "CityBank" (international call-center 2003), "Hotels.com (international call-center- 2003).

 Tutor for "Università degli Studi di Parma" (Italy) and I.A.L. Emilia-Romagna to develop an swapping project to settle students from Parma at various Spanish companies (2002).

 Guide at the Universal Forum of Cultures, Barcelona (2004).

 Assistant at MACBA (Contemporary Art Museum, Barcelona), **publication dept.** (2004).

 Professor of Italian language, Journalism and Art History at Francisco Marroquin University of Quetzaltenango (Guatemala) (2005).

 Professor of Italian language, Journalism and Art History at The Italian Cultural Institute of Guatemala and México (2005-2006-2007).

 Professor of Italian language, Journalism and Art History at UNAM, México (2006-2007).

 On-line Courses: Cyber-Archaeology; Immersive Architectures for cultural heritage visualization at University of Lugano (Switzerland).

 Teacher Assistant in Sociology at UC Merced (2008).

 Teacher Assistant in Political Science at UCMerced (2008).

 Teacher Assistant in Criminology at UCMerced (2009).

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Born in Bologna (Italy) on May 5th, 1934.

Laurea *Cum Laude* in Physics at the University of Pisa on December 12, 1957.

Full professor in General Physics as of 1979. As of year 1980 part-time resident at Fermilab to participate in the Collider Detector Experiment at the Tevatron.

Spokesperson of the Pisa Photoproduction Group at the Frascati Electron-Synchrotron, from 1960 to 1963.

Spokesperson of the Pisa-Stony Brook experiment at the CERN Intersecting Storage Rings (ISR, Switzerland), from 1968 to 1974.

Chairman of the Intersecting Storage Rings Committee of CERN from 1980 to 1985.

Director of the National Laboratories of Frascati (LNF) of the *Istituto Nazionale di Fisica Nucleare* of Italy (INFN) from 1974 to 1976.

Chairman of the INFN Program Advisory Committee for Accelerator Experiments from 1971 to 1974 and from 1985 to 1991.

Deputy Spokesperson of the Solenoidal Detector Collaboration at the Superconducting Super Collider (SSC, United States), from 1990 to 1992. In 1992 the U.S. House of Representatives canceled the SSC program.

Spokesperson of the Italian groups collaborating in the Collider Detector Experiment at Fermilab (CDF, United States) from 1980 to 2000.

Member of the Scientific Policy Committee of CERN from 1992 to 1998.

Co-spokesperson of the CDF Collaboration at Fermilab from 1995 to 1997.

Member of the Program Advisory Committee of Fermilab from 1997 to 2001.

Member of the Advisory Committee for project 242 of the *Agenzia Spaziale Italiana* from January 2001 to September 2001.

Member of the International Technology Recommendation Panel of the International Committee for Future Accelerators, 2003

Member of the Spokesperson Reading Group of CDF as of January 2007.

RESEARCH

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experiments on antiproton interactions in nuclear emulsions (1957-1959)(i);

experiments on meson photoproduction at the Frascati Electron-Synchrotron (1960-1963)(ii);

experiments on elastic scattering, quasi-elastic scattering, total cross-sections of proton, pions and K-mesons on protons, neutrons and nuclei at the CERN PS (1964-1970)(iii), and polarized scattering of hadrons on protons(iv);

experiments on total cross-section and correlations in particle production(v), and on production of muon pairs in proton-proton interactions at the CERN ISR (1970-1980)(vi);

design of the Magnetic Detector for ALA (MDA) to study meson spectroscopy at the high intensity, 2 GeV electronpositron collider Anello di Luminosità Alta (ALA) of the National Laboratories of Frascati(vii); and

experiments on production and decay of Intermediate Vector Bosons, beauty quark physics, jet physics, and search for top quark and new particles in proton-antiproton interactions at the Fermilab Tevatron Collider, as of 1980.

The two major results of his experiments have been the discovery of the raising total proton-proton cross-section

at the ISR in 1972, and the evidence for, and the discovery of, the top quark at the Fermilab Tevatron Collider in 1994 and 1995.

PUBLICATIONS

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Author or Co-author of over 500 publications in international scientific journals. Some references to the above-mentioned discoveries are:

"Measurement of the Total Proton-Proton Cross Section at the ISR, "S.R. Amendolia et al., Physics Letters 44B, 119 (1973).

"Evidence for Top Quark Production in ppbar Collisions at s=1,8 TeV" F. Abe et al., Phys. Rev. Letters 73, 225 (1994).

