

## Core Technologies in Life Sciences (CTLS) 2016 Conference Summary

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From June 12 to 15, 2016, the second Core Technologies in Life Sciences (CTLS) conference was held at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany. The CTLS grew out of a sense in the core facilities community that there was no single organization that could provide direct representation of all European core facility scientists. In April 2013, Spencer Shorte, the director of the ImagoPOLE imaging platform at Institut Pasteur in Paris, hosted a meeting where numerous stakeholders from throughout Europe and beyond came together to discuss the possibility of forming a new organization to promote and support European core facility science. Presentations and discussions focused on what the attendees would like to see in a core facility association based in Europe. George Grills, Association of Biomolecular Resource Facilities (ABRF) Executive Board member, spoke via teleconference, and from the start, connections between CTLS and ABRF were considered essential.

During the meeting in 2013, strong interest was expressed in holding a larger conference for core facility scientists. Over the course of the next year, an organizational committee led by Shorte and CTLS Founding Organizer Patrick England, who runs the biophysics core at Institut Pasteur, put together the program for the inaugural CTLS congress. The meeting took place over 4 beautiful Parisian days in June 2014. With over 350 attendees, hailing from 26 countries, including America and Australia, as well as from Africa, the initial congress gave significant impetus to moving forward toward a more formal organization. At CTLS 2014, Elke Küster Schöck spoke about the ABRF and in particular, the International ABRF, a group that includes ABRF members who meet regularly to discuss international issues relevant to the ABRF and includes ABRF Executive Board representation.

CTLS 2014 was a tremendous success, and plans for a follow-up meeting began nearly immediately. Iain Mattaj, director general of EMBL, and Rainer Pepperkok, head of

Core Facilities at EMBL, generously offered to host CTLS 2016. A group of individuals who had offered to help coordinate and plan the meeting was led by Shorte and England, defining the scope and organizing the sessions and presentations. This is how, on a warm Sunday in mid-June 2016, ~250 core facility scientists found themselves perched above the Neckar River Valley in the EMBL main conference auditorium listening to the initial keynote being delivered by Pepperkok who explained the importance of core facilities in biomedical research.

Over the next three days, many presentations were given on a wide range of issues relevant to core facility scientists. Whereas CTLS 2014 was organized around 3 parallel tracks, supplemented with plenary keynote sessions, all of CTLS 2016 took place as a single, cohesive program. There were sessions that focused on technology development, data management, administrative and management issues, teaching and training, as well as networking. Speakers came from the United Kingdom, Belgium, Germany, France, Spain, Austria, Switzerland, and the United States. In addition to keynote and invited speakers, presentations were given by attendees based on abstracts they had submitted, and these included both 15 min talks and rapid-fire, 2 min “flash” presentations, highlighting selections of particular interest from the poster sessions. The congress was followed on the Wednesday afternoon by a smaller satellite session on training issues in core facilities, led by Elena Trovesi.

The first session of the CTLS 2016 meeting raised a number of key questions that set the stage for the roundtable discussions that would continue for the rest of the conference. Iain Mattaj was able to convey the value of core facilities—not just to work being conducted at EMBL but also, across borders, throughout the world. Mattaj explained how the EMBL European Bioinformatics Institute (EBI) receives ~12,000,000 requests per day. Thus, EBI has emerged as a prototype for the management and sharing of big data. However, he explained that the funding mechanisms to support the formation and maintenance of shared infrastructures, as well as external access to them, seem to be lagging behind what is required. Furthermore, he pointed out that at every level, scientists are not currently trained in the necessary statistics and analytics that are already underpinning the next greatest biomedical discoveries.

