WORKSHOPS

I. GENDER STUDIES

Chair: Lilia. Meza-Montes
Instituto de Física, Benemérita Universidad Autónoma de Puebla, México, lilia@ifuap.buap.mx

This workshop will cover several themes on gender issues. The first session, conducted by Eden Hennessey, is designed to inspire critical analysis of the challenges faced by women in science-based educational programs and careers. In particular, it will focus on methods to increase gender equity in the post- secondary educational context, and it will also incorporate empirical research findings from the first Laurier Centre for Women in Science Residence Learning Community (WinS RLC i.e., a residential floor consisting of only female students in STEM) to illuminate the experiences of young female science students. During the second session, Anitha Kurup, on the other hand, will present results from studies of the STEM profession at the post-PhD stage and the leaky pipeline, that compare and contrast the experiences of women scientists and engineers in two countries, India and the USA. The key themes include work-life balance, structure and dynamics of formal spaces in S&T institutions and therole of mentors among others. The last session, by Prajval Shastri and Lilia Meza-Montes will be devoted to discuss policy initiatives to promote gender parity, with examples primarily from India and Latin America. The intent of this session is to initiate participatory dialogue that can result in formulating social science investigations to assess specific questions on social impact of policy.

EQUITY AND EDUCATION: EXAMINING GENDERED STIGMA IN SCIENCE

Eden Hennessey
Wilfrid Laurier University, Waterloo, ON, Canada

This workshop is designed to inspire critical analysis of the challenges faced by women in science-based educational programs and careers. In particular, the workshop will focus on methods to increase gender equity in the post-secondary educational context. Although women in Canadian post-secondary institutions now outnumber men (Turcotte, 2011), certain scientific fields remain male-dominated. Research shows that women in STEM (i.e., science, technology, engineering and mathematics) continue to report subtle and overt gender discrimination (Stout et al., 2011). Not surprisingly then, more women than men transfer out of science-based educational programs, which contributes to the cycle of fewer women in STEM programs and careers. As such, this workshop will challenge societal notions of what scientists 'look like' and to broaden understanding of why gender discrimination in STEM continues.

Through a combination of presentation and interactive discussion, the workshop will contain interesting trivia and information on the challenges faced by women in science. The workshop will also incorporate empirical research findings from the first Laurier Centre for Women in Science Residence Learning Community (WinS RLC i.e., a residential floor consisting of only female students in STEM) to illuminate the experiences of young female science students.

Data were collected from the community's residents using qualitative and quantitative methods. First-year female science students (N = 20) completed measures of self-esteem, social belongingness, academic motivation, stress, coping, and system justification. In addition to these measures, participants also completed semi-structured interviews about their experiences. Results indicated that the WinS RLC positively affected academic outcomes; however, findings also showed that residents experienced gender discrimination. Thus, future research must continue to examine ways to reduce the negative impact of gender discrimination in STEM programs in order to increase gender equity in post-secondary education.

A COMPARATIVE STUDY OF WOMEN SCIENTISTS AND ENGINEERS: EXPERIENCES IN INDIA AND THE US; IMPRESSIONS FROM THE FIELD

Anitha Kurup
School of Social Sciences, National Institute of Advanced Studies Indian Institute of Science Campus Bangalore, India bkanitha@gmail.com

The number of women pursuing a career in academia after earning a PhD in science and engineering remains disproportionately low. Research studies in India and the US have concentrated on the drop out of women in science at the high school and undergraduate levels, paying less attention to women who

drop out after obtaining a PhD. In an attempt to understand the leaky pipeline of women scientists and engineers after a PhD, the following study was undertaken. The study consisted of two phases. Phase I focused on women scientists and engineers in India. A total of 312 women scientists and engineers and 161 men scientists and engineers were surveyed online and over the telephone. For comparison purposes, a similar study was carried out in the University of California system during 2011-2012. The workshop will focus on the impressions from the field drawing on key themes that compare and contrast the experiences of women scientists and engineers in the two countries. The key themes include work-life balance, Structure and dynamics of formal spaces in S&T institutions, role of mentors among others.

TOWARDS GENDER EQUITY THROUGH POLICY:
CHARACTERISING THE SOCIAL IMPACT OF INTERVENTIONS

P. Shastri[1], L. Meza-Montes[2]
[1]Indian Institute of Astrophysics, India, prajval.shastri@gmail.com, [2]Instituto de Física, Benemérita Universidad Autónoma de Puebla, México, lilia@ifuap.buap.mx

The last several years have seen heightened debate about the persisting stark gender gap in physics practice. There has also been gradual institutional and governmental recognition world-wide that gender parity is required to achieve excellence and maximise scientific productivity, which has resulted in policy interventions of several kinds. While there is consensus that the goals ought to be long-term, and some policy interventions do indeed promote the required cultural change, others might actually hinder it. The time is ripe to evaluate policies world-wide that promote gender equity in physics from the point of view of their long-term social impact. Several examples, mainly from India and Latin America will be discussed. This session will be highly participatory, with the intent to formulate specific questions that need to be asked, and social science studies to address them, in order to inform future policy.

INTERVENTIONS TOWARDS GENDER EQUITY IN PHYSICS:
SEEDING OR HINDERING CULTURAL CHANGE?

P. Shastri
Indian Institute of Astrophysics, India, prajval.shastri@gmail.com;

The last several years have seen heightened debate about the persisting stark gender gap in physics. In India, acceptance of the problem among physics practitioners is limited, but governmental policy does reflect the recognition that gender parity is required to achieve excellence and maximise scientific productivity. The time appears ripe now to critically evaluate the initiatives undertaken so far, especially in the context of the desire for long- term cultural change in mindsets which is required for gender equity. While some interventions do promote such cultural change, others might actually hinder it.

II. PHYSICS EDUCATION

Chairs: Renee Horton[1] and Marina Milner-Bolotin[2]
[1]NASA Michoud Assembly Facility New Orleans, USA; [2]University of British Columbia, Vancouver, Canada

ASSESSING GENDER DIFFERENCES IN STUDENTS' UNDERSTANDING OF MAGNETISM

Chandralekha Singh and Jing Li
Department of Physics and Astronomy, University of Pittsburgh, USA

We investigate gender differences in introductory physics students' difficulties with concepts related to magnetism using a multiple-choice survey whose reliability and validity have been substantiated earlier. The controlled study included impact of stereotype threat, e.g., by asking students in some classes to explicitly write things related to their gender before working on the magnetism survey. We also conducted individual interviews with a subset of students to get a better understanding of the rationale behind their responses. We will discuss the results from both the algebra-based and calculus-based introductory physics courses and conclude with some possible reasons for these differences.
We thank the National Science Foundation for support.

TEACHING, LEARNING AND ASSESSING INQUIRY BASED SCIENCE EDUCATION

Eilish McLoughlin, Odilla Finlayson, Paul van Kampen, Sarah Brady and Deirdre McCabe.
CASTeL, School of Physical Sciences, Dublin City University, Dublin 9, Ireland

During the period 2008-2014, the EC funded several large scale projects in Science Education, on the basis of the findings of the EC Rocard Report. All these projects were aimed at the introduction and broader use of Inquiry Based Science Education (IBSE) through enriching the skills of teachers, by delivering appropriate teacher education programs at both initial teacher training as well as for continual professional development. This presentation will report on experiences gained from coordinating two pan-European projects, ESTABLISH (2010-2013) and SAILS (2012-2015), which have been funded under the EU Seventh Framework programme. The aim of these two projects was to support science teachers in the use and dissemination of Inquiry based approaches in their own classrooms with students aged 12-18 years.

Many IBSE resources and models for teacher education in IBSE have been developed through projects arising from national and international programmes, including the European Science and Technology in Action Building Links with Industry, School and Home (ESTABLISH) project. This project collaboration has developed 18 substantial IBSE teaching and learning units that form the core aspect of ESTABLISH IBSE teacher education programmes, for both in-service and pre-service teachers. These materials and programmes have been trialled and implemented across 11 European countries and support teachers in using IBSE methods in the classroom. A particular focus of this project was to engage with policy makers and scientific and industrial community in developing these resources.

The recent trend across the EU towards competence-based teaching and learning and a learning outcome approach, has resulted in significant changes occurring at school curricula level in traditional subject areas such as physics (science). These curricula are now being treated in more engaging cross-curricular ways, with greater emphasis being placed on developing skills and positive attitudes towards science alongside knowledge. Therefore, a key starting point for the Strategies for Assessment of Inquiry-based Learning in Science (SAILS) project was to review the key skills and competencies desirable for young people in the 21st Century as identified by different international sources and to map these against those developed through IBSE. The Framework for 21st Century learning was used as a basis for identifying key 21st century skills and competencies and those that can be developed through scientific inquiry and the mapping of these inquiry skills under this framework's learning and innovation skills, Creativity and Innovation, Critical Thinking and Problem Solving and Communication and Collaboration, will be presented. The overall objective of the SAILS project is to support teachers in developing assessment strategies and techniques that help them to assess these important inquiry skills that are so difficult to capture under traditional exam conditions. The on-going work of the SAILS project is to further develop and enhance resources developed by the ESTABLISH project and other such projects, specifically through the addition of assessment strategies and items and to use these teacher education programmes. In particular, the SAILS project aims to prepare teachers not only to be able to teach through IBSE, but also to be confident and competent in the assessment of their students' learning. Through this unified approach of implementing these multiple components for

transforming classroom practice, i.e. teacher education, curriculum and assessment around IBSE pedagogy, a sustainable model for IBSE will be achieved.

The outcomes and experiences gained from coordinating these two pan-European projects will be presented and the lessons learnt in teaching, learning and assessing inquiry will be discussed along with the impact of these IBSE projects across Europe.

HELPING PHYSICS TEACHER-CANDIDATES DEVELOP QUESTIONING SKILLS THROUGH INNOVATIVE TECHNOLOGY USE

Marina Milner-Bolotin, Heather Fisher and Alexandra MacDonald
University of British Columbia, Vancouver, Canada

Active learning pedagogies, such as Peer Instruction (PI), have been found to be effective in undergraduate physics teaching. However, they are still rare in secondary schools and in physics teacher education programs. One of the reasons for that is physics teachers' lack of experience in asking effective conceptual STEM questions and underestimating their pedagogical value. Thus research-based multiple-choice conceptual questions in STEM teacher education are still underutilized. In this study Peer Instruction pedagogy was supplemented by the use of a collaborative online system – PeerWise (PW) (peerwise.cs.auckland.ac.nz) to help teacher-candidates develop these skills. In addition, a special STEM resource of conceptual multiple-choice questions (http://scienceres-edcp-educ.sites.olt.ubc.ca/) was developed and used in STEM methods courses. We report on the effects of a research-based technology-enhanced physics methods course on teacher-candidates' content and pedagogical knowledge, on their attitudes about active learning, and on willingness and ability to implement active learning pedagogy during their practicum.

III. IMPROVING THE WORKPLACE ENVIRONMENT FOR WOMEN

Chairs: Igle Gledhill[1], Gillian Butcher[2]
[1]Council for Scientific and Industrial Research, South Africa, [2]University of Leicester, UK

The ideal workplace is one in which women and men can work to their potential and are respected and recognised for their contribution. But what are the conditions that would create this environment and how can we achieve this?

In this workshop we will hear from selected speakers about initiatives taking place in their country, both broad ranging and specific. We will also discuss some of the less tangible aspects of the environment such as unconscious bias. There will be discussion time in each session to allow all workshop participants the chance to share the best practice in their region.

The aim will be to produce guidelines on recommended best practice to improve the workplace environment for women physicists, considering how individuals, women's working groups, employers, professional bodies and funding agencies can each contribute.

IMPROVING THE WORKPLACE FOR WOMEN IMPROVES IT FOR EVERYONE

Melanie Campbell
Dept of Physics and Astronomy & School of Optometry and Vision Science, University of Waterloo, Waterloo, Canada

Prof. Campbell was the first female graduate student in her PhD program of study at the Australian National University and the first to negotiate a maternity leave while in Australia on a CSIRO postdoctoral fellowship. She was a University Research Fellow with funding from Canada's NSERC. As such, she negotiated the first maternity leave taken in that program. In the following years she lobbied for parental leaves and .stop the clock policies., both locally at the University of Waterloo and nationally as a member of NSERC's Scholarship and Fellowships Policy committee. She will also discuss other equity initiatives which improve the workplace for women and all other members of the university community: including spousal appointments and best practices in hiring.

THE JUNO PROJECT OF THE UK INSTITUTE OF PHYSICS: ADDRESSING GENDER ISSUES IN UNIVERSITY PHYSICS DEPARTMENTS

Brian Fulton
Physics Department, University of York, York, UK

Th Institute of Physics IoP) in the UK is the national body for the physics community. The Institute's Project JUNO is an award scheme that recognises and rewards higher education physics departments that are working to address the under-representation of women at all levels of physics academia. The IoP Diversity Team works closely with departments to support them in gaining this recognition, providing data for national comparison, running workshops, and providing bespoke advice. There are three levels of engagement with Project Juno; Supporter, Practitioner and Champion. As a Supporter, physics departments endorse the five principles set out in the Code of Practice. Practitioner status requires the department to demonstrate that its Juno journey is well underway and an initial evidence-based action plan demonstrating how the department aims to achieve Champion status is created. As a Champion, physics departments are confirmed to have met the five principles set out. There are currently 10 Champion departments, 11 Practitioners and 25 Supporters across the UK and Ireland. Over the past six years, the proportions of female physics staff in the UK have risen: the proportion of professors who were female rose from 5% to 9%, senior lecturers/lecturers who were female rose from 14.8 to 19% and researchers who were female rose from 17% to 19%.

ANALYSIS OF OFFICE/LABORATORY STAYING HOUR AND HOME WORKING HOUR OF JAPANESE SCIENTISTS AND ENGINEERS

Akira Ejiri
Graduate School of Frontier Sciences, University of Tokyo, Tokyo, Japan

Recently, work-life balance (WLB) is becoming an important issue. However, for the case of researchers, it is not easy to keep the work and life balance, because longer working hours are thought be inevitable to get better research record and better position and larger budget. As a result, most of researchers are reluctant to keep WLB. The third questionnaire for scientists and engineers was carried

out in 2012 [1], and status of Japanese scientists and engineers were analyzed and reported. In this report, a part of the data (i.e., data of 3,570 answerers from three societies, including the physical society of Japan) was reanalyzed from the viewpoint of WLB. In particular, office/laboratory staying hour and home working hour were analyzed and dependences on various factors were investigated. It should be noted that nearly 90% are researcher or educator, and the ratio of engineer is 5% in the answerers. Figure 1 shows the effect of family for men and women in a two-dimensional space. These effects are stronger for women than for men. The hours are also affected by the field of expertise, age, affiliation and so on. For example, life science requires longer office/lab hours, and those who work in a private university spend longer hours than the others. In addition to the hours, employment style (i.e., the ratio of permanent position), the factors to choose scientific job are analyzed. It was found that women are more affected by her family and relatives than men.

[1] Japan inter-soc. liaison assoc. committee for promoting equal participation of men and women in science and engineering, "Third questionnaire for scientists and engineers from the viewpoint of equal participation of men and women" Aug. 2013.
http://www.djrenrakukai.org/doc_pdf/2013/3rd_enq/3rd_enq_report130918.pdf

COMBATING ISOLATION: BUILDING MUTUAL MENTORING ALLIANCES

Anne J Cox
Physics, Eckerd College, Florida, US

Women physicists can often feel isolated at work. This talk will discuss a particular project, supported by a grant through the ADVANCE program of the National Science Foundation (US government funding), aimed at combating isolation through mentoring networks. I will discuss how we organized our alliance, what contributed to its success, some of the outcomes, and how it might be implemented in other contexts.

A STUDY OF STATUS OF WOMEN IN PHYSICS IN NAGPUR

Seema Ubale
Dharampeth M.P.Deo Memorial Science College, Nagpur, India

The Science and Technology Policy (2003) statement of Government of India clearly envisages a vision "To promote the empowerment of women in all Science and Technology activities and ensure their full and equal participation". Networking plays an important role in fulfilling these goals. A small and local network of 'Women in Physics in Nagpur' was launched in July 2013 with about 10-15 members. A Google group named 'Women in Physics Nagpur' was also launched which is being managed by one of the authors. The main aim of the network was to set collective goals towards a vision for Indian Women Physicists. The group will work for a judicious mix of small and big science for future progress. The present paper reports the findings of a study undertaken about the status of Women in Physics in Nagpur city. A survey of the women professionals with Physics background in Government sector, Public sector, Banking sector, Insurance sector, Software sector, Education sector, Politics sector and Research sector was undertaken for generation data on the progress of Women in Physics. The study also aims to deliberately increase networking of Women in Physics in the sense of collaborations at a local and micro level across all sectors of Nagpur. The RTM Nagpur University data of number of girls graduating with physics is also correlated with the career choices of Women in Physics. The study was carried out with a carefully designed questionnaire. The primary data that has been generated through the present study will be widely publicized for the benefit of Women in Physics.

ATTRACTIVENESS OF THE PHYSICS WORK ENVIRONMENT FOR WOMEN

Igle Gledhill
Council for Scientific and Industrial Research,, South Africa

The work environment includes some issues which affect women in particular, and many which affect all people who depend upon that environment. I'll summarise major issues highlighted in an old but useful study of improving effectiveness in research institutes, and cite a few of the data in the Global Survey of Physicists and in the Benchmark study performed in South Africa in this context. These include some of the well-known top issues: personal safety, fairness, a safe environment in which to raise concerns, and similar topics. Many points – such as staying in business, excellence, good governance, and a passion for science – form a vision shared by women and men, but some of the barriers that women encounter

appear to be invisible. I'll explore these in the context of the gender schema, a set of hypotheses which affect our expectations of other people, with a brief reference to the fact that studying such schemas assists us in building diversity across many minorities encountered in the workplace. Some useful concepts will be briefly covered, such as accumulated advantage and disadvantage, and those internal struggles which have been recognised and named, such as the imposter syndrome, the two-body problem, and the Dean's Dilemma. I hope to conduct a short workshop to uncover and communicate other well-defined, frequently-faced experiences, to build on the previous speakers' comments, and make the conceptual vocabulary available to our Working Groups and Teams in building environments that are better for us all.

IV. PROFESSIONAL DEVELOPMENT AND LEADERSHIP

Chairs: Manling Sui[1], Xia Guo[1], Jin-Hee Yoon[2]
[1]Beijing University of Technology, China, [2]Inha University, Korea

CONTINUED ENGAGEMENT IN PROMOTION IN PHYSICS

Kae Nemoto
National Institute of Informatics, 2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430, Japan

It is probably fair to say that the situation of the gender imbalance in physics has improved over the last two decades. Some countries have shown rapid changes, and some have been rather slow in change, however it is clear that the numbers, such as the ratio of female researchers and the number of professors, have been improving, creating a trend of linear increase. For a long time, we could only see isolated cases of outstanding female figures in physics here and there in the history, now we have the trend, the linear increase. It sounds promising; only the problem is the ratio of the linear growth. It is, of course, inevitable and has to be the case that the such a growth eventually will be saturated at a certain point, when the balance of gender is established. However, in this case, in many countries unfortunately it is far from such a equilibrium point, and the linear growth is almost flat in some countries, Japan is typical among them. This enlightens two factors: the trend and the speed. It has been definitely improving, though the improvement is rather too small to see significant changes in our life time. In my talk, I would like to focus on facts behind this and discuss possible ways forwards.

Each countries have different trends and problems, however the slow linear growth is almost the universal trend over the globe. In this talk, I aim to initiate discussions on how we can understand and improve the situation we are facing, highlighting pairs of complementary factors: universal and local, social and personal, and expectation and deviation. For instance, Japan is one of the countries failing to show sufficient improvements. Japan has been historically a male-dominated society, and for long years it failed to acknowledge the imbalance of gender in workforce as a social problem. Japan is also known to be mono-culture, and being a closed society makes any changes difficult. When the gender imbalance in Japan is discussed, it tends to end up with the Japanese “unique culture” argument. Japanese culture prevents women to do physics..., is that so? Isn’t it so special to have a history of male-dominant society around the world? In many cases, we can see similar problems in other countries, in different degrees and through different aspects. What can we learn from the case study of Japan.

One of such universal problems is lack of women leadership. A TED talk by Sheryl Sandberg, Facebook CEO was symbolic to re-capture how few women are involved in decision making at the top of each sector.[1] In academia, the situation could be worse. How many university presidents or vice chancellors are women. How many nobel prizes were sent to female researchers. How many large grants are given to female PIs, and how many large grant applications by female PI have failed. Why do we fail to convey talented women to these leading positions? The first observation in my talk is deeply related to this: a lack of a delivery system.

The lack of the delivery system is deeply related to a lack of social expectations. Of course, social expectations differ from a county to another, or a region to a region. The details of social expectations are different, yet they rather commonly fail to convince women to pursue leadership. Social expectations kick in at the very early stage of our lives, hence this is related the process of education, which is not necessarily school systems, note scientific education at school. People consciously and unconsciously expect other people to behave. Our conscious and unconscious views implement unseen barriers to prevent young people to pursue particular directions based on gender difference. This indicates that there are many so-called glass celling in many different stages., which also suggests that the long-term commitment is necessary for promotion of women in physics.

We also consider the norms in certain professions. It is probably not too wrong to assume that we, humans, are in some extent designed to accept the standard views. When the community is so unbalanced, the standard views naturally tend to be unbalanced, however how unbalanced would not be noticed by the members of the community. This could be a serious problem for women in physics, in particular for female leadership, simply because the factors to be influential in the physics community are not purely physics. As science is a human activities, the physics community cannot be exempted from human factors, physics is only one factor. Though the education we learn to be a professional physicist, but what if that is already hugely unbiassed?

How capable is the physical society to accept deviation which diversity would give? The more society is closed, the firmer the standard expectations are established, hence the less ground to

accommodate different ideas and opinions deviated from the main stream. Sometimes we have to think it away from the reality we know both consciously and unconsciously.

To consider these factors and how to overcome them, brain science might give us a hint.[2] By all means, I don't intend to give scientific statements. The point I would like to emphasise is that we, physicists, should use our analytical minds and skills to understand and improve our problems in our community. This approach could initiate further scientific analysis, and will present different solutions complementary to the governmental policies and strategies. In the last few decades, the government in many countries has places new policies and systems to address gender imbalance, and some improvement has been seen in many sectors. In physics, these efforts are not necessarily successful, and we should seek more efficient approaches. Letting us take the problems with our scientific hands, scientific approaches may give new directions in the long standing issues.

[1] http://www.ted.com/talks/sheryl_sandberg_why_we_have_too_few_women_leaders
[2] Temple Grandin and Catherine Johnson, Animals in Translation, 2005, and also see the references cited within.

THE NATIONAL STATUS OF GENDER ISSUES IN KOREA AND INTRODUCING GENDER SUMMIT

Youngah Park
Korea Institute of S&T Evaluation and Planning, Korea

The first female president Geunhye Park of South Korea and the Prime Minister Angela Dorothea Merkel of Germany, are globally famous female leaders. Not just in politics, it has been an issue how we should make the most of the female work force in science as they are dynamically participating in various field playing major roles. In order to innovate science and technology that lead to economic development, greater emphasis has been made that the female work force in science should be more encouraged in participating in economic activities. Recently, the concept of 'gender innovation' such as the recognition of female's different pattern from that of male and the influence of that recognition, is receiving more interest in addition to gender equality issues. This presentation will introduce the gender issues highly recognized in South Korea and explore the ways to get it more activated.

Among the many different issues regarding gender, Equity, Participation, Diversity and Cognition can be the main factors that can be discussed when considering the situation of South Korea. In terms of equity, gender budgeting is currently being operated in Korea linking the policy and budget. As long as participation is concerned, opportunities for female work force, their participation in economic activities and fostering them on S&T area are mainly discussed. When it comes to diversity, providing female work force with a variety of opportunities in many fields while encouraging them to be outstanding leaders are discussed. While these three issues have been actively on the agenda for quite some time, cognition is the one recently brought up. As the importance of cognition is being increased, it is being regarded as a policy, which means that R&D is to be proceeded taking gender into consideration.

When the policies work properly and efficiently considering the gender issues including the 4 factors mentioned above, the innovation of S&T driven by both genders should be stimulated. Also it is crucial that these issues are shared and considered in a global perspective through constructing a global network and different countries working together. There will be 'Gender Summit 2015' in Seoul under the theme of 'Better Science for Better World' which will foster these collaborative activities. The history of 'Gender Summit' and introduction of 'Gender Summit 2015 in Seoul' will be presented. Based on the presentation, it is expected that the concept of 'gender innovation' is better understood and most female workers as well as the workforce in science can be encouraged to actively participate in economic activities and become the leaders in major areas of the society.

CAN PHYSICS DISCIPLINARY SOCIETIES MAKE A DIFFERENCE IN THE SUCCESS OF WOMEN IN PHYSICS?

Beth A. Cunningham
American Association of Physics Teachers

The number of women earning physics degrees in the United States over the last 20 years has steadily increased to around 20% of all Bachelor's, Master's, and PhD's earned. This increase can be partially attributed to efforts made by physics departments and faculty. In addition, physics disciplinary societies have created a number of initiatives to increase the number, persistence, and success of women in the U.S., focusing on the programs, conferences, and activities that these organizations offer. The American Association of Physics Teachers (AAPT) offers a number of activities and programs to support women in

physics. These include childcare grants for attendees of AAPT national meetings to support care for children during conferences, a committee devoted to issues of women in physics, and workshops and talks at national meetings on women in physics including gender issues in the classroom. Finally, AAPT has performed an inventory of women in leadership roles, awards, plenary speakers, and editorial boards to evaluate the current status in the Association and assess whether current practices and policies need to be revised. A summary of these AAPT activities will be outlined in this poster. Suggestions for other efforts by professional societies to increase the number of women in physics, including those going into the teaching profession, will be included.

THE AURORA LEADERSHIP PROGRAMME

Nicola Wilkin
School of Physics & Astronomy, University of Birmingham, UK

This innovative and new programme for 2013 within the United Kingdom aims to support women in the early stages of their career as they develop themselves for future leadership roles in higher education.

The programme, which is women-only has five one-day modules covering understanding the sector; developing leadership behaviours; growing confidence and a leadership identity and building networks and support processes.

Having been sponsored by the University of Birmingham to participate, I will discuss its benefits and possible improvements, including contributions from: other participants; role models; Senior University management and the organizers, the Leadership Foundation.
http://www.lfhe.ac.uk/en/programmes-events/you/aurora/index.cfm

EXPANDING GIRLS' HORIZONS IN PHYSICS AND OTHER SCIENCES : A SUCCESSFUL STRATEGY SINCE 1976

Cherrill M. Spencer
Emeritus Member of Board of Directors of the Expanding Your Horizons Network and
Emeritus Magnet Engineer at the SLAC National Accelerator Laboratory, USA

For the past 40 years the USA's Expanding Your Horizons Network (EYH/N) has been encouraging young women aged 12 to 18 years to pursue careers in science, technology, engineering and mathematics (STEM). Believing that early intervention is a key step in attracting and nurturing scientific talent, the EYH Network continues to build and disseminate its flagship program: annual Expanding Your Horizons in Science, Mathematics and Engineering Conferences (EYH) for girls only. Since the first EYH, held in California in 1976, the Network has held over 2500 EYH conferences across the United States and in 8 other countries, reaching over 900,000 young women with the message that careers in science, mathematics, and engineering can be rewarding and are attainable by them.

In order for young women to move towards and achieve STEM careers, they need to be motivated and prepared, starting during the critical ages of 12 to 16. An EYH conference is a low-cost strategy, organized by a local volunteer committee with these characteristics: the attendees are only girls and they take part in hands-on STEM activities (including physics) lead by women scientists, engineers and mathematicians who work in their local community and act as role models; the conference takes place on a Saturday on a local college campus. The hands-on activities are designed to provide enjoyment and promote confidence in STEM subjects; the STEM role models speak to the girls about the need to take science and maths classes in high school in order to proceed to a college education in a STEM subject, they describe to the girls how much they enjoy the technical work they are doing, they explain that STEM jobs pay well and contribute to society. The girls discover that normal women with regular lives can be scientists or engineers and you don’t need to be a genius.

As role models, the women workshop leaders are charged to share the excitement of their work through related hand-on activities. These hands-on workshops are the "bread and butter" of every EYH Conference and the key to their success. The key factor is that the learning is "hands-on”, the girls are active participants; as EYH surveys and related literature prove, involvement in hands-on activities has a more lasting effect than passive listening. The workshop titles are preferably intriguing, e.g. one archaeology workshop is entitled "Archeologists will DATE any old thing"; two physics workshops are called "Electrons at Work and Play"; and "Jelly Waveguides".

The EYH Network staff provides technical assistance and conference organization materials to EYH conference site committees, committees primarily composed of volunteers. The Network staff actively encourages new sites to start EYH conferences, and this EYH strategy works well all over the world to motivate girls to consider a STEM career - EYHs have happened and been enjoyed in Australia,

Ireland, Italy, Japan, Malaysia, Singapore, Switzerland, Thailand and in 33 states in the USA. The EYH/N is eager to help EYH conferences start in other countries besides the USA. This talk will describe a typical EYH conference, how to put one on in your home town and how the EYH Network will help you in various ways.

CAN YOU HAVE IT ALL? MAKING IT WORK FOR YOU

Cathy Foley
CSIRO, P.O. Box 218, Lindfield NSW 2070 Australia

This presentation will consider the career path of women in science and how you can be a woman and a scientist with a flourishing career. I will present some practical ways that help women to manage all the things that are expected of them and also how to position themselves to be successful in their career.

INSPIRATION FROM THE ANALECTS OF CONFUCIUS

Shao-ping Zhu
Institute of Applied Physics and Computational Mathematics, P. O. Box 8009, Beijing 100088, P. R. China

Once discussing the professional development and leadership, I always connect it with some words, such as team, group and institution. Team, group or institution, I think, are the boundary conditions for discussion of professional development and leadership because most of us is a staff of one institution or a member of a research group. As a member of a group or a team, we hope to have a good professional development and to play key roles in the team. As a leader of team or group, everyone hopes that the team becomes better and better under his leading. How can we achieve these aspirations.

Confucius was living from 551 B.C. to 479 B.C. and is a great thinker and philosopher. The analects of Confucius named LunYu records Confucius's ideas and point of view on life, human nature and so on. Some remarks given in the analects of Confucius, I think, are beneficial to discussing professional development and leadership. In this presentation, I shall introduce some remarks from the analects of Confucius. Also, we shall give brief introduction on the present status of inertial confinement fusion research in China.

THE CONFERENCES FOR UNDERGRADUATE WOMEN IN PHYSICS

Susan K. Blessing
Florida State University and the American Physical Society, USA

The American Physical Society Conferences for Undergraduate Women in Physics (CUWiP) are the continuation of a grass-roots collaborative effort that began in 2006. The goals of the conferences are to increase retention and improve career outcomes of undergraduate women in physics. I will describe the conferences, including organization and participant response, and encourage other countries to host similar programs for their undergraduate women.

BUILDING BRIDGES FOR WOMEN PARTICIPATION IN PHYSICS, ZAMBIA

Lister Mulindwa Kaziya
University of Zambia, Lusaka, Zambia

My name is Lister Mulindwa Kaziya (Mrs.); I was the first ever indigenous female to have completed a Bachelor's Degree in Physics in Zambia, I proceeded to do Post- Graduate Diploma in Condensed Matter Physics at the International Center for Theoretical Physics in Italy upon completion, I carried on to pursue a Master of Science Degree in Material Science (Physics) at Trent University in Canada. Upon graduation I was offered a lecturing position at the University of Zambia where I am currently.

In contributing to the development and growth of Physics in Zambia, I was profiled in the Building Bridges programme in Zambia by Forum for African Women Education in Zambia (FAWEZA) which was the programme for women who have excelled in different spheres of academic and social cycles. Further I held motivational talks to young school girls about Physics and encouraged them to take physics as a career path.

Physics in Zambia is a male dominated field simply because of the so many challenges arising from cultural and social barriers. Before I obtained my Bachelor's Degree in Physics, Physics was a no goal area for women but I stood as an example to many other young women and proved that, "Physics

Knows no Gender". With the right support we can excel and wake the giant in women participation in Science and more especially Physics. After I graduated and having had such motivational talks we have seen slow but positive steps of the Zambian Women taking up Physics as a career path.

From the conference, I would like to continue with motivational talks about physics careers in Zambia and worldwide and inspire even more by undertaking a PHD in Physics should an opportunity arise.

V. CULTURAL PERCEPTION AND BIAS / SCIENCE PRACTICE AND ETHICS

Chairs: Kwek Leong Chuan[a] and Silvina Ponce Dawson[b]
[a]*Centre for Quantum Technologies, Singapore;* [b]*Universidad de Buenos Aires, Argentina*

This workshop will address two separate issues both from a general perspective and in relation with the activity and development of women physicists. The first session of the workshop will be devoted to Cultural Perception and Bias and the second session to Science Practice and Ethics. During the third session we will summarize the themes discussed in the first two sessions and elaborate a series of recommendations to be presented at the General Assembly of ICWIP14.

(i) CULTURAL PERCEPTION AND BIAS

Culture permeates all human activities. Although science is supposed to be objective and to have a quantitative method that can be accurately replicated across laboratories and countries, the everyday life of scientists is directly affected by the local environment where it is performed. Differences in cultural perception affect female scientists more directly because the advancement of the women agenda has started at different moments and proceeded at different paces in different countries. In this session Rachel Ivie from AIP will present the results of the International Survey of Physicists analyzed by region. This presentation will be followed by a round-table with the participation of JG Lin from Taiwan and V. Pierron-Bohnes from France. The session will then be open for the discussion of all workshop participants. In this way we will to exchange a variety of experiences, learn from the differences and elaborate on ideas that can improve the situation of women physicists all over the world.

(ii) SCIENCE PRACTICE AND ETHICS

The frequency with which scientists incur in some sort of scientific misconduct is a matter of controversy. A review of the biomedical literature by Fang et al shows that over all retracted papers as of May, 2012, “67% of retractions were attributable to misconduct, including fraud or suspected fraud (43.4%), duplicate publication (14.2%), and plagiarism (9.8%)”. Some of these inappropriate behaviors might be triggered by the increasing competition among scientists that is, in turn, related to the lack of enough funds for a growing scientific community. The “publish or perish” culture required to be successful in academia can clearly conflict with the objectivity of research. In fact, as shown by D. Fanelli (2010), publication pressures increase scientific bias. A recent study by Fang et al (2013) has shown that female scientists are less likely to commit fraud than their male counterparts. This behavior is correlated with other observations that show that men are more likely to break social rules and take risks than women. Understanding why this happens might give hints on how to change science practice. In this breakout session we will present some of these recent results and will discuss ways in which the practice of science may be changed so as to minimize scientific misconduct.