"Kinematical Evidence for Top Pair Production with Multijet Events in ppbar Collisions at s=1,8 TeV," F. Abe et al., The CDF Collaboration, Phys. Rev. 51D, 4623 (1995).

"Observation of Top Quark Production in ppbar Collisions with the Collider Detector at Fermilab," F. Abe et al., Phys. Rev. Letters 74, 2626 (1995).

TEACHING

=========

Assistant Professor of:

- *Atomic Physics*, 1960-1961 (University of Pisa)
- *Electronics*, 1961-1963 (University of Pisa)

Associate Professor of:

- *Nuclear Physics*, 1966-1977 (University of Pisa)
- *Electronic Optics and Particle Accelerators*, 1978 – 1989 (University of Pisa)

Full Professor of:

- *Classical Mechanics and Thermodynamics*, 1989- 1992 (University of Ferrara) and 1992 - 1996 (University of Pisa)
- *Physics with Particle Colliders*, from 1997 to 2006 (University of Pisa)

COLLOQUIA

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Speaker in many international conferences, colloquia and seminars at Physics Institutions in Europe and the U.S.

Chairman and co-organizer of a number of International Conferences.

Co-founder and co-organizer of the *Rencontres de Physique de la Vallee d`Aoste* that are held annually in La Thuile,

Italy as of 1987.

Co-Founder of the Italian Scientists and Scholars North America Association, ISSNAF, 2007

HONORS

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Prize for Physics of the Italian Minister for Science and Technology, 1998;

First Prize of the Joint Institute of Nuclear Research, Dubna (Russia), 1999;

American Physical Society Fellow, 1999;

Commendatore of the Italian Republic, 2000.

Lauea in physics “Honoris Causa” of JINR, 2005

Carlo Matteucci Medal by the Italian Academy of Sciences, 2006

Member of the Theatine Academy for Sciences, 2007

Proposed program of scientific training of Italian university students in the USA

Emanuela Barzi (Fermilab), and Giorgio Bellettini (University and INFN, Pisa)

Novembre 16, 2009

Since 1984 the Italian groups of the Istituto Nazionale di Fisica Nucleare (INFN) collaborating in the Collider Detector experiment (CDF) at the national DOE laboratory of Fermilab (Batavia, Illinois) have organized a two months summer training program for Italian students. At the start the program involved only four Pisa physics students. The program was soon extended to engineering students. For many years the program has been supported jointly by the Italian CDF groups and by Fermilab. Since 2004 the program is officially supported in part in by DOE in the frame of an exchange agreement with INFN**. In 2007 an agreement was reached between the Scuola Superiore di S.Anna (SSSA) of Pisa and Fermilab, who are jointly supporting each year four engineering students of the School.**

By now (summer 2209) the program has grown greatly in complexity and scope. This year Fermilab hosted 9 physics students from the universities of Bologna, Pisa, Rome, Turin, Trieste and Udine, and 13 engineering students of Pisa and Turin. The physics students were supported by DOE and by the CDF Visitor budget. Four engineers were supported jointly by SSSA and Fermilab. A larger number of engineering students were supported by the Beams Division, the Technical Division and the Computing Division. The entire laboratory was involved in the program.

We believe that the program is so successful because it fits the interests of all parties involved. The students love visiting the USA and learning to work hard in the American style. INFN and SSSA are interested in training at best their students before their merging in research or industry. Fermilab wants to be known and appreciated by the new generations, and the lab research groups want to increase their chance of recruiting skilled young scientists and engineers.

The training plans offered to our students span a wide area of science and technology. Physics students learn how to handle software for advanced data analysis and to implement subtle statistical methods. Computing engineers learn how to design and program software components and how to handle data libraries and fast data transmission. Electronic engineers work on fast decision-making and data acquisition electronics and on fast controls of large systems. Mechanical engineers help designing and procuring components of delicate instruments. Automation engineers collaborate in setting up and operating optical inspection and video control of prototypes of new accelerators.

To inform and recruit our trainees, in January each year a poster is displayed in the Physics and Engineering Departments of the Universities hosting CDF groups. Students are encouraged to apply to a local board of CDF physicists. Candidates are selected on the basis of curriculum, skills and scientific interests.

A key action-item is contacting research groups and finding out which ones are interested in offering a training program to Italian students. It is essential to find a match between the profiles of the candidates and the interest of the groups. Students matching an available training program are approved. The Fermilab Visitor Office is informed and sends to the students the job offers needed for getting an appropriate entry visa in the US.

