

**The Broader the Base, the Taller the Tower: Including Underserved Minority Students in the Quest to Explore the Great Beyond**

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The Saturday Academy for Space Science (SASS), a NASA outreach program on the south side of Chicago, brought space scientists together with underserved minority high school students. During a typical Saturday program, space scientists shared their research projects and involved students in experiments, models, or investigations relevant to their research. The program emphasized astronomy, physics, chemistry and mathematics. Students worked in teams to construct telescopes and robots. Hands This allowed our students to gain insights into technological design for scientific investigation. For twenty Saturdays/year for three years, African American, Hispanic, and Asian high school students were given excellent opportunities and assumed leadership roles in developing and carrying out space science research. The result of the program was and is far reaching.

As a result of the program over one hundred students participated in overnight observations at the Yerkes Observatory, six students went to space camp at the NASA space center in Huntsville, Alabama and twelve students took advantage of the space program at the University of Illinois. A number of the students that participated in the SASS program, one student participated in Astro-Science Workshop at Adler Planetarium. All of our students have or will be graduating from high school and most students are going on to college studies in various science disciplines. The impact on the community was also far reaching. The parents of the students were intensely involved with the program. Parents volunteered to chaperone field trips, participate in meetings, prepare snacks for students and staff and assisted students in projects and experiments. Parents gained insights into the advantages of studying science and took it upon themselves to inform school counselors about the program thereby encouraging greater student participation.

## **Working on the Resource Control and the Integration of a Database Server with a Web Server**

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The Department of Mathematics and Computer Science of Chicago State University has three controlled computer teaching laboratories and four servers. Students from various classes access the computers of these labs. We intended to give students the maximum access capabilities without losing the security control as well as without wasting the resources. This paper addresses our experience in the development of the control mechanism to facilitate students to be able to access the computers on the first day of their classes. We describe an automatic method for the students' printing control. Also, we state the way to integrate our database server and web server so that students who publish their web pages can interact with the database they use.

## **Complementary and Alternative Medicine: An Overview**

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As a moderator, I will start the session by briefly describing what complementary and alternative medicine is and the major types of complementary and alternative medicine, including mind-body medicines, biologically based practices, manipulative and body-based practices, energy medicine, and whole medical systems. The session will end with some statistics on the use of complementary and alternative medicine in the United States.

## **A Study of Bloodletting Technique in Suwen**

Dr. Chuan-Min Wang, D.C., L.Ac.

An ancient Chinese acupuncture treatment technique that can apply to many conditions is bloodletting. Perhaps there is reluctance to use this method due to the drawing of blood, which can transmit blood-borne pathogens; there may also be some concern about causing the patient potential discomfort. However, bloodletting technique is a specialized technique for specific conditions that can produce effective and dramatic results when the patient's condition is diagnosed properly and the bleeding method expertly executed.

<Suwen>(素問) is the first part of <Haung Di Nei Jing>(黃帝內經) which is the foundation textbook of Traditional Chinese Acupuncture. In the 81 chapters of <Suwen>, there are 20 chapters to discuss the bloodletting technique for specific disease and usage principles.

In Chapter 20 <San Bu Jiu Hou Lun>(三部九候論), if Blood stasis in the vessels must be removed (Bloodletting) prior to the regulation (acupuncture and/or moxibustion). It is important to balance Chi(Qi) and blood no matter what disease are treated.

In chapter 16 <Zen Yao Jing Zhong Lung>(診要精微論), the chi(qi) of the body flows in accordance with heaven chi(qi) and earth chi(qi)'s regulation. During the spring you may bloodlet the scattered shu points; During the summer you may bloodlet the luo shu points; During the autumn you may bloodlet the skin; During the winter you may bloodlet shu points deeply .

In chapter 41 <Ci Yao Tong>(刺腰痛), bloodlet popliteal area with Foot Taiyang channel lumbago; bloodlet fibular head area with Foot Shaoyang channel lumbago.

There are theoretical explanations and clinical technique instructions in <Suwen> . This study will try to analysis these explanations and instructions, then bring this specific technique to the daily practice.

## **Instructional Technology and Change Management**

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Change management strategies and team building are essential to move an organization through dramatic change. Change management and team building strategies are being tossed about as solutions for how leaders in education can successfully facilitate the integration of instructional technologies into their learning environments. I propose that as we spend time focusing on change management strategies or even faculty team building that we focus on the core trust issues including what is needed to secure this key construct before attempting to infuse technologies into the classroom.

