

Reports from IUPAP Working Groups for Meetings in Singapore, November 2014

Collected by Cecilia Jarlskog

The reports here below are from

- WG.1 - International Committee for Future Accelerators (ICFA)
- WG.2 - Communication in Physics
- WG.5 - Women in Physics
- IUPAP Gender Champion, Marcia Barbosa
- WG.7 - International Committee on Ultrahigh Intensity Lasers (ICUIL)
- WG.9 - International Cooperation in Nuclear Physics (ICNP)
- WG.10 - Astroparticle Physics International Committee (ApPIC)
- WG.11 - Gravitational Wave International Committee (GWIC)
- WG.12 - Energy
- IUPAC - IUPAP Joint Working Group

WORKING GROUP 1

Activities of the International Committee for Future Accelerators (ICFA)

September 2013 - September 2014

Roy Rubinstein - ICFA Secretary

1. Introduction

During the past year there were two ICFA meetings: on 20/21 February 2014 at the DESY laboratory in Hamburg, Germany, and on 6 July 2014 during the International Conference on High Energy Physics (ICHEP) in Valencia, Spain. At the February meeting, which is the major annual ICFA meeting, directors of the world's leading particle physics laboratories were also invited, as has been the practice for the past ~ 2 decades. This allows a much more extensive discussion of the present and future status of particle physics.

The current ICFA membership is given in Appendix I.

2. International Linear Collider (ILC)

The design of, and planning for, the ILC has been led by ICFA for over a decade, and led to the ILC Technical Design Report in 2013. Japan is now seriously considering hosting the ILC, and an ILC Project Office at KEK is operating. A preferred site decision has been made, and an international review concluded that the site was totally acceptable. The Japanese ministry MEXT has set up a task force with an Academic Experts Committee under it; a report is expected by March 2016. This group will study total ILC cost, human resources, the Japanese ILC organization, and the social and economic impact of the ILC in Japan.

The Linear Collider Collaboration (LCC), led by Lyn Evans under ICFA's Linear Collider Board (LCB) has been working closely with the ILC Project Office on site-specific ILC design activities. The LCC has also been interacting with Japanese government representatives and with labs and funding agencies around the world to further the realization of the ILC. The LCB has established MOUs with labs in several countries for LCC activities.

The LCB has recently established two subcommittees; the first will produce recommendations for the ILC Lab structure, including such items as governance, project management, etc.; the second will propose an international agreement for the ILC project.

Current consideration is that the ILC would start operation as a 250 GeV Higgs Factory, with later upgrades in stages to 500 GeV.

3. Global Planning for Particle Physics, Including a 100 TeV Collider

There are two very large (~100 km) future colliders---FCC in Europe and CEPC in China---under emerging consideration by the world HEP community; ICFA is starting to look into whether it should play a role in any world-wide effort on the needed R&D for such a project.

The European Strategy document high priority items include a collider at the energy frontier. Tunnels of ~ 100 km have been considered for the FCC, and a preparatory group is preparing a preliminary parameter set; ~ 100 TeV pp, ~ 350 GeV e+e-, and ep options are being looked at. CEPC would be initially a Higgs Factory ~ 240 GeV e+e- collider in a ~50-70 km tunnel, with later conversion to a pp collider.

ICFA encouraged the two studies to work as close together as possible.

4. ICFA Statement

In July 2014, ICFA issued a Statement http://www.fnal.gov/directorate/icfa/ICFA_Statement_20140706.pdf reaffirming its continued support of the ILC and also encouraging studies of future accelerators.

3. ICFA Seminar

ICFA Seminars are held every three years, with the next one being at IHEP/Beijing on 27-31 October 2014. These Seminars allow for an international exchange of information on plans for future facilities in the field of particle physics. Typical attendance is 150-200 invited leading members of the fields of accelerator and particle physics, together with leaders from related topics such as astroparticle physics, scientific computing, outreach, etc. Representatives of government funding agencies and the media are also invited.

6. ICFA Chair

Nigel Lockyer (Fermilab) is the current Chair of ICFA; Joachim Mnich (DESY) will become ICFA Chair for a three-year term starting on 1 January 2015.

7. Reports

Reports were presented to ICFA meetings on the activities of ICFA's Panels; the ICFA/ICUIL collaboration on particle acceleration by lasers; and of each country and lab represented at the meeting. There were also reports given on InterAction (the particle physics communicators' organization) and activities of the Funding Agencies for Large Colliders (FALC).

Appendix I

ICFA MEMBERSHIP

September 2014

CERN Member StatesR. Heuer
M. Krammer
J. MnichUSAN. Lockyer (Chair)
D. MacFarlane
I. ShipseyJapanT. Mori
A. SuzukiRussiaA. Bondar
S. IvanovCanada

M. Roney

China

Y. Wang

Other CountriesL. de Paula
V. Matveev
A. RoyC11

H. Aihara

(Secretary: R. Rubinstein)

WORKING GROUP 2

The members of the Working Group on Communication in Physics are listed below. Each has an interest in physics communication issues, and in many cases have strong connections with physics society publications. The group has been meeting yearly, with meetings in 2012 in CERN and 2013 in Ridge, NY. In 2014, we have a virtual meeting scheduled. The current members are:

Gene Sprouse (Chair)
Editor in Chief, American Physical Society
Ridge, NY

Xavier Bouju
CEMS/CRNS
Toulouse, France

Enrique Canessa
Abdus Salam ICTP
Trieste, Italy

Nicola Gulley
Editorial Director
Institute of Physics Publishing
Bristol, U.K

Li Lu
Professor and Deputy Director
Institute of Physics, Chinese Academy of Sciences
Beijing, China

Sergio M Rezende
Professor of Physics at the Universidade Federal de Pernambuco
Former Minister for Science and Technology of Brasil (2005-2010).

Ken-Ichi Ueda
Institute for Laser Science
Tokyo, Japan

Jens Vigen
Head Librarian(CERN).
Geneva, Switzerland

In 2012, our group had extensive discussions about researcher identifiers, and has made a proposal for the General Assembly to endorse ORCID. ORCID is an open, non-profit, community-based effort to provide a registry of unique researcher identifiers and a transparent method of linking research activities and outputs to these identifiers. ORCID is unique in its ability to reach across disciplines, research sectors, and national boundaries and its cooperation with other identifier systems. Our group proposed the following statement to be adopted by the IUPAP General Assembly:

Statement to the IUPAP Council from the Working Group on communication in physics

The IUPAP Working Group for Communication in Physics acknowledges the long-standing problem of accurately linking researchers with their professional activities, and fully supports ORCID's efforts to create a registry of researcher identifiers and embed these within research workflows.

To support the adoption of ORCID, the Working Group recommends that IUPAP encourage the physics community to adopt ORCID:

- as individuals, by registering for ORCID identifiers(IDs);
- as member organizations, by joining ORCID and integrating ORCID IDs into workflows, for example by
 - o a) integrating ORCID IDs into member registration processes;
 - o b) integrating ORCID IDs into manuscript submission processes; and
 - o c) informing their members of the advantage to them and their community of linking their scholarly activity to their ORCID ID.

In 2013, the Working Group turned its attention to the issue of Data. We met with Chris Biemesdorfer from the AAS, who explained to us various initiatives in Astronomy and other physics fields. After extensive discussions and reports from each member of the committee concerning how data issues are viewed in their location, we developed the following proposal to the IUPAP General Assembly:

Statement to the IUPAP Council from the Working Group on communication in physics.

The working group were asked to consider the benefits and challenges to making research data open for wider reuse. The group recommends that to facilitate the discussions there should be a preferred definition to define data. We propose the following definitions:

Level 0 data – raw data, unprocessed

Level 1 – convert data to standard units; some initial calibrations

Level 2 – some data analysis, such as fit to curves, calibrations etc. Generally the data that will be supporting any figures in published articles and reports

Using this definition the group recommends that Level 2 data could be a good candidate for making openly available. Level 1 and Level 0 data require supporting information and formatting to be of most use and to facilitate accessibility.

There are many good examples of research communities sharing data well and integrating it into publication practices. Data supplementing articles is being published across disciplines, and in the life sciences mandatory publication of data for reproducibility already underpins several disciplines/journals. Research communities such as Astronomy and High Energy Physics have established formatting, linking and archiving protocols for data. However this is not the case across all areas of physics. The working group recognises that there are a number of initiatives and new publications emerging that help to bridge the gaps between the raw data classed as level 0 and the fully processed data at level 2 and that these should be monitored; new services emerging also provide suitable options for authors to index and store their data but the current landscape is still very fragmented.

In conclusion we recommend that IUPAP invite the physics community to provide, whenever and however possible, these data whilst recognising that this will be more complex in some areas than others, with additional supplementary information such as software, for example, required in some cases.

The publishing and library communities can play an instrumental role in this process in designing submission processes and guidelines together with linking mechanisms that can lead to more robust management, discoverability and archiving of the data. The benefits of this would contribute significantly to reducing duplication of effort at a later stage in the future.

We also recognise that by making data available researchers need some assurance that ethical practices will be adopted by others when making use of their data, abiding by any embargo periods or restrictions that may be imposed due to the nature of the data, and suitably acknowledging the original authors.

WORKING GROUP 5

Report on the activities of the IUPAP Working Group on Women in Physics, 2013-2014

The Working Group on Women in Physics was formed by resolution of the Atlanta IUPAP General Assembly with the following mandate:

- to survey the present situation and report to the Council and the liaison committees
- to suggest means to improve the situation for women in physics.

One of the main activities of the Working Group is the organization of the International Conferences on Women in Physics (ICWIP) that take place once every three years. At these conferences experiences and data from a large number of countries are exchanged. This year the Fifth IUPAP International Conference on Women in Physics took place in Waterloo, Canada from August 5th through August 9th (<http://icwip2014.wlu.ca/>). This was the first time that the conference was held in North America. 215 participants from 49 countries attended the conference. The country list included both developed and developing countries many of which are not part of IUPAP. To guarantee the participation of people from countries in need we awarded full Travel Grants. We received 93 grant applications from 34 different countries, many of them from Africa. This shows the positive impact that the Conference held in South Africa in 2011 had on the Physics community in the continent. In that regard, it is remarkable that our Working Group has links with active groups of women in many countries that do not have a strong tradition in the practice of Physics and are not part of IUPAP. Unfortunately, although we had agreed to cover the travel expenses of many applicants, we had last minute cancellations due to visa problems. Although we knew we could be facing this problem, we did not have many resources to address it. It would be good to develop a strategy for the future. Finally, 46 Travel Grant awardees attended the conference. They came from the countries listed in the following table.