F. C. Fang R. G. Steen, and A. Casadevall (2012) Misconduct accounts for the majority of retracted scientific publications, Proc Natl Acad Sci, doi:10.1073/pnas.1212247109
F. C. Fang, J. W. Bennett and A. Casadevall (2013) Observation: Males Are Overrepresented among Life Science Researchers Committing Scientific Misconduct, mBio 4:1, e00640-12, doi:10.1128/mBio.00640-12; Fanelli D (2009) How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. PLoS ONE 4(5): e5738. doi:10.1371/journal.pone.0005738
Fanelli D (2010) Do Pressures to Publish Increase Scientists' Bias? An Empirical
Support from US States Data. PLoS ONE 5(4): e10271.
doi: 10.1371/journal.pone.001027

COUNTRY POSTER ABSTRACTS

1. ALBANIAN WOMEN IN PHYSICS

Antoneta Deda[a], Mirela Alushllari[b], Silvana Miçco[c]
[a]Faculty of Natural Sciences, University of Tirana Albania; [b]Institute of Applied Nuclear Physics, University of Tirana, Albania; [c]University 'Ismail Qemali' , Vlora, Albania

In Albania during three years (2011-2014), the number of girls in first-year undergraduate physics has been particularly high and stable, about 50%. This is due to the entrance exam system, which assigns a student to a discipline according to his/her grades and not according to his/her preference. At the graduate level, the number of girls is still high, due to the high percentage of girls enrolled in graduate studies like didactic of physics, environmental physics and biophysics, But the problem is that the number of women with academic careers in physics suddenly drops, after they receive a graduate degree. This indicates that when serious career obligations interfere with family responsibilities, women drop out Nevertheless, during three years (2011-2014) a shift from the lecturer to the assistant professor level or from assistant professor level to professor level has been observed. In the Faculty of Natural Sciences, University of Tirana the contribute of women physicist in this shift about 30% and more than 30% in all exact sciences (included Physics, Chemistry, Mathematics, Biology and Informatics) Also the percentage of girls (women) underwritten in doctorate in Physics is higher then three years before, so in 2012 was 44%, in 2013 was 70%.

2. IS IT A REAL PROBLEM THE "GLASS CEILING" FOR PHYSICISTS' WOMEN IN ARGENTINA?

Marisa A. Frechero[1], Ana Amador[2], Antonio J. Ramirez Pastor[3] and Francisco Tamarit[4]
[1]Fisicoquímica, Dpto. Química, CONICET-Universidad Nacional del Sur;
[2]Departamento de Física , CONICET–FCEN- Universidad de Buenos Aires; [3]Instituto de Física Aplicada, CONICET-Universidad Nacional de San Luis; [4]Instituto de Física E. Gaviola, CONICET-Universidad Nacional de Córdoba

In 1986 an article coined the term "women glass ceiling" referring to an invisible barrier blocking women from getting top jobs. Since then, this hypothesis has been studied in very different work environments.

In previous IUPAP Conferences, Argentinean group has addressed the issue of women in physics as a minority population and, going beyond this, trying to define if the difference in male- female relation begins in elementary school. A possible origin of the difference could be that physics might not be a very popular choice among young women. But, what if the cause of this lies in the future and not in the past?

Traditionally, women did not choose physics as a profession but female population in physics has been growing considerably in last years. It remains to be known if women population is equally distributed in all levels of education and research. We have delved into this issue by analyzing the Argentinean situation using several indicators, as for example the proportion of R&D women leaders in Physics groups and the proportion of women in different levels of the principal research council of Argentina (CONICET). In this way, we were able to evaluate the distribution of female physicists in the workforce. We consider that this is a good gage to evaluate if the female physicists have the opportunity to "break down the glass ceiling" in our country and, if it really exists. Our statistics have been very encouraging regarding the numbers of the last years and seems to be changing towards better.

3. WOMEN IN PHYSICS IN ARMENIA

Mary Zazyan
Yerevan Physics Institute, Armenia

Armenia had a long tradition of excellence in science, technology, and education. However, today Armenian science, famous especially for its achievements in physics, confronts most serious challenges. Low social prestige, bad funding and low income of scientists make physics unwelcoming to women. In our paper we discuss the current situation and the most important problems Armenian women in physics face.

4. AUSTRALIAN COUNTRY UPDATE ON WOMEN IN PHYSICS - 2014

C.P. Foley
CSIRO P.O. Box 218 Lindfield NSW 2070

There has been little progress in increasing the number of women in physics in Australia since 2010. In the last four years, Australia has had vastly changing political and cultural impacts on women in general. From having our first women Prime Minister and many women in the most senior roles including in science, the number of women in senior roles has fallen away quickly. This suggests that early gains that had been won were based on a fragile level of support. When the support is removed, the number of women in leadership roles and in science reduces; for example the loss of a male champion or, when funding is tight or there is a crisis, awareness of gender in decision making forgotten.

There is also a concerning number of young girls who do not choose to study science and maths in the final years of high school. Furthermore the number of girls who study two sciences (a strong indicator of transition to studying post school STEM courses) in their final years has dropped significantly to alarming levels. This has been recognized by the Prime Minister's Science, Innovation and Engineering Council and reported in a STEM Country Comparison study undertaken by the Australian Council of Learned Academies at the request of the Australian Chief Scientist [1]. The number of women in physics in Australian universities has remained about the same. However due to budget cuts post the Global Financial Crisis, collection of statistics has stopped and so the information is anecdotal. "Women in Astronomy Group" is strong but in other areas women in physics activities have been piece meal.
The current Australian Institute of Physics executive are very supportive of the Women in Physics group and efforts are underway to rebuild the group with the allocation of a budget to run workshops and meetings.

It should be noted that there are some excellent initiatives undertaken by individual research organisations (usually not in physics departments) and these are being highlighted as best practice [2]. However these initiatives require funds to support them. A new research report on women in science will be released soon. This was funded by the Australian Research Council via a competitive grant. The outcomes of this research will include a tool kit to assist organisations to address retaining of women in science sector.

There has also the realization the women and men have different career paths and this needs to be understood and managed. There is also the issue that early career women do not, in general, experience problems and often do not engage is "women's only" networks and other activities. It is usually in their mid to late careers that issues of gender difference emerge with women experiencing disadvantage for the first time. This is because at this stage in their careers, their track records are not be as competitive as their male colleagues (usually due to career breaks), the competition for positions is high and unintended levels of bias contribute to women not progressing into higher level or permanent roles.

References

1. S. Marginson, R. Tytler, B. Freeman and K. Roberts, STEM : Country Comparisons (2013)
http://www.acola.org.au/PDF/SAF02Consultants/SAF02_STEM_%20FINAL.pdf
see pages 127-136
2. Gender Equity, Walter and Eliza Hall Institute Web site.
http://www.wehi.edu.au/about_us/gender_equity/

5. NATIONAL SURVEY ON WOMEN IN PHYSICS IN AUSTRIA

C. Berkmann[1], A. Rodriguez[1,2], I. Brodacz[1], N. Dilaver[1], A. Suárez[1], P. Ayala[1]
[1]*University of Vienna, Faculty of Physics, Boltzmanngasse 5, a-1090, Austria;*
[2]*IQOQI Wien, Hardtmuthgasse 110, a-1100, Vienna, Austria*

We performed a nationwide study to follow the changes of the career perspectives and the performance of female physicists in Austria since 2008 through a web-based survey, which was distributed among students and academia members.

In the summer semester of 2013, when the survey was carried out, the number of women studying physics did not differ substantially from preceding years. Nevertheless, compared to men at the same career stage, the percentages remain as low as 20% for bachelor, 17% for master and 20% for PhD students. We have tried to understand why still few women are motivated to study physics and why even less stay on the academic path or choose an industrial career path related to applied physics. Only

few respondents reported on gender-related issues within the scientific community. Gender bias related to the "suitability" of women to study physics could not be detected from our poll. Contradictory to this, women working in academia still think their gender had a negative influence on their career path. Family responsibilities seem to have a deeper impact on the woman's career. While 45% of men said that having children had no impact on their careers, only one woman made the same statement. Surprisingly, we found a group of female physicists without children encountering barriers when it comes to participating in science popularization and outreach activities.

As a final point, we have found out that initiatives to support women in scientific careers are quite well known throughout the physics community and there is a high percentage of women who declared having participated in one of them. However, there still seems to be a stigma about applying scholarships targeting women with the thought that it diminishes the value of the female researcher.

Acknowledgement: We kindly acknowledge the support of the Austrian Physical Society (specially Prof. Karl Riedling), the center for Gender Equality and Diversity of the University of Vienna (specially Mag. Sylwia Bukowska) and the Deanery of the Faculty of Physics for the financial and logistic support to the Austrian Team.

6. WOMEN IN SCIENCE: CURRENT ADVANCES AND CHALLENGES IN BELARUS

Iya I. Tashlykova-Bushkevich
Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus

The underrepresentation of women in scientific careers has been a continuing cause for concern in Europe. While Europe maximizes its total research potential the number of women pursuing careers in scientific disciplines is comparatively small in relation to the number trained in the physics and other disciplines of natural sciences. One crucial assumption is that the stronger involvement of women in research would contribute to the future development of science in European countries. Belarus is a developing Eastern European country where women constitute 53.5% of the population. This report reviews the positions of women in science in Belarus to draw out current advances and challenges encountered by female scientists in the former socialist country. Presented new statistical data are broken down by gender and aimed at advancing the general agenda for women in science.

7. GENDER EQUITY IN THE BRAZILIAN PHYSICS COMMUNITY AT PRESENT DAY

Elisa Maria Baggio Saitovitch[a*], Marcia Cristina Bernardes Barbosa[b], Renata Zukanovich Funchal[c], Suani Tavares Rubim de Pinho[d], Ademir Eugênio de Santana[e]
[a]*Centro Brasileiro de Pesquisas Físicas, Rua Xavier Sigaud, 150, 22290-180, Rio de Janeiro, RJ, Brazil;* [b]*Instituto de Física, Universidade Federal do Rio Grande do Sul, 91501-970, Porto Alegre, RS, Brazil;* [c]*Instituto de Física, Universidade de São Paulo, Cidade Universitária, 05508-090, São Paulo, SP, Brazil;* [d]*Instituto de Física, Universidade Federal da Bahia, 40210-340, Salvador, BA, Brazil;* [e]*Instituto de Física, Centro Internacional de Física da Matéria Condensada, Universidade de Brasília, 70-910-900, Brasília, DF, Brazil*
[*]*elisa@cbpf.br*

Introduction: We present an overview of the advances and difficulties in gender equity in the Brazilian physics community in present days. The analysis considers the expertise of the Authors as permanent members of the Commission for Relations and Gender (CRG), an organization sponsored by the Brazilian Physical Society (BPS). The CRG-BPS was created in 2003, in order to investigate and eventually to bring light to the unbalanced participation of women and men in physics, at all levels; i.e. in undergraduate and graduate courses and in professional activities as education, research and industry. The CRG-BPS has consolidated its activities, focusing in several directions, including the organization of conferences and working as a political actor for discussion in government spheres and in physics community.

Methods: Over the last two years, we have been carrying the CRG-BPS activities starting from the following framework: (a) women are underrepresented in physics area; (b) this fact reflects an androgenic discrimination, oppression and violence against women; (c) this violence is by nature founded on social structures; not on biological elements [1,2]. These pillars have paved three main roads of actions to CRG-BPS [3,4,5]: (i) political, (ii) scientific, and (iii) social analysis. In particular, we raised data about women in physics from Brazilian Government Agencies and from BPS. We have analyzed, preliminarily, some of these data from a qualitative and quantitative methodological perspective.

Results and discussions: Considering (i), many actions have been carried out, regarding discussion with the physics community and with the government people, looking for political or financial support or both. As a result of these actions, the CNPq (a Brazilian Government Agency for Research) opened a call for projects in scientific divulgation, which was directed to girls in high school level. In terms of scientific action, the CRG-SBF considers that its work has to be along of a permanent search for qualification of women in the area of physics. In this sense, the Commission efforts have been directed to provide support for women taking into account specific
aspects. For instance, due to CRG-BPS movements, the CNPq has extended the research fellowship period of a woman researcher for one more year, in the case of pregnancy. For the social analysis (iii), and the political and scientific aspects together, we have proposed and organized the Brazilian Conference for Women in Physics, the first of which was held in Rio de Janeiro, Aug/2013; the next will is in progress. Still in attention to this scientific aspect, we have been organizing publications for studies in gender and a preliminary analysis of data obtained from Government agencies and from the BPS shows an astonishing situation [3,4]: in the most high levels of qualification in physics, a great discrepancy in gender remains unbalanced in favor of men, for at least one decade, without any changing tendency.

Conclusions: Despite all advances and works carried out by the CRG-BPS, and even considering that we have, since 2003 a Ministry for Woman Politics, where we find support for our claims and discussion, the process of changing the situation of gender inequity in physics is far from a desirable level; and in some cases, it has been unchangeable for a time scale more than one decade [3,4]. This has pushed the discussion inside the CRG in two directions: keeping on along the lines in developing right now and analyzing the creation of new ways for addressing the problem of gender equity and the participation of women in science.

Acknowledgements: This work was supported by CNPq (a Brazilian Government Agency) and the Brazilian Physical Society.
Keywords: Gender, Physics, Brazil

References.

1. P. Bourdieu, Masculine Domination, Stanford Univ. Press, 2001.
2. Iris. M. Young, Justice and Politics of Difference, Princ. Univ. Press, Princeton NJ,1990.
3. Marcia C. Barbosa, Betina S. Lima, Mulheres na Física do Brasil:Por que tão poucas? E por que tão devagar? In: Trabalhadoras: Análise da Feminização das Profissões e Ocupações, Ed. Silvia Cristina Yannoulas,(url: www.if..ufrgs.br/~barbosa/LivroBarbosaLimaFisicas.pdf) 4. Mônica Alonso Cotta, Marília J. Caldas, and Marcia C. Barbosa, Climbing the Academy Ladder in Brazil: Physics, Proceedings of Third IUPAP International Conference on Women in Physics, AIP Conference Proceedings1119, 80 (2009).
5. Elisa B. Saitovitch, et. al (CRG-SBF), A exclusão Invisível 2012, sbfisica.org.br/comissoes/CRG.

8. RESULTS OF THE BURKINA FASO WOMEN IN PHYSICS WORKING GROUP: ACTIVITIES AT THE UNIVERSITY OF OUAGADOUGOU

Pétronille Kafando and Issa Zerbo
University of Ouagadougou, Burkina Faso

Burkina Faso Working Group (WG) is born after the 3rd ICWIP held in Seoul (South Korea) in 2008. At this Conference, the situation of women in sciences (5% of students) in general and particularly in physics (less than 1%) was presented. This low percentage is mainly due to religious and cultural considerations, financial and economic reasons, social pressure (mathematics, physics, and techniques are thought to be dedicated to men), and the lack of future prospects for scientists in Burkina Faso. Some strategies to better feminize physics (and the sciences) in Burkina Faso have also been presented. Some of these actions were initiated at UFR-SEA (Faculty of Applied and Exact Sciences) of University of Ouagadougou. These actions and their feed-back from University's actors (the Faculty Administration, female students ...) have been presented at the 4th ICWIP. The results of five years' activities of the WG will be presented highlighting the strengths and weaknesses of the actions.

9. WOMEN IN PHYSICS IN CANADA

Li-Hong Xu[a], Shohini Ghose[b], Marina Milner-Bolotin[c], Janis McKenna[c], Sampa Bhadra[d], Adriana Predoi-Cross[e] , Arundhati Dasgupta[e], Melanie Campbell[f], Svetlana Barkanova[g], Michael Steinitz[h]
[a]University of New Brunswick; [b]Wilfrid Laurier University; [c]University of British Columbia; [d]York University; [e]University of Lethbridge; [f]University of Waterloo; [g]Acadia University; [h]St. Francis Xavier University, Canada

The topic of Women in Physics is becoming more prominent in Canada at all levels. Championed by several passionate and successful female physicist role models, national Women in Physics Canada Conferences have been organized across the country. These conferences attract many early-career female Physicists as well as at all academic levels. The 4th Canadian Women in Physics Canada Conference is currently in planning. Canada also participated in and was a co- host of the 1st North American Gender Summit that took place Nov. 13-15, 2013, in Washington D.C. The Tri-Council (Canadian Institute on Health Research (CIHR), National Sciences and Engineering Research Council (NSERC) and Social Sciences and Humanities Research Council (SSHRC)) Working Group on Gender Policies was created following the release of the 2012 Council of Canadian Academies' report on Women in Universities, entitled Strengthening Canada's Research Capacity: The Gender Dimension. Currently, climbing the academic ladder implies a very active international research career, and usually implies mobility, which has caused some difficulties for women seeking to reconcile a scientific career with family life. Following international guidelines and policies, several national programs devoted to women in society, citizenship, and gender issues have been implemented in Canada. One example is the NSERC Chairs for Chairs for Women in Science and Engineering Program, which works toward increasing the participation of women in science and engineering. The last decade allowed not only the growth of funded projects, but also a refreshing of the scientific human potential, with a clear increase in female representation. In exact/pure sciences, the total number of Principal Investigators for research grants has grown. The less-participated-in scientific fields are engineering and technology and the pure sciences. The most recent Gender Equity Programs reinforce the notion of equality of gender as an important factor for national competitiveness and development, and act (1) by reinforcing transverse gender representation in social and political environments, (2) through affirmative action in areas where women face the most discrimination, and (3) by introducing the perspective of gender in all areas of discrimination. Overall, the situation for women in physics in Canada has been continuously improving, enhanced by efforts to include women through increasing outreach activities, family- friendly policies and gender equity programs. Canadian Country Team Leader: Dr. Li-Hong Xu, University of New Brunswick.

10. SPEECH IN REMOTE AREAS AND INSPIRATION TO YOUNG STUDENTS - AN OUTREACH ACTIVITY FOR WOMEN IN PHYSICS IN CHINA

Man-Ling Sui[a], Xia Guo[a], Dong-Mei Gu[b], Xiu-Dong Sun[c], Ya-Jing Feng[d], and Shao-Ping Zhu[e]
[a]Beijing University of Technology; [b]Chinese Physical Society; [c]Harbin Institute of Technology; [d]Institute of Physics, Chinese Academy of Sciences; [e]Institute of Applied Physics and Computational Mathematics, Beijing, China

The Working Group on Women in Physics (WIP) of the Chinese Physical Society (CPS) in Beijing has been set up since 2002. In the past 12 years, we have worked on the surveys and reports of the situation of women in physics in mainland China, wrote proposals to suggest the ways to improve the situation for women in physics as well as women in science, and set up the website of CPS-WIP and the networking of women scientists. Besides the regular activities for each year, such as organizing the Round Table Meeting for CPS-WIP on the CPS Fall Meeting in September and publishing the WIP special issue of the Chinese journal "Physics" in March, we launched a new outreach activity in the last year, named "Speech in remote areas and inspiration to young students". In view of that the development is not balanced in vast mainland China and the educational level in the west region is lower than the east part, especially in the remote areas, we would like to make our contribution to try changing the status quo. To broaden the horizons of young students in the remote areas and inspire their exploration and enterprising, we launched the first session of the outreach activity "Speech in remote areas and inspiration to young students" in Guizhou province during October 11-17, 2013.

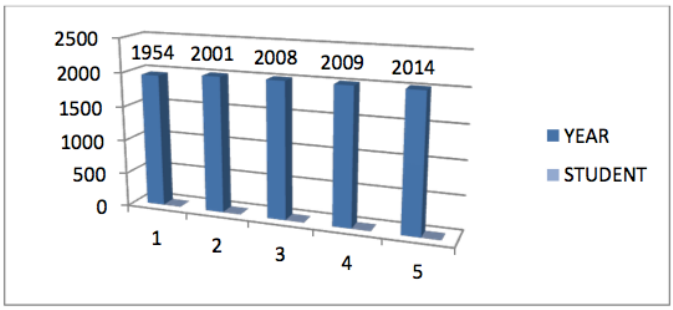
Seven outstanding women physicists joined in the trip to five remote campuses in Guizhou province and gave their inspiring speeches and talked with the students, especially girls there. The feedback is very positive, which encouraged us to plan the second session of the outreach activity "Speech in remote areas and inspiration to young students" in this year. We will continue this serial outreach activity every year in the future.

11. DEMOCRATIC REPUBLIC OF CONGO ABSTRACT, STATUS OF WOMEN IN PHYSICS

Nzeba Banza Elvire
Université de Kinshasa, Faculté de Sciences, Département de Physique

For the Democratic Republic of Congo, the physics department is only in the Faculty of Sciences at the University of Kinshasa. The University of Kinshasa was built in 1954 and the first stone was placed at the Faculty of Science. The academic year began the same year.

It is the year 2001; the Faculty of Sciences was registered for the first time a girl at the Physics Department. She's named Carine tshimba, and she is currently in England where she did her thesis. Since 2001 until 2007, the faculty has not registered girls in the Department of Physics. The girls did not join physics, saying that physics is difficult and it is a science of man. In 2008 the faculty has recorded three girls at the Physics Department (Elvire Nzeba; Esther Ntumba and Sona Honda). The three girls have completed their degree in Physics with Distinction. In 2013 the Department of Physics in collaboration with the Belgian project agreed to enroll in master, but this master was not funded, which had discouraged the three girls. Honda Sona is doing a small job that does not even enough for her to pay academic fees, Esther Ntumba evolves in research and me, Elvire Nzeba, I am in research and education, volunteering at university, hoping to find a scholarship funding to finish my master or to continue elsewhere. The department also recorded in 2009, another girl named Paola Physics Ntumba, who also completed his honors degree graduate with distinction.
Until today, the girls did not come to enroll in the Department of Physics. We have a physics club in ours department, where I am a member in this club, we mobilize women to come in physics. Many times we go to school to teach physics but what we lack is the motivation or increased funding for career in physics among girls.



12. FIRST REVIEW OF STATUS OF WOMEN IN SCIENCES IN CYPRUS

Martha Constantinou
University of Cyprus, Nicosia, Cyprus

The status of women in high level positions in Cyprus is reviewed with emphasis in women in sciences and particularly in Physics. We describe the development of Physics in the country, focusing on the contribution and participation of women. We present statistical data for the last 5 years reviewing the percentage of women that are pursuing Physics as a subject of study or as a profession. We quantify the changes of the gender ratio at different career stages and we find that although women are well represented in the undergraduate studies, women physicists are underrepresented in senior positions. We discuss factors that might affect the career evolution of women in Physics in Cyprus.

13. WOMEN IN PHYSICS IN ECUADOR: WHAT ARE THEY DOING?

Silvana Guitarra[1], Paola Ayala[2], and Paulina Romero[3]
[1]Universidad San Francisco de Quito USFQ, Colegio de Ciencias e Ingeniería, Campus Cumbayá, Quito, Ecuador; [2]Universität Wien, Fakultät für Physik, Wien, Austria; [3]Escuela Politŏécnica Nacional, Departamento de Nuevos Materiales e Ing. Eléctrica y Electrónica, Ladrón de Guevara E11-253, Quito, Ecuador

Although the number of women in Physics in Ecuador is still relatively low, the increasing return of female professionals with postgraduate education starts to make a difference in the academic development of Physics as a whole. Three research fields, namely: Condensed Matter, Medical Physics and Particle Physics, have notoriously developed in the last years. The policies for networking and collaborating among local and international universities have radically changed in this country with limited resources. Further, it is important to recognize the active participation of undergraduate students in these research groups. This paper not only provides an overview on how Ecuadorian Female Physicist are working but it reports on the big steps towards the development of science.

14. WOMEN IN PHYSICS IN EGYPT

Mona Mohsen
Ain Shams University, Egypt

The present study shows a progressive increase in the number of female physicists as undergraduates and post graduates in several governmental universities. For instance, In Ain Shams university, the percentage of women that selected physics as a major course of study increased from 7.2% in 2012 to 10.8% in 2013 and 15.7% in 2014. The study also provides the current gender distribution in the various positions among the teaching staff in seven governmental universities. The data supports the fact that female demonstrators are increasing in these universities.

15. WOMEN IN PHYSICS IN EL SALVADOR: PERSPECTIVES AND CHALLENGES

Telma Jiménez[a], Diana Jiménez[b] and Gloria Larios[a]
[a]Universidad de El Salvador, Facultad Multidisciplinaria Oriental, San Miguel, El Salvador; [b]Universidad Gerardo Barrios, San Miguel, El Salvador

Since the creation of Physics career in El Salvador, back in 1968, women were an essential part of the development of this new and unknown career. It has not been an easy task, because the University of El Salvador, where Physics career was born, was at the eye of the hurricane of the civil war for long. From all those graduated on Physics in El Salvador, less than the 30 % are women, and even though in recent years there is some increase in the number of Physics students, the proportion between women and men remain more or less the same. Just a few Physicists of the graduated at the University of El Salvador have postgrad studies, women included. There are reasons for this situation. To get a Master or a Doctor degree in Physics, women (and men) need to go abroad. Under this condition, to do this is more difficult for a woman, especially if she has a family of her own (husband, children). Female Physicist in El Salvador work at the most important universities of the country, monitoring facilities for Earth Sciences and high schools. About college entrance to Physics career, the low interest it can be explained because students are not motivated for their teachers because most of them have poor training in hard Sciences, Physics included and in Math. As a result is very common, students enter college opting for careers that do not involve numbers. Along 2014, talks have developed about Physics as a career path, targeting high school students. In addition and prior to this actions, a group of high school teachers who work in Natural Sciences and do not have the specialty –Physics, Chemist or Biology- have been trained by university professors as part of an effort to raise the level of education in the country. This training program is developed in collaboration with the Ministry of Education and Spain Cooperation. At the present moment, they are in a phase of follow up, with three different assessments, finding a change of attitude in the teachers, improving the teaching-learning process. The actual trends in professional development for women in Physics in El Salvador shows a rising awareness of the need for specialization. Some women go for the master degree inside the country, mainly on the fields of education sciences or environmental related postgrads. Some others choose a blended mode to follow a postgrad at a university abroad.

In this scenario, it is necessary to highlight the courage and determination of the women in Physics from El Salvador, fighting for level up the production of knowledge in our context. Even when women represent less than 30% of the Physicist in El Salvador, their scientific production is at least the 50% of the total.

16. COUNTRY REPORT: ESTONIA

Helle Kaasik
University of Tartu, Estonia

General situation of women in education, work and research in Estonia is relatively good: there are even more new female PhDs than male, the overall proportion of female researchers in Estonia is over 40% and it exceeds European average. Nevertheless, science (plus mathematics and computing), and especially engineering, manufacturing and construction remain male-dominated fields. Proportion of scientists and engineers in the total workforce for females is about 2/3 of that of the males. The gender imbalance in the researcher population increases with age, meaning that the gender ratio is more equal among younger generations but also reflecting stronger imbalance at top positions. Annual growth rate for women researchers is exceeding that of men. Nevertheless, significant pay gap and power imbalance between genders remain both in Estonian society in general and in the field of science and technology. According to Statistics Estonia, in October 2013, the gross hourly earnings of female employees were 24.8% lower than the gross hourly earnings of male employees, and the gender pay gap grew by 0.2 percentage points compared to the previous year. Calculated according to Eurostat's slightly different methodology, the gender pay gap in Estonia is steadily one of the biggest in the European Union (e.g. 30% in 2012, when estimated EU average was 16.4 %). Documents concerning gender policy, e.g., the National Health Plan 2009–2020, the Development Plan for Reducing Violence for the years 2010–2014 and the Development Plan of Children and Families 2012–2020 have been accepted. Several activities to promote gender equality in working life have been carried out under the Estonian European Social Fund programmes, e.g. Promoting Gender Equality 2011–2013. The areas covered by different activities include legal awareness, gender stereotypes, gender pay gap, gender equality in organisations, active fatherhood and work-life balance. In June 2012, the new Public Service Act was adopted and entered into force on 1 April 2013. The remaining reference to equal treatment in the new act states that public offices have to ensure the protection of public servants against discrimination, follow the principle of equal treatment and promote equality. Several legal documents and equality policies have been officially accepted and EU- funded projects were carried out. Nevertheless, in many practical situations the behaviour of both men and women is still guided by gender stereotypes.

17. UPDATE ON WOMEN IN PHYSICS IN FINLAND

Kukka Miikkulainen[1] and Jaana Vapaavuori[2]
[1]*Oxford Instruments Analytical Oy*, Finland, [2]Université de Montréal

A new Women in Science network was launched in spring 2014 at the Kumpula Science Campus of the University of Helsinki, and a multidisciplinary network on gender equality issues has also been forming in the north of Finland, with a startup seminar held in Oulu in October 2012. A seminar on diversity in mathematics and physics was held at Aalto University on 20th March 2013. This is being evolved into a yearly happening.

Helsinki Association of Women Researchers have organized several seminars on gender equality issues and more informal meetings for women researchers, many physicists have participated in these. On the other hand, the Finnish working group on Women in Physics (FinWiP) has been rather quiet over the last few years. Annual meetings have been held at the annual conferences of the Finnish Physical Society and there is an e-mail group for sharing information. Website is kept up to date, with a reading list and links to international conferences. Lunch meetings were organized once a month at the Kumpula Science Campus in Helsinki until 2012, but participation was so mild that they have been stopped. Women physicist seem to be too busy and too spread out even in the Helsinki metropolitan area to attend regularly. A couple PhD thesis have been written since 2011 on the advancement of women researchers in their studies and working life, there is also some data on physicists. An article series introducing female physicists has been planned for a magazine aimed at secondary school science teachers and their students.

No notable advances have been made recently in increasing girls' participation in physics. About 25% of students taking the matriculation exam in Physics are female. The ones who do take it tend to get better results on average than the male students.

18. WOMEN IN PHYSICS IN FRANCE

Véronique Pierron-Bohnes,
IPCMS-UMR7504 CNRS-UdS, 23 rue du Loess, BP43, F-67034 Strasbourg
F&Φ, SFP, Femmes&Sciences, CNRS
vero@unistra.fr, jaegy.caroline@yahoo.fr

In France, several associations are working for the improvement of women positions in physics. We can mention three independent associations (with common members):
1. The "Femmes&Physique" ("Women and Physics", F&Φ) Commission of the French Physical Society (SFP);
2. WIN France (Women in Nuclear);
3. The "Femmes & Sciences" ("Women and Science") Association that has a multidisciplinary basis (in relation with similar associations for mathematics, engineering...).
There are also dedicated units or networks related to the human resource management of research institutions:
4. The Mission for the Place of Women at CNRS (National Centre for Scientific Research);
5. PDF (Promoting Diversity & Women) in CEA (French Alternative Energies and Atomic Energy Commission);
6. CPED (network of the Equality-Diversity representatives in the universities). The network has 65 members and includes 3/4 of the French universities.

The activities of these groups can be summarized as follows:

- Organizing conferences: historical evolutions of women work in research, *statistics on women situation and promotion*, women work-life balance, girls' job choices and the underlying stereotypes, making propositions over the *origins of the differences* and over what can be done to improve the position of women... (1,3,4,6);
- Speaking in primary and secondary schools/organizing visits in laboratories, in order to show to girls that physics (science) is "cool", to give them living examples of female physicists as role models, to convince them that physics is useful in everyday life. (2,3,4,5);
- Improving women's visibility: build up lists of speakers for different audiences, including general public, scholars, and media (1); recommend a female/male ratio equivalent to the ratio in the field pool among organizing committees, invited speakers, speakers for the conferences with financial impacts (1,4,5,6); recommend women for awards and honorific positions (1,2,3,4,6), encourage living female physicists to write their web pages and publish web pages on famous female physicists (1,2); promote international women networks (2,3,4);
- Setting up a mentoring scheme: to help women to make good choices/to take part to a network (1,2,5,6);
- Interfering with the institution management in order to initiate changes: propose new rules/selection criteria, motivate women for participating to hiring/promoting committees, make these committees aware of the existing bias and their consequences (1,4,5,6).

19. AREA OF ACTIONS – EQUAL OPPORTUNITIES FOR WOMEN IN PHYSICS IN GERMANY

Anja Sommerfeld[1], Susanne Kränkl[2], and Barbara Sandow[3]
[1]Weberplatz 27, D-14482 Potsdam, Germany; [2]Universität Siegen, Walter-Flex-Straße 3, D-57068 Siegen, Germany; [3]Freie Universität Berlin, Habelschwerther Allee 45, D-14195 Berlin, Germany

Germany has a long tradition in the feminist movement and in gender studies going back about 50 years. During this period changes in the law and in various regulations were introduced which have enforced the implementation of instruments for providing equal rights for women and men. New institutions for research were founded, e.g. the Center of Excellence Women and Science in 2000 and various Centers for the Promotion of Women's and Gender Studies, one of the first in Bielefeld in 1980. The most

important aims of their work include the establishment of structural foundations for a more equitable participation of female scientists and the integration of gender studies into science and education.

Our poster will show the current status of equal opportunities for women in physics, and in particular in academia, in Germany [1]. We present the latest statistical data, which shows an underrepresentation of women in research and teaching.

This tendency has also been found in a new survey of gender disparity in careers of physicists and mathematicians performed by Mischau and Langfeldt and initiated by us, the Working Group on Equal Opportunities (Arbeitskreis Chancengleichheit, AKC) of the Deutsche Physikalische Gesellschaft e.V. (DPG, German Physical Society) [2]. We present and discuss results, such as the fact that parenthood affects the duration of female physicists' higher education as well as the career distinctly stronger than it does for men. Their professional competence and accomplishments are less appreciated. Furthermore, women's income is still lower than for their male counterparts for equal duties and responsibilities and the same educational level.

Nevertheless, there have been efforts to improve the situation of women in physics. We describe programs initiated by governmental institutions and societies that support women in their personal career in research. Widely spread are, for example, mentoring programs where particularly female students, graduates and postgraduates of MINT (Mathematics, Informatics, Natural science and Technology) professions receive personal guidance for the transition from education to professional life by experienced physicists.

Furthermore we analyze the situation of women in the DPG after the foundation of the Working Group on Equal Opportunities. We can point to a positive development in the participation of women in our Society in general, in membership as well as in the chairing of committees [3]. Moreover, the Hertha-Sponer-Prize for outstanding young female physicists, initiated by the AKC in 2002, has become an award with a very high reputation. Finally, we present current activities which include workshops, the co-organization of the annual German Conference of Women in Physics and the annual DPG mentoring program.

[1] Federal Bureau of Statistics
[2] "Paths to Career and Success for Women in Science", 221-240p. 2014, Springer Verlag and Presentation during the German Conference of Woman in Physics, Heidelberg 2013
[3] DPG Communication

20. WOMEN IN SCIENCE IN GHANA: PROSPECTS FOR ADVANCEMENT IN THE 21st CENTURY

Aba Bentil Andam[1*], Paulina Amponsah[1], Irene Nsiah-Akoto[1], Christina Oduma Anderson[2], and Baaba Andam Ababio[3], Yaa Akomah Asenso , Savanna Nyarko[1]
[1]School of Nuclear and Allied Sciences, P.O. Box AE1, Legon, Ghana; [2]Department of Physics, University of Cape Coast, Cape Coast, Ghana; [3]Bentil Education Associates, P.O.Box WY588, Kwabenya, Ghana
[*]Corresponding author, Email: bentilandam@yahoo.com

The Ghana Science Clinics for Girls, started in 1987, gave rise to a paradigm shift in the inclusion of girls in science education. This innovation was the brainchild of a Director General of the Ghana Education Service, the accomplished educationist Prof. J.S.Djangmah. The gender imbalance in science and mathematics classes, and the paucity of girls' participation in these studies, was likened to a "malaise". Once diagnosed as such, a "remedy" was prescribed, which included the special holiday camps dubbed "clinics". The science clinics for girls in Ghana were such a successful initiative that the concept quickly gained currency and was adopted outside Ghana, particularly in West African countries. The annual programme attracted participants and resource persons throughout the African continent. One generation after its introduction, we review the impact of this brilliant, novel idea. Our study indicates that progress has been made in the effort to mainstream women into science studies and careers, mainly as a result of the changes that took place through this intervention strategy.

