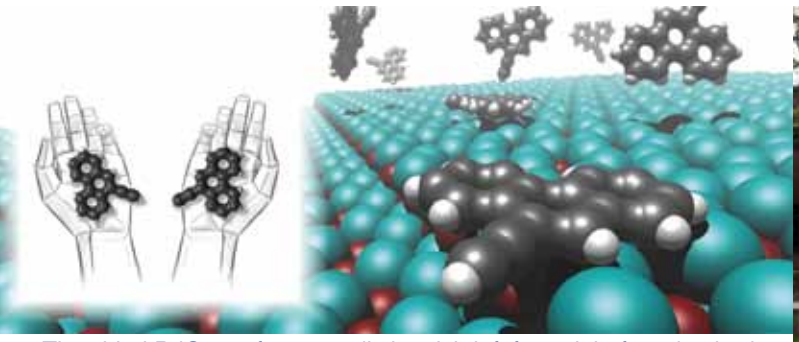
⟨S|P|S⟩ swiss physical society

Nr. 49
Juni 2016

SPG MITTEILUNGEN
COMMUNICATIONS DE LA SSP



The chiral PdGa surface can distinguish left from right for adsorbed 9-Ethynylphenantrene molecules with exceptionally high selectivity. Read the interesting article on p. 23.

The five Gold medals winners of the Swiss Physics Olympiad 2016, from left to right, Nicolà Gantenbein (5), Quirin Reding (3), Caroline Rossier (4), Bastian Lengen (1), Henning Zhang (2). More on page 37.
Photo M. Gerber.

The image shows only a fraction of the about 3000 physicists of the ATLAS collaboration at CERN's Large Hadron Collider. How about assessing collaborative and individual merits? Read page 31. © CERN

USI's Aula Magna, the main location of our annual meeting. © USI

Annual Meeting of the Swiss Physical Society

23 - 25 August 2016
Università della Svizzera italiana, Lugano

General Information: p. 12, preliminary program: p. 14

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Académie suisse des sciences techniques
Accademia svizzera delle scienze tecniche
Swiss Academy of Engineering Sciences

Editorial

Improving Communications

Hans Peter Beck & Andreas Schopper

Effective communication of every society, of which SPS is no exception, always has multiple goals. For SPS, this includes connecting with all members of the SPS, and in reaching out to all persons with professional or private interests in physics in general, and to all those who share the objectives of SPS in particular. The way a well-defined and clear communication strategy shall evolve, is to allow the strengthening and promotion of scientific exchange, to stimulate discussions arching over physics research, physics in industry, physics education, physics in society and to integrate politics in areas where physics has words to say.

Today, the existing communication blueprint involves the printed edition of the "SPG Mitteilungen", which is sent to every SPS member with three to four editions yearly, and the SPS web-site *http://www.sps.ch*. Obviously, when reaching out more globally to the members of our society, and more generally to research and industrial scientists, university and high-school teachers, university and high-school students, school kids, politicians, and also including the broad public, usage of modern tools eases the task by a lot. Rethinking state of the art communication strategies, members of the SPS board have formed a dedicated Communication Working Group to define the relevant needs, the does and dont's of communication to further improve, and importantly to stay cost efficient.

Apart from renewing the complete infrastructure of the SPS communications system and introducing state of the art mailing lists, some of the new features will be the introduction of an SPS electronic newsletter and improved web functionalities, including not only a public area but also a dedicated area for SPS members. For example, the new system shall allow anyone to apply via an online interface for SPS membership and to register to conferences organised by our society. SPS members will be able to update their own coordinates in the member area and to subscribe or unsubscribe from mailing lists of interest. Members will further receive the "SPG Mitteilungen" in a high quality printed version, but in addition functionality will be provided to be able to run over the pages of current and previous issues on the SPS web-site. The graphical layout of the web-site will be renewed to ensure a perfect representation of its content when viewed from any device, whether it is a desktop computer, a tablet or a smartphone, and independent from landscape and portrait mode.

One of the long awaited new features of the new system will be the introduction of the electronic newsletter. This will allow to complement the information published via the "SPG Mitteilungen" and to disseminate important news and up-to-date information on a more regular basis. Not only members will be able to receive this newsletter to which anyone will be able to subscribe (or unsubscribe) at any time.

Last but not least a new conference management system will be introduced, which allows the organization of lectures, meetings, workshops, and conferences. This system is based on the Indico system *http://indico-software.org/about* well known at CERN and available for free, that can be configured for our specific needs. Indico not only handles timetables, registrations and abstract submissions, but also serves to archive any kind of material. For example, presentations in conferences or minutes of meetings are stored in a variety of formats like e.g. Word or PowerPoint and are automatically converted into a platform independent pdf format.

With all these measures in modernising its communication system, the society looks forward in continuously improving its interaction with its members in particular and in reaching out to the general public. The project is in full swing and we are confident that first improvements shall become visible in the coming months to those of you interacting with the SPS via the Internet or by e-mail. We are trying to improve the new system in all conscience, and we are open to criticism. We welcome suggestions for further improvements from our members who certainly will bring in ideas from different perspectives. We are awaiting your feedback via e-mail to *sps@unibas.ch*.

News from SPS Committee meetings (January - March 2016)

Our *SPG Mitteilungen - Communications de la SSP* is approaching its 50th issue shortly, an event to mark with a white stone! We are proud of its standard and thank the colleagues who have accepted our invitation to contribute with scientific or historical articles.

The study "Physics and the Swiss Society" has received support from the platform MAP of SCNAT. A task list has been prepared and the analysis should be based on data. The first stage is therefore to gather the different data sources and in a second stage to analyse the data, prepare articles on success stories and write-up.

In the frame of establishing collaborations with sister national societies, a common prize shared by the SPS and SFP (Société Française de Physique) is in the process of soon being signed. The collaboration with the regional French Physical Society section (SFP-Alpes) on the next Dautreppe seminars continues on the theme *Energy* for 2016, and most probably the theme *Cosmology* for 2017 (see also

SPG Mitteilungen Nr. 48 p.41-42 for 2015). A member of the Swiss Physics Olympiad participated again in the Jury of the French Physics Olympiads in Jan. 2016 (see p.39).

SPS Awards: The number of candidatures fluctuates from year to year and is often rather low. The committee thinks that there are many more excellent candidates and we should find ways to promote the awards better, i.e. address PhD supervisors directly, while still maintaining the high quality of the candidatures.

Next Annual Meetings: In 2017, the joint SPS-ÖPG annual meeting will be held in Geneva from 21 to 25 August at the places of CERN and CICG (Centre Int. de Conférences de Genève). As the meeting is in Switzerland, CHIPP has decided to join in addition to its usual 2-years rhythm.
For 2018 the location and date are still open. In 2019, the joint SPS-ÖPG meeting will again be held in Switzerland.

During this period, members of the Committee have also participated to the following meeting and events: Meeting with the SFP, EPS Council (Mulhouse, 1-2 April), Platform MAP meeting (Bern, 23 March), Swiss Physics Olympiads (Aarau, 3 April).

Antoine Pochelon, SPS Secretary

The SPS remembers Samuel G. Steinemann

The Board of the SPS learnt with deep sadness the passing away of Professor Samuel G. Steinemann in his 93th year on 22.02.2016. Professor Steinemann was a solid state physicist, active in the Physics Department of the University of Lausanne and was President of our Society in the period 1987 to 1989.

As a student, I had Professor S. Steinemann as my teacher for one semester of crystallography. Albeit I did not pursue my career in solid state physics, the subject of crystallography and the relationship between crystal symmetry and their physical properties fascinated me during my student years. I personnally shall always keep the memory of his class and the in depth way he conducted his exam with us.

Our sympathy goes to his family and our Society will always remember his dedication for the Society activites.

M. Q. Tran, President of the SPS

Jahrestagung der SPG in Lugano, 23. - 25. August 2016
Réunion annuelle de la SSP à Lugano, 23 - 25 août 2016

Vorwort

Nach langer Zeit organisieren wir die Jahrestagung der SPG wieder einmal im Tessin, und wir freuen uns, im 2016 dorthin zurückzukehren. Gastgeber ist die *Università della Svizzera italiana* (USI) in Lugano. Auch dieses Jahr beteiligt sich das Schweizerische Institut für Teilchenphysik (CHIPP) mit zahlreichen Beiträgen.

Neben der bewährten Mischung aus Plenarvorträgen, Fachsitzungen und Händlerausstellung steht auch wieder ein öffentlicher Vortrag, sowohl für Tagungsteilnehmer als auch das allgemeine Publikum, auf dem Programm.
Zusätzlich können sich die Teilnehmer für eine Besichtigung des Nationalen Hochleistungsrechenzentrum der Schweiz (CSCS) anmelden (Teilnehmerzahl beschränkt).

Im Folgenden finden Sie die wichtigsten Tagungsinformationen sowie eine vorläufige Programmübersicht. Das definitive Programm wird in Kürze auf der SPG-Webseite verfügbar sein. In diesem Sinne hoffen wir auf eine rege Beteiligung an der diesjährigen Tagung und freuen uns auf Ihren Besuch.

Avant-propos

Cela fait depuis longtemps que nous n'avons pas organisé notre réunion annuelle au Tessin et, pour 2016, nous y retournons avec plaisir. La conférence sera hébergée par l'*Università della Svizzera italiana* (USI) à Lugano. L'institut suisse de la physique des particules (CHIPP) participe aussi cette année avec de nombreuses contributions.

En plus de la combinaison de conférences plénières, sessions techniques et de la participation d'exposants qui a fait ses preuves, nous aurons à nouveau au programme une conférence publique, destinée aussi bien aux participants à la conférence que pour le grand public.
En plus, les participants peuvent s'inscrire pour une visite du Centre Suisse de Calcul Scientifique (CSCS) (nombre limité).

Vous trouverez les principales informations sur la conférence ainsi qu'un aperçu du programme préliminaire ci-dessous. Le programme définitif sera disponible prochainement sur le site de la SSP. Nous espérons avoir une participation soutenue à la conférence de cette année avec ce programme stimulant et nous nous réjouissons de votre visite.

Preisverleihungen - Cérémonies de remise des prix

Università della Svizzera italiana, Via Giuseppe Buffi 13, 6900 Lugano, Aula Magna

SPG Preise, CHIPP Preis, SGN Preis - Prix de la SSP, CHIPP et SSDN

Dienstag 23. August 2016, 15:30h - Mardi 23 août 2016, 15:30h

Preise für die besten Poster - Prix pour les meilleurs posters

Donnerstag 25. August 2016, 10:20h - Jeudi 25 août 2016, 10:20h

Generalversammlung 2016 - Assemblée générale 2016

Dienstag 23. August 2016, 14:30h - Mardi 23 août 2016, 14:30h
Università della Svizzera italiana, Via Giuseppe Buffi 13, 6900 Lugano, Aula Magna

	Traktanden	**Ordre du jour**
1.	Protokoll der Generalversammlung vom 2. September 2015	Procès-verbal de l'assemblée générale du 2 septembre 2015
2.	Kurzer Bericht des Präsidenten	Bref rapport du président
3.	Projekte	Projets
4.	Rechnung 2015, Revisorenbericht	Bilan 2015, rapport des vérificateurs des comptes
5.	Statutenanpassung	Modification des Statuts
6.	Präzisierung des Preisreglements	Clarification du réglement des prix
7.	Wahlen	Elections
8.	Neue Ehrenmitglieder	Nouveaux membres d'honneur
9.	Diverses	Divers

A note from the President

At the joint annual meeting between the Austrian Physical Society and ours, I had the pleasure to meet many of you and, through the presentation of activities, discuss with you about some guidelines of the activities of the Board in the following year. I would like here to present to you a short summary of the activities in 2015-2016.

2015 was the International Year of Light. In Switzerland the event was sponsored by Swiss Photonics and our Society and more than 50 events were organized. While the majority of them (80%) were science outreach ones, the rest covered fields we usually defined as humanities such as music, light and architecture. Most important for me is the fact that we were able to get very young children interested in sciences.

Turning now to more specific activities we have announced at the General Assembly, one of our first actions was to organise the 2016 Annual Meeting in Lugano. I would like to thank here the President of the USI, Prof P. Martinoli and his team, in particular M. A. Zgraggen, for their effective support in the organisation. In 2017 we shall have again the joint meeting with our Austrian colleagues, but this time in Switzerland. The place has been chosen: it will be Geneva, both at CERN and the downtown "Centre International de Congrès de Genève". We have reserved the week of 21-25 August 2017. Please mark this week in your agenda.

We have continued our action to improve our communications. At the time of writing these lines, a contract with a software company is being prepared. We expect that we shall have an electronic communications system serve the physics community in a more efficient way, Let me emphasize here that our SPS has benefitted from the support of SCNAT, which is sincerely acknowledged here.

As I have mentioned at the General Assembly, the teaching of physics at school level has been since years a priority in our programme of actions. Let me remind the courses for physics teachers, the "Physics in Advent". A new step was performed in 2015, with the signature of an agreement with the "Société Suisse des Professeurs de Mathématiques et de Physique" (SSPMP) to offer joint membership between SPS and SSPMP. In parallel, we are keeping tight contacts with cantonal organisations of physics teachers to strengthen our link on the operational level, such as allowing them to attend course organized by research institution.

Strengthening the links with our sister societies is another focus. We already have continuous and excellent relationship with the Austrian Physical Society. We are working together on joint initiatives with the French Physical Society through the organisation of events like the Dautreppe seminars or the French Olympiads. We are now approaching the Dutch Physical Society. I expect to be able to report to you the results of on-going initiatives.

Last but not least. You have noticed that the present issue of our Communications bears the number 49. We shall therefore soon celebrate its jubilee. Let me thank all and each of you for having contributed to the articles of very high quality.

I hope that for the next 50 issues will benefit from the same enthusiasm from your side.

As you can see from the brief report, we were able to realize the projects proposed to and by you at the 2015 General Assembly. But our SPS is yours and our growth and strength rely on your commitment and dedication.

I am therefore looking forward to meeting you in Lugano and to have, as at every General Meeting, a fruitful exchange of view.

Minh Quang Tran, SPS President

Statistik - Statistique

Neue Mitglieder 2015 - Nouveaux membres en 2015

Albert Carlo, Belosevic Ivana, Böttcher Lucas, Brunschwiler Thomas, Castelli Ivano Eligio, Dahmen Charlotte, Dash Soumya, de los Rios Paolo, Derbois Elias, Dewi Freitag Marc, Fontcuberta i Morral Anna, Gasser Urs, Gharavipour Mohammadreza, Girard Olivier, Gröbner Matthias, Henrich Beat, Hofer Mirjam Y., Iklé-Habegger Lukas, Induni Gaël, Jotzu Gregor, Kenzelmann Michel, Klossner Melanie, Knaut Can, Komarov Ilya, Kottmann Franz, Krstic Marinkovic Marina, Kuonen Axel, Ladner Thilo, Marcolongo Aris, Mathis Simon Valentin, Mazzola Giulia, Moreno William, Mounet Nicolas, Mourad Maryam, Rawlik Michal, Richard Thibaut, Roldan Cevallos Ana Lucia, Ruch Patrick, Schönenberger Myriam, Schopper Herwig, Tempus Martin, Xu Zhirui, Zhu De Hua, Zürcher Dominik

Ehrenmitglieder - Membres d'honneur

Prof. Hans Beck (2010)
Dr. J. Georg Bednorz (2011)
Prof. Jean-Pierre Blaser (1990)
Prof. Jean-Pierre Borel (2001)
Prof. Jean-Pierre Eckmann (2011)
Prof. Charles P. Enz (2005)
Prof. Hans Frauenfelder (2001)
Prof. Jürg Fröhlich (2011)
Prof. Hermann Grunder (2001)
Dr. Martin Huber (2011)
Prof. Verena Meyer (2001)
Prof. K. Alex Müller (1991)
Prof. Hans Rudolf Ott (2005)
Prof. T. Maurice Rice (2010)
Prof. Louis Schlapbach (2010)
Prof. Herwig Schopper (2015)
Prof. Francis Troyon (2014) († 2016)

Assoziierte Mitglieder - Membres associés

A) Firmen

B) Universitäten, Institute

- Albert-Einstein-Center for Fundamental Physics, Universität Bern, 3012 Bern
- CERN, 1211 Genève 23
- Swiss Plasma Center (SPC), EPFL, 1015 Lausanne
- Département de Physique, Université de Fribourg, 1700 Fribourg
- Departement Physik, Universität Basel, 4056 Basel
- Departement Physik, ETH Zürich, 8093 Zürich
- EMPA, 8600 Dübendorf
- Lab. de Physique des Hautes Energies (LPHE), EPFL, 1015 Lausanne
- Lab. de Physique de la Matière vivante (LPMV), EPFL, 1015 Lausanne
- Paul Scherrer Institut, 5332 Villigen PSI
- Physik-Institut, Universität Zürich, 8057 Zürich
- Section de Physique, Université de Genève, 1211 Genève 4
- Section de Physique, EPFL, 1015 Lausanne

C) Studentenfachvereine

- AEP - Association des Etudiant(e)s en Physique, Université de Genève, 1211 Genève 4
- Fachschaft Physik und Astronomie, Universität Bern, 3012 Bern
- Fachschaft Physique, Université de Fribourg, 1700 Fribourg
- Fachverein Physik der Universität Zürich (FPU), 8057 Zürich
- FG 14 (Fachgruppe für Physik-, Mathematik- und Versicherungswissenschaft), Universität Basel, 4056 Basel
- Les Irrotationnels, EPFL, 1015 Lausanne
- Verein der Mathematik- und Physikstudierenden an der ETH Zürich (VMP), 8092 Zürich

Verteilung der Mitgliedskategorien - Répartition des catégories de membres (31.12.2015)

Ordentliche Mitglieder	678
Doktoranden	67
Studenten	44
Doppelmitglieder DPG, ÖPG oder APS	154
Doppelmitglieder PGZ	64
Mitglieder auf Lebenszeit	131
Assoziierte Mitglieder	20
Bibliotheksmitglieder	2
Ehrenmitglieder	17
Beitragsfreie (Korrespondenz)	6
Total	**1183**

Protokoll der Generalversammlung vom 02. September 2015 in Wien
Protocole de l'assemblée générale du 2 septembre 2015 à Vienne

Agenda

1. Minutes of the General Assembly held in Fribourg on 2nd July 2014
2. Brief Report from the President
3. Projects 2015 - 2016
4. 2014 Finances and Auditors Report
5. Elections
6. New Honorary Member
7. Miscellaneous

The President opens the meeting at 12:00.

1. Minutes of the General Assembly held in Fribourg on 2nd July 2014

The protocol of the last General Assembly, published in the *SPG Mitteilungen Nr. 46* on p. 5 - 6 is unanimously approved.

2. Brief Report of the President

You can find on page 5 of the last *SPG Mitteilungen* (Nr. 46) a brief report on the activities of last year.

During last year, the number of new members has increased significantly but when deducting the departing members the total does not change much even if we have a positive trend. Please talk about our Society in your circles and encourage your colleagues/friends to become member.

EPS has published a "Statement on European Energy Policy and Global Reduction of CO_2 emission" that can be found on *http://www.eps.org/?page=policy_energy_env* . This statement has been sent to Mrs. Doris Leuthard. The SPS board will reflect on this subject and prepare a specific report at its next board meeting.

The contact with the International Union of Pure and Applied Physics (IUPAP) has been revived and we have proposed Swiss candidates to become members of some IUPAP Commissions (18 commissions in total).
New award: COMSOL has offered to sponsor an SPS award and we will have, starting in 2016, an award in Computational Physics.
This means that the SPS will have 5 awards for young physicists. This number should not increase much more to guarantee high quality candidates. However, we could consider having some sort of "mid-career prize" for scientists who have contributed significantly to a field or for a series of articles, …

Contact has been made with the Société Française de Physique and many events have been organised in collaboration. The last one this year will be the "Dautreppe seminar on Photonics" in Grenoble.

We have also, as in the past, supported activities of our Young Physicists Forum as well as the Swiss Physics Olympiads. Here, the Swiss team came back from the International Physics Olympiad 2015 in Mumbai with 2 bronze medals and 3 honourable mentions.

The SPS together with the Société Suisse de Photonique are sponsors of the International Year of Light events. The closing ceremony will be held at EPFL on 5th December 2015.

Discussion on the Membership: The number of students and PhD students is very low and the help of the professors could be asked to increase this number. Other suggestion: register all the PhD students for free. The Young Physicists Forum had been created in the past with the purpose to attract students but it is not very successful.
The advantages of becoming a member should be more clearly explained and advertised. The networking it can create should also be emphasised.
The Physics Olympiads could be approached too.
The EPS Young Minds are hoping for new sections in Switzerland. There is already one at ETHZ. The SPS Young Physicists Forum could be merged with them (www.epsyoungminds.com).

3. Projects 2015 - 2016

We are now in the process of changing our webpage to improve our communications.

We also want to strengthen our relationship with the physics teachers through their associations.

Some national societies will also be approached for better relations and interaction.

The next annual meeting will be held at the Università della Svizzera Italiana in Lugano in the week from 22 to 26 August 2016.

4. 2014 Finances and Auditors Report

The 2014 Annual Financial Report is presented by the treasurer, Dr. Pascal Ruffieux, on pages 6 and 7 of the *SPG Mitteilungen Nr. 46*. Prof. Dr. Ph. Aebi and Dr. P. Gröning, the auditors of this report, have approved the numbers and their statement can be found on page 7.

A benefit of CHF 32'561.78.- is accounted for. This positive number is mostly due to the very successful meeting of last year in Fribourg.

The Annual Financial Report is approved unanimously by the General Assembly.

5. Elections

The president thanks the resigning members of the committee, namely, Dr. Kai Hencken (Physics in Industry), Prof. Antoine Weis (Atomic Physics & Quantum Optics) and Dr. Tibor Gyalog (Education and Promotion of Physics).

The new committee members are elected unanimously by the General Assembly:
- Physics in Industry: Dr. Thomas Brunschwiler from IBM (teaming with Patrick Ruch)
- Atomic Physics & Quantum Optics: Prof. Philipp Treutlein from the University of Basel
- Education and Promotion of Physics: Dr. Gyalog will be

continued on page 10

Jahresrechnung 2015 - Bilan annuel 2015

Bilanz per 31.12.2015

	Aktiven	Passiven
Umlaufsvermögen		
Postscheckkonto	94.587,49	
Bank - UBS 230-627945.M1U	7.962,91	
Debitoren - Mitglieder	3.013,00	
Debitoren - SCNAT/SATW u.a.m.	50.210,30	
Transitorische Aktiven	15,50	
Anlagevermögen		
Beteiligung EP Letters	15.840,00	
Mobilien	1,00	
Fremdkapital		
Mobiliar		1,00
Mitglieder Lebenszeit		62.918,25
Transitorische Passiven		9.515,11
Eigenkapital		
Vefügbares Vermögen		94.709,49
Total Passiven		**167.143,85**
Gewinn		**4.486,35**
Kontrollsumme	**171.630,20**	**171.630,20**
Verfügbares Vermögen per 31.12.15 nach Gewinnzuweisung:		99.195,84

Erfolgsrechnung per 31.12.2015

	Aufwand	Ertrag
Gesellschaftsaufwand		
EPS - Membership	12.436,24	
SCNAT - Membership	8.239,00	
SATW-Mitgliederbeitrag	1.750,00	
SCNAT Verpflichtungskredite		
SPG-Jahrestagung	26.919,95	
Schweizer Physik Olympiade	4.000,00	
SPG Young Physicist's Forum	6.013,65	
Coordination International Year of Light	5.323,06	
International Physics Tournament	1.000,00	
SPG Bulletin/Tagungsband (SCNAT)	6.810,07	
SCNAT Periodika (SPG-Mitteilungen, Druckkosten)	20.503,90	
SCNAT Swiss Young Phys. Tournament	11.000,00	
Betriebsaufwand		
Löhne	12.209,51	
Sozialleistungen	1.848,30	
Porti/Telefonspesen/WWW- und PC-Spesen	3.089,05	
Versand (Porti Massensendungen)	6.281,90	
Unkosten	5.090,75	
Büromaterial	547,65	
Bankspesen	154,50	
Debitorenverluste Mitglieder	1.690,00	
Debitorenverlust SCNAT/SATW u.a.m.	7.500,00	
Sekretariatsaufwand extern	12.668,78	
Ertrag		
Mitgliederbeiträge		98.687,25
Inserate/Flyerbeilagen SPG Mitteilungen		5.810,00
Zinsertrag		12,60
Ertrag aus EP Letters Beteiligung		3.052,81
SCNAT Verpflichtungskredite		
SPG-Jahrestagung (SCNAT)		15.000,00
Schweizer Physik Olympiade		3.500,00
SPG Young Physicist's Forum		4.000,00
Lehrerfortbildungsevent 2014 ff		5.000,00
Coordination International Year of Light		1.500,00
International Physics Tournament		3.000,00
SPG Bulletin/Tagungsband (SCNAT)		5.000,00
Periodika (SPG-Mitteilungen, Druckkosten) (SCNAT)		5.000,00
SCNAT Swiss Young Phys. Tournament		10.000,00
Total Aufwand/Ertrag	**155.076,31**	**159.562,66**
Gewinn	**4.486,35**	
Summe	**159.562,66**	**159.562,66**

Revisorenbericht zur Jahresrechnung 2015

Die Jahresrechnung 2015 der SPG wurde von den unterzeichneten Revisoren geprüft und mit den Belegen in Übereinstimmung befunden.
Die Revisoren empfehlen der Generalversammlung der SPG, die Jahresrechnung zu genehmigen und den Kassier mit bestem Dank für die gute Rechnungsführung zu entlasten.