Country and number of funded participants
Albania, 1
Algeria, 1
Argentina, 2
Armenia, 1
Belarus, 1
Brazil, 1
Burkina Faso, 1
Cameroon, 1
Congo, D. R., 1
Cyprus, 1
Ecuador, 2
Egypt, 2
El Salvador, 1
Estonia, 1
Ethiopia, 2

Honduras, 1
Ghana, 2
India, 2
Indonesia, 2
Iran, 1
Ireland, 1
Kenya, 1
Lithuania, 1
Mexico, 2
Morocco, 1
Nepal, 1
Nigeria, 1
Pakistan, 1
Peru, 1
Philippines, 1
Russia, 1
Sudan, 1
Tanzania, 1
Tunisia, 1
Uganda, 2
Zambia, 1

We could support the travel expenses of so many participants thanks to the funds we received from the following agencies and individuals:

IUPAP
Beth Cunningham
Judy Franz
Beverly Hartline
Stefan Zollner
Juana Rudati
Network For Good
American Association of Physics Teachers (AAPT)
American Institute of Physics (AIP)
American Physical Society (APS)
Argonne National Laboratory (ANL)
Brookhaven National Laboratory
Jefferson Science Associates (JLAB)
National Academy of Science (NAS-USLC)
National Institute of Science & Technology (NIST)
Stanford Linear Accelerator Center (SLAC)
College of Science & Physics Department Northeast University
Yale University
Korean Physical Society (KPS)
Asia Pacific Center for Theoretical Physics (APCTP)
Association of Asia Pacific Physical Societies (AAPPS)
Japan Physical Society JPS
Japan Society of Applied Physics - JSAP
Physical Society of Republic of China, Taiwan
ICSU
National Science Foundation (through AAPT)

The Working Group was responsible to apply for this support. The Local Organizing Committee obtained funding from their country to cover other expenses of the conference. Several Physical Societies, on the other hand, helped the conference through the support of their own country team members.

As planned, at the conference there were six very successful plenary talks delivered by Melissa Franklin (Harvard University, USA), Silvia Torres-Peimbert (UNAM, Mexico), Claudia Felser (Max Planck Institute for Chemical Physics of Solids, Germany), Patience Mthunzi (National Laser Centre of South Africa), Sabine Stanley (University of Toronto, Canada) and Tsai-Chien Chiang (China, Taipei, author of the biography entitled "Madam Wu Chien-Shiung: The First Lady of Physics Research"). One copy of the book by T-C Chiang was given to each participating country thanks to a donation from the publisher.

The Conference had very interesting outreach activities. There was a public lecture by Jill Tarter, the outgoing Director of the Center for SETI Research who inspired Carl Sagan for his novel "Contact". There was a Panel Discussion on "How to succeed with physics" especially intended for undergraduate students, featuring four women physicists with "non-standard" careers (Sandy Eix, developer of shows, programs, and exhibits at Science World, Canada; Marina Milner-Bolotin, Assistant Professor in Science Education at the University of British Columbia; Clara Moskowitz, Associate Editor at Scientific American and Eileen Pollack, novelist, essayist, and short story writer with an undergraduate degree in Physics). A special lunch was organized where the pioneering Canadian physicist and activist, Ursula Franklin, talked about her life and signed her book, "Ursula Franklin Speaks".

The distinctive feature of ICWIPs is that they are highly participative. Attendants not only present their country and scientific posters, but are also engaged in discussions and elaboration of resolutions and proposals. The climate of the conference, on the other hand, is such that most people are willing to share their feelings, thoughts and experience. Associated with the 5th ICWIP there were two activities that promoted this exchange. On one hand, participants were invited to share stories that reflected their life in Physics. These stories that came from all over the World are available at <http://mystemstory.wlu.ca/>. Then, Beth Cunningham and Toni Sauncy worked on a video project as part of an NSF grant for which over 40 women participants of ICWIP were interviewed. The video is currently being edited and will be made available soon. Finally, as in previous conferences, during the 5th ICWIP there were 5 parallel breakout sessions where discussions were fostered. They covered the following subjects: Gender Studies, Physics Education, Improving the workplace, Professional Development and Leadership, Cultural perception and bias/ Science Practice and Ethics. Apart from the resolutions to be presented at the IUPAP General Assembly, we want to highlight here two points that came out of the discussions of the breakout sessions. On one hand, a deeper involvement of specialists on gender studies was perceived as necessary either during ICWIP or by holding a separate specific international conference. On the other hand, the need for a continuous survey of the situation of physicists throughout the world was pointed out. Namely, at one of the breakout sessions, Casey Tefaye from the American Institute of Physics presented the results of the 2010 Global Survey of Physicists analyzed by regions. This analysis was restricted to the 12 countries with at least 30 female respondents to the Survey.

The data turned out to be not representative of any nation or region, but reflected the respondents' experience. A multi-level analysis considering age, employment sector, gender and children was applied. Yet, some global trends were inferred with respect to gender. In 9 of the analyzed countries, women had fewer opportunities than men and in a different 9-country subset they had fewer resources than men. Regarding career progress, women with children progressed more slowly than men in 8 of the analyzed countries. The percentage of men who perceived that their careers had advanced more slowly, on the other hand, was smaller for men with than for men without children. These findings were consistent in many countries, but not all. This shows that there is still work to be done and that a deeper study is necessary to learn from the differences between countries. The multi-level analysis, however, requires that data from many more individuals be collected. There is therefore a need to have a continuous global survey of physicists.

The results of the discussions of the breakout sessions were presented at a General Assembly that was held the last day of the conference. Based on these results the set of resolutions included at the end of the report was unanimously approved.

As in previous conferences, AIP will publish the Proceedings of the 5th ICWIP. Papers for the proceedings are currently being collected. About 30 scientific papers, 28 of the 49 country papers, 4 of the 5 workshop papers, and at least one of the plenary speakers papers have already been received. We thus expect these proceedings to be ready much earlier than the previous ones.

All conference participants and the Working Group members think that there is a compelling need for the Group to continue to exist. Although there has been great progress more work is needed to increase the number and improve the situation of women physicists throughout the world. To pursue its goals efficiently, Working Group members need to be renewed. Our proposal is that Igle Gledhill replaces Silvina Ponce Dawson as chair of the Working Group after the IUPAP General Assembly and that Shohini Ghose from Canada replaces Silvina, Prajval Shastri from India replaces Shobhana Narasimhan and Kwek Leong Chuang from Singapore replaces Jin-Hee Yoo from Korea as Working Group members. The Working Group website, currently hosted by the University of Buenos Aires, will also be updated and moved to Singapore. As always, it is very important to mention that none of the Working Group activities would be possible without the continuous help of Jacquelyn Beamon-Kiene with the full support of the American Physical Society.

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Resolution for the IUPAP 28th General Assembly
Submitted by the
5th IUPAP International Conference on Women in Physics
Waterloo, Canada, August 5-8, 2014

Physics is a key discipline for understanding our Universe, improving the global standard of living, and solving problems confronting society. Yet, globally, the involvement of women and girls in physics is very different across countries and is still limited in most of them. Learning from regional differences is thus relevant to continue improving the situation of women in Physics worldwide. The Fifth IUPAP International Conference on Women in Physics, held in August 2014 in Waterloo, Canada, brought together 215 women and men from 49 countries. It was the first such gathering in North America. In this way the Conference has travelled across the globe since its existence. The positive impact that the previous Conference, held in South Africa, had on the Physics community of the continent was reflected in that representatives from 16 African countries attended ICWIP in Canada (and more would have attended it if it had not been for visa problems). At the final conference assembly, participants unanimously endorsed the following resolutions for approval by the 28th IUPAP General Assembly in Singapore.

1. IUPAP is asked to support and encourage Physical Societies, through their National Liaisons, to facilitate the sharing of insights and successful strategies for inclusion and advancement of women in Physics. Adaptation of shared international material to local circumstances should be considered by the National Liaison members.
 - a. The National Liaison Committees should encourage Physical Societies to organize Workshops on Professional Development for Women in Physics at all educational and career stages. A training workshop specifically on publication culture for young researchers and students is advisable.
 - b. The IUPAP Working Group on Women in Physics is tasked to promote the sharing of workshop material between countries.
2. We reiterate our stand regarding the need to promote gender equity at all levels in physics practice. In order to have a set of guidelines in this regard, we ask IUPAP to mandate the Working Group on Women in Physics to craft out a “Waterloo Charter” based on the Baltimore Charter and the Pasadena Recommendations formulated by the American Astronomical Society in 1993 and 2003, respectively, for the IUPAP to uphold in the future. It would be advisable that this Charter be also shaped and guided by the principles dictated by the JUNO project initiated by the Institute of Physics (UK).
3. There is a need to continue to conduct regular updates of the Global Survey of Physicists presented in 2011 in Stellenbosch.
 - a. We ask IUPAP to take the necessary steps to continue the Global Survey of Physicists periodically, ideally every 5 years.
 - b. The continued survey should use the same questions and translations as the first Survey.

4. We charge the IUPAP Working Group on Women in Physics with further analysis of country data presented at ICWIP2014 from the 2010 global Survey, including
 - a. evidence-based implementation of policy within countries,
 - b. Seeking of consistent data according to guidelines,
 - c. Inclusion of some qualitative analysis where quantitative data not available.
 - d. This analysis should be included in WG report and distributed via the IUPAP website.
5. We recommend that IUPAP endorse an annual International Women in Physics Day.
 - a. The recommended date is November 7th, in commemoration of the birthday of Marie Curie and of Lise Meitner and of the announcement of the first Nobel Prize in Physics awarded to a woman.
 - b. A campaign is recommended on this day to reduce conscious and unconscious bias and its consequences. Improvement of the Public perception of physicists, with special reference to gender, would be included in the campaign.
 - c. We recommend that awareness of subtle gender bias should be incorporated into the training of teachers/physicists as teachers.
6. Recognizing that Physics Education Research has just begun to take effect for girls in physics, we request IUPAP to recommend that the outreach activities required for IUPAP-funded conferences include:
 - a. a content-based physics learning session for school teachers, and
 - b. an event for girls under 16.
7. Given the success with which the IUPAP International Conferences on Women in Physics have met as a means of providing a forum for both men and women to exchange best practice on involving women in IUPAP and in physics in general, we charge the Working Group to organize the 6th IUPAP International Conference on Women in Physics.

Waterloo Charter for Women in Physics

We hold as our guiding principles that:

- Women and men are equally good in doing excellent science and deserve equal opportunity.
- Diversity contributes to excellence in science so that the full participation of women and men will maximize excellence in the field of physics.
- Current recruitment, training, evaluation and award systems often prevent the equal participation of women.
- Formal and informal mechanisms that are effectively discriminatory are unlikely to change without intervention. Both thought and action are necessary to ensure equal participation for all.
- The measure of equal opportunity is outcome, namely gender equity is attained when the percentage of women in the next level of advancement equals the percentage in the pool.
- Increasing the number of women in physics will improve the professional environment and improving the environment will increase the number of women.
- Long-term change requires periodic evaluation of progress and consequent action to address areas where improvement is necessary.

Context

The IUPAP established the working group on Women in Physics (WIP) in 1999 as a resolution of the Atlanta General Assembly as Working Group 5. The working group is charged with the following responsibilities:

- To survey the situation for women in physics in IUPAP member countries;
- To analyze and report the data collected along with suggestions on how to improve the situation;
- To suggest ways that women can become more involved in IUPAP, including the Liaison Committees, the Commissions, the Council, and the General Assemblies.

This Charter was formulated at the fifth IUPAP International Conference for Women in Physics organized by the working group in WIP in Waterloo, Canada from August 5-8, 2014. The Charter is based on the rubrics of the Baltimore Charter and the Pasadena Recommendations formulated by the American Astronomical Society in 1993 and 2003 respectively. The document is also shaped and guided by the principles dictated by the JUNO project initiated by the Institute of Physics (UK).

Rationale

Physics has a long and honorable tradition of participation by women, who have made many significant and highly creative contributions to the field. However, the percentage of female physicists remains low. It is increasingly clear that scientific careers are strongly affected by social and cultural factors, and are not determined solely by ability.