ISSNAF believes that favorable conditions exist for extending such a program to other US laboratories and Universities, and for involving more Italian Universities and Research Centers. ISSNAF would coordinate and fund the program. We are negotiating with Fermilab and proposing that the lab takes care of the entry visa also for students to be trained at other laboratories. Student salary would be charged to ISSNAF fully or in part, depending on agreements to be reached with the hosting groups**. Joint support agreements with ISSNAF, like the one existing between SSSA and Fermilab could be the most appropriate way to cover the costs.** ISSNAF members and friends in the US would find training programs in many areas of advanced science and technology. ISSNAF would organize the recruiting process in Italy, be responsible for the training programs and for the student quality, and handle the relationship with the supervisors.

Italian or American institutions, including private Corporations, are urged to support this program by means of donations to ISSNAF. Fellowships would be established in research fields of their interest.

Consiglio Nazionale delle Ricerche

Istituto di Biofisica

Genova, Milano, Palermo, Pisa, Trento

IBF

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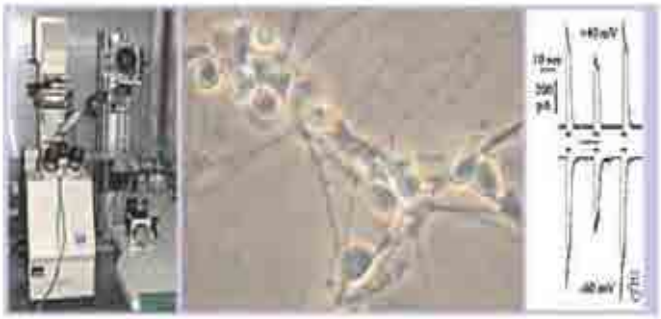

IBF staff

The IBF staff comprises 50 research scientists, 28 technical staff members and 12 accounting & secretarial staff members. Furthermore, 24 research associates collaborate with the Institute.
IBF plays an important role in research training: numerous grants are assigned yearly to young researchers to work within specific projects and many IBF research scientists are involved in the tutoring of PhD and undergraduate students.

Scientific publications

In 2008, IBF research scientists authored 96 scientific papers published in leading international journals as well as 10 book chapters. The institute's activity was also disseminated at numerous scientific congresses and through science books published by Italian and international publishers. IBF's average impact factor in the five-year period ending in 2007 was 3.44.

Collaboration with other organizations

IBF research scientists have a long-standing tradition of international liaising: strong relationships are maintained with teams located in at least 20 countries. Links are also well established within Italy, particularly with research teams in Italian universities and research centres.

National and international projects

In 2008, IBF was involved in five projects funded by the European Union and international institutions. Several projects within the framework of bilateral science agreements are currently in progress and around 12 national projects funded by both public organizations and private companies are also underway.
IBF's 2008 revenue from external funding bodies amounted to over one million euros, of which over 200,000 from the European Union and other international organizations. Over 550,000 euros were received from Government departments and local authorities under specific research programmes.

www.ibf.cnr.it

The Biophysics Institute (IBF) is part of Italy's National Research Council (CNR). It was established in May 2001 from the merging of five CNR research centres, respectively located in Genoa, Milan, Pisa, Palermo and Trento. Its mission is to investigate biological systems using methods that are typical of the physical sciences. A wide spectrum of subject areas are covered at IBF by a research staff including physicists, physiologists, molecular biologists, chemists and biochemists.

RESEARCH AREAS AT IBF

Membrane processes in communication within and between cells.

Membrane proteins interacting with the outside environment and regulating signal transduction pathways, cell to cell communication, transport of physiological and xenobiotic ions. Physiopathological role of Cl- channels and purinergic receptors in astrocytes and neurones; transport modulated by NAD+ e cADPR; channels and receptors interaction with metals, organophosphoric pesticides and peptide toxins from bacteria, plants, insects and higher animals; channels formed by cytolytic bacterial toxins; design of inhibitors and immunotoxins; activation and differentiation by ABA/ Ca2+/ PKC/ Ciclasi of immunitary, staminal cells and intracellular organelles; transporters of sugar, nutrients and metals and their interactions with eucaryotic channels.