Die Revisoren der SPG:

Prof. Dr. Philipp Aebi

Dr. Pierangelo Gröning

Basel, 11. März 2016

SPG Buchhaltung, Departement Physik, Klingelbergstrasse 82, CH-4056 Basel
Tel : 061 382 45 13, Email : francois.erkadoo@unibas.ch

continuation from page 7

replaced in 2016, since the second chair of the section, Dr. Hans Peter Beck, is confirmed unanimously for his second term.

6. New Honorary Member

Prof. Herwig Schopper receives the title of Honorary Member of the SPS in recognition of his contributions and achievements in the field of particle physics, notably the realization of the Large Electron Positron (LEP) Collider at CERN, for his efforts to promote international scientific collaborations at CERN, also in the context of the SESAME project in Jordan, for his vision for science without borders which is also a guiding principle for Switzerland in its role as host state of CERN, and as a supporting nation of SESAME.

7. Miscellaneous

Please remember that the Committee is at your service and can be contacted for any question or suggestion.

The Mitteilungen need also your input, any suggestion of an article is welcome. Of course some kind of review will be performed by the Editor.

On 14th September will be the inauguration of the Einstein House in Bern as EPS Historical Site. You are welcome to participate.

The President closes the meeting at 13.00.

Protocol: Edith Grüter

Statutenanpassung - Modification des statuts

Dieses Jahr ist eine kleine Anpasung der Statuten vorgesehen. Zukünftig soll auch der Vizepräsident zeichnungsberechtigt sein, Art. 8 wird daher wie folgt geändert:

Art. 8
Die Gesellschaft ist verpflichtet durch die Kollektivunterschrift des Präsidenten oder des Vizepräsidenten und des Sekretärs oder des Kassiers.

Art. 24
Die gegenwärtige Version der Statuten der Schweizerischen Physikalischen Gesellschaft wurde an der Generalversammlung vom 23. August 2016 in Lugano angenommen. Sie annulliert alle vorherigen Bestimmungen.

Weiterhin wird in Anhang 1 die neue Doppelmitgliedschaft mit dem VSMP (siehe SPG Mitteilungen 48) ergänzt:

Doppelmitglieder DPG, ÖPG, APS oder VSMP: 60.-

Cette année une petite adaption des status est prévue. Dans le futur, le vice-président doit être justifié de signer, Art. 8 est modifié comme suite:

Art. 8
La Société est engagée par la signature collective du président ou du vice-président ainsi que du secrétaire ou du trésorier.

Art. 24
La présente version des statuts de la Société Suisse de Physique a été adoptée par l'assemblée générale à Lugano, le 23 août 2016. Elle annule toutes les dispositions antérieures.

En plus, dans l'annexe 1 la nouvelle affiliation double avec la SSPMP (voir Communications de la SSP 48) sera ajoutée:

Affiliation double DPG, ÖPG, APS ou SSPMP: 60.-

Neue Ehrenmitglieder - Nouveaux membres d'honneur

Der Vorstand hat dieses Jahr zwei Vorschläge für neue Ehrenmitglieder erhalten. Die Ernennung findet im Rahmen der Generalversammlung am 23. August 2016 statt.
Le comité a reçu deux propositions pour des nouveaux membres d'honneur cette année. La nomination aura lieu le 23 août 2016 lors de l'Assemblée générale.

Piero Martinoli

Piero Martinoli studied physics at the ETHZ where he received his PhD in 1972 with a thesis on the proximity effect of superconductor-normal metal contacts exposed to a magnetic field. From there on, he was a senior researcher at ETHZ until 1978, with an interlude as a visiting associate professor at the Ames Laboratory of the Iowa State University, USA from 1976 to 1977. In 1978 he was appointed full professor for physics at the University of Neuchâtel. There Piero Martinoli and his group developed an original research program on two-dimensional superconducting systems (Josephson junction arrays and networks) with a variety of geometric structures, which provide the unique opportunity to explore a broad range of fundamental concepts. This work involved not only technological developments in array fabrication, but also the invention of new techniques for measuring the electromagnetic response, and the application of advanced theoretical methods of both condensed-matter physics and statistical mechanics. Piero Martinoli is internationally known for his outstanding work on pinning and dynamics of both vortex lines and vortex lat-

tices. He contributed substantially to the understanding of various types of phase transitions (e.g., Kosterlitz-Thouless or commensurate-incommensurate) and, in particular, to the effects of fractality, frustration and disorder.

Piero Martinoli distinguished himself for his steadfast service to the scientific community through his activity both in the Swiss National Science Foundation - from 1993 to 2000 as a director of the Division of Physical and Engineering Sciences, from 1993 to 2000 as a member of the Research Council - and in the European Science Foundation. He contributed to the development of the Swiss research infrastructure, the Swiss Light Source (SLS) at the PSI, and the platform for High-Performance and High-Productivity Computing (HP2C) at the Università della Svizzerà Italiana (USI).

In 2003 Piero Martinoli joined the USI Council, and two years later he became president of the USI. The number of students evolved during his presidency from approximately 2000 to 3000. He established a new Faculty of Biomedical Sciences, which will be operative shortly.

Norbert Straumann

Norbert Straumann initiated his impressive career with a PhD under the guidance of W. Heitler in 1961. It concerned the mass splittings of mesons and hyperons in a non-local field theory and was completed less than two years after his Diploma on axiomatic field theory with Res Jost. Straumann continued his work on particle physics and quantum field theory first in Zurich, then at CERN. In 1964 he became assistant professor at Zurich University. In 1967 he took on an associate professor position at Duke University and in 1969 he returned to Zurich University where he became full professor in 1978.
The first part of his work concerned mainly particle physics. He worked on the mass differences of bosons and on current algebras, a predecessor of modern quantum chromodynamics.
In the 1970ies Straumann changed the focus of his research to gravitation, the general theory of relativity. His, probably, most important work concerns solutions of the Einstein-Yang Mills equations, so called non-Abelian black holes. He has shown that all solutions with properties of the field configurations which are not fixed by the mass, the angular momentum and the charges, are unstable. Hence even though non-Abelian black holes or solitons can have 'hairs', the so called Bartnik-McKinnon solutions, these are always unstable. He also found other 'hairy' black holes and solitons (solutions of the non-linear sigma-model, i.e. skyrmions) and showed that they are all unstable. Even though the general proof is still missing, this work is a very relevant step in establishing the 'no hair' theorem, which in its original formulation by J. A. Wheeler does not hold beyond the Einstein-Maxwell theory.
Straumann worked also on many other astrophysical and cosmological issues, especially on Bose stars, on the theory of gravitational lensing and on the problem of the cosmological constant, which remains unsolved until today, but which he has clarified in his sharp and precise manner.
In recent years Norbert concentrated mainly on the history of physics. Among other topics he studied Einstein's 'Zurich Notebooks' and Einstein's path to General Relativity, the history of the cosmological constant and Einstein's 'Annus Mirabilis'.

But the most influential part of Norbert's work are his textbooks on theoretical physics. They grew out of his excellent courses which he gave at the University of Zurich and which influenced a generation of Swiss theoretical physicists. He wrote textbooks on Classical Mechanics, Electrodynamics, Thermodynamics, Quantum Mechanics, Relativistic Quantum Field Theory and, in particular his classic on General Relativity.
These are rigorous but concise textbooks for undergraduate and graduate students always with a special emphasis on the foundations of the topic and always enabling the student to do the relevant calculations. They profit from Norbert's enormous and unequaled breadth as a theoretical physicist. They are unique in first introducing and then applying the modern mathematical language truly adapted to the subject already early on. Due to their modern style, they will remain a most valuable source for University lecturers and students for many years.
Norbert Straumann has been active also in science policy in Switzerland and in Germany. He has been instrumental for the build up of the theory group at the Swiss Institut for Nuclear Research (presently Paul Scherrer Institute), he has served many years in the Research Council of the Swiss National Science Foundation and as 'Fachbeirat' of the Albert-Einstein-Institute of the Max-Planck-Gesellschaft in Potsdam. He held visiting professor positions at several Universities and in 2005 Norbert Straumann was honored with a 'Doctor Philosophiae honoris causa' of the University of Berne.

Allgemeine Tagungsinformationen - Informations générales sur la réunion

Konferenzwebseite und Anmeldung

Alle Teilnehmeranmeldungen werden über die Konferenzwebseite vorgenommen.

www.sps.ch

Anmeldeschluß: 1. August 2016

Tagungsort

Università della Svizzera italiana, Via Giuseppe Buffi 13, 6900 Lugano

Tagungssekretariat

Das Tagungssekretariat befindet sich in der Halle vor der Aula Magna.

Öffnungszeiten:

Mo 22.08.	15:00 - 19:00
Di - Mi 23.08 - 24.08.	08:00 - 18:00
Do 25.08.	08:00 - 12:00

Alle Tagungsteilnehmer melden sich bitte vor dem Besuch der ersten Veranstaltung beim Sekretariat an, wo sie ein Namensschild und allfällige weitere Unterlagen erhalten sowie die Tagungsgebühr bezahlen.
Wichtig: Ohne Namensschild ist kein Zutritt zu einer Veranstaltung möglich.

Wir empfehlen Ihnen, wenn möglich den Montag Nachmittag für die Anmeldung zu nutzen. So können Sie am Dienstag direkt ohne Wartezeiten die Vorträge besuchen.

Hörsäle

In allen Hörsälen stehen Beamer und Hellraumprojektoren zur Verfügung. Bitte bringen Sie Ihre eigenen Mobilrechner und evtl. Adapter und USB Stick/CD mit.

Postersession

Die Postersession findet am Dienstag Abend sowie am Mittwoch während der Mittagspause in der Halle statt. Bitte bringen Sie Befestigungsmaterial (Reissnägel, Klebestreifen) selbst mit. Die Posterwände sind entsprechend diesem Programm numeriert, sodaß jeder Teilnehmer "seine" Wand leicht finden sollte. Alle Poster sollen an allen beiden Tagen ausgestellt bleiben.
Maximale Postergröße: A0 Hochformat.

Zahlung

Wir bitten Sie, die Tagungsgebühren im Voraus zu bezahlen. Sie verkürzen damit die Wartezeiten am Tagungssekretariat, erleichtern uns die Arbeit und sparen darüber hinaus noch Geld !
Die Angaben zur Zahlung werden während der Anmeldung direkt auf der Webseite angezeigt.

Am Tagungssekretariat kann nur bar bezahlt werden (in CHF). Kreditkarten können leider nicht akzeptiert werden.

ACHTUNG: Tagungsgebühren können nicht zurückerstattet werden.

Site web de la conférence et inscription

L'inscription des participants se fait sur le site web de la conférence.

www.sps.ch

Délai d'inscription: 1er août 2016

Lieu de la conférence

Università della Svizzera italiana, Via Giuseppe Buffi 13, 6900 Lugano

Secrétariat de la conférence

Le secrétariat de la réunion se trouve dans le hall situé devant l'Aula Magna.

Heures d'ouverture :

Lundi 22.8.	15:00 - 19:00
Mardi - Mercredi 23.8. - 24.8.	08:00 - 18:00
Jeudi 25.8.	08:00 - 12:00

Tous les participants doivent se présenter en premier lieu au secrétariat de la conférence afin de recevoir leur badge et les divers documents ainsi que pour le paiement des frais d'inscription.
Attention: Sans badge, l'accès aux sessions de la manifestation sera refusé.

Nous vous recommandons de vous inscrire déjà le lundi après-midi afin d'éviter des temps d'attente inutiles mardi matin.

Auditoires

Les auditoires disposent tous d'un projecteur multimédia (beamer) et d'un projecteur pour transparents. Veuillez apporter votre ordinateur portable ainsi que d'éventuels accessoires tels que clé USB ou CD.

Séance posters

Les posters seront présentés dans le hall le mardi soir et pendant la pause de midi de mercredi. Veuillez amener vous-même le matériel nécessaire pour fixer les posters (punaises, ruban adhésif). Les panneaux de posters seront numérotés suivant le numéro de l'abstract indiqué dans le programme. Tous les posters doivent rester installés pendant les deux jours.
Dimension maximale: A0, format portrait.

Paiement

Nous vous prions de régler à l'avance vos frais d'inscription. De cette manière vous évitez des files d'attente et facilitez notre travail. De plus, vous réalisez des économies !
Les informations pour le paiement sont indiquées directement sur la page web lors de l'enregistrement.

Les paiements lors de la conférence ne pourront être effectués qu'en espèces (CHF). Les cartes de crédit ne pourront malheureusement pas être acceptées.

ATTENTION: Les frais d'inscription ne pourront pas être remboursés.

Preise gültig bei Zahlung bis 1. August - Prix valable pour des paiements avant le 1er août	
Kategorie - Catégorie	**CHF**
Mitglieder von SPG, CHIPP - Membres de la SSP, CHIPP	100.-
Doktoranden, die in einer der obigen Gesellschaften Mitglied sind - Doctorants membres d'une des sociétés mentionnées ci-dessus	80.-
Nicht-Mitglieder - Non-membres	140.-
Doktoranden, die NICHT Mitglied sind - Doctorants qui ne sont PAS membres	100.-
Studenten VOR Master/Diplom Abschluß - Etudiants AVANT le degré master/diplôme	55.-
Plenarsprecher, Eingeladene Sprecher, Preisträger - Conférenciers pléniers et invités, lauréats	0.-
Spezialangebot für "Noch nicht Mitglieder" (s.u.) - Offre spéciale pour "Non-membres" (voir ci-dessous)	150.-
Konferenz Abendessen - Dîner de la conférence	65.-
Zuschlag für Zahlungen nach dem 1. August sowie Barzahler an der Tagung - Supplément pour paiements effectués après le 1er août et pour paiements en espèces à la conférence	**20.-**

Kaffeepausen, Mittagessen

Die Kaffeepausen, Apéro (Dienstag Abend) und Lunchbuffet (Mittwoch) finden in der Halle bei der Händlerausstellung statt. Diese Leistungen sind in der Konferenzgebühr enthalten.

Die Mensa auf dem Campus sowie umliegende Restaurants stehen zum Mittagessen zur Verfügung.

Konferenz-Abendessen

Das Abendessen findet am Mittwoch im "Swissminiatur" Park im Anschluß an die Parallelsessions statt. Der Preis beträgt CHF 65.- pro Person (beinhaltet Transfer, Menü und Getränke). Bitte registrieren Sie sich unbedingt im Voraus, damit wir disponieren können. Eine Anmeldung vor Ort ist nicht möglich !

Spezialangebot für "Noch-Nicht" SPG-Mitglieder

Planen Sie, an unserer Tagung teilzunehmen sowie Mitglied der SPG zu werden ? Sie können nun beides zum äusserst günstigen Preis von nur CHF 150.- (CHF 170.- nach dem 1. August). Dieser Betrag deckt die Konferenzgebühr sowie die Mitgliedschaft für 2016. Verpassen Sie dieses Angebot nicht ! Wählen Sie einfach bei der Online Registrierung die Kategorie "Special Offer", laden Sie das Anmeldeformular (*http://www.sps.ch/fileadmin/doc/Formulare/anmeldeformular_d-f-e.pdf*) für neue Mitglieder herunter, drucken es aus und schicken oder faxen es ausgefüllt an das SPG-Sekretariat.

(Dieses Angebot gilt nicht für Studenten oder Doktoranden. Diese profitieren sowieso von der Gratis-Mitgliedschaft im ersten Mitgliedsjahr, und zahlen nur die in der Tabelle angegebene Konferenzgebühr.)

Anreise und Unterkunft

Alle Informationen zur Anreise finden Sie auf der USI-Webseite: *www.usi.ch/en/universita/campus_lugano/campus_lugano_raggiungerlo.htm*

Für die Tagungsteilnehmer ist ein Kontingent an Hotelzimmern vorreserviert. Aufgund der Feriensaison empfehlen wir eine frühzeitige Reservierung. Details finden Sie auf *www.sps.ch*.

Pauses café, repas de midi

Les pauses café, l'apéro (mardi soir) et le buffet de midi (mercredi) se dérouleront dans le hall près des exposants. Ces prestations sont inclues dans les frais d'inscription.

Le restaurant du campus ainsi que des restaurants autour de l'université sont disponibles pour les repas de midi.

Dîner de la conférence

Le dîner se tiendra le mardi soir dans le parc "Swissminiatur", après les séances orales. Le prix est de CHF 65.- par personne (transfert, repas et boissons inclus). Veuillez s.v.p. absolument vous enregistrer à l'avance pour des raisons d'organisation. Il n'est plus possible de s'inscrire sur place !

Offre spéciale pour les non-membres de la SSP

Voulez-vous participer à la conférence et devenir en même temps membre de la SSP ? Profitez de notre offre avantageuse ! Pour la somme de CHF 150.- (CHF 170.- après le 1er août) nous vous offrons l'inscription ainsi que la cotisation de membre de la SSP jusqu'à fin 2016. Ne ratez pas cette occasion! Cochez simplement la case « Special Offer » lors de votre inscription en ligne, téléchargez le formulaire d'admission à la SSP de *http://www.sps.ch/fileadmin/doc/Formulare/anmeldeformular_d-f-e.pdf* , imprimez-le, et renvoyez-le dûment rempli par courrier ou par fax au secrétariat de la SSP.

(Cette offre ne s'applique pas aux étudiants et aux doctorants. Ceux-ci profitent en effet d'une affiliation gratuite à la SSP pendant la première année et ne paient que les frais d'inscription indiqués dans le tableau ci-dessus.)

Arrivée et hébergement

Toutes les informations se trouvent sur la site web d'USI: *www.usi.ch/en/universita/campus_lugano/campus_lugano_raggiungerlo.htm*

Un contingent de chambres d'hôtel a été pré-réservé pour les participants à la conférence. A cause de la saison de vacances, nous vous recommandons de réserver au plus vite. Les détails se trouvent sur *www.sps.ch*.

Vorläufige Programmübersicht - Résumé préliminaire du programme

Das vollständige Programm wird allen Teilnehmern am Tagungssekretariat abgegeben sowie auf der Konferenz- und der SPG-Webseite publiziert.

Hinweise:

- Je Beitrag wird nur der präsentierende Autor aufgeführt.
- Die Postersitzung ist am Dienstag von 18:30 - ca. 20:00 (mit Apéro) sowie am Mittwoch von 12:00 - 14:00 (mit Lunch Buffet).
- (p) = Plenarsprecher, (i) = eingeladener Sprecher

Le programme final complet sera distribué aux participants au stand du secrétariat de la conférence et sera publié sur le site de la conférence et de la SSP.

Indication:

- seul le nom de l'auteur présentant la contribution a été indiqué.
- la session poster a lieu le mardi de 18.30 à env. 20.00 (avec apéro) ainsi que le jeudi de 12:00 à 14:00 (avec buffet de midi).
- (p) = orateur de la session plénière, (i) = orateur invité

Plenary Session

Tuesday, 23.08.2016, Aula Magna

Time	ID	Plenary Session I *Chair: Gian Michele Graf, ETH Zürich*
12:45		**Official Conference Opening**
13:00	1	**Variationally-Enhanced Sampling** *Michele Parrinello, USI Lugano & ETH Zürich (p)*
		Chair: Minh Quang Tran, EPFL
13:45	2	**Science with the most modern stellarator, Wendelstein 7-X** *Sibylle Günther, MPI für Plasmaphysik Garching (p)*
14:30		***General Assembly***
15:30		***Award Ceremony***
16:00		***Coffee Break***
16:30		***Topical Sessions***
18:30		***Postersession and Apéro***
		Public Lecture *Chair: Stéphane Goyette, Uni Genève*
20:00	11	**Is there a new role for science after the Paris climate conference (COP21)** *Hervé Le Treut, Université Pierre et Marie Curie & Ecole Polytechnique, Institut Pierre Simon Laplace, Paris (p)*
21:15		***END***

Wednesday, 24.08.2016, Aula Magna

Time	ID	Plenary Session II *Chair: Christian Rüegg, PSI Villigen & Uni Genève*
09:00	3	**Artificial Ferroic Systems** *Laura Heyderman, ETH Zürich & PSI Villigen (p)*
		Chair: Jan Lacki Uni Genève
09:40	4	**Biography of an Idea: the Case of Gravitational Lensing** *Tilman Sauer, Johannes Gutenberg Universität Mainz (p)*
10:20		***Coffee Break***
		Chair: Giovanni Dietler, EPFL
10:50	5	**2D-material nanopores as a new playground for biophysics** *Aleksandra Radenovic, EPFL (p)*
		Chair: NN
11:30	21	**Winner of the ABB Award** *NN (i)*
12:00		***Postersession (continued) with Lunchbuffet***
14:00		***Topical Sessions***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

Thursday, 25.08.2016, Aula Magna

Time	ID	Plenary Session III *Chair: Philipp Treutlein, Uni Basel*
09:00	6	**Trapped-ion quantum state engineering** *Jonathan Home, ETH Zürich (p)*
		Chair: Andreas Schopper, CERN
09:40	7	**The state-of-the-art in the direct search for dark matter** *Laura Baudis, Uni Zürich (p)*
10:20		***Poster Award Session***
10:40		***Coffee Break***
11:15		***Topical Sessions***
13:15		***Lunch***
14:00		***Topical Sessions***
16:45		***END OF CONFERENCE***

Research and Beyond – How Physics impacts the Marketplace

Wednesday, 24.08.2016, Room A 22

Time	ID	Research and Beyond – How Physics impacts the Marketplace *Chair: Thomas Brunschwiler & Patrick Ruch, IBM Rüschlikon*
16:30	51	**Corporate Research vs. Start-Ups: Two Ways for Physicists to Shape Industry** *Christian Ohler (i)*
17:00	52	**Quantum Physics from the Lab to the Marketplace: The Story of a Successful Start-Up** *Nicolas Gisin (i)*
17:30	53	**Science and Business: Publication or Trade Secret?** *Volker Graf (i)*
18:00	54	**Computational Modeling and Simulation in Entertainment** *Bernhard Thomaszewski (i)*
18:30		**Panel Discussion**
19:00		***END; Transfer to Dinner***
19:30		***Conference Dinner***

History of Physics

Wednesday, 24.08.2016, Room A 32

Please read also p. 22 for a detailed session description.