The search for excellence that unites all scientists can be maintained and enhanced by increasing the diversity of its practitioners. Great discoveries have always strived

on cross-cultural diversity. The attainment of such diversity needs revised criteria for judging excellence, free of cultural perceptions of talent and promise.

Current available data on the relative numbers and career histories of women and men in science reveals widespread discrimination: access to the profession, like graduate education, hiring, promotion, and funding, is not always independent of gender. There are cases where unequal treatment of women occurs in the laboratory, the lecture hall and the observatory. Some of these discriminations could be subtle, rather than overt discrimination, creating a non-conducive atmosphere that not only discourages and distresses women but also alienates them from the field. Ultimately, such discrimination can only damage the profession.

The working group believes that IUPAP should assume responsibility for implementing strategies that will enable women to succeed within the existing structures of physics and allow the desired acceptance of diversity to develop fully.

Recommendations

1. Significant advances for women have been made possible by affirmative action. Affirmative action involves the establishment of serious goals, not rigid quotas, for achieving diversity in all aspects of the profession, including hiring, invited talks, committees, and awards.
 - (a) Standards for candidates should be established and publicized in advance. Criteria that are culturally based or otherwise extraneous to performance or the pursuit of scientific excellence should not be applied.
 - (b) Women should participate in the selection process. If insufficient numbers of women are available at particular institutions, outside scientists can be invited to assist. Men must share fully the responsibility for implementing affirmative action, as they hold the majority of leadership positions.
 - (c) The selection of women should reflect on average their numbers in the appropriate pool of candidates and normally at least one woman should be on the short list for any position, paid or honorific. When women are underrepresented in the pool, their numbers should be increased by active and energetic recruitment.
 - (d) Data concerning equal opportunity for women should be widely publicized. If the goals for affirmative action are not achieved, the reasons must be determined.
2. The criteria used in hiring, assignment, promotion and awards should be broadened to include different pacing of careers, care of older and younger family members, and demands of dual-career households. Provision for day care facilities, family leave, time off and re-entry will instantly improve women's access to a career and in physics is of equal benefit to men.

A. Tenure-Track Hiring

Traditional hiring practices may work against women as candidates for tenure-track positions in research universities, large national observatories, and science institutes. Statistics show that the fraction of women in the tenure-track pool has increased over the last two decades, but the fraction of women in tenure-track positions has not grown commensurately. It is the clear responsibility of research organizations to take affirmative steps to ensure that all viable candidates for tenure-track positions are identified and

given equal opportunity both for hiring and success. While specifically calling out tenure-track hiring as an area of immediate concern, we recognize that the same practices should be applied to hiring for all positions. In this spirit, we make the following recommendations to be adopted.

Recommendations:

- a. Ensure that all search committees for tenure-track positions contain two or more members whose specific task is to advocate for consideration of candidates from groups that are underrepresented in physics.
- b. Require that search committees be informed about what constitutes legal and ethical hiring practices.
- c. Actively recruit women to apply for tenure-track positions.
- d. Develop policies encouraging flexible means of accommodating dual-career couples.
- e. Require accountability in the hiring process, using appropriate institutional channels, so that results are commensurate with the possible candidate pool.
- f. If two candidates for the same position have equal qualifications within the uncertainties, the candidate from the underrepresented group should be hired.

B. Career Advancement and Recognition

The "classic" career path for physicists in academia has been a progression through undergraduate and graduate school, a postdoc or two, and then a research faculty job at a major university. Statistics indicate that women are lost from this "progression" in proportion greater than for men, for a variety of reasons such as unsupportive work environments, lack of role models, and insufficient opportunity for recognition of their performance. Recognition often comes in the form of professional awards and invited presentations, where women frequently have been underrepresented relative to their achievements. Informal mentoring is easy and widespread for young people who resemble those already in the field but often is nearly inaccessible to those from underrepresented groups. We offer several recommendations to ameliorate this situation:

Recommendations:

- a. Academic institutions should provide regular evaluation, mentoring and career counseling to young faculty members.
- b. Universities and individual departments should set up formal programs to train mentors for younger students and professionals, with attention paid to both career and family issues. In addition, IUPAP should sponsor periodic special sessions or short training programs at the semi-annual general meetings. The individual astronomy and physics departments then should take the responsibility of implementing a mentoring program, so that their more junior members have a mechanism to acquire support and advice. Specific areas of interest for training and mentoring would include information about rules (both written and unwritten), expectations, networking, and the general decision-making process of a particular institution.
- c. Ph.D.-granting universities should recognize the potential of graduate-student applicants from institutions that traditionally serve underrepresented groups. Departments should develop working relationships with faculty at these institutions, and establish specific

- mentoring programs for graduate students who may undergo "culture shock" upon arrival at a major research university.
- d. Decisions on advancement should result from an open process, based on specific criteria that are spelled out in advance. Senior faculty and other senior personnel must provide an environment that enables all junior faculty to have an equal opportunity to succeed and advance in this process.
 - e. Organizations and academic institutions should offer women equal opportunity for scientific recognition in the form of awards (IUPAP awards and others) and invitations to present invited talks in a variety of circumstances, including all IUPAP and physical societies meetings, topical professional meetings, and traditional colloquia/seminars. Prize nominee pools and invited speaker lists should adequately reflect the diversity of the profession. The institutions responsible for selecting awardees and invitees should review periodically their policies and progress in this area, in order to ensure that the achievements of women are being represented fairly.
 - f. Along with direct contributions to science, criteria for success should include teaching and other functional terms of employment. Specifically, outreach and education activities are important both for the future of physics and in relation to possible career paths; involvement in such activities should be supported and rewarded at all levels, including hiring decisions and performance evaluations. Paradoxically, individual women sometimes are heavily burdened with committee service in an effort to achieve greater diversity; this additional service also should be recognized in advancement decisions.
 - g. The responsibility to create institutional changes that promote equity in physics lies first and foremost with the senior and more established members of an institution. However, individuals at a more junior level have a strong interest in such change and should participate as is feasible. In addition, these younger physicists should not be thwarted by apparent barriers, but should enthusiastically pursue their own goals and dreams for scientific achievement and career advancement.

C. Institutional Policies

Institutions have a responsibility to change the face of our profession, by developing and implementing policies that are friendly to women and that ensure equal access to all benefits and opportunities that will help them advance in their careers. Many institutions have policies that are limited in scope or outdated. Consistent policies that are supportive of diversity, among institutions that grant degrees in physics or employ physicists, play a critical role in "leveling the playing field" for women physicists.

Recommendations:

- a. All institutions should establish and promote strong policies and training in the areas of sexual harassment and general ethics, including clear complaint paths and accountability, taking care that these policies apply both to permanent employees and to short-term visitors (e.g., students and visiting observers).
- b. Institutions should endorse and implement the Waterloo Charter as far as possible. The IUPAP should maintain a public list of institutions and

organizations that endorse this Statement.

- c. Members of the departments granting degrees in physics or employing physicists should work proactively with their institutions to establish policies that allow all department members access to affordable health and childcare. This access should not be reserved only for faculty, but be extended to graduate students, post docs, research and administrative staff as well.
- d. All job applicants should be made aware of institutional policies and benefits e.g., health care, childcare, leave policies, spousal/partner hire policies, spousal/partner job search assistance, and retirement) provided at all levels.
- e. IOP maintains an assessment scheme to recognize and reward physics department that can demonstrate that they have taken action to address the under-representation of women in university physics and to encourage better practice for both women and men. IUPAP should encourage member countries to adopt such self-assessment schemes.

D. Varied Career Paths

Many, if not most, professional physicists worldwide are employed in positions other than tenure-track positions at major research universities. Examples are employment at national or private laboratories, colleges that do not grant Ph.D.s, science centers, industry, or various roles in science or university management. The paths to these roles typically are not well understood, nor are the opportunities available to develop skills that are useful in these various types of positions.

Recommendations:

- a. Academic departments should encourage outside training in non-research fields, such as program/project management or science policy, in order to prepare their students for the possibility of future careers in managing a variety of scientific endeavors. This may include, for example, courses outside the academic department or department seminars given by people in various related careers.
 - b. Educational institutions that are co-located with related industrial employers, research institutions, or observatories should establish specific programs that enable students to "cross-train" between the university and the other organizations. Likewise, informal and formal science discussions, mentoring groups, seminars and colloquia, etc. at these professional institutions should have an open door policy and encourage student participation.
 - c. Mentoring programs such as that recommended in the section on "Career Advancement and Recognition" should include discussions and explorations of options outside the traditional faculty progression; physics departments should work with their university's career development centers, and with their own graduates, to provide information about these options to their undergraduate and graduate students.
3. Strong action must be taken to end sexual harassment. Education and awareness programs are standard in many governments and in the industry and should be adopted by the physics community. Each institution should appoint one or more women to receive complaints about sexual harassment

and to participate in the formal review process. Action against those who perpetrate sexual harassment should be swift and substantial.

A. Cultural Issues

Some of the strongest, but most difficult to quantify, reasons that individuals from underrepresented groups can feel disadvantaged arise from a mismatch with the majority "culture" –i.e., implicit norms and expectations of behavior. Specific recommendations that are made above would go far toward dealing with some of these issues in terms of policies and practices, but there remains a large gray area of subtle cultural issues that contribute to the underrepresentation of women in tenured and other leadership roles. In the words of Jocelyn Bell Burnell (Science 304, p. 489, 2004): "Women and minorities should not do all the adapting. It is time for society to move toward women, not women toward society."

Recommendations:

- a. Institutions should encourage gender-equity training and make it available at all levels. This should include discussions of the well-studied effects of subtle discrimination, unconscious bias, and the accumulation of disadvantage.
- b. In an era in which the ability to work within a large team is becoming increasingly important for scientific success, departments should foster a collaborative and team-oriented approach rather than just the more traditional, competitive scientific culture. Responsibilities and rewards should be shared equitably in the team environment. It is also expected that such a team should be composed of diverse members of the department, where appropriate (for example, men and women, junior and senior faculty, students, etc.).
- c. Good communication channels should be maintained and encouraged throughout academic departments and laboratories, both within peer groups and spanning traditional hierarchical levels. Department chairs should organize regular opportunities for two-way communication throughout the hierarchy.
- d. Institutions should ensure that a career in research is compatible with having a family; professional activities (e.g., class and meeting schedules) as well as employment benefits (e.g., childcare, family leave, etc.) should be developed with this specific goal in mind.

B. Statistical Information

Evidence of the underrepresentation of women in the physics community relies on insufficient long-term statistical data. Better longitudinal data, specific to physics, are needed to assess women's representation and to assess the effectiveness of remedies. The issue of statistics must be recognized for its central importance to understanding the social and cultural forces that shape the characteristics of our field.

Recommendations:

- a. The IUPAP should commission a longitudinal study of young women in physics, beginning with those aged 18-23. A similar group of men should be used as a comparison sample. Both subjects that remain in the field and those that leave the field should continue to be tracked

for the duration of the study. The IUPAP should commit to continue this study for at least 10 years, in order to establish statistics on retention and career paths for this cohort. Professional sociologists, using accepted statistical techniques, should carry out this study. One goal of this study would be to measure whether there is differential attrition of women from the pipeline and if so, to learn the reasons for it.