Biomolecular aggregation processes

Mechanisms of biomolecular aggregation (crystallization, glass transition, etc.); Mechanisms of formation of amyloid fibrils (conformational changes, nucleation, elongation, role of solvent); Thermodynamic and conformational stability of proteins in solution (common pathways leading to different biologically relevant structures, role of phase transitions and critical fluctuations); Molecular Dynamics studies of molecular interactions (molecular recognition, conformation and dynamics of biopolymers); Mechanism of biopolymeric gelation (relation between gelation mechanism and mechanical properties, control and characterization of biopolymeric materials); Drug delivery systems (Relation between structural and release properties in biopolymer structures).

Photoinduced processes in biomolecules and cells

Molecular mechanisms of photoreception and sensory transduction in photomotile microorganisms Identification and characterization of photoreceptor pigments in archeobacteria and ciliates and of their spatial intracellular distribution. Biological effects of UV radiation and visible light on aquatic ecosystems. Photoactive biomolecules involved in the visible light induced increase of O2 consumption rate in living cells of different taxa. Natural pigments investigated as photodynamic chromophores as well as inhibitors and fluorescent probes of the aggregation of neurotoxic peptides.

Modelling of structure and dynamics in complex systems

Study of the biophysical mechanisms underlying memory, learning processes and neural synchronization phenomena; modelling of calcium dynamics; nonlinear analysis of biological signals; modelling of stem cells population. Study of ventricular tachyarrhythmias from patients with implantable cardioverter defibrillators. Development of an information theory based on geometric and topologic methods with applications to optics. Meromorphic continuation and interpolation of complex functions. Complex angular momentum in physics.

Plant bioenergetics and molecular biology

Characterization of native and reconstituted photosynthetic complexes; thermodynamics of photosynthesis; role of structure, antenna size and inter-chlorophyll-complex interaction on the rate of photochemistry; analysis of mutants of respiratory and photosynthetic electron transport; photoinhibition; regulation of Ca2+ATPase and H+ATPase in the plasma membrane: molecular mechanisms and physiological role; molecular basis of barium blockage in Kcv potassium channel; measurements and analysis of Kcv single-channel current; purification of Kcv membrane protein; biotechnology applied to biodiversity preservation; plants as bioreactors. Control of biogenesis of organelles during embryo development

Protein structure and dynamics

Photophysics of the triplet state of tryptophan (and red-absorbing analogs) and development of novel spectroscopic approaches for examining structure-dynamics-function relationships in enzymatic proteins, membrane transporters and pharmaco proteins. Report on the influence of the environment (homogeneous

solutions, additives, interfaces, biomedical devices), chemical modification and extreme conditions of temperature, pressure and water activity (ice, dehydration) on the native structure and biological activity of these macromolecules. Investigation of genetic doping in human muscle tissues aimed towards the development of suitable indicators.

Molecular mechanisms of membrane permeability

Ion channels and transporters are studied at the cellular level in native cell preparations, as well as at the single molecule level in heterologous expression systems. Major focuses are: the neuronal glutamate receptor, the major excitatory CNS channel; the epithelial Cl- channel CFTR, that is mutated in cystic fibrosis; and CLC Cl- channels and Cl-/ H+ antiporters, which are mutated in several diseases. Chief methods employed are patch clamp recording, fluorometry, mutagenesis, biochemical purification and analysis, and molecular modeling

Biomolecules and biodevices

Primary photoevents in photoreceptive processes: the case of algae; isolation and over expression of photoreceptive proteins of algae for the fabrication of biomolecular electronic devices; digital Microscopy: set-ups and applications; probiotics for diabetes and cardiovascular diseases; heavy metal screening in water bodies by means of microalgae.

Marine carbon cycle: dynamics of dissolved organic matter

Dissolved organic matter (DOM) dynamics in the ocean, particularly addressed to its biological lability. CDOM optical properties (absorption and fluorescence) as indicators of its molecular characteristics. Role of DOM in carbon export at depth and in carbon sequestration. Carbon budget in the Mediterranean Sea and its role in the global carbon cycle.

Lagoon and transitional water quality: cellular response to environmental contaminants

Study of cellular processes acting in plants and algae to cope with environmental stress: study of detoxification mechanisms based on the synthesis of glutathione-related peptides (phytochelatins) in response to metal stress, and their use as biomarker of metal exposure in microalgae; selection of plants suitable for the phytoremediation of metal polluted environments; isolation and characterization of proteins involved in mechanisms of defence from saline and biotic stress in plants of agricultural and food interest.

The Bioplysics Institute

Biophysics Institute Divisions

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