Time	ID	History of Physics: New insights on Jost Bürgi's science and modernity *Chair: Jan Lacki, Uni Genève*
14:30	81	**Scientific Instruments at the Time of Jost Bürgi (1552-1631)** *Paolo Brenni (i)*
15:15	82	**The role of practical mathematics in the era of Jost Bürgi** *Jim Bennett (i)*
16:00		***Coffee Break***
16:30	83	**The Renaissance of Jost Bürgi** *Fritz Staudacher (i)*
17:15	84	**A Way to Bürgi's Method of Calculating Sine Tables** *Peter Ullrich (i)*
18:00	85	**Jost Bürgi: Trigonometry and Differences** *Jörg Waldvogel (i)*
18:45		***END***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

KOND

Tuesday, 23.08.2016, Room A 11

Time	ID	KOND I: Magnetism *Chair: NN*
16:30	101	**Observation of acoustic electromagnons via inelastic x-ray scattering** *Sándor Tóth (i)*
17:00	102	**Study of the Magnetic Excitations in the Dimer Compound $Ba_{3-x}Sr_xCr_2O_8$** *Alsu Gazizulina*
17:15	103	**Anomalous thermal decoherence in a quantum magnet measured with neutron spin-echo spectroscopy** *Felix Groitl*
17:30	104	**Dimensional crossover in a metal-organic Heisenberg antiferromagnet** *Björn Wehinger*
17:45	105	**NMR criterion to distinguish between attractive and repulsive Tomonaga-Luttinger liquids in spin ladders** *Minki Jeong*
18:00	106	**Dimerization transitions in spin-1 chains** *Natalia Chepiga*
18:15	107	**Magnetic order in the anisotropic triangular material $Cs_2CuCl_{4-x}Br_x$** *Natalija van Well*
18:30		***Postersession and Apéro***
20:00		***Public Lecture***

Wednesday, 24.08.2016, Room A 21

Time	ID	KOND II: Award Talks *Chair: NN*
14:00	111	**Winner of the IBM Award** *NN (i)*
14:30	112	**Winner of the Oerlikon Award** *NN (i)*
15:00	113	**Winner of the METAS Award** *NN (i)*
15:30	114	**Phase Behavior of Binary and Polydisperse Suspensions of Compressible Microgels** *Andrea Scotti (i)*
16:00		***Coffee Break***

Wednesday, 24.08.2016, Room A 11

Time	ID	KOND III: Topology and Theory *Chair: NN*
14:00	121	**Entanglement of magnetic and spin-orbit order in multiferroic Rashba semiconductors** *Hugo Dil (i)*
14:30	122	**Interband Coupling of Topological Surface States in Sequential Bulk Energy Gaps of Bi_4Se_3 and Bi_4Te_3** *Andrew Weber*
14:45	123	**Edge current in chiral p-wave superconductors – revisited** *Sarah Etter*
15:00	124	**Non-Abelian topological spin liquids from arrays of quantum wires or spin chains** *Jyong-Hao Chen*
15:15	125	**Spin- and Valley-Polarized Transport across Line Defects in Monolayer MoS_2** *Artem Pulkin*
15:30	126	**Adiabatic Pumping of Chern-Simons Axion Coupling** *Maryam Taherinejad*
15:45		
16:00		***Coffee Break***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

Thursday, 25.08.2016, Room A 11

Time	ID	KOND IV: Structures and Methods *Chair: NN*
11:15	131	**Lattice distortions analysis across the metal-to-insulator transition in $PrNiO_3$ - applying the novel symmetry mode decomposition approach** *Dariusz Jakub Gawryluk*
11:30	132	**Exploring distorted phases in vanadates perovskites** *Hugo Meley*
11:45	133	**Structure of self-assembled manganese atom chains on Si(001)** *Renan Villarreal*
12:00	134	**Time-resolved x-ray powder diffraction study of photoinduced phase-transition in Ti_3O_5 nanoparticles** *Kelin Tasca*
12:15	135	**ARPES measurements in the presence of electrical current in cuprates** *Muntaser Naamneh*

12:30	136	**Off-resonance intermittent contact mode AFM using multiple harmonics** *Marcos Penedo*
12:45	137	**Nearly shot-noise limited kinetics from femtosecond transient absorption** *Bernhard Lang*
13:00	138	**The Role of Entropic Forces in the Dynamics of a Molecular Rotor** *Jeffrey Gehrig*
13:15		***Lunch***
		KOND V: **Strongly Correlated Electron Systems** *Chair: NN*
14:00	141	**Discovery of a superconducting quantum critical point** *Daniel Mazzone (i)*
14:30	142	**Coexistence of low moment magnetism and superconductivity in tetragonal FeS and suppression of T_c under pressure** *Stefan Holenstein*
14:45	143	**Direct evidence of nodeless clean superconductivity and determination of the superfluid density in single-layer FeSe grown on $SrTiO_3$** *Zaher Salman*
15:00	144	**High pressure magnetic state of MnP probed by means of muon-spin rotation** *Rustem Khasanov*
15:15	145	**Direct evidence for a pressure induced nodal superconducting gap in the $Ba_{0.65}Rb_{0.35}Fe_2As_2$ superconductor** *Zurab Guguchia (i)*
15:45	146	**Giant effect of isovalent doping on magnetism in $BaFe_2(As_{1-x}P_x)_2$** *Jonathan Pelliciari*
16:00	147	**Two-dimensional hole gas at ferroelectric $BaTiO_3$ film surfaces** *Stefan Muff*
16:15	148	**Strong enhancement of s-wave superconductivity near a quantum critical point of $(Ca_{1-x}Sr_x)_3Ir_4Sn_{13}$ and $(Ca_{1-x}Sr_x)_3Rh_4Sn_{13}$** *Jonas Krieger*
16:30		***END***

ID	KOND Poster
161	**CAMEA — A novel multiplexing analyzer for neutron spectroscopy** *Felix Groitl*
162	**Spin-chain of alternating Ising and Heisenberg spins with two different local anisotropy axes: magnetic properties** *Jordana Torrico*
163	**Higher-Order Flavour Wave Theory of the SU(N) Antiferromagnetic Heisenberg Model** *Francisco Kim*
164	**Enhancement Mechanism of the Electron g-Factor in Quantum Point Contacts** *Grégoire Vionnet*
165	**Mechanical disorder-induced quantum spin liquid in a two-dimensional triangular lattice** *Péter Szirmai*
166	**Structural and magnetic properties of spin-1/2 layered ferrimagnet $Bi_2Cu_5B_4O_{14}$** *Arjun Unnikrishnan*
167	**Effects of exchange disorder on an prototypical spin ladder material** *Simon Ward*
168	**Nanoscale investigation of few monolayers thin exfoliated dichalcogenides** *Árpád Pásztor*
169	**Non-equivalent conducting interfaces in $LaAlO_3/SrTiO_3$ heterostructures** *Giulio Tieri*
170	**Diffraction Instruments at the Swiss Spallation Neutron Source SINQ** *Vladimir Pomjakushin*

Electronic Properties at Surfaces and Interfaces

Wednesday, 24.08.2016, Room A 11

Time	ID	Electronic Properties at Surfaces and Interfaces *Chair: Thorsten Schmitt & Ming Shi, PSI Villigen*
16:30	201	**Spin-split states: from Rashba to topological surface states** *Marco Grioni (i)*
17:00	202	**Electronic structure of buried interface and impurity systems explored by soft-X-ray ARPES** *Vladimir N. Strocov (i)*
17:30	203	**Strain Tuning of a Metal-Insulator Transition in $SrVO_3$ films** *Elias Ferreiro-Vila*
17:45	204	**Resonant Inelastic X-ray Scattering (RIXS) study of the orbital excitations in thin film $CaVO_3$** *Daniel McNally*
18:00	205	**Spin polarization and time delay in photoemission from spin-degenerate states** *Mauro Fanciulli*
18:15	206	**Tailoring the nature and strength of electron–phonon interactions in the $SrTiO_3$(001) 2D electron liquid** *Zhiming Wang*
18:30	207	**Single-Domain Transfer and Stacking of sp2-Layers on a 4”-Scale** *Carlo Bernard*
18:45	208	**Visualizing topological quantum states by photoemission spectroscopy: from topological Kondo insulator to Weyl semimetal** *Nan Xu*
19:00		***END; Transfer to Dinner***
19:30		***Conference Dinner***

Nuclear, Particle and Astrophysics (TASK)

This session has been organised in conjunction with CHIPP

Tuesday, 23.08.2016, Aula Magna

Time	ID	CHIPP Plenary Meeting (Non Scientific Topics) *Chair: Tatsuya Nakada, CERN*
09:15	31	**Welcome, news from Board and EB** *Tatsuya Nakada*
09:30	32	**Elections** *Tatsuya Nakada*
09:45	33	**CHIPP outreach** *Hans Peter Beck*
10:00	34	**CHIPP computing** *Christoph Grab*
10:15	35	**ACCU** *Michael Dittmar*

10:30	36	**ECFA** *Leonid Rivkin*
10:45	37	**ApPEC** *Teresa Montaruli*
11:00	38	**NuPECC** *Bernd Krusche*
11:15	39	**CERN council** *Olivier Schneider*
11:30	40	**The FCC project** *Leonid Rivkin*
12:00		***LUNCH***
13:00		***Plenary Session***
14:30		***SPS General Assembly***
15:30		***Award Ceremony***
16:00		***Coffee Break***
		TASK I: *Chair: NN*
16:30	301	**CHIPP Award Winner** *NN (i)*
17:00	302	**Highlights from ICHEP 2016** *Florencia Canelli (i)*
17:30	303	**Towards a novel high-brightness low-energy muon beamline** *Ivana Belosevic*
17:45	304	**In Search of Charged Lepton Flavor Violating Decays at PSI** *Giada Rutar*
18:00	305	**Current status and plans of the Gerda Experiment** *Rizalina Mingazheva*
18:15	306	**Status of the MicroBooNE Experiment** *Matthi Lüthi*
18:30		***Postersession and Apéro***
20:00		***Public Lecture***

16:00		***Coffee Break***
		TASK III: Detector R&D II, Cosmic probes *Chair: NN*
16:30	321	**Muon Beam Monitoring Using Luminophore Foils at PSI** *Zachary Hodge*
16:45	322	**A Scintillation Stopping Target for the MEG II Experiment** *Felix Berg*
17:00	323	**Design and characterisation of the Xurich II dual-phase xenon time projection chamber** *Michelle Galloway*
17:15	324	**A versatile liquid Xenon R&D platform for future low-background detectors** *Basho Kaminsky*
17:30	325	**A Pixelated readout and cold electronics for the ARGONCUBE Liquid Argon TPC** *Damian Göldi*
17:45	326	**Updates on Time-Dependent and Stacking Analyses of IceCube Data at the University of Geneva** *Tessa Carver*
18:00	327	**Precision Measurement of Nuclei Fluxes and their Ratios in Primary Cosmic Rays with the Alpha Magnetic Spectrometer on the International Space Station** *Yang LI*
18:15	328	**POLAR: A dedicated Gamma-Ray Burst polarimeter ready to be launched** *Merlin Kole*
18:30	329	**The Spectrometer/Telescope for Imaging X-Rays (STIX) of the ESA Solar Orbiter Mission** *Diego Casadei*
18:45	330	**Probing TeV-scale particle physics at eLISA** *Germano Nardini*
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

Wednesday, 24.08.2016, Aula Magna

Time	ID	**TASK II: Detector R&D I** *Chair: Roland Horisberger, PSI Villigen*
14:00	311	**Radiation hardness studies of silicon sensors for the ATLAS upgrade** *Claudia Merlassino*
14:15	312	**Readout electronics and test bench for the CMS Phase I pixel detector** *Riccardo Del Burgo*
14:30	313	**3D Monitoring of LHCb Inner Tracker using BCAM** *Pavol Stefko*
14:45	314	**Reconstruction software and alignment of silicon tracker of DAMPE** *Andrii Tykhonov*
15:00	315	**Nuclear charge measurement using the DAMPE Silicon-Tungsten Tracker** *Stefania Vitillo*
15:15	316	**High performance prototype SiPM camera for the single mirror small size telescope for the Cherenkov Telescope Array project** *Matthieu Heller*
15:30	317	**Characterization of VUV Silicon-Photomultipliers for xenon based dark matter detectors** *Julien Wulf*
15:45	318	**Development of scintillating fibre tracker technology for the next LHCb tracking system and other applications** *Olivier Girard*

Thursday, 25.08.2016, Aula Magna

Time	ID	**TASK IV: Standard Model Measurements** *Chair: NN*
11:15	331	**Fully hadronic search for ttH production using the matrix element method** *Daniel Salerno*
11:30	332	**Real-time data analysis with the LHCb detector** *Maurizio Martinelli*
11:45	333	**B_s^0 lifetime measurement using semileptonic decays at the LHCb experiment** *Brice Maurin*
12:00	334	**Search for the $B_s \to \eta\phi$ decay at LHCb** *Sebastiana Gianì*
12:15	335	**Investigation of the photon polarization in $B^+ \to K^+\pi^-\pi^+\gamma$ decays at LHCb** *Violaine Bellée*
12:30	336	**Time-dependent measurement of CP violation in $B_d \to D\pi$ decays at LHCb** *Vincenzo Battista*
12:45	337	**Search for CP violation in the charm sector at LHCb** *Maxime Schubiger*
13:00	338	**Study of the inclusive J/ψ production at the LHCb experiment** *Liupan An*
13:15		***Lunch***

Time	ID	TASK V: Beyond Standard Model Searches *Chair: NN*
14:00	341	**Search of the top quark heaviest supersymmetric partner with the ATLAS detector** *Geoffrey Mullier*
14:15	342	**Search for direct pair production of a chargino and a neutralino in pp collisions with the ATLAS Detector** *Thomas Weston*
14:30	343	**ATLAS searches for Supersymmetry with jets and missing transverse momentum (MET)** *Teng Jian Khoo*
14:45	344	**Searches for SUSY with two opposite-sign, same-flavor leptons, jets and MET with the CMS detector** *Minna Leonora Vesterbacka Olsson*
15:00	345	**The search for sterile neutrinos at future particle colliders** *Oliver Fischer*
15:15	346	**The Search for Bosonic Super-WIMPs in XENON100** *Peter Barrow*
15:30	347	**The XENON1T Dark Matter Experiment** *Yuehuan Wei*
15:45	348	**Neutron Electric Dipole Moment experiment at PSI** *Malgorzata Kasprzak*
16:00	349	**Looking for axions with the nEDM experiments** *Michał Rawlik*
16:15	350	**Magnetic monopole searches with ATLAS and MoEDAL** *Anthony Lionti*
16:30		***END***

ID	TASK Poster
361	**Search for the lepton flavour violating decay $B_{s,d} \rightarrow e^{+}\mu^{-}$ at the LHCb experiment** *Guido Andreassi*
362	**Systematics related to neutron detection in PSI nEDM** *Prajwal Mohan Murthy*
363	**Development of a high-brightness muonium beam** *Narongrit Ritjoho*
364	**Monitoring of the Ortho D_2, tritium and HD concentrations in the moderator deuterium of the PSI UCN source** *Nicolas Hild*
365	**T2K neutrino flux predictions using the replica target measurements by NA61/SHINE** *Muhammad Ajaz*
366	**Flavour tagging in pp collisions at LHCb** *Vincenzo Battista*
367	**The Scintillating Fibre Tracker for the LHCb Upgrade** *Axel Kuonen*
368	**Performance of missing transverse momentum (MET) reconstruction at the ATLAS experiment** *Marco Valente*
369	**Displaced vertex searches for sterile neutrinos at future lepton colliders** *Eros Cazzato*
370	**Characterisation of HV-CMOS active pixel sensors for the High Luminosity ATLAS upgrade.** *Marco Rimoldi*
371	**Performance of pixel detectors based on pCVD diamond at particle fluxes up to 7MHz/cm²** *Diego Alejandro Sanz Becerra*
372	**Production and quality assurance of scintillating fibre modules for the LHCb upgrade** *Plamen Hopchev*
373	**The Mu3e Fibre Sub-Detector: Readout, Integration and Sensitivity Studies** *Simon Corrodi*
374	**Towards accurate cesium magnetometry for the nEDM experiment at PSI** *Zoran Grujic*
375	**News on the laser based Hg Co-magnetometer at nEDM** *Sybille Komposch*
376	**Search on the associated Z+Higgs Boson Production in the leptonic+beauty Final State** *Gaël Perrin*

Theoretical Physics

Wednesday, 24.08.2016, Room A 14

Time	ID	Theoretical Physics *Chair: NN*
14:00	401	**Quantum synchronization** *Christoph Bruder (i)*
14:30	402	**Lattice QCD at non-zero matter density** *Philippe de Forcrand (i)*
15:00	403	**Fermionic Exchange Symmetry: Quantifying its Influence beyond Pauli's Exclusion Principle** *Christian Schilling*
15:15	404	**Decoherence of a probe qubit coupled to an MBL environment** *Evert van Nieuwenburg*
15:30	405	**Constraining RG flows in quantum field theory** *Lorenzo Vitale*
15:45		
16:00		***Coffee Break***
16:30	406	**Ultrasensitive hysteretic force sensing** *Ramasubramanian Chitra (i)*
17:00	407	**Quantum heat engine based on photon-assisted Cooper pair tunneling** *Patrick Hofer*
17:15	408	**Large deviations theory for chemical reaction networks** *Andrea Agazzi*
17:30	409	**On Landau-Zener transitions for dephasing Lindbladians** *Lisa Hänggli*
17:45		***END***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

Atomic Physics and Quantum Optics

Wednesday, 24.08.2016, Room A 12

Time	ID	Atomic Physics and Quantum Optics I *Chair: NN*
14:00	501	**Generation of single photons with highly tunable wave shape from a cold atomic ensemble** *Melvyn Ho*
14:15	502	**Towards storage of quantum dot single photons in a rubidium quantum memory** *Janik Wolters*
14:30	503	**Long-lived solid-state quantum memory for quantum networks** *Cyril Laplane*

14:45	504	**High precision measurement of the Dzyaloshinskii-Moriya interaction between two strongly interacting Nd^{3+} ions** *Emmanuel Zambrini Cruzeiro*
15:00	505	**Detection of Bell correlations in a spin-squeezed Bose-Einstein condensate** *Matteo Fadel*
15:15	506	**Bell inequalities with three ternary-outcome measurements - from theory to experiments** *Sacha Schwarz*
15:30	507	**Macroscopic quantum measurements: In what direction does a magnet point?** *Marc-Olivier Renou*
15:45		
16:00		***Coffee Break***
		Atomic Physics and Quantum Optics II *Chair: NN*
16:30	511	**Transport of ultracold atoms through a quantum wire: From one scanning gate to a mesoscopic lattice** *Dominik Husmann*
16:45	512	**Optomechanics with a hybrid atom-membrane system** *Gianni Buser*
17:00	513	**Genuine quantum signatures in synchronization of anharmonic self-oscillators** *Niels Lörch*
17:15	514	**A magnetic source imaging camera** *Vladimir Dolgovskiy*
17:30	515	**Comparison of the measured relaxation times with different methods in a Rb vapor-cell** *Mohammadreza Gharavipour*
17:45	516	**First accuracy evaluation of the METAS-FoCS2 primary frequency standard** *Antoine Jallageas*
18:00	517	**Energy scaling in multi-pass thin-disk lasers** *Karsten Schuhmann*
18:15		***END***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

ID	Atomic Physics and Quantum Optics Poster
531	**An atomic magnetometer to search for exotic physics in the GNOME project** *Theo Scholtes*
532	**Precision-spectroscopy of a single trapped molecular ion.** *Kaveh Najafian*
533	**Coupling an Ultracold Ion with a Metallic Nanowire** *Panagiotis Fountas*

Mott Physics Beyond the Heisenberg Model

This session has been organised by the SNF Sinergia Network MPBH between groups at EPFL, UZH and PSI

Tuesday, 23.08.2016, Room A 21

Time	ID	I: Theory *Chair: Frédéric Mila, EPF Lausanne*
16:30	601	**Spin-orbit dimers in double perovskites** *George Jackeli (i)*
17:15	602	**First-principles simulations of the electronic and magnetic structure of iridates** *Vladimir Mazurenko (i)*
18:00	603	**Triangular lattice Ising antiferromagnets with long-range interactions: application to $Ba_3CuSb_2O_9$ and nano-magnet arrays** *Andrew Smerald*
18:30		***Postersession and Apéro***
20:00		***Public Lecture***

Wednesday, 24.08.2016, Room A 21

Time	ID	II: Experiments 1 *Chair: Henrik M. Rønnow, EPF Lausanne*
16:30	611	**Exotic magnetism produced by strong spin-orbit coupling in complex Ir oxides** *Hidenori Takagi (i)*
17:15	612	**Disentangling orbital and magnetic contributions to the exotic Spin Peierls transition in $TiPO_4$** *Marcus Dantz*
17:45	613	**Magnetic excitations in the partially stuffed CuO planes of $Ba_2Cu_3O_4Cl_2$** *Sara Fatale*
18:15	614	**Asymmetry of collective excitations in ambipolar $Y_{0.38}La_{0.62}(Ba_{0.82}La_{0.18})_2Cu_3O_y$** *Xingye Lu*
18:45		
19:30		***Transfer to Dinner***
20:00		***Conference Dinner***

Thursday, 25.08.2016, Room A 21

Time	ID	III: Experiments 2 *Chair: Johan Chang, Uni Zürich*
11:15	621	**Magnetic correlations and implications for topological order in $Sm_2Ir_2O_7$** *Des McMorrow (i)*
12:00	622	**Orbital Selective Mott Physics in Ca_2RuO_4: An Angle Resolved Photoemission Spectroscopy Study** *Denys Sutter*
12:30	623	**Synchrotron Spectroscopic Experiments on Ruthenates** *Claudia Fatuzzo*
13:00	624	**ARPES study of the exotic insulating phase in the high-T_c superconductor parent compound $BaBiO_3$** *Nicholas Plumb*
13:15		***Lunch***
		IV: Materials Discovery *Chair: Ekaterina Pomjakushina, PSI Villigen*
14:00	631	**Direct Evidence for Bond-Dependent Exchange in the Honeycomb Iridate Na_2IrO_3** *John Mitchell (i)*
14:45	632	**High pressure crystal growth, structure and properties of $Sr_3Pt_{23}As_{11}$ and Sr_2Pt_8As.** *Sergiy Katrych*
15:15	633	**The interplay of ferromagnetic and antiferromagnetic exchanges in the the 3d-5d transition metal oxides Sr_2MIrO_6 (M = Ni, Cu, Zn)** *Katharina Rolfs*
15:45	634	**Ab initio methods for electronic and magnetic properties of iridates** *Vamshi Katukuri (i)*
16:30		***END***

Plasma Physics, Applied Physics and Earth, Atmosphere and Environmental Physics (combined session)

Tuesday, 23.08.2016, Room A 12

Time	ID	Plasma Physics *Chair: Stephan Brunner, EPFL*
16:30	701	**In-vessel and heating system upgrades for the TCV tokamak** *Yves Martin (i)*
17:00	702	**Progress in the investigation of blob secondary instabilities** *Fabian Manke*
17:15	703	**Stabilization and Preemption of NTMs with ECRH/ECCD in TCV** *Mengdi Kong*
17:30	704	**Nanostructured tungsten by unbalanced magnetron sputtering** *Laurent Marot*
17:45	705	**Investigation of erosion patterns in highly magnetized capacitively coupled plasma for ITER First Mirrors applications** *Lucas Moser*
18:00	706	**Towards the Optimization of a Gyrokinetic Particle-in-Cell (PIC) Code on Large Scale Hybrid Architectures** *Noé Ohana*
18:15		***END***
18:30		***Postersession and Apéro***
20:00		***Public Lecture***

Tuesday, 23.08.2016, Room A 13

Time	ID	Combined Session *Chair: Stéphane Goyette, Uni Genève*
16:30	721	**Electronics and DAQ for a high rate PET-MR insert** *Christian Ritzer*
16:45	722	**High-power femtosecond mode-locked thin-disk oscillators: from power-scaling towards novel applications** *Norbert Modsching*
17:00	723	**Multi-megahertz repetition-rate THz generation driven by high-power thin-disk oscillator** *Clément Paradis*
17:15	724	**Formation of rogue waves in a strong-wind regime** *Maura Brunetti*
17:30	725	**Climate physics for non-experts: The Climanosco project and its value in teaching science** *Michel Bourqui*
17:45	726	**Iron oxidation state and partitioning in Earth's lower mantle** *Hélène Piet*
18:00		***END***
18:30		***Postersession and Apéro***
20:00		***Public Lecture***

ID	Plasma Physics, Applied Physics, Earth, Atmosphere and Environmental Physics Poster
741	**Hard X-ray tomographic spectroscopy and suprathermal electron physics studies in the TCV Tokamak** *Dahye Choi*
742	**A Drift-Kinetic Model for Tokamak SOL Plasmas** *Rogério Jorge*
743	**Potential to increase sensitivity of Atomic Force Microscopy** *Alessia Del Monte*
744	**Numerical investigation with a coupled single-column lake-atmosphere model. Model description and an application to western Switzerland** *Stéphane Goyette*

Magnetism and Spintronics at the Nanoscale

Thursday, 25.08.2016, Room A 12

Time	ID	I: Spintronics and Molecular Magnetism *Chair: Anna Suszka & Naëmi Leo, PSI Villigen*
11:15	801	**Current-induced spin torques and magnetoresistance in ferromagnet/heavy metal layers** *Pietro Gambardella (i)*
11:45	802	**Room temperature manipulation of long lifetime spins in metallic-like carbon nanospheres** *Bálint Náfrádi*
12:00	803	**Reversal mechanisms in a (Co/Pt)n multilayer by strong interfacial exchange coupling to a high coercivity rare earth ferrimagnetic film TbFe** *Xue Zhao*
12:15	804	**Magnetic and Structural Properties of Epitaxial FeCo/W Bilayers grown on GaAs(001)** *Santos Alvarado*
12:30	805	**Magnetic Remanence in Single Atoms** *Fabio Donati*
12:45	806	**Switching the Molecular Conformation of Endohedral Single-Molecule Magnets using magnetic torque** *Aram Kostanyan*
13:00		
13:15		***Lunch***
		II: Complex spin structures, Skyrmions and artificial spin systems *Chair: Naëmi Leo & Anna Suszka, PSI Villigen*
14:15	811	**Oxide nanomagnonics: spin waves at near soft-x ray wavelengths** *Dirk Grundler (i)*
14:45	812	**Real space in situ manipulation of skyrmions by electric field** *Ping Huang*
15:00	813	**Room-temperature skyrmions in Pt/Co/Ir multilayers with inhomogeneous Dzyaloshinskii-Moriya interaction observed by MFM** *Mirko Bacani*
15:15	814	**Increasing skyrmion lattice stability: theory and experiment** *Alex Kruchkov*
15:30	815	**Quantitative Magnetic Force Microscopy with capacitive tip sample distance control** *Johannes Schwenk*
15:45	816	**Dynamic Cantilever Magnetometry on Individual Nanomagnets** *Andrea Mehlin*
16:00	817	**Tunable Spin Waves Dynamics in Two-Dimensional Ferromagnetic Nanodot Lattices with Varying Lattice Symmetry** *Susmita Saha*
16:15	818	**Domain formation and control in artificial toroidal nanolattices** *Jannis Lehmann*

16:30	819	**Hard X-ray Magnetic Imaging at the Nanoscale with Dichroic Ptychography** *Claire Donnelly*
16:45		***END***

ID	Magnetism and Spintronics Poster
831	**Optically-pumped atomic magnetometry for magnetic nanoparticle detection and characterization** *Simone Colombo*
832	**Magneto-optical detection of spin-orbit torques in ferromagnetic/heavy metal heterostructures** *Christoph Murer*
833	**Investigations on individual cobalt nanoparticles by means of X-ray photo-emission electron microscopy** *Tatiana Savchenko*
834	**Investigating individual magnetic metal oxide nanoparticles using X-ray photo-emission electron microscopy** *David Bracher*
835	**X-ray magnetic scattering in thermally active artificial spin ice** *Oles Sendetskyi*
836	**The first single-atom magnet** *Luca Persichetti*
837	**Crystalline Magnetoresistance in epitaxial $Co_{50}Fe_{50}$ grown on GaAs[110]** *Phuong Dao*
838	**Domain structure and magnetic anisotropy of Pt/YIG films with YIG-thicknesses from few unit cells to 100 nm** *Johannes Mendil*
839	**Time resolved imaging of spin-orbit torque induced magnetization reversal by STXM** *Manuel Baumgartner*
840	**Depth resolved measurements of magnetic properties in thin films of single molecule magnets** *Zaher Salman*

Biophysics and Medical Physics

Wednesday, 24.08.2016, Room A 23

Time	ID	Biophysics and Medical Physics *Chair: Giovanni Dietler, EPFL*
14:00	901	**Title not yet known** *A. Barducci (i)*
14:30	902	**Imaging proteins at the truly single molecule level** *J.-N. Longchamp (i)*
15:00	903	**Can Dissipative Properties of Single Molecule Be Reliably Extracted from Single Molecule Dynamic Force Spectroscopy Experiment?** *Sergey Sekatski*
15:15	904	**Construction of a time of flight positron emission tomography system** *Yves Bandi*
15:30	905	**SAFIR Project: Status of the Reconstruction Software** *Parisa Khateri*
15:45	906	**Tapping Mode SNOM based on properly bended and attached to quartz tuning fork glass fiber-made probes** *Anton Smirnov*
16:00		***Coffee Break, END***
19:00		***Transfer to Dinner***
19:30		***Conference Dinner***

Special Public Event: Particle Fever

Particle Fever is a documentary movie following six particle physicists during the launch of the Large Hadron Collider, and up to the discovery of the Higgs Boson in 2012. As they seek the keys to unlocking the very building blocks of physics, the six protagonists are joined with more than 10,000 scientists from over 100 countries in pursuit of a single goal: to recreate conditions that existed just moments after the Big Bang and to find the Higgs boson, potentially explaining the origin of all matter and to confront an even bigger challenge: have we reached our limit in understanding why we exist?
Directed by Mark Levinson, a physicist turned filmmaker, from the inspiration and initiative of producer David Kaplan and masterfully edited by Walter Murch (Apocalypse Now, The English Patient, The Godfather trilogy), *Particle Fever* is a celebration of discovery, revealing the very human stories behind this epic machine.