I have spent a great deal of time looking at issues related to change and innovation both in my roles as a hospital and a higher education administrator. My dissertation focused on an analysis of factors, which influence the success of integration of new technologies in rural areas. As a Director of Behavioral Services for Northern Michigan Hospital, I lead the organization through a process of trust building with key community mental health care providers, which enabled collaborative and successful projects to come to fruition. As Director of Information and Telecommunication Services for the Healthshare Group of Northern Michigan, I lead a department through radical changes in responsibility, process and accountability. As the Assistant Provost for Technology and Learning Resources at Chicago State University, I have been leading a team of educators as they attempt to both infuse instructional technologies into the classroom as well as grow on-line courses. These successes have been accomplished through intense attention to problem analysis and calculated efforts to build trust through participation and relationship development.

I would like to share research, experiences and suggestions to manage the often neglected fundamental need to create an environment where logical solutions such as team building and continuous quality initiatives can succeed. It is essential that we manage change in a collaborative fashion if we wish to be successful.

## **Technology and Global Education in the College Foreign Language Classroom**

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The standards for Foreign Language Learning as determined by the American Council on the Teaching of Foreign Languages include the study of "culture" as one of the most important aspects for foreign language students. The standards promote in this regard the acquisition of 1/"knowledge and understanding of other cultures;" 2/the "participation of "insight into the nature of language and culture;" and 3/students' "participation in multilingual communities at home and around the world" (1996). These standards stress the target culture and encourage cross-cultural comparisons with the home culture, American culture in our case. In a world today defined by globalization and interdependence, the cultural dimension in our foreign language classrooms must encompass more than the study of the culture/cultures where the target language is spoken. We must go a step further to mirror what our new realities are: the fact that all countries exist in an independent world and that complex connections exist between nations and the people who live within them. This paper will show how the use of *Internet-Mediated Technologies* can be a powerful tool in the development of a global approach in teaching culture in the foreign language classroom: an approach that highlights the complex interconnections between nations and peoples, raises awareness about cultural, socio-economic, and political issues related to diasporas and their effect on national and international relations. Such an approach, aided by technology, will lead the constructive reflections about global issues such as the environment, religion, economic disparities, and militarization.

## **Localization of Chromosome Inversion Breakpoints Using *In Situ* Hybridization of Fluorescent DNA Probes.**

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A series of four non-overlapping chromosomal inversions exist on Chromosome 17 (Chr 17) of the common house mouse (*Mus musculus*). These inversions define a genomic interval referred to as the *t* complex. These chromosomal inversions arose in natural ancestral populations of the mouse between 500,000 and 2 million years ago. The inversions created a scenario whereby subsequent gene mutations could be “trapped” and inherited as a unit, creating a mutant gene complex. To date, the boundaries (breakpoints) of the inversions have not been defined at the molecular level. Defining the boundaries would allow the inversion mechanism to be better understood, and could identify genes disrupted by the inversions. We propose to generate a series of DNA probes mapping close to the putative proximal and distal boundaries of the fourth inversion of the *t* complex. This will be done by identifying DNA segments with nucleotide polymorphisms between the inverted and non-inverted forms of Chr 17 using the mouse DNA sequence database. Once a series of probes have been constructed using PCR amplification of genomic DNA and subsequent fluorescent labeling, the probes will be applied, *in situ*, to metaphase chromosome spreads from mitotically arrested cells of mice heterozygous for the inverted and non-inverted forms of Chr 17. Visualization of the hybridized probe signals will allow us to distinguish DNA segments residing within the chromosome inversion from those segments outside the inversion. Eventually, this will enable precise determination of the inversion boundaries.

## **Basic Research and Applications with Nanoporous Templates**

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The anodized aluminum oxide (AAO) template has attracted tremendous interest in recent years. These materials contain straight and uniform nanopores with diameters between 10 and 400 nm. Very high aspect ratio over 1,000 can easily be obtained. These nanopores are arranged in hexagonally close packed arrays. Due to their straight pores and high surface areas that enable better control of the reaction conditions, the template framework has been recognized as an excellent support for heterogeneous catalysis. High selectivity has been observed with use of these membrane catalysts. The nanostructured AAO surface, when coated with a thin layer of palladium, showed high sensitivity and fast response toward hydrogen. New hydrogen sensors based on both nanotubes and nanowells have been developed. The nanostructured surfaces such as AAO nanowells and barrier layers, when evaporated with a thin silver or gold film, showed very high surface enhanced Raman scattering (SERS) activities. These materials are being tested for chemical and biochemical sensing. The nanopore arrays, when coupled with silver or gold thin films, are showing intense color. Plasmonic behaviors associated with light propagation in these materials are being actively pursued. Ferromagnetic nanowires prepared in these nanoporous templates, due to spatial confinement, showed enhanced coercivity. Better magnets toward higher magnetization and coercivity may be built from these templates. A general overview on the basic science and applications with use of AAO nanoporous templates will be presented.

