Chapter IV.7

JUAS during the period 2017–2020

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This chapter covers the period Philippe Lebrun was JUAS Director (i.e. between 2017 and 2020).

Louis Rinolfi presented Philippe Lebrun's candidature as the JUAS Director to the Advisory Board meeting of 2015. It was agreed that Lebrun would follow JUAS 2016 as Director Designate, in tandem with Rinolfi in his last year as Director. This enabled Lebrun to become acquainted with the job and be ready to take over for the preparation of JUAS 2017. This was an arrangement that was reproduced successfully in 2020 with Lebrun's successor, John Jowett. In 2016, Lebrun worked in particular on the analysis of the course evaluations by the students, introducing compound histograms presenting the results of the surveys without loss of information, thus allowing the detection of outliers, to which statistical moments alone do not give access. The 2016 meeting of the Advisory Board, hosted by University Federico II of Naples, marked Lebrun taking office as JUAS Director. This chapter briefly reviews the actions taken and changes implemented during Lebrun's mandate, focusing on three areas: academics, networking and communication, and logistics.

IV.7.1 Academics

My first action as Director was to draft a Mission Statement and a Code of Conduct for the school (posted on the JUAS website). These were submitted to the Advisory Board for approval, and they were then presented to each new class of students on their first day at the school.

The main changes to the syllabus during my mandate were the introduction of seminars in common with the sister school, the European School of Instrumentation in Particle and Astroparticle Physics (ESIPAP), of a short "Introduction to RF" by Andrea Mostacci to bridge the gap between basic electromagnetism and the lectures on "RF engineering" by Fritz Caspers, of lectures on "Survey and alignment of accelerators" by Hélène Mainaud-Durand, of new seminars on "Particle accelerators, instruments of discovery in physics", on "Hybrid collisions in LHC" by the Director Designate John Jowett, and of (graded) oral presentations by the students on their practical days at CERN. The practical day at Bergoz Instrumentation was also reorganised, being condensed into a half-day focusing on beam instrumentation, after discussion with the new CEO Etienne Touzain, who enthusiastically supported this action. Practical days at CERN required every student of JUAS Course 2 to work on two topics chosen from magnets, RF, vacuum, superconductivity, and accelerator beam measurements, the latter on the newly

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converted CLEAR[1] facility. As in previous years, laboratory visits took place at CERN, ESRF Grenoble, PSI Villigen, and HUG.

In line with increased digital practice, JUAS decided in 2018—initially as a test—to stop distribution of paper copies of course documents to the students, instead providing them with USB sticks for downloading material from the Indico repository. Consequently, laptop computers became authorised, without Wi-Fi connections, for the exams. In the absence of complaints from the students, this was repeated in subsequent years and has become the standard practice.

There were also some changes in lecturers at their own request: in 2017, Bertrand Jacquot replaced Frédéric Chautard on "Cyclotrons", Paolo Ferracin replaced Martin Wilson on "superconducting magnets"; in 2018, Hannes Bartosik replaced Iannis Papaphilippou on "non-linear effects"; in 2019, David Alesini replaced Jean-Baptiste Lallement on "linacs", and Rasmus Ischebeck replaced Ricardo Bartolini on "synchrotron radiation"; and in 2020, Nicolò Biancacci replaced Jean-Marie De Conto on "particle optics".

Following previous practice, and schedule permitting, two volunteer students from JUAS Course 1 were sent to the SOLEIL synchrotron in Saclay to participate, under the supervision of Laurent Nadolski and Pascale Brunelle, in a machine development session, for which they had to prepare and write a report. In 2018, the schedule did not match at the SOLEIL synchrotron, and instead, four students were able to participate in a machine development session at ESRF in Grenoble under the supervision of Andrea Franchi and Francesco Carmignani.

Regarding the evaluation of student performance, JUAS grading was benchmarked by statistical comparison with the European Commission's ECTS Grading Table, as well as with the marks of the Master "Grands Instruments" at Paris-Saclay University, which regularly sends a contingent of students to JUAS. Since 2018, updated attendance certificates and grade sheets better match the differentiated needs of master's, doctoral, and professional students, whether or not they are taking exams. Finally, a survey of ECTS credit allocations to JUAS students was conducted in 2020, and this showed large variations among partner universities.