The movie will be shown in English on Monday 22 August 2016, 20:00 in USI's Aula Magna. Free entry.

New insights on Jost Bürgi's science and modernity

Taking the opportunity of the History of Physics session at the next Annual meeting of the Swiss Physical Society, a group of international scholars will discuss a recent discovery in history of science related to the work of the 17th century Swiss scholar Jost Bürgi.

History of science is an everlasting field of novelty and excitement. New documents are discovered and new assessments of past episodes are proposed. Recently, Menso Folkerts, a renowned German historian of mathematics, has discovered an unknown manuscript, *Fundamentum Astronomiae* written by the 17th century Swiss scholar Jost Bürgi (1552–1632), a gifted designer of scientific instruments, innovative astronomer, mathematician, and collaborator of Johannes Kepler. The manuscript contains surprising mathematical results. Menso Folkerts published his findings in his article *Jost Bürgi's method for calculating sines* in April 2016 in *Historia Mathematica* together with Dieter Launert and Andreas Thom. Considering the importance of these results, history of mathematics and physics in16th and 17th centuries will have to be completed if not revised.

Bürgi's breakthrough

The most surprising and interesting invention of Jost Bürgi is his unconventional procedure for calculating and tabulating sines. It is totally different from the traditional procedure used until the 17th century and rooted in Greek antiquity. By only using additions and halving, Bürgi's method is elementary, fast, of high precision, and appears a milestone in computing and in astronomy.

Included in this *Fundamentum Astronomiae* is thus a high accuracy sinus table in steps of 1'. Most recent analyses show that Bürgi used for its tabulation (as early as 1588/92) very ingenious algorithms. Bürgi's use of differences, not for checking tabular values, but in order to compute new ones, is indeed a very modern approach. It anticipates by 200 years the work of the French de Prony, and the British Babbage and deserves highest attention also because it might have influenced, as is argued in the research of Dieter Launert, the work of the British logarithm specialist Henry Briggs.

Internationally renowned experts

In order to assess the context of Bürgi's science, the History of Physics session will start with two presentations by internationally renowned experts on XVIIe science:

Paolo Brenni, president of the *Scientific instrument Society* and former president of the *International Commission for Scientific Instruments*, will present the uses and issues of instruments at the time of Bürgi.

Then ***Jim Bennett***, former head of the History of Science museum in Oxford and former President of the *British Society for the History of Science* will explain the content and disciplinary situation of 17th "applied" mathematics.

Celestial sphere (1594) by Jost Bürgi. Most precise astronomical instrument of the Renaissance. Marked with 1028 star positions. Integrates Bürgi's four core competencies.
© Nationalmuseum Zürich.

Fritz Staudacher, the biographer of Jost Bürgi and president of the Lichtensteig Bürgi Symposium will next provide an overview of the life of Jost Bürgi.

Peter Ullrich, president of the historical section of the German Mathematics Association, will analyze the way Jost Bürgi could have used his methods to solve the *Artificium* algorithms and will present his latest findings.

Finally, ***Jörg Waldvogel***, ETHZ Professor of mathematics and specialist in Bürgi's logarithms, will analyse Bürgi's mathematical methods and their stability in terms of modern mathematics.

Gathering these distinguished specialists of Bürgi's times and science, the organizers intend not only to promote Bürgi's achievements and trigger further interest in his work, but to illustrate the potential of history of science in scientific education and public awareness of science.

Jan Lacki, Bernhard Braunecker

Progress in Physics (54)

The Swiss Nobelprize laureate Heinrich Rohrer from IBM Rüschlikon always pushed the vision that the physical research field of Nanoscience will once prosper as reliable tool in fields like material science. Thus he would have enjoyed the following exciting article of our colleagues from Empa and EPFL, describing the adsorption of organic molecules on complex metallic surfaces like PdGa.

Bernhard Braunecker

Exploring enantioselective processes on intrinsically chiral metal surfaces

Oliver Gröning [1], Jan Prinz [1]. Harald Brune[2] and Roland Widmer [1]
[1] Empa, Swiss Federal Laboratories for materials Testing and Research, Überlandstrasse 129, CH-8600 Dübendorf
[2] EPFL, Ecole Polytechnique Fédérale de Lausanne, Station 3, 1015 Lausanne

1. Introduction

One remarkable feature of biochemical and physiological processes is their often dramatic dependence on the handedness or more technically chirality of the involved molecular components. A rather harmless example is the odor of the two mirror symmetric forms of Carvone ($C_{10}H_{14}O$), where the right-handed R-enantiomer tastes of spearmint and the left-handed S-Carvone of caraway. As a consequence, the synthesis of stereopure chemicals is of tremendous importance for the production of pharmaceuticals, synthetic flavors and agrochemicals but also for materials for nonlinear optics. In this respect the tragic example of the chiral pharmaceutical agent Thalidomide, which has caused severe birth defects in several thousand children in the early 1960's, is often cited. The detailed relation of the handedness of Thalidomide and its physiological effects, being a sedative on one hand and a mutagen on the other, is still not fully resolved and complicated by the racemization of the molecule in the physiological environment [1].

The synthesis of a specific enantiomer, i.e. a stereoisomer with a specific stereogenic or chiral center, can be accomplished by purification of the racemic mixture or by means of homochiral catalysis. In the latter case, as the physiochemical properties of two enantiomers are exactly the same, an enantioselective reaction step in catalysis requires chiral binding centers. In homogeneous catalysis (Figure 1A), these binding centers may be provided by enantiopure molecules, which bind achiral reactants in a chiral configuration, leaving a specific site of the reactant exposed for the attack of a second reactant. This directs the reaction into a predefined chiral pathway which leads to enantioselective synthesis. In heterogeneous catalysis, enantioselectivity is commonly achieved by using surface modifiers or auxiliaries. Typically, those are chiral molecules that are adsorbed on an achiral support. In the example shown in Figure 1B, the adsorbate complex and the surface form a chiral binding center for the achiral reactant. Also "naturally" chiral surfaces, i.e. surfaces that exhibit chiral features in the pristine, adsorbent-free state, have been investigated with respect to chiral adsorption and enantioselective separation of racemic mixtures [2,3]. In the case of achiral crystals, chirality can be induced by vicinal cutting of single crystals at low symmetry crystal planes. The resulting high-Miller index surfaces can exhibit chiral binding centers at atomic kink sites (Figure 2C), and in consequence might offer an energetically favorable binding for one of the enantiomers of the adsorbed racemat.

A different approach is based on the intrinsic chirality of materials, as present for example in minerals [4]. In contrast to the heterogeneous methods discussed above, where the chirality is imparted by chiral modifiers or precise cutting of achiral single crystals, these materials are chiral in their bulk crystal structure, which might be projected to their surface (Figure 1D). In principle, the chirality is conserved also af-

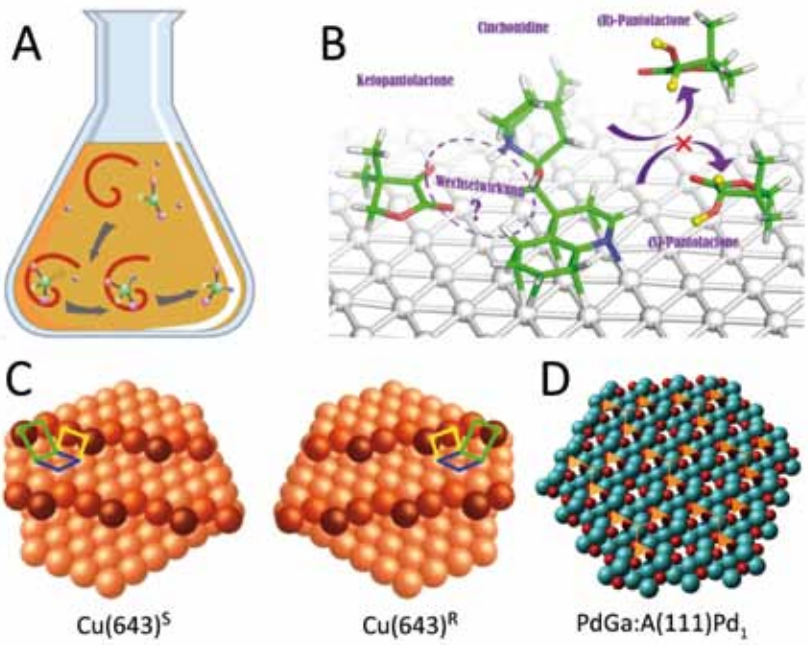

Figure 1: *Different approaches to chiral synthesis of molecules.* ***A)*** *Homogeneous enantioselective catalysis is based on chiral molecules (red spirals) binding the non-chiral reactant (3-atomic molecule). A fourth atom (blue) connects on a well-defined site, defining the handedness of the product (4-atomic molecule).* ***B)*** *In heterogeneous catalysis, an adsorbed chiral auxiliary (Cinchonidine) binds an achiral reactant (Ketopantolactone), which is subsequently hydrogenated from the side of the substrate (figure adapted from Ref. [5]).* ***C)*** *Kinks of single crystal surfaces offer chiral binding sites (figure adapted from Ref. [2]).* ***D)*** *Clean surface of a chiral intermetallic compound exhibiting chirality in every surface unit cell (structure indicated by orange triangles). The handedness is defined by the bulk enantiomer form of the compound.*

ter grinding of these materials into powders, or after surface etching, which makes them prospectively interesting materials as industrial catalysts. We show that on the Pd_1 terminated PdGa(111) surface room temperature adsorption of a small prochiral molecule (9-Ethynylphenanthrene) leads to exceptionally high enantiomeric excess ratios of up to 98%. Our findings highlight the great potential of intrinsically chiral intermetallic compounds for the development of novel, enantioselective catalysts which can be operated at high temperatures and potentially also in harsh chemical environments.

2. Results and Discussion

In the investigation of stereochemical processes at surfaces the use of chiral metal substrates has been extremely scarce and mainly limited to self-assembled chiral molecular layers [3,6-7] and vicinal surfaces exhibiting chiral kink sites at the step edges of atomic terraces [2,8-9]. Due to its non-centrosymmetric bulk structure of the space group $P2_13$, the intermetallic compound PdGa exists in two enantiomeric forms A and B, which are denoted as PdGa:A and PdGa:B respectively [10-12]. Large PdGa single crystals can be grown by the Czochralski method and all the low index surfaces (111), (-1-1-1), (100) and (110) can be prepared to show large single atomic terraces by standard ultra-high vacuum (UHV) preparation using sputtering and annealing cycles [11-13]. As no significant surfaces reconstructions occur [11,12], the bulk chirality is preserved at all these surfaces. This means that a high density of chiral bonding centers is present on the bare surfaces, potentially leading to higher enantioselective catalytic activity compared to approaches based on the handedness of terrace step kink sites [2,8-9].
PdGa:A(111) is terminated by an atomic layer containing one isolated Pd atom per surface unit cell [11] and is denoted as Pd_1 (Figure 2A). These single Pd atoms form a hexagonal lattice with 0.69 nm lattice constant and the chiral nature of the surface can only be appreciated when considering the structure of the 2nd and 3rd outermost surface layers, consisting of Ga and Pd trimers respectively. As can be seen in Figure 2A the subsurface Pd (blue) and Ga (red) atoms form equilateral trimers rotated to the right and the left respectively. The enantiomorph of the PdGa:A(111) (abbreviated $A:Pd_1$) is the PdGa:B(-1-1-1) surface ($B:Pd_1$), where the rotation of the subsurface trimers is mirrored with respect to the $A:Pd_1$ surface.

The effect of the intrinsic chirality of the $A:Pd_1$ and $B:Pd_1$ surfaces on enantioselective adsorption is investigated by deposition of the prochiral molecule 9-Ethynylphenanthrene (9-EP, see Figure 2A). Prochirality is a property of planar molecules which possess in-plane but not out-of-plane mirror symmetry and are thus achiral. However, when deposited on a surface the molecule forms a chiral adsorbate complex by lying either “face-up” or “face-down”, forming either enantiomer R or S. For achiral substrates, energetically equivalent adsorption sites for the R and S enantiomers are available, and thus they appear in equal abundance [14]. To achieve an excess of one of the two enantiomeric forms, i.e., enantioselectivity, the substrate must exhibit chiral binding sites that promote the preferred adsorption into either R or S configuration.

Figure 3 shows high resolution STM images of 9-EP deposited at room temperature (RT) with submonolayer coverage, imaged at 5 K on $A:Pd_1$ and $B:Pd_1$ respectively. Single 9-EP molecules can easily be distinguished and appear in two predominant morphologies. The most relevant ones regarding enantioselectivity consist of three differently sized lobes in the STM topography (see Figure 3C). The handedness of these types can be inferred from the sense of rotation going from the largest to the smallest lobe [15], where the clockwise rotation from the large, over medium, to small protrusion is defined as R-, and the counterclockwise sequence as S- enantiomer, as labelled in Figure 3A and B. For adsorption on $A:Pd_1$, shown in Figure 3A, the excess of the R- enantiomer is evident (R:S = 215:7, evaluated over a series of STM images), while S is predominant on $B:Pd_1$ (Figure 3B) (R:S = 2:196). Due to the threefold symmetry of the substrate, each enantiomer appears with equal probability in three orientations which are rotated by 120° to each other. The 0°:120°:240° rotated orientations for the R and S enantiomers, are observed in quantities of 69:68:78, and 69:77:50, on the $A:Pd_1$ and $B:Pd_1$ surfaces, respectively. Alternatively, 60° rotated configurations with the centered phenanthrene ring atop a Ga trimer of the 2nd layer are observed. As the clockwise or anticlockwise rotations of these alternative adsorbates can still be identified, they are considered a sub group of the R and S enantiomers in this study. For deposition at RT, the statistical analysis of molecules in R and S configuration yields an enantiomeric excess *ee* (*ee* = |R-S| / (R+S)) of 0.94 and 0.98 on $A:Pd_1$ and $B:Pd_1$, respectively. A third group of adsorbed 9-EP molecules is observed as brighter protrusions, which are molecules bound to surface vacancies(γ) [12].

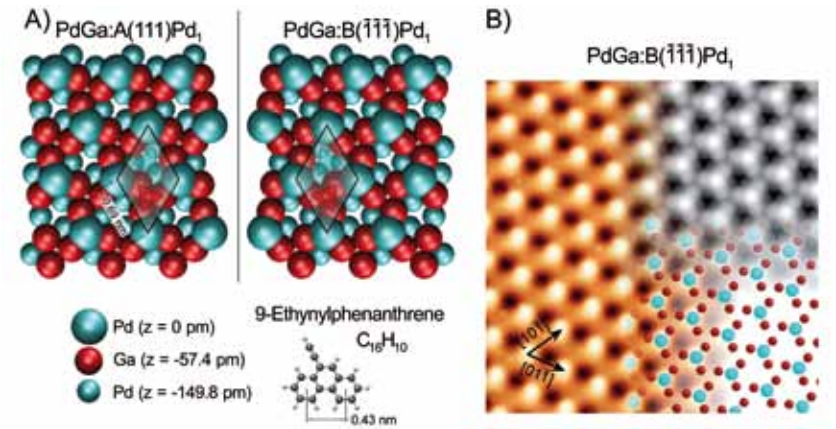

Figure 2: A) *Surface structure of PdGa:A(111)Pd_1 and its enantiomorph B(-1-1-1)Pd_1. The chiral arrangement within the hexagonal surface unit cell (black lozenge) is highlighted by the cyan and red triangle, representing the Pd and Ga trimers of the subsurface layers, respectively. Upon adsorption on a surface, the prochiral molecule 9-Ethynylphenanthrene forms a chiral adsorption complex.* ***B)*** *STM image (left) and superimposed DFT based STM simulation (top right) of the $B:Pd_1$ surface together with a ball structure representation (lower right). Figure adapted from [16] and [17].*

Evaporating the 9-EP molecule with the surfaces kept at low temperature of 100 K results in a roughly 50:50 (i.e. *ee* ≈ 0) racemic mixture of the R and S configurations. Upon annealing of the racemic mixture to temperatures close to 300 K results in the development of the enantiomeric excess. To quantify the temperature dependence of

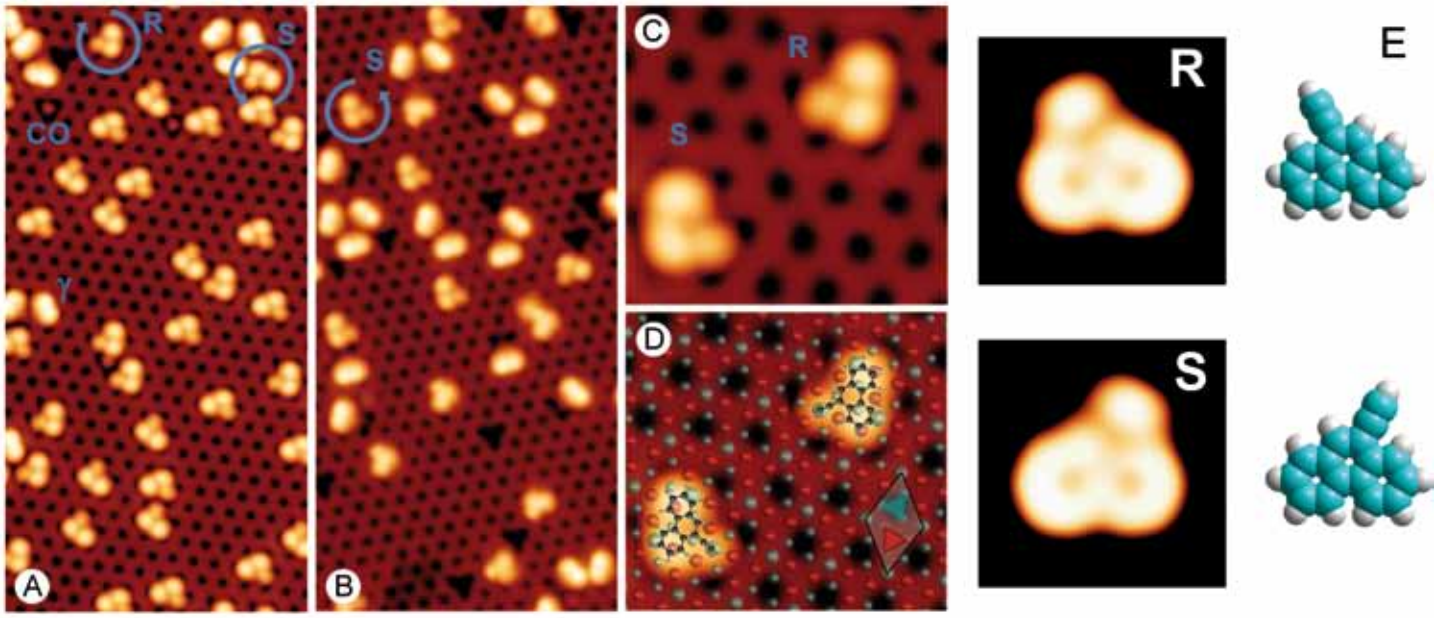

Figure 3: *STM images (10 x 20 nm, 0.02 V, 2 nA, T = 5 K) of 9-EP adsorbed at room temperature on* ***A)*** *the PdGa:A(111)Pd$_1$ surface and* ***B)*** *the PdGa:B(-1-1-1)Pd$_1$ surface. The different adsorbates are identified as clockwise (R) and counterclockwise (S) adsorption conformation, vacancy pinned molecules (γ) and CO molecules. Some unoccupied vacancy defects (dark features) are visible in B.* ***C)*** *Zoom (3.8 x 3.5 nm) showing R and S enantiomers on A:Pd$_1$.* ***D)*** *The structure overlay allows to identify the adsorption position within the surface unit cell. (cf. Figure 2).* ***E)*** *Extended Hückel Theory based STM simulations of the R- and S-9-EP with the corresponding chemical structure models. Figure adapted from [16].*

the enantioselectivity of the Pd$_1$ surface towards the adsorption of 9-EP, we evaluated and assigned a large number of adsorbates (N ≈ 400) for each of the experiments performed at different adsorption and annealing temperatures. In every case all the absorbed molecules have been classified in the categories; R, S, γ and dimers, which start forming at annealing temperatures of 400 K. 9-EP molecules whose adsorbate configuration cannot be unambiguously determined from their topographic appearance in STM, are classified as unidentified. The result is shown as vertical colored bars in Figure 4, representing the normalized fraction of adsorbate configurations R, S, γ and molecules that have formed dimers. Atop the bars, the amount of unidentifiable adsorbates is given for each experiment. Based on the temperature dependent quantities, a tentative phase diagram was constructed for the 9-EP species on A:Pd$_1$ (see background in Figure 4). The graph shows the transition from the racemic mixture of R and S enantiomers at low temperatures, over a region yielding high enantioselectivity situated around 300 - 350 K, to the formation of dimers for T ≥≈ 450 K. The appearance of γ type molecules, i.e. molecules pinned at vacancies, at higher substrate temperature is linked to the increase in mobility. *ee* is shown for each experiment as black marker with estimated errors for temperature and statistically computed errors for *ee*.

3. Conclusion and Outlook

We have demonstrated remarkably high enantioselective adsorption of a prochiral molecule on the bare, chiral surface of an intermetallic compound at room temperature. The adsorption of 9-Etynylphenanthrene on the A(111) surface and its mirror symmetric equivalent the B(-1-1-1) surface of PdGa has shown enantiomeric excess of 0.94 and 0.98 for the R and the S enantiomorphs, respectively. By studying the temperature dependence of the process we showed that the racemic molecule mixture, formed by adsorption of the 9-EP at temperatures below 120 K, is efficiently transformed to an almost enantiopure ensemble at room temperature. This observation shows that the bulk chirality of PdGa can be expressed sufficiently strong at its surfaces to yield highly enantioselective processes.

After having showed highly selective adsorption the next step in line is the demonstration of the on-surface synthesis of homochiral molecules. We are currently pursuing this goal within the SNF project “Chiral Intermetallic Surfaces For Enantioselective Reactions”. In a first stage to achieve this goal we have observed the formation of prochiral 9-EP trim-

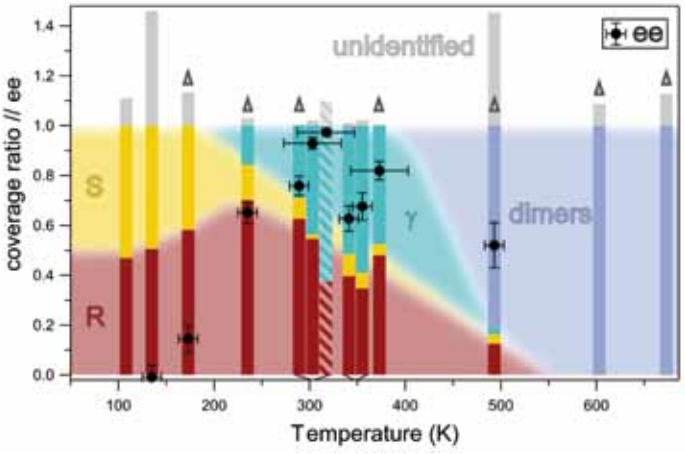

Figure 4: *Phase diagram based on statistical evaluation of 9-EP molecules on Pd$_1$. Normalized abundances for the R and S enantiomers, as well as molecules pinned to surface vacancies (γ), and dimers. Annealed samples are marked by gray triangles. A phase-diagram, based on the data of the different adsorbate configuration ratios, is presented as background. All bars represent the A:Pd$_1$ surface apart from the striped one representing B:Pd$_1$ (colors for R and S are inverted for clarity). The enantiomeric excess (ee) is given for each experiment as black circles. Error propagation of the counting errors in the number of R and S enantiomers was used to compute the error for ee. Figure from [16]. Reprinted by permission of John Wiley & Sons, Inc.*

ers with a large enantiomeric excess on the A(-1-1-1) and B(111) PdGa surfaces, which in contrast to the Pd_1 surfaces (i.e. PdGa:A(111) and PdGa:B(-1-1-1)) terminate in Palladium trimers [17]. The 9-EP trimers form at 490 K starting from a racemic mixture at room temperature. At the moment the bonding motive in the trimer (covalent or metal coordination) is not clear and under investigation. However, these preliminary results are very encouraging for the prospect of achieving chiral heterogeneous catalysis under operation conditions beyond the ones allowed by catalyst surfaces based on functionalization with organic, chiral modifiers.