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**The Knowledge Management of Global Culture and E-Learning: An Example of National Digital Archives Program Integrating into Teaching Chinese as a Second Language in Taiwan**

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Also, I work at World Chinese Language Association and the position is Vice Secretary General.

## **Using Digital Image Capture and Analysis to Enhance Biology Courses**

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The popularity of digital cameras in the consumer electronics market has lowered the price of digital cameras. These price reductions make bringing digital image capture to the classroom practical. The wide availability of this technology in the classroom gives us the opportunity to help students build image processing and image analysis skills.

There are four main areas of emphasis.

- 1) Image capture and storage;
- 2) Analysis of images to support experimental results;
- 3) Using image processing to prepare images for presentation; and
- 4) Ethical considerations in image processing. We have developed a workshop for summer students using commercially available software to provide an introduction to these four areas.

## **The Science of Homeopathy**

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Homeopathy is a healing system using “The Law of Similar.”  
Homoio=similar, Pathy=suffering. Thus, the homeopathic Similar Principal states:  
“A substance which can produce a spectrum of symptoms in a healthy person will cure that same spectrum of symptoms in a sick person.”

Although the concept of Homeopathy is ancient, dating back to Hippocrates (460?AD) And before, its clinical application initiated in 1800s, by the German physician Samuel Hahnemann (1755-1843). The core premise of Homeopathy is that “Each living organism has a unique character which its vital force (energy) and intelligence, that could heal itself when its life-force is off balanced. But when its energy is too weak to heal itself, then it needs a stronger but a Similar pattern of energy, (a homeopathic remedy) to Return to its original homeostasis.

Remedies are selected on the basis of symptoms, factors that make them better or worse, disposition and appearance.

Although clinical cure cases have been abundant since its usage, homeopathic mechanism of action has been elucidated only in the past few decades. The energy, resonance of the remedy has been brought to light through recent biophysical research by using theories of “Quantum Electrodynamics, Coherence concept, and Cluster phenomenon.”

Hence Homeopathy is a natural healing system with a significant body of scientific evidence validating its effectiveness.

## **Applications of Nanotechnology in Biomaterials and Medical Diagnostic Industry**

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Nanomedicine covers drug delivery, nanomaterials, and medical devices. Nanotechnology holds great promise for advanced medical diagnostics, biosensors and implantable material or devices. In the future, molecular machine systems and medical nanorobots will enable instant disease diagnosis including complicated tasks such as instant pathogen identification, chromosome replacement, and individual-cell-surgery in vivo.

Nanomaterial and nanotech-based medical device business opportunities include:

- Implantable materials – Tissue repair/replacement and structural implant materials.
- Implantable devices – implantable medical devices, sensors and sensory aids.
- Surgical aids and operating tools
- Diagnostic tools – Genetic/protein biomarkers and imaging devices

Nanotechnology already showed promise with bone repairs using biocompatible nanomaterials. Nanotechnology also is near reality in bioresorbable materials such as nanopolymers currently used as sutures and orthopedic fixation devices.

Nanoscale sensors has been used to detect a targeted chemical or physical property such as blood glucose level by planting the sensor subcutaneously. Implantable micro fluidic systems has been demonstrated in dispensing drugs as a robotic device. Fluid injection can be controlled electrically on demand for the direct target treatment such as cancer therapy.

The total in-vitro diagnostic market is currently \$23 billion. It is estimated that molecular technology will be the main paradigm of scientific medicine from the year 2010. Nanotechnology will enable molecular diagnostics no longer a limited access tool.