Following the advice of the Advisory Board, student ranking was abolished in 2020; however, the best student from JUAS Course 1 continued to be proposed every year for the special grant to attend the International Particle Accelerator Conference. Thanks to this grant, Sofia Kostoglou went to IPAC 2017 in Copenhagen, Simon Vallières to IPAC 2018 in Vancouver, and Konstantinos Paraschou to IPAC 2019 in Melbourne; IPAC 2020 took place remotely due to the COVID-19 pandemic, and the laureate Daniele Butti did not go to Caen.

The 2020 session of JUAS Course 2 was impacted by the pandemic, with the lockdown and closing of borders happening just before the final exam week. The JUAS team had to improvise remote examinations while preserving quality standards. The students already having access to all documentation as in previous years, the critical issues were to ensure that they completed the exam in the allocated time and without communicating. This was achieved by "real time" remote exams and individual declarations of honour by the students.

[1] CLEAR: CERN Linear Electron Accelerator for Research.

IV.7.2 Networking and communication

New partnership agreements with Université Paris-Saclay and Universitetet i Oslo, prepared by my predecessor Louis Rinolfi, were signed and entered into force in 2017, bringing the number of partner universities to 16. The same year, I established a formal link with the CERN Accelerator School (CAS), with *ex officio* cross-participation of the school Directors in the CAS Program Committee and the JUAS Advisory Board. According to our practice of visiting our different partner universities in turn, we held the Advisory Board meetings in Saclay/Orsay (2017), Rostock (2018), Alba/Barcelona (2019), and remotely in 2020.

Each year, we produced a Curriculum Vitae Yearbook of the students, which was distributed *inter alia* to the sponsors of the school. Because little use had previously been made of the "JUAS news" page on the website, I tried to regularly post illustrated short news stories pertaining to the life of the school. Alumnae/alumni groups were created in 2017 on Facebook and LinkedIn, but participation was limited; the implementation of a new, professional platform in 2020 was no more successful, the probable reason being that former JUAS students are preferentially active on the alumnae/alumni groups of their home universities. Nonetheless, I conducted a survey of recent alumnae/alumni covering three years, yielding interesting information on the career development of recent students and on their appreciation of the usefulness of attending JUAS for their professional activities; the results of this survey were presented to the Advisory Board meeting of 2020.

A promotional video clip of JUAS was produced in 2017, and a special, well-attended event was organised in 2018 to jointly celebrate the 25th anniversary of ESI and the 25th session of JUAS (see Appendix IV.7.A). This event gave rise to articles in the local press, as well as in specialised media such as the CERN Bulletin and "Reflets de la Physique", the bulletin of the French Physical Society. In 2018, JUAS was recognised as a training centre by the International Atomic Energy Agency for professional students from the SESAME international light source in Jordan.

As usual, JUAS manned a booth in the exhibition area at IPAC. The school was also presented orally at several national and international events such as the CERN–US–Japan–Russia Accelerator School, the FCC Weeks, the Journées Accélérateurs SFP, and a Plenary ECFA meeting. JUAS and its sister school ESIPAP were the subject of letters submitted to the European Particle Physics Strategy Update in 2018, and to the similar Snowmass exercise in the USA in 2020. I was also involved in the preparation of the industry session and student tutorials for the IPAC 2020 conference, which eventually took place remotely.

The year 2020 also saw the production of several sessions for the massive open online course (MOOC) on "Introduction to accelerators", under the aegis of the Horizon 2020 European Program ARIES. The first elements of this MOOC, targeted at final-year bachelor's students, are now available at http://mooc.particle-accelerators.eu/.

IV.7.3 Budget and logistics

The JUAS business model rests largely on volunteer action, both at the personal (lecturers, tutors, Director) and institutional (staff secondments, visits, practical sessions) levels. As a consequence, the accounting book represents only a fraction of the complete activity. In 2017, we decided to present a

"consolidated" budget for the first time, including both financial and in-kind revenues and expenditure. The consolidated budget amounts to about twice the financial budget.

Over the years, the facilities and services at ESI have gradually been improved, with the introduction of a shuttle service to and from the student housing facility, of a free hot-drink distributor, and of weekly "welcome" buffet lunches and "burger-and-beer" after-work gatherings. The computer room, Wi-Fi service, and heating system were rejuvenated. Finally, yet importantly, Stéphanie Vandergooten joined the ESI team to replace Marie Gautier.