Acknowledgements

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Progress in Physics (55)

Upgrading the TCV tokamak to get closer to fusion reactor conditions

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Introduction

In a recent SPS paper [1], A. Fasoli succinctly presented challenges that physicists must solve to harness fusion as an energy source for the benefit of mankind.
Fusion is the energy that powers the stars. To reproduce the process on Earth, one needs to heat the Hydrogen isotopes, Deuterium and Tritium, to very high temperatures, around 10 - 20 keV (100 - 200 Million °C), to reach an efficient fusion reaction rate. At these temperatures, the ‘fuel’ is in the plasma state and can then be confined in a toroidal vessel via magnetic fields in such a way as to reduce the contacts with the walls to minimal values.
The major remaining challenges, following [1], are to overcome the breakeven condition and reach high fusion gains, to control burning plasmas, especially their fast ion population, to reduce the detrimental effect of turbulence on the energy and particle transport, to minimize the impact of energy and particle exhaust onto the walls, and to optimize the efficiency of the blanket modules and their ancillaries where the Tritium breeding occurs and the generated heat

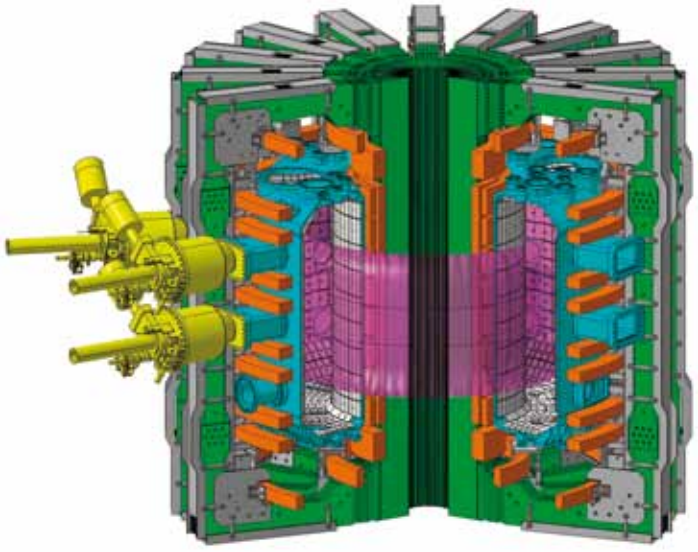

Figure 1: The TCV tokamak with its vacuum vessel (cyan), toroidal magnetic field coils (green), poloidal magnetic field coils: OH transformer and shaping coils (orange) and three ECH launchers (yellow).

is recovered for running the turbines that produce electricity. The TCV tokamak and its ongoing upgrades are conceived, built and operated to contribute to these challenges, in parallel with the construction and future operation of ITER [1] as well as the preparation of the next generation device, a demonstration power plant called DEMO.

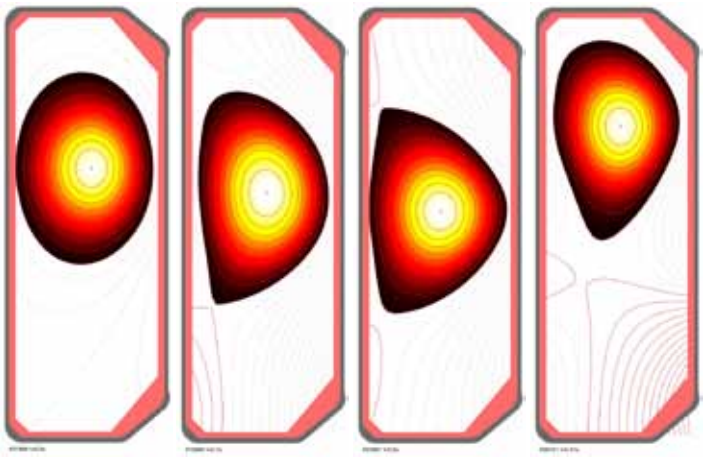

Figure 2: Plasma configurations obtained in TCV: limited, diverted with single null X-point, diverted with double null X-points, snowflake.

TCV

The TCV tokamak [2], operated since 1992, is composed of a toroidal vacuum vessel with a vertical rectangular cross section surrounded by three sets of coils as shown in Fig. 1. A set of vertical coils produces the main magnetic toroidal field ($B_T \leq 1.5$ T). A toroidal coil set, located near the vertical axis of the machine, provides the magnetic flux, whose variation induces the plasma current ($I_P \leq 1$ MA) which is needed to stabilize the plasma via the poloidal magnetic field it generates. Finally, a set of 16 poloidal field coils, all powered independently, are used to generate the magnetic field configuration, which gives the plasma its shape.
Plasma configurations obtained in TCV include both limited as well as diverted plasmas. Limited plasmas lie against the vessel wall, as shown in Fig. 2. The separatrix is defined as the surface that separates the domain where the magnetic field lines are closed on themselves from the domain where they hit the vessel. Diverted plasmas have no direct contact with the vessel but are connected to it via 'separatrix legs' that extend from a null point in the poloidal magnetic field, called X-point, to the vessel. Most tokamaks presently produce single null (one X-point) or double null (two X-points, one at the top and one at the bottom of the plasma) configurations. See examples from TCV in Fig. 2. Snowflake configurations, with two coinciding X-points, that is with four separatrix legs, have been pioneered in TCV, see SPS communication [3]. Snowflakes and other diverted configurations such as super-X, are of great interest in the quest of solving the heat exhaust problem, to which a large fraction of the TCV upgrades is dedicated. Beside the variety of possible configurations, TCV and its 16 shaping coils allow control of plasmas in wide ranges of shape parameters. A great chapter of TCV history already covers the effect of the plasma shape on its properties, especially its energy confinement.

To reach the plasma temperature ranges required for fusion, ohmic heating is not sufficient. In the past, the TCV has opted for the electron cyclotron resonance heating (ECRH) method, since the millimeter wave beam can easily be directed and focused in different regions of interest in the plasma [4]. This approach is based on injecting an electromagnetic wave at a frequency corresponding to the electron gyrofrequency or one of its harmonics. The advantage of this heating method is that the wave penetrates into the plasma without interactions before reaching the resonance layer, which consists of a vertical plane passing through the plasma, therefore allowing localised heating, either at the plasma centre, mid-radius, or at the plasma edge, as shown in Fig. 3. The limitations of the current ECH system on TCV are a relatively low cut-off density ($4.2 \times 10^{19} m^{-3}$) for the second harmonic (X2 - 82.4 GHz), but which is fully absorbed at the first pass, and a lower absorption for the third harmonic (X3 - 118 GHz), which on the other hand has a higher cut-off density ($12 \times 10^{19} m^{-3}$). Lateral launchers with revolving and tilting mirrors allow localised injection of the microwaves at the 2nd harmonics, single pass, and have led to a large number of scientific achievements, including internal transport barriers, with the electronic temperature record of 17 keV, full sustainment of the plasma current (200 kA) by the EC microwaves via their current drive capabilities, used instead of the magnetic induction, and full sustainment of the plasma current via bootstrap current, a transport phenomenon resulting from the presence of a strong pressure gradient, which builds up when the plasma is heated locally. On the other hand, microwaves at the 3rd harmonic are launched from the top, along the resonance layer, to compensate the lower absorption rate with a longer path in the absorption region. Interesting results have also been obtained using the X3 system, especially in the high confinement regime, called H-mode, which builds up after a transport barrier develops at the plasma edge (the H-mode is the operational regime foreseen for ITER). However, since the 3rd harmonic microwave absorption increases with temperature, multi-step scenarios were developed to approach the high density and high temperature fusion reactor-relevant operational domain. A more direct access would be preferable. This would be possible by adding another heating scheme such as neutral beam injection.

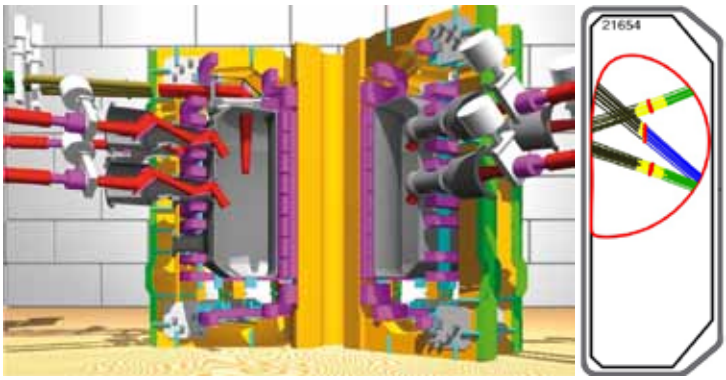

Figure 3: Left, schematic view of the ECH launching system. ECH beams, in red, are launched from six lateral ports and one top port. Right, simulation of the absorption of the ECH beams with different orientations in a plasma. The red zones indicate the resonance location.

In summary, TCV with its high plasma shaping and heating capability has proven to be a very valuable device to improve our knowledge of a variety of basic phenomena in

1 https://www.iter.org

fusion plasmas. The next step consists of merging these capabilities and findings in more relevant fusion reactor conditions. To do so, a series of upgrades to the TCV infrastructure are required [5]. Some have currently already been installed and other are planned for the coming years; all are described in the next sections.

TCV Upgrades

EC waves interact with, and transfer energy to electrons only. At low densities, for which ion-electron collision rates are low, the ion temperature actually decreases when the electron temperature increases, due to the further reduced ion-electron collision rate. At higher densities, the ion temperature slightly increases, but direct ion heating is necessary to reach ion temperatures in the range of 10 - 20 keV, as required for fusion reactions. Two 1 MW neutral beam heating systems will fulfill this requirement.
Reactor relevant conditions also include operation at higher plasma densities. It is therefore necessary to improve the EC capability at the 3rd harmonics. Two 1 MW gyrotrons working at two frequencies (126 GHZ - 3rd harmonic and 84 GHz – 2nd harmonic) will be installed.
Finally, to address the exhaust issues, and in particular to test new divertor concepts, different sets of baffles, equipped with measurement systems will be developed together with gas feeding and pumping capabilities. Additional shaping coils will complete the divertor improvements.

ECH system upgrades

The ECH system of TCV, in operation since 2000, is built on three independent, high voltage (80 kV), well regulated power supplies. The first two power supplies feed two clusters of three 500 kW gyrotrons each. These microwave sources, of maser type with a cavity of about 5 cm, produce beams at the frequency of 82.4 GHz, which corresponds to the 2nd harmonic of the electron cyclotron frequency in TCV. The microwave beams are then led to the tokamak in individual transmission lines (corrugated wave-guides), and launched in TCV from lateral ports via independent sets of revolving and tilting mirrors. The last power supply feeds another cluster of three 500 kW gyrotrons, producing microwaves at 118 GHz, which corresponds to the 3rd harmonic resonance in the plasma. Individual transmission lines carry the beams to the top of the tokamak where they converge on one tilting and radially adjustable mirror, as shown in Fig. 3.
The upgrade first consists of replacing three defective 82.7 GHz gyrotrons by two 750 kW units producing beams at the same frequency and being powered by one power supply. The beams are then launched into TCV through the lateral ports. The first of these two gyrotrons, provided by GYCOM, Russia, has just been installed, tested and accepted at the SPC.
The three surviving 82.4 GHz gyrotrons are now grouped in the other X2 cluster and their waves injected into TCV from the other set of lateral launchers. The 3rd harmonic, 118 GHz, cluster of three gyrotrons remains untouched but will be powered, in the future, by the same power supply as the remaining gyrotrons. The plan is to also modify the transmission lines to allow injection of the 118 GHz beams from top or lateral ports. For this, new segments of transmission line and three way switches will be installed.

In a second step (2017 - 2018), two dual frequencies, 84 GHz and 126 GHz, gyrotrons will be added. Their resonant cavity is designed to produce microwaves at these different frequencies. Moving from one frequency to the other only requires the operator to change the external magnetic field and the angle of the last mirror in the gyrotrons. The output power should reach 1 MW at both frequencies. The design of these gyrotrons has been performed in collaboration with KIT and Thalès, which will also build them. The microwaves produced by these new devices will be injected into TCV through existing top or lateral ports using another set of microwave switches. Fig. 4 shows the gyrotrons implementation and Table 1 summarises the possible schemes for using the different sources once the whole system will be installed.

Cluster	Power	Ports	Physics goals
Old 82.4 GHz gyrotrons (X2)	1.25 MW	Lateral	Localised heating or current drive of low density plasmas
New 84 GHz gyrotrons (X2)	1.5 MW		
Old 118 GHz gyrotrons (X3)	1.5 MW	Top or lateral	Bulk heating of high density low temperature plasmas Localised heating or current drive of high density high temperature plasmas
New 126 GHz gyrotrons (X3)	2 MW		

Table 1: Usage of the different gyrotron clusters.

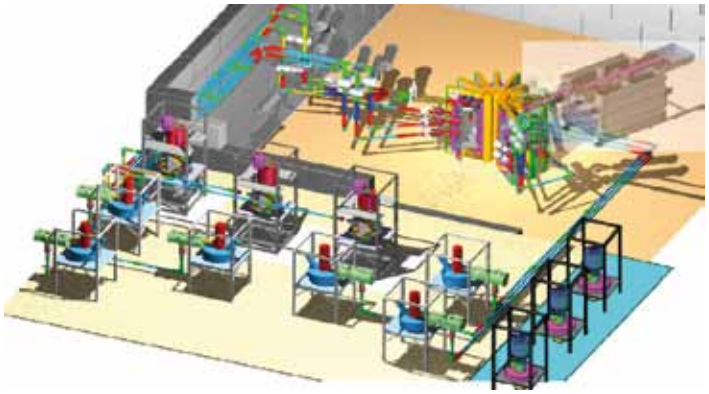

Figure 4: Implementation of all gyrotrons on the plateform next to TCV.

Neutral Beam Injection

Neutral Beam Injection consists in launching high energy neutral Hydrogen isotopes into the plasma. The reason to launch neutral particles, instead of charged particles, lies in the fact that charged particles would be deflected before entering the tokamak, due to the presence of the magnetic fields. Entering the plasma, these particles nonetheless get ionised and confined by the magnetic field and consequently can transfer their energy to the plasma particles through collisions. NBI has the advantage of directly heating the ions at the energies required for TCV.
A NBI system contains a plasma source that generates the charged particles, which are then accelerated in a series of high voltage grids, before entering a volume filled with neutral gas where charge exchange occurs. Fast neutrals then

exit from this volume and fly in a straight line into the plasma. The remaining charged particles are deflected away. The SPC has purchased one 1 MW 35 keV beam from Budker INP, Russia. It is now installed on the TCV tokamak and the first results showed operation close to specifications and ion heating in accordance with the simulations.
To benefit from a longer beam/plasma interaction region, neutral beams are usually launched tangentially into tokamaks. Therefore, prior to the installation of the neutral beam, modifications of the TCV vacuum vessel have been performed to accommodate tangential injection, as shown in Fig. 5: two radial ports located on the equatorial plane of the machine have been replaced by tangential ports. This work has been performed by De Pretto technicians who directly modified the vessel from inside. The second new tangential port is planned to dock a second 1 MW beam, with slightly higher energy to study fast ion physics. It will also be provided by Budker, INP, likely in 2018.

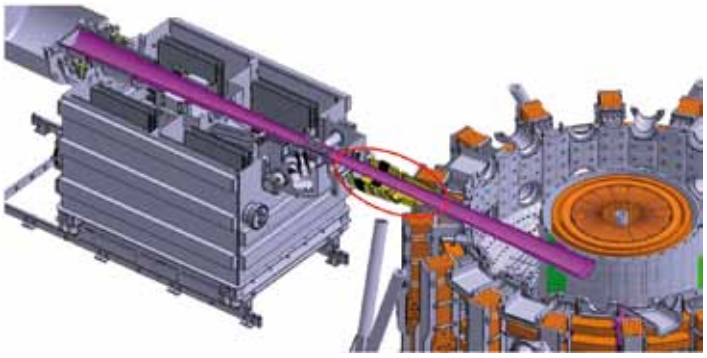

Figure 5: Horizontal cut of the neutral beam injection system (left) and TCV (right). From the top left corner, the plasma source, the neutralyser, the beam duct and the tangential port. The second tangential port is visible at the lower right corner.

Due to their tangential injection, neutral beams also inject toroidal momentum, thus inducing plasma rotation, which, in turn, strongly influences the plasma characteristics, especially the access to the high confinement regime, the so-called H-mode. The process is not yet fully understood, since, for instance, plasma rotation is also observed with radial injection of EC waves, which do not carry toroidal momentum. To contribute to the clarification of these observations, the new tangential ports have been oriented in opposite direction to allow neutral beam injection in the same direction of the plasma current or in the opposite direction, or in such a way as to compensate each other.
Neutral beam injection will then directly bring high density plasmas to high temperatures, i.e. provide more reactor relevant conditions. In particular, H-mode regimes should be easily obtained by NBI and the 3rd harmonic of ECH could then be used to act on the temperature profile, in order, for instance, to create an additional internal transport barrier, or to act on the edge transport barrier itself.
Finally, having two high power systems that independently heat the electrons and the ions allows studying plasmas with a wide range of different ion to electron temperature ratios. This is of prime importance, since different turbulent regimes seem to develop according to the different temperature ratios.
In summary, the combination of NBI and ECH opens wide new fields of investigations of high relevance to fusion research.

Closed divertor

In diverted configurations, charged particles that exit the plasma by crossing the separatrix, find themselves on open magnetic field lines, and thus flow towards the vessel walls until they hit it near the separatrix strike points, i.e. where the separatrix legs connect to the vessel. Most escaping particles thus hit the walls in two bands that fully expand toroidally but have a very narrow expansion poloidally.
The power density deposited onto the walls at the vicinity of the strike points of a large fusion device will be extremely large, up to 10 - 20 MW/m^2, leading to material surface damage. Measures must therefore be taken to reduce it. The first idea, already tested in JET for instance, is to tilt the divertor plates in order to obtain a wider wetted area. An alternative consists of moving back and forth the strike points in an oscillating motion to also increase the time-averaged wetted area. Furthermore, the strike points can be displaced towards a larger major radius to increase the length of the interaction region in the toroidal direction, in the so-called super-X configuration. Another possibility consists of merging two X-points together, which results in a configuration counting four separatrix legs, called the snowflake divertor. Variants of these configurations, which include different flux expansion and X-point locations, provide a continuum of shapes that can be addressed in TCV.
A completely different but complementary approach consists of radiating a large fraction of the power before it hits the vessel walls. The idea is to inject neutral gas (Deuterium, Nitrogen, Neon or Argon) in the divertor volume, which is the region that expands from the X-point to the strike points. The radiated power is then distributed over a much larger surface area and strongly reduces the heat load near the strike point. To implement this idea, a clear separation between the main plasma volume and the divertor volume

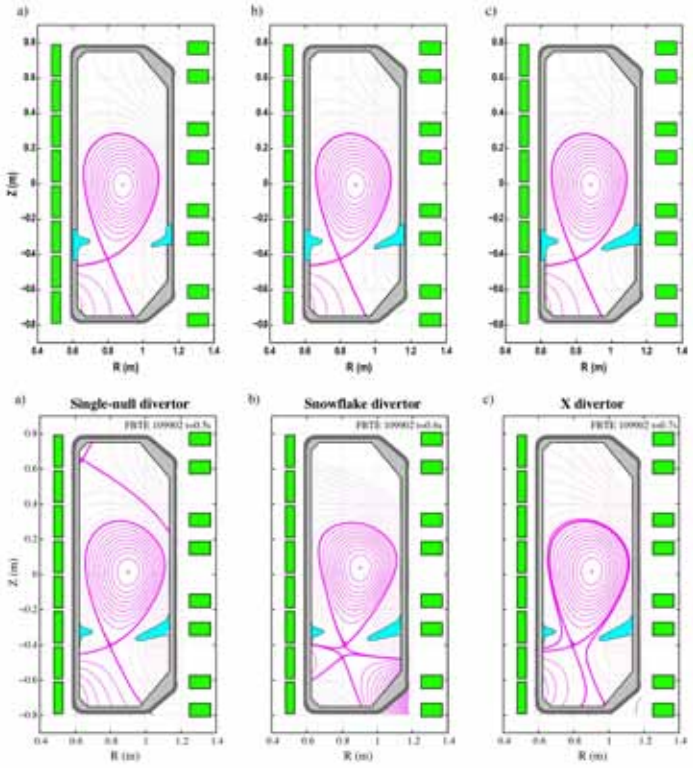

Figure 6: 1st row: implementation of baffles with different lengths. 2nd row: simulations of different plasma configurations showing the compatibility with the most closed baffles.

is then necessary to maintain control of the pressure in the two different regions.
The TCV vessel cross section is by design almost rectangular, to accommodate the largest variety of plasma configurations and shapes. This proved to be very useful to develop new configurations and to explore the influence of shape parameters over very wide ranges but requires significant modifications if one wants to explore closed divertor physics, especially while keeping the high plasma shaping and divertor configuration capability of TCV.
It has therefore been proposed to install a gas baffle structure in the lower part of the TCV vessel. This device consists of a ring of graphite tiles attached to the inner wall on the high field side together with a set of three different exchangeable rings, made of graphite tiles as well but with different lengths in order to vary the closure of the divertor region, mounted alternately against the outer wall (low field side), as shown in Fig. 6. A solution that does not require human access inside the torus to switch from one to the other sets is currently under investigation. These baffles will be equipped with thermocouples to monitor their temperature and with Langmuir probes to measure the characteristics (density, temperature and floating potential) of the plasma close to the tile surface. Additional IR cameras will complement the characterisation of the interaction between the plasma and these baffles.
Gas valves and pressure gauges will be implemented in the walls surrounding the two regions to separately control, if closure permits, the neutral pressure in the plasma region and in the divertor region. A high capacity pumping system consisting of two rings of cryogenic panels will be installed under a 'false floor' in the bottom part of the vessel to help control the neutral density in this region when strong gas puffing will be used to increase the radiated power.
Several plasma diagnostics will need to be upgraded to accommodate measurements in the two regions. In particular, the divertor region will be equipped with a series of additional channels for the Thomson scattering system in order to collect precise temperature measurements of the plasma flowing in the divertor. It will also be mandatory to equip the divertor region with bolometric cameras to measure the radiation emissivity, in 2D, of the divertor plasma, in order to qualify the performance of the closed divertor in terms of radiated power. Divertor spectrometry will complement the information of the bolometers arrays by estimating the impurity content of the plasma.
Finally, a series of up to three poloidal field coils will be installed in the space between the vacuum vessel floor and the toroidal field coils, as shown in Fig. 7, to improve the control capability of advanced divertor configurations especially for snowflake divertors, but also for super-X divertors or other variants. High temperature superconductors are foreseen for this since they can sustain a much higher current density than conventional conductors and thus strongly reduce the impact of these coils in a region already occupied by several measurement systems.
The detailed design of the different components of the closed divertor, i.e. the baffles, the diagnostics, the cryopumps and the coils, will be initiated at the end of 2016. Procurements, fabrication and installation are planned for 2018 and 2019. All actions to upgrade the TCV tokamak should be completed by 2020.
The TCV team will then continue to significantly contribute to its chosen fields with a still very flexible device while approaching reactor-relevant plasma conditions.
The Swiss Plasma Center wants to express its sincere gratitude to all Swiss and European institutions that provide funding for these upgrades as well as for the research activities that are pursued in the mean time.

Figure 7: Schematic view of the divertor upgrades: baffles (cyan), superconducting coils (orange) and cryogenic pumps (blue-grey in the bottom of the vessel).

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Physics and Society

Big Science – Assessing Collaborative and Individual Merits

Hans Peter Beck, Uni Bern

Scientific progress in fundamental research has been made by individuals, by small groups, and in the recent decades also by ever-larger growing collaborations, nowadays involving thousands of scientists from hundreds of institutions across the globe. Complex, expensive infrastructure especially designed, developed and built by the collaborations over years, sometimes even over decades, only exists because of the hard work of many, concentrating small funds from many sources, and creating together the shear impossible. A success story but not without problems.

Collaborative efforts in the quest for fundamental knowledge

Despite of the scientific success in the quest of deeper and deeper understanding of the structure of matter and the buildup of the Universe, the ever-growing size of scientific collaborations has been criticized ever since groups started working together. Scientific collaborative efforts started in the 1950's (or even earlier), when small teams involving two to three groups of geographically not too far-away universities were joining, up to these days, where groups involving 200 university teams across the globe are spanning together and focusing their efforts towards a common research goal that otherwise would be unthinkable to achieve. Recent examples are the direct observation of gravitational waves, this February, and published jointly by the LIGO and the VIRGO scientific collaborations, signed by 1011 co-authors from 133 institutes [1], or the discovery of the Higgs boson at CERN's Large Hadron Collider by the ATLAS and CMS collaborations in summer 2012. Here, ATLAS and CMS are competing collaborations both selecting, measuring and analyzing proton-proton collisions at the Large Hadron Collider independently and at opposite collision points of the ring. In order to prevent possible scientific bias from one experiment to the other, the two groups develop their tools and methods independently, and minimize premature exchange of know-how and preliminary results to an absolute minimum. Still, the observation of a new particle in summer 2012 (at that time, it was not yet established, whether this new resonance was indeed the sought after Higgs boson, or something completely new) was announced jointly in two seminar talks in a single session at CERN, and was submitted to the same journal a few weeks later on a beforehand agreed day and journal editor [2, 3]. The count of authors of these two papers is impressive, with 2932 signing the ATLAS paper, and 2900 signing the CMS paper. This is not the limit, which today, at least to my knowledge, occurs for common publications between the ATLAS and the CMS collaborations, as happened recently, when ATLAS and CMS data were statistically combined resulting in a measurement of the mass of the Higgs boson to be 125.09 ± 0.21$^{(stat)}$ ± 0.11$^{(sys)}$ GeV c^{-2} i.e. with 2‰ precision [4] and 5154 signing authors. Another example where an important and crucial scientific result is obtained through a collaboration of two otherwise distinct collaboration is the observation of a rare decay of a B meson into a muon pair with a measured branching ratio $\mathcal{B}(B_s^0 \to \mu^+\mu^-) = 2.8^{+0.7}_{-0.6} \times 10^{-9}$ [5], compatible with the Standard Model prediction. This very stringent test of the Standard Model is signed by 2830 authors, and as an exception in the field of particle physics, is published in Nature, where open access under the Creative Commons

Selected for a Viewpoint in *Physics*

PRL **114,** 191803 (2015) PHYSICAL REVIEW LETTERS week ending 15 MAY 2015

Combined Measurement of the Higgs Boson Mass in pp Collisions at $\sqrt{s} = 7$ and 8 TeV with the ATLAS and CMS Experiments

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(ATLAS Collaboration)[†]
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(Received 25 March 2015; published 14 May 2015)

A measurement of the Higgs boson mass is presented based on the combined data samples of the ATLAS and CMS experiments at the CERN LHC in the $H \to \gamma\gamma$ and $H \to ZZ \to 4\ell$ decay channels. The results are obtained from a simultaneous fit to the reconstructed invariant mass peaks in the two channels and for the two experiments. The measured masses from the individual channels and the two experiments are found to be consistent among themselves. The combined measured mass of the Higgs boson is $m_H = 125.09 \pm 0.21\,(\text{stat}) \pm 0.11\,(\text{syst})$ GeV.