21. WOMEN IN PHYSICS IN HONDURAS

A. Sánchez
Universidad Nacional Autónoma de Honduras

Honduras a country in development ways, and whose main production activity is agriculture, should promote research and application of technologies that help us get through this low international production and trade stage. This is why The Universidad Nacional Autónoma de Honduras (UNAH), responsible to deliver graduates capable of producing economic and production growth, opened the degree of Physics since 1969, ground on which women had slowly gained and continue gaining force on the mentioned profession.

22. TOWARDS GENDER EQUITY IN PHYSICS IN INDIA: INITIATIVES, INVESTIGATIONS AND QUESTIONS

Prajval Shastri
Indian Institute of Astrophysics, Bangalore, India

Initiatives towards gender parity in the sciences in India have occurred both at the national, governmental level as well as at the local and institutional level. Available data suggest that reasons for the existing gender gap are not predominantly to do with lack of interest in science among girls, nor the lack of desire among them to pursue careers in science. A relatively high gender gap in physics persists nevertheless. The paper will outline recommendations to effectively build upon the existing interest in science and the positive impacts of the initiatives so far.

23. STATUS OF INDONESIAN WOMEN IN PHYSICS

Monika Raharti
Surya University, Indonesia

Currently the Indonesian Physical Society has up to 962 women, including students, postgraduates, teachers, researchers, and scientists in schools, universities, government and industry. This number came up from the homepage of Indonesian Physical Society, which represents they who registered themselves through the website, http://hfi.fisika.net/. Compare to the male physicists registered on this website, the women is 26.1% of the total physicists registered (3,677). The expectation of the real number of physicists in Indonesia is higher than it showed on the website.

In Indonesia, the percentage of women in Physics has never reached 30%, as targeted by the Asia-Pacific Women in Physics working group in its meeting in 2013 (Tokyo). As examples, the percentage of women staff in Physics Department of a College of Education in East Java is only 13.6%. One of the biggest science and technology university in Indonesia, ITB, has 125 female students out of 460 students in the Physics Department, it means only 21.3% female students as shown in Figure-1.

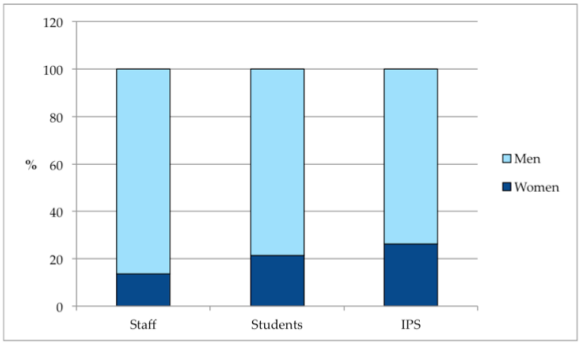


Figure-1 : Statistics of female physicists in Indonesia (2013)

It is interesting to see how it was going on in the secondary school. At the moment I have not had data about schools through out Indonesia, so I just take one example of a high school in Bandung, it is a capital city of West Java Province. In science class they have twice girls than boys, with higher exam score for the girls. Probably the nature of adolescents, which shows earlier maturity of girls, has high

effect on it. The interest of entering Physics in the higher education seems like very low on the girls, as we can se from the statistics of universities students in Figure-1.

The issue of gender in Physics society in Indonesia is not to bring women into less opportunity in science career. Low percentage of women in Physics is more because of the person itself, or I would blame the culture in daily life of eastern people. They choose not to continue in postgraduate study even the opportunities were there. We have only one female professor in Physics. Only 30% women staff in the university has doctoral degree, 13% has master degree, and the rest of 57% only have bachelor degree. Of course it need more investigation to have accurate and reliable data about it.

The Indonesian Women in Physics is about to be formed by the Indonesian Physical Society (IPS) this year. It has been planned that in the IPS yearly symposium in October 2014, which will take place in the beautiful 'island of the gods' Bali, there will be a 2 hours session dedicated to the women in Physics. In this session, 3 women physicists as panelists will lead presentations and discussion on several scientific topics in Physics, followed by the formation and establishment of Indonesia Women in Physics (IWP). It is also expected that in this occasion the IWP's first activity in 2015 in the conjunction with "The International Year of Light 2015" organized by the UNESCO, will be initiated.

24. IMPROVING THE STATUS OF IRANIAN WOMEN IN PHYSICS

A. Iraji zad[1*], F. Roshani[2] and D. Izadi[3]
[1]Physics Department and Institute for Nanoscience and Nanotechnology Sharif University of Technology, Tehran, Iran Iraji@sharif.edu; [2]Physics Department of Alzahra University, Tehran, Iran farinaz@ipm.ir; [3]Ariaian Young Innovative Minds Institute (AYIMI), Tehran, Iran info@ayimi.org

Iranian women have shown improving contribution in the field of physics as students and researchers in recent years. More than 60% of BSc and MSc students, 47% of PhD students and 18% of faculties in the physics departments in Iran are female. However in higher level of academic fields and managements still records are below the expected values. The established branch of "Women in Physics" in the Physics society of Iran (PSI) studies the related cases to find the suitable strategy to improve the situation.

25. THE ENVIRONMENT FOR WOMEN IN PHYSICS IN IRELAND

Eilish McLoughlin[1], Sandra Fee[2], Eithne McCabe[3]
[1]School of Physical Sciences, Dublin City University, Dublin 9, Ireland; [2]Education Department, NUI Maynooth, Co. Kildare, Ireland; [3]School of Physics, Trinity College Dublin, Dublin 2, Ireland

Due to recent initiatives in Irish University Physics Departments, gender awareness in this sector is increasing. However there is a lack of national benchmarking data in Ireland in relation to gender issues in Physics. The seven national University Physics departments are working together to gather data on an annual basis from all the physics departments in Ireland. The data collected differs from any previous data collected as it includes data on permanent academic staff, contract staff, technical and administrative staff in addition to research staff. It also considers staff numbers counted as full-time equivalents thereby offering a more complete representation of female/male staff participation. In general, the participation of women in Physics in Ireland is influenced partly by the numbers of females taking national state examinations in physics at the end of secondary schools – 26% in 2013 - but largely by the numbers of females who graduate with primary degrees in Physics - the national five year average percentage is approximately 24%. The national five year percentage of female PhD students is reported to have a five year average of 27%.

A recent national report (*Powering economic growth; Attracting more young women into science and technology*, Acenture 2014) into attracting more young women into science and technology reveals that proportion of women working in jobs that utilize STEM skills is less than 25 percent of the workforce. Data was collected of the views of 1,000 female secondary school students, young women (age 18-23), secondary school teachers and parents with daughters in post-primary education. The goal was to understand what influences secondary school students' choices of subjects and in particular STEM-related subjects. The reason being that secondary school students' subject decisions affect their course choices to third level and ultimately their career opportunities. The research findings indicate that female students and their parents are struggling to make informed decisions when it comes to choosing subjects in secondary school because of a number of key barriers include: Negative stereotypes persist that STEM is more suitable for boys, and perceptions exist that STEM subjects are overly difficult;

Parents lack information on STEM career options, yet parents are the main influencers when it comes to advising their daughters on how to define educational and career paths; There is fragmented information available about STEM careers, making it difficult for students and their parents to evaluate options; A disconnect exists between industry's skill needs and students' subject choices for their end of secondary school Examination.

These key barriers are ultimately contributing to the shortage of women with STEM skills in the workplace and this gender gap in physics (STEM)-related work will continue to pose a major problem for Ireland's economic growth in the decades ahead. Without enough skilled workers in science, technology, engineering and mathematics roles Irish enterprises will lack the key talent required to compete domestically and globally.

26. RECENT ACTIVITIES FOR GENDER EQUALITY PROMOTION IN THE SOCIETIES OF PHYSICS IN JAPAN

H. Mori[a*], M. Sasao[b], K. Nemoto[c], E. Tamechika[d] and M. O. Watanabe[e]
[a]The Univ. of Tokyo; [b]Doshisha Univ.; [c]Natl. Inst. of Inf.; [d] NTT Adv. Technol. Corp.; [e]Japan Sci. & Technol. Agency

Recent activities of JPS (The Physical Society of Japan): The percentage of women members in JPS increases gradually from 2 % (in 1985) to 5.5 % (2011) and 5.7 (2013), although total number of JPS are constant during these 7-8 years (Fig. 1). It is, however, far from 30 %, the goal in 2020 in science and engineering fields in Japan. The recent activities of gender equality promotion committee in JPS, founded in the same year of IUPAP-WIP (Paris) in 2002, are introduced, as follows:

(1) Development of next generation —Summer and Spring Schools: The 10th summer school for girl students in junior and high schools has been held at national women's education center (Saitama, Japan) on Aug.7-9 in 2014. This two-nights-three-days school has been started since 2005 by Prof. Torikai et al., who has got the idea from the science camp of Korean Physical Society for high school girls' students. In 2013, JPS members support the science camp for the programs of the experiment "Let's observe the ambient pressure", the poster "Wonder world of atomic nuclei", small experiment "Magnetic levitation by superconductivity", and international program "Chat in English", as well as the co-sponsored spring school.

(2) International Workshop: The 3rd AAPPS (Association of Asian Pacific Physical Societies) workshop on "Women in Physics" in APPC12 (12th Asia Pacific Physics Conference, Makuhari in Japan) on July 18, 2013, has been organized by the Liaison Association Committee for Gender Equality in Physics of JPS and the Japan Society of Applied Physics (JSAP). The main subject "affirmative action and networking" has been introduced and discussed by 55 participants representing nine countries and territories. In JPS, Athena (Acceleration of Theoretical and Experimental Researches of Networking for Carrier Advancement on Women in Physics) program has started to make networking in Asia-Pacific area.

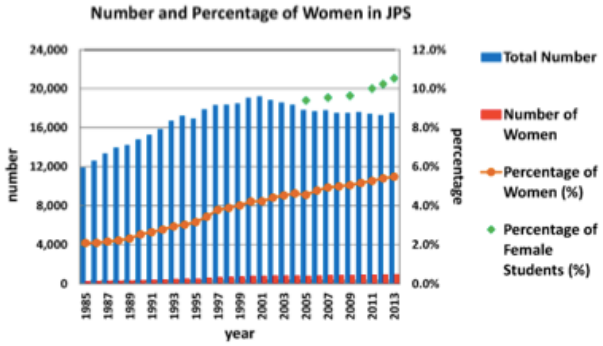


Fig.1. Number and % of total and women members in JPS

(3) Symposium in JPS annual meeting: In annual JPS meeting in March 2014, the symposium "Development of Next Generation on Physics" has been organized collaboratively with gender equality and physical education committees.

(4) Activity in Japan Inter-Society Liaison Association Committee for Promoting Equal Participation of Men and Women in Science and Engineering (EPMEWSE): In 2012, the 3rd questionnaire survey of

around 16,000 members in EPMEWSE was carried out and the proposal based upon the analysis of questionnaire was submitted from EPMEWSE to the government in April 2014.

Recent activities of JSAP (The Japan Society of Applied Physics)
The percentage of women members in JSAP is shown in Fig. 2 (a). The rate monotonously increased from 5% (in 2005) to 6%, and the tendency is almost as same as that of JPS. Fig. 2 (b) shows the distribution of women members in JSAP as a function of age. The data were acquired in 2005 and 2014. The small dip is observed in ages around 35. The ages correspond to those for childcare, implying we need some political action to release child- and/or day-care loads from women researchers.
(1) Symposiums: In order to show activities of women researchers, we have organized new symposiums: the theme of one symposium was solar cells, and the other for photonics. The symposium was composed of invited talks and regular talks. The speakers of the regular talks were all women researches, and the symposium was open for public. Thus, we could demonstrate high activities of women researchers to not only inside JSAP but also outside JSAP. Furthermore, the speakers were good roll-models for young women scientists and engineers. This is a kind of "visualization" measure, because the majority of JSAP is men researchers as shown in Fig. 2 (a) and the women researcher's activities are apt to embed in men's activities at usual symposiums and meetings.
(2) Networking: The importance of networking has been confirmed in APPC12. Women in Physics (WIP) at APPC is good for making an external networking in the Asia Pacific region, however, an internal networking is an issue of diversity promotion in science and technology in JSAP. Thus we have started a special meeting called "Jyoshi-kai", which means a women's meeting. It is a free discussion meeting in which women researchers are majority and they lead a discussion. The aim of the meeting is to tighten women's networking and to make a plan in order to encourage women researchers activities.
(3) Other activities: We put following actions into practice as regular activities: award nomination for supporting female researchers; career consulting for graduate students and post-doctoral; promoting science among junior/high school students; providing nurseries during biannual JSAP conferences.

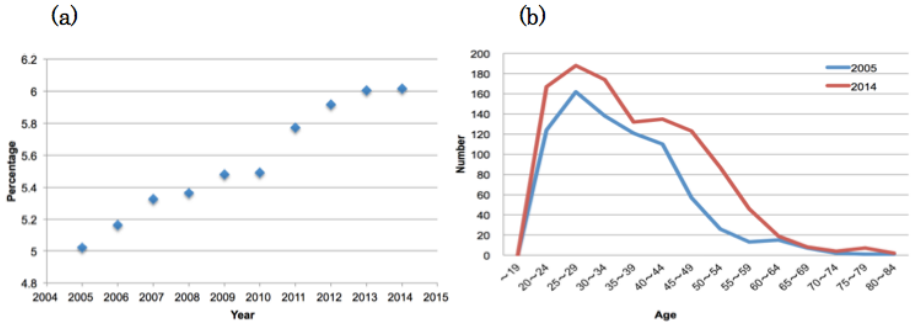


Fig. 2. (a) Percentage of women members in JSAP, and (b) distribution of women members as a function of age.

27. THE ROLE OF ACADEMIA AND INDUSTRY IN NURTURING WOMEN IN PHYSICS IN KENYA

Cecilia Nyamwandha[1], Angeline Kasina[2], Zipporah Wanjiku[3] and Emily Awuor[4], Paul Baki[5]
[1]Center for Earthquake Research and Information, University of Memphis, USA; [2]Katholieke Universiteit, Leuven, Belgium; [3]Chuka University, Kenya; [4]Laikipia University, Kenya; [5]Technical University of Kenya, Kenya

In this paper we look at some of the prime initiatives taken toward nurturing the goals and dreams of Kenyan women physicists by the academia and industry. We highlight key transformative lines of progress registered thus far as evidenced by statistics and discuss the enabling environments and platforms upon which these were made possible.

28. REPORT OF THE CURRENT SURVEY IN KOREA

Eun Kyung Suh[a,b], Jin Hee Yoon[a,c], Youn Jung Jo[a,d], Wonkun Oh[a,e], Bongjin Simon Mun[a,f] and Youngah Park[a,g,h]

[a]The Korean Physical Society; [b]Chonbuk National University; [c]Inha University; [d]Kyungbuk National University; [e]Chungbuk National University; [f]Gwangju Institue of Science and Technology; [g]Myongji University; [h]Korea Institute of S&T Evaluation and Planning, Republic of Korea

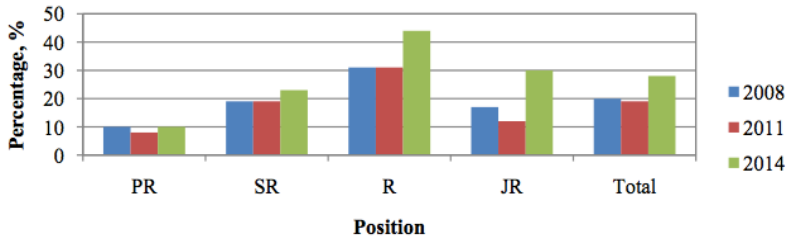
As a follow-up to the first and second survey conducted by the Korean Physical Society (KPS) Women Committee in 2005 and 2010, respectively, which gathered broad information regarding the working environments and professional career developments of female members of the KPS, we performed a third run extensively in April 2014 so that we can trace the tendency and relevance of the previous data. In previous surveys, we concentrated on obtaining the basic data on the academic education, employments, professional experiences, family life, and career development, according to their age and sexuality. In this third survey, we focused career development and major difficulties in the career development, and extended our interest to government policies employed and needed to be established. We also suggest some helpful policies to overcome major difficulties. In this presentation we will show the survey results and compare with those of previous surveys.

29. LITHUANIAN WOMEN PHYSICISTS TODAY

Dalia Šatkovskienė[a], Alicija Kupliauskienė[a], Živilė Ruželė[b] and Živilė Rutkunienė[c]

[a]Vilniaus Universitetas, Lithuania; [b]Centre for Physical Sciences and Technology, Lithuania; [c]Kaunas Technological University, Lithuania

The changes of women in physics situation in Lithuanian Country Report are discussed on the basis of available statistics. During the last years the reform of research and education system was implemented and some of research institutions merged and changed their dependence becoming subdivisions of Universities. There are seven universities in Lithuania and three of them educate undergraduate and graduate students in physics. Additionally there are one research center and two research institutes belonging to Vilnius University where physicists are doing their research in physics in Lithuania at the moment also. Vilnius University and Kaunas Technological University together educate 923 undergraduate and graduate students in physics. The number of female students varies from 18% to 28% in different universities while an overall percentage of 19 show the situation in the country. The percentage of women among doctoral student's physicists varies from 13% to 50% giving an overall score of 31%. In research laboratories women physicists take various positions from junior to principal researchers in laboratories. Figure below demonstrates changes of Women physicist's percentage in different academic positions in Lithuanian universities and research institutes since 2008. There are used the following designations: Principal researchers (PR), senior researchers (SR), researchers (R) and junior researchers (JR)).



Position The presented results show that there is a noticeable increase of female scientists in most positions except the highest one. The overall percentage of women physicists in research are 28%. The statistics also show that women physicists are actively participating in national and international projects and even take main roles in some of them. Though women physicists do not participate at the Physics Faculty Board of Vilnius University as well they are not still among members of Lithuanian Academy of Science or Committees of Lithuanian Science Council the situation in generally is improving. Thus there are from 6 to 14 percent female members of Science Councils and Faculty Boards in other institutes. Moreover, women physicist occupy the vice dean position of science at Kaunas Technological University of faculty of Mathematics and Natural Sciences and three out of five heads of departments at VU

Institute of Theoretical Physics and Astronomy are female as well. The initiatives of Lithuanian women scientist's taken during three last years to change situation as well as the outcomes are discussed in the Report. The active implementation of EU gender mainstreaming policy and achievements defining measures for promoting equality in research organizations are encouraging that changes will be accelerated and sustainable in Lithuania also.

30. WOMEN IN PHYSICS IN MEXICO: THE FEMALE SCIENTISTS QUESTION

Isabel Delgadillo-Holtfort[a], Silvia Fernández-Sabido[b], Belinka González-Fernández[c], Ana Laura Cárdenas[d], Amalia Martínez[e], and Lilia Meza-Montes[f]
[a]Departamento de Ingeniería Física, División de Ciencias e Ingenierías, Universidad de Guanajuato; [b]Centro Multidisciplinario de Educación, Ciencia y Cultura, SCP; [c]Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México; [d]Instituto Nacional de Lenguas Indígenas; [e]Centro de Investigaciones en Óptica; [f]Instituto de Física Benemérita Universidad Autónoma de Puebla, Mexico

The Mexican female scientists question has been a matter of constant interest for the Group of Women in Physics in Mexico [1,2]. Particularly, in the last contribution to the IUPAP-ICWP it has been proposed to study the situation of Mexican female scientists, using women physicists as a case of study [3]. To this aim, an open inquiry about situations women face during their studies in physics was launched on the internet among a small group of people. Based on it, a compendium of recurring problems identified by Mexican female physics students has been identified. The product of such inquiry has been a questionnaire which is to be distributed among some of the most important educational institutions in Mexico.

Additionally, two more strategies of promoting better conditions for Mexican women in science have been followed. The first one, already reported to the IUPAP-ICWP, is the organization of regional conferences that emphasize the presence and participation of women in science [2]. This particular strategy is represented by continuing with the co-organization of the annual meeting "Participation of Women in Science" from 2004 to 2014, of the Conference Ring celebrating the Women Day in Puebla, Puebla and Merida, Yucatan and the national photography contest "Woman in Science and Maternity" (2013). The second strategy is the construction and strengthening of alliances to other groups of women in other disciplines in Mexico as well as abroad. As example of this strategy, we can mention that in collaboration with the CYTED Ibero American Network of Science, Technology and Gender (Red Iberoamericana de Ciencia, Género y Tecnología CYTED 613RT0479) it has been working on creating a general framework to analyze the situation of women in science. Along with part of the Mexican chapter, we are working on a specific proposal for our country.

Concrete actions have also started to be taken to improve the general situation of Mexican female science students. Namely, the Group of Women in Physics in Mexico is currently collaborating with women of other disciplines to elaborate a request in order to change the regulations of the Mexican National Science and Technology Council (CONACyT, Consejo Nacional de Ciencia y Tecnología) concerning grant students who get pregnant during the funding period. Presently, the regulations of the council allow students in this situation the chance of getting a financially unsupported pause until they are able to resume activities, instead of an extension of the financial support.

It is imperative that the active interest of the Mexican Group of Women in Physics to the Mexican female scientists question goes on. Equally important is to get a better knowledge and understanding of the community we represent: Who and where we are, what we do and why, are still questions to be answered.

References

L. Meza-Montes and A.M. Cetto, Women in Physics, The 1st IUPAP International Conference on Women in Physics, B. K. Hartline and D. Li, Eds., AIP Conference Proceedings, Vol. 628, New York 2002.

A. Martínez and L. Meza-Montes, Women in Physics, The 3rd IUPAP International Conference on Women in Physics, B. K. Hartline, K. R. Horton and C. M. Kaicher, Eds., AIP Conference Proceedings, Vol. 1119, Melville, New York, 2009.

A. Martínez, N. Blázquez, Y. Gómez, C. Vales and L. Meza-Montes, The 4th IUPAP International Conference on Women in Physics, B. A. Cunningham, Ed., AIP Conference Proceedings, Vol. 1517, Melville, New York, 2013.

31. PHYSICIST WOMEN IN MOROCCO: CAUSES OF LOW PRESENCE IN PHYSICS RESEARCH

Mina Bettachy[1], Mimouna Baitoul[2], Fatiha Maaroufi[3], Zineb Mimouni[4] and Abdelali Derouiche[1]
[1]Hassan- II- Mohammedia university/ Casablanca – Morocco; [2]Sidi Mohamed Ben Abdallah University/ Fès – Morocco; [3]Mohamed Premier University / Oujda – Morocco; [4]Cadi Ayyad University/ Marrakech-Morocco

In this paper, we make an investigation of research areas invested by women researchers in various research laboratories of Physics in some Moroccan universities and their proportion among the community of researchers in physics. We present here women's contributions in different fields of physics research and the percentages of the presence of women researchers. We elucidate the constraints to wider participation of women in research and the causes of vertical segregation which persists in the areas of research and in scientific decision -making bodies.
Education in Morocco is experiencing a significant change. Enrollment rates have improved steadily in all levels of education. Almost equal enrollment in technical science courses between girls and boys was observed at the national level. Overall, the success rate of bachelor rose 41.8% to 57.3% during the period 2008- 2012; the percentage of baccalaureate girls increased compared to boys. By discipline, the girls recorded the best results since 2008 mainly in technical and scientific fields . The number of women at university has grown. The growth is noted at both undergraduate and postgraduate levels. At University, girls represent half of the average number of new students enrolled in science .
There has been a significant increase in the number of women who obtain their PhDs in Science. The pourcentage depends of the discipline : in Science the pourcentage of female Phd graduates is about 38% (46% at UE, 56% in Tunisia) ; this pourcentage is 49% in medicine and health. But in the physical sciences and mathematics the proportion of women is much less important.
While the feminization of the student population is one of the defining factors of developments in recent years, academic staff at universities (teaching and research) remains deeply marked by a significant vertical segregation . The field of physics does not escape this situation.
Women researchers have succeeded to some extent, to integrate a number of areas of scientific research in physics. There are more women who have attained skills in physics, they are invested in many disciplines of physics, but they still represent a minority .

32. WOMEN PHYSICISTS IN NEPAL

N. Shrestha[a], and S. Shrestha[b]
[a]Department of physics, Tri-chandra multiple campus, Tribhuvan University, Kathmandu, Nepal; [b]Central Department of Physics, Tribhuvan University, Kirtipur, Kathmandu, Nepal
nilamspradhan@gmail.com

Nepal is one of the least developed countries in world and education has been the major focus of government. Half of the population constitutes women and providing education to women has been one of the biggest challenges of the government. On the top, science education to girls is with a focus to physics is again herculean task. Enrollment of girls for higher education merely crosses 25 percent that reveals the population status of women physicists in the country. Data from 2002 to mid 2014 points out that the number of women in physics is increasing gradually though they are countable in fingers. Best way for encouraging girls for science education for these days is to provide scholarships at all the level of education since the science and technology have been the driving force for the nations' development and key ingredients for qualitative change leading to improve quality of life and sustainable livelihoods.

33. WOMEN IN PHYSICS IN THE NETHERLANDS: PROGRESS AND DEVELOPMENTS

Petra Rudolf[a*], Noortje de Graaf[b*], Renée-Andrée Koornstra[c], Paula van Tijn[c*], Dorien Kool[c]
*[a]Zernike Institute for Advanced Materials, University of Groningen, Groningen; [b]Netherlands' Physical Society (NNV); [c]Foundation for Fundamental Research on Matter (FOM), Utrecht. *Presenting authors.*

The visibility of women and the awareness of a healthy gender balance in physics in the Netherlands has clearly improved over the last years. Initiatives to promote women and their possibilities to pursue a career in physics are plentiful and commendable. Nevertheless, the numbers do not yet show the desired impact of all these initiatives. Although student numbers have increased, the percentage of female first-year student remains at approximately 13% of the total students in physics. Similarly, the relative numbers of female PhD candidates and postdocs have been stable over the last years at (both)

approximately 20 to 25%. Despite the number of women obtaining a PhD in physics and continuing a scientific career as postdoc, the presence of women further up on the scientific ladder in physics remains strikingly low. Especially after PhD and postdoc, there is a big 'drop-out' of women from science. For example within FOM, the Dutch Foundation for Fundamental Research on Matter, the percentage of women in positions beyond post-doc is currently 9%, where it was 7% in 2010 but 11% in between. We will here focus on the current status, ambitions, and initiatives in the Netherlands to promote women, and especially to keep them, in physics.

34. WOMEN IN PHYSICS IN NIGERIA: STATUS, ACTIONS AND PROGRESS

Ibiyinka A. Fuwape and Babatunde Rabiu
Department of Physics, Federal University of Technology, Akure, Nigeria

In Nigeria the number of women picking up careers in Physics is increasing. The progress made by Nigerian Women in Physics is presented. The Nigerian women in physics working group continues to organize activities to encourage more girls and women into physics. One of such activity is the bi-annual conference of women in physics in Nigeria. Through this many Nigerian women in physics attend and few women from educationally disadvantage part of Nigeria attend and presents their research work. In this report we present progress been made to bring in more women into physics in Nigeria.

35. WOMEN IN PHYSICS IN PAKISTAN
"AN EFFORT TO BRING WOMEN PHYSICISTS AT ONE PLATFORM"

Aziz Fatima Hasnain[a], Aquila Islam[a], Asima Ali[a], Riffat Mehmood Qureshi[b], Anisa Qamar[c]
Centre for Physics Education[a], National Centre for Physics[b], Peshawar University[c]

The working committee on Women in Physics successfully organized a national level meeting of women physicists at National Centre for Physics, Quaid-e-Azam University to discuss the agenda for ICWIP2014. This country report describes the outcome of the meeting and the status of female physicists in Pakistan. The report also includes a comparative study of the enrolment of women in undergraduate and graduate programs in physics along with a brief description of factors that create hurdles for female students opting for higher education in this field.

36. THE FIRST MEETING OF PERUVIAN WOMEN PHYSICISTS

María Luisa Cerón Loayza
Soil Analysis Laboratory, Mossbauer Spectroscopy Laboratory, Physics Department, Universidad Nacional Mayor de San Marcos, Apartado 14-0149, Lima 14, Peru.
malucelo@hotmail.com

Continuing with our concern about the low level of participation of Peruvian women in the physical sciences and our work begun in 2005, it was with great enthusiasm that we organized The First Meeting of Peruvian Women Physicists which took place on last February 17th – 21st in Lima, Peru. This meeting aimed to bring together researchers, professors, teachers, graduates and students, who are active in various areas of physics, in order for them to communicate the labor problems they may have at their respective institutions, and share their work experience and advances in their research work. This meeting was useful to strengthen our commitment and gain more information about women working in public and private institutions. As organizers, we prioritized the economic support to cover travel expenses to women physicists working at universities with low budgets; these funds were provided our National Science and Technology Council-CONCYTEC. Also, we should mention we received support from two private companies and some organizations which provided laboratory materials. We thank so much to all of them. The meeting was viewed online on http://www.mujeres-fp.com. Besides, men participated also in poster presentation sessions and as attendees.

The First Meeting of Peruvian Women Physicists-2014, has been of most importance for the following reasons: it was possible to congregate a total of 76 participants (56 women and 20 men). Specifically, it included the participation of three invited women speakers: Dr. Marcia Barbosa, Dr. Ana Champi F. and M. Sc. Bertha García (OWSD), 8 participants for a round table discussion session, 14 speakers (11 women and 03 men), 15 poster presentations (11 by women and 4 by men), and 41 attendees (27 women and 14 men).
At the closing session of the meeting, the following tasks were approved by the participants:

1. Issue the resolution numbered 001-21/02/2014, which will be delivered to IUPAP, several universities, schools and scientific societies.
2. Form the network of Peruvian women physicists in order to promote the interaction among women scientists.
3. Form a Work Group of women physicists composed of participants from different Peruvian universities. .
4. The aforementioned Work Group will formulate work strategies, and it will announce its conclusions in the next meeting which will be held in the city of Trujillo, Peru in 2015. Dr. Vilma Mendez, vice chancellor of Universidad Nacional de Trujillo, will preside over the organization of this event.

Acknowledgements: My deepest gratitude to the organizing committee: Mirian Mejia, Mirtha Pillaca, Marisel Espinoza, Fanny Mori, Luisa Sanchez and Elvira Zeballos. Likewise, I thank the following institutions: CONCYTEC, Nuclear Control, Technolab, and SOPERFI, and the support from the Dean of the Faculty of Physical Sciences of Universidad Nacional Mayor de San Marcos.

37. UPDATE ON WOMEN IN PHYSICS IN THE PHILIPPINES

May T. Lim and Jose Perico H. Esguerra
National Institute of Physics, University of the Philippines Diliman, 1101 Quezon City, Philippines
Samahang Pisika ng Pilipinas (Physics Society of the Philippines), 1101 Quezon City, Philippines

Since the participation of the Philippines in the 3rd IUPAP International Conference on Women in Physics in 2008, the biggest change in the environment has happened online. Online social media consumption is pervasive, especially among the young. The uptake of government scholarship support for Physics degrees continues to be popular with BS and MS students regardless of gender. The country also went through a change in leadership in 2010. Subsequently, policy directions were made that directly affected the science research agenda, which in turn changed the research funding landscape and has become an equal-opportunity source of encouragement (or frustration) for research scientists. The country has also adopted the K-12 education system and its impact on university employment remains to be seen.

38. WOMEN-PHYSICISTS IN RUSSIA IN PERIOD OF NEW REFORMS IN FUNDAMENTAL SCIENCE AND HIGHER EDUCATION

Nelli Didenko[a], Evelina Domashevskaya[b], Elena Ermolaeva[c],
Ekaterina Kunitsynad, Renata Vitmand,
[a]St. Petersburg Research Centre of RAS; [b]Voronezh State University; [c]Moscow Lomonosov State University; [d]Ioffe Physical-Technical Institute RAS

Recently the new holistic reforms in the system of Higher education and the State Academy of Sciences have been carried out in Russia [1]. New types of universities were founded: Federal State Universities and National Research Universities. The main goal of the Russian Ministry of Higher Education and Science was to develop basic research to an increasing degree in universities, to shift the system for the funding of science in State Academy of Sciences to grant form. Another idea of the Ministry was to attract more foreign well-known scientists through Megagrants of 3-5 mln dollars to form new modern labs in universities and research institutes. Russian scientists-emigrants were given preference in receiving this funding as project managers. One of the chief objectives of the Ministry was to attract today's youth to science, to raise the level of scientific research in breakthrough areas. All these reforms had an impact on the situation and issues for women in physics as well.
Russia holds 61st place among 136 countries in Global Gender Gap Index of WEF-2013 with overall index 0.7 and gender parity in education accessibility [2]. The general involvement of women and men in Russian economy is almost equal, but there is vertical and horizontal gender imbalance. Only 31% of higher level professionals are women in natural and technical sciences, while their share is 73% in others [3]. The share of female students in Russian universities now is 56%, only 24% in IT, 37% in physical and math sciences; 46% of all postgraduates are females, 29% – in physics and math, 25% – in technical sciences [4].
Among 11775 applications filed to new Russian Research Foundation, which includes 108024 participants, about 42% were women-scientists [5].

Women are active in all areas of physics in Russia, but the share of women in the management of institutes is still low. But there is a first women – vice-president of the Russian Academy of Sciences, Prof. Taliya Habrieva, a lawyer [1].
Now the share of women–physicists with PhD degree is 33%, but the women's share of full professors makes mere 5% of the MSU Physics department's staff. The percentage of female post-graduate students from total number trained in the MSU on specialties "engineering and technology" is 20%, "physical and mathematical sciences" - 30%. In 2014 the share of young girls - winners of MSU Olympiads on physics was about 27% [6].
In St.Petersburg Research Centre of RAS there are 24,7% of women-physicists, but the percentage of women with PhD among them consists 20%, and the share of women with Dc. of Sc. degree is only 16,4% [7].
To date, 64 best young Russian women-scientists have received UNESCO-L'OREAL Fellowship. In 2013 all nominees were from the institutes of RAS. And competition is increasing every year. Statistical data shows that middle age of women-scientists is less than men middle age [8].
Women are active in international projects, including Megaprojects. For example, the project of Prof. Evelina Domashevskaya, Head of the Solid State Physics Department in Voronezh State University, holds much promise. Since 2001 she has involved in the investigations of nanosystems with synchrotron radiation techniques. There is long term collaboration between the scientists of Voronezh State University and researches from SRC (USA) and BESSY II (Germany) synchrotron radiation centers. One of the important advantages is the activity of young scientists of the University synchrotron research group that allowed the successful preparation of more than 20 Master dissertation projects and 10 PhD theses [9].
Today scientists face new challenge such as the conflict between global and native interests. But there is good reason to believe that now the considerable progress in research can be made only through international cooperation with colleagues from all over the world.