- b. The working group (WG5) has been engaged in a Global survey. There is a need to continue to conduct regular Global Survey of Physicists. Questions pertaining to cultural perception and bias should be crafted into the survey. We recommend that physical societies adopt all the questions in this Global Survey of Physicists for their own use within their countries.

The IUPAP should build the Global survey and form a "Committee on Statistics"; whose main objective would be collecting, analyzing and reporting data on the demographics of our field. This committee could work closely with other relevant IUPAP committees (as well as organizations such as the National Science Foundation and American Institute of Physics (AIP) that conduct their own surveys). This committee should provide complete and regular access to statistics on items such as gender balance, the fraction of beginning students who earn their Ph.D., and the mean time to completion.

- c. The above mentioned committee's prime focus should be to examine the demographic status of the IUPAP membership and the physics community in a three-fold approach: (a) mining standardized yearly departmental reports (using those currently administered by the AIP) for statistical information, (b) administering and analyzing in depth periodic surveys and (c) giving input to and reporting results from longitudinal studies.
4. Gender-neutral language and illustrations are important in the formation of expectations, both by those in power and those seeking entrance to the profession. Documents and discussions should be sensitive to bias that favors any one gender, race, sexual orientation, life style, or work style. Those who represent physicists to the public should be particularly aware of the power of language and images that, intentionally or unintentionally, reflect on Physics as a profession.
 5. Physical safety is of concern to all physicists and of particular significance to women, who often feel more vulnerable when working alone on campus or in observatories. This issue must be addressed by those in a position to affect security, making it possible for everyone to work at any hour, in any place, as necessary.

Report from IUPAP Gender Champion

Gender Champion Report

Marcia Barbosa

The International Union of Pure and Applied Physics in addition to the direct activities of the Working Group on Women in Physics has been involved in the following steps toward improving the situation of women.

1- In Brazil the main researchers receive a fellowship from the Brazilian Grant Agency CNPq. This fellowship in addition to a month payment is a quality stamp for all other grants in the country. Rarely someone out of this system can receive a grant. Each researcher is evaluated every three or four years depending on the level. During this period the researcher had to produce a certain minimum of papers and students. The Brazilian Team affiliated to the IUPAP Working Group on Women in Physics have demonstrated to the agency that women are underrepresented in this group probably because it is very hard to produce papers in the year a woman gives birth to a child, therefore the new mothers are usually excluded from this fellowship and later from all other grants as well. The government as response to this demand established a new policy in which the fellowship is extended one additional year for these women. This is the first positive action taken by the government in this direction.

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2- Recognizing that in Latin America there existed almost no policies on women in sciences, in some countries in which there was not yet any group of women associated to the IUPAP Working Group on Women in Physics started to become organized. One example was Peru. A group of physicists, acknowledging the existence of the IUPAP WGWI, organized a meeting on Women In Physics in Peru. (<http://www.mujeres-fp.com/>). I was one of speakers (<http://www.mujeres-fp.com/programa.html>) and I was able to highlight the positive impact that the resolutions written during the IUPAP International Conferences of Women in Physics has had on agencies and governmental bodies. The final resolution of the event was to write a document with propositions to authorities in Peru and internationally to IUPAP. The document assembles measures to improve the participation of women in physics, particularly to stop age limits in applications for fellowships and grants.

3- The International Center of Theoretical Physics (ICTP) commemorated its 50th Anniversary this October (<http://www.ictp.it/ictp-50th-anniversary.aspx>) Within its program there was a session on Women in Physics where I could also speak

(http://www.ictp.it/ictp-50thanniversary/programme_50_anniv.aspx) showing statistics collected during the First IUPAP International Conference on Women in Physics in 2002 and studies also presented in this meeting as well as in the Fourth IUPAP International Conference on Women in Physics that show the underrepresentation of women in physics and the positive impact of mentoring. The presentation highlighted the positive impact that acknowledging the existence of the problem has in solving it and the progress that IUPAP has made since 1999 when the WGWIP was created. A group of women already working on this topic at ICTP will push for a larger representation of women among the fellowship recipients and visitors. One of the policies would be asking for the creation of a daycare for small children.

4- Statistics about the Conferences Supported by IUPAP – In this report only the conferences that sent their report up to October 2014 have been included.

Commission	Title	Participants	Speakers
C2	International Conference on Precision Physics of Simple Atomic Systems	Total:63 Women:9 (14%)	Total:13 Women: 4 (30%)
C3	5th International Conference on NanoStructures	Total:728 Women:371 (50%)	Total:29 Women:5 (17%)
C16	7th Int. Conf. on the Physics of Dusty Plasmas	Total: 180 Women: 40(22%)	Total:31 Women: 9 (29%)
AC4	International Conference on Medical Physics	Total: 835 Women: 265 (32%)	Total: 92 Women: 15 (16%)
	RAD 2014 Conference and SEERAS Symposium	Total: 312 Women:135 (43%)	Total: 20 Women: 9 (45%)

WORKING GROUP 7

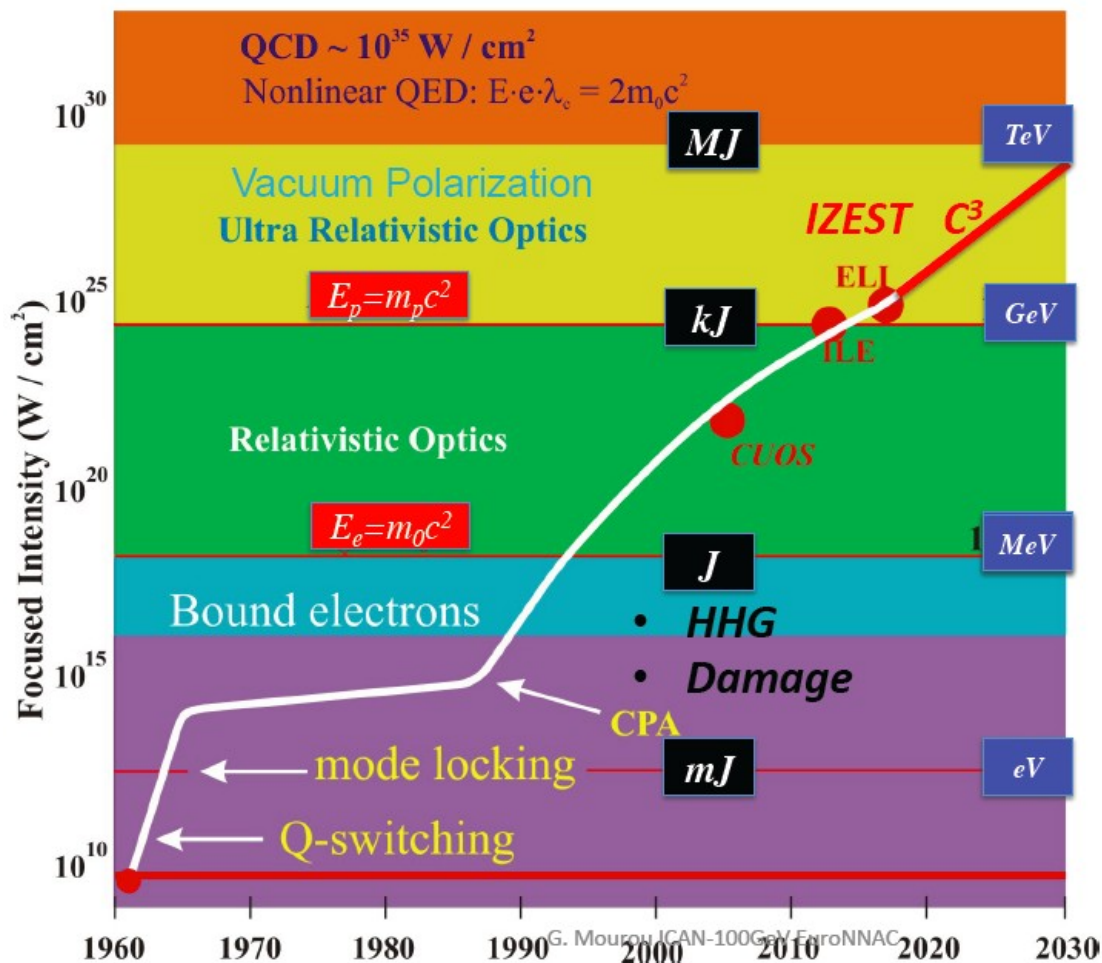
Annual Report to IUPAP September 2014

www.ICUIL.org

ICUIL Activity Overview

ICUIL continues to be engaged with the advancement of the international field of ultra-high intensity lasers. Our goals are to provide a venue for discussions, among representatives of high-intensity laser facilities and members of user communities, on international collaborative activities such as the development of the next generation of ultra-high intensity lasers, exploration of new areas of fundamental and applied research, and formation of a global research network for access to advanced facilities by users. As summarized in this report, ICUIL continues to be active in promoting collaborations required to establish high-intensity laser infrastructures for the benefit of the international physics community. Thanks to the ICUIL leadership, the laser intensity continues to exponentiate over the years. See below what we call the Mourou Chart (after the first Chair of ICUIL, Professor Gerard Mourou). This activity overview highlights progress and events for 2014.

- Chair**
Toshiki Tajima
- Co-Chairs**
Chris Barty
Alexander Sergeev
- Secretary**
Terry Kessler
- Treasurer**
Tsuneyuki Ozaki



A European ESFRI roadmap project, the Extreme Light Infrastructure (ELI) consists of ELI-Beamlines, ELI-Nuclear Physics, and ELI-ALPS (attosecond science pillar) which are on their way towards initial operation in 2018. Professor Wolfgang Sandner, our former Co-Chair of ICUIL, continued in his role as Director General and CEO of the ELI Delivery Consortium. The Extreme Center for Exawatt Laser Science (XCELS), aspiring to be the fourth pillar - ELI-High Field Science, has the goal of achieving 200 petawatts for frontier experiments.

The high intensity laser community and accelerator community engaged in synergistic activities over the last year. ICUIL representatives reported to the ICFA (International Committee for Future Accelerators) General Assembly in February. In response to recommendations in the Joint Task Force Report that lasers having higher repetition rate and higher efficiency are required, the International Coherent Amplification Network (ICAN) started a development consortium and the European Network for Novel Accelerators (EuroNNAC) is holding an Advanced Accelerator Conference in the US this year. Also, the Stanford Linear Accelerator Center (SLAC) will host a high power laser workshop in 2014.

Laser facilities around the world continue to advance rapidly. The current highest intensity laser is at GIST (Gwangju Institute of Science and Technology, Korea) at 1.5PW. Fast in its footsteps are Chinese initiatives such as at SIOM, IOP, Peking University, Shanghai, and Jiaotong University in China. University in Japan is also pursuing an exawatt initiative. Lawrence Livermore National Laboratory (LLNL) is near completion of their Advanced Radiographic Capability (ARC) petawatt level laser. India is hosting the 2014 ICUIL Conference at Goa where they will showcase their high intensity laser efforts and liaisons with the wider scientific and industrial communities of India.