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Topics relevant to big data processing, storage, curation, and dissemination were discussed in excellent presentations from Ian Bird, LHC Computing Grid Project leader from the CERN Information Technology (IT) Department, and Ewan Birney, director of the EBI. Bird described the many layers of processing power underlying the complex chain of data filtering, storage, and analysis required for particle collider studies. LHC is creating ~30PB of data/yr that needs to be analyzed and stored, and this is just the data that are actually of use analytically, subsequent to extensive prefiltering. That is in addition to the meta data that include information regarding issues, such as instrument calibration. Amazingly, they support a global transfer rate of 35 GB/s through an EduGAIN-credentialed File Transfer Protocol interface. Birney also described the very large-scale data management operation implemented by EBI. The institute currently has 70PB of storage and actually based much of its current IT strategy on CERN's model. Birney had extremely interesting insights into the future of genomics, both from the point of view of personalized medicine, as well as for research purposes using humans or at least their genomes as "model organisms." Given the complex and potentially litigious nature of medical issues, as well as questions of efficiency and differences in cultures, Birney suggested that each nation that hosts EMBL activities (currently Germany, France, the United Kingdom, and Italy), should have its own dedicated bioinformatics center.

Another speaker who discussed issues relevant to transnational clinical research was Jacques Demotes-Mainard, director general of the European Clinical Research Infrastructure Network (ECRIN), an instrument to facilitate clinical trials across European Union (EU) member states. Interestingly, the model that ECRIN has adopted is to use representatives within individual countries so that transnational trials are supported with specialist-resident knowledge not directly beholden to any single investigation. Antje Keppler, head of Imaging Infrastructure Strategy Development at EMBL, also spoke about transnational research in Europe, in particular, with regards to the Euro-BioImaging (EuBI) infrastructure initiative that is currently funded by the European Commission Horizon 2020 framework. The preparatory phase of EuBI started in 2010 and provides access to "nodes" that house specialized equipment and expertise for biologic microscopy. The implementation phase of EuBI recently began, and the network of 29 nodes across Europe should be fully operational in 2017. The organizational structure includes a hub for biologic imaging at EMBL, with nodes in 10 other European countries. Participants expressed the opinion that such studies that are cross border would be facilitated by an organization, such as CTLS.

Ángeles Rodríguez-Peña, deputy director general for European Programs for the Spanish Ministry of Science and Innovation, spoke about EU-funded networks, in particular, the Cooperation in Science and Technology (COST) program. COST grants are available to fund collaborative meetings and workshops, and although it is the longest continuously running EU framework program, available funds are very tight, and there is currently only a 5% success rate for new applications. Speaking specifically about experiences with a successful COST grant, Robert Gilbert, from the University of Oxford, discussed the Molecular Biophysics Approaches for Biology and Healthcare (MOBIEU) network, which is a collaborative resource for developing methods, standards, and access. MOBIEU is closely allied with the Association of Resources for Biophysical Research in Europe (ARBRE), which is led by England. Together, MOBIEU and ARBRE have arranged meetings, generally as satellites to scientific conferences, where they have forged strong links among biophysics researchers in Europe. It was proposed that CTLS might find a niche to apply for COST funding to further the networking of core facility scientists.

Several speakers provided unique perspectives on specific aspects of core facility science. Kurt Anderson spoke of his recent move from the Beatson Institute in Glasgow to the Crick Institute in London, where he has begun the process of building an extremely large microscopy core facility. Located in the heart of London, the Crick is a joint endeavor among several universities (Imperial College London, King's College London, and University College London), charities (Cancer Research UK and the Wellcome Trust), and the UK Medical Research Council. Anderson spoke about the complexities of combining existing core facilities with their own cultures, staff, and instrumentation within a new space, with expanded capabilities and extensive investment. He also spoke about links with other types of core facilities, such as electron microscopy, and in particular, resources that can be shared across disciplines, such as image analysis.