Three trends that will shape and drive the future growth of the molecular diagnostic and nanomedicine market

1. An increase in government and private insurance reimbursement rates for novel tests and technologies.
2. The increase in automation. The development of instrumentation that significantly increases through-put will drive the employment of molecular diagnostic tests. This requires a magnitude increase of detector sensitivity and the micro scale sample and reagent delivery system. Currently developing MEMS and micro fluidic systems aided with nanotechnology based detector systems will enable the reality of such automation.
3. The quickly approaching of personalized medicine led by the deployment of

pharmacogenomic technologies, such as genotyping and SNP detection. The healthcare agencies and research organizations start to understand how human genes influence a patient's response to treatment and the progression of diseases. The pharmacogenomic marketplace is poised to experience explosive growth. Due to the sensitivity and timing requirement, these products need additional user friendly technologies to enable them for routine operations in the hospitals or health clinics. Nanotechnology has the greatest potential to enable pharmacogenomic testing as a routine laboratory tests.

Medical devices, comparing to drug delivery systems, require much smaller budget and development time. It holds great potential for new biotech companies to have major impact in worldwide nanomedicine in the future.

## **Fluorescence spectroscopy to study protein conformational changes**

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Teaching biophysical techniques can be a daunting task because many students do not see the biological connections to the mathematical concepts. Research can be used to create these connections. Our laboratory uses fluorescent spectroscopy to study the mechanisms that underlie the formation of cancers.

Cancer arises as a result of the inability of damaged cells to stimulate signals that result in the destruction of these cells and clearance of these cells from the body. This process, known as apoptosis, is necessary to prevent the uncontrolled replication of damaged cells that leads to cancer. We use the pro-apoptotic protein, Bax, as an example of a membrane-associated protein that undergoes conformational changes. These structural changes are important for understanding the mechanism through which this protein promotes cell death.

Questions that attempt to relate structure and function to mechanism use biophysical techniques to understand these processes. Classical structure-function studies are performed using X-ray crystallography or NMR spectroscopy. However, these techniques have not been very successful at determining the structure of membrane-associated proteins. Even recent advances in solid state NMR have been unable to resolve these relationships because of limitations in the technique.

Fluorescence spectroscopy is a very powerful technology that can be used to study many aspects of membrane-associated protein behavior. We currently use this technique to study the structure and oligomeric state of membrane-associated Bax and also to determine how Bax interacts with membranes by performing functional studies. The use of intrinsic protein fluorescence allows us to study the conformational changes in a protein without adding probes that may disrupt the protein structure. Oligomerization is studied through the addition of a fluorescent probe that is conjugated to the protein and allows the study of the protein without the artifacts induced by crosslinking. Finally, we can use membrane probes to study how Bax inserts into membranes as well as to study the functional consequence of this insertion. Using these techniques we can begin to address the functional consequences of protein conformational changes.

## **A General Introduction of Nanoscience and Nanotechnology**

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This paper intends to give a brief introduction of nanoscience and nanotechnology to those who are unfamiliar with the field. Starting from a brief history of nanotechnology, the paper will describe (1) the major differences in chemical and physical properties of nanomaterials compared with the same materials at a larger size, (2) techniques to produce and manipulate nanomaterials, (3) methods to measure and evaluate nanostructures, and (4) applications in various industries. The future trend and potential benefits and impacts to our daily life will be discussed.

## Heat Transfer In Nanofluids--Opportunities And Challenges

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Nanofluids are fluid/ solid suspensions developed primarily for heat transfer applications. Unlike conventional suspensions the solid phase is composed of nano-sized materials. These nano-sized materials may be in the form of mono-dispersed spherical particles (metallic or dielectric spheres of typical radii of a few nanometers) or carbon nanotubes (CNT) that has a very large aspect ratio (length/diameter  $\sim 1000$  or more) Typical solid phase concentrations are  $\sim 0.1 - 1$  volume %. Despite these low solid concentrations surprisingly significant enhancement of the thermal conductivities (from tens of percents to  $\sim 150\%$  above that of the base fluids which are common heat transfer fluids such as water or ethylene glycol) in some of these nanofluids has been reported. Yet for some materials/fluid combinations negligible heat transfer enhancement has been observed. These unusual and sometimes conflicting thermal response behaviors present both opportunities and challenges. It suggests the potential emerging opportunity of a new class of heat transfer fluids with advanced capabilities. The challenges are to arrive at an understanding of both the reported unusual thermal behaviors for some and the seemingly lack of anomalous thermal responses yet for other nanofluids. For most nanofluids such understanding remains limited at present. Nevertheless substantial progress has been made in the class of CNT-based nanofluids from the percolation and scaling perspectives and results will be presented. The understanding achieved for the thermal response of CNT-based nanofluids illustrates the interplay between using basic research tools towards confronting real-world technological challenges. The need for employing similar research strategy to exploit the emerging opportunities and to meet the challenges offered by nanofluids will be discussed.