ICUIL Biennial Conferences

ICUIL has a decade-long history of promoting unity and coherence in the field by convening conferences dedicated to ultra-high intensity lasers and their applications. The 6th biennial ICUIL conference will be held **September 12-17 in Goa, India** and will be hosted by the **Tata Institute of Fundamental Research**, with R. Kumar serving as the conference chairman. It will be located in the city of Goa, on the west coast of India, about 600 km south of Mumbai. ICUIL is expected to showcase the latest on multilateral projects like the ELI, XCELS and IZEST as well as the efforts in individual institutions across the world. The Tata Institute of Fundamental Research (TIFR), Mumbai has been the hub of preparations for ICUIL2014. TIFR has led Indian contributions to collaborative efforts at CERN, Fermi lab and KEK. It currently hosts 100TW and 20 TW, femtosecond Ti-sapphire lasers. Another center of the Department of Atomic Energy (DAE), the Raja Ramanna Centre for Advanced Technology has a 150 TW, femtosecond Ti-Sapphire laser. With these lasers and a multiplicity of set ups and diagnostics, these two Indian centers have made many advances in high intensity laser-plasma interaction studies and laser driven particle acceleration. Currently both centers have approved and funded plans for the installation of petawatt laser facilities by 2016.



2014 Annual General Assembly (GA) Meeting

It is anticipated that a quorum will be reached at the annual GA meeting held in Goa, India in October. The agenda for the meeting will consist of member rotation, the 2014 ICUIL Conference, website development, the world map, fund raising, and laser infrastructure initiatives and collaborations with ICFA, ELI, XCELS, and IZEST. Bi-monthly teleconferences continue to be effective in maintaining progress in each of these activities.

ICUIL Member Rotation

Several of the current ICUIL members will have completed two terms of service by 2016 and will be required to step down according to the bylaws of the ICUIL charter. A gradual member rotation will begin in 2014 to maintain continuity and ensure that ICUIL continues to advance while maintaining balance both geographically and between the various high field science working groups of IUPAP.

ICUIL Newsletter

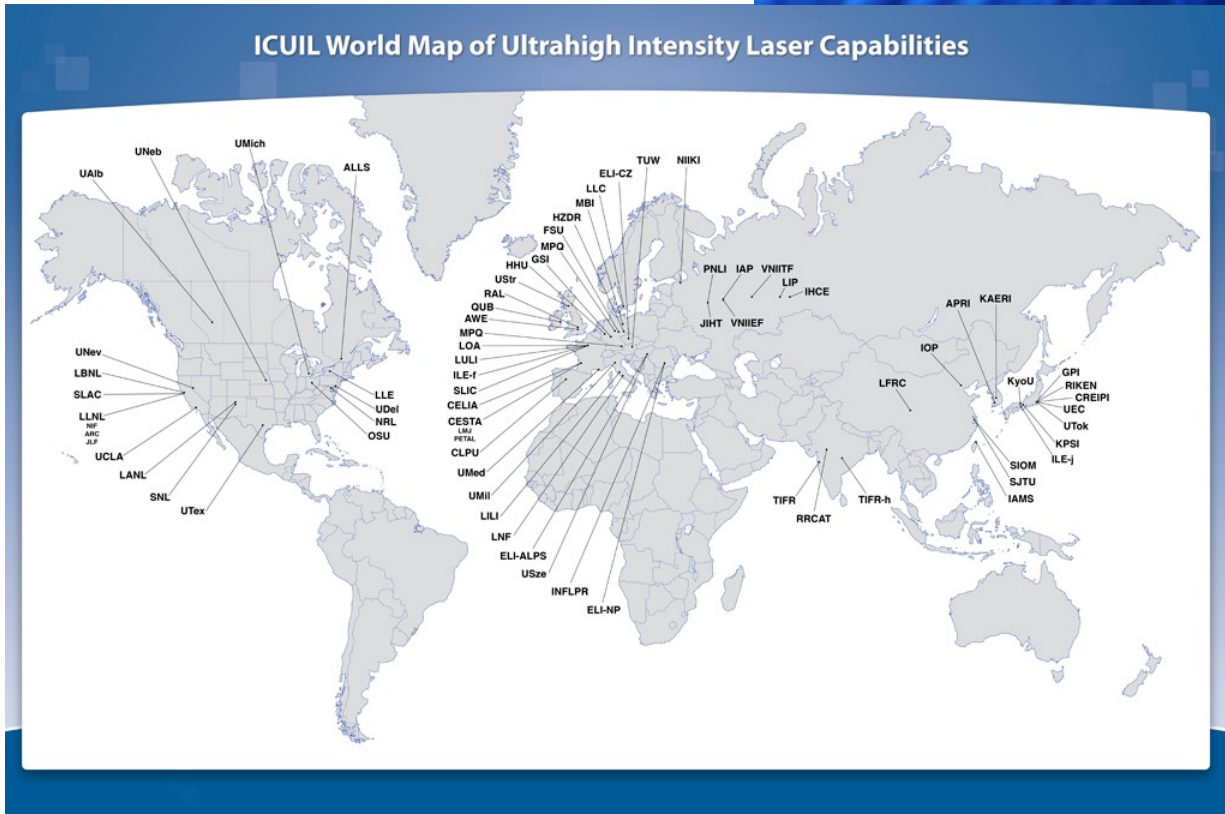
ICUIL continues to achieve its goal of publishing a newsletter annually. The fifth ICUIL Newsletter (Volume 5) was sent out to the high intensity laser community in June 2014 and is also available at the ICUIL website. The chief editor, C. Labaune, managed the illustration and publication resources to distribute an eight-page newsletter to hundreds of readers, highlighting the major laser construction and laser science projects within the HIL community, major conferences, and related workshops.

Fund Raising

ICUIL has continued its corporate support program to afford maintenance of the ICUIL website, publish an annual newsletter, and support biennial conferences. The remaining funds are being targeted towards support of new outreach activities including student competitions held at the biennial conferences.

ICUIL Website

One of the features of the ICUIL website is an interactive world map that highlights the high intensity laser facilities around the world as shown below. Surveys of the worldwide laser community are conducted by ICUIL in an effort to provide an accurate accounting of all existing and planned ultrahigh intensity laser facilities that are capable of reaching intensities above $10E19$ W/cm².



2014 ICUIL Membership

Toshiki Tajima	Chairman	International
Chris Barty	Co-Chairman	United States
Alexander Sergeev	Co-Chairman	Russia
Terry Kessler	Secretary	United States
Tsuneyuki Ozaki	Treasurer	Canada
Gerard Mourou		France
Hiroshi Azechi		Japan
John Collier		United Kingdom
Dino Jaroszynski		United Kingdom
Thomas Kuehl		Germany
Ravi Kumar		India
Christine Labaune		France
Wim Leemans		United States
Ruxin Li		China
Chang Hee Nam		Korea
Bedrich Rus		Czech Republic
Wolfgang Sandner		Germany
Heinrich Schworer		South Africa
Ken-ichi Ueda		Japan

Associate Members (without vote)

Ryosuke Kodama	Japan
Sandro de Silvestri	Italy
Nilson Dias Vieira Jr.	Brazil
Claes-Goran Wahlstrom	Sweden

ICUIL Related Science and Technology Highlights

I. ICFA/ICUIL Joint Task Force (JTF)

High-energy physics studies the fundamental particles and forces that make up and govern our universe. Large facilities like the LHC at CERN are needed to observe these tiny particles and determine their properties with higher and higher resolution. Accordingly, the last decades have shown a clear trend: every new accelerator at the energy frontier, being more powerful than its predecessor, could provide a significant step forward in resolution and beam energy. The energy of the particle beams however dictates the technology, which in turn determines the size of the machine and its tunnel. A team of worldwide experts is already exploring the next possible machine at CERN that could have a tunnel of up to 100 kilometers. The field requires alternative technologies that could make acceleration of particles more efficient, e.g. using plasma wake acceleration. In particular with CERN's AWAKE project, ICUIL is contributing to the basic research in this field. The update of the European Strategy for Particle Physics recommends design studies for accelerator projects in a global context for high-energy-frontier machines coupled to "vigorous" accelerator research and design. High gradients and high energies will remain a core challenge of particle physics, and tackling them with ingenious technologies like high-intensity and high coherence lasers that could shorten accelerators dramatically would be a revolution in the field of accelerators or detectors. In February, the regular board meeting of ICFA took place at DESY in Hamburg. ICUIL was represented by Toshiki Tajima with a SKYPE presentation, and by Thomas Kuehl, who participated in this meeting. ICFA is leading a concerted international effort to coordinate and support these world-wide activities, aiming to define the future of high-energy physics in the next twenty-to-thirty years. The agenda included reports and discussion on a number of future accelerator projects. Ideas for large scale facilities were presented which will be proposed to be installed in Japan, Europe, China and Korea. ICUIL chairman Toshiki Tajima explained the latest progress in laser technology towards an improvement of average power, as needed for a wide application of laser drivers for high energy accelerators. The connection between the ICFA and ICUIL communities was further documented in the report of Brigitte Cros, Univ. Paris-Sud, chair of the ICFA Panel on Advanced and Novel Accelerators. Although the main line of discussions was centered on the extension of classical accelerator schemes, the importance of novel laser acceleration approaches is well recognized. It was emphasized that a next dedicated meeting on laser acceleration would be a timely step to encourage a close interplay between international developments towards novel acceleration schemes.

II. Extreme Light Infrastructure (ELI)

In February, Prime Minister Victor Orban, together with ELI- Attosecond Light Pulse Source (ALPS) Managing Director Lorant Lehrner and with the ELI DC Director General, Wolfgang Sandner, laid the cornerstone for the building. The presence of the Prime Minister indicates the support that ELI-ALPS enjoys from the Hungarian Government. While still waiting for the arrival of Structural Funds from the European Union the Hungarian Government had already pre-financed building planning and construction preparation such that a contract with an international consortium of constructors had already been concluded early in the year. Similarly, ELI-ALPS' international industrial and scientific partners, including many from the ICUIL community, have already concluded contracts to help

developing the Technical Design Report and supplying scientific equipment. ELI-ALPS – and, hence, ELI as a whole - has taken another huge step on its way towards implementation. The European Commission, more precisely, the Directorate General on Regional Policy, during the first week of May officially released the first and major part of the over 200 million Euro EC contribution towards the construction of ELI-ALPS. Therewith, construction of the ELI facilities in the Czech Republic, Hungary and Romania is now fully secured at a total level of 850 Mio Euro, with roughly 85% percent coming from the European Union and 15% from the host countries. ELI is a pioneer among the research infrastructures contained in the European ESFRI Roadmap in using EU structural funds for construction. Similar progress as in Hungary occurs at the other pillars. The building construction at ELI-Beamlines in Prague and at ELI Nuclear Physics (ELI-NP) in Magurele, Romania, is making impressive progress. ELI-NP recently celebrated the conclusion of a multiten-million-Euro contract for delivery of a world-wide unique gamma beam source. A contract over delivery of two 10petawatt lasers had already been concluded earlier, similar to a contract over a 10-Hertz, diode pumped petawatt laser to be built by Lawrence Livermore National Laboratory for ELI Beamlines in Prague. The Romanian lasers will be built by a French company, while the gamma beam source will be developed by a European consortium of companies and institutions under the leadership of the Italian nuclear physics institute INFN – demonstrating the international character of ELI and its close cooperation with industry and academia during implementation. The pan-European character of the ELI project has recently been further strengthened by the British Science and Technology Facilities Council STFC with its CEO John Womersley (also ESFRI Chair) having officially joined the ELI-DC International Association. STFC and RAL's Central Laser Facility will jointly represent UK in the Association. It now contains members from the three host countries CZ, HU, and RO, as well as from Italy, Germany, and the United Kingdom. Wolfgang Sandner, Director General of the ELI-DC International Association AISBL, is already negotiating with other countries to join, and is inviting the international ICUIL community to maintain its strong support for this world-wide unique laser project.