The important issues of training in a core facility context were addressed by several speakers. Chris Guérin, manager of the Bio Imaging Core at the Vlaams Institute for Biotechnology (VIB) in Ghent, Belgium, spoke of the many levels that training cores must provide. Every two years, the VIB runs a week-long microscopy course targeted at Ph.D. students and postdoctoral fellows that includes both theoretical and practical aspects. He explained that with so many areas of technology being used in modern research, even otherwise highly trained scientists may have a knowledge gap in particular areas and made the case for developing the skills base and technical expertise of core facility users. Guérin also discussed the need to work

together with the principal investigators and group leaders, so that those who manage laboratories that use core facilities are aware of what is and is not possible with cutting-edge techniques and instrumentation. This led into a very lively panel discussion about training, where several key questions were raised. Among the issues that Guérin and fellow speakers—Catherine Brooksbank from EMBL–EBI, Fernando Peláez from the Spanish National Cancer Research Center, and Elisa May from the Bioimaging Center of the University of Konstanz in Germany—discussed were how to connect training of core-facility users within the teaching mission of a university; how to strike the right balance among electronic teaching resources, lectures, and hands-on instrument training; as well as whether or not to charge for these types of courses. Finally, training programs to develop and encourage the next generation of core facility scientists were addressed and the possible ways an organization, such as CTLS, could participate.

The meeting was concluded by an invited presentation from Bill Hendrickson, president of ABRF. Hendrickson, who recently retired from running the core facilities at the University of Illinois, Chicago, gave an informative keynote talk that covered a tremendous amount of material relevant to core facility scientists. Hendrickson summarized the organizational structure of the ABRF and the role of the ABRF in promoting core facility science. He talked about recent Webinars organized by ABRF, including one on the timely subject of “lean” management, and described the important roles played by the ABRF domain-specific “research groups.” In particular, Hendrickson highlighted a study published by the ABRF Next Generation Sequencing Research Group in *Nature Biotechnology* in 2014 concerning the future of personalized genetic profiling, as well as the important work published in ABRF’s *Journal of Biomolecular Techniques*. Finally, Hendrickson raised the question of whether the ABRF and other core facility-focused organizations, such as CTLS, should form a global federation.

On the final evening of the conference, before the participants enjoyed a memorable banquet dinner, the CTLS Founding General Assembly was held. This included the inaugural Annual General Meeting and election of an Executive Council (EC) and Board of Directors (BoD) for the CTLS association, although the official status is pending as the statutes are currently in the process of being filed. The members of the founding EC of CTLS were approved and include the following: Nicholas Berrow, Marco Borra, Catherine Brooksbank, Julia Fernandez-Rodriguez, Chris Guérin, Peter O’Toole, Fernando Peláez, Marie-Anne

Rey-Cuillé, Andreas Tiran, Achim Treumann, Nadine Utz, and Geert van Minnebruggen, as well as the consequent approval of the following EC members to be on the BoD: Spencer Shorte, president; Patrick England, vice president; Rainer Pepperkok, treasurer; Elena Trovesi, vice treasurer; Josh Rappoport, secretary; and Ralf Palmisano, vice secretary.

During CTLS 2016, participants were invited to visit the CTLS association booth and fill in an Expression of Interest membership form. Eight-four future members of the association were thus “recruited” on the spot, from which emerged volunteers to constitute the founding EC. CTLS 2016 brought a record number of commercial sponsors for a conference hosted at EMBL, and several companies have already expressed interest in being involved with the CTLS association. Instrument vendors and consumables suppliers are often key partners and collaborators in advancing core facility science. Thus, CTLS plans to offer Associate Membership status to industrial stakeholders.

It is evident from the rapid increase of formal core facilities that universities and research institutes recognize the value of shared-technology platforms in modern high-technology research. Largely growing out of individual laboratories with specialized expertise, core facilities are gaining popularity because of their efficiency and reliability. The days when an individual scientist could master all of the technological tools to perform cutting-edge research are over. With so many technological advances and the increasing sophistication of biomedical research tools, core facilities are essential to harness the promise of progress. That being the case, organizations, such as ABRF and now, CTLS, are well poised to help coordinate and network expert scientists working in core facilities, establish jointly agreed upon standards and benchmarks, enable shared technology development, lobby for resources, and develop strategies for sustainability in high-tech scientific research. Already, plans are under way for the third CTLS conference (location to be determined), and the organizational structure of CTLS, including formal links with the ABRF, are in process. It is hoped that this young organization, along with ABRF, will help confirm technology core facilities as an integral and essential part of life sciences research.

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