DOI: 10.1103/PhysRevLett.114.191803 PACS numbers: 14.80.Bn, 13.85.Qk

The study of the mechanism of electroweak symmetry breaking is one of the principal goals of the CERN LHC program. In the standard model (SM), this symmetry breaking is achieved through the introduction of a complex doublet scalar field, leading to the prediction of the Higgs boson H [1–6], whose mass m_H is, however, not predicted by the theory. In 2012, the ATLAS and CMS Collaborations at the LHC announced the discovery of a particle with Higgs-boson-like properties and a mass of about 125 GeV [7–9]. The discovery was based primarily on mass peaks observed in the $\gamma\gamma$ and $ZZ \to \ell^+\ell^-\ell'^+\ell'^-$ (denoted $H \to ZZ \to 4\ell$ for simplicity) decay channels, where one or both of the Z bosons can be off shell and where ℓ and ℓ' denote an electron or muon. With m_H known, all properties of the SM Higgs boson, such as its production cross section and partial decay widths, can be predicted. Increasingly precise measurements [10–13] have established that all observed properties of the new particle, including its spin, parity, and coupling strengths to SM particles are consistent within the uncertainties with those expected for the SM Higgs boson.

The ATLAS and CMS Collaborations have independently measured m_H using the samples of proton-proton collision data collected in 2011 and 2012, commonly referred to as LHC Run 1. The analyzed samples corre-

This Letter describes a combination of the Run 1 data from the two experiments, leading to improved precision for m_H. Besides its intrinsic importance as a fundamental parameter, improved knowledge of m_H yields more precise predictions for the other Higgs boson properties. Furthermore, the combined mass measurement provides a first step towards combinations of other quantities, such as the couplings. In the SM, m_H is related to the values of the masses of the W boson and top quark through loop-induced effects. Taking into account other measured SM quantities, the comparison of the measurements of the Higgs boson, W boson, and top quark masses can be used to directly test the consistency of the SM [17] and thus to search for evidence of physics beyond the SM.

The combination is performed using only the $H \to \gamma\gamma$ and $H \to ZZ \to 4\ell$ decay channels, because these two channels offer the best mass resolution. Interference between the Higgs boson signal and the continuum background is expected to produce a downward shift of the signal peak relative to the true value of m_H. The overall effect in the $H \to \gamma\gamma$ channel [18–20] is expected to be a few tens of MeV for a Higgs boson with a width near the SM value, which is small compared to the current precision. The effect in the $H \to ZZ \to 4\ell$ channel is expected to be much smaller [21]. The effects of the interference on

As an example from [4]: While the first 7 pages of the publication describe the scientifc method and result, the following 26 pages list the 5154 authors and their affiliations.

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CC BY-NC-SA 3.0 [6] was negotiated with the publisher. Indeed, CERN authors are requested to publish all their results following the Gold Open Access policy [7]. One may think that gravitational physics and particle physics are special cases, but other fields are catching up as recent papers e.g. in biomedical sciences and other fields show, where complex research topics are a driving force for collaboration building. Indeed, previous record holders in hyperauthorship was the collaborative effort put up for the sequencing of the human genome by the International Human Genome Sequencing Consortium, with over 2700 authors publishing papers in Nature already over ten years ago [8]. What is sometimes criticized as bad, and as putting science in jeopardy, is indeed the result of continuing answering complex scientific questions, that otherwise could not be tackled at all. Not science in its quest for deeper, fundamental understanding of the world is in jeopardy, but only the way authorship has to be seen, and how the merits of collaborative efforts and of individual researchers are assessed; this indeed needs re-thinking.

Publications – a few words on hyperauthorship

Apart from these highly visible papers on the Higgs discovery, that are reaching thousands of citations and counting, the LHC collaborations are true publication factories with in average producing over two fully peer reviewed papers per week! Publishing papers on searches for new exotic physics phenomena predicted by theories involving new symmetries, extra spatial dimensions, new forces between elementary particles, typically trying to explain mass hierarchies of existing particles, explaining the nature of Dark Matter in the Universe, or getting gravity involved at the quantum scale. Literally hundred of groups are involved in data taking, in hardware and software maintenance, developments and future upgrades, in detector alignment and calibration, usually done with in-situ measurements of individual particles and known Standard Model particles acting as standard candles – all before final analysis efforts for individual results can be sought off, that again is taking place in many parallel functioning groups. Internal peer review processes take a huge effort where every author is asked to contribute and to comment on internal paper drafts and on draft conference contributions, written by smaller analysis and editorial teams, guided by senior physicists and steered by publication and physics coordination. Individual results often take months until they pass internal quality control and internal peer review before a draft paper is finally signed off and submitted to a journal for the real peer review to start. With all involved for every paper, it is virtually impossible not to allow all collaboration members to be co-author of these papers. Trying to establish a different system with just few authors signing individual results, has been considered but has always found to be un-just, and would likely put collaborations, that rely on people and groups co-working, in jeopardy. No one would agree devoting him/herself in calibration or detector maintenance efforts if the consequence would be to be deprived from signing physics results – motivation and coherence inside the collaboration would fall apart.

While it is important to keep cohesion inside collaborations at top, it is not without consequences for the reputation of those fields where such big collaborations are needed for advancing the field. Further, it can be of severe consequences for individuals working in such collaborations, for advancing in their personal scientific career.

Coopetition, collaborative sociology, and internal rulings

Working together, with sometimes thousands of individual, hard-working, colleagues where also all are pushing their own academic career in parallel, be it for reaching their PhD, for obtaining their next PostDoc position, longing for tenure, or professorship, is a complex task by itself. Individual academic excellence is sought after in a highly competitive and by far too small job-market, but the effort only succeeds as a team player. Only those who are widely accepted for their scientific competence, communication skills, visibility inside the collaboration, which is usually paired with leadership within their collaboration, will succeed. The coined term describing these competing and also conflicting skills is *coopetition*, merging the words cooperation and competition. Coopetition excellently describes the demand on young researchers inside large collaborations and is shaping a skillset of great use for those many who will (have to) find their way in industry after leaving the academic field.

Complex internal rules have been established inside every collaboration, defining what it takes to become an author (usually granted only after one year with significant service effort to the detector and other infrastructure); defining what information has to stay inside the collaboration and what information can be used and be shown at scientific conferences or in public. Blogging a new result prematurely can have bad consequences for the overall reputation of a collaboration (or of a whole field) and is therefore sanctioned inside the collaboration. Presenting new results at conferences is only possible when being chosen by a selection committee that is balancing individual merits, with overall geographical, institutional, and gender parity. Personal invitations by conference organizers need the blessing from the collaboration and it can happen that a request to decline such a personal invitation follows for overall balancing reasons and to give way to another colleague to give the invited talk instead.

People that can flourish inside such collaborations feel themselves in a very engaging, competitive and stimulative environment, where career opportunities can open within the same or in a near by collaboration. When it comes to assess individuals outside the collaboration, for instance when a new faculty member needs to be hired and multiple candidates need to be compared, it becomes difficult to distinguish the individual merits among the candidates. They will have the same long list of publications and the selection boards have to trust the personal statements in each CV, and the individual recommendation letters received. Often a short-list of those publications where personal impact was highest is thus amended to the list of publications. The same difficulties arise when evaluating research proposals, where excellence is demanded, but where these proposals also need to follow the collaborations overall momentum and needs, imposing strong boundary conditions. Prizes honoring individual contributions of physicists are not easy to attribute – despite the many individuals engaging with vigor and contributing important elements to the overall success of their collaboration.

Curbing hyperautorship – should it even be considered?

In a recent development, and, in my view, in a helpless effort trying to teach collaborations to re-think their rulings, university ranking agencies have decided to discard those papers that have more than 1000 authors or that have an unusual high number of institutional affiliations, as e.g. [9,10]. Obviously, discarding collaborative papers can be seen as a cure for those active in fields where small groups pursue their individual research. On the other hand, this also nullifies the Higgs discovery, or the observation of gravitational waves, and is putting the scientific value of these milestone achievements in question. Other consequences are that highly distinguished institutes which are mainly active in particle physics get downgraded by bureaucratic decision making mechanisms, as has happened e.g. with LIP (the Laboratório de Instrumentação e Física Experimental de Partículas) in Portugal by declaring that all publications with a high count of authors are no longer considered for their ranking. Especially when ranking directly impacts research funding and overall reputation, the field of research of the next to be hired faculty member won't be one where the field is dominated by collaborative efforts.

The San Francisco Declaration on Research Assessment and the Leiden Manifesto

There is certainly no silver bullet to solve this conundrum, but a change in vision and strategy for the assessment of merits in research is needed, and is slowly making progress. Certainly, assessing individuals on publication indices in high-impact-factor journals has reached a level where more problems than benefits are seen. This is certainly true when assessing collaborative papers, but is also shown to be problematic in other fields, where science gets severely biased by chasing impact factors alone. The San Francisco Declaration on Research Assessment (DORA) [11] or the Leiden Manifesto [12] are steps in the right direction and recognize the need to eliminate the use of journal-based metrics, such as Journal Impact Factors, in funding, appointment, and promotion considerations; as well as the need to assess research on its own merits rather than on the basis of the journal in which the research is published; and the need to capitalize on the opportunities provided by publishing online. As of today, over 12'000 individuals and over 600 organizations have signed DORA, among those the Universities of Bern, Neuchâtel and Zurich, the Swiss Federal Institute of Aquatic Science and Technology (EAWAG), the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), the Swiss Federal Laboratories for Materials Science and Technology (EMPA),or the Swiss National Science Foundation (SNF); just to name a few in Switzerland.

Assessing the collaborative individual – The HEPP-EPS Memorandum

Other measures on assessing individual researchers in large collaborations have been established in a memorandum jointly written by the High Energy and Particle Physics division of the European Physical Society (HEPP-EPS) and the European Committee for Future Accelerators (ECFA) [13] stating not to focus on journal rankings, but to evaluate the visibility of individuals inside their collaborations, their participation in committees and boards as members and as individuals, their presentations at international conferences, their invitations to seminars and colloquia, the prizes, awards and other distinctions received, their impact generated in and outside their collaboration, and by careful written letters of recommendation.

Conclusion

Big Science has contributed to a deep understanding of nature in physics and in other fields. Deep scientific questions will continue to require huge collaborative efforts that will take years of investments and that are uncertain at the beginning and only get clear during the course of building up new methods and tools, and infrastructure. Assessing correctly the merits of collaborative efforts, the collaborations engaging in it, and even more the individuals on whose crucial contributions success and perdition hinges, is of highest importance not only for the benefits of Big Science but will ultimately also allow to improve the situation of smaller groups, where the publish or perish paradigm, leading to biases in science, also deserves a deeper discussion. DORA, the Leiden manifesto, or the HEPP-EPS/ECFA memorandum are steps in the right direction, and can be used as role models for further and wider discussions to take place.

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Physicists in Industry (1)

The rapid change and the increasing complexity of modern technologies need much more cooperation between engineers and physicists to fully exhaust the inherent potentials. The SPS could be an "… effective portal for accessing and meeting people (as will be stated below) ..." to bridge the gap between the academic and the industrial side. One possibility to stimulate the dialogue is to ask physicists working in industry, if young colleagues should be encouraged to work in their field?

B. Braunecker

Iain A. Neil, Physicist and Optical Designer

Introduction

The international year of Light IYL15 demonstrated impressively the overwhelming possibilities of photonic systems in the future. Light as a carrier of spatial, spectral and time information will be used more and more for many scientific and industrial applications. But we need *smart optical systems* to control the data flow of very large space-time-bandwidth products. Consequently, the design and the fabrication of high quality optical systems will be of major importance. While in former times the optical design was more the working field of mathematicians, the change to photonic systems will require more and more the *expert knowhow of physicists*.

In the following we ask *Iain A. Neil*, who recently joined our society, how he sees the advancement of optical design? Iain, who is now living in Switzerland for over a decade, is one of the world's best known optical designers. During his impressive career he developed many camera lenses for the movie industry. It must be exciting for him to watch great Hollywood movies and read the credits such as 'Filmed with cameras and lenses by Panavision', of which many of the lenses he worked on developing. No wonder, that the Hollywood movie industry honoured him with 12 Academy Awards!

I Design Skills

Q: What are the criteria of a good design?

IN: It tends to depend somewhat on the application where size, weight, image quality, cost and so on are important to varying degrees but usually the main aim is to achieve a design that acceptably meets the target specification and which is producible at an economic cost.

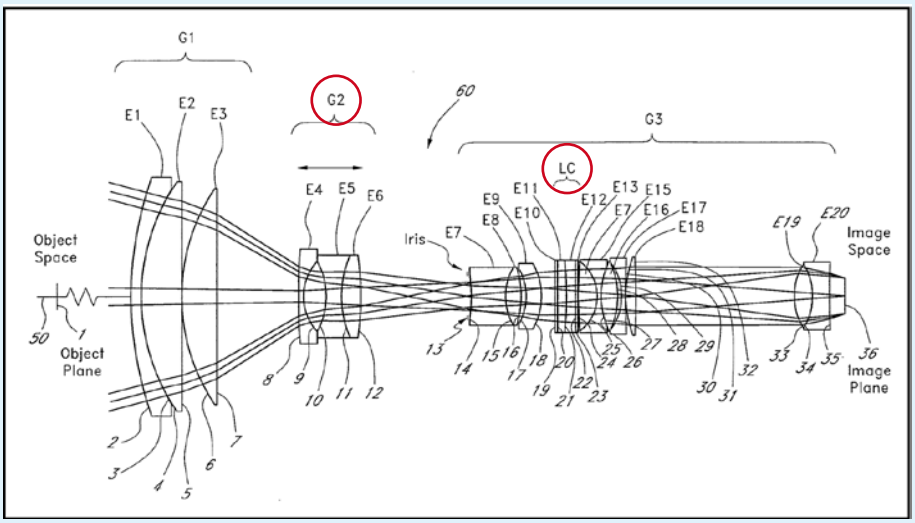
Q: Why is optical design work still challenging, even with today's powerful programs and hardware?

IN: What seems to never end is computer hardware and software becoming more sophisticated, customer requirements becoming more demanding and almost impossible optical solutions needed to be found, at virtually no cost of course. The overall challenge for optical design work to be successful is to properly combine a variety of technologies not just lenses but lighting, sensors, etc. which means that there are many permutations to finding good optical solutions.

Q: How important is intuition and how do you proceed?

IN: I have always thought of optical design work as being both scientific and artistic in nature, where the scientific part requires sound knowledge of Physics and Mathematics and the artistic part involves some intuition, as in an optical design which has light rays smoothly passing through optical components. Improving the latter can actually help speed up the design process and reach good solutions. For most optics, including high end optics, it always makes sense to

Novel zoom lens system utilizing a single axially movable lens group (G2) combined with a **stationary variable power lens cell** (LC) to provide zooming, focusing and thermal compensation (US patent 8,773,766 B2). The optical power of the liquid cell is altered by varying the electrical charge applied to a metal housing which contains two immiscible liquids having significantly different refractive indices, so that the interface surface between the two liquids changes shape. This 7.6x zoom system offers diagonal fields of view from 7.6 to 54.0 degrees with a maximum image f/no. of 2.8 covering a 1/3 inch image sensor.



do some initial technical due diligence like reviewing what's been done before through public domain information such as technical papers and patents. This doesn't always provide a starting point optical design but often suggests the design direction to go in and what steps and in what order should be undertaken. When doing novel zoom lens optical design work my preference is to divide the optical system into separate optical parts for early optimization. For example, the focusing objective group, the zoom groups and the rear stationary group can first be optimized individually then later joined together to be optimized as a whole. Even with a streamlined process zoom lenses can take several years to optically design.

Q: What about other skills?

IN: Optical design is a multi-skill discipline that encompasses a broad range of skills such as being or acting as a scientist, artist, listener and interpreter of customer wishes, understanding innovation, being novel, patenting optical inventions and ideally appreciating the whole design and development process of going from concept to reach final product.

II Relation to Physics

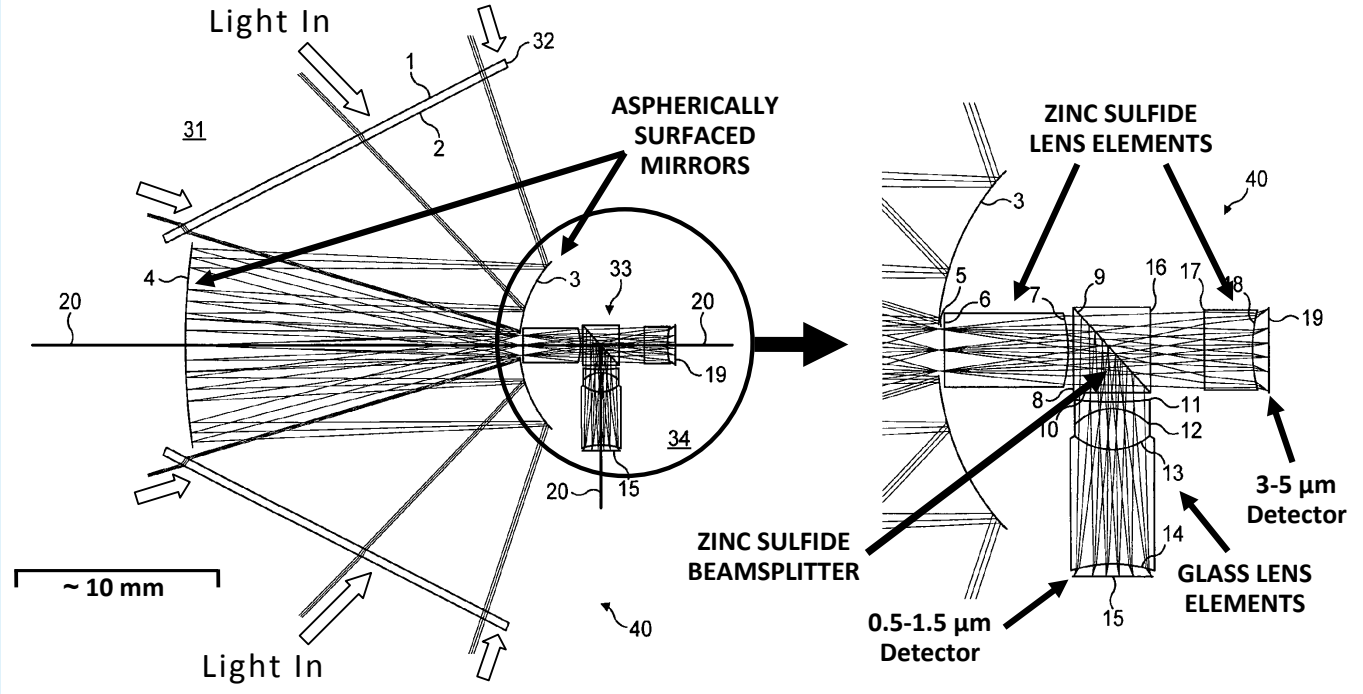
The optical design field is expanding because of the number and diversity of applications. We mention some examples, (i) new space optics working under severe environmental conditions like irradiation by energetic particles, extreme temperature ranges and large mechanical shock, (ii) light sources from and between 13 nm to the terahertz region, (iii) femto- and attosecond pulses of up to several MW power and their desired or undesired interaction with matter, (iv) very fast scanning systems, (v) smart modulated coherent light for metrology applications with nm resolution at m working distances, (vi) very tiny dimensions including nano-optics, (vii) multi-configuration systems for simultaneous sensing & shooting, (viii) wafer chip sensors having integrated optical systems and so on – all those modern applications require a profound ***physical understanding****.*

Q: Why should physicists work in optical design?

IN: Since Physics is a core subject for addressing the aforementioned topics Physics really becomes a must for entering the optics arena. Optics is also an interesting field for physicists because there is so much groundbreaking work taking place. For the inventive physicist I believe that optical design can be an exciting occupation and coupled with entrepreneurship can provide excellent remuneration. However, there are drawbacks to becoming an experienced optical designer. Even though general optics training is available at many academic institutions, today there is little training focused specifically on optical design. Furthermore, formal practical optical design training which was once almost universally available in industry in the form of apprenticeships has become less common. One way for physicists to acquire optical design experience is to work under an optical design mentor in industry who acts as a teacher and guide thus enabling experience to be gained over say five to ten years.

Q: Why did you join the SPS and what do you expect?

IN: Most of my optical design experience has been obtained outside of Switzerland and although I do know some Swiss physicists I would like to meet others, especially those ac-



Golf ball sized extreme wide angle multispectral imaging system employing high order **aspherically surfaced mirrors** and **refractive lens materials that transmit in the visible to near-infrared and mid-wavelength infrared wavebands** to provide almost hemispherical images at two sensors (US patent 8,503,074 B2). This optical system which spans the 0.5 - 5.0 µm wavelength region offers a 15°- 80° by 360° field of view with a maximum image f/no. of 5 covering 1/6 inch sensors.

Iain A. Neil is a Swiss based Optical Consultant whose company *ScotOptix* contracts globally with optical technology companies; providing technical, business and intellectual property expertise with specialization in zoom lenses, multi-configuration optical systems and new technology implementation.
Previously, he was employed as Executive Vice President of Research and Development and Chief Technical Officer at *Panavision Inc.*, Manager Systems Engineering at *Ernst Leitz Canada Ltd.* (now *Raytheon*) and Head of Optical Design at *Barr & Stroud Ltd* (now *Thales*).
In addition, he has been involved in start-up and venture capital funded companies in various capacities including Managing Director. He has over 100 worldwide optically related patents issued and applied for, has published and edited 30+ papers and books and has garnered 12 Academy Awards, 2 Emmies and the Fuji Gold Medal.
In 2003, he was awarded Alumnus of the Year from the University of Strathclyde in Scotland, and in 2004 became Visiting Professor of their Department of Physics. In 2015 he was also awarded an honorary Doctor of Science degree from the University of Strathclyde. He has been active in the optics industry for over 38 years and is currently a fellow member of SPIE and SMPTE, a member of SPS, OSA and ASC and a voting member of ©A.M.P.A.S ®.

tively involved in the field of optics. When one owns an optical consulting business the priority is on keeping it running, so SPS seemed to me like an effective portal for accessing and meeting people. I also thought that SPS might be a good platform for science meeting industry in optics. Considering that optics in university is different from optics in industry, SPS might offer an optics bridge between academia and industry. This could include some kind of involvement by SPS with cross learning activity, perhaps via continuing professional development (CPD) courses in optics, like the one I am involved in preparing and which is planned to start later this year at the University of Strathclyde in Glasgow, Scotland, UK.

III Optical Industry

Q: The mass market of consumer optics is Asian dominated, but where can Europeans take profit?

IN: High end optical systems would be the most obvious ones to concentrate on but there are other opportunities. What is important here is to maximize the use of skill-sets and in-depth hands on experience. These work very effectively in the design, development and final assembly plus testing of optical devices even for those that are not totally high end. In comparison, parts manufacture may be generally difficult to do competitively in Europe, although this could possibly be done in some automated way. However, copying by competitors will surely happen. The skill-sets that are important for Europe should be protected by not transferring knowledge to others involved in the product cycle. This can be tricky to accomplish when one is working with suppliers who want to know how to do things all by themselves! One way to mitigate this is to keep moving the bar, so that even as a supplier learns what's involved to make a current product, a new functionally equivalent but technologically different product materializes. Another way to stay ahead of competitors is to greatly innovate an optical product. When effectively done this may even help keep alive the consumer market.

Q: How important is the feedback and local proximity between designer and production?

IN: Feedback between design and production is always important for maximizing the features and advantages of any product. With modern optical product the economic factors are inclined to dominate the choice of locations for design and production, which in the case of Europe usually means many optical parts being supplied from abroad. What may be more important is that the designers, either by themselves or via marketing/business personnel, listen closely to what the marketplace wants as opposed to what the producer wants to give them. For example, in the entertainment industry you not only need to hear from afar what camera lenses the cinematographer wants to use but to fully understand his/her needs, you really should be with the cinematographer on the film set, maybe even in the studio. This could mean that the designer needs to be located at, or at least visits, one of the biggest industry hubs such as Los Angeles. Here it can be seen firsthand how the cinematographer is actually using the camera equipment including the camera lens before commencing with any new optical design development.