## **Development of Super Vancomycin Resistant Enterococci in Pork Meat**

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**BACKGROUND:** The emergence of antimicrobial resistance in bacterial pathogens is a major public health concern worldwide. Enterococci are one of bacterial groups in the human gastrointestinal tract. In clinical environments, enterococci have become second major cause of nosocomial infections in USA and cultures with *vanA*, *vanB* have become the model for development of vancomycin resistance in Enterococci. The objective of this study was to evaluate whether Enterococci in meat carries any vancomycin resistant genes other than *vanA*, *vanB* complex.

**METHODS:** Fresh minced pork samples collected from Chicago grocery stores were screened for presence of Enterococci by standard methods. All the cultures were then tested on BHI plates with and without 5 and 10 $\mu$ g/ml of vancomycin.

**RESULTS:** The bacterial cultures resistant to 5  $\mu$ g/ml vancomycin, but sensitive to 10 $\mu$ g/ml were selected for further study. One such strain was then incubated overnight with 5  $\mu$ g/ml vancomycin and tested on plates containing 10, 50, and 100 $\mu$ g/ml of vancomycin. The culture showed resistance to 100 $\mu$ g/ml of vancomycin. The strain when further tested showed high resistance to 1000  $\mu$ g/ml of antibiotic. The minimal inhibitory concentration (MIC) was determined following NCCLS guidelines. The result showed that MIC of this strain was 1,300  $\mu$ g/ml of vancomycin which is much higher than known *vanA* and *vanB* strains. The PCR analysis further showed that this gene is different than *vanA* and *vanB* genes.

**CONCLUSION:** We conclude that the retail pork meat may provide a major reservoir for potentially vancomycin super resistant enterococci.

## **Sequencing the CD43 gene in cancer cells: an educational platform for training students in cell biology**

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CD43 is a glycoprotein abundantly expressed on the surface of T cells and other leukocytes. It is also a marker for leukemias and lymphomas, and is aberrantly expressed on many carcinomas. CD43 is necessary for normal T cell function and is thought to have roles in regulating T cell proliferation, differentiation, adhesion and migration. These are processes that must be dysregulated during oncogenesis. We hypothesize that mutations in CD43 may contribute to the development of cancer. A bioinformatics analysis of the intracellular domain (ICD) of CD43 revealed that it is more conserved than the extracellular domain. The ICD contains several motifs that suggest that it may function in the nucleus. CD43 is possibly a member of a growing number of transmembrane proteins that are cleaved by regulated intramembrane proteolysis, leading to translocation of the ICD to the nucleus. Mutations in ICD sequences necessary for normal nuclear function may be oncogenic. We propose to sequence the gene for CD43 in a large number of human cancer cell lines. The sequences will be compared to the normal CD43 sequence deposited in GenBank. We expect to discover novel mutations in the ICD of CD43. The sequencing project will serve as an educational platform for the training of students in cell and molecular biology and bioinformatics.

**Surface Tension Dominant Micro/Nano Fluidic Systems  
for Rapid Bioassays and Micro DMFC**

**表面張力主導之奈微米流體系統**

**應用於快速生醫檢測與微型直接甲醇式燃料電池**

Prof. Fan-Gang Tseng

曾繁根 教授

Nano/Micro Bio and Fluidic Systems Lab

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National Tsing-Hua University, Taiwan

In micro/nano scale, surface tension force becomes dominant since its line scale force nature. Employing surface tension force in micro/nano scale can carry out more efficient fluid manipulation than those by pressure driven means. This talk introduces three examples passively employing surface tension in micro/nano scale for fluid manipulation, precise dosage control, and powerless operation. The first example will be a hand-controllable fluidic network system employing surface tension for slug fluid manipulation in nl-pl volume, micro-fluid mixing by three dimensional vortex, and bioassays in parallel. The second system, a 3-in-1 micro/nano protein arrayer, utilizes surface tension force for protein array formation and protein assay processes. The third system, a powerless droplet manipulation system, employs surface hydrophobicity gradient for droplet manipulation, which will be applicable for passive micro-Direct Methanol Fuel cell (DMFC). All three examples demonstrate efficient and precise fluid control results in micro/nano scale.