References
[1]http://www.ras.ru
[2]http://www.weforum.org/reports/global-gender-gap-report-2013
[3] http://www.gks.ru/bgd/regl/b13_11/IssWWW.exe/Stg/d1/06-05.htm
[4] Women and men of Russia. Stat.book/Rossstat.-M., 2012, -P.299
[5] http://www.rscf.ru/sites/default/files/nauchnie%20gruppy-stat.pdf
[6] http://www.phys.msu.ru
[7] St.Petersburg Research Centre of the Russian Academy of Sciences (in Russian)//IPRE, SPbNC RAN, SPbGUAP, 2014, 82 p.
[8] http://www.lorealfellowships.org/index.php?action=about&subaction=whole (April 23, 2014)
[9] Synchrotron investigations of an electron energy spectrum in III–V-based nanostructures /E.P. Domashevskaya, V.A. Terekhov, V.M. Kashkarov, S.Yu. Turishchev, S.L. Molodtsov, D.V. Vyalykh, D.A. Vinokurov, V.P. Ulin, M.V. Shishkov, I.N. Arsentev, I.S. Tarasov, Zh.I. Alferov // Semiconductors, 2003, V.37, N8, pp. 992–997.

39. THE JOURNEY: WOMEN IN PHYSICS IN SOUTH AFRICA

M. Diale
University of Pretoria, South Africa

The progress from 2005 to now is evident. The journey has been a slow uphill with numbers increasing in the country. Different universities have graduated a woman in physics PhD while there are women professors in different institutions. Government structures have recognized the importance of women in science that the department of science and technology have acknowledged the success of women in Physics in South Africa by continuous funding. The president of the institute of physics in South Africa is a woman, the second woman to be president of the organization since its existence more than 55 years ago. Some few women have taken the positions of head of physics department with the other small increase becoming top researchers with their own funding. We call this the journey to a brighter future for more women in physics in South Africa.

40. WOMEN IN PHYSICS IN TAIWAN

Shih-Ying Hsu[1]*, Jauyn Grace Lin[2], Mon-Shu Ho[3], Shu-Fen Hu[4], Ya-Ping Chiu[5], Hsien-Chung [Kao4], and Fu-Jen Kao[6]
[1]*Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan;*
[2]*Center for Condensed Matter Sciences, National Taiwan University, Taipei, Taiwan*
[3]*Department of Physics, National Chung Hsin University, Taichung, Taiwan*
[4]*Department of Physics, National Taiwan Normal University, Taipei, Taiwan*
[5]*Department of Physics, National Sun Yat-sen University, Kaohsiung, Taiwan*
[6]*Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan*
**syhsu@cc.nctu.edu.tw*

The Committee on Women in Physics of the Physical Society of Republic of China in Taiwan was officially established in 2003 with the functions of actively monitoring the number and status of female physicists in Taiwan and facilitating the promotion of women physicists. Over the 2008-2013 period, the average ratios of the female to total students in physics obtained bachelor, master, and Ph.D. degrees are 14.3%, 16.8%, and 12.5%, respectively [1]. Percentages of female faculties in Physics and approved National Science Council (NSC) projects in physics for female scientists are around 11.7% and 9%, respectively [2]. Although the NSC of Taiwan has funded the project on "Gender in Science and technology" since 2007 and set a gender-protective regulation in which the evaluation can be extended over two more years in case of childbirth, various social customs have hampered women's activities. The obstacles, such as the disproportionate male/female ratio in physics and the struggles of job security that young faculties or researchers have been facing, still require great efforts to work on.
Acknowledgments We are grateful for the financial support from the National Science Council and Physical Society of Republic of China (Taiwan).

References:
[1] Ministry of education of republic of China (Taiwan), "Gender statistics in education", http://english.moe.gov.tw/ct.asp?xItem=14508&CtNode=11431&mp=1
[2] W.F. Pong, Ite A. Yu, I.F. Ho, A.C. Hsu, and K.H. Lu, "Gender statistics in NSC projects", conference report (2013)

41. DEVELOPMENT OF SUDANESE WOMEN IN PHYSICS

N. Essa, M. Elmardi, B. Adam, M. Elgadi and S. Abass
Sudanese women in Science Organization (SWSO) PO Box 12303, Khartoum, 1111, Sudan
nash.eassa@gmail.com

Gender inequalities result in a failure to recognize women's capabilities and how women contribute half of the human knowledge in general. In Sudan women face more challenges to pursue a career in science and especially in physics than men. Statistically, the number of women who pursue science studies in higher education institutions is higher than that of men. However, there are still very few physicist women; and even fewer in leadership positions. This is due to lack of recognition of women's abilities as well as lack of obtains high qualification such as Master and doctorate degree in physics.
In this paper history of women involvement in physics will be presented in addition to current status for women in physics. Issues that play a critical roles, impact negatively and limit women progress generally in science and specifically in physics in Sudan will be discussed. These issues include culture, religion, economics and politics. Different approaches including advocacy and capacity building will also be considered to accelerate women's access/exposure to and participation in physics and technology.

42. THE CURRENT STATUS OF WOMEN IN PHYSICS IN TANZANIA

Najat K. Mohammed and Brenda Kazmili
Physics Department, University of Dar es Salaam Tanzania

Women presentation in the disciplines of Physics in Tanzania is generally low in participation and performance. Various studies have shown that girls have obstacles in many ways to utilize their educational and intellectual capabilities. The situation is even worse in the field of Physics and Mathematics due to the stereotype perception that the subjects are too difficult. The number of women in Physics at the University level is highly associated with their number in secondary school level as well as

their performance. Several interventions have been undertaken both nationally and institutionally to address gender imbalance in education as has been shown in our previous papers. This paper is analyzing the current status of women engaged in Physics in Tanzania at the academic institutions. The results will be compared with the previous data.

43. GOOD PRACTICES TO PROMOTE GENDER EQUALITY IN PHYSICS IN TUNISIA

Sihem Jaziri, Souad Lahmar
University of Carthage Tunisia

Tunisian women are more present than ever in higher education and research, but remain severely underrepresented at the top of scientific careers. At this highest level, the gender imbalance in science and engineering is only slightly larger than in all scientific fields taken together: women represent 15% of grade A staff in science and engineering and 12% of grade A staff in all scientific fields together. Tacking account of this disproportion, two associations organized workshops.
i) "Women and Science": The main goal of this non-profit organization is to give greater visibility to women's underrepresentation and under-valorization in scientific research. Organization, since 2005, of an annual multidisciplinary conference to make women's participation in scientific research visible and to encourage young researchers to persevere in this area. Prizes are awarded to the best presentations in different scientific fields.
ii) "Optic Tunisian Society" organized Optics summer school for young women scientists. The Summer school lasted for 10 days and was held in September 2012. The aim was to orientate young women scientists in the rapidly evolving fields of optics and photonics while giving them career skills and a deeper understanding of what is needed to succeed as a woman scientist.

44. FEMALE PHYSICISTS IN UGANDA UNIVERSITIES

Florence D'ujanga, Gertrude Ayugi, Rashida Akoba and Biira Saphina
Makarere University, Uganda

For a long time, there was only one public university in Uganda which had a Department of Physics. A number of ladies graduated from this department, but not many of them showed much interest in pursuing higher degrees in physics. For quite some time also, there was only one female physicist, at the level of university lecturer, who also doubled as the Head of Department of Physics. Currently, there are five public universities in Uganda with departments of physics and there has been an increase in the numbers of female graduates in physics. At the same time, there has been an increase in the number of ladies pursuing higher degrees in physics and the universities have registered an increase in female physics lecturers at these institutions. This paper intends to show the trend of female physicists in Ugandan universities: the challenges ladies face and what has led to the sudden increase in numbers of female physics lectures. The paper will also give experiences of some of these ladies and how they managed to make it in a male-dominated field.

45. WOMEN IN PHYSICS IN THE UK: UPDATE 2011 - 2014

Ann Marks[a], Jenni Dyer[b], Maisie Munro[c], Gillian Butcher[d]
[a]UK team leader, Women in Physics Group, Institute of Physics, UK; [b]Diversity Programme Leader, Institute of Physics, UK; [c]Diversity Programme co-ordinator, Institute of Physics, UK; [d]Women in Physics Group, Institute of Physics, UK.

The Institute of Physics (IOP), the UK national physical society [1], 'For Physics, for Physicists, for all'; supports those interested in and studying physics at all levels from schools, universities, through to career physicists and policy makers. The work of the IOP's Diversity Programme [2] and the Women in Physics Group (WIPG) [3] is recognised as being at the forefront of progress for women in science in the UK.

Girls in Physics initiatives, the IOP published the 'Closing Doors' report [4] in December 2013. This to post-16 physics are likely to depend on the whole school environment. The IOP has subsequently secured substantial funding to run further pilot projects to explore actions to encourage more girls to take physics post-16. IOP's Project JUNO [5] is an award scheme that recognises and rewards higher education physics departments that are working to address the under- representation of

women at all levels and the IOP Diversity Team works closely with physics departments to support them in gaining this recognition. Over 75% of departments in the UK are now signed up to Project Juno and are working towards an award. Additionally, after a membership survey in association with WIPG, the IOP has established a Carers' Fund [6] to assist carers to attend conferences.

Numerous initiatives to increase the participation of women in Science, Technology, Engineering and Mathematics (STEM) careers have continued to develop across the UK including the Royal Society's 'Leading the way' project [6] the STFC programme 'Leadership for women', the first RSE 'National Women in Engineering Day' and the ScienceGrrl network.

The Equality Challenge Unit runs the Athena SWAN award scheme [7] which recognises all STEM departments in their efforts to address the under-representation of women. Recently, there has been a marked increase in gender activities within academic science, particularly in medical departments, since their funding council linked grant awards to attaining a particular level in the Athena SWAN award; other funding councils are considering following suit. However recent reports, such as that published by the UK Parliament in January 2014 [8], still highlight inequalities showing there is much to be done.

[1] http://www.iop.org
[2] http://www.iop.org/policy/diversity/index.html
[3] http://www.iop.org/activity/groups/subject/wip/
[4] http://www.iop.org/education/teacher/support/girls_physics/closing-doors/page_62076.html
[5] http://www.iop.org/policy/diversity/initiatives/juno/
[6] http://royalsociety.org/policy/projects/leading-way-diversity/
[7] http://www.athenaswan.org.uk/
[8] http://www.publications.parliament.uk/pa/cm201314/cmselect/cmsctech/701/70102.htm

46. WOMEN IN PHYSICS IN THE UNITED STATES: RECRUITMENT AND RETENTION

Nina Abramzon[a], Patrice Benson[b], Edmund Bertschinger[c], Susan Blessing[d], Geraldine Cochran[e], Anne Cox[f], Beth A. Cunningham[g], Jessica Galbraith-Frew[h], Jolene Johnson[i], Leslie Kerby[j], Elaine Lalanne[k], Christine O'Donnell[m], Sara Petty[n], Sujatha Sampath[p], Susan Seestrom[q], Chandralekha Singh[r], Cherrill Spencer[s], Kathryne Sparks Woodle[t], Sherry Yennello[u]

[a]California Polytechnic University Pomona; [b]United States Military Academy; [c]Massachusetts Institute of Technology; [d]Florida State University; [e]Rochester Institute of Technology; [f]Eckerd College; [g]American Association of Physics Teachers; [h]Utah University; [i]St. Catherine University; [j]University of Idaho; [k]United States Navy; [m]University of Virginia; [n]Virginia Polytechnic Institute and State University; [p]University of Wisconsin- Milwaukee; [q]Los Alamos National Laboratory; [r]University of Pittsburgh; [s]SLAC National Accelerator Laboratory; [t]Pennsylvania State University-University Park; [u]Texas A&M University

Initiatives to increase the number, persistence, and success of women in physics in the U.S. reach pre-teen girls through senior women. Programs exist at both the local and national levels. The Expanding Your Horizons (EYH) program targets 12 to 18 year old girls across the country. Nearly one quarter of the female undergraduate physics students in the country participated in the 2014 Conferences for Undergraduate Women in Physics (CUWiP).
Workshops designed to help postdocs, teachers, assistant professors, senior faculty and researchers are held at national physics meetings. The National Science Foundation provides funding to increase the participation and advancement of women in academic science and engineering careers (ADVANCE). Broader efforts include the White House Council on Women and Girls, established by the U.S. President to address inequalities that still persist, including the underrepresentation of women in science fields. In addition, researchers have investigated issues related to gender equity in physics, including the role of social factors such as prevailing stereotypes, the presence (or absence) of role models, and teacher and parental influences on the decisions of women to enter physics careers. These studies have led to insights on ways to increase the persistence of young women in their pursuit of physics careers. Anecdotal evidence shows a recent increase in mass media coverage of women in science. All of these efforts are both motivated and made more effective by the collection and presentation of data on the presence, persistence, and promise of women in physics. Highlights of these and other initiatives along with recent research and statistics will be presented.

47. THE PRESENCE OF WOMEN IN PHYSICS IN URUGUAY

Erna Frins
Universidad de la República Montevideo, Uruguay

If we take a photo of the situation today by the master and PhD students of Chemistry and Biology, the rate between women and men is around 67 %. However, this rate becomes 42% and 27% in physics and maths, respectively. Researchers in Uruguay are categorized in three levels. In the first level, i.e. the lower one, the rate between women and men is almost identical with the rate of physics PhD students. However in the second level, the presence of women decrease to a half in comparison with men and in the highest level there is no woman. In this poster we aim to describe the presence of women in physics in Uruguay and their scientific activity

48. THE ARAB SPRING AND ITS IMPACT ON WOMEN IN PHYSICS IN YEMEN

S Fakhraddin[1,2] & Rash Alyusufi[1]
[1]*Physics Department, Faculty of Science, Sana'a University, Sana'a, Yemen;*
[2]*Physics Department, Faculty of Science & Arts (Girls Division), Najran University, Najran, Saudi Arabia*

Yemen one of the Arab Spring countries where women played a crucial role in the last four years of resistance to dictatorships. The movements of the Arab Spring have given them unprecedented visibility not only on the political level but also on the academic level. The Arab Spring, which began in 2010 and radiated across North Africa and the Middle East, has been messy, exhilarating, chaotic and often violent. Despite all these circumstances number of women participating in Physics has increased on the academic level as full faculty members and as well the students enrolled in Masters Program and in undergraduate level. Also the Arab Spring has caused migrants of many academic personals to neighboring countries not only form Physics department but also from other disciplines. One of the key questions informing the inter-disciplinary research agenda is framed within the terms of "can we determine whether post-Arab Spring things are better or worse for the Yemeni women in Physics.

49. ZAMBIAN WOMEN IN PHYSICS, THEIR CAREER PATHS AND GLOBAL COLLABORATIONS

Chilufya Mwewa
University Of Cape Town, South Africa

A career in Physics offers a wide variety of choices from Theoretical Physics to Applied Physics but what have the Zambian women pursuing Physics careers opted for and what has influenced their choices? Do they feel fulfilled in these career paths and are they part of or working towards being part of collaborations that are making major discoveries in the world? This paper presents answers to these and many other questions concerning the status of Zambian women in Physics. It also highlights how young Zambian women pursuing Physics careers can be helped to be part of various Physics collaborations worldwide. Following the paper presented at the ICWIP in 2011 on the experience of Zambian women in Physics, this paper also presents how this conference helped in uplifting the status of Zambian women in Physics.

SCIENTIFIC POSTER ABSTRACTS

GENERAL

1. ANALYSIS OF SAME METALS IN PLASTIC BOTTLES WATER

[a]Mirela Alushllari, [b]Silvana Mico, [c]Antoneta Deda
[a] Institute of Applied Nuclear Physics, University of Tirana, Albania; [b] Faculty of Natural Sciences, University of Vlora, Albania; [c] Faculty of Natural Sciences, University of Tirana, Albania

Albania is one of the richest countries with resources of water. However, often the problems of water quality are evident. Exists distribution network of drinking water in Tirana, but in recent years increased the trend of consumption of packaged bottled water. Some of the reasons are: amortization of distribution network, the supply timetable, supply of water storage, communication network of drinking water with sewage and external environment, illegal interventions in the network, the decline of water levels in wells during the summer season, the absence of drinking water in some areas, advertising on the media over the quality and origin of bottled water, Bottled water is used in instead of drinking water for ease, taste better, and perceived purity. This study was conducted for the measurement and determination of the concentrations of same metals such as cadmium (Cd), chromium (Cr), cooper (Cu), potassium (K), lead (Pb) and Strontium (Sr) in plastic bottled water. A total of 11 samples of 0.5 litter plastic bottles of water were purchased at random in the Tirana city.

Table 1: Concentration of elements in surface water and in the muscle of fish samples

Nr	Code	Cd (µg/L) ±SD	Cr (µg/L) ±SD	Cu (µg/L) ±SD	K (µg/L) ±SD	Pb (µg/L) ±SD	Sr µg/L) ±SD
1	M_1	0.123 ± 0.01	1.15 ± 1.23	119 ± 0.21	815 ± 1.34	1.68 ± 0.11	469 ± 0.02
2	M_2	0.277 ± 0.12	5.24 ± 0.02	93 ± 0.19	517 ± 0.03	2.64 ± 0.20	364 ± 0.14
3	M_3	0.148 ± 0.03	3.19 ± 0.78	108 ± 0.05	1369 ± 2.02	3.48 ± 0.09	394 ± 0.17
4	M_3_G	0.095 ± 0.08	2.41 ± 0.23	122 ± 0.08	419 ± 2.15	1.79 ± 0.38	101 ± 0.06
5	M_4	0.119 ± 1.12	1.59 ± 0.21	129 ± 1.02	596 ± 0.54	0.97 ± 0.27	124 ± 0.04
6	M_5	0.084 ± 0.25	3.64 ± 0.12	123 ± 0.15	2764 ± 0.32	1.23 ± 0.98	152 ± 0.31
7	M_6	0.129 ± 0.31	1.56 ± 0.31	119 ± 0.23	1856 ± 0.01	3.04 ± 0.04	209 ± 0.04
8	M_7	0.324 ± 1.23	1.32 ± 0.25	132 ± 0.37	312 ± 0.03	0.73 ± 0.08	132 ± 0.12
9	M_7_G	0.146 ± 0.28	4.12 ± 0.01	126 ± 0.21	190 ± 0.03	1.62 ± 0.56	208 ± 0.18
10	M_8	0.352 ± 0.09	3.75 ± 0.07	119 ± 0.02	3374 ± 0.07	5.21 ± 0.84	412 ± 0.11
11	M_9	0.287 ± 1.24	3.98 ± 2.18	93 ± 0.09	1157 ± 0.09	2.43 ± 0.05	386 ± 0.17

Note: M1_Bureto; M2_Bora; M3_Trebeshina; M3G_Tepelana Gassed; M4_Tepelena; M5_Glina; M6_Sanbenedeto; M7_Qafshtama; M7G_Qafshtama Gassed; M8_Tap Water; M9_Ground Water

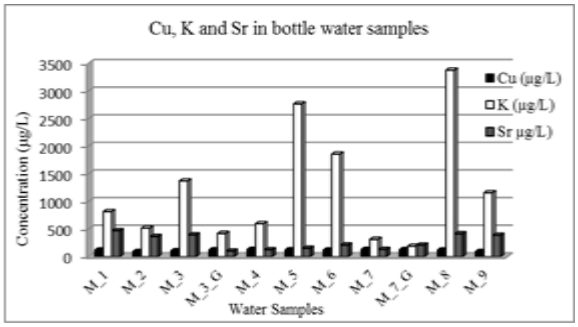


Figure 1: Concentration of Cu, K and Sr.

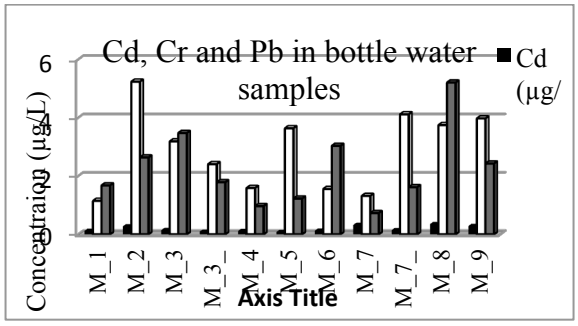


Figure 2: Concentration of Cd, Cr and Pb.

For each water sample were taken and analysed two parallel samples. The analyses of metals in water samples were performed at the Institute of Applied Nuclear Physics, University of Tirana, using Graphite Furnace and Flame Atomic Absorption Spectrometry. The current study reports the presence of metals in all of the analysed water samples. The average concentration of metals Cd, Cr, Cu, K, Pb and Sr were respectively: 0.19µg/L, 2.9 µg/L, 116 µg/L, 1215 µg/L, 2.3 µg/L and 268 µg/L. Heavy metals concentrations are compared with the Maximum Concentration Level (MCL) specified by the World Health Organization (WHO) and the Environmental Protection Agency (EPA) for drinking water standards.

2. PSYCHOLOGICAL STRESS ASSESSED BY THE CARDIAC RESPONSE: ALTERNATIVE PARAMETERS AND GENDER

Isabel Delgadillo-Holtfort[a], María Raquel Huerta-Franco[b], Francisco Miguel Vargas-Luna[a], Ismael Morales-Mata[b], Corina Flores-Hernández[b], and Juana Berenice Montes-Frausto[a]
[a]Department of Physical Engineering. Science and Engineering Division, University of Guanajuato, Loma del Bosque 103, Col Lomas del Campestre León, Guanajuato 37150, Mexico
[b]Department of Applied Sciences to Work, Health Science Division, University of Guanajuato, Aquiles Serdán # 924, Obregón Col, 37320, León, Guanajuato, Mexico

In this multidisciplinary study involving physicists and physicians the Stroop test has been used on 19 male and 20 female public safety workers to evaluate their psychological stress response through analysis of their electrocardiographic (ECG) signals. To this aim, traditional and alternative parameters have been extracted from these signals. The results demonstrated that the traditional parameters show no significant differences with the Stroop stress test. The variability of the R-wave amplitude, i.e. of the highest peak of the ECG signal periodic train measured by electrodes positioned in the so-called Eindhoven configuration, and the Poincare parameters of the heart-rate were more sensitive to evaluate the autonomous nervous system response to psychological stress than the traditional heart-rate variability. From all the analyzed parameters in this work, the median of the total area of the low-and-high frequency region, ranging from 0.04 to 0.4 Hz, of the power spectrum of the variability of the R-wave amplitude is the more sensitive. Moreover, it also allows to identify gender differences consistent with those encountered in other studies [1-4].

References

1. Garcia S, Mariscal MA, Garcia J, Ritzel DO. Influence of task demands on occupational stress: Gender differences. *J Safety Res*. 2012;43(5-6):365-374.
2. Matud MP. Gender differences in stress and coping styles. *Pers Indiv Differ*. 2004;37(7):1401-1415
3. Stroud LR, Salovery P, Epel ES. Sex differences in stress response: social rejection versus achievement stress. *Biol Psychiatry*. 2002;52(4):318-327.
4. Verma R, Balhara YPS, Gupta CS. Gender differences in stress response: Role of developmental and biological determinants. *Ind. Psychiatry J*. 2011;20:4-10

3. MODERN NANOSTRUCTURES INVESTIGATIONS PERFORMED BY VORONEZH STATE UNIVERSITY RESEARCH GROUP AT SRC (USA) AND BESSY II (GERMANY) SYNCHROTRON RADIATION CENTERS

Evelina Domashevskaya
Voronezh State University, 394006, Voronezh, Universitetskaya pl.1., Voronezh, Russia

Since 2001 the nanosystems investigations with the use of synchrotron radiation is the modern scientific trend for researchers in the Voronezh State University. Our team successfully realized more than 15 project according to the long term collaboration with scientists from USA and Germany resulted in a series of scientific papers published at national and international levels in peer-reviewed journals. These investigations at the crossing point of the solid state physics, material research, chemistry, surface science, and nanotechnology requires enhanced experimental conditions leading to higher level research. Our group used a wide range of the scientific equipment provided by Synchrotron Radiation Center of University of Wisconsin Madison (Stoughton, USA) and BESSY II storage ring of Helmholtz Zentrum Berlin (Berlin, Germany). SRC is a well known and "historical" place for all scientists working in the field of solid state physics since the first pioneer experiments in the field of synchrotron radiation applications was performed there more than 40 years ago. BESSY II is one of the newest and brilliant

light sources in Europe built up for a wide range of modern science interdisciplinary applications from cultural heritage to single particle physics.

We are studying a wide variety of perspective multifunctional nanosystems of different dimensionality including (but not limited) the following. Silicon based nanostructures for the luminescent devices formed in framework of silicon technologies, tin oxides based nanosystems for manufacturing of highly productive gas sensing electronic nose devices, magnetic particles nanocomposites for a wide range of applications in modern nanoelectronics and spintronics. All results of the activities mentioned above will be illustrated in the presentation.

One of the important parts is the activity of young scientists of the Voronezh State University synchrotron research group that allowed the successful preparation of more than 20 master dissertation projects and 10 PhD theses.

Looking beyond present days of international collaborations initiated by the Voronezh State University scientists in fields of modern physics we are opened to all type of joint activities for deep understanding of nanostructures science and technology.

4. DETECTION AND QUANTIFICATION OF TRACE ELEMENTS IN RICE AND RICE PRODUCTS USING X-RAY FLUORESCENCE

Kelly Foran, and David E.B. Fleming
Mount Allison University, Sackville, New Brunswick, Canada

Recently, concern about the effect of low-level arsenic (As) exposure over an extended time period has prompted the evaluation of arsenic concentration in foods, especially rice. We set out to use x-ray fluorescence (XRF) to examine the presence and the concentration of arsenic and other trace elements in rice and rice products. A portable XRF analyzer was used to test samples of brown, jasmine, basmati, instant, and microwave rice as well as mixed rice, rice krispies, rice crackers, and brown rice flour. Data from the XRF was used to find amplitude values, in counts, for K, Mn, Fe, Ni, Cu, Zn, and As. Available calibration standards, providing a relationship between sample mass and counts/ppm, were used in converting amplitude values to concentration values for Mn, Zn, and As. Significant concentrations of Mn and Zn were found in most products, and these values were compared to literature. The merit of K, Fe, Ni, and Cu detections was explored by examining observed and expected changes in these elements between different types of rice. The detection limit of the portable XRF system was sufficiently low to detect As in some, but not all, of the rice and rice products.

5. QUANTUM VOTING USING A MULTIQUBIT ENTANGLED CHANNEL

S. Ghose,[1,2] A. Kumar[3], and A. M. Hamel[1]
[1]*Department of Physics and Computer Science, Wilfrid Laurier University, Waterloo, Canada*
[2]*Institute for Quantum Computing, University of Waterloo, Canada*
[3]*Indian Institute of Technology Rajasthan, Jodhpur, India*

We construct a new multiqubit entangled state and showed how two sender can each teleport a qubit to a receiver using the entangled channel. The multiqubit channel for teleportation is not equivalent to a product of maximally entangled Bell pairs under local unitary operations. The structure of the proposed entangled state is interesting because we can use it to construct a protocol in which both parties in the network must participate in order for the qubits to be successfully teleported. Such an all-or-nothing scheme cannot be implemented with standard two-qubit entangled Bell pairs and can be useful for different communication and computing tasks. We describe the application of the scheme to voting and show that it can be used to meet the standard requirements established in the literature for voting protocols. Our results will help towards understanding the nature of multipartite quantum entanglement for designing large-scale quantum computing networks and developing useful communication applications

6. REVISITING CONTROLLED TELEPORTATION SCHEMES FROM THE CONTROLLER'S POINT OF VIEW

Xi-Han Li[1,2], and Shohini Ghose[1,3]
[1]*Department of Physics and Computer Science, Wilfrid Laurier University, Waterloo, Canada*
[2]*Department of Physics, Chongqing University, Chongqing, China*
[3]*Institute for Quantum Computing, University of Waterloo, Canada*
sghose@wlu.ca

Quantum entanglement is a unique phenomenon in quantum world and also a crucial resource for quantum information processing. One of the most interesting applications of entanglement is quantum teleportation [1]. An arbitrary quantum state can be reestablished in a remote place with the aid ofa pair of entangled qubits and two bits classical information. Teleportation is an impossible task in the classical world, demonstrating the uniquely quantum nature of entanglement. Besides standard quantum teleportation which involves only two parties, the sender and the receiver, a variant called controlled teleportation was first proposed in 1998 [2]. In this scheme, the teleportation procedure is controlled by a controller, i.e., the arbitrary quantum state cannot be teleported without the permission of the controller [3]. Controlled teleportation is useful in various contexts in quantum communication, such as quantum networks and cryptographic conferences. Many controlled teleportation schemes have now been proposed, which differ in the quantum channel or the states be teleported [4–10]. However, although a lot of work has been devoted to explore controlled teleportation, very little is discussed about the controller's measurable authority. Here, we evaluate these quantum controlled teleportation schemes from the controller's point of view.

We calculate a quantitative measure of the controllers power, and us it to compare the controller's power in different controlled teleportation schemes can be compared. Then we establish a lower bound on the control power required for controlled teleportation and use it to revisit some previous controlled teleportation schemes. We show partially entangled channels are not suitable for controlled teleportation of arbitrary quantum states from the controller's point of view. However, they can be used for controlled teleportation of restricted sets of states, in which they can even outperform maximally entangled channels. We establish some general rules for evaluating the eligibility of different entangled channels for controlled teleportation schemes.

[1] C.H. Bennett, H.G. Brassard, C. Crepeau, R. Jozsa, A. Peres, W.K. Wootters, Phys. Rev. Lett. 70 1895 (1993). [2] A. Karlsson and M. Bourennane, Phys. Rev. A 58, 4394 (1998).
[3] M. Hillery, V. Buz ek, and A. Berthiaume, Phys. Rev. A 59, 1829 (1999).
[4] C. P. Yang, S. I. Chu and S. Han, Phys. Rev. A 70,022329 (2004).
[5] Y. Yeo, e-print quant-ph/0323030v1 (2003).
[6] F. G. Deng, C. Y. Li, Y. S. Li, H. Y. Zhou and Y. Wang, Phys. Rev. A 72,022338 (2005). [7] Z. X. Man, Y. J. Xia, N. B. An, Phys. Rev. A 75,052306 (2007).
[8] T. Gao, F. L. Yan and Y. C. Li, Euro. Phys. Lett., 84, 50001 (2008).
[9] Z. X. Man, F. Su, Y. J. Xia, Opt.Commun., 283, 4411C4414 (2010).
[10] X. H. Li, F. G. Deng, H. Y. Zhou, Chin. Phys. Lett., 24, 1151 (2007).

7. PHASE PRESERVATION IN A BEAM EXPANDER FOR BIOMEDICAL IMAGING

Mercedes Martinson
University of Saskatchewan, Saskatoon, Saskatchewan, Canada

X-ray imaging using synchrotron radiation has been well established around the world, allowing a variety of techniques that are not possible with traditional X-ray sources. Many of these techniques rely on the brightness and coherence of synchrotron sources, which uses phase interference to image soft tissue and distinguish features not visible through simple absorption imaging. The major limitation of using synchrotron light for biomedical imaging is the small field of view in the vertical direction. The traditional method to overcome this limitation is by building long beamlines, allowing the light to diverge to a suitably large area. However, at the Canadian Light Source, this solution was not an option. This encouraged the development of a beam expander using bent Laue crystals, allowing a vertical expansion of 10x the original beam height. The implementation and results of this beam expander are presented.

8. DIFFUSIVITY OF SOLITONS IN DEFORMABLE SYSTEMS WITH THERMAL BATH

Rosalie Laure Woulaché, Fernand Naha Nzoupé and Timoléon C. Kofané
Laboratoire de Mécanique, Département de Physique, Faculté des Sciences, Université de Yaoundé I. B.P. 812, Yaoundé, Cameroun

We investigate the diffusivity of kink in a nonlinear system, in the presence of thermal fluctuations. We focus here on the class of Remoissenet-Peyrard parametrized potentials $V_{RP}(x, s)$, whose shape can be gradually varied as a function of s, recovering the sine-Gordon potential as particular case. The dynamics of the system, crucially dependent on the temperature, is strongly influenced by the shape of the substrate potential. Specifically, the diffusivity of kink recently reported [G. Lythe et al. Phys. Rev.67, 027601(2003) and references therein] is significantly affected by the variations of the shape parameter s.

ELEMENTARY PARTICLES AND FIELDS

9. IDENTIFYING CHARGED CURRENT SINGLE PION NEUTRINO INTERACTIONS AT SUPER-KAMIOKANDE

Sophie Berkman
University of British Columbia, email: sberkman@phas.ubc.ca

Super-Kamiokande is a large water Cherenkov detector that is used to detect neutrino interactions and measure neutrino oscillation parameters. In Super-Kamiokande charged particles are identified by classifying the rings of Cherenkov light produced by charged particles, traditionally as either electron-like with a fuzzy ring edge, or as muon-like with a sharp ring edge. A maximum likelihood reconstruction algorithm now makes it possible to identify other particles such as pions. Unlike muons, charged pions undergo hadronic interactions in the water that affect the amount and properties of Cherenkov light that they produce. These hadronic interactions make it possible to distin- guish muons from charged pions even though the Cherenkov rings they produce are similar. Reconstructing charged pions also makes it possible to identify the multi-ring Charged Current single π+ production neutrino interactions ($\nu + p/n \rightarrow \mu + \pi^+ + p/n$) at Super-Kamiokande. These events can act as an additional signal events in measurements of neutrino oscillation parameters.

10. ARE QUARKS AND LEPTONS FUNDAMENTAL PARTICLES?

Tracey Berry
Royal Holloway, University of London, UK

This question can be addressed at the Large Hadron Collider, CERN, Switzerland using the ATLAS experiment. A search is conducted for deviations from Standard Model expectation in invariant mass and, for the first time, also the angular distribution, in dielectron and dimuon final states. The latest results are presented, using the full LHC 2012 proton-proton collision dataset recorded by the ATLAS detector, corresponding to 20 fb^{-1} at $\sqrt{s} = 8$ TeV.

11. NNLO CORRETIONS TO THE DECAY B → Dπ

T. Huber, and S. Kränkl
Theoretische Physik 1, Naturwissenschaftlich-Technische Fakultät, Universität Siegen, Walter-Flex-Straße 3, D-57068 Siegen, Germany
Emails: thuber@physik.uni-siegen.de, kraenkl@physik.uni-siegen.de

Over the last decades the Standard Model (SM) of particle physics has proven to be a successful theory describing the interactions between the so far known particles. One major ingredient is the Cabibbo-Kobayashi-Maskawa (CKM) matrix which describes the flavour mixing of the three quark generations. In the SM the CKM matrix is a 3×3 unitary matrix. Hence any deviation from unitary would be a sign of "New Physics".

The large variety of B mesons decays to two hadrons yields a broad spectrum of measurable observables, e.g. branching ratios, for investigating the structure of the CKM matrix. The theoretical description of these ratios often involves matrix elements of the form $\langle B|\mathcal{O}_i|f_1 f_2\rangle$where the operator $\mathcal{O}_i$describes the weak interaction of the underlying decay of the B meson to some final hadrons $f_{1,2}$. The strong interactions of the hadronic process which are described by Quantum Chromodynamics (QCD) complicate the calculation of these matrix elements. Over the last two decades a general framework to describe the latter have been established. This framework, known as QCD factorization (QDCF), disentangles perturbative from non-perturbative effects in the heavy-mass limit.