22nd Swiss Physics Olympiad, Aarau 2016: five young Swiss gymnasians will participate to the International Physics Olympiads, this year in Zürich!

Antoine Pochelon (SSP Secrétaire), Lionel Philippoz (SwissPhO, UZH)

For interested students of gymnasial age, Olympiads in various domains are organized in Switzerland each year: in biology, chemistry, geography, informatics, mathematics, philosophy and of course physics (see olympiads.ch). The final round of the Swiss Physics Olympiad took place in Aarau on 2-3 April at the Neue Kantonsschule Aarau. During two days, the students had to tackle experimental and theoretical questions. Twenty-five participants, who qualified in the first selection round in January (in Bern, Zurich, Lausanne and Lugano), were confronted to 6 hours examinations. The goal is to get in the top five, which is equivalent to a place in the team representing Switzerland at the International Physics Olympiad (IPhO) this year, which will be held in Zurich. Furthermore, the first and second places get the "SPG Nachwuchsförderpreis, Prix de la Relève de la SSP" from our Society. The Academy SCNAT is supporting us for funding this activity.

The tough competition is challenging for the participants. They were tested in part on their theoretical knowledge in various fields of physics: they have notably been asked to investigate the source of energy of a space probe, the mechanics of the co-orbital moons of Saturn and properties of synchronous motors. On the other hand, the experimental part allowed participants to express their practical skills, such as measuring the period of a physical pendulum with the oscillations of a spring and determining the characteristics of a water jet.

The medal ceremony this year started under the sign of Albert Einstein, since Einstein and Aarau effectively cultivate a privileged relationship. Before entering ETHZ, Einstein completed his final year of high school at the Alte Kantonschule Aarau. This was described in the very interesting presentation by Dr. Herbert Hunziker, Alte Kantonsschule Aarau, entitled "Der junge Einstein und Aarau, Einstein auf dem Weg zur speziellen Relativitätstheorie", in front of a public of the same age than Einstein was here more than a century ago. His talk also presented a very convincing demonstration of the *non-absolute* nature of time and space – that is the *relativity* of time and space! (see Fig. 1). Dr. Hunziker initiated also the installation of a bronze memorial tablet about Einstein in Aarau train station, witnessing the type of questions Einstein was raising at the age of seventeen (Fig. 2).

Fig. 1: "Einstein auf dem Weg zur speziellen Relativitätstheorie", presented by Herbert Hunziker. *Photo T. Uehlinger.*

Fig. 2: Einstein Memorial Tablet in main train station in Aarau, inaugurated in 2011, an initiative of Dr. Herbert Hunziker. *Photo Markus Suter.*

In the same vein, presenting rapidly the Swiss Physical Society, the next talk developed the recent finding of gravitational waves, a discovery that at the same time confirms by a direct measurement Einstein's hundred years old prediction of their existence and is the first proof of the existence of black holes, opening new fields of research in astrophysics and cosmology.

Fig. 3: Middle: Bastian Lengen, prix de la Relève de la SSP, and first Gold medal; left: Henning Zhang, SPG Nachwuchsförderpreis, and second Gold medal. Right: Antoine Pochelon as representative of the SPS. *Photo M. Gerber.*

Among the top five who were awarded gold medals and who have now the possibility to represent Switzerland at the IPhO 2016 in Zürich in July, the first and second, Bastian Lengen (Lycée-Collège de la Planta, Sion, VS, from Uvrier) and Henning Zhang (Kantonschule Wettingen, AG, from Villigen) received the special prize for young academics from the Swiss Physical Society, (Fig. 3). The two SPS-prize winners will normally be accompanied by the three other Gold-Medals winners, Quirin Reding (Kantonschule Alpenquai, LU, from Honau), Caroline Rossier (Collège Sainte-Croix, FR, from Cottens) and Nicolà Gantenbein (Ehemals Kantonschule Wattwil, SG, from Eschenbach), (see photo on the title page). But there is a surprise now: Henning Zhang performed also extremely well at the Swiss Mathematics Olympiad (SMO), where he came out first in the preliminaries; this made him decide to continue the SMO line, leaving the place open for Markus Köhler (Kantonsschule Heerbrugg, SG, from Balgach) who thus will also contribute to the IPhO 2016 team.

Clearly, one would like to know a little bit more about these young people participating to the Olympiads, about their motivation and trajectory. In the box below are some answers about their motivations from the winners of the SPS prize over the last four years, collected at the occasion of the SwissPhO 2016.

In conclusion, most oft the earlier participants and winners are truly happy to have this opportunity to continue as organizers for the younger one to come. As Viviane Kehl summarizes: “A lot of work but a lot of fun”.

“Dass ich mich vor etwas mehr als drei Jahren dazu entschieden habe, an der Schweizer Physikolympiade teilzunehmen, war nebst meinem großen Interesse für die Physik wohl auch etwas Zufall. Obwohl ich mich immer sehr leicht für Naturwissenschaften begeistern ließ, habe ich mich nie nach Möglichkeiten umgeschaut, meine Fähigkeiten in einem kompetitiven Umfeld unter Beweis zu stellen. Ich war damals in meinem letzten Jahr des Gymnasiums, Schwerpunktfach Physik und Mathematik, mit Plänen für ein Studium in Maschinenbau an der EPFL. Ein Klassenkamerad hat mich auf die Physikolympiade aufmerksam gemacht und nachdem ich mich etwas über den Wettkampf informiert hatte, war ich mir sicher, dass ich es zumindest einmal ausprobieren sollte. Mein Interesse war ebenfalls stark durch den Trailer der IPhO gestärkt worden, welcher mir ein besseres Bild davon gab, was für ein Umfeld mich an einer Physikolympiade erwarten würde. Und ich bin nicht enttäuscht worden. Mit einer Gruppe von interessierten, wissensdurstigen Jugendlichen soviel Zeit zu verbringen, andere Kulturen kennen zu lernen und dabei meinen eigenen Kenntnisse zu erweitern waren nur einige der Dinge, welche die Olympiade für mich zu einem Highlight zum Abschluss meiner Schulzeit gemacht haben, und mich auf der anderen Seite gut auf die höheren Anforderungen an einer Universität vorbereitet haben.”
Sven Pfeiffer, SwissPhO 2013, IPhO 2013. Student in Mechanical Engineering EPFL, presently in exchange at Carnegie Mellon University Pittsburgh.

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“An der SwissPhO lernte ich viele interessierte und interessante Leute aus der ganzen Schweiz kennen, das war auch der Hauptgrund, teilzunehmen. Zusätzlich habe ich mich sehr an den Experimenten gefreut, insbesondere am Millimeterpapier, da dies sehr genaues Abtragen ermöglicht und somit erstaunlich genaue Resultate liefert. Und natürlich an den Laborbesichtigungen, wo wir Einblicke in die aktuelle Forschung erhielten. Ich weiß nun dank der SwissPhO, dass die EPFL einen kleinen Kernreaktor, Crocus, besitzt! ”
Viviane Kehl, SwissPhO 2012-13. Student in mathematics ETH Zürich and President of the Swiss Mathematical Olympiads.

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“Ich habe an der SwissPhO teilgenommen, um Gleichgesinnte aus der ganzen Schweiz zu treffen und Spaß zu haben. Auch das Lösen der Aufgaben hat mir Freude bereitet. Vor allem die Experimente waren toll, weil man da herumbasteln konnte, wenn man bei den Rechnungen stecken blieb.”
Barbara Roos, SwissPhO 2013-14, IPhO 2014. Student in mathematics at ETH Zürich, member and volunteer at SwissPhO.

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“Meine Motivation für die Teilnahme an der Physikolympiade war vor allem das Vorbereitungstreffen in Lausanne. Das Ziel war, die erste Runde zu bestehen, und am Training an der EPFL teilnehmen zu dürfen. Entsprechend groß war dann die Freude, als ich die erste Runde geschafft hatte, und ich ein spannendes Wochenende in Lausanne verbringen konnte.”
Rafael Winkler, SwissPhO 2013-14, IPhO 2014. Student in physics at ETH Zürich, member and volunteer at SwissPhO.

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“Dès mon plus jeune âge, j’ai cherché à comprendre les mille et un mystères qui se présentaient à moi quotidiennement. Les plus intrigants m’apparaissaient à chaque fois que je me couchais dans l’herbe, les soirs d’été. J’y contemplais le ciel étoilé, si profond, si mystérieux, qui me bombardait de questions.
En grandissant, un grand nombre de ces interrogations ont trouvé des réponses. L’école m’a permis de solutionner quelques-unes d’entre elles, mais il me fallait plus. J’ai alors commencé à faire des recherches de mon côté. J’y ai découvert quantité d’explications à de nombreux phénomènes. Ma curiosité ne s’atténuait jamais; au contraire elle s’en trouvait ravivée. Chaque réponse que je trouvais me mettait face à de nouveaux mystères.
La physique ! C’est la physique qui explique tous ces mystères! Il m’a paru dès lors logique de m’intéresser à celle-ci lorsqu’il me fût possible de l’étudier. J’y ai découvert une branche qui m’a passionné. Celle-ci conciliait tout ce que j’aimais : maths, explications de nombreux mystères, réflexion, etc…
Option spécifique: Physique/mathématiques appliquées. Travail de maturité : Physique/Les Maelströms. A chaque fois que j’en ai eu le choix, j’ai choisi la physique. Dès lors, lorsqu’il me fut proposé de prendre part aux Olympiades de Physique, ma participation me parut évidente. J’allais découvrir la physique, la vraie physique, celle des passionnés, celle des scientifiques. C’était le moyen pour moi de voir si j’en avais le niveau, si l’intérêt que j’avais pour cette branche était réel, si je pouvais me tourner vers cette voie pour la suite de mes études.
Pour résumer, ces Olympiades m’ont permis de répondre à la grande question : « Est-ce que je peux faire de la physique mon avenir ? » Je pense qu’au vu des résultats, je peux vous laisser deviner la réponse à celle-ci.”
Bastian Lengen, SwissPhO 2016, IPhO2016. Inscribed at EPFL, physics section.

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“Die SwissPhO gab mir die Möglichkeit, mich strukturiert und intensiv mit der Physik auseinander zu setzen und erlaubte mir außerdem, vieles über das spannende und faszinierende Fach von den Teilnehmern und Lehrern der Olympiade zu lernen.”
Henning Zhang, SwissPhO 2016

En janvier dernier s'est déroulée à Paris la finale nationale des Olympiades de Physique France (http://odpf.org/). Sur invitation de Pierre Chavel, président du comité national de ce concours, j'ai ainsi une nouvelle fois eu l'occasion d'y assurer une présence helvétique au sein du jury responsable d'évaluer les prestations des équipes finalistes.

Nous parlons en effet bien d'équipes, puisque c'est là que réside l'une des principales différences entre ce concours et les Olympiades dont nous avons l'habitude en Suisse. Lors de cette compétition, des équipes de deux lycéens ou plus entreprennent durant plusieurs mois d'étudier par eux-mêmes un phénomène physique de leur choix (ce travail est souvent initié par leurs travaux pratiques "ordinaires", mais se complexifie avec l'avancée du projet). Il leur revient alors de mettre en place un protocole expérimental adéquat afin de mettre en évidence ce phénomène, d'étudier la littérature ad hoc et de consulter au besoin des chercheurs actifs dans le domaine concerné. A l'issue de diverses sélections régionales, vingt-six groupes se retrouvent durant deux jours pour la finale nationale. A ce stade de la compétition, chaque équipe doit ainsi défendre son projet au cours d'un oral de 40 minutes incluant la présentation des résultats, quelques démonstrations pratiques, de même que les questions du jury à qui revient la charge d'évaluer non seulement cette prestation orale, mais également un rapport écrit rédigé spécialement pour l'occasion. Au terme du concours, un classement en trois groupes (1er, 2e et 3e prix) permet enfin de récompenser toutes les équipes.

Les thèmes abordés par ces jeunes lycéens-chercheurs sont variés – caléfaction, effet photoacoustique ou encore résonance de Helmholtz pour n'en citer que quelques uns – et la qualité des recherches effectuées n'a parfois rien à envier aux travaux de leurs aînés, ce qui donne sans aucun doute une idée de la motivation et du dévouement des participants. Leur jeune âge – en moyenne 16-17 ans – force également l'admiration au vu de la complexité des thématiques relativement à leurs connaissances scolaires.

De telles initiatives ne peuvent donc que nous réjouir, tant elles permettent d'insuffler aux jeunes le goût de la recherche, dans un esprit ludique, avec néanmoins toute la rigueur de la méthode scientifique. Notons encore que, chaque année, quelques équipes étrangères prennent aussi part à cette compétition. Ne pourrait-il pas être intéressant pour quelques groupes suisses de se lancer un jour dans l'aventure ?

Lionel Philippoz, UZH, SwissPhO

Pour la 6ème année consécutive, la Suisse participe à l'International Physicist's Tournament

Benoît Truc, étudiant physique 3ème année EPFL, membre de l'équipe suisse

Cette année, c'est une équipe de six étudiants terminant leur bachelor en physique à l'Ecole Polytechnique Fédérale de Lausanne qui a eu la chance de représenter la Suisse, lors de la 8ème édition de l'*International Physicists' Tournament*. Cette place n'était pas acquise, puisqu'elle a dû d'abord s'obtenir lors de la sélection nationale.

L'équipe suisse (de gauche à droite): Aymeric Galan, André Reggio, Benoît Truc, Rebecca Duarte, Vivien Bonvin (Président de l'IPT), Carla Nannini, Eric Paic.

Cette compétition oppose quinze équipes représentant chacune leur pays venu des quatre coins du globe. Pour la gagner? Il faut être créatif, savoir présenter, écouter, animer un débat et bien entendu aussi trouver les failles des présentations. Voici quelques lignes de ce qu'a vécu la *Swiss CRAABE Team* lors de ce séjour à Paris.

Nous sommes jeudi, trois jours avant le départ, en train de peaufiner les présentations des 12 problèmes sur les 17 à choix que nous avons tentés de résoudre. Je dis "tenté", car oui, tous nos problèmes n'ont pas fonctionné aussi bien que nous l'avions souhaité. Il nous reste encore du pain sur la planche.

Le dimanche venu, nous nous retrouvons à la gare de Lausanne et partons pour Paris. Aussitôt assis, les ordinateurs et cahiers sont dégainés, plus de temps à perdre, l'équipe continue sa préparation. Quelques heures s'écoulent, nous arrivons à l'hôtel et récupérons nos badges. Après une petite photo d'équipe, nous nous installons dans la chambre. Là encore, chaque minute est comptée pour avancer nos présentations. Le soir, les équipes sont conviées à une première ouverture des jeux par le comité local qui en profite pour nous expliquer le déroulement du séjour. Vient ensuite, un moment très attendu: le tirage au sort des groupes. Nous serons confrontés aux deux équipes françaises, la Russie, la Chine, la Colombie, la Grèce, l'Ukraine et l'Espagne.

Le début de semaine commence. C'est à l'*ESPCI Paris Tech* que les participants se retrouvent pour débuter les "physics fights". Durant 3 jours, 4 fights auront lieu afin de sélectionner les trois finalistes. Ces matchs sont séparés en trois étapes, qui chacune durent une heure. En effet, dans un match trois équipes sont opposées et doivent l'une après l'autre assumer les rôles de "reporter", "opponent" et "reviewer". Le premier consiste à présenter la résolution d'un problème proposé par l'opponent qui devra trouver les failles et donner des critiques constructives. Le reviewer est une sorte de deuxième Jury, son rôle est de faire progresser le débat scientifique, tel un médiateur. Les notes données par un jury formé de professeurs et doctorants, vont de 0 à 10, où 10 est la meilleure note. Pour donner une idée, une moyenne de 5 est rattrapable, 6 est un score correct, 7 est une bonne présentation et au-dessus, excellente.

Il est 14h15, dans 15 minutes le premier physics fight commence. Les trois équipes sont déjà prêtes. Nous serons opposés à la France et la Chine. L'ordre de passage est déterminé par un Captain's Fight dont le principe est simple: les trois capitaines se départagent en deux minutes autour d'un problème de physique original, celui dont la réponse a l'ordre de grandeur le plus proche de la réalité gagne. Un exemple de question : "combien de temps prend une boule de bowling de 1 kg pour toucher le fond de la fosse des Mariannes." Le français remporte de justesse devant Eric, notre capitaine. Nous commencerons par opposer les français, puis, au deuxième tour, nous présenterons et nous terminerons par reviewer. Le premier fight se termine, beaucoup de questions et de discussions sont ouvertes, notamment sur la notation du jury pour le poste de reviewer car, tout le monde ne semble pas d'accord. Nous finissons deuxième de ce fight, derrière l'équipe de France. Nous ne sommes pas satisfait de notre présentation, mais avons fait un score correct. Nous rentrons à l'hôtel et nous accordons une séance babyfoot avant de reprendre le travail. Le premier classement tombe et à notre grande surprise nous sommes troisième derrière les deux équipes françaises. Cela nous motive d'autant plus! Les heures filent, il est déjà deux heures du matin, le réveil étant prévu pour sept heures, il est temps de se coucher.

Après un bon petit déjeuner, nous sommes d'attaque pour le deuxième jour de compétition. Nous avons de la peine à opposer et nos présentations n'arrivent pas à convaincre tout le monde. Le review est bon, mais malheureusement, cette partie rapporte moins de points que les deux autres. Nous chutons à la 7ème place, ce n'est pas grave, nous avons appris de nombreuses choses aujourd'hui.

Mercredi est un grand jour, en effet, aujourd'hui se dérouleront les deux derniers physics fights et comme les problèmes ne peuvent pas être présentés deux fois, le choix des présentations devient difficile. Le matin nous sommes opposés à la deuxième équipe de France venant de l'ENS Ulm et à la Colombie. Tout se déroule bien et nous remportons notre premier physics fight, nous sommes particulièrement fiers de ce succès, puisque l'équipe française comptait un de nos amis de classe en échange pour une année. Cette victoire nous fait remonter à la 6ème place du classement, l'après-midi fixera le classement final puisque s'y joue le dernier match des qualifications. Après un bon début, notre présentation divise le jury. Encore une fois, bien que déçus, nous sommes contents et avons pris de bon conseils pour l'année prochaine.

Nous terminons 8ème sur les 15 équipes présentes et 7ème pays sur 14, la grande finale qui aura lieu vendredi opposera, l'équipe de France (ENS Lyon), la Pologne et la Russie. Jeudi est le jour off, cela nous permet de nous remettre du peu d'heures de sommeil et des longues journées. Des visites ont été organisées, pour nous, direction le Louvre! Nous profitons encore une fois du beau temps qui rend encore plus agréable ce séjour dans la capitale française. Le soir, les équipes sont invitées à présenter les problèmes qu'ils n'ont pas pu faire découvrir lors de la compétition. Cette séance est plus décontractée, des équipes se sont même mis ensemble pour présenter un même problème et se compléter. Une grande force de ce tournoi, c'est qu'après s'être "combattu" tous les participants se retrouvent et discutent pour améliorer les solutions des uns et des autres, le but est avant tout de faire avancer la physique!

Finalement, le grand jour est arrivé, vendredi jour de la finale, l'auditoire est rempli et la télé prépare déjà la diffusion en direct du dernier fight. Comme d'habitude, c'est le captain's fight qui ouvre les festivités. La question? Chaque équipe dispose de feuilles et de scotch, en cinq minutes elles devront bâtir la tour la plus haute possible. Les français et russes partent sur la même idée, à savoir faire des rouleaux et de les empiler. Après un instant de réflexion la Pologne, utilise son plus grand physicien en guise de structure pour la tour et toute son équipe commence à coller des feuilles autour de lui. Le public éclate de rire et le jury ne s'y attendant pas, doit débattre pour valider ou non la technique. La décision a été prise, la Pologne remporte le défi.

La première présentation est celle de l'équipe Polonaise et c'est à la seconde près que Łukasz Gładczuk termine son exposé, impressionnant. Les français sont tout aussi soigneux et les deux équipes se détachent progressivement de la Russie. Après délibération, la France remporte le tournoi.

La soirée débute et tout le monde se retrouve lors d'un Gala pour fêter la fin de la compétition. Voici quelques mots d'Aymeric membre de l'équipe qui résume parfaitement ce séjour: "L'IPT a été un grande expérience. C'est une compétition très motivante, intéressante, aussi bien du point de vue scientifique que social. On découvre de nombreuses façons d'aborder un même problème, on apprend dans quelles conditions les autres étudiants du monde travaillent, leur manière de penser, de réfléchir, mais aussi de s'amuser. Parce qu'après la physique, on visite la ville et on fait un peu la fête, faut l'avouer!".

Pour conclure ce bel épisode, nous tenons encore à remercier l'EPFL et la Société Suisse de Physique ainsi que toutes les personnes qui nous ont aidé pour ce projet. Une partie de l'équipe se représentera l'année prochaine dans l'idée de faire encore mieux. Des rumeurs circulent déjà sur la possibilité d'organiser la 10ème édition à nouveau en Suisse.

Liens: *http://switzerland.iptnet.info*, *http://iptnet.info*, *http://2016.iptnet.info*

Kurzmitteilungen - Short Announcements

Short report on the EPS Council 2016, Mulhouse, France

Christophe Rossel, EPS President

This year's EPS Council war rather well attended with over 80 participants representing the National Physical Societies members, the Individual and Associate members as well as the Divisions, Groups and Action Committees of the European Physical Society. The meeting took place in the aula of the governance building of the University of Haute Alsace (UHA) next to our Headquarters. All past EPS presidents were invited and eight of them came for a special event and an open discussion on their own views and perspectives about EPS.

A vote for the new EPS president-elect was planned, but because of the last minute withdrawal of one of the two candidates, the election has been postponed until later this year. The 13 members of the Executive committee also had to be either reelected or new candidates elected. It is good news that our SPS president Quang Minh Tran was elected as new member, representing the national physical societies with less than 10'000 members (i.e., smaller than DPG and IOP).

In addition to the report of the president, secretary and treasurer the discussion focused on the review of the strategy plan 2010+ and the presence of EPS in Brussels. A special review committee established at last year's Council addressed these points and proposed a plan with recommendations and priority measures for the coming years. As you might know EPS has opened an office in Brussels and needs to staff it with the appropriate persons for achieving the proposed tasks in representing the physics community at the EU government level and engaging with policy makers and other stakeholders. To enhance our efficiency and also our link to the Science Advisory Mechanism (SAM) created by Carlos Moedas, the EU commissioner for Research, Science and Innovation, a new Advisory Board for Science Policy was created. It is presently formed of 6 high-level physicists with excellent network and experience in Brussels activities.

New EPS fellow were confirmed by Council and several awards distributed.

The Council meeting is also the opportunity to get insight on specific scientific topics with either talks or round tables. On the evening of the first day, Prof. Kathrin Altwegg, head of the Rosina science team at the University of Bern, gave an outstanding review on the Rosetta mission with the title 'Living with a comet: what Rosetta tells us about our origin'. The enthusiastic audience was then invited for the Council dinner at the Cité de l'automobile, a great museum with hundreds of classic cars collected by the brothers Schlumpf in Mulhouse.

The following day a very interesting round table on Physics for Development (PfD) was organized by the chair of our EPS group on PfD with various speakers representing specific projects from UNESCO, ICTP and NGOs like Sunshine4Palestine and Liter of Light. John Dudley, past EPS president and chair of the IYL2015 reviewed the worldwide activities related to light and light-based technologies. Finally another discussion on the positive and negative aspects of research assessment and bibliometric took place, based on documents like the *Leiden Manifesto for Research Metrics* (2015), the *San Francisco Declaration on Research Assessment* (2012) and the *EPS Statement on Bibliometric Indices during Assessment* (2012). An important issue in this area is the non-recognition by some evaluation bodies of publications with more than 100 authors – particularly relevant for facilities like CERN- and the need to use other factors than the so-called 'objective' parameters (such as indices, impact factors, net social values, etc.) to rank individuals, research groups and scientific infrastructures. The debate remains open and EPS will have to address this global issue together with other organisations.

Altogether the EPS Council 2016 was a successful meeting, showing that EPS is a dynamic, well regarded and active organisation in the European scientific landscape.

More information as well as the Activity Report 2015 can be obtained under *www.eps.org* or requested from the EPS Secretariat in Mulhouse. Do not hesitate in becoming an EPS individual member and all inputs or personal contributions from members of the national societies are welcome.

Neuer ESA-Direktor für Raumfahrzeugträger

Am Rande einer Sitzung des ESA-Rates im engeren Kreis am 16. März 2016 in Paris wurde die Ernennung von Herrn Daniel Neuenschwander zum neuen ESA-Direktor für Raumfahrzeugträger bekanntgegeben.
Neuenschwander ist gegenwärtig Leiter des Schweizerischen Büros für Weltraumangelegenheiten und der Delegation der Schweiz bei der ESA sowie Vorsitzender des Programmrats für Raumfahrzeugträger (PB LAU). Ferner ist er als Stellvertreter des für Raumfahrtangelegenheiten zuständigen schweizerischen Staatssekretärs tätig, unter anderem hinsichtlich des Mitvorsitzes der Schweiz im ESA-Rat auf Ministerebene.