The above enumeration may convey the (wrong) impression that my mandate triggered or produced fundamental changes to the JUAS school. Certainly, the numerous contributors to JUAS, committed to its constant improvement, achieved significant progress in the different areas of academics, organisation, logistics, and communication. The truth is that we only brought our modest contributions to the solid construction that had been patiently established by our predecessors, in particular the visionary previous JUAS Directors.

Appendix

IV.7.A JUAS at 25 and photos 2017–2020

Address delivered on 15 February 2018 on the 25th anniversary of ESI and 25th session of JUAS

Mesdames et messieurs les représentants des autorités locales, des universités partenaires et des sponsors de JUAS,

Madame la Directrice Générale du CERN,

Monsieur le Directeur des Accélérateurs et des Technologies du CERN,

Chers collègues, chers amis,

Les accélérateurs de particules sont d'étranges machines : inventés à l'aube du siècle dernier, en même temps qu'émergeait le concept de particule en physique moderne, ils se sont développés comme chevaux de trait de la physique nucléaire et des particules pour devenir les plus grands instruments scientifiques jamais construits par l'homme. Aujourd'hui, ils constituent également des outils incontournables dans l'étude de la matière condensée et des macro-molécules biologiques, et trouvent de nombreuses applications pour la société dans le diagnostic et le traitement médicaux, l'industrie des polymères et des composants électroniques, la sécurité des personnes et la sûreté des aliments et des produits de santé.

Particle accelerators are strange machines: invented at the turn of the 20th century, at the same time as modern physics reinvented the concept of the particle, they developed as workhorses of nuclear and particle physics to become the largest scientific instruments ever built by man. Today, they also constitute essential tools for the study of condensed matter and biomolecules, and they find numerous societal applications in medical diagnostics and treatment, the polymer and electronic components industry, public security, and food and health product safety.

Outre leur intérêt pédagogique propre comme « retombée » de deux grandes avancées de la physique, l'électromagnétisme de Maxwell et la relativité d'Einstein, la science et la technologie des accélérateurs, domaines spécifiques de la physique et de l'ingénierie, se doivent d'être enseignées dans leurs derniers développements aux futurs concepteurs, constructeurs et exploitants de ces étranges machines. C'est le rôle dévolu depuis 1994 à l'École Interuniversitaire sur les Accélérateurs de Particules JUAS, qui propose chaque année—initialement à l'Université de Grenoble puis à l'European Scientific Institute d'Archamps—deux cours spécialisés de cinq semaines chacun à des étudiants de niveau Master, Doctorat ou à des professionnels de l'industrie ou des centres de recherche, cours sanctionnés par des examens qui peuvent donner lieu à l'attribution de crédits ECTS. Ce sont ainsi plus de 1000 étudiants qui ont ainsi été formés à l'École depuis sa création.

Beyond their sheer educational interest as spin-offs from two major advances in physics, Maxwell's electromagnetism and Einstein's relativity, the science and the technology of accelerators, specific domains of physics and engineering in their own right, must be taught together with their latest developments, to future designers, builders, and operators of these strange machines. This is precisely what JUAS, the Joint Universities Accelerator School, has been doing yearly since 1994—first at the University of Grenoble and then at the European Scientific Institute in Archamps—through two specialised courses of five weeks each, for master's and doctoral students, as well as for professionals from industry or research centres. The exams at the end of each Course can grant students ECTS credits in their home

universities. Overall, more than 1000 students have been trained at JUAS since its foundation.

Il n'est pas question de vous présenter cette École en détail, mais laissez-moi en dégager quelques lignes de force.

Avant tout, l'expertise scientifique portée par ses quatre précédents directeurs Marcelle Rey-Campagnolle, Joël Le Duff, François Méot et Louis Rinolfi, et aujourd'hui par mon adjoint Elias Métral et la cinquantaine d'enseignants issus des universités, des laboratoires et des industries actifs dans le domaine, accrédités par le Conseil de Surveillance où sont représentées les 16 Universités Partenaires de JUAS.

A few key points about the JUAS School.