We calculate the branching ratio for the decay $\bar{B}_0 \rightarrow D^+\pi^-$ at next-to-next-to-leading-order (NNLO) accuracy in QCDF providing a further test of the latter. Here, we present the result of the NNLO hard scattering kernel. The calculation has been performed using multi-loop techniques like Laporta's reduction to master integrals and Mellin Barnes representations and differential equations for evaluating the latter.

12. TESTING Pb212 REMOVAL FROM LINEAR ALKYL-BENZENE USING QUADRASIL COLUMNS AND DETECTOR REFURBISHMENT THROUGH PHOTO MULTIPLIER TUBE REPAIRS FOR SNO+

Megan VanAlstine and Chloe Gagnon
Laurentian University, Sudbury, ON, Canada

SNO+ is an experiment that will search for neutrinoless double beta decay in its first stage and will later focus on solar neutrinos, reactor neutrinos, and geoneutrinos. SNO+ inherited its hardware from the SNO experiment, however many adjustments are necessary to prepare the hardware for SNO+'s different liquid scintillator (Linear Alkyl-Benzene, or LAB) and new primary objectives. This switchover created a need for many small student projects that range from process testing to hardware design and production. In addition to adapting the hardware to the new experiment 800 of the 10,000 photomultiplier tubes (PMTs) require repairing before they are used in SNO+. This poster will focus on two of these projects: testing Pb212 removal from LAB using quadrasil columns and PMT repairs. The motivation for these projects and their procedures will be expanded upon.

13. BREMSSTRALUNG FOR JET PARTICLES IN HEAVY ION COLLISION

Jin-Hee Yoon
Department of Physics, Inha University, Yonghyun-dong, Nam-gu, Incheon, 402-751, Korea

In relativistic high energy heavy-ion collisions, jets particles lose a lot of energy through Bremsstrahlung process. Therefore the exact estimation is necessary to analyse the huge data to get the meaningful information. Due to the infrared behaviour there are quite amount of soft (low- energy) photons in electron-electron scattering. However these photons are mostly aligned following the incoming particle in high energy scattering, and therefore a strong peak in forward direction. We calculate the cross section of bremsstrahlung from e-e scattering when the incident particle energy is as high as jet energy. This calculation can be extended to QCD in which electrons are replaced by quarks and photons by gluons.

NUCLEAR PHYSICS

14. NATURAL RADIOACTIVITY LEVELS IN THE AREA AROUND THE URANIUM DEPOSIT OF THE BAHI DISTRICT IN DODOMA REGION

Ebenezer E. Kimaro and Najat K. Mohammed
Department of Physics, Universty of Dar es Salaam, P.O.Box 35063, Dar es Salaam, Tanzania
najat@udsm.ac.tz

Economically viable uranium deposit has been discovered at Bahi district in Dodoma Region of Tanzania. The uranium deposit in Bahi is reported to be shallow therefore the activity concentration of the area is expected to be high. Exploration still going on in Bahi might also result into radioactive contamination into the environment. The radioactivity might then be transferred to the food chains in the area which may pose a health problem to a big population within the Dodoma region and the nearby places. Moreover, the expectations of uranium mining in the near future pose another concern on the environmental contamination of radionuclides. This is because uranium mining normally leave behind a huge volume of radioactive waste. Hence, there is a need to implement routine radiological surveillance during mining, whereby surveillance is best carried out when the pre-mining data are available for comparison purposes. In this study samples of soil from different areas in the Bahi district were analysed for radioactivity using gamma ray spectrometry of the Tanzania Atomic Energy Commission in Arusha Tanzania. The selection of sampling locations was based on the accessibility of the sampling station to the public, as well as their proximity to the centre of the deposit and the exploration sites. The aim of this work was to determine the radioactivity levels in the Bahi district to assess the current radiological status of the area. The information will also play an important role on the estimation of any change on the environmental radiation due to the expected uranium mining activities.

15. NUCLEON POLARIZABILITY EXTRACTION VIA COMPTON SCATTERING

Meg Morris
Mount Allison University, Canada, email: mmorris@mta.ca

The A2 collaboration at the Institute for Nuclear Physics in Mainz, Germany, is experimentally determining the polarizabilities of hadrons in the grand pursuit of better understanding the strong interaction. The scalar polarizabilities of the neutron, specifically, have been difficult to determine experimentally due to the additional challenges involved, such as the impossibility to produce a free-neutron target. Experimental work thus far has been unsatisfactory because of the large uncertainties acquired. Lead by the Glasglow and Mount Allison groups, the A2 collaboration is in the process of preparing a high-pressure, active helium target to more precisely determine the neutron scalar polarizabilities in the com- ing years. Over the summer, a great deal of testing is being conducted, including the evaluation of new photomultiplier tubes required for the target to fit inside the Crystal Ball detector in Mainz, as well as a study of the effect the nitrogen concentrations have on the detector response. I was involved in the calibrations in addition to running simulations in or- der to determine the background-event contributions. It is expected that this target and the projected experimental setup will allow the collaboration to determine the scalar polarizabilities of the neutron with much reduced uncertainty. These values can then be applied to test a number of important theoretical models in nuclear physics.

16. ANALYSIS SOFTWARE FOR HADRON POLARIZABILITY EXPERIMENTS

Hannah Stegen
Mount Allison University

The A2 Collabaration at the Institute for Nuclear Physics in Mainz, Germany, is working towards solving the polarizabilities of hadrons through Compton scattering experiments. Raw data is taken in by the Crystal Ball detector, which detects photons after being scattered off a proton target. Specifically, my contribution to the collaboration includes working with the programs that analyze the data. The software package GoAT, or Generation of Analyzing Trees, is a program that can input simulated or real data and make specific cuts and organizes data into tree files is one of the main tools used in the collaboration. I have been working towards making a very general physics class, which will be useful to the whole

institute. We plan to implement this software so that it will be manageable to both beginners and the more experienced. Solving the mysteries of Quantum Chromodynamics will be made easier and more efficient with this general program.

17. CALCULATION OF ISOTOPE YIELDS FOR RADIOACTIVE BEAM PRODUCTION

F. Garcia[1], C. Andreoiu[1], P. Kunz[1,2]
[1]*Simon Fraser University, Department of Chemistry, Burnaby BC*
[2]*TRIUMF, Vancouver, BC*

The Nuclear Science group at Simon Fraser Univeristy (SFU) is interested in using radioactive beams for scientific applications such as nuclear structure studies, nuclear medicine and astrophysical investigations. These radioactive beams are produced at TRIUMF[1], Canada's national laboratory for nuclear and particle physics. The radioactive ion beams are produced by bombarding a target, made of a specific material, with the 500 MeV proton beam provided by TRIUMF's cyclotron. Through nuclear interactions such as fission, spallation and fragmentation, a plethora of rare isotopes are created, which are either examined for their properties, or used as probes for other studies.

The purpose of this project is to simulate the production rates of these rare isotopes when an uranium carbide target is bombarded with the proton beam using the Monte Carlo nuclear toolkit Geant4[2]. Geant4 is a powerful nuclear simulation package which, though having no defaults, allows the user to define parameters such as target geometry, target material and selected physical processes. Once the model is complete, and the physics implemented, its results will be compared to those of the TRIUMF yield station[3] and other comparable nuclear transport codes such as FLUKA[4].

Alongside the yield calculations, the code will be benchmarked by comparing the model results to the experimental data of a small scale experiment involving the measurement of the alpha decay spectrum of a Plutonium-239 sample, set up and measured at SFU.

A simple model of the target set up has been constructed to begin the simulation work in Geant4. The results from this preliminary model are presented.

1. Tri-University Meson Facility (TRIUMF), Vancouver, BC
2. Geant4 - A Simulation Toolkit, S. Agostinelli et al., Nuclear Instruments and Methods A 506 (2003) 250-303
3. ISAC Yield Database, http://mis.triumf.ca/science/planning/yield/beam
4. Nuclear Models in FLUKA: present capabilities, open problems and future improvements, F. Ballarini et al., SLAC-PUB-10813 (2004)

18. RADON ASSAY FOR SNO+

Janet Rumleskie
Laurentian University, Sudbury, ON, Canada

The SNO+ experiment is located 6800 feet below the surface of the earth at SNOLAB, deep within VALE's Creighton Mine. It requires such a depth in order to be shielded from the various surface backgrounds. However, emanation of radioisotopes in the U- 238 and Th-232 chains from the rock surrounding the lab can lead to other unwanted backgrounds. One such isotope, Rn-222, has a half-life of around 3.8 days, and the characteristic decay of it and its subsequent daughter isotopes allows for a specific technique for counting the amount of Rn-222 atoms collected. There are different traps employed within SNO+ to collect the Rn-222 isotope from various positions and materials. In this poster I will discuss how to build the board for the trap which will collect Rn from the linear alkylbenzene (LAB), which is the organic liquid scintillator used to detect interactions within SNO+.

19. RADON: COMMUNICATING RISK

Irene Nsiah-Akoto[1], Aba Bentil Andam[2]
[1]National Nuclear Research Centre, GAEC, P.O.Box LG80, Legon Accra
[2]School of Nuclear and Allied Sciences. P.O.Box AE1, Atomic, Accra
Corresponding author: ina82ma@gmail.com

Effective risk communication requires co-operation between organizations, clear and coordinated messages, and the enlistment of collaborators with good community credibility. As part of radon risk communication, the development of a set of core messages aimed at target audiences is recommended. These messages should be simple, brief, and to the point. An assessment of perceptions and the level of knowledge regarding radon in the target audiences are strongly recommended. This should be done both before and after a risk communication campaign. Communicating clearly and effectively with the public should be a primary objective in a national radon programme. Principal components of these steps include: assessment of the public perception of risk, clear and understandable risk messages, identification of target audiences, and in some situations using comparisons (e.g. lung cancer due to radon compared to lung cancer from other sources) to clarify the risk associated with exposure to radon. The communication of radon risk and prevention messages poses serious challenges because radon is not widely known and may not be perceived as a health risk by the public. This paper will provide an overview on how to communicate the risk to radon exposure to the public.

Key words: radon, risk, communication, national radon programme, public

ATOMIC AND MOLECULAR PHYSICS

20. ATOMIC-SCALE INTERFACIAL BAND ALIGNMENT ACROSS VERTICALLY PHASED-SEPARATED POLYMER/FULLERENE HYBRID SOLAR CELLS BY CROSS-SECTIONAL STM

Ya-Ping Chiu[1*], Min-Chuan Shih[1], Bo-Chao Huang[1], Chih-Cheng Lin[2], Shao-Sian Li[2], Hsin-An Chen[2], and Chun-Wei Chen[2]
[1]Department of Physics, National Sun Yat-sen University, Kaohsiung, 80424, Taiwan [2]Department of Materials Science and Engineering, National Taiwan University, Taipei, 10617, Taiwan
**ypchiu@mail.nsysu.edu.tw (e-mail address of submitting author)*

The cross-sectional scanning tunneling microscope (XSTM) was utilized to demonstrates the direct visualization of high-resolution interfacial band mapping images across the film thickness in an optimized bulk heterojunction polymer solar cell consisting of nanoscale phase segregated blends of poly(3-hexylthiophene) (P3HT) and [6,6]-phenyl C61 butyric acid methyl ester (PCBM). The quantitative link between the vertical morphologies and their corresponding local electronic properties provides an atomic insight of interfacial band alignments between the two opposite electrodes, which will be crucial for improving the efficiencies of the charge generation, transport, and collection and the corresponding device performance of polymer solar cells.[1]

1. Min-Chuan Shih, Ya-Ping Chiu, et al., *Nano Lett*., **13**, 2387 (2013).

21. ENHANCING STIMULATED EMISSION BASED FLUORESCENCE DETECTION WITH INTERFEROMETRIC SETUP

Shen-Shou Max Chung, Jia-Huei Deng, Po-Lin Lin, and Fu-Jen Kao*
Institute of Biophotonics, National Yang-Ming University, Taipei 11221, Taiwan, ROC
E-mail: fjkao@ym.edu.tw
Keywords: Stimulated emission, fluorescence, interferometry

Stimulated emission, being spatially coherent, supports unattenuated fluorescence detection at extended distance with low NA optics. We have demonstrated stimulated emission (SE) imaging in a long-working distance configuration. Additionally, the corresponding fluorescence lifetime imaging is realized by electronically controlling the time delay between the excitation and the SE pulses in the nanosecond ranges through pump-probe configuration.

However, the sensitivity of SE based fluorescence detection is usually limited by the dynamic range and saturation of photodetectors. We are showing that interferometric setup can greatly enhance the detection sensitivity by reducing the DC level of the stimulation beam with destructive interference. The setup also allows optical coherence tomographic sectioning with the stimulated emission beam, reaching a resolution of approximately 25 μm that is dependent on the corresponding spectral width. The results show that there are many interesting possibilities by combining interferometric techniques with stimulated emission based fluorescence detection.

References:

[1] J. Ge, C. Kuang, S.-S. Lee, and F.-J. Kao, “Fluorescence lifetime imaging with pulsed diode laser enabled stimulated emission,” Optics Express, 20, 28216–28221 (2012)
[2] P.-Y. Lin, S.-S. Lee, C.-S. Chang and F.-J. Kao, “Long working distance fluorescence lifetime imaging with stimulated emission and electronic time delay,” Optics Express, 20, 11445-11450 (2012)
[3] T. Dellwig, P.-Y. Lin, and F.-J. Kao, “Long-distance Fluorescence Lifetime Imaging Using Stimulated Emission,” J. Biomed. Opt. 17, 011009 (2012)

22. SPEED OF SOUND OF A BOSE-EINSTEIN CONDENSATE WITH DIPOLE-DIPOLE INTERACTIONS

Belinka González-Fernández
Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México

In the present work we consider a Bose-Einstein condensate (BEC) trapped in a potential with the form of an anisotropic harmonic oscillator. Additionally, we take into account the presence of a magnetic dipolar moment that induces a dipole–dipole interaction between the particles, which turns out to be a

key element in the description of the system. Some parameters are deduced (for instance, speed of sound, radii of the BEC, chemical potential and number of particles) and we find an interesting effect due to this extra interaction: the speed of sound is anisotropic.

23. AN ANALYTICAL APPROACH TO THREE PHOTON IONIZATION OF HYDROGEN ATOM IN PRESENCE OF MULTIPLE BEAMS

N.Shrestha[a], and Ramesh Babu Thayyullathil[b]
[a]Department of Physics, Tri-Chandra Multiple Campus, Tribhuvan University, Kathmandu, Nepal
[b]Department of Physics, Cochin University of Science and Technology, Kerala, India

Analytical expression for the three photon ionization rates of hydrogen atom in the presence of multiple beams are evaluated, in the frame work of higher order perturbation theory and using the variation of Dalgarno Lewis method. It is shown that, the rate depends on a function of polarization, phase shift, intensities and frequency of the incident photon. In this formulation we can use any number of incident beams with arbitrary polarization.

24. SEEING THE WORLD AT THE TIP OF A LASER BEAM: IN-LINE COHERENT IMAGING

Chenman Yin
Queen's University, Kingston, ON, Canada

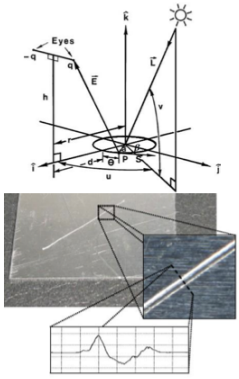
Laser material processing has found success in various medical and industrial applications due to its high transverse flexibility as well as the wide range of available laser types. With this growing prominence comes a stark need for laser cutting depth control, which has been a long standing challenge. We have developed a system called in-line coherent imaging, or ICI, as a novel diagnostic that enables in situ, real-time monitoring of laser processing dynamics. ICI utilizes similar principles to the gold standard for 3D retinal imaging known as optical coherence tomography (OCT). ICI possesses high sensitivity with a dynamic range of 60dB and micron- scale axial resolution. Imaging speed can go up to 300 kHz which gives us a window of observing light matter interaction on time scale of microseconds. Additionally, laser beam penetration depth into material can be adaptively controlled based on ICI feedback in real time. This capability has recently led to three-dimensional surface modification on materials like hard tissue and stainless steel.

ELECTROMAGNETISM, OPTICS, ACOUSTICS, HEAT TRANSFER, CLASSICAL MECHANICS AND FLUID DYNAMICS

25. HANDMADE HOLOGRAM BY SCRATCHING ON PIECE OF A PLASTIC

Siavash Amiri, Yasamin Masoumi
Ariaian Young Innovative Minds Institute, AYIMI, Tehran , Iran
http://www.ayimi.org, Email: info@ayimi.org

This paper refers to handmade holograms, which is consistent of light geometrics and the shiny points, which make a hologram. For making a hologram, a piece of plastic (e.g. Plexiglas) and a compass for scratching are needed. The cross section of the scratch can be considered as the part of a circle. When incident light strikes the scratch and setting a screen $x = L$ then by summing squares of y and z components of the reflected light, a constant is obtained so we reach a circle equation, which means reflected light scatters on a cone with the half angle, same as the incident light. The main reason for having 3D holograms can be binocular disparity, by which we calculated the depth of the shiny points. The scratches cannot be considered as the part of a parabola, which means shiny points are not the focal points, which confirms the previous conjunctions cannot be correct. In our experiments, we observed a circle which radius matched our theory also the pressure applied on the plastic during drawing the scratches lessens our vision field for observing the hologram, which lessens the quality of holograms.



References
1. C. Bosch, X. Pueyo, S.Mérillou, D. Ghazanfarpour, A Physically-Based Model for Rendering Realistic Scratches, EUROGRAPHICS 2004 / M.-P. Cani and M. Slater,Volume 23 (2004), Number 3
2. William T. Plummer and Leo R. Gardner, A mechanically generated hologram?, APPLIED OPTICS, Vol. 31, No. 31, 1 November 1992
3. Qian, N., Binocular Disparity and the Perception of Depth, Neuron, 18, 359-368, 1997.
4. Gregory, R.L. 1997 Eye and Brain. Princeton University Press: Princeton N.J.
5. Howe CQ, Purves D (2005) Perceiving geometry : geometrical illusions explained by natural scene statistics Springer : New York
6. Wertheimer, M. (1938) in W.D. Ellis (Ed) A Source Book of Gestalt psychology. Harcourt Brace : New York
7. Luneburg, R.K. (1947) Mathematical Analysis of Binocular Vision. Princeton University Press, Princeton, N.J.
8. Wertheimer, G. (2008) "Geometrical-optical illusions and the neural representation of space". Vision Res, 48, 2128-2142

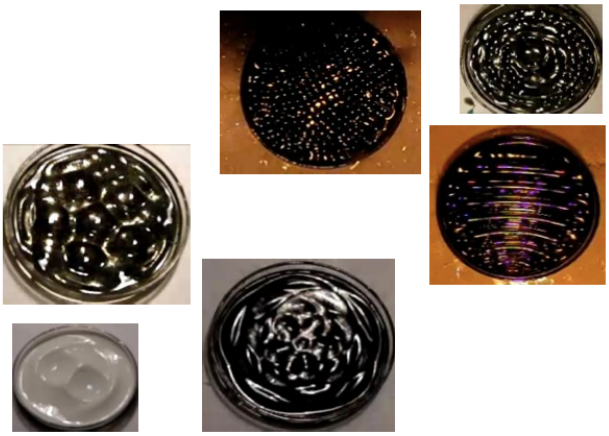
26. OBSERVATION OF DIFFERENT SYMMETRICAL PATTERNS ON FLUID

Siavash Amiri, Mahtab Shakibmanesh, Maede Jannesari
Ariaian Young Innovative Minds Institute, AYIMI, Tehran , Iran
http://www.ayimi.org Email: info@ayimi.org

In this research we report different symmetrical patterns that can be observed on a fluid surface in a vertical vibrating reservoir and the reason of their appearance.
Nonlinear and dispersive effects in waves give rise to astonishing behavior and phenomena. For small oscillation amplitudes because of the contact line between the free surface of fluid and reservoir, Ripples will appear. These ripples have linear interaction, means that, if two waves pass through each other they won't influence each other because of their small amplitudes, but as we increase the frequency, the waves that interact with each other will exchange energy and thus a nonlinear interaction happens. An amplitude for nonlinear behavior is derived that can predict the preferred pattern.

$$\frac{dA_n}{dt} = sA_n - g_0 A_n^3 - \sum_{\substack{m=1 \\ m \neq n}}^{N} g(\Theta_{nm})\,|A_m^2|\,A_n$$

Which s is the linear growth, g_0 is the self-interaction that is due to viscosity and $g(\Theta nm)$ gauges the interaction of two waves. (J. Fluid Mech. (2003), vol. 496, pp. 1–32.)



A function named Lyaponuv has a relation with the amplitude. We found out that in a specific angle if two waves interact with each other and make a new wave, it will be damped. So, many waves will be damped and the waves that have less interaction will survive, and depending on which N-fold symmetry minimize the Lyaponuv function, a symmetrical pattern will appear on the surface of the fluid. We used a speaker, a signal generator, a high speed camera and a stroboscope to find the frequency the speaker is oscillating. As we increased the viscosity, more waves will be damped, thus fewer patterns could be observed. Depending on the size of the container and wavelength of the waves, the shape of the container maybe effective or ineffective on the observed patterns. We also found out that the height of the liquid has an influence on this problem.

References:

1- J. Fluid Mech. (1994), i d 279. pp 49-68
2-J. Fluid Mech. (2003), vol. 496, pp. 1–32
3- Jean Rajchenbach, Didier Clamond, and Alphonse Leroux. Observation ofstar-shaped surface gravitywaves. Physical Review Letters 110, 9, 094502 (2013))

27. STUDY ON RETARDING FORCE AS A MAGNETIC BRAKE

Siavash Amiri, Yasamin Masoumi
Ariaian YoungInnovative Minds Institute, AYIMI, Tehran , Iran
http://www.ayimi.org Email: info@ayimi.org

To find the retarding force applied on a magnet falls down a non-ferromagnetic metal tube we have done some experiments. It is assumed a pipe to be series of circular paths which the maximum magnetic flux is in these rings and the maximum magnetic field is in vertical direction. By considering the relation for magnetic flux, the horizontal rings have the maximum flux, so the maximum induced electric currents result the maximum retarding force in direction. By experiment for a fifty cm copper pipe that has been divided into two vertical parts (so there is no horizontal electric current induced within it by the magnet) we reach the falling time 0.35±0.02 sec and for a free fall 0.33 sec which confirms our assumption. At first the dissipative power, which from conservation of energy is equal to the ohmage power within all rings

$f = \frac{wv}{\rho_E 2\pi a} \int_{-\infty}^{+\infty} \left(\frac{d\phi}{dz}\right)^2 dz$

is calculated (where ρ_E: Electric Conductivity, a: Inner Radius of Pipe, w: Pipe Width and ϕ: magnetic flux). For confirming our theory, the length of the pipe has been increased from 10 to 40 cm and the linear changes show that the magnet has a constant velocity. In this study we did not use dipole approximation because this approximation is useful when the distance of magnet and pipe is more than 3 cm. Although this problem is solved completely with Maxwell's equations, we have simplified it and achieved satisfactory results.

1-Robert Kingman, S. Clark Rowland, and Sabin Popescu /An experimental observation of faraday's law/Am. J. Phys., Vol. 70, No. 6/13 June 2001
2-Frank j. Blatt ,Principles of Physics Vol.3 Inducing Magnetic Field
3-Eric r. Laithwaite, linear Electric Machines- A Personal View
4-"Parcours pédagogique — Ampère et l'histoire de l'électricité". CNRS, July 31, 2012.

28. MODE INVISIBILITY TECHNIQUE - A QUANTUM NONDEMOLITION MEASUREMENT FOR LIGHT

Marvellous Onuma-Kalu
Department of Physics and Astronomy, University of Waterloo ON, Canada

A quantum measurement of an observable of a system to acquire information about its state must change the system thereby adding excessive backaction noise effects to the system. This makes it difficult to repeat a measurement on the same measured observable. A simple example is the measurement of the photon distribution of an electromagnetic (EM) field using a photodetector. Photodetectors absorb incoming photons subjected to them, converting their energy into an electrical signal and destroying the field state in the process. Such excess destruction is not fundamental. Through a careful selection of measurement device, preparation of quantum states, and interaction model, one can indeed measure the photon number of an EM-field without destroying the field state. This is known as quantum non-demolition (QND) measurement.

In an optical QND measurement, a measuring device and the system to be measured interact weakly via a selected Hamiltonian and a correlation is established between the two systems. The weak interaction ensures that the object to be measured remains unperturbed during and after the interaction process. Although a QND measurement scheme leaves the state of a quantum system unchanged, and accessible for future measurement; information acquired from the quantum state itself is reduced due to a weak interaction between the probe and measurement object. This lead to the questions: 1) "How weak can we make the interaction between the probe and system, such that minimization of the system's perturbation is achieved without canceling the information gained in the quantum system?" 2) "What kind of measurement scheme do we have in mind?" We could consider any sort of atomic interferometer that yields information about a quantum system with high sensitivity.

With the production of cavities having high quality (High-Q) factor that are able to sustain photons for a long damping time, it is possible to detect in a non- demolition way, single photons without destroying the field state. A remarkable QND measurement scheme that counts photons trapped in a high-Q factor microwave cavity without destroying them has been reported. The detector in the form of a

beam of highly excited Rydberg atoms evolve into a superposition of two distinct atomic states and was made to interact non-resonantly with the relevant field mode. The non-resonant interaction ensures a non-demolition of the field state. However a shift in the atomic gap proportional to the photon number is observed that is measurable using a Ramsey atomic interferometer. We pursue the same objective of this scheme to improve the amount of information obtainable from the system. Our method involves establishing a resonant interaction between the detector and light field. Although a resonant interaction results in a larger phase shift gain, however, it increases the perturbation experienced by the field system, thereby jeopardizing the idea of a QND measurement. Fortunately one can take advantage of the spatial distribution of the field modes in order to minimize the effect of the resonant mode on the transition probability and still have a strong contribution to the phase. To this end, we proposed the 'mode invisibility' technique that minimizes the effect of resonant interaction while optimizing the phase shift gain. We show that we obtain a very good resolution to measure photon population differences between two given Fock states by means of atomic interferometry. Our method is robust and applicable to detect in a non-demolition way, the parameters that characterize a family of Gaussian state such as coherent state and squeezed coherent state respectively.

29. QUANTUM EXPERIMENTS AT SPACE SCALE, QUESS

Thomas Scheidl, Rupert Ursin, Matthias Fink, Johannes Handsteiner, Nina Fleischmann, Ana Rodríguez.
Institute for Quantum Optics and Quantum Information (IQOQI)
Austrian Academy of Sciences, Boltzmanngasse 3, A-1090 Vienna Austria

Besides a classical channel, like the internet, a quantum channel can be used for key sharing, known as Quantum Key Distribution (QKD). In such a quantum link, classical bits are replaced by Qbits. Those Qbits can be realized with the polarization state of single photons. Nowadays fiber-based QKD-systems are well developed and already available at the market. Nevertheless losses and decoherence in fibers restrict such systems to distances of 100- 200km. Developing a quantum link from the Earth to a satellite allows extending these links to global distances. A collaboration project between the Chinese Academy of Science and the Institute for Quantum Optics and Quantum Information (IQOQI) from the Austrian Academy of Science, with the title Quantum Experiments at Space Scale (QUESS), works on establishing such a link for the very first time.

A Chinese satellite will be equipped with photon sources while the task of IQOQI is to provide Optical Ground Stations (OGS) in Europe to be utilized as receiving stations for the single photons. The satellite will feature two different photon sources, both encoding information in the polarization degree of freedom of the photons, such that it is possible to demonstrate quantum communication protocols and investigate fundamental questions of nature. Therefore, control over the polarization transformations in the channel and in the OGS is of utmost importance.

Up to now we have investigated one of the OGS included in the project, which is placed in Graz (Austria). We have equipped the telescope with a single-photon polarimeter module. To characterize the link we have sent photon pulses with well-defined polarization to the receiving telescope over a corner-cube-reflector mounted on a telecommunications tower approx. 3km away.

30. A WAVELENGTH SPACING SWITCHABLE HIGH-BIREFRINGENCE FIBER LOOP MIRROR FOR MULTIWAVELENGTH FIBER LASER

Yu Wan[1] and Li Wei[1,2]
[1]*Department of Physics and Computer Science, Wilfrid Laurier University, Waterloo, ON N2L 3C5, Canada*
[2]*Department of Physics and Astronomy, University of Waterloo, ON N2L 3C5, Canada*
**lwei@wlu.ca*

The generation of multi-wavelength fiber lasers is of great interest due to their potential applications in optical signal processing, optical testing, optical fiber sensing, and wavelength division multiplexed (WDM) optical communication systems. Different approached have been demonstrated to obtain multiwavelength operation; however, the wavelength spacing is fixed. In this work we proposed and experimentally demonstrated a wavelength spacing switchable multiwavelength fiber ring laser. The wavelength spacing tunability of the multiwavelength laser is achieved by implementing a periodic fiber

loop mirror with three sections of high-birefringence fibers. The fiber laser with increased flexibility on wavelength spacing shall be useful for numerous applications.

31. RECENT PROGRESS ON PHYSICS RESEARCH OF LASER FUSION IN CHINA

Shao-ping Zhu
Institute of Applied Physics and Computational Mathematics P. O. Box 8009, Beijing 100088, China
E-mail address: zsp@iapcm.ac.cn

Nuclear fusion is the energy source of stars and has been studied by scientists in many countries of the world for about five decades. Laser fusion is one of the approaches to nuclear fusion. The main key physical issues for laser fusion are laser plasma interaction, laser–to–x–ray energy coupling, implosion symmetry, hydrodynamic instabilities, mixing and nuclear reaction dynamics. All of these key problems are complicated and interesting. Computer simulation is a powerful tool to get insight into the physics of these key issues. In the present poster, the main computer simulation codes used for laser fusion physics research will be introduced and some of simulation results will be shown. Since the beginning of the century, a number of physical experiments have been done at Shenguang-II laser facility and Shenguang-III prototype laser facility. Also some of experiment results will be given in the poster.

CONDENSED MATTER
STRUCTURAL, MECHANICAL AND THERMAL PROPERTIES

32. DEFORMATION-INDUCED STRUCTURAL TRANSITION IN BODY-CENTERED CUBIC MOLYBDENUM

Manling Sui
Institute of Microstructure and Property of Advanced materials, Beijing University of Technology, Beijing 100124, P.R. China
Email address: mlsui@bjut.edu.cn

Molybdenum is a refractory metal that is stable in a body-centred cubic structure at all temperatures before melting. Plastic deformation via structural transitions has never been reported for pure molybdenum, while transformation coupled with plasticity is well known for many alloys and ceramics. Here we demonstrate a structural transformation accompanied by shear deformation from an original <001>-oriented body-centered cubic structure to a <110>-oriented face-centered cubic lattice, captured at crack tips during the straining of molybdenum inside a transmission electron microscope at room temperature. The face- centered cubic domains then revert into <111>-oriented body-centered cubic domains, equivalent to a lattice rotation of 54.7°C, and ~15.4% tensile strain is reached. The face-centered cubic structure appears to be a well-defined metastable state, as evidenced by scanning transmission electron microscopy and nanodiffraction, the Nishiyama–Wassermann and Kurdjumov–Sachs relationships between the face-centered cubic and body- centered cubic structures and molecular dynamics simulations. Our findings reveal a deformation mechanism for elemental metals under high-stress deformation conditions.

References

[1] S.J. Wang, H. Wang, K. Du, et al., Nature Communications, **5:3433** DOI:10.1038/ncomms4433 (2014)

33. PHOTOELECTRIC EFFECT OF SILICON QUANTUM DOTS

Shu-Fen Hu
Department of Physics, National Taiwan Normal University, Taipei, 116, Taiwan
e-mail: sfhu.hu@ntnu.edu.tw

Low-dimensional silicon materials have been attracting more and more attention to seek visible luminescence for Si optoelectronic applications, such as single electron transistor, light emitting diode, and solar cell devices. In this work, silicon quantum dots (QDs) in silicon nitride/silicon superlattice structures (SN/Si-SLs) were fabricated on the silicon substrates with different deposition times of silicon by low pressure chemical vapor deposition system. Transmission electron micrographs demonstrated that silicon QDs were formed in SN/Si-SLs. The photoluminescence (PL) peaks change with the deposition time of silicon layers at room temperature and was analyzed with 1931 CIE position chromaticity diagram for color determination. The explanation for the light emission from these as-grown films is due to the three-dimensional quantum confinement of carriers recombining radioactively in this kind of Si nanocrystals embedded in nitride material. A simple model of gap state was built to explain the PL mechanism of silicon nitride/silicon thin film.

The organizing light harvesting nanostructures which are based on a p^+-i-n^+ cell structure, includes a multi-quantum-dot (QD) layers in the intrinsic region of the structure, so that they efficiently absorb light in the visible and near infrared region, and transport electrons within the films. The cell parameters obtained were an open-circuit voltage *V*oc of 500 *mV*, short-circuit current *J*sc of 41 *mA cm*$^{-2}$, fill factor FF of 51.2%, and conversion efficiency of 10.69% from two layers of Si QDs embedded in 9 nm thickness of Si_3N_4.

Acknowledgement: This work was partially supported by the National Science Council (NSC 100-2112-M-003-009-MY3), National Nano Device Laboratories in Taiwan and National Taiwan Normal University.

34. TITLE: EXTRUSION OF A VORTEX LATTICE

Jonathan Watkins & Nicola Wilkin
University of Birmingham, UK

We present an unconventional metallurgy of the flowing vortex lattice that allows for a reduction in density by up to an order of magnitude whilst still remaining crystalline. Flow of the resultant non equilibrium steady state is facilitated by two distinct populations of dislocations. One that relaxes shear stresses at the boundary whilst the other relaxes density.

CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETICS AND OPTICAL PROPERTIES

35. NUMERICAL STUDIES OF OPTICAL PROPERTIES OF TOW ASSEMBLED GOLD-CORE/POLYMER-SHELL NANOPARTICLES IN DIELECTRIC MEDIUM

A. Akouibaa, A. Derouiche, H. Ridouane, A. Bettachy, F. Benzouine
Laboratoire de Physique des Polymères et Phénomènes Critiques/ Faculté des Sciences Ben M'sik-Université Hassan-II- Mohammedia.