Nach seinem Studium der Physiogeografie an der Universität Freiburg und seiner Ausbildung zum Linienpiloten hat Neuenschwander eine berufliche Laufbahn im Luft- und Raumfahrtsektor eingeschlagen.

http://www.esa.int/ger/ESA_in_your_country/Switzerland_-_Deutsch/Neuer_ESA-Direktor_fuer_Raumfahrzeugtraeger_ernannt

SATW-Forschungsübersicht zu Advanced Manufacturing in der Schweiz

Die Schweizer Wirtschaft hat in den vergangenen Jahrzehnten im Vergleich mit den meisten anderen Industrieländern eine hohe Wertschöpfung kombiniert mit hoher Beschäftigung aufgewiesen. Unsere Industrie ist schneller gewachsen als diejenige in den Nachbarländern und hat uns Wohlstand bei geringer Arbeitslosigkeit beschert. Dies sind grundsätzlich gute Voraussetzungen, um den Herausforderungen zu begegnen, denen sich die Schweizer Industrie in Zukunft stellen muss.

Gegenwärtig ist die industrielle Produktion in einem schnellen und grundlegenden Wandel begriffen, der hohe Qualität und Flexibilität bei den Produkten bei geringeren Kosten – auch bei kleinen Stückzahlen – verspricht. Diesem Wandel begegnet die Industrie mit neuen, additiven Herstellungsverfahren. Diese Technologien, umgangssprachlich bekannt als 3D-Druck, bieten prinzipiell revolutionäre Möglichkeiten und haben das Potenzial, traditionelle Fertigungsprozesse abzulösen. Neue Produktionsprozesse verlangen nach innovativen Steuerungsmöglichkeiten. Mit Industrie 4.0 ist ein neues Konzept für die Fabrikationssteuerung und das Produktdesign definiert worden, welches das Potenzial für fundamentale Umwälzungen hat.

Beide Themen werden an Konferenzen diskutiert und zu beiden Themen existieren in der Schweiz bereits etliche Forschungsaktivitäten. Die Schweizerische Akademie der Technischen Wissenschaften SATW will dazu beitragen, diese Aktivitäten besser aufeinander abzustimmen. Die SATW hat deshalb die Forschungsübersicht «Advanced Manufacturing in der Schweiz» erstellt.

Die Aktivitäten der Forschungspartner, das heisst der Universitäten und Fachhochschulen, wurden detailliert erfragt und in der Forschungsübersicht abgebildet. Die kurzen Texte der beteiligten Institute sind in die beiden Themengebiete «Additive Fertigung» und «Industrie 4.0» unterteilt. Um einen einfachen und übersichtlichen Zugang zu den Daten zu ermöglichen, wurden jedem Institut maximal sechs übergeordnete Fachbegriffe – visualisiert als Symbole – zugeordnet, welche die Aktivitäten und Kompetenzen widerspiegeln. Somit kann in der Forschungsübersicht entweder systematisch nach Instituten oder nach Aktivitäten und Kompetenzen gesucht werden.

Die Forschungsübersicht «Advanced Manufacturing in der Schweiz» zeigt, dass viele Akteure mit einer aussergewöhnlich grossen Vielfalt an Aktivitäten tätig sind.

www.satw.ch/advanced-manufacturing

The PhysiScope

The PhysiScope aims to guide young people into the heart of physics to experience scientific concepts hands-on.

The PhysiScope is an interactive demonstration lab in which visitors play the starring role: in exchanges with our scientific staff, they discuss physics, perform experiments, and relate them to the important goals of today's research. We aim for surprise and fun while awakening our visitors' passion for science and guiding them towards key questions in our high-technology world. Each session lasts about one hour, with minimal reference to mathematical formulae, but nonetheless based on an accurate description of the experimental observations to illustrate the underlying physics concepts and inspire the public.

The PhysiScope is located in the University of Geneva, at the heart of the Physics Section, recognised world-wide for the quality of its research. Inaugurated in 2008, it has already attracted more than 28'000 visitors (5'400 during the last 12 months). Last year, it ran 345 shows over 36 weeks. It can stage up to 4 shows per day, 5 days a week, and is usually booked well in advance.

This innovative teaching laboratory is mainly aimed at 11-18 years old school classes (75% of the visitors), accompanied by their teachers. However, all the demonstrations are also adaptable towards younger children, as well as to adults and seniors. The PhysiScope is open to any group of 10-28 people. The visitors can choose among different, regularly updated topics. Current topics include electricity, mechanics, different states of matter, scientific inquiry, colours, pressure, and astronomy. Our visitors come mainly from the Geneva region, but also from further away in Switzerland, as well as from abroad (France, Finland, Denmark, Netherlands, Portugal, England, Germany, Greece, Kazakhstan…).

The PhysiScope is run by an interdisciplinary and motivated team composed of 3 professors, 1 scientific collaborator, 1 specialised technician, 10 research assistants, 1 model

maker, 1 3D animator, and 1 communication officer. The place is a resolutely high-tech venue with spectacular demonstrations, which is important to excite and interest younger generations, more and more used to fancy gadgets.

Many other activities

But that's not all. The PhysiScope is also involved in a range of other edutainment activities. We contribute to articles in the Migros magazine describing simple experiments that children can easily reproduce at home. We further participate in outdoor activity centers; holiday passports; demonstrations during the Night of Science; a travelling art&science exhibition named "Supra100" (a collaboration between scientists and artist Etienne Krähenbühl to celebrate the 100 year anniversary of the discovery of superconductivity) to different museums; astronomy workshops, extra muros shows; collaboration with CERN for "*La main à la pâte*" and "*Dans la peau d'un chercheur*", and many more.

From PhysiScope to ScienScope

The success of the PhysiScope has inspired similar projects within the Faculty of Science, and resulted in the creation of the ChimiScope (2011), the BioScope (2014), the MathScope (2015), and the Stellarium Gornergrat (2015). All these Scopes, as well as the already existing BiOutils, are part of a broader structure, the ScienScope. This educational platform created in 2014 is designed to gather scientific outreach initiatives open to the public in various disciplines of the Faculty of Science, to strengthen their impact and to increase their visibility.

ODK

Last but not least, the PhysiScope has also been involved for the last 4 years in the co-production of a weekly TV show for the RTS, the french speaking Swiss national TV. The show is called "*ODK - L'Oreille Des Kids*" and targets 7 to 11 year old children. Each show explains one topic in 12 minutes, starting with an interview of child participants, followed by explanations from a specialist, with a lab experiment and a 3D animation that helps to visualise the underlying scientific concept. This is then followed by an interview of a professional in a related field, and ends with a description of a simple experiment that the young viewers can do at home by themselves. The first two years were devoted to physics, complemented for the last two years by topics in astronomy, biology, chemistry and mathematics developed by the others Scopes of the Faculty of Science.

The first 32 science episodes are available on DVD and can be ordered on the PhysiScope web site. Primary school teachers in Switzerland can order it free of charge for restricted usage in their teaching activities.

Conclusion

If you have not had the opportunity to do so already, you should definitely come to Geneva and attend a show, you will surely enjoy the visit!

Links

PhysiScope: http://physiscope.ch
Faculty of Sciences: http://www.unige.ch/sciences/index_en.html
Migros magazine: http://physiscope.ch/migros-magazine/
Night of Science: http://www.ville-ge.ch/mhs/nuit_science.php
Supra100: http://dqmp.unige.ch/physics-for-all/art-science/
Dans la peau d'un chercheur: http://www.danslapeau-dunchercheur.org
Bioscope: http://bioscope.ch
BiOutils: http://bioutils.ch
Chimiscope: http://chimiscope.ch
Mathscope: http://mathscope.ch
Stellarium Gornergrat (an online astronomy observatory): http://stellarium-gornergrat.ch
Scienscope: http://scienscope.unige.ch (site under construction, online soon)
ODK-L'Oreille Des Kids: http://www.rts.ch/jeunesse/l-oreille-des-kids/

Zeitlich passend zur Eröffnung des Gotthard Basistunnels am 1. Juni 2016 soll kurz auf die eingesetzte Messtechnik eingegangen werden, ohne die dieses technische Meisterwerk nicht hätte verwirklicht werden können. Unser Autor Prof. (em) Dr. H. Ingensand war vor seiner ETHZ-Zeit bei Leica Geosystems in Heerbrugg.

BB

Wie navigiert man die Tunnelbohrmaschinen 1000 m unter der Erde?

Hilmar Ingensand, ETHZ

Auch wenn heute mit dem Global Positioning System (GPS) viele Vermessungsprobleme einfacher zu lösen sind, so ist diese Technik nur unter freiem Himmel und Sichtbarkeit der Satelliten einsetzbar. GPS hat jedoch dazu beigetragen, dass für den 57 km langen Gotthard-Basistunnel von Erstfeld bis nach Bodio mit Millimeter-Genauigkeit Passpunkte für die unterirdische Vermessung erstellt werden konnten. Diese oberirdischen Koordinaten müssen über die Zugangsstollen und Schächte der Haupt- und Zwischenangriffe auf das Tunnelniveau übertragen werden. Dieses geschieht mit elektrooptischen Messverfahren, die sich in den letzen Jahren ebenso weiterentwickelt haben wie GPS, das inzwischen vom russischen GLONASS, dem chinesischen BEIDOU und dem europäischen Galileo Navigationssystem ergänzt worden ist. Man spricht daher heute nicht mehr nur von GPS, sondern von Global Navigation Satellite Systems (GNSS), die von modernen Empfänger simultan empfangen werden können. Untertage werden dagegen heutzutage Robotertheodolite mit automatischer Anzielung eingesetzt. Durch eingebaute CCD Kameras ersetzen sie inzwischen das scharfe Auge des Geodäten.

Wie findet man die Richtung in 1000 m Tiefe?

Eines der Hautprobleme bleibt jedoch die unterirdische Richtungsangabe für den Tunnelvortrieb, da die Richtungsübertragung mit sogenannten Polygonzügen mit wachsender Länge immer ungenauer wird. Dazu werden an einem Stahlband aufgehängte nordsuchende mechanische Kreisel eingesetzt, die ihre Drehachse aufgrund des physikalischen Gesetzes der Präzession auf die momentane Rotationsachse der Erde ausrichten (siehe Abbildung 1).
Diese Methode ist auch tief im Erdinneren nahezu unabhängig von anderen Einflüssen. Einzig die lokalen Lotabweichungen müssen bei einem bandgehängten Kreisel berücksichtigt werden. Zur Kontrolle dieser Kreiselmessungen wurde in Zusammenarbeit mit dem Institut für Geodäsie und Photogrammetrie der ETHZ und der Technischen Universität München im 800 m tiefen Schacht von Sedrun ein Inertialsystem eingesetzt. Wie der Name sagt, stellt dieses Flugzeugnavigationsgerät ein völlig autonomes, koordinatenbestimmendes Messsystem dar, welches über drei Laserkreisel und drei Beschleunigungssensoren verfügt. Mit diesem System konnte die Richtung von der Erdoberfläche in den Berg übertragen werden. Es wurde in einem der Aufzüge in Sedrun installiert, die mit 11m/s in die Tiefe fahren. Damit wurde eine unabhängige Kontrolle der eingangs erwähnten Kreiselmessungen möglich. Der Tunneldurchschlag mit einer Lagedifferenz von nur 8 cm ist letztendlich auf diese Messtechniken zurückzuführen.

Abbildung 1: Vermessungskreisel der ETHZ.

Die Erde verhält sich aufgrund der Rotation wie ein Kreisel und ist aufgrund der Fliehkraft abgeplattet. Da die Rotationsachse der Erde rund 66,5° gegen die Ebene der Ekliptik geneigt ist, verursacht die Anziehung von Sonne und Mond ein Drehmoment, das die Erdachse aufzurichten versucht. Dieses führt ebenso zu den kreiseltypischen Achsbewegungen der Präzession und Nutation. Zusätzliche Effekte entstehen durch Verlagerung von Massen im Erdinneren. Die Bewegung der Rotationsachse der Erde wird als Polbewegung mit hochgenauen Verfahren wie z.B. der *Very Long Baseline Interferometrie* beobachtet. Die Bewegungen haben für die Präzession eine Periodizität von 25'600 Jahren und für die Nutation von 18,6 Jahren. Die momentane Abweichung der Erdachse von der idealen Achse wird natürlich bei den Kreiselmessungen im Gotthard mitberücksichtigt.

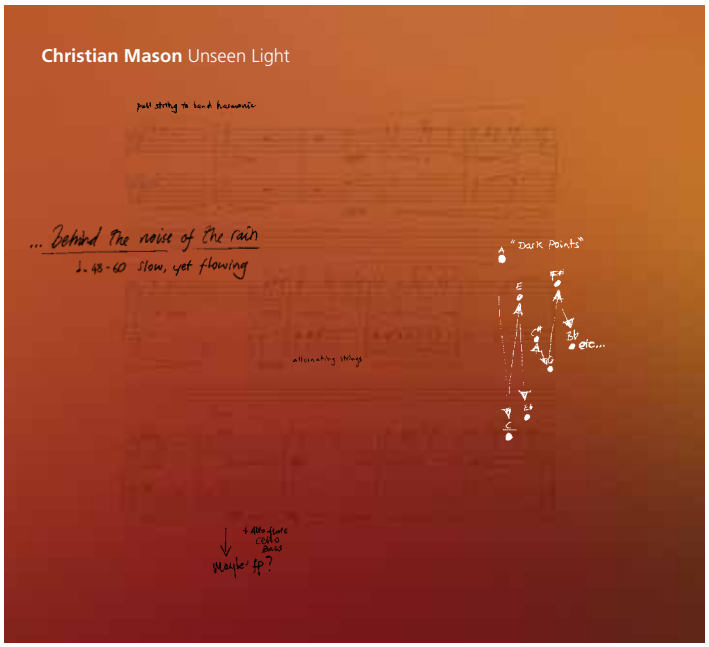
Unseen Light

Zum Ausklang des IYL2015 sei hier noch auf neuzeitliche Klangwerke verwiesen, die um das endlose Thema kreisen: Kann man Licht vertonen? Die neueste CD des jungen Komponisten Christian Mason wurde von der renommierten Fachzeitschrift *Fono Forum* mit der Höchstnote bewertet. Lesen Sie bitte die uns freundlicherweise zur Verfügung gestellte Rezension von Tilman Urbach. Die CD kann man Probehören und online herunterladen von
https://www.col-legno.com/en/shop/complete_catalog/unseen_light

BB

Zart ist diese Musik, fast zärtlich zunächst, auf sich selbst bedacht, flirrend, aber nie auftrumpfend. Minimale Bewegungen innerhalb eines Klangkontinuums, fast durchgängig einem Grundton verpflichtet. Überhaupt diese Besetzung: zwölf Mundharmonikas, zwei Stimmen und gemischtes Ensemble. „The Years of Light“ schrieb Christian Mason 2013/14. Der junge Gewinner des Komponistenpreises der Ernst von Siemens Musikstiftung verschafft einem hier feinste Hörerlebnisse.
Christian Mason ist dem Einzelton verpflichtet, seiner wechselnden Gestalt, seinem Klangfarbenspektrum, wenn er mit anderen Tönen gekreuzt wird. Dem großen Klangmagier Giacinto Scelsi nicht unähnlich. Aber Masons Musik steht auf einer breiteren Basis. Melodien scheinen vereinzelt auf, Motive, die aber genauso schnell wieder brüchig werden. Die hervorragende Carolin Widmann an der Geige exerziert das hier mit Simon Lepper am Flügel meisterhaft im Duo-Stück „Learning Self-Modulation“ durch. Überhaupt scheint Modulation das treffende Wort, will man Masons Musik beschreiben. „Isolarion: Rituals of Resonance“ für großes Orchester ist eine dynamische Herausforderung. Leise, dann wieder in der äußersten Aufwallung muss hier das Deutsche Symphonie-Orchester Berlin unter Gergely Madaras einen eindrucksvollen, oft chromatischen Spannungsbogen bauen. Und doch geht es letztlich um ein modales Grundmodell und dessen Verwandtschaften. Auch Christoph Eschenbach mit den Bamberger Symphonikern fächert auf „Clear Light“ den Klang auf, lässt ihn schimmern, auflodern und aufflammen. Kann man Licht vertonen? Die Titel legen es nahe. Masons Musik ist ein Innehalten. Ein meditativer, manchmal lyrischer Blick auf die Welt, der überwältigen kann. Musik als Erscheinung! So kann man es sagen. Selten hat die Musik eines jungen Komponisten eine solche Magie ausgestrahlt.

Tilman Urbach / Copyright FONO FORUM



Zeitschrift „FONO FORUM“

Die 1956 gegründete deutsche Klassikzeitschrift „FONO FORUM“ feiert mit der Januar-Ausgabe ihr 60-jähriges Jubiläum. Monat für Monat berichtet das Leitmedium für Klassische Musik und Jazz über namhafte Künstler, Interpreten und Komponisten. Einige der besten Autoren deutscher Sprache bürgen für Kenner- und Leidenschaft. Mit einer umfangreichen Rezensionsstrecke aktueller CDs und Schallplatten gibt die Redaktion eine wunderbare Übersicht mit Bewertung. Zudem lohnt sich immer ein Blick auf *www.fonoforum.de* und das überwältigende Archiv.

International Year of Light

A Little Night House was an illumination of the Villa « *Le Lac* » *Le Corbusier* by Daniel Schlaepfer on the occasion of the 16th Long Night of Museums of the Riviera Vaudoise, Switzerland, on May 30, 2015 and the fiftieth anniversary of Le Corbusier's death. The event was part of the Swiss activities for **IYL2015** and its announcement was up-loaded to the IYL2015 event-calendar by Patrick Moser, curator of the Villa « *Le Lac* » *Le Corbusier*. We asked the artist Daniel Schlaepfer about his motivation to work with 'light'? And how does he see generally the interaction between art and science?

B. Braunecker

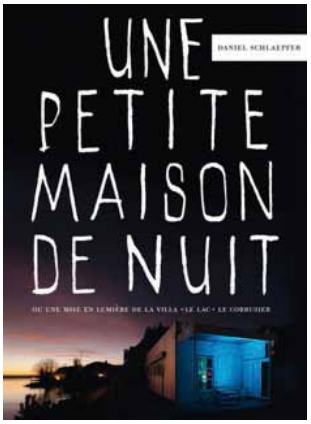
Une petite maison de Nuit ou une mise en lumiere de la villa « Le Lac » Le Corbusier

Daniel Schlaepfer

Illuminer, l'espace d'une nuit, la Villa « Le Lac » que Le Corbusier a destinée à ses parents, a été une belle opportunité d'explorer une fois encore ma propre intimité avec les lumières du Léman. Même si cette maison, de par sa sobriété, est peu intrusive pour le paysage lémanique, elle a été construite en effet pour en capter les lumières, pour la plus grande jouissance de ses habitants. L'architecte lui-même qui avait su construire des villes entières et des bâtiments de grande taille, a fini sa vie, on le sait, dans une autre construction de dimensions et d'apparence modestes, un cabanon de 13 m^2 au bord immédiat de la Méditerranée, là où il passait de longues périodes de vacances. Faire revivre une nuit, d'une manière symbolique, dans la tentative de retrouver l'esprit même de Le Corbusier, l'aventure de la lumière, de la terre et de l'eau fut bien l'objectif de cette illumination.

Le Corbusier a toujours célébré la lumière en tant qu'elle structure l'espace. A vrai dire, il l'a toujours reconnue comme Architecte avec un grand A. Et au bord du lac plus encore qu'ailleurs, c'est bien la lumière, qu'elle soit géométrique ou diffuse, qui a guidé sa main dans le dessin de cette petite maison aux larges ouvertures et aux orientations favorables. Confronté à cette stupéfiante leçon de simplicité et d'harmonie, j'ai donc utilisé, pour tenter de prolonger pendant la nuit la magie des lumières du jour, d'humbles moyens techniques en rapport avec les projets de l'artiste : de simples rampes de LED colorées dont les lumières peuvent facilement être mélangées et modulées. Une électronique élémentaire permet de les faire évoluer au gré du temps, en s'inspirant des lentes variations des lumières naturelles sur le lac pendant la journée.

Le caractère éphémère de l'exercice d'illumination m'a incité à utiliser des lumières franchement colorées, comme pour permettre à la maison de pavoiser l'espace d'une nuit. Les couleurs furent choisies dans une palette que Le Corbusier n'aurait pas reniée : des couleurs archaïques chaudes comme les ocres utilisées dans les œuvres d'art de la préhistoire qui se marient si bien avec les couchers de soleil, ainsi que les complémentaires de ces ocres qui jouent si bien avec les couleurs de l'eau du lac. L'artiste ne trouve pas son énergie seulement dans la nature ou dans son imaginaire, mais encore dans une forme de référence au sacré, conçu comme le révélateur des harmonies du monde.



Le livre "Une Petite Maison de Nuit" (en français, allemand et anglais) peut être commandé sur www.call-me-edouard.com .

Mais n'oublions pas qu'un sculpteur de lumière est aussi un artisan et les techniques contemporaines de production et de guidage de la lumière accompagnent ses gestes. Apprivoiser les propriétés des sources, des fibres optiques, des microlentilles, des filtres interférentiels etc. à des fins artistiques, demande que l'on ait expérimenté beaucoup de matériel technologique dont les caractéristiques ne correspondent pas souvent à ce qu'un artiste peut espérer. Dans ce domaine, seule la pratique compte. Les LED, par exemple, dont on a dit tant de bien dans cette année de la lumière, sont des sources capables du meilleur et du pire. Tous les

Villa « Le Lac »

Petit bijou d'ingéniosité et de fonctionnalisme, la Villa «Le Lac» (*www.villalelac.ch*) est un manifeste architectural où l'on trouve déjà les idées maîtresses du programme développé par Le Corbusier dans les années 1920 pour ses célèbres «villas blanches». Véritable laboratoire des idées modernes, la Villa «Le Lac» compte parmi les réalisations les plus personnelles et les plus inventives de l'architecte.

La Villa «Le Lac» rassemble déjà trois des futurs cinq points d'une architecture nouvelle : le toit-jardin, le plan libre et la fenêtre en longueur. Véritable «machine à habiter», elle illustre les préoccupations que Le Corbusier avait énoncées dans ses premiers ouvrages et qui avaient assuré le succès de ses villas construites à partir des années 1920.

praticiens de l'éclairage savent qu'il faut vraiment les bien choisir, si l'on veut éviter des résultats inattendus.

Si je n'utilise pas souvent un spectromètre pour mesurer les lumières que je façonne, c'est simplement parce qu'avec le temps et l'expérience j'ai fini par acquérir un "œil spectroscopique", et c'est bien ainsi, puisque pour l'artiste plasticien l'œil doit demeurer le véritable arbitre. Il n'en reste pas moins qu'au delà de la technique, le sculpteur de lumière a tout intérêt à entretenir de bonnes relations avec les sciences de la lumière telles qu'on les rencontre dans les laboratoires. Comprendre les phénomènes n'a jamais nui à leur utilisation créative, bien au contraire. En tant qu'artisan qui est toujours jugé sur la base de résultats concrets, je n'établis pas volontiers de relations avec ceux de ces laboratoires qui annoncent des miracles trop rarement ou trop tardivement réalisés. Je préfère les scientifiques, et il en existe un bon nombre, dont la pratique relève de la même humilité dont Le Corbusier a fait preuve pour la construction de la Villa « Le Lac ».

Dans mon cas personnel, j'ai beaucoup appris par la fréquentation assidue des membres du Laboratoire d'optoélectronique des matériaux moléculaires de l'EPFL. J'y ai consolidé, par exemple, ma maitrise des LED et des matériaux fluorescents; je me suis inspiré des sphères intégrantes du laboratoire pour apprivoiser la diffusion multiple de la lumière; j'y ai connu et manipulé aussi les sources OLED (Organic Light Emitting Diodes). On retrouve ces expertises d'origine scientifique dans plusieurs de mes œuvres récentes. En outre cette rencontre entre art et science m'a permis de partager la rédaction et l'illustration d'un livre intitulé *Lumières du futur* avec le Professeur Libero Zuppiroli de l'EPFL, livre où art, science et technologie se rencontrent me semble-t-il fort à propos.

Que penser, d'une manière plus générale de la relation entre art et science ? De tous temps les artistes se sont méfiés du discours trop rationnel qu'ils attribuent à tort ou à raison à la science, et les scientifiques n'ont pas toujours été convaincus par les démarches des artistes de leur temps. Pris dans une course folle destinée à la recherche de projets et de fonds nécessaires à leur survie, les artistes

tout comme les scientifiques d'aujourd'hui ne sont pas forcément disponibles à une collaboration transdisciplinaire réelle. Dans ce cadre, seul les liens qui peuvent se tisser au niveau individuel et sur des bases concrètes me semblent prometteurs. Les institutions peuvent parfois encourager positivement de telles démarches. Pour tout dire, j'ai l'impression que les expériences réussies dans ce domaine – parce qu'elles impliquent le rêve de l'artiste autant que du scientifique – relèvent presque automatiquement de ce que l'on appelle parfois la *slow science* dans la mesure ou elle saurait s'associer, pour ne pas dire s'acoquiner, avec le *slow art*.

L'Atelier Daniel Schlaepfer

L'Atelier D. Schlaepfer (*www.dschlaepfer.com*) entreprend des réalisations au carrefour de l'art et du design en intervenant dans des lieux tels que bâtiments publics, habitations privées, milieux urbains ou naturels.
Pour élaborer ses interventions, l'Atelier collabore régulièrement avec des artisans, des architectes, et des scientifiques, en proposant une scénographie de l'espace, sous la forme d'une mise en lumière, d'une mise en couleur ou d'un concept formel.
L'Atelier a de nombreuses réalisations à son actif en Suisse comme sur le plan international (France, Portugal, Hollande, Inde, Chine, Bolivie, USA). Ses travaux ont été présentés dans des expositions d'art contemporain (Bex, Môtiers), ont pris part à des événements urbains (Arbres en Lumière, Lux festival, Artonscience) ou ont été l'occasion de conférences nationales et internationales.

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