III. Exawatt Center for Extreme Light Studies (XCELS)

XCELS is a prospective project for international collaboration and is aimed at establishing an international center for the study of extreme light fields in Russia. The XCELS is now at the prototyping stage. It includes creation of two modules with the power of 15 PW at IAP RAS by the end of 2016 and is based on the laser architecture proved during construction of "PEARL" and "PEARL-10" facilities. Further work on creation of a subexawatt laser will be performed at the implementation stage. It includes construction of a new building and engineering infrastructure in the suburb of Nizhny Novgorod city, assembling of the 0.2EW 12-channel laser system, several high-average-power laser facilities for innovative applications, an electron source with particle energies of 100 MeV, experimental laboratories, computer and communication centers, and supporting services. To accommodate XCELS, ground area of about 5 hectares, rather far from highways and industrial plants will be used. The total area of the laboratory, administrative and ancillary facilities will be about 25 000 m², about 15 000 m² of which must have different degrees of radiation protection. The operational stage will start in 2020, and during two subsequent years all research laboratories around the XCELS source will come to the continuous operation mode. They include laboratories for experiments on the physics of strong fields, high-energy physics, laboratory astrophysics and cosmology, nuclear optics, neutron

physics, laboratories for studying the properties of vacuum, attosecond and zeptosecond physics, and fundamental metrology. XCELS will also comprise a powerful center for data processing and computer modeling of the interactions of extreme light fields.

In 2014 XCELS became a part of the CREMLIN project under The Horizon 2020 call that unites efforts of 19 large European labs including DESY, CERN, ESRF, JINR, Kurchatov Institute, and others. This will foster scientific cooperation between the Russian Federation and the European Union in the development and scientific exploitation of large scale research infrastructures. It has been triggered by the recent so-called megascience projects initiative launched by and in the Russian Federation which is now very actively seeking European integration. The proposed megascience facilities have an enormous potential for the international scientific communities and represent a unique opportunity for the EU to engage in a strong collaborative framework with the Russian Federation. The CREMLIN proposal is a first step to identify, build and enhance scientific cooperation and strong enduring networks between European research infrastructures and the corresponding megascience facilities to maximize scientific returns. The proposal follows the specific recommendations of an EC Expert Group by devising concrete coordination and support measures for each megascience facility and by developing common best practice and policies on internationalization. The Extreme Light Infrastructure Delivery Consortium (ELI-DC) and the IAP RAS will jointly lead the work package devoted to the XCELS project. On the European side, the French CEA, Laser Interactions and Dynamics Laboratory (LIDyL) is another partner in this work package. ELI-DC, CEA and the IAP will organize workshops on the development and technological challenges of next generation high power lasers, and carry out expert meeting, round table discussions and workshops devoted to internationalization and governance issues of high power laser infrastructures.

IV. Shanghai Institute of Optics and Fine Mechanics (SIOM)

Celebrating its 50th anniversary, the Shanghai Institute of Optics and Fine Mechanics has pioneered important advances in high power lasers, high-field laser physics and solid-state lasers. The Shanghai Institute of Optics and Fine Mechanics (SIOM) has been widely recognized as the most important research center of laser science and technology in China. SIOM has become a comprehensive research institute with primary research fields that include high power laser technologies, high-field laser physics, information optics, quantum optics, solid-state laser technologies and their applications, and materials for laser and optoelectronics. SIOM has been engaged in the research and development of high power laser technology and engineering for decades, and developed in recent years the first Chinese multikilojoule laser facility, Shenguang (SG for short and means “magic light” in Mandarin) –II facility. The SG-II laser facility includes nine laser beams [see Fig.1(a) and (b)], that has been stably operated for more than 10 years and will be upgraded to be a 20 kJ-class laser facility in the near future. This facility has become an international user facility for high energy density physics research. SIOM developed the first Chinese petawatt, femtosecond laser facility in 2007 based on the chirped pulse amplification (CPA) scheme. This laser system was recently upgraded to 2 PW based on a 100-mm dia. Ti:sapphire amplifier. A 10 PW level femtosecond laser system combining the Ti:sapphire based CPA chain and an OPCPA booster amplifier is being built. A hybrid Ti:sapphire-CPA and LBO-OPCPA laser system has been developed to produce 0.61 PW/33.8 fs pulse output near 800nm. SIOM has successfully developed large aperture Nd-doped laser glass slabs, which are the key active material of high-power laser-fusion drivers. Moreover, optical coatings for high-power laser applications can be customized for wavelength ranges from

deep ultraviolet to infrared. The laser-induced damage thresholds for mirrors and polarizers are higher than 60 J/cm² and 30 J/cm² (1064 nm, 10 ns) respectively. Driven by the PW laser facility, a two-stage laser wake field accelerator (LWFA) with near-GeV quasi-monoenergetic electron beams (QMEBs) was demonstrated in 2010. The collimated QMEBs with peak energy of ~0.8 GeV are achieved with an acceleration gradient of 187 GV/m.

V. National Ignition Facility's Advanced Radiographic Capability (ARC)

The Advanced Radiographic Capability (ARC) at LLNL, a petawatt laser system, is rapidly moving along the path to completion and commissioning. Over the past year, the ARC utilities, including electrical cabling, vacuum and ventilation systems, platforms, and cleanrooms, have been installed. One year ago, the ARC team completed a major milestone by propagating first light into ARC Compressor Vessel 1, and the first ARC main laser system shot to the Roving Mirror Diagnostic Enclosure (RMDE) was fired in November. A recent series of laser shots to the RMDE calorimeters operationally tested a subset of the ARC systems, including the ARC Injection Laser System (ILS), Integrated Computer Control System (ICCS) automated shot software and Laser Performance Operations Module shot setup and analysis software. The ARC ILS consists of the ARC master oscillator, dual regenerative amplifiers for the A and B beamlets, the split-beam injection system, and modifications to the NIF preamplifier module to switch between NIF to ARC operation using ICCS controls. The laser shots were performed in parallel with the installation and alignment of the compressor and Parabola Vessel line replaceable units (LRUs) in the Target Bay and the ARC short-pulse diagnostics LRUs in the Target Bay and switchyard. Grating alignment in the compressor vessels is now complete. When complete, ARC will be the world's most energetic short-pulse laser, capable of creating picosecond-duration laser pulses to produce energetic x rays in the range of 50-100 keV for backlighting NIF experiments. ARC is designed to deliver kilojoule laser pulses with adjustable pulse durations from 1 to 50 picoseconds and a peak focused intensity above 10E17 W/cm². ARC uses up to four NIF beamlines, propagating two short-pulse beams per NIF aperture in a split-beam configuration. Staggering the arrival of the eight ARC beamlets onto backlighter targets will produce an x-ray "movie" to diagnose the fuel compression phase leading up to ignition of a cryogenic deuterium-tritium target with tens-of-picoseconds resolution. ARC is important to help us understand what's happening in the compressed core of NIF targets. ARC will also enable new experiments in frontier science and high-energy-density stewardship science.

VI. International Center for Zetta-Exawatt Science and Technology (IZEST)

IZEST, headquartered at the Ecole Polytechnique, will unify a number of exawatt class facilities such as the ELI-Fourth Pillar, the Russian XCELS, as well as possible Japanese and Chinese exawatt lasers. Almost 30 laboratories in 13 countries have signed a collaboration agreement with IZEST. The second IZEST meeting was held November, 2012 at Strathclyde University, Scotland. The main objective of the conference was to explore the potential of very high fields available from the next generation of high power lasers and also the potential of combing them with high-energy particle beams from laser-plasma accelerators, for fundamental studies of the structure of matter. The third IZEST meeting

was held at the Lawrence-Livermore National Laboratory in July 2013 to discuss the development of novel exawatt and zettawatt laser technologies and the development of frontier, ultrahigh intensity science and applications. The last meeting of 2013 was held in Asia in November at the French embassy in Tokyo. The meeting was followed, November 20 by the IZEST Participant Council at the University of Tokyo hosted by Professor K. Yamanouchi and his staff. Participation of the most prominent Asian laboratories in particle physics, and ultra intense lasers in Japan, Korea, Taiwan, and India, in addition to those of the European Union, Russia and the USA occurred. An important contingent from industry was also in attendance. A large part of the meeting was devoted to the revolutionary laser architecture ICAN (International Coherent Amplification Network) that has the ability to generate laser pulses at ultra-high Intensity, high average power and high efficiency. The main applications discussed included Particle Colliders, a Higgs factory, High-energy Astrophysics, Nuclear Transmutation, Proton Therapy, Proton Diagnosis, Nuclear Pharmacology, the identification of spent nuclear fuel in general and exposed fuel (i.e. Fukushima), as well as Homeland Security. In January 2014, IZEST had the privilege to present to the Ecole Polytechnique Levée de Fonds Bureau headed by Claude Bebear, Olivier Mitterand and the President Jacques Biot. In a symposium called Passion Lumière Extrême, highly distinguished researchers like Michel Spiro (CEA), Gilles Cohen Tannoudji (CEA), Etienne Parizot (APC-Université Diderot), Roy Aleksan (CEA), Olivier Napoly (CEA) and other top scientists from the University, demonstrated the wide range of applications in the extreme light regime for fields like High Energy Physics, Nuclear Physics, Astrophysics and Cosmology. Currently there is a strong emphasis within the accelerator community on utilizing the strong fields supported within plasma for extending current and future acceleration facilities beyond the limitations of RF technologies. The emphasis is now placed on laser-driven technologies and the progress being made by labs working around the globe on the challenge of accelerating electrons to 100s of GeV.