Recently, the polymer modified gold nanoparticles have showed much potential in advanced materials. In fact, metal nanoparticles, especially gold, silver and copper nanoparticles, have been extensively investigated over the past decade due to their unique electronic, optical and catalytic properties. These properties are neither those of bulk metal nor those of molecular compounds as have been widely demonstrated in both experimental and theoretical investigations, but they strongly depend on the particle size, shape of the nanoparticles, and interparticle distance as well as the nature of the protecting organic shell. In this work we have used the finite element method (FEM) for the calculation of effects of coupling on the plasmonic resonances of the gold -core/polymer -shell nanospheres. Several plasmonics structures have dimensions much smaller than the wavelength of the incident light. Under these conditions, retardation effects are negligible and the field distribution problem then reduced to solve Laplace's equation. The study is performed for various possible configurations of two coated gold nanoparticles (GNPs) when they are aggregating in dielectric medium. The numerical results that we have obtained show that the absorption spectrum of coupled coated-GNPs is depending to the polymer-shell thickness, the nature of the polymer constituting the shell and the gold -core radius. When the shell thickness of a core/shell particle is decreased, the surface plasmon resonance (SPR) shifts to longer wavelengths. This red shift is accompanied by an increase in peak intensity where the two GNPs are parallel or randomly oriented relative to the direction of applied electric field . The obtained results also show that, when the polymer-shell permittivity or the gold-core radius increases, the SPR peak position is strongly red shift and its amplitude increases.
Keywords—coated gold nanoparticles, polymers shells optical properties, surface plasmon resonance, finite element method

36. PHONONIC CRYSTAL WAVEGUIDES IN GAAS

Golnaz Azodi and James Stotz
Department of Physics, Engineering Physics & Astronomy, Queen's University, Kingston, Ontario, Canada

Compare to photonic crystals which can be used to manipulate light, phononic crystals (PnCs) with inclusions in a lattice can be used to manipulate sound. While trying to propagate in a periodically structured media, acoustic waves may experience geometries in which propagation forward is totally forbidden, but they can also be confined or constrained to follow complicated routes, on a wavelength scale. Using advanced methods in fabrication technology, we aim to implement these features to control surface acoustic waves (SAWs) propagation on the piezoelectric surface and eventually interact SAWs with quantum struc- tures. We create SAWs by applying an oscillating radio frequency (RF) signal to an interdigital transducer (IDT) patterned on GaAs while there are differ- ent phononic crystal structures present in between a pair of transducers. PnC designs for this study are periodic structure of shallow air holes etched into the surface of GaAs. FDTD simulation shows evidence of SAW waveguiding in such PnCs. Our goal is to design and fabricate a PnC to propagate guided modes along the channel, while the non guided modes would eventually be dissipated. A scanning Sagnac interferometer is used to map the energy density of the SAW along the waveguide to correlate with theoretical simulation. The Sagnac inter- ferometer is designed to measure the outward displacement of a surface due to the SAW.

37. QUALITY FACTOR OF SUPERCONDUCTING MICROWAVE FILTERS

Claudia Berkmann[1], Lukas Prochaska[1], Wolfgang Lang[1], Johannes D. Pedarnig[2]
[1]University of Vienna, Faculty of Physics, Electronic Properties of Materials, Boltzmanngasse 5 , A-1090 Wien, Austria
[2]Johannes-Kepler-University Linz, Institute of Applied Physics, Altenbergerstrasse 69, A-4040 Linz, Austria

The low surface impedance of superconductors allows for the fabrication of microwave bandpass filters with very sharp resonances. Using high-T_c cuprate superconductors (HTS) relaxes the cooling requirements substantially. The prototypical HTS $YBa_2Cu_3O_7$ (YBCO) with its critical temperature of about 92 K can be operated by cooling with liquid nitrogen and is, thus, especially interesting for technical applications. We examine the power handling capability of YBCO microwave filters by analyzing the resonance curves as a function of the microwave input power. Our samples were produced by patterning a microstrip dipole resonator into a YBCO thin film on a sapphire (Al_2O_3) substrate and compared to copper filters of the same geometry. We found that the quality factor of the YBCO filters in the superconducting state is about 25 times better than that of the copper filter. At high microwave input power, the YBCO filter exhibits a decrease of the quality factor due to high edge current densities.
Work supported by the COST Action MP-1201 “Nanoscale Superconductivity: Novel Functionalities through Optimized Confinement of Condensate and Fields”

38. SYNCHROTRON CHARACTERIZATION OF FUNCTIONAL TIN DIOXIDE NANOWIRES

Evelina Domashevskaya, Olga Chuvenkova, Sergey Turishchev
Voronezh State University, 394006, Voronezh, Universitetskaya pl.1., Voronezh, Russia, e-mail: ftt@phys.vsu.ru, tel./fax: +7 473 2208363

Tin oxide crystalline nanowires attract presently enormous attention. They are characterized by high surface to volume ratio and cover gas-sensing, memory and light emitting devices technology applications. Non-destructive techniques that are sensitive to the local atomic environment in surface nanolayers are highly informative and really demanded for characterization of this kind of materials. Samples modifications, spectroscopy and microscopy measurements were performed at the Russian-German Beamline of the Helmholtz Zentrum Berlin BESSY II storage ring (Berlin, Germany) and at the SRC synchrotron radiation facility (University of Wisconsin Madison, Stoughton, USA).
Obtained data demonstrated that binding energies values for the references we used have the tendency to grow up with the increase of the oxidation degree. Oxide that observed at the nanowires surface is similar to the one covering reference metallic tin foil. For the first time the M4,5 absorption edge of pure metallic tin is registered for the reference sample after in-situ mechanical removing of the native oxide. This allowed to clearly divide the absorption edge of metallic tin states and the "defect" pre-peak observed in a gap near the absorption edge of SnO_2 by their shape and energy position. This pre-peak is mostly like caused by oxygen vacancies states that exists over the surface layer and is observed for reference samples and studied wires.
Spectromicroscopy technique proved to be effective for characterization after wire-like crystals sedimentation onto prepared substrates since sharp images were registered for separated nanowire for the first time. Nevertheless samples surface nonuniformity after sedimentation can be a serious obstacle that did not allow to extract spectroscopic information from the separated SnO_2 wire at the microscopic level.
The work was supported by the Ministry of Education and Science of Russia in frameworks of state task for higher education organizations in science for 2014-2016. Projects 757 and 1606. This work is based in part upon research conducted at the Synchrotron Radiation Center, University of Wisconsin-Madison which is supported by the National Science Foundation under award No. DMR-0537588.

39. CHARACTERIZATION AND DETERMINATION OF CATECHINS IN GREEN TEA LEAVES USING UV- VISIBLE SPECTROMETER

Bekele T. Erko
Ethiopia

In this research paper, characterizations of pure major catechins and method for determination of total catechins in green tea leaves have been reported using UV-visible spectrometer. The optical transition properties of Epigallocatechin Gallate (EGCG) and Epicatechin Gallate (ECG) in water, methanol, ethanol, acetonitrile and Epigallocatechin (EGC) and Epicatechin (EC) in water were measured. The results show that, EGCG has highest molar decadic absorption coefficient in methanol than in the other solvents. ECG has the highest absorption cross-section, transitional dipole moment, and oscillator strength of all the catechins in water. On the other hand, EGC has the least optical transition properties of all the catechins in water. After characterization of the electron transition, a method was developed for UV-Visible determination of total catechins. Using the developed method, the content of total catechins in Ethiopian and Sri Lanka green tea leaves at room temperature was determined. The result of the experiment indicates that, Ethiopian green tea leaves has the greater total catechins (17 ± 0.01) % than Sri Lanka green tea leaves (7.17 ± 0.12) %.

40. A COMPARATIVE STUDY OF OPTICAL TRANSMISSION IN THE LIQUID CRYSTAL CELLS FOR DISPLAYS AND OPTICAL SENSORS

Nazish Fatima[1] Afshan Dabeer[2], Sara Akhter[3]
Federal Urdu University Of arts Sciences and Technology, St.Joseph's College for women Karachi
Nazish.fatima@gmail.com, afshandabeer@gmail.com

The work in discussion have been done for the better use and improvement of optical transmission in the liquid crystal cells for displays and optical sensors using doping techniques and adding impurities to LC's i.e Nano particles and azo-dyes. The methods are used to enhance the optical properties as well as electrical properties of LC's, keeping the ratio of tilt angle in consideration, HeNeon laser have been used for experimental optical transmission along with the photo induced alignment by UV source and white light . Experiments, both with azo-dye- doped polymers and with addition of Nano particles as impurities, show that the alignment of a LC at the interface is significantly modified when the polymer is in contact with the LC during illumination. Also the light intensity needed to align the director of the LC in the dye-doped LC cells was found to be extremely small energy densities sufficient to write both high-resolution holographic gratings and binary images.

41. STUDIES IN INTERFACE EFFECTS ON THE STRUCTURE AND PROPERTIES OF MANGANITE THIN FILMS.

Yaqing Feng, Kui-juan Jin, Wenjia Zhou, Cong Wang, Rui-qiang Zhao
Beijing national Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing, China

The interface of manganite oxides provides us both opportunities and challenges, and many fundamental phenomena near the interfaces remains to be understood for operating magnetic tunnel junctions. In our study, we have performed a systematic study on the structure and physical properties of the La0.8Sr0.2MnO3(LSMO) thin films on the SrTiO3(STO) substrates in order to gain more information on the important issues such as the thickness dependent of the Curie temperature or the origin of the dead layer. We have demonstrated that by obtaining a single-terminated, atomically smooth substrate surface and using the optimized growth conditions, the transport properties of the LSMO thin films can be greatly enhanced, for example the insulator-to-metal transition temperature Tp is 335 K for a 30u.c. LSMO thin film and it exceeds 320K which is the Tp of a bulk LSMO. These results confirm that structural defects and dislocations near the interfaces is a key factor that suppresses the ferromagnetic order near the interface. In addition, recent enhancement of aberration-corrected STEM has enabled us to identify the behaviors of light atoms like oxygen as well as to obtain the EELS element maps. Using this powerful tool, we have investigated the crucial role played by the oxygen vacancy near the interface.

42. ALGAINP LIGHT-EMITTING DIODES WITH SACNTS AS CURRENT-SPREADING LAYER

X. Guo[a], C. W. Guo[a], Y. H. Jin[b], Y. Chen[a], Q. Q. Li[b], S. S. Fan[b]
[a]*School of Electrical Information and Control Engineering, Beijing University of Technology, Beijing 100124, China*
[b]*Department of Physics and Tsinghua-Foxconn Nanotechnology Research Center, Tsinghua University, Beijing 100084, P. R. China*

Transparent conducting current-spreading layer is important for the quantum efficiency and thermal performance of light-emitting diodes (LEDs). The demand for tin-doped indium oxide (ITO) caused the price greatly increasing. Super-aligned carbon nanotubes (SACNTs) and Au-coating SACNTs as current-spreading layer were applied on AlGaInP LEDs. The LEDs with Au-coating SACNTs showed good current spreading effect. The voltage bias at 20mA dropped about 0.15V and the optical power increased about 10% compared with the LEDs without SACNTs.

43. A NEW METHOD FOR FABRICATION OF THE HIGH QUALITY SURFACE NANOSCALE AXIAL PHOTONICS MICRORESONATORS

Tabassom Hamidfar and Pablo Bianucci
Department of Physics, University of Concordia, Canada

In the last decade, an important goal in the research and development of optoelectronic devices has been to build micro-scale devices for trapping and slowing light Silica-based whispering gallery modes (WGM) resonators have become favored because of their low losses, very high quality factors, and ease of fabrication. Surface Nanoscale Axial Photonics (SNAP) devices are a new generation of WGM microresonators, which consist of an optical fiber with nanoscale variations of its radius.

Here, we present a new fabrication method of SNAPs that uses a regular hydrogen- oxygen torch. While current methods work very well, they require equipment that might not be easily available, such as carbon dioxide lasers, and is not needed by our technique. We characterize our SNAP with evanescent spectroscopy where the excitation source is a tapered optical fiber. A typical transmission response of a fabricated SNAP is shown in Fig. I. It shows a collection of resonant modes, with some displaying very high quality factors. For instance, peaks (ii) and (iii) show quality factors of 8.6×10^5 and 8.3×10^5, respectively. Due to the very low losses, optical non-linear processes (such as those caused by the thermo-optic effect) are enhanced. Signatures of the non-linear thermal processes can be seen in modes (i) and (iv). This shows that SNAPs fabricated with hydrogen-oxygen torch have the potential to host very low loss resonant modes with significant thermal non-linear effects.

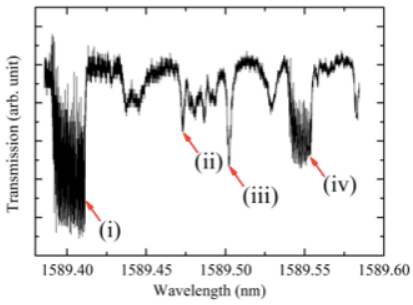
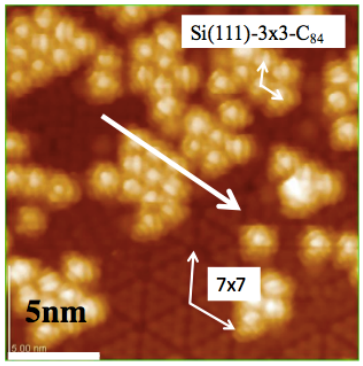


Fig. 1: The normalized transmission response of the fabricated SNAP.

44. PROBING CHARACTERISTICS OF SI(111) SURFACE WITH EMBEDDED FULLERENE MOLECULES VIA SCANNING PROBE MICROSCOPY

Mon-Shu Ho[*a, c], Chih-Pong Huang[a], Wan-Sheng Su[b] and Chih-Chuan Su[a]
[a]*Department of Physics, National Chung Hsing University, Taichung 402, Taiwan*
[b]*National Center for High-Performance Computing, Tainan 741, Taiwan*
[c]*Institutes of Nanoscience, National Chung Hsing University, Taichung 402, Taiwan*
msho@dragon.nchu.edu.tw

A monolayer of fullerene molecules on Si(111) surfaces is fabricated in an ultrahigh vacuum chamber through a controlled self-assembly process. The characteristics of self-assembled Si(111) surfaces, including supramolecular structures, electronic density of states, the quantum confinement effect, field emission features, and optoelectronical properties with embedded C84 are determined by the use of an ultrahigh vacuum scanning probe microscope. The results revealed that such a silicon surface with embedded C84 has a wide band gap of ~3.4eV, high emission efficiency and low turn-on voltage, all of which are crucial to nano-electronics, optoelectronics, and the fabrication of semiconductor carbide. The measured data derived from photoluminescence emission experiments further confirm the corresponding band gap value obtained from I-V curves. The theoretical results from first-principles calculations for the field enhancement factor are compared with experimental measurements.



STM images with analysis of profile of Si(111)-3x3-C84 super-lattice surface on self-assembled surfaces

Reference

[1] C. P. Huang, C. C. Su, W. S. Su, C. F. Hsu, M. S. Ho, *Appl. Phys. Lett.*, 2010, **97**, 0.3 061908-061910.

45. EFFECT OF RU DOPING ON ELECTRONIC TRANSPORT PROPERTIES IN J_{EFF}=1/2 MOTT INSULATOR SR_2IRO_4

Y. J. Hong[1], Hwan Young Choi[2], Nara Lee[2], Young Jai Choi[2], Y. J. Jo[1]
[1]*Department of Physic, Kyungpook National University, Daegu 702-701, Korea*
[2]*Department of Physics and IPAP, Yonsei University, Seoul 120-749, Korea*

Sr_2IrO_4 is a fascinating compound to understand physical properties of J_{eff}=1/2 Mott insulator. These novel properties are based on strong spin-orbit coupling(SOC) which is not easy to be seen in the 3d and 4d transition metal oxides. Electronic and magnetic properties of Sr_2IrO_4 can be changed by a lot of factors such as applying strain or doping other elements. In this study, we measured the electronic transport properties of Sr_2Ir_1-xRu_xO_4 derived from the effects of doping Ru element. With controlling the polar angle(q) along the c-axis, the anisotropy of resistivity was observed between the out-of-plane and the in-plane direction. In addition, the different trends of angle dependent magnetoresistance(AMR) were observed depending on concentration of Ru doped. With increasing Ru concentration up 10%, both magnetic transition temperature and degree of AMR were reduced.

46. LONG RANGE ELECTRON-ELECTRON INTERACTIONS IN GRAPHENE MAKE ITS ELECTRODYNAMICS NONLOCAL

Hsien-chung Kao
Physics Department, National Taiwan Normal University, Taipei 11677, Taiwan

Graphene, a one layer thick hexagonal array of carbon atoms, when undoped, exhibits a curious mixture of properties pertinent to either metals or insulators. On the one hand, despite near absence of both charge carriers and impurities, it has a finite conductivity like a metal. On the other hand, the Coulomb interaction between electrons is unscreened like in a dielectric and hence is long range. The chemical potential is pinned right between the conical valence and conduction bands causing quasiparticles to move like massless relativistic particles. We demonstrate that the electrodynamics of graphene exhibits nonlocality on a macroscopic level due to the combination of the long-range interactions and the linear dispersion relation. The frequency and wave vector **k** dependent conductivity tensor, in addition to a local pseudo-Ohmic part $\sigma_T\delta_{ij}$, a nonlocal contribution $\sigma_{nl}k_ik_j/k^2$. While the coefficient of the local part is $\sigma_T \approx e^2/(4\hbar)$, the coefficient of the nonlocal part is proportional
to the Coulomb interaction strength $\alpha, \sigma_{nl} = \sigma_T\alpha$. This leads to several remarkable effects is transport and optical response. In particular, resistance of the grapheme
flake depends on the location and the geometry of source, drain and probes. A voltage perpendicular to the current appears in a time-reversal symmetric situation and the polarization of reflected and transmitted light is modified, without either the magnetic field (like in Faraday effect) or anisotropy.

47. SPRAY PYROLYSIS DEPOSITION OF CU-ZNO AND ZN-SNO2 FOR SOLAR CELLS

A. Khelfane, B. Sebboua, H. Zerrouki, N. Kesri
Univ. of Sci. & Tech.of Houari Boumediene (U.S.T.H.B.), Faculty of Physics, Semiconducting Materials &Metal Oxides Lab. (LSMMO), BP.32, El-Alia, Algiers, Algeria

Currently, most photovoltaic solar cells are based on silicon p-n junctions. However since the prototype of a dye-sensitized solar cell (DSSC) was reported in 1991 by O'Regan and Gratzel [1] with photoelectric conversion efficiency of 11% [2], many research groups have been focused on the improving the photocurrent and photovoltage by developing new organic- inorganic solar cells. Large gap metal oxides like titanium, tin and zinc oxides have attracted great interest because of their remarkable potential in the DSSC and their low cost and simple preparation procedure. Recently, people are pursuing some new materials for replacing the widely used TiO2 in order to avoid its limitations and agree in that Zn2SnO4 (ZTO) is a promising material for DSSCs [3]. In DSSCs, the recombination of the photo-excited electrons with the electrolyte ions is one of the principal factors that limits the photocurrent quantum efficiency and to some extent the open circuit photovoltage Voc. For suppressing the recombination, one way is the formation of heterojunction between two oxides as SnO2 and ZnO, undoped or suitably doped. By coupling these different semiconductor oxides, more efficient spatial separation of photogenerated charges appears and it result decrease of recombination. In this work, several Zn-SnO2 and Cu-ZnO thin films are sprayed as electrodes for dye sensitized solar cells (DSSC). The preparation of cells comprises the following steps: a tin oxide (TO) thin film, acting as transparent and conducting electrode (TCO), is deposited on glass by spray and characterized, followed par a zinc-tin oxide (ZTO) or copper-zinc oxide (CZO) film. Then, a layer of nanoporous TiO2 was done with the doctor blade method and the TiO2-particles are sensitized with an eosin aqueous solution. For the counter electrode, a thin film of carbon is past on SnO2 TCO glass. An electrolyte based on I- /I3- solution is injected on the TiO2-particles before sealing.

REFERENCES

[1] O'Regan B, Gratzel M. Low-cost high-efficiency solar cell based on dye-sensitized colloidal TiO2 films. Nature, 1991, 353, 737—740
[2] Gratzel M. Solar energy conversion by dye-sensitized photovoltaic cells. Inorg Chem, 2005, 44, 6841−6851
[3] Seok-Soon Kim, Jun-Ho Yum, Yung-Eun Sung, Improved performance of a dye- sensitized solar cell using a TiO2/ZnO/Eosin Y electrode, Solar Energy Materials & Solar Cells, 2003, 79, 495–505

48. EFFECTS OF MAGNETIC FLUX IN AN S-$S_{\pm}$ SUPERCONDUCTING LOOP

Rosa Rodriguez Mota*, Tami Pereg-Barnea and Erez Berg
*McGill University, Canada

Determining the symmetry of the superconducting order parameter in iron based superconductors is a key step to understand the microscopic origin of the superconducting phase in these materials. Shortly after their discovery, their superconducting mechanism was proposed to be spin fluctuations. The resulting order parameter, known as $s_{\pm}$, changes sign between the hole and electron pockets of the Fermi surface. One of the experiments that provide evidence in favour of this pairing symmetry is the measurement of half integer flux quantum transitions in an Nb-$NdFeAsO_{0.88}F_{0.12}$ composite loop [1]. In order to provide a better understanding of how the results from this experiment are related to the $s_{\pm}$ pairing symmetry, we study the effect of magnetic flux in a superconducting loop composed of an s-wave and an $s_{\pm}$ superconductor. Our results show that the internal sign difference of the $s_{\pm}$ superconductor may lead to an unconventional energy vs flux relation with minima at flux values different than integer flux quantum.

References

[1] C.-T. Chen, C. C. Tsuei, M. B. Ketchen, Z.-A. Ren, and Z. X. Zhao. Integer and half-integer flux-quantum transitions in a niobium-iron pnictide loop. *Nature Physics*, 6(4):260–264, 2010.

49. GE:MN DILUTE MAGNETIC SEMICONDUCTOR

L.Obied[1], S. Roorda[2], D.A.Crandles[1]
[1]*Department of Physics, Brock University, St. Catharines, ON, Canada*
[2]*Department of Physics, University of Montreal, Montreal, QC, Canada*

The synthesis of Dilute magnetic semiconductors (DMS) has attracted great interest because of the potential application of these materials in spintronics. DMS can be fabricated by alloying semiconductors with magnetic transition metal elements (TM), such as Mn. However, the concentration of TM needed to realize the ferromagnetic order in a semiconductor is still hard to achieve because of the low solid solubility of TM in semiconductors. Non-equilibrium methods, such as low temperature Molecular Beam Epitaxy (MBE) and ion implantation, have been suggested to increase the solubility of TM in a semiconductor host .

The aim of this work is the synthesis of Ge:Mn DMS and study the fundamental origin of ferromagnetism in this system. Using ion implantation, a single crystal Ge wafer was doped with magnetic Mn2+ ions at 77 K. A superconducting quantum interference device (SQUID) was used to investigate the magnetic properties of three samples. Pure Ge exhibited diamagnetic behaviour. The magnetic measurements of the amorphous implanted sample showed a Curie paramagnetic behaviour at low temperature which can be explained by the localized magnetic moments. However, The field-dependent magnetization of the implanted and annealed sample exhibits magnetic Hysteresis at 5K and 200 K indicating the existence of some FM phases in the sample after annealing.

50. GRAPHENE-SILVER NANOWIRE HYBRID STRUCTURE AS A TRANSPARENT AND CURRENT SPREADING ELECTRODE IN ULTRAVIOLET LIGHT EMITTING DIODES

Tae Hoon Seo, Ah Hyun Park, Gun Hee Lee and Eun-Kyung Suh*
School of Semiconductor and Chemical Engineering, Semiconductor Physics Research Center (SPRC), Chonbuk National University, Jeonju 561-756, Korea, Email:eksuh@jbnu.ac.kr

The indium tin oxide (ITO) layer has appeared to be increasingly problematic due to limited transparency in the ultra-violet (UV) region. However, graphene has been attracting much attention owing to its physical properties such as a high intrinsic mobility and high transparency in the UV ranges [1]. Even though graphene has a high mobility and excellent optical transmittance in the UV wavelength region, the adoption of bare graphene on *p*-GaN for transparent and current spreading electrode (TCSE) of UV-light emitting diodes (UV-LEDs) gives rise to problems such as a large turn on voltage, low hole injection efficiency toward active region, severe current crowding under a *p*-metal electrode, and heat generation because of its high sheet resistance [2]. To this end, Ag nanowires (AgNWs) have attracted significant attention because of their advantages in materials properties such as low sheet resistance and high optical transmittance at UV wavelength region [3]. However, disadvantages of AgNWs film such as a

long-term stability issue, typical high nanowire-nanowire junction resistance, and the poor adhesion to substrate, have limited application as a TCSE material in UV-LED device.

We report a device that combines graphene film and AgNWs as TCSE for UV-LEDs, grown on sapphire substrate by metal organic chemical vapor deposition (MOCVD), as shown in Fig. 1(a). The current-voltage (I-V) characteristics and electroluminescence (EL) performance show that graphene network on AgNWs well-operates as a transparent and current spreading electrode in UV-LEDs devices due to the reduced sheet resistance and the effective current spreading. This results show that graphene network on AgNWs can provide efficient current diffusion pathways and are able to provide injected current to the active junctions of UV-LEDs through *p*-GaN layer.

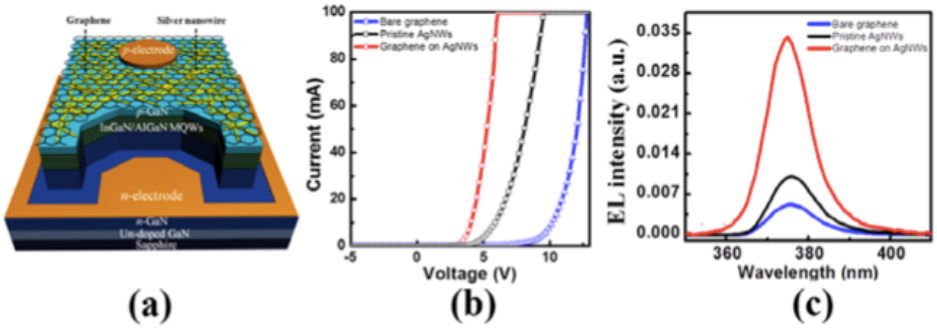


Fig. 1. (a) Schematic diagram of fabricated InGaN/AlGaN MQWs UV-LED with Ag nanowire-graphene hybrid structure as the TCSE. (b) I-V characteristics and (c) EL spectra UV-LEDs with various TCSEs.: Bare graphene film, Pristine AgNWs, and graphene on AgNWs.

References:
[1] K. S. Kim, Y. Zhao, H. Jang, S. Y. Lee, J. M. Kim, K. S. Kim, J. H. Ahn, P. Kim, J. Y. Choi, and B. H. Hong, Nature 457, 706 (2009).
[2] T. H. Seo, B. K. Kim, G. Shin, C. Lee, M. J. Kim, H. Kim, and E.-K. Suh, Appl. Phys. Lett. 103, 051105 (2013).
[3] S. Coskun, E. S. Ates, and H. E. Unalan, Nanotechnology 24, 125202 (2013).

51. MODE MANIPULATION AND NEAR-THZ ABSORPTIONS IN BINARY GRATING-GRAPHENE LAYER STRUCTURES

Xiudong Sun, Haiming Yuan, and Pengzi Liu
Department of Physics, Harbin Institute of Technology, 92 West Dazhi Street, Harbin 150001, China. xdsun@hit.edu.cn

Absorption properties of gratings coupled graphene surface plasmons were studied. It was found that a mode excitation was mainly decided by incident frequency and duty ratio of gratings and there is a strong absorption in near-THz range.

52. NANOSCALE MICROSTRUCTURE EFFECTS ON HYDROGEN BEHAVIOUR IN RAPIDLY SOLIDIFIED ALUMINIUM ALLOYS

Iya I. Tashlykova-Bushkevich
Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus

A key breakthrough in hydrogen embrittlement (HE) studies in Al-based systems is considered to be nanoscale and sub-micrometer characterization of their local composition and structure accompanying H measurements. While embrittlement mechanisms remain controversial regarding Al alloys of commercial interest as liner materials for efficient storage of compressed hydrogen gas, it should be highlighted that up to date there is a lack of detailed understanding of H behaviour in aluminium materials prepared at exceptionally high cooling rates. Therefore advanced rapidly solidified processing technique provides a renewed stimulus to developing a deeper mechanistic understanding of hydrogen/microstructure interactions in high strength Al alloys aimed to govern HE susceptibility of Al alloys in energy technologies.

This work presents an overview of our recent results on diffusion and trapping of hydrogen with emphasis on nano-scale microstructural evolution in rapidly solidified (RS) Al-based alloys. Application of scanning photoelectron microscopy (SPEM) using synchrotron radiation and ion beam analysis (IBA) techniques in a complementary way provided direct observations of the microstructure evolution and depth profiling of the elemental composition with nanoscale precision in the RS alloys. Thermal desorption spectroscopy (TDS) was employed to reveal hydrogen trapping in the specimens regarding alloy composition.

It was found that hydrogen behaviour in RS Al alloys is strongly affected by microstructural features available due to rapid solidification and represents the trapping of hydrogen at least at four states associated with alloying element atoms, vacancies, dislocations and voids. The IBA analysis accomplished by SPEM enables the evaluation of how solute atoms interact with lattice defects at microscopic scale, as shown in Fig., clarifying the role of alloying elements in H−nanostructured defects interactions in the materials toward H behaviour in RS Al alloys, as far as the high density of quenched-in vacancies is concerned. For the first time, we revealed that amount of H resided with quenched-in vacancies in pure Al is drastically decreases in the alloys and is supposed to be a result of alloying element segregation process. Overall, the alloying elements are observed to be responsible for a strong tendency for H to be trapped by dislocations as well as alloying element atoms in substitutional lattice sites. Based on obtained patterns of hydrogen evolution as well as dope depth distribution behaviour in RS foils it can be concluded that the role of lattice defects on solute/microstructure interactions represents key contribution to the understanding of H trapping in RS Al alloys.

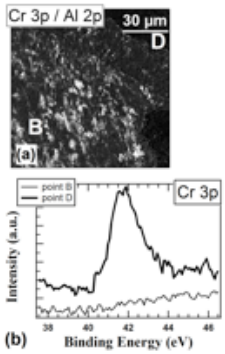


Fig. Solute behaviour in RS Al alloy foils: SPEM image (a) and Cr 3p photoemission spectra (b) of Al-3.0 at% Cr alloy surface

Award of a Research Fellowship from the Matsumae International Foundation (No. 08G11) and award of a JSPS Invitation Fellowship for Research in Japan (No. L-13546) from the Japanese Society for the Promotion of Science (JSPS) are gratefully acknowledged

53. INVESTIGATION OF THE DISPERSION OF SURFACE PLASMONIC GAP-MODES IN A SYMMETRIC CONDUCTOR-GAP-DIELECTRIC STRUCTURE

Li Wei[1,2*], Sarah Aldawsari[2], and Wing-Ki Liu[2]
[1]*Department of Physics and Computer Science, Wilfrid Laurier University, Waterloo, Canada*
[2]*Department of Physics and Astronomy, University of Waterloo, Canada*
*lwei@wlu.ca

In recent years, surface plasmon polariton (SPP) based waveguides have attracted tremendous research interest because they can manipulate optical signals on a namometer scale. SPPs are electromagnetic waves bounded to the interface of metals and dielectrics that can propagate in plasmonic waveguides beyond the fundamental diffraction limit. The advantage of enhanced field confinement with relatively long propagation distance in hybrid plasmonic waveguides has made them ideal candidates for the fabrication of plasmonic functional devices. In our recent work, we theoretically analyzed and characterized the SPP modes in a hybrid plasmonic waveguide, with a symmetric conduction-gap dielectric (SCGD) structure, consisting of a metal conductor symmetrically sandwiched by a low-index and a high-index layer. Since the permittivities of the metal and dielectrics are wavelength dependent, it is very important to characterize the dispersion of the SPP modes in the SCGD waveguide. In this work, based on the analytical dispersion equations we derived, we numerically investigate the

effect of the operating wavelength on the modal index, cutoff low-index gap thickness, and propagation distances. For fixed metal thickness, with increase of the gap thickness the modal index decreases, and with increase of the wavelength, the model index curve shifts downwards while the propagation distance is improved. Our results also show that the cutoff gap thickness slightly varies with the operating wavelength.

INTERDISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY

54. INFORMATION PROCESSING IN THE SENSORY RECEPTOR OF THE PADDLEFISH

Ibiyinka A Fuwape
Department of Physics, Federal University of Technology, Akure

Electroreceptors abound in the rostrum of the paddlefish. The paddlefish has a passive electrosensory system. We study information processing in a peripheral sensory receptor system which possesses spontaneous dynamics with two distinct rhythms. We use computational modeling to elucidate the functional role of the secondary afferent oscillators in conveying information from the sensory periphery to the brain. The canonical theta neuron model is used for the computations. The results give insights to how information is processed in the dorsal octavolateral(DON) region of the paddlefish brain.

55. BIOACCUMULATION FACTOR OF LEAD AND CADMIUM IN FISH

Antoneta Deda[a], Mirela Alushllari[b]
[a]*Faculty of Natural Sciences, University of Tirana, Albania*
[b]*Institute of Applied Nuclear Physics, University of Tirana, Albania*

Lake Ohrid is one of the largest and oldest lakes in the Balkan. It is 695 above sea level and its surface area is 349 km^2. The deepest point of the lake is 289 m. In the south- western part of the lake is located the town of Pogradec, Albania with coordinates $40^0$58"50.15"N; $20^0$40"38.89" E. There are about 40 species in the lake, among the best known and most economically important fishes are Salmo letnica and Salmothimus Ohridanus. The pollution of the aquatic environment with heavy metals has become a worldwide problem during recent years, because they may be toxic to aquatic fauna, ecosystems and humans. Heavy metals including both essential and non-essential elements have a particular significance in ecotoxicology, since they are highly persistent and all have the potential to be toxic to living organisms. Among environmental pollutants, metals are of particular concern; due to their potential toxic effect and ability to bio accumulate in aquatic ecosystems. In our study we determined concentration of lead (Pb) and cadmium (Cd) in water and fish samples in Oher Lake. We have collected samples from two sites in the lake (Tushemisht and Pojske). The samples were analysed using Graphite Furnace Atomic Absorption Spectrometry (GFAAS) method, in the Institute of Applied Nuclear Physics, University of Tirana. The current study reports the presence of heavy metals Cd and Pb in all the analysed samples, although it should be mentioned that their concentrations are quite low. Is observed that the measured concentrations are very much lower than the Maximum Contaminant Levels specified by the WHO and EEC respectively for water and muscle of fish. In water and fish samples, according to analysis results, the following findings were obtained for the concentration ranges. Cd: 1.08-2.31 μg/L; Pb: 3.46-8.14 μg/kg.

56. ANOMALIES FIELD ANALYSIS FOR EL SALVADOR PRECIPITATION USING MULTIVARIATE STATISTICS

Telma Jiménez, Estela Contreras
Facultad Multidisciplinaria Oriental, Universidad de El Salvador, San Miguel, El Salvador

In recent decades, many modes of climate variability have been discovered. This different modes have different time scales which range from days to hundreds of thousands years and each one can be seen as waves with different origins, some well understood, some others yet to be understood. The world climate in a particular moment of history is the result of the superposition of all this waves of different sizes. The purpose of this research is to start the understanding of how these modes determine the climate variability in El Salvador, beginning with the study of how two of those modes are determinant for climate variability of precipitation in El Salvador. The present study evaluates the effect of ENSO (El Niño – South Oscillation) and the Madden – Julian Oscillation (MJO) on the precipitation for El Salvador. To measure the impact of these modes of climate variability on precipitation in El Salvador, it was used the Principal Component Analysis (PCA). ENSO was characterized for the sea surface temperature (SST) of the 3.4 region of El Niño, as defined by NOAA. To characterize the Madden – Julian Oscillation (MJO) it was used the time series of the daily amplitude of the MJO developed by Wheeler and Hendon.