First and foremost is the scientific expertise provided by its four previous Directors, Marcelle Rey-Campagnolle, Joël Le Duff, François Méot and Louis Rinolfi, and today by my deputy Elias Métral and some 50 lecturers from academia, laboratories, and industries active in the field, accredited by the Advisory Board in which the 16 partner universities of JUAS are represented.

Ensuite, une pédagogie innovatrice et sans équivalent, mêlant cours magistraux, petites classes, séminaires, ateliers de travail en groupe, visites de laboratoire et travaux pratiques, y compris pour certains étudiants la possibilité de participer à des séances de développement sur de vrais accélérateurs en exploitation—cette année sur les synchrotrons de l'ESRF à Grenoble et sur l'accélérateur linéaire CLEAR du CERN. Mentionnons encore l'implication de l'École dans la réalisation d'un MOOC, cours ouvert en ligne sur les accélérateurs de particules, dans le cadre de l'activité « Enseignement, Communication et Médiation Scientifique » du programme européen ARIES.

Then, an innovative pedagogical approach, with a unique mix of lectures, tutorials, seminars, group workshops, laboratory visits, and practical sessions, including for some students the opportunity to take part in machine development sessions on real accelerators in operation—this year on the synchrotrons of ESRF in Grenoble and on the CLEAR linear accelerator at CERN. Also to be mentioned is the involvement of the school in the production of a MOOC, massive open online course on accelerators, in the framework of the "Training, Communication, and Outreach" work package of the European programme ARIES.

L'École est également caractérisée par la diversité de son recrutement, physiciens et ingénieurs, novices et expérimentés issus d'une vingtaine de pays d'Europe, d'Asie et d'Amérique. A noter que cette année, un tiers de nos étudiants du premier cours sont des étudiantes. Cette diversité impose un enseignement en Anglais, *lingua franca* de la communauté scientifique d'aujourd'hui. Elle crée aussi des opportunités de contacts internationaux et interculturels, et prépare les étudiants à des parcours professionnels flexibles dans un contexte mondialisé.

The school also exemplifies diversity in its attendance, with a mix of physicists and engineers, students, and experienced scientists coming from some 20 countries in Europe, Asia, and America. It is worth noting that one third of the 2018 students in our first course are female. This diversity requires teaching to be done in English, the lingua franca *of today's scientific community. It also creates opportunities for international and intercultural exchange, and it prepares the students for flexible careers in a global context.*

Enfin, le succès de JUAS repose essentiellement sur le bénévolat, bénévolat institutionnel des uni-

versités, des laboratoires, des industries et du CERN qui détachent leurs enseignants et donnent accès à leurs équipements, soutien financier de ces différents acteurs, et investissement personnel des animateurs de l'École : qu'ils en soient tous ici remerciés. C'est grâce à ces diverses formes de bénévolat que nous pouvons continuer à assurer à nos étudiants une formation de haut niveau, tout en maintenant très bas les frais d'écolage. La valeur réelle de JUAS est ainsi bien supérieure à son budget comptable.

Finally, the success of JUAS mainly rests on volunteer action, from academic institutions, laboratories, and industrial companies that second lecturers and grant access to their premises and equipment, on financial support from these different actors, and on personal commitment from the school's leaders: let all of them be thanked here. It is only through this volunteer action that we can maintain high-level standards of teaching to our students while keeping tuition fees very low. In this respect, the true value of JUAS greatly exceeds its financial budget.

Je pourrais évidemment continuer à vous entretenir longtemps des mérites de notre École, mais il est temps de conclure en souhaitant longue vie à JUAS… au moins pour les 25 prochaines années.

Long live JUAS… for at least the next 25 years!

Fig. IV.7.A.1: The class of 2017, JUAS Course 1.

Fig. IV.7.A.2: The class of 2017, JUAS Course 2.

Fig. IV.7.A.3: The class of 2018, JUAS Course 1.

Fig. IV.7.A.4: The class of 2018, JUAS Course 2.

Fig. IV.7.A.5: The class of 2019, JUAS Course 1.

Fig. IV.7.A.6: The class of 2019, JUAS Course 2.

Fig. IV.7.A.7: The class of 2020, JUAS Course 1.

Fig. IV.7.A.8: The class of 2020, JUAS Course 2.

Fig. IV.7.A.9: Some pages from the Curriculum Vitae Yearbook of 2017.