WORKING GROUP 9

IUPAP Working Group WG.9 (International Cooperation in Nuclear Physics)

Activity Report 2012 – 2014

Mandate:

- 1. provide a current description of the landscape of key issues in Nuclear Science research**
- 2. produce (maintain) a compendium of facilities existing or under development worldwide**
- 3. establish a mapping of these facilities onto the scientific questions outlined above**
- 4. identify missing components that would have to be developed to provide an optimized, comprehensive network of international facilities for Nuclear Science**
- 5. explore mechanisms and opportunities for enhancing international collaboration in Nuclear Science**
- 6. identify R&D projects that could benefit from international joint effort**
- 7. serve as a source of expert advice for governmental or inter-governmental organizations in connection with efforts to coordinate and promote Nuclear Science at the international level**
- 8. serve as a forum for the discussion of future directions of Nuclear Science in the broadest sense.**
- 9. document the cross section disciplinary impact of Nuclear Science and of Nuclear Science facilities and identify mechanisms for expanding (fostering) cross disciplinary research**

Present membership of IUPAP WG.9:

Robert E. Tribble – Chair [Texas A&M University, USA]

Anthony W. Thomas – Past-Chair [University of Adelaide, Australia]

Willem T.H. van Oers – Secretary [TRIUMF/University of Manitoba, Canada]

Jonathan A. Bagger – Director TRIUMF [Canada]

Angela Bracco – Chair NuPECC [INFN-Milano, Italy]

NuPECC – Nuclear Physics European Collaboration Committee

Umberto Dosseli – Director Laboratori Nazionali di Frascati [Italy]

Hideto En'yo – Director RIKEN [Japan]

Donald F. Geesaman – Chair NSAC [ANL, USA]

NSAC – Nuclear Science Advisory Committee to the US DoE and US NSF

C. Konrad Gelbke – Director NSCL [USA]

Dominique Guillemaud-Mueller – Deputy-Director IN2P3/CNRS [France]

Kobus Lawrie – Acting-Director iThemba Laboratories [Zuid-Afrika]

Alinka Lepine-Szily – Co-Chair ALAFNA [Universidade de Sao Paulo, Brazil]

ALAFNA Associacao Latino Americana de Fisica Nuclear e Aplicacoes

Victor A. Matveev – Director JINR-Dubna [Russia]

Dong-Pil Min – Chair ANPhA [Seoul National University, Korea]

ANPhA Asia Nuclear Physics Association

Hugh Montgomery – Director Jefferson Laboratory [USA]

Berndt Mueller – Associate-Director BNL [USA]

Guenther Rosner – Past-Chair NuPECC [FAIR, Germany]

Naohito Saito – Deputy-Director J-PARC [Japan]

Hideyuki Sakai – Chair IUPAP C12 [RIKEN, Japan]
Susan J. Seestrom – Past-Chair NSAC [LANL, USA]
Dinesh Srivastava – Director VECC [India]
Horst Stoecker – Director GSI [Germany]
Yanlin Ye – Past-Chair ANPhA [Beijing University, China]
Wenlong Zhan – Vice-President Chinese Academy of Sciences [IMP-Lanzhou, China]

Meetings of IUPAP WG.9:

The Annual General Meetings are held to discuss the various long range plans in terms of the nuclear science priorities, their implementation, and the major nuclear physics facilities, existing, under construction, and being planned. The long range plans are those for NSAC in the US, for NSERC and TRIUMF in Canada, for NuPECC in the European Union. Also discussed are the nuclear physics collaboration efforts in Latin-America by ALAFNA and in the Asia-Pacific region by ANPhA. The Annual General Meetings of IUPAP WG.9 are preceding those of IUPAP C12 (the Commission on Nuclear Physics).

The meetings in the period 2012-2014 took place at:

- Nishina Research Center (RIKEN), Japan, August 17-18, 2012
- Laboratori Nazionali di Frascati INFN, Frascati, Italy, June 1, 2013
- GSI Helmholtzzentrum fuer Schwerionen Forschung GmbH, Darmstadt, Germany, July 11-12, 2014

In addition IUPAP WG.9 organizes the triennial Nuclear Science Symposia which focus on the seven main topics of nuclear physics to date:

- Can the structure and interactions of baryons/hadrons be understood in terms of QCD?
- What is the structure of nuclear matter?
- What are the phases of nuclear matter?
- What is the role of nuclei in shaping the evolution of the universe, with the known forms of nuclear matter only comprising a meager 5%, the rest being dark matter 27% and dark energy 68% ?
- What is the physics beyond the Standard Model?
- What is the role of nuclear physics serving society?
- What is the role of nuclear energy in the global energy question?

The first Nuclear Science Symposium was held at TRIUMF, July 2-3, 2010, while the second was held at Laboratori Nazionali di Frascati INFN, May 31 – June 1, 2013.

The next Nuclear Science Symposium will take place in 2015 in Washington, DC.

The Nuclear Science Symposia are public meetings attended by the proponents of nuclear science, long range planning committee members, directors of the various large nuclear physics facilities, and funding agency/government representatives.

Major Nuclear Physics Facility Construction:

Paramount in the discussions during the meetings of IUPAP WG.9 appeared the large nuclear physics facilities required to advance the field. In the three year period 2012-2014, much of the upgrade of CEBAF (Continuous Electron Beam Accelerator Facility) to 12 GeV at Jefferson laboratory in Newport News, VA, was completed. Simultaneous experimentation in three of the four experimental halls is to commence in 2015. The construction of FRIB (Facility for Rare Isotope Beams) at Michigan State University in

East-Lansing, MI, has started. J-PARC (Japan Proton Accelerator Research Complex) in Tokai, Japan, is moving forward through its phased approach of reaching the design objectives of 50 GeV and beam power of 1.7 MW. Construction has also started of FAIR (Facility for Antiproton and Ion Research) at GSI (Helmholtzzentrum fuer Schwerionenforschung, GmbH) in Darmstadt, Germany. All four are very large nuclear physics facilities; the latter three each with price tags well in excess of one billion dollars. To advance in knowledge about the structure of the nucleon in terms of its constituents (quarks and gluons and their QCD interactions) a high energy electron-ion collider is being discussed for construction. Its priority will be established through Long Range Plan exercises.

IUPAP Report 41:

This report is a handbook of the nuclear physics facilities world-wide, together with a concise outline of the current nuclear physics challenges, and is produced, maintained, and updated in response to one of the mandates given to IUPAP WG.9 (among other by the OECD Global Science Forum).

IUPAP Report 41 was first published as a hard copy on April 12, 2007.

The first electronic version was posted on the IUPAP WG.9 website

<http://www.triumf.info/hosted/iupap/icnp/index.html>

on July 9, 2007 with an update posted on January 1, 2011.

Following the Nuclear Science Symposium held at Laboratori Nazionali di Frascati on May 31, 2013, the introduction of the report (the roadmap for nuclear science for the next five to ten years) has been rewritten with the aid of proponents of nuclear physics. Furthermore, requests were sent for updates of the individual nuclear science laboratory entries in the report. A total of 52 out of the 88 individual laboratory descriptions were revised. Also the report now contains descriptions of the large deep-underground science laboratories and nuclear theory institutes. The updated version of IUPAP Report 41 has been posted on the above mentioned website on January 1, 2014.

Further tasks of IUPAP WG.9:

It has started the planning of the third Nuclear Science Symposium to be held in June/July 2015 in Washington, DC, following the suggestion by Timothy J. Hallman, Associate Director for Nuclear Physics, of the Office of Science, US Department of Energy. The Symposium will be organized through IUPAP WG.9 by the funding agency/government representatives, the long range plan committees' representatives and the nuclear science community at large.

It is giving an enhanced profile to the Association of Latin-America Nuclear Physics and Applications, ALAFNA, [website : <http://www.alafna.net>] and Asia Nuclear Physics Association, ANPhA, [website : <http://ribf.riken.jp/ANPhA>]

It is discussing the publication of a report on 'Nuclear Physics and Medicine' as was done by NuPECC for the European Union community.

Willem T.H. van Oers
Secretary of IUPAP WG.9
TRIUMF, September 10, 2014

WORKING GROUP 10

Annual Report from Working Group 10 to IUPAP September 2014

ApPIC Astroparticle Physics International Committee Activity Overview
Michel Spiro, Chair
Pierre Binetruy, Secretary

The [Astroparticle Physics International Committee](http://iupap.org/working-groups/wg10-astroparticle-physics-international-committee-appic/) (ApPIC), <http://iupap.org/working-groups/wg10-astroparticle-physics-international-committee-appic/>

was established by the 2011 General Assembly. In October 2012 the Executive Council authorised that members be appointed, and that the mandate be drawn up in consultation with the first members of the Committee. The current members are listed in the Appendix.

Charge to Working Group

- Review on a regular basis the scientific status of the field of Astroparticle Physics;
- Engage in a continuous dialogue with “The Astroparticle Physics International Forum (APIF)” of the Global Science Forum (GSF)² and to give scientific advice to APIF, whose members are appointed by funding agencies;
- Comment on and liaise with similar national and international organs on assessment and road-mapping activities, as the need may arise, such as for promoting the global coherence of plans, priorities and projects, in Astroparticle Physics.

The ApPIC International Committee met for the first time on May 9th, 2014, in Paris in the Astroparticle and Cosmology (APC) laboratory.

Two main items were on the agenda :

- Data Policy in Astro-particle Physics
- High Energy Multi-Messenger Astronomy

The intention was to deliver a message to the Funding Agencies through APIF (Astroparticle International Forum of Funding Agencies) which met soon after on May 9th. The Chair of APIF, Michael Turner, participated in part of the meeting and made a presentation about APIF. The chair of ApPIC was invited to the APIF meeting to report on the conclusions of the ApPic meeting. The messages were the following:

- Example of Data Policy in Gravitational Wave Physics
 - Ground-based gravitational antennas have adopted a bottoms-up approach, with a science-driven data policy
 - LISA (space gravitational antenna) follows the ESA space agency data policy (public funding implies open data policy, just like in the US)
 - General considerations: avoid false discoveries, give proper credit by quoting properly the used data release (collaboration), resources have to be planned from the very beginning with funding agencies
- General Data Policy Structure (5 levels)
 - Data validation (Collaboration)
 - First data releases for joint analyses (Collaborations)
 - . For combinations and mutual cross-checks
 - . For complementary approaches
 - Open trigger on or off line (Collaborations)
 - Data in open access for the community (prepare the community, virtual observatory model)

and help-desk?)

- Data preservation and legacy

- Ideas for general implementation

- ApPIC could trigger a session on this topic in the next large international conference on Astroparticle Physics, TAUP 2015

- This would be a discussion with the community on guiding rules for data policy in Astroparticle Physics

- ApPIC would come back to APIF and provide an interface between APIF and the community (one of the roles of ApPIC)

Messages to the Funding Agencies on High Energy Multi Messenger Astronomy

- High Energy and Ultra High Energy Astronomy :

- Gamma ray astronomy paves the way, providing a reference map of the high energy sky

- Strong evidence for extraterrestrial TeV to PeV neutrinos, but origin is not yet known.

- Cut-off of the cosmic ray high energy spectrum seen, but composition near the cut-off is controversial and origin of the cut-off still debated.

- Gravitational waves will enter the game soon and open new questions (this is already the case with BICEP2)

- Conclusions on High Energy Multi Messenger Astronomy :

- Many recent achievements and open questions

- Huge discovery potential

- Multi messenger approach crucial, including gravitational waves and conventional astronomy (open data policy, virtual observatories including these new messengers will help)

- We could also trigger a discussion on this subject at TAUP 2015, looking at the global coherence and at priorities

Plans for future meetings

The next meeting will very likely be a joint meeting with the ICFA neutrino subpanel (Working Group 1) to discuss the plans for neutrino physics (accelerator based and non-accelerator based). This should happen in early 2015.

We plan to hold a meeting at the TAUP Conference in September 2015 (approved by the organizers) to trigger discussions with the community on Data Policy and global coherence and priorities in high and ultrahigh energy astronomy (follow-up of the May 9th, 2014 meeting).

We also plan to discuss Cosmology, Dark Matter and Dark Energy in a future meeting.

Appendix: **MEMBERSHIP**

Chair: Michel Spiro, France
Secretary: Pierre Binetruy, France
Roger Blandford, USA
Zhen Cao, China
Eugenio Coccia, Italy
Don Geesaman, USA
Kunio Inoue, Japan
Naba Mondal, India
Angela Olinto, USA
Natalie Roe, USA
Sheila Rowan, GB
Valery Rubakov, Russia
Bernard Sadoulet, USA
Subir Sarkar, GB/Denmark
Christian Spiering, Germany
Yoichiro Suzuki, Japan

WORKING GROUP 11

Gravitational Wave International Committee (WG.11) report to IUPAP

6 October 2014

(prepared by Stan Whitcomb, *Caltech* [Secretary] and
Eugenio Coccia, *Gran Sasso Science Institute and U. of Rome "Tor Vergata"* [Chair])

The Gravitational Wave International Committee (GWIC) was formed in 1997 to facilitate international collaboration and cooperation in the construction, operation and use of the major gravitational wave detection facilities world-wide. From 1999 until 2011, GWIC was recognized as a subpanel of PaNAGIC (IUPAP WG.4). In 2011, GWIC was accepted by IUPAP as a separate Working Group (WG.11).