This daily database was converted to a monthly database and standardized. The results of the application of the PCA show that is possible to explain 68.86% of climate variability of precipitation in El Salvador using the first three components. The first component is due to the seasonality, the second component is the ENSO and the third corresponds to the MJO.

57. COBALT FERRITE, A PROMISING CANDIDATE FOR MAGNETIC FLUID HYPERTHERMIA

Heba. M. Kahil
Physics Dept. Faculty of Science, Ain Shams University, Cairo, Egypt.

Magnetic fluid hyperthermia for cancer therapy has gained importance in the last few years. In this study Cobalt ferrite is chosen as it possesses supreme magnetic properties. Cobalt ferrite samples with particle sizes in the range of 7.8 to 13 nm are prepared using the method of co-precipitation. The work focuses on the investigation of the dependence of the AC losses on the size of the particles in this very narrow range. The dependence of the AC losses on the applied frequency and field strength of the different samples in powder form are also investigated. Samples are then coated with sodium citrate to constitute colloids in water. Zeta potential and dynamic light scattering are used to measure the stability of the colloid and the hydrodynamic volumes respectively. The specific absorption rate (SAR) of the different colloids at a frequency of 174 kHz is calculated. The sample with the highest SAR is then chosen to test the efficiency of the prepared colloid for cancer therapy. The SAR value of the sample in water is compared to that in saline and in a suspension of Ehrlich ascites tumor cells. Finally, cell viability for different exposure conditions is calculated. The results show that Cobalt ferrite is a promising candidate for cancer therapy.

58. EMERGING BATTERY RESEARCH IN INDONESIA: THE ROLE OF NUCLEAR APPLICATION

Evvy Kartini
Center for Science and Technology of Advanced Materials National Nuclear Energy Agency, Indonesia

Indonesia with the fourth largest populations in the world has increased its consumption of energy for the transportation, industry, household, etc. The energy that is used is mostly fossil fuels which will be a burden in the near future, due to limited sources, environmental damage and increasing CO2 emission. On the other hand, a new life style that is widespread among all generations, such as using portable electronic devices or gadgets, also increases the energy consumption. Given this situation, the innovative technology related to the renewable energy sources that support green energy and green economy will be indispensible. The research and development of a new generation of batteries, such as lithium ion batteries, will play important role in the move towards innovative sustainable energy. In order to reduce the lithium battery production cost, the government has come up with the strategy to use local resources. Thus the battery technology based on local resources becomes a major concern of national research interest in Indonesia, since there are abundant local resources here. In order to expedite the program, the government has facilitated the construction of new battery laboratories at several research agencies and universities. A national consortium of lithium ion battery which consists of several institutions, universities and industry was started in 2013. In the private sectors, the production of new national electric vehicles (MOLINA) has been started. To this end, the global market of compact size and large-scale rechargeable batteries, with up to 400Wh/kg capacity will generate an enormous market. Therefore, this technology becomes part of the National Industrial Strategic Plan.

For the realization of the of rechargeable lithium ion batteries, with highly targeted values, a comprehensive research and technology on processing the battery components such as electrolyte, electrodes, separator, current collectors and even the electrolyte/electrode interfaces of rechargeable battery are very crucial and indispensable. The importance of understanding on how lithium ions work during charge and discharge, in the structure of electrode and electrolyte is unavoidable. In order to elucidate the basic science of the battery processing within the spatial and time correlations, the application of nuclear technology is very important. The unique properties of neutrons to detect the light elements such as, Lithium ion, is indispensable. The utilization of neutron scattering facilities at National Nuclear Energy Agency (BATAN) in Indonesia will provide significant contributions. It is believed that the growing battery research communities in Indonesia will turn into potential users of neutron scattering techniques. Furthermore, the international networking with worldwide neutron facilities like J-PARC in Japan will bring mutual benefits. In order to achieve the goal, BATAN, has design the road map to become one of the Center of Excellence within the regional.

59. ASSESSMENT OF THE ESSENTIAL AND TOXIC ELEMENTS IN COMPLEMENTARY FOODS FOR CHILDREN (0-5 YEARS) IN TANZANIA USING EDXRF

Catherine Paschal, Najat K. Mohammed
Department of Physics, University of Dar es Salaam, Dar es Salaam, Tanzania

Mineral malnutrition still remains a persistent problem for children under age of five years in Tanzania. Attempts have been made to devise strategies for combating the problem by developing complementary foods based on local grown food crops of cereal-legume combinations. However, there is inadequate data in respect to the nutritional quality of the complementary foods for infants and young children produced in Tanzania. At the same time, the formulae suggested by the scientists in Tanzania are said to be based mostly in eradicating Protein Energy Malnutrition (PEM) rather than mineral malnutrition. This hypothesis is supported by the fact that recent statistics on stunting which is deficiency of Zn and anaemia which is a deficiency of Fe in Tanzania are still high. Tanzania is ranked the 3rd after Ethiopia and the Democratic Republic of Congo in contribution to world's stunted children in Africa, and belongs to the worst affected countries across the globe ranking 10th in contributing to all chronically undernourished children in the world. In this study elemental analysis of commonly used complementary foods for children in Tanzania were carried out in order to analyse the essential and toxic elements. The complementary foods were purchased from shops in Dar es Salaam, Moshi and Arusha and analysed using Energy Dispersive X-Ray Fluorescence. Results obtained showed that samples collected from Dar es Salaam had significantly ($p<0.05$) higher mean concentration values of Mg, Al, K, Ca, Mn, Fe, Cu and Zn than the samples collected from Moshi and Arusha. The results of this study were referenced to the Recommended Nutrient Intake (RNI) values for 6-12 months old children. Based on these comparisons, all the food samples studied in this work contained less essential elements than expected from the RNI values. On the other hand, the concentrations of the toxic elements Ni and As were higher than the Maximum Tolerable Limits (MTL) set by IOM and WHO. It was therefore recommended that infants and young children fed on complementary foods produced in Tanzania should be breastfed for two years and be given other animal based foods to enhance the absorption of the
essential elements. Furthermore, the study advises the authorities to adopt the methods used by other African countries to fortify the foods with the recommended essential elements as a step to reduce mineral malnutrition to infants and young children in Tanzania.

60. COST- AND CONGESTION-REDUCTION TRAFFIC SCHEMES IN SPATIAL NETWORKS

Gerold C. Pedemonte and May T. Lim
National Institute of Physics, University of the Philippines Diliman, 1101 Quezon City

Local congestion occurs when traffic inflow volume exceeds the local load capacity of a routing system. Here we study congestion in a spatial random network that employs a store-and-forward algorithm for packet delivery. For burst data transmission, the transmission is split into smaller burst sizes. In the trivial case of a single path with no branches, reducing the burst size to below the capacity of a node results in no congestion. In a network, however, this leads to the unwanted effect of introducing the likelihood of congestion at frequently visited nodes. In this work, we show the effect of transmission capacity reductions schemes on the congestion period.

61. EYE DIMENSIONS DURING LENS INDUCED MYOPIA (SHORTSIGHTEDNESS) AND RECOVERY IN THE CHICK

Zheng Shao[1,2] Kaitlin Bunghardt[1] Marsha L Kisilak[1,2] Melanie CW Campbell[1,2]
[1]*Physics and Astronomy, University of Waterloo, Waterloo, ON, Canada*
[2]*School of Optometry and Vision Science, University of Waterloo, Waterloo, ON, Canada*

Purpose: Both the chick and human eyes refocus defocused images, primarily through changes in growth rates of the eye. However, in some people this process fails, and they develop near-sightedness, which is growing in prevalence around the world. We have reported changes in the focal length of the eye during recovery from near-sightedness induced with lenses (lens induced myopia or LIM) in the chick eye. Here we analyze changes in eye dimensions in LIM and recovery.
Methods: Six chicks had a negative lens placed in front of one eye (-15D) from the day of hatching to day 7 when the lens was removed. Measurements continued to day 10 for a total of 10 time points. The eyes' defocus (mean ocular refraction or MOR), axial length (AL), the distance from the cornea to the

back of the lens (CBL), eye lens thickness (LT), and vitreous chamber depth (VCD) were measured; eye power changes were inferred from MOR and axial length after correction of the small eye artefact. Paired t-tests, linear fits and ANOVAs were performed to compare treated and control eyes and dimensions on a given day compared to the day prior to treatment change.
Results: The change in CBL both during goggling with the lens and after goggle removal, relative to CBL prior to goggling or upon goggle removal, correlates with the change in AL. This suggests an expansion of the front of the eye during LIM while the eye elongates. During LIM, the defocus of the goggled eye partially compensated (-11.3 D) for the goggle by day 7, due to the increase in eye length. AL, VCD and CBL differ significantly from control eyes ($p<0.001$). On day 7, 57% of the AL increase between goggled and control eyes is due to VCD and 43% to CBL. CBL, LT, AL, and VCD increase significantly within again both eyes. Eye power in both eyes decreases ($p<0.001$) similarly with age. During recovery after lens removal, there are significant differences in AL, LT, and CBL between goggled and control eyes, and in VCD by eye×day. A significant difference in LT is found on day 8 between eyes. Eye power varies by eye ($p<0.001$), by day ($p=0.001$), and by eye×day ($p<0.001$). Eye power in the treated eye drops significantly between days 7 and 8 (t-test, $p<0.001$). Recovery is complete by day 9, and defocus approaches zero in both eyes. After day 8, dimensions and eye power did not differ significantly between eyes.
Conclusions: Compensation to the lens (LIM) is mainly due to a change in axial length of the eye; however, the distance between the corneal vertex and rear of the crystalline lens (CBL) also contributes to changes in axial length in lens induced myopia. On day 7, significantly thicker lens and CBL were observed, suspecting a smaller eye power, rather than a bigger eye power inferred from defocus and axial length. This suggests the need to assess changes in curvatures of refracting surfaces. After lens removal, during recovery, AL, LT and CBL remain relatively constant while MOR magnitude decreases, and the rapid decrease in eye power acts as the initial source of defocus reduction. After recovery is completed, neither dimensions nor power differ between the two eyes. This work indicates that changes in the optics of the eye and dimensions other than length need to be studied in more detail in order to understand the causes of near-sightedness.
Keywords Eye growth and development, Defocus compensation, Lens induced myopia (LIM), Recovery, Chick

GEOPHYSICS, ASTRONOMY AND ASTROPHYSICS

62. X-RAY AND PARTICLE DETECTORS FOR THE SIXS INSTRUMENT ON THE BEPICOLOMBO MISSION TO MERCURY

H. Andersson[1], K. Kuparinen[1], K. Miikkulainen[1], J. Lehti[2], J. Saari[2], E. Valtonen[2,4], J. Huovelin[3], R. Vainio[4], A. Lehtolainen[3], F. Garcia[5]
[1]*Oxford Instruments Analytical Oy, Finland*
[2]*Aboa Space Research Oy, Finland;*
[3]*Department of Physics, University of Helsinki, Finland*
[4]*Department of Physics and Astronomy, University of Turku, Finland*
[5]*Helsinki Institute of Physics, Finland*

BepiColombo is European Space Agency's first mission to planet Mercury, scheduled for launch in 2016. The Solar Intensity X-ray and particle Spectrometer (SIXS) is one of the scientific payloads chosen to fly on the Mercury Planetary Orbiter (MPO) of the BepiColombo composite spacecraft. The SIXS instrument project is lead by the University of Helsinki, and its main scientific goal is to provide measurements of X-rays and highly energetic particles incident on the surface of planet Mercury. The data from the SIXS instrument will be used together with the data from the Mercury Imaging X-ray Spectrometer (MIXS) for the analysis of X- ray fluorescence and scattering from the planet's crust. The X-ray data from SIXS will also be very valuable for the investigation of solar corona, and due to the large field-of-view (FoV, 1⁄4 of full sky) of the X-ray detectors it can also be used for studies of the X-ray background and overall brightness of the X-ray sky. SIXS consists of an X-ray detector sub-system and a particle detector sub-system, working independently of each other, but packaged into the same sensor unit housing. The sensor unit has been designed and manufactured by Oxford Instruments.

The unit houses three X-ray detectors multiplexed to the same readout electronics and operated one at a time. The energy range of these 0.3 mm thick Si PIN diodes is 1 to 20 keV. The detectors have Fe-55 calibration sources integrated to their collimators to determine the energy scale and resolution accurately despite of their temperature dependence and the gradual degradation of the detectors caused by high energy particle radiation in space. Each detector has its own thermoelectric cooler and the first stage of the preamplifier packaged all together in a hermetically sealed transistor type can.

The particle detector is a closely packed arrangement of five 0.15 mm thick Si PIN detectors and a 5 x 5 x 6.3 mm^3 CsI(Tl) scintillator with photodiode read-out. It detects electrons in the range 50 keV to 3 MeV and protons in the range 1 to 30 MeV with a total geometric factor of ~0.15 cm^2 sr.

SIXS needs to always be in the line-of-sight of the Sun, making the thermo-mechanical design quite complex. The unit has to withstand both the intense solar radiation at Mercury distance and the heat load presented by the Mercury surface with a temperature at maximum above 400°C. The high intensity of ionizing radiation in the form of highly energetic particles is also a challenge. Dose estimations were carried out with Sector Shielding Analysis Tool (SSAT), and EEE components (electronics) have been tested to doses of 100-300 krad(Si) and the detectors to 10^{12} protons/cm^2.

63. PLANETARY SPIN AND ROTATION PERIOD: A MODERN APPROACH

Arbab Ibrahim Arbab
Department of Physics, Faculty of Science, University of Khartoum, P.O. Box 321, Khartoum 11115, Sudan

Using a new approach, we have obtained a formula for calculating the rotation period and radius of planets. In the ordinary gravitomagnetism the gravitational spin (S) orbit (L) coupling, $L \cdot S \propto L^2$, while our model predicts that $L \cdot S \propto m/M\, L^2$, where M and m are the central and orbiting masses, respectively. Hence, planets during their evolution exchange L and S until they reach a final stability at which $MS \propto mL$, or $S \propto m^2/v$, where v is the orbital velocity of the planet. Rotational properties of our planetary system and exoplanets are in agreement with our predictions.

64. DETECTION OF ATMOSPHERIC TIDES AT LAKE TANGANYIKA ANALYSIS BY FOURIER TRANSFORM

Elvire Nzeba Banza
Department de Physics (Assistante M2), Faculty of Sciences / UNIKIN P.O. Box 190 Kinshasa-XI/D.R.C
E-mail : elvire88@yahoo.fr. Telephone number: +243 816140155

The Sun, the Moon and the other planets exert a gravitational pull on the Earth. The Moon product of gravitational effects observed in the terrestrial hydrosphere by against the Sun has the effects of gravitational pull observed in the earth's atmosphere. The combination of these effects influences certain natural phenomena on the Earth that can be present under three aspects depending on the composition of the earth; the ocean, atmospheric and terrestrial tides. Thus, these natural phenomena could disrupt the behavior of living beings and the environment.

The atmospheric tides that we observe in the atmosphere do not come only from the combination of gravitational effects solar and lunar, but also from the radiation salary which would entail the variation of the speed of winds. In our topic of research, we have proposed to detect these atmospheric tides in the fluctuations of the temperature of the ambient air, the horizontal component of the wind speed and the temperature of the air in the tower of Lake Tanganyika. These fluctuations collected to Mpulungu in Zambia and recorded continuously, all three hours during a one year.

As results of the analysis made by using the method of the transformed of Fourier on matlab, we have observed the diurnal components of 8, of 12 and 12 midnight in the above mentioned fluctuations and we have allocated them to the periods of oscillation of atmospheric tides. As well, we have suggested the existence of atmospheric
tides around the Lake Tanganyika.

65. DETERMINATION OF STELLAR PARAMETERS USING BINARY SYSTEM MODELS

Georgina Blay
Mount Allison University, Sackville, New Brunswick, Canada

Stellar parameters can be constrained more tightly with binary systems than can typically be done with single stars. We use the JKTEBOP code to fit models to the eclipses of a collection of potential binary systems observed with the Kepler satellite. This fits will constrain the mass ratio, radii ratio, surface brightness ratio, ecosΩ, esinΩ, and the orbital inclination. As some of the binaries appear to include at least one pulsating star, these parameters will be used to constrain pulsation models.

66. EQUATORIAL MIDDLE ATMOSPHERIC DYNAMICS

Uma Das[*,1,2,] C. J. Pan[2] and William Ward[1]
[1]*Department of Physics, University of New Brunswick, Fredericton, New Brunswick, Canada*
[2]*Institute of Space Sciences, National Central University, Jhongli, Taiwan*

The Earth’s atmosphere is continuously in motion that can be described as a superposition of waves of different periods and horizontal and vertical wavenumbers. The waves are mainly forced by the Sun, however, there is an important contribution from sources in the lower atmosphere. The equatorial middle atmosphere presents an interesting feature of the stratospheric quasi biennial oscillation (QBO) which is fed by alternating eastward and westward propagating planetary waves and gravity waves generated at and below the tropopause. One of the dominant waves confined to the equator are the atmospheric Kelvin waves. They are eastward propagating planetary waves which feed the eastward regime of the QBO. They have been studied in detail and their gross nature is well understood. However, there are a variety of geophysical processes that are not investigated, but affect their generation and consequent upward propagation for their effect to be seen on the QBO. In the present study we are investigating the effect of El Nino southern oscillation (ENSO) on the generation of Kelvin waves and the corresponding wave-mean flow interactions in the lower atmosphere. We are using the state of the art temperature data obtained from Global Positioning System based Radio Occultations (GPSRO) by the FORMOSAT-3/COSMIC satellites. We observe that the El Nino is generating stronger Kelvin wave activity which, coupled with favorable ambient zonal winds, results in a much faster downward propagation of the eastward regime of the QBO. These results help in understanding the varying quasi-biennial nature of stratospheric dynamics and the energy balance in the atmosphere as a whole.

67. REMOTE SENSING: DEVELOPMENT OF OPTICAL METHODS TO STUDY ATMOSPHERIC CONSTITUENTS

E. Frins*, M. Osorio, N. Casaballe, J. Ramos, P. Gervasini, G. Belsterli and J. Ferrari
Instituto de Física, Facultad de Ingeniería Universidad de la República
email: efrins@fing.edu.uy

The development of optical methods based on differential optical absorption spectroscopy (DOAS) is important for studying the physics and chemistry of the atmosphere, and modeling the atmospheric dynamics with the purpose to make predictions concerning the climate and air quality more precisely. In this poster we will review our research to study pollutant emissions in the atmosphere.

68. REVERSE SHOCK EMISSION IN GAMMA RAY BURSTS

Resmi Lekshmikuttuyamma
Indian Institute of Space Science and Technology Valiamala, Kerala 695547, India

Central engines of Gamma Ray Bursts (GRBs) and the way they power the explosion remain as important unresolved questions in GRB physics. Understanding the ejecta composition, especially the degree of magnetization is a major step in unraveling the central engine. Prompt and early multi-wavelength emission are the main tools to probe the burst ejecta. Early multi-wavelength emission is expected to contain contribution from the reverse shock (RS) that develops once the ejecta encounters the cold medium surrounding the burst. Strength of RS emission will depend on a range of physical parameters. We predict reverse shock contribution with diverse assumptions and compare them with the observations. We carry out a statistical study that can be compared with early radio observations of afterglows.

69. ELEMENTAL AND MINERALOGICAL CHARACTERIZATION OF SEDIMENTS FROM THE "LA MILAGROSA LAGOON" AT CHILCA BY PHYSICAL TECHNIQUES

Cerón Loayza, M.L[1], Bravo Cabrejos, J.A[1] and Franko Urcia[1,2]
[1] *Lab. de Análisis de Suelos, Lab. de Espectroscopia Mössbauer. Facultad de Ciencias Físicas. Universidad Nacional Mayor de San Marcos, Apartado 14-0149, Lima 14.Perú.*
[2] *Universidad Pedro Ruíz Gallo de Lambayeque*.

Preliminary results of the study of sediments collected at the "La Milagrosa" Lagoon, located in the District of Chilca, Cañete Province, Peru, are presented. The sediments of this Lagoon are used for therapeutic purposes and were first studied about a decade ago [1,2], The fact that its aspect has been altered by local authorities in the last five years, it has prompted an update of the characterization of its sediments. At the present time this Lagoon appears as a single lagoon and samples were collected using an extractor from different horizons at different sites within the lagoon, which were characterized by different hue, texture and elemental composition. The collected samples from the central part of the Lagoon were designated MML-VER, MML-CR, MML-PCL and MML-NEG; the sample MML-EXT was collected from one extreme end point of the Lagoon.

The analyzed samples correspond to the sand fraction (< 2 mm). The elemental composition analysis by the energy dispersive X-ray fluorescence technique (EDXRF) shows the presence of Ca, Cl, S, K, Sr, Fe, Cu, Mn, Zn, Br, Zr. The analysis by transmission Mössbauer spectroscopy (TMS) of the samples collected from the central part of the lagoon shows the presence of mineral phases associated to two structural sites occupied by Fe^{+3} cations in the paramagnetic state: one doublet is assigned to illite and the other one to pyrite, and to a site occupied by Fe2+ cations in the paramagnetic state which is assigned to montmorillonite (bentonite). In the MML-EXT sample it is observed the presence of three sites occupied by Fe in the magnetic state and four sites occupied by Fe in the paramagnetic state; two of the magnetic sites are assigned to magnetite and the third one to hematite: two of the paramagnetic doublets are assigned to montmorillonite, one to illite and the fourth Fe^{3+} doublet is left unassigned.
Keywords: medicinal lagoon sediments, energy dispersive X-ray fluorescence, transmission Mössbauer spectroscopy.

References

1. M.L. Cerón Loayza, J.A. Bravo Cabrejos. Revista de Investigación de Física, Vol. 8 (2), 9- 13 (2005).
2. M.L. Cerón Loayza, J.A. Bravo Cabrejos. Libro de Resúmenes –T4-P18. Montpelier France

70. PROBING THE PHYSICS OF SEYFERT GALAXIES USING THEIR EMISSION-LINE REGIONS

Prajval Shastri
Indian Institute of Astrophysics, Bangalore, India

Active galaxies have powerhouses of radiation in their nuclear regions which are driven by accreting supermassive black holes. The accretion system also generates outflows of ionised gas, as well as synchrotron-emitting bipolar jets of plasma, which could have a significant impact on the host galaxy. We have initiated an investigation into the physics of nearby active galaxies by studying the morphology, kinematics, excitation and abundance structure of about 100 nearby targets. We present the first results from this investigation.

PHYSICS EDUCATION AND WOMEN IN PHYSICS

71. HEATING ZINC POWDER – AN EXPERIMENT TO IMPROVE TEACHING OF EXPERIMENTAL METHODS

Sarah Akhtar[1], Shoaib Zaidi[2], Nazish Fatima[3]
[1]*Federal Urdu University of Arts, Sciences and Technology, Gulshan Campus,Karachi, Pakistan*
[2]*Habib University, Karachi, Pakistan*
[3]*St.Joseph's College for Women, Karachi, Pakistan*

We report the results of heating Zn powder (Merck) in a muffle furnace. The samples were heated in a natural ambient for 120 minutes at 350 °C, 400 °C and 450 °C respectively.
Analysis of Zn and the three heated samples was performed using powder X-ray diffraction (PXRD), SEM, EDX and Fourier-transform infrared Spectroscopy (FTIR). Observable differences in the results are disseminated and discussed.

There are global concerns about how our students are immersed in virtual environments. One of the many negative effects is a decrease in their connections with the tactile world and there is a direct impact on experimental competence and confidence. To encourage participation and interest in experimental science is important.

This experiment is simple and generates interesting results. The exercise of understanding and describing these results is open ended. Such experiments are useful tools to introduce students to analysis of experiments.

72. THE FIRST PROFESSIONAL SKILLS WORKSHOP IN LATIN AMERICA

A. Avila[1], Lilia Meza-Montes[2], and Silvina Ponce-Dawson[3]
[1]*Departamento de Ingeniería Eléctrica y Electrónica, Universidad de los Andes, Bogotá-Colombia*
[2]*Instituto de Física, Benemérita Universidad Autónoma de Puebla, México*
[3]*Departamento de Física, Universidad de Buenos Aires, Argentina*

To effectively build capacity for STEM research and training across Latin America a gender perspective must be factored in. In Latin America and the Caribbean, female enrollment is less than two thirds of the total student enrollment in science and engineering majors. At the professional level the numbers are not encouraging either; female professors and scientists represent only 15 % of the total research workforcein the region. Awareness of the situation as well as the multiple personal challenges experienced because of gender disparity, motivated a group of female scientists in four countries to organize a workshop with the goals of empowering young Latin American female scientists; assessing ongoing challenges they face in the areas of engineering, chemistry, earth sciences, physics, agronomy, material sciences and medical programs, currently working in eight different countries; and improving their skills in proposal and project writing. This is the first workshop of its kind in Latin America. It will take place at the end of July 2014 in Chiapas, Mexico.
Guiding questions include:
• Are our work environments gender inclusive? – (Are there well established communication platforms? is there equal workload distribution by gender? are there harassment policies in place?)
• Does the structure of academic departments reflect gender parity? – (What is the female ratio in adjunct, associate, tenure, researcher and directive positions?)
• What issues negatively impact the confidence of female scientists at the beginning of their professional careers?
• What sources of funding and collaboration platforms are there available for junior scientists?
• What obstacles prevent gender parity in STEM fields?
• What role do senior female scientists play in promoting gender parity in STEM fields?
Applicants filled out a perception survey about their experiences as young scientists. After the workshop, the organizers will draft a report analyzing the findings and outcomes of the experience as well as stating recommendations on good practices and policy changes needed to ensure gender parity in STEM fields.

References
De Wit, H; I.C. Jaramillo; J. Gacel-Ávila; y J. Knight, eds. (2005): Higher Education in Latin America: The international dimension. Washington, D.C.: World Bank.

73. SMASH – EXPERIENCE FOR MIDDLE SCHOOL GIRLS
Geraldine L. Cochran and Kara L. Maki

We created the Summer Math Applications in Science with Hands-On (SMASH) Experience for Girls at Rochester Institute of Technology (RIT) to engage K-12 girls in STEM through mathematics. Perceived mathematical ability is a key barrier keeping girls from pursuing STEM degrees. This mathematics barrier persists even among prior female participants of informal STEM experiences. The SMASH Experience uniquely addresses this mathematics barrier through its focus on mathematical modeling and self- efficacy. In mathematical modeling, real-world situations are described by mathematical equations that both give fundamental insight into the process and predict outcomes. By connecting everyday activities to mathematical thinking, modeling can be particularly attractive to girls, who like to understand how things work, solve problems, do hands-on activities, and ask questions. Self-efficacy is an estimate of one's capability for successfully coping with a particular situation or task, and helps determine effort, persistence, and resilience. Research shows dramatic increases in mathematical success in students with high self-efficacy. In the SMASH Experience, participants reflect on their own sense of competence through self-affirmation activities aimed to increase their confidence in their own ability to do mathematics. The inaugural 2014 SMASH Experience will be presented.

74. HORIZONTAL MENTORING ALLIANCES: THE VALUE OF PEER MENTORING
Anne J. Cox
Eckerd College, Florida, US

No one disputes the value of good mentoring, but as faculty move into more senior ranks, they are more often called upon to serve as mentors rather than be mentored. At senior ranks, mentors often are peers. However, for women physics faculty at small colleges in the U.S., there are unlikely to be other peers who are also senior women physicists. The shared experience of being a woman in a male-dominated field can provide valuable perspectives and insights in a peer mentoring relationship. The goal of the “Collaborative Research for Horizontal Mentoring Alliance” project (2006-2010) funded by the National Science Foundation ADVANCE (for the Advancement of Women in Academic Science and Engineering Careers) program was to create peer mentoring networks among senior women faculty in chemistry and physics from small colleges. In 2007, I was invited to participate in a mentoring alliance of 4 other senior women faculty from colleges across the country. This poster will outline the way the alliance worked and how surprisingly helpful our alliance continues to be 7 years later.

75. THE EUROPEAN PLATFORM OF WOMEN SCIENTISTS (EPWS) 2011- 2014: THE VOICE OF WOMEN SCIENTISTS ACROSS EUROPE
Claudine Hermann[a], Ann Marks[b] and Dalia Satkovskiene[c]
[a]*Vice-president of EPWS and Femmes & Sciences, France*
[b]*EPWS and WIPG Institute of Physics, UK*
[c]*EPWS and BASNET Forumas association*

The European Platform of Women Scientists, EPWS, is an umbrella organization bringing together networks of women scientists and organizations committed to gender equality in scientific research in all disciplines in the 28 European Union (EU) Member States and the countries associated to the EU research programme. EPWS is a non-profit Belgian association (AISBL).
EPWS’s missions are to:

- Promote women scientists;
- Represent the concerns, needs, ideas, aspirations and interests of European women scientists in all disciplines and all stages of their career paths;
- Coordinate support activities for women scientists to facilitate their active role in the European Research Area as researchers as well as participants in the research policy debate in Europe.

Main goals are:

- Increasing the participation of women scientists in European research policy and the shaping of the EU research agenda;

- Enhancing the participation of women in science and its decision-making bodies as well as in national and European research programmes, especially in EU Framework Programmes for Research and Technological Development;
- Better understanding and integration of the gender dimension in science.

Activities:

- A yearly Conference e.g. 2014 in France - New Perspectives for Women Scientists' Careers in Europe, 2013 in Germany - Institutionalising Gender and Diversity in University structures;
- Participating in or providing expert contributions to major European science gender projects;
- Preparing responses to EC consultations with position papers and open letters,
- Disseminating EU policy decisions concerned with gender in science issues and news from members via newsletters and the EPWS website.
- Benchmarking reports e.g. for the French ministry of Higher Education and Research;
- Organizing debates on gender in science issues with policy makers e.g. Lunch-debate at the European Parliament, January, 2012.
- An Annual General Assembly e.g. 2012 in Brussels, Belgium; 2013 in Essen, Germany;
- 2014 in Paris, France.
- Participation in International Programme Committees at, and presentations to international or European conferences e.g. during the European Presidencies:
    - The high level presidency conference "Structural Change Producing Gender Equality in Research Organisations", Lithuania, November 2013,"Promoting Gender Equality
    - in Science", Vilnius November 2012.
    - "Gender, Science and Democracy", Vilnius June 2012;
    - "Training, Career and Mobility of Researchers in the Innovation Union", Hungary, June 2011.

Membership:

EPWS has more than 100 member organisations, representing more than 12,000 women researchers active in academia and in industrial research, with more than 1600 on its newsletter distribution list. It is governed by an international, multidisciplinary Board of Administration of 11 senior women scientists, of whom four are physicists, and welcomes new member organisations and individuals.

EPWS Website: www.epws.org

76. ATTRACTING WOMEN TO STEM BASED DISCIPLINE BY PROMOTING COMPUTATIONAL THINKING APPLICATION SCRATCH IN CLASSROOMS

Anum Khattak, and Hasan Shodiev
Wifrid Laurier University, Waterloo, Canada

Even though female outnumber men in tertiary level education, this does not hold true for STEM base fields. According to Statistics Canada (2011), only 20% women choose STEM as their undergraduate program. This decline of female participation in stem base discipline is raising concerns among educators and policy makers about the implications of gender gap for the labor market in the long run. The literature review shows that use of computational thinking applications increases female participation rate in classrooms. In our research, we will conduct a study where we introduce computational thinking based application such as Scratch to analyzed the effect of technology on female level of engagement in STEM based discipline. The aim of this study is to understand ways to encourage women to choose stem based careers.

77. A NONTRADITIONAL UNDERGRADUATE ASTRONOMY COURSE: CHANGING PEDAGOGY TO BETTER MEET STUDENTS' NEEDS

Katarin Macleod, Mohamed Shajahan Razul, and Jamie Powell
St. Francis Xavier University, Antigonish, Nova Scotia, Canada

The authors examined a change of pedagogy in the delivery of a three-credit, first-year astronomy course offered to nonphysics majors by a Department of Physics at a small undergraduate university in Canada. The pedagogy was changed to better meet the needs of the students enrolled in the course. The research includes a description of some of the activities and teaching strategies utilized by the professor; an analysis of the students' perspectives, attitudes, and reactions towards this nontraditional

astronomy course; and what recourse meant for the students, their level of understanding of science, scientific literacy, and connection between science and society. The article provides insight into the professor's perceptions, views, classroom observations, and overall analysis of the effectiveness of changing the pedagogy and concludes with thoughts on whether the effort was worth the end result.

78. INTEGRATING SCIENCE, TECHNOLOGY, SOCIETY AND ENVIRONMENT (STSE) INTO PRE-SERVICE PHYSICS TEACHER EDUCATION: IMPLICATIONS FOR PHYSICS EDUCATION AND TEACHER TRAINING

Katarin Macleod
St. Francis Xavier University, Antigonish, Nova Scotia, Canada

Although STSE has recently received attention in educational research, policy, and science curricula development, fewer strides have been made in moving theory into practice. There are many examples of STSE-based and issues-based teaching in science at the elementary and secondary levels, which can be found in the literature (Alsop, Bencze, & Pedretti, 2005; Hodson, 1993, 2000; Pedretti & Hodson, 1995), yet little has focused specifically on physics education. This research examined pre-service physics teachers' beliefs and perceptions, challenges and tensions which influence their adoption of STSE education in the context of a pre- service physics education course (Curriculum and Instruction in Physics Education at the B.Ed level). An interpretive case study design as described by Merriam (1988) was employed for this research (Merriam, 1988; Novodvorsky, 2006). The specific phenomena this case study examined and explored were the pre-service physics teachers' views and perceptions, challenges and tensions influencing their adoption of physics curricula that explicitly emphasized an STSE orientation to physics education. The pre-service physics teachers' evolution of perceptions and attitudes show growth in the areas of curricula understanding and implementation issues, potential student concerns, and general fit of the subject within the context of a student's learning journey. This study contributes to our understanding of the challenges pre-service physics teachers face when considering teaching physics through an STSE lens, provides insight and implications for both physics education researchers and in teacher training.

79. EXPLORING TECHNOLOGY-ENHANCED ACTIVE LEARNING IN PHYSICS TEACHER EDUCATION

Marina Milner-Bolotin*, Heather Fisher, Alexandra MacDonald
University of British Columbia, Canada

Active learning pedagogies, such as Peer Instruction (PI), have been proven to be effective in undergraduate physics teaching. However, they are still rare in secondary schools and in physics teacher education programs. One of the reasons for that is methods instructors' mistrust of the pedagogical effectiveness of multiple-choice conceptual questions. While modern educational technologies open opportunities for using open-ended questions in PI, multiple-choice conceptual questions in teacher education are still underutilized. In this study Peer Instruction pedagogy was supplemented by the use of a collaborative online system – PeerWise (PW) (peerwise.cs.auckland.ac.nz). PI&PW pedagogy allowed researchers to investigate the development of questioning skills in secondary teacher-candidates through the use of peer collaboration. We report on the effects of PI&PW implementation in a semester long physics methods courses on teacher-candidates' content and pedagogical knowledge, on their attitudes about active learning, and on willingness and ability to implement active learning pedagogy during their practicum.

80. HELPING PHYSICS TEACHER-CANDIDATES DEVELOP QUESTIONING SKILLS THROUGH INNOVATIVE TECHNOLOGY USE

Marina Milner-Bolotin*, Alexandra MacDonald, Heather Fisher
University of British Columbia, Canada

Active learning pedagogies, such as Peer Instruction (PI), have been found to be effective in undergraduate physics teaching. However, they are still rare in secondary schools and in physics teacher education programs. One of the reasons for that is physics teachers' lack of experience in asking effective conceptual STEM questions and underestimating their pedagogical value. Thus

research-based multiple-choice conceptual questions in STEM teacher education are still underutilized. In this study Peer Instruction pedagogy was supplemented by the use of a collaborative online system – PeerWise (PW) (peerwise.cs.auckland.ac.nz) to help teacher-candidates develop these skills. In addition, a special STEM resource of conceptual multiple-choice questions (http://scienceres-edcp-educ.sites.olt.ubc.ca/) was developed and used in STEM methods courses. We report on the effects of a research-based technology-enhanced physics methods course on teacher-candidates' content and pedagogical knowledge, on their attitudes about active learning, and on willingness and ability to implement active learning pedagogy during their practicum.

81. WOMEN IN PHYSICS: REDUCING THE GENDER GAP AT THE COLLEGE LEVEL

Christine O'Donnell[a, b] and Beth Cunningham[b]
[a]Frank Batten School of Leadership & Public Policy, University of Virginia, Charlottesville, VA [b]American Association of Physics Teachers, College Park, MD

In the US, too few women in college obtain physics degrees. Despite efforts from many stakeholders including universities and government agencies, a significant gender gap continues to exist among physicists. Although women obtain more than half of all bachelor's and advanced degrees in the U.S., only 20 percent of physics bachelor's degrees and 17 percent of PhDs are awarded to women. In the past few decades, progress has been made on the issue. The rate of female recipients of science, technology, engineering, and mathematics (STEM) bachelor's degrees has more than doubled from 16.6 percent in 1966 to 40.4 percent in 2010. In addition, a much higher proportion of physics bachelor's degrees were awarded to women in 2010 than in 1966 (20.4 percent in 2010 versus 4.9 percent in 1966), but the numbers are still significantly lower than the overall STEM figures [1].

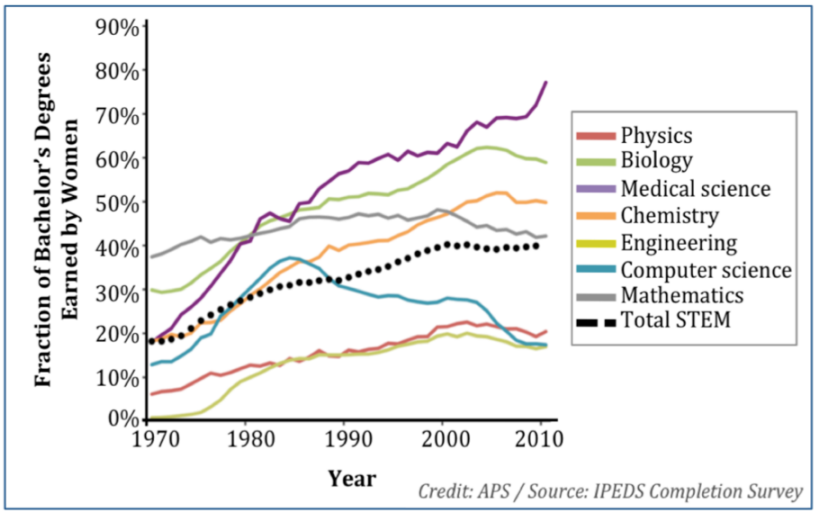


Figure 1: The representation of women in physics continues to lag behind other sciences [1].

A policy analysis was conducted to examine different strategies for addressing this disparity through improving physics courses and providing additional support in order to retain more female college physics students. Some of the alternatives considered included simple psychological interventions (e.g., [2]), interactive engagement methods (e.g., [3], [4], and [5]), and tutoring programs (e.g., [6] and [7]). These alternatives were evaluated on their cost-effectiveness, feasibility, and risks of unintended consequences. Based on this evaluation, the analysis recommends prioritizing simple psychological interventions such as value affirmation because they are low-cost yet highly effective and very feasible. Finally, the analysis discusses strategies for implementing the recommendations.

References

[1] American Physical Society. (2014). "Fraction of bachelor's degrees in STEM disciplines earned by women". Retrieved from: http://www.aps.org/programs/education/statistics/womenstem.cfm (accessed 17 April 2014).
[2] Miyake, A., Kost-Smith, L. E., Finkelstein, N. D., et al. (2010). Reducing the gender achievement gap in college science: A classroom study of values affirmation. Science **330**: 1234-1237.

[3] Hake, R. R. (1998). Interactive-engagement methods in introductory mechanics courses. Journal of Physics Education Research **74**: 64-76.
[4] Lorenzo, M., Crouch, C. H., & Mazur, E. (2006). Reducing the gender gap in the physics classroom. American Journal of Physics **74**(2): 118-122.
[5] Pollock, S. J., Finkelstein, N. D., & Kost, L. E. (2007). Reducing the gender gap in the physics classroom: How sufficient is interactive engagement? Physics Education Research **5**:010107.
[6] Kost, L. E., Pollock, S. J., & Finkelstein, N. D. (2009). Characterizing the gender gap in introductory physics. Physics Education Research **5**: 010101.
[7] Sorby, S. A. & Baartmans, B. J. (2000. The development and assessment of a course for enhancing the 3-D spatial visualization skills of first year engineering students. Journal of Engineering Education **89**(3): 301-307.

82. PUBLIC DIALOGUE ON PHYSICS AND RELATED TECHNOLOGY AFTER FUKUSHIMA-DAIICHI NUCLEAR ACCIDENT

M. Sasao
Organization for Research Initiatives and Development, Doshisha University, Kyotanabe, Kyoto 610-0321, Japan

Since importance of building new relationships between Science and Technology (S&T) and society was specially mentioned in the 2nd Science and Technology Basic Plan [1] by Japanese Government in 2001, academics have begun various outreach activates in Japan. Outreach activities of researchers in physics mainly focused on public lectures, extracurricular classes, back-up activities for high-school physics teachers [2, 3].

As scientists in nuclear fusion energy, we also have developed various physics experiments for extracurricular classes, such as a plasma fire ball in a microwave oven, spectroscopy of salts using a paper craft spectrometer and so on. Most of targets of these classes were high school students and citizens with basic scientific knowledge and curiosity. In these classes, our mythology was as follows: start from physics experiments to stimulate curiosity, proceed to the basic lecture of quantum mechanics or plasma physics, and extend to stories of nuclear fusion energy or radioactivity/radiation, or Sun and Universe, according to the request of planners of the school or the audience.

However, after Fukushima-Daiichi Nuclear Accident some people felt explanation given by scientists and engineering's questionable. In these circumstances, bottom-up dialogue from public and/or two-way dialogue in S&T with public are demanded. The matching of the interest and the ability of receiver of the S&T side is essential in dialogue.

As to the matching, we have started to investigate what people want to know in physics. Some people are interested in the energy security, which is one of severe problems of Japan, but some people are more interested in radioactivity and radiation. The people of the latter case are mostly women of all generations. We start to send questionnaires to them:

What do you want to ask to physicists if you have 3 minutes for dialogue?
What do you want to ask to physicists if you have 20 minutes for dialogue?
What do you want to learn from physicists if you have 3 hours to learn?

Here, we notice that even words such as "physics" cannot be accepted easily, and we have to start from visible examples.

We also notice role of women in physics as receivers in two-way communication. Women in physics have more or less similar education background with women in public, and common interest for future views of society.

References

[1] http://www8.cao.go.jp/cstp/english/basic/2nd-BasicPlan_01-05.pdf
[2] J. Fujita, Journal of Plasma Physics and Fusion Research, 88 (2012) 296 [3] T. Shimoda, Journal of Physics Society of Japan, 58 (2010) 223

83. THE AIP CAREER PATHWAYS PROJECT

Toni Sauncy, Kendra Redmond, Roman Czujko
American Institute of Physics, College Park, Maryland, United States

In the United States, an average 40% of all physics baccalaureate degree recipients opt to go directly in to the workforce rather than entering graduate school. It is essential for departments aiming to build robust programs to prepare all students for a broad range of career paths. Undergraduate physics programs, with effective recruitment, retention and appropriate
preparation of students, have the potential to add to the numbers of excellent members of the STEM workforce. However, the default focus of many departments is on preparing students for entry into advanced physics degree programs. Based on this apparent gap, the American Institute of Physics undertook a project funded by the National Science Foundation in an effort to understand, compile and disseminate effective practices for preparing undergraduate physics students to enter the STEM workforce upon graduation. The project entailed site visits to eight schools with strong records of students entering STEM fields, in order to discern effective practices in recruitment and preparation of students for those opportunities. While each school was somewhat unique, we have identified a set of common features. We have developed careers- education resources for students, faculty advisors/mentors and career professionals. Each of these groups requires targeted information that addresses their particular roles in the collaborative process that will lead to not only an increase in the numbers of students who enter the STEM workforce, but in the quality preparation of those students. The tools for each of these groups will be discussed, with special emphasis on a set of career tools for students and their mentors.

84. THE CHANGE OF CONCEPTUAL REPRESENTATION OF ACCELERATION OF PRIMARY GIFTED STUDENTS VIA 3D VIRTUAL REALITY

Jina Song, Deaho Shin, Sungwoo Lee, Wonkun Oh[*]
Dept. Physics Education, Chungbuk National Univ. Cheongju 361-763, Korea
[*]*wkoh@cbnu.ac.kr*

This study is to investigate the change of conceptual representation of acceleration of primary gifted students. The subjects were 20 students participating in a gifted science education program without experience of regular school science class for acceleration. They were required to participate computer based laboratory experiment and 3D virtual reality simulation activity. Pretest and post test for each acitivity were done, and the data were analyzed. The result shows that meaningful change in representation of acceleration for the students are possible, which comes from the simpleness of the 3D simulation activity compared to the lab experiment.

85. WHY THERE IS A GENDERED DIFFERENCE IN THE CAREER CHOICES OF FINNISH PHYSICISTS AND MATHEMATICIANS WITH PHD?

Jaana Vapaavuori[1], Riikka Kangaslampi[2], Ville Valtavirta[2], and Jenny Vainio[2]
[1]*Department of Chemistry, University of Montreal, Montreal, QC, Canada*
[2]*Department of Applied Physics and Mathematics, Aalto University, Helsinki, Finland*
e-mail: jaana.vapaavuori@umontreal.ca

Earlier studies indicate unanimously that the domain of Finnish university physics is highly gendered (Vainio2012). Although Finland in general ranks to the top on the studies of general gender equality, it wasn't until 1970s that women began to enter the physics departments in larger numbers and until 2004 than first female professor of physics was nominated (University of Helsinki 2004). In 2012, Vainio published a seminal monograph tackling cultural and historical processes behind the gender-gap in the field of physics in Finnish multi-discipline universities (Vainio2012). However, to the best of our knowledge this topic has never been studied at Polytechnic universities, in which the number of females who embark on basic studies is remarkably lower than in multi-discipline universities.

The aim of this study is to qualitatively map the reasons for career choices of people, who have completed their academic degrees in the study program of Engineering Physics and Mathematics of Aalto University (former Helsinki University of Technology), in Finland. We start from the statistical fact that over the years 2002-2010 the proportions of the female M. Sc. (Tech) and Dr (Tech.) graduates constituted 16.5% and 16.7% of the total number of graduates, respectively. Interestingly, the

phenomenon of gradual drop out from academic career path after B. Sc. and M. Sc. degrees, as observed in the studies done in multi-discipline universities, is not seen here. However, the number of permanent female faculty members remains well below 10%.

As the statistics do not explain the cultural phenomena behind, we aim to elucidate the reasons behind the gendered career segregation processes by analyzing career stories of Dr. (Tech.) graduates of years 1995-2010 gathered through a web inquiry in May 2014. Through qualitative inductive analysis of the narrative data, we raise different factors affecting the career choices and twists of Dr. (Tech.) graduates awareness of which can further help to increase the diversity of people in permanent faculty positions.

86. MEASURING AND ADDRESSING THE IMPACT OF GENDER STEREOTYPES ON PERFORMANCE IN INTRODUCTORY UNIVERSITY PHYSICS

Margaret Wegener, Serene Choi, Cavin Talbot
The University of Queensland, Australia

Despite use of teaching methods that have been shown to be effective and socially inclusive, around the world equity issues persist in university physics, with equally-capable females performing worse than males. This paper explores how beliefs about self affect learning performance. It investigates the transferability of an intervention shown to eliminate the gender gap in performance for physics students in the USA [Miyake et al, 2010], where female students significantly improved their achievement via a value-affirmation exercise. The theory is that those who identify with a group who are "known" not to perform as well in a particular situation experience "identity threat" when they enter that situation; if they go through a process of thinking about values that are important to them personally, they bolster their sense of self, and can cope well with the situation.

The gender gap has been observed in Physics at The University of Queensland, Australia, where teaching includes the reportedly helpful strategies of interactivity, collaboration and Peer Instruction [Lorenzo et al, 2006]. We investigated students' confidence, attitudes, previous education in physics and mathematics, and performance on a well-established Mechanics diagnostic test (FCI). The study involved two cohorts of introductory physics students. The participants were enrolled in either core physics or service teaching courses – each of more than 100 students, with a mix of genders. As per the protocol of Miyake et al, in a brief exercise at the start of classes, some students wrote about values important to them, while those in a control group wrote about values not important to them but that might be important to other people. Performance on the diagnostic test pre- and post-instruction was used to calculate learning gain achieved during the course. We surveyed students to measure how strongly and how commonly they endorse a negative belief that "other" people succeed at physics.

We found that endorsement of a stereotype of males performing better than females at physics is quite uncommon in our students. Thus Australian students are not generally susceptible to stereotype threat relating to gender. Statistical analysis of the performance of randomly-assigned control vs intervention groups, and with respect to the strength of endorsement of negative beliefs, shows the value-affirmation exercise working in our context. The small group of those females who strongly endorsed a negative gender stereotype significantly improved learning gain if they did the value-affirmation exercise. The activity had no significant effect on others (male or female). Therefore this study provides evidence that a value-affirmation intervention can affect the outlook of at-risk female students in a way that results in improved learning performance.

References

Lorenzo, M. et al "Reducing the gender gap in the physics classroom" American Journal of Physics vol. 74 no. 2, February 2006 pp118-122

Miyake, A. et al, "Reducing the gender achievement gap in college science: A classroom study of values affirmation", Science vol. 330 26 November 2010 pp1234-1237

87. FROM 'FIXING WOMEN' TO 'INSTITUTIONAL TRANSFORMATION': AN ADVANCE CASE STUDY

Sherry Yennello and Chris Kaunas
Texas A&M University

In 2007, The U.S. Academy of Sciences, National Academy of Engineering, and Institute of Medicine released a report indicating that the United States' position in the global economy required an influx of women into science, technology, engineering, and mathematics (STEM) fields in order to remain competitive. Despite this call, the representation of women in STEM continues to be low. For example, women represent only 24% of the STEM workforce, hold only 18% of faculty positions in the physical sciences, and only 13% of faculty positions in engineering (National Science Foundation, 2011).

One program that addresses this issues is the National Science Foundation's (NSF) ADVANCE Program. The goal of the ADVANCE Program is to increase the representation of women in academic STEM fields. However, in contrast to past efforts aimed at "fixing" women (e.g., helping them develop skills to navigate male-dominated contexts), ADVANCE seeks to address the institutional structures and barriers (e.g., the lack of women in leadership positions) that impede women's progress in STEM academia.

Through ADVANCE Institutional Transformation (IT) grants, NSF provides funds to academic institutions to support programs that aim to transform higher education in ways that increase the number of women in STEM academic careers. This poster introduces the NSF's ADVANCE-IT Program and includes a case study of the Texas A&M University's ADVANCE Center. Texas A&M's institutional transformation plan will broadly illustrate the multifaceted process of organizational change within STEM academia.

88. TEACHING, LEARNING AND ASSESSING INQUIRY BASED SCIENCE EDUCATION

Eilish McLoughlin, Odilla Finlayson, Paul van Kampen, Sarah Brady and Deirdre McCabe.
CASTeL, School of Physical Sciences, Dublin City University, Dublin 9, Ireland

During the period 2008-2014, the EC funded several large scale projects in Science Education, on the basis of the findings of the EC Rocard Report. All these projects were aimed at the introduction and broader use of Inquiry Based Science Education (IBSE) through enriching the skills of teachers, by delivering appropriate teacher education programs at both initial teacher training as well as for continual professional development. This presentation will report on experiences gained from coordinating two pan-European projects, ESTABLISH (2010-2013) and SAILS (2012-2015), which have been funded under the EU Seventh Framework programme. The aim of these two projects was to support science teachers in the use and dissemination of Inquiry based approaches in their own classrooms with students aged 12-18 years.

Many IBSE resources and models for teacher education in IBSE have been developed through projects arising from national and international programmes, including the European Science and Technology in Action Building Links with Industry, School and Home (ESTABLISH) project. This project collaboration has developed 18 substantial IBSE teaching and learning units that form the core aspect of ESTABLISH IBSE teacher education programmes, for both in-service and pre-service teachers. These materials and programmes have been trialled and implemented across 11 European countries and support teachers in using IBSE methods in the classroom. A particular focus of this project was to engage with policy makers and scientific and industrial community in developing these resources.

The recent trend across the EU towards competence-based teaching and learning and a learning outcome approach, has resulted in significant changes occurring at school curricula level in traditional subject areas such as physics (science). These curricula are now being treated in more engaging cross-curricular ways, with greater emphasis being placed on developing skills and positive attitudes towards science alongside knowledge. Therefore, a key starting point for the Strategies for Assessment of Inquiry-based Learning in Science (SAILS) project was to review the key skills and competencies desirable for young people in the 21st Century as identified by different international sources and to map these against those developed through IBSE. The Framework for 21st Century learning was used as a basis for identifying key 21st century skills and competencies and those that can be developed through scientific inquiry and the mapping of these inquiry skills under this framework's learning and innovation skills, Creativity and Innovation, Critical Thinking and Problem Solving and Communication and Collaboration, will be presented. The overall objective of the SAILS project is to support teachers in developing assessment strategies and techniques that help them to assess these

important inquiry skills that are so difficult to capture under traditional exam conditions. The on-going work of the SAILS project is to further develop and enhance resources developed by the ESTABLISH project and other such projects, specifically through the addition of assessment strategies and items and to use these teacher education programmes. In particular, the SAILS project aims to prepare teachers not only to be able to teach through IBSE, but also to be confident and competent in the assessment of their students' learning. Through this unified approach of implementing these multiple components for transforming classroom practice, i.e. teacher education, curriculum and assessment around IBSE pedagogy, a sustainable model for IBSE will be achieved.

The outcomes and experiences gained from coordinating these two pan-European projects will be presented and the lessons learnt in teaching, learning and assessing inquiry will be discussed along with the impact of these IBSE projects across Europe.

89. EXPANDING GIRLS' HORIZONS IN PHYSICS AND OTHER SCIENCES: A SUCCESSFUL STRATEGY SINCE 1976

Cherrill M. Spencer
Emeritus Member of Board of Directors of the Expanding Your Horizons Network and
Emeritus Magnet Engineer at the SLAC National Accelerator Laboratory, USA

For the past 40 years the USA's Expanding Your Horizons Network (EYH/N) has been encouraging young women to pursue careers in science, technology, engineering and mathematics (STEM). With few exceptions women are still heavily underrepresented in most STEM fields. Believing that early intervention is a key step in attracting and nurturing scientific talent, the EYH Network continues to build and disseminate its flagship program : annual Expanding Your Horizons in Science, Mathematics and Engineering Conferences (EYH) for girls aged 12 to 18. Since the first EYH, held in California in 1976, the Network has held over 2500 EYH conferences across the United States and in 8 other countries, reaching over 900,000 young women with the message that careers in science, mathematics, and engineering can be rewarding and are attainable.

In order for young women to achieve STEM careers, they need to be motivated and prepared, starting during the critical ages of 12 to 16. This preparation must include encouraging girls to take appropriate pre-requisite-to-college mathematics and science courses when they are 15 to 18 years old. An EYH conference is a low-cost strategy, organized by a local volunteer committee with these characteristics: the attendees are only girls and they take part in hands-on STEM activities lead by women scientists, engineers and mathematicians who work in their local community and act as role models; the conference takes place on a Saturday on a local college campus. The hands-on activities are designed to provide enjoyment and promote confidence in STEM subjects; the STEM role models speak to the girls about the need to take science and maths classes in high school in order to proceed to a college education in a STEM subject, they describe to the girls how much they enjoy the technical work they are doing, they explain that STEM jobs pay well and contribute to society. The girls discover that normal women with regular lives can be scientists or engineers and you don't need to be a genius. Over 90,000 women working in STEM careers, many of them physicists, have been EYH workshop leaders these past 38 years and they benefit from this experience as much as the girls!

As role models, these women are charged to share the excitement of their work through related hand-on activities. These hands-on workshops are the "bread and butter" of every EYH Conference and the key to their success. The key factor is that the learning is "hands-on", the girls are **active** participants; as EYH surveys and related literature prove, involvement in hands-on activities has a more lasting effect than passive listening. The workshop topics might be aligned with typical girls' interests such as: *"It Makes Scents"* is the title of a chemistry workshop where the girls explore the production of perfume; "*Something Fishy"* lets girls meet and work with a marine biologist; one archaeology workshop is entitled "*Archeologists will DATE any old thing";* physics workshops: *"Electrons at Work and Play"; "Jelly Waveguides";* Many engineering workshops sport intriguing titles such as *"London Bridge is Falling Down"* or *"More Power to You"* (Electrical Engineering); *"Let's Get Crude"* (Petroleum Engineering); while *"How to Make Crime Pay"* features activities typical for a career in forensics.

The EYH Network staff provides technical assistance and conference organization materials to conference site committees, committees primarily composed of volunteers. The Network staff actively encourages new sites to start EYH conferences, and this EYH strategy works well to motivate girls to

consider a STEM career all over the world - EYHs have happened in Australia, Ireland, Italy, Japan, Malaysia, Singapore, Switzerland, Thailand and in 37 states in the USA. The EYH/N is eager to help some EYHs start in Africa and South America.

Please visit my poster at the 5th ICWIP where you will learn more about the Expanding Your Horizons conferences, how to start one, how to find one near your home, how little it costs to hold an EYH, what their short term and long-term impacts are on the girls who attend and how they benefit the local community. If you want to find out more before the ICWIP visit our website at www.expandingyourhorizons.org.

ADDITIONAL SCIENTIFIC POSTER ABSTRACTS

90. CAN PHYSICS DISCIPLINARY SOCIETIES MAKE A DIFFERENCE IN THE SUCCESS OF WOMEN IN PHYSICS?

Beth A. Cunningham
American Association of Physics Teachers

The number of women earning physics degrees in the United States over the last 20 years has steadily increased to around 20% of all Bachelor's, Master's, and PhD's earned. This increase can be partially attributed to efforts made by physics departments and faculty. In addition, physics disciplinary societies have created a number of initiatives to increase the number, persistence, and success of women in the U.S., focusing on the programs, conferences, and activities that these organizations offer. The American Association of Physics Teachers (AAPT) offers a number of activities and programs to support women in physics. These include childcare grants for attendees of AAPT national meetings to support care for children during conferences, a committee devoted to issues of women in physics, and workshops and talks at national meetings on women in physics including gender issues in the classroom. Finally, AAPT has performed an inventory of women in leadership roles, awards, plenary speakers, and editorial boards to evaluate the current status in the Association and assess whether current practices and policies need to be revised. A summary of these AAPT activities will be outlined in this poster. Suggestions for other efforts by professional societies to increase the number of women in physics, including those going into the teaching profession, will be included.

91. GENDER OUTLOOK IN ENROLLMENT OF UNDERGRADUATE PHYSICS COURSES IN NAGPUR UNIVERSITY

Sushma Chopde and Sricevi Darisi
L.A.D and S.R.P College for Women, Nagpur
Seema Ubale
Dharampeth MP Deo Memorial Science College, Nagpur

In Pre-independence period only rich and upper caste society had access to education. During that period many social reformers like Mahatma Jyotiba Phule fought for right to girls' education for other strata of society. After independence many Acts were passed to promote education basically the primary education which was made free up to the age of 14. Recent studies show that Engineering and medicine are the 1st choice as it provides lucrative jobs and better social life as compared to basic sciences. The present paper is a study on the role of gender in the choice of Physics as a subject in undergraduate courses of the Nagpur University region.

92. THE LINEAR MIRROR SYSTEM

Hans Grassmann[1,2], Elvis Kapllaj[1,2], and Barbara Sandow[3]
[1]Isomorph s.r.l., Visogliano 9R1, I-34013 Duino-Aurisina, [2]Department of Physics, University of Udine, Via delle Scienze 208, I-33100 Udine, [3]Department of Physics, Free University Berlin, Arnimallee 14, D-14195 Berlin

At the time exist several quite different techniques for exploiting solar energy. One of this techniques exploit solar energy by means of concentrating mirror systems. We investigate a two-dimensional array of plane mirrors operated by two motors and a solar thermal collector, which collects efficiently sun light in order to produce heating water. This system preserves the merits of previous state-of-the-art solar power plants but is simpler and applicable in every one family house. The investigation of the linear mirror system are focused on temperature- and heat capacity profiles as a function of day-time and the solar altitude angle. The results and the efficiency of the linear mirror will be discussed in comparison to other solar thermal heat systems.

93. On the detection of Gamma-Ray Bursts with the High Altitude Water Cherenkov Observatory

Kathryne Sparks Woodle Pennsylvania State University, United States

Gamma-ray bursts (GRBs) are extremely powerful transient events that occur at cosmic distances. Observations of energy spectra of GRBs can provide information about the intervening space between the burst and Earth as well as about the source itself. The High Altitude Water Cherenkov Observatory (HAWC) is a second-generation water Cherenkov detector being built near the peak of Sierra Negra in

Mexico. At the altitude of 4100 m, the HAWC Observatory is sensitive to very high-energy (VHE) gamma rays. Due to its wide field of view (~2 sr) and high duty cycle, HAWC can observe the earliest phases of GRBs in the sub-TeV to multi-TeV energy range. HAWC will be able to constrain the spectral shape at the highest emitted energies of GRBs, especially in conjunction with observations from other detectors such as the Fermi-LAT satellite. The HAWC Observatory has been operated throughout construction, and a likelihood-based search for VHE emission from GRBs will be presented.

93. ON THE DETECTION OF GAMMA-RAY BURSTS WITH THE HIGH ALTITUDE WATER CHERENKOV OBSERVATORY

Kathryne Sparks Woodle
Pennsylvania State University, United States

Gamma-ray bursts (GRBs) are extremely powerful transient events that occur at cosmic distances. Observations of energy spectra of GRBs can provide information about the intervening space between the burst and Earth as well as about the source itself. The High Altitude Water Cherenkov Observatory (HAWC) is a second-generation water Cherenkov detector being built near the peak of Sierra Negra in Mexico. At the altitude of 4100 m, the HAWC Observatory is sensitive to very high-energy (VHE) gamma rays. Due to its wide field of view (~2 sr) and high duty cycle, HAWC can observe the earliest phases of GRBs in the sub-TeV to multi-TeV energy range. HAWC will be able to constrain the spectral shape at the highest emitted energies of GRBs, especially in conjunction with observations from other detectors such as the Fermi-LAT satellite. The HAWC Observatory has been operated throughout construction, and a likelihood-based search for VHE emission from GRBs will be presented.

95. ATOMIC‐SCALE FACETING IN COPT NANOPARTICLES EPITAXIALLY GROWN ON NACL

Véronique Pierron-Bohnes [a], Ileana Florea [a], Ovidiu Ersen [a], Corinne Ulhaq-Bouillet [a], Christine Goyhenex [a], Nadi Braidy [b, c], Christian Ricolleau [b], Yann Le Bouar [c] and Damien Alloyeau [b]
a Institut de Physique et Chimie des Matériaux de Strasbourg (IPCMS UMR 7504 CNRS-UDS) 23 rue du Loess BP 43 F-67034 Strasbourg Cedex 2, France b Laboratoire Matériaux et Phénomènes Quantiques, (MPQ UMR 7162 CNRS-UP7) Bâtiment Condorcet Case courrier 7021 F-75205 Paris Cedex 13, France c Laboratoire d'Etude des Microstructures (LEM UMR 104 CNRS/ONERA) BP 72 92322 Châtillon Cedex, France

New physical properties are expected for nanometer-sized particles, and they are nowadays widely developed for many applications. The anisotropic alloys like CoPt are interesting for catalytic applications (5 times more efficient than Pt for oxygen reduction reaction in fuel cells) and magnetic properties (magnetization more stable than for Co so smaller size or higher temperatures can be used for storage media, MRI imaging, drug delivery...).
The questions we raise here are the following: Is the Wulff's law (shape controlled by the surface energy balance of facets) for macroscopic crystals still valid in the nm range? Is the surface segregation observed in macroscopic single crystals also present in nanoparticles?
Sub-10 nm CoPt nanoparticles were slowly grown at 400°C in epitaxy on a NaCl substrate. Their faceted shape and composition profile were analyzed using state-of-the-art TEM techniques: aberration-corrected imaging, electron tomography and probe-aberration-corrected scanning transmission electron microscopy. These nanoparticles consist in truncated octahedrons with a chemically disordered face centered cubic (FCC) structure. We evidenced slight variations of the truncation of these nano-octahedrons depending on their size: the largest particles are less truncated than the smallest particles. No segregation was evidenced on either present facets.
Energy descriptions of these NPs were made by using quenched molecular dynamic in the framework of the second moment approximation of the tight-binding formalism, while taking into account the random distribution of Co and Pt atoms. In a general manner, this original energy approach for studying faceting in chemically disordered nanoalloys is consistent with experi-mental results, particularly for small-size clusters. The Wulff's macroscopic law is thus valid down to 6 nm; below this limit a departure is observed due to the contributions of elastic relaxations, cut bonds, and edges.

96. NATURAL AND ANTHROPOGENIC RADIOACTIVITY LEVEL IN THE SOIL OF SHIGAR (A BEAUTIFUL VALLEY IN CENTRAL KARAKORAM NATIONAL PARK OF BALTISTAN)

Aquila Islam[x] and Manzoor Ali[¥]
Dept. of Physics, Karakoram International University, Gilgit-Baltistan, Pakistan

Karakoram Mountains are famous in the world for their grandeur, natural beauty, medicinal plants, magnificent glaciers and habitat of the white snow leopard. The Central Karakoram National Park (CKNP) is a 10,000 m^2 area marked as conservation Park. Men and Women living in this area are usually as strong as the towering mountains, where they reside on the foot-hills. Longevity of these people has been a world record. These are the trekkers and guides of the mountaineering teams from the world over. But the profile has been changing from recent past. Health issues are creeping up. Carcinoma has made its appearance and some young deaths have negated the longevity. Hence the present research was undertaken with a view to assess possible radiation hazard due to natural and man-made radioactive elements in the soil. Any trace of radioactivity in the soil poses a long term persistent danger as the houses built using this soil are not very well ventilated due to extreme weather conditions This research is funded by an Italian project of Socio-Economic and Educational Development(SEED). The radioactivity levels were determined in 40 soil samples from Shigar valley in CKNP using gamma-ray spectrometry. The samples were collected at an average altitude of 2300 m above sea level. The average activity concentration of natural radionuclides; 226Ra, 232Th, 40K, and anthropogenic radionuclide; 137Cs, were found as 26.43(2.6) Bq/ kg, 49.81(6.4) Bq/ kg, 443.75(35) Bq/ kg and 2.75(0.6) Bq/ kg respectively.
In Shigar samples the air absorbed dose rate was found as 61.59 nGy/h, annual effective dose rate from terrestrial radionuclides as 134.1 Sv/y, effective dose rate due to the deposition of 137Cs on soil as 0.15 Sv/y and dose rate from the cosmic radiations as 829(3) Sv/y. The results were compared with the similar measurements made in other parts of Gilgit-Baltistan and the world. A comparison with the other cities of Pakistan revealed that Shigar soil presented the higher external exposure rate. Three hazard indices named as the radium equivalent activity, external hazard index and internal hazard index were found as 131.78 Bq/ kg, 0.36 Bq/kg and 0.43 Bq/kg respectively. The collective health detriment calculated for Shigar was 2.3 persons.

[X:] Dean(r) of Natural and Earth Sciences and President CPE[€] Chair Dept. of Physics

97. SYNTHESIS AND CHARACTERIZATION OF AU/CDSE AND AG/CDSE CORE/SHELL NANOCOMPOSITES

Afaf Gadalla
Physics Department, Faculty of Science, Assiut University, Assiut, Egypt.
afaf_gadalla1@yahoo.com

The synthesis structure which contains Au or Ag core metallic particles and a shell of CdSe semiconductor has the combined properties of quantum dots and the metallic particles. A new method has been developed to grow plasmonic semiconductor nanocomposites of Au/CdSe and Ag/CdSe nanostructure. The method based on preparing seed of metal nanoparticles which used as a seed using organometllic pyrolysis followed by adding the semiconductor precursors. Their chemical composition crystal structure is determined via X-Ray Diffraction. The collective optical properties of the plasmonic semiconductor nanohybrid has been measured using spectrophotometer techniques and compared to those individual components. The main features which observed in the hybrid nanostructure is broadening of Plasmonic band and decrease in its amplitude in addition to shifting excitonic energy band to higher wave length. The quenching of the emission of Au/CdSe has been observed due to photo induced electron injection into metallic seed. The electron transfer processes from CdSe to the gold is more faster than that of the silver. For this reason, we can consider the Au/CdSe is strong plasmonicexcitonic coupling but Ag/CdSe is week plasmonic-excitonic coupling.

98. CARBON NANOTUBE – NO_X INTERPHASE: PHYSISORPTION VS. DESORPTION INDUCED BY X-RAY RADIATION

G. Ruiz-Soria[1], M. Sauer[1], P. Lacovig[2], M. Dalmiglio[2], S. Lizzit[2], A. Goldoni[2], T. Pichler[1], Paola Ayala[1]
[1]*University of Vienna, Faculty of Physics, Vienna;* [2]*Sincrotrone ELETTRA, Trieste, Italy*

Using single-walled carbon nanotubes as gas sensors implies studying the changes in their electric response while interacting with gas molecules. With this perspective, several papers can be found in the literature but a large percentage corresponds to studies that use nanotube-material that is either highly defective or nonpurified, which obliges us to rethink the established sensing principles, or at least how to describe the sensing mechanism addressed to a specific nanotube- based sensor. Using photoemission and X-ray absorption, which are highly surface sensitive techniques, we have observed revisited the adsorption of NOx on the nanotube outer surface. We have encountered that physisorption governs the adsorption mechanisms on ultrapure metallicity sorted nanotubes and we have observed that the reaction of the NOx molecules are governed by photo-induced effects. This is fundamentally different to the already thought as “well established mechanisms”.