GWIC meets annually adjacent to an appropriate conference. In June 2014, GWIC met in Banff, Canada, in conjunction with the International Pulsar Timing Array annual meeting. This was the first time that GWIC met in conjunction with a pulsar timing meeting, and helps cement the participation of the pulsar timing community in GWIC. Other recent meetings have been held in Warsaw (2013), Rome (2012), Cardiff (2011), Hannover (2010), Pasadena (2009), and New York City (2009). Other business during the year is conducted via email or other electronic communication.

GWIC maintains a website at <https://gwic.ligo.org/> which contains an up-to-date listing of members, its by-laws, announcements of its activities, and links to other items of interest to the gravitational wave community.

GWIC Membership

The membership of GWIC represents all of the world's active gravitational wave projects, as well as other relevant communities, covering gravitational wave frequencies from nanohertz to kilohertz. Each project has either one or two members on GWIC depending on size. GWIC also includes representatives from ISGRG (IUPAP AC2) and from the astrophysics/theoretical relativity community. Two members of GWIC (Eugenio Coccia and Sheila Rowan) are also members of ApPIC (WG.10), ensuring close communications.

Each member project in GWIC determines its representatives on GWIC. In this year, only one member project appointed a new representative: Virgo (Fulvio Ricci).

GWIC Activities in 2012-2013

GWIC convenes the biennial Edoardo Amaldi Conference on Gravitational Waves, sponsored by IUPAP as a "class B" Conference. The Amaldi meeting is considered by many in the gravitational wave community to be their most important international

gathering. The members of GWIC serve as the Scientific Organizing Committee for the Amaldi meetings. The 2015 Amaldi meeting will be held at Gwangju (Korea) in June 2015. This is the first time that the Amaldi meeting will be held in Korea, and only the second time in Asia. GWIC heard a report on the planning for the conference at its meeting in Banff.

Since 2006, GWIC has awarded an annual international prize for an outstanding Ph. D. thesis based on research in gravitational waves. At its meeting in Warsaw, agreed to coordinate its prize with the Stefano Braccini Thesis Prize. In 2011, an informal group (the Friends of Stefano Braccini) created a separate thesis prize, to honor Stefano, a talented young physicist who had worked with the Virgo project. It was decided that GWIC would manage the solicitation of nominations and selection of the two winners. Furthermore, it was proposed that the two prizes be distinguished by emphasizing the impact to the field for the GWIC Thesis prize and by emphasizing creativity and innovation for the Stefano Braccini Prize. This new arrangement was used for the 2013 prizes. There were 17 theses nominated this year, from six different countries.

The 2013 GWIC Thesis Prize was awarded to Sheon Chua from the Australian National University, and the 2013 Stefano Braccini Prize was awarded to Tjonnje Li from Vrije University Amsterdam. Springer agreed to extend its agreement with GWIC to accept nominations from GWIC of both prize winners for publication in the Springer Thesis Series. Both Prize winners were accepted by Springer for publication this year.

At its meeting in Banff, GWIC heard that the International Astronomical Union (the analogous international body to IUPAP in the area of astronomy and astrophysics) was undergoing a reorganization and had just issued a call for new Commissions. GWIC discussed that some scientists in the community had expressed interest in proposing a new Commission on gravitational wave astrophysics. The conclusion was that this Commission would benefit the gravitational wave community broadly and that GWIC should support this proposal if asked. However it was also decided that the new IAU Commission would have a different mission and should be independent from GWIC. If the Commission proposal is accepted, GWIC decided that it should explore cross-representation with the new Commission, in the same spirit of collaboration and communication as it has with other IUPAP bodies.

Also in conjunction with the Banff meeting, GWIC organized a focused workshop on the question of what level of confidence, both statistical and instrumental, is required for a first direct detection claim. This workshop brought together the two communities that are poised for a possible first detection in the next few years: the ground-based interferometer community and the pulsar timing community. The frank discussion and broad overview of this workshop was widely viewed as extremely valuable.

Membership of GWIC (as of October 2014)

Chair: Eugenio Coccia

ACIGA: Peter Veitch

AURIGA: Massimo Cerdonio

Einstein Telescope: Michele Punturo

European Pulsar Timing Array (EPTA): Michael Kramer

GEO 600: Karsten Danzmann, Sheila Rowan

IndIGO: Bala Iyer

KAGRA: Takaaki Kajita, Yoshio Saito

LIGO, including the LSC: Gabriela Gonzalez, David Reitze

LISA: Neil Cornish, Bernard Schutz, Robin Stebbins, Stefano Vitale

NANOGrav: Frederick Jenet

NAUTILUS: Eugenio Coccia

Parkes Pulsar Timing Array (PPTA): George Hobbs

Spherical Acoustic Detectors: Odylio D. Aguiar

VIRGO: Fulvio Ricci, Jean-Yves Vinet

Theory Community: Clifford Will

AC2 Representative: Beverly Berger

Executive Secretary: Stan Whitcomb

WORKING GROUP 12

Report from WG 12 Energy, September 2014

Mandate

At the working group's meeting in Tokyo in July 2013, the following mandate was approved

- The working group (WG 12) shall review current energy issues and through International Union of Pure and Applied Physics (IUPAP) make briefs available for the global physics community and policy makers as well as the public at large.
- The group meets once or twice a year to review selected topics taking advantage of local experts where the meeting is held.
- The topics considered should include energy supply, carriers, storage and use. Both advanced and low tech systems shall be looked into.

It was agreed to make briefs on selected issues rather than technical reports.

Oslo meeting

The working group had its second meeting in Oslo September 1st to 4th. Drafts for some 15 briefs have been received or are in the process of being prepared. These include solar energy, wind energy, hydro power, ocean wave energy, ocean tidal energy, geothermal energy, nuclear power, fusion, coal, gas hydrates, biogas, biofuel, bioenergy (solid), energy storage, batteries. Included is a survey paper on the various energy resource estimates.

In addition there were site visits to the Norwegian distribution center for electricity (Statnett) and to head quarter of the Norwegian petroleum company, Statoil.

The drafts were discussed at the meeting and it was agreed to publish them in a series of EnergyPages similar to the Canadian SciencePages (<http://sciencepages.ca/publications/>). Each document will have a ISBN and the key authors will be named on behalf of the group. The typical length of a brief will be 6 pages that can be printed in paper format.

IUPAP-SCOPE

IUPAP is a member of SCOPE (Scientific Committee of Problems of the Environment) which has its secretariat at the UNESCO premises in Paris. SCOPE has experience in publishing policy briefs similar to the EnergyPages planned by the working group. The leader of the working group was elected president of SCOPE this year. After consulting with the executive councils of IUPAP and SCOPE, it was agreed that the briefs should be published as a series of IUPAP-

SCOPE energy briefs. For the working group this means that we have access to professional staff that can help in the practicalities of preparing the briefs and distributing the briefs. It also means that experts in the SCOPE network will be available to the working group.

Publications

The briefs are planned to be published in batches of four. The first four briefs being hydro power, nuclear energy, coal and biofuels. The target date is April 2015. Before publication, the briefs will be peer reviewed. Hopefully, a science writer will be engaged in the final editing of the briefs if funding can be secured.

Members of the energy group:

Jon Samseth (chair) (Norway), Kristina M Johnson (USA), Kimitoshi Kono (Japan), Mats Leijon (Sweden), Hardo Bruhns (Germany), Glauca Mendes Souza (Brasil), Wikus van Niekerk (South Africa), Chris Llewellyn Smith (UK), George Crabtree (USA), Hushan Xu (China), Kohei M. Itoh (Japan), David Faiman (Israel), Lincoln Paterson (Australia), Eduard Son (Russia), Jack Saddler (Canada).

Proposed resolutions for the IUPAP GA in Singapore, November 2014 concerning the continuation of the working group on energy, WG 12.

- The WG 12's work should continue for another period of 3 years.
- Inactive members should be replaced, and new members should be chosen by the Chair to fill gaps in the expertise that is needed to produce further Briefs that are felt to be important (taking into account geography, gender).
- If possible, provide a budget for the group (one person attended the meeting in Oslo at his own expense).
- The existence of the Briefs should be publicised (with whatever disclaimer is felt necessary), and persuade the world's Physical Societies to do the same.

**IUPAC - IUPAP
JOINT WORKING GROUP**

2014 status report on the IUPAC/IUPAP Joint Working Party (JWP) for the discovery of new elements:

The IUPAC and IUPAP Joint Working Party (the 4th JWP) to consider claims for the discovery of new elements was charged with considering claims, submitted electronically by 31 May 2012, for the discovery of the remaining elements in the seventh row of the Periodic Table for which no assignments have yet been made: namely elements with atomic numbers 113, 115, 117 and 118. As of the end of September 2014, all committee members have returned reviews of the second draft of our recommendations which have now been subdivided into two reports. One report will focus on 113, 115 and 117 because these experiments and their interpretations are “entangled” among the three elements. The second will deal only with element 118.

As is the continuing philosophy of the JWP, much of our concern in these recommendations is to be very sensitive to the influence they will have on future JWPs and claims.

Both RIKEN (Japan), and Dubna (Russia)/Livermore (US) have claims for discovery of $Z = 113$ and it can be argued that these may overlap in time. The former, following a “cold fusion” synthesis route to a very limited number of events, have possible links through known decay products which, if accepted, would support their claim. The latter, employing “hot fusion”, have many decay chain events, but rather than connecting to known nuclear decays, terminate in non-specific spontaneous fission. These odd mass number nuclei ($Z = 113, 115,$ and 117) have many accessible decay pathways, one of several situations which complicates satisfying the discovery criterion of redundancy.

Claims for $Z = 115$ and $Z = 117$ arise only from the Dubna-Livermore collaboration(s). The JWP is carefully debating within its constituency both supportive and disputing points. Since no anchoring to known nuclides occurs, cross bombardments (a “triangulation” of Z assignment which has been used before to satisfy criteria) have proven especially critical to assessments. Recent cross bombardments have provided additional input to aid in deciding the level of confidence in any final recommendation.

Chemical identification has proven problematic in some of these claims as their interpretation relies on difficult relativistic model calculations which, in turn, rely on experiments for validation.

Our review of the few events for $Z = 118$ by the Dubna-Livermore-Oak Ridge collaboration(s) has proven less troublesome, hence the separation of its recommendation from the others.

Our third revision of recommendations should go to the full JWP this coming week and is likely to yield the final report ready for submission. Fortunately or unfortunately, there have been no claims for any elements beyond atomic number 118 in the long interim for this process.

Disclosure: This informal progress statement has been prepared entirely by the Chair of the JWP and has not been reviewed by the membership.

Paul J. Karol, *Chair*
7 October 2014

Appendix

Members of the JWP

Emeritus Professor R. C. Barber
Department of Physics and Astronomy
University of Manitoba
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Emeritus Prof. Paul J. Karol (Chair)
Chemistry Department
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Dr. Bradley Sherrill
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