Position Paper

Excellence Alliance Core Facilities

Core4Life

Excellence alliance

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1. Background: The "omics" (R)evolution

The completion of the first sequence of the human genome in 2003 changed life sciences as much as the first man landing on the moon in the late 1960's changed astronomy. Both landmark events triggered a technological (r)evolution, which in turn, accelerated field-specific insights. Today, in the new (gen)omics era, it becomes routine for life scientists to determine the complete DNA sequence of an organism under study and therefore to obtain a full description of the biological information stored in the genome.

Similarly, the determination and analysis of transcriptomes, as well as its manipulation by siRNA and (small molecule) compounds in order to determine the gene functions, have become part of the daily lab work. On the proteome level this is not yet possible to the same extend. However, high-end technologies already provide quantitative data on thousands of different proteins. This allows detailed comparisons of protein sets between cells or tissues under different conditions (e.g. healthy vs diseased) to discover the molecular basis of their phenotypes.

Microscopy is another field that has experienced a technology jump in the last years. Several super-resolution techniques have been developed that are pushing the resolution limit into the deep nanoscale, aiming to completely close the detection gap between light and electron microscopy. One of the biggest challenges is to develop strategies to analyse, annotate, manage and store all the data that is being produced using the new technologies, and similar landmark changes are expected in scientific computation.

In whole, the technological (r)evolution changed the landscape of life sciences and made it possible to combine holistic and reductionist approaches to study biological phenomena of interest. New disciplines like systems biology, computational biology, integrative biology and translational biology arose, attempting to take a birds-eye view and to integrate information obtained with a multitude of approaches. The counterpart of the technological (r)evolution is however that it is becoming close to impossible for a life science research department – let alone a single research group - to master all technologies and to have them functionally imbedded in the home lab.

2. The Core Facilities Concept

To anticipate this trend, renowned research institutes started to surround their individual research labs and departments with supportive groups and service facilities operating specialized state-of-the-art technology platforms. Those institutional core facilities are staffed with expert technologists, engineers & technicians and have ample experience in a specific technology-driven field (e.g. genomics, proteomics, bioinformatics & computational biology, recombinant protein-, antibody- & nanobody production, microscopy, high-throughput screening, etc.). By providing open access to their respective service panels, core units speed-up the progress of particular research projects significantly. Services often include the whole process from experimental design to data delivery and analysis, whereby the core facilities provide individual labs the flexibility to outsource technology-demanding projects to centralized, well equipped state-of-the-art facilities. This approach prevents a multiplication of costs through several peripheral investments in technology platforms with low capacity, low efficiency and lack of expertise. A major advantage for the individual labs is to be able to focus on their research questions and not to spend time and effort in the investment in expensive, sophisticated equipment and training of their personnel.

3. The 'Core' Challenges

Managing the needs of all stakeholders bears a multitude of challenges. Keeping the expertise of good core facility staff is essential to the successful operation of a platform. Core directors thus have to create an interesting and rewarding working environment for their staff that includes not only adequate salaries and (long-term) career perspectives, but also a culture in which the core facility staff are respected by their scientist colleagues and are acknowledged for their work. Satisfying a broad user base is a task on its own, and implicates that decisions have to be made whether to go for high-throughput and cost-effectiveness or rather for customization and added value. General guidelines on how to work with the facilities, standard operation procedures, quality control systems for entering samples as well as for the processes performed on the platforms, and good policies for data management need to be implemented. At all times, both facility staff and customers should be aware of the fact that changing institute policies and scientific direction influence decision making of core facilities directors, as well as changes in the funding situation.

Finding good costing and pricing models for core facilities is an important issue. Core facilities generally are expected to operate in a cost-neutral way, i.e. to generate neither profit nor loss. A sustainable pricing system has to be developed that achieves this goal, that makes core facilities attractive to researchers and possibly industry, but without invoking unfair competition with companies offering similar services. In addition to that, researchers need to have the possibility to charge services to grants, so the pricing system also has to be justifiable in the project audits by the different granting agencies (e.g. the EU only refunds actual cost that has to be proven with bills, time sheets, etc.). The EU FP8 will demand full cost accounting for all core facilities, so the platforms have to be ready for this change.

Probably the biggest challenge in core facilities is the **short life-time of new technologies** due to the increasing speed of technological innovation. This has consequences for the strategic planning of a sustainable core facility infrastructure on several levels. Technological developments and innovations have to be monitored continuously in order to enable timely decision making about what to keep in-house, what to give up because it is no longer useful, what to outsource because it has become a commodity and can be obtained cheaper from commercial providers, and what to invest in as a promising future technology. Ways to effectively scout for scientific value and market potential of new emerging technologies, and programs for continues training of core facility staff have to be developed to ensure that they are ready to master new technologies as they arrive.

Life sciences institutes of high international standing need to provide their researchers with the necessary resources – financially and technologically - to be at the forefront. However, as high-end equipment becomes more expensive and short-lived, each institute has to decide for a few technological areas in which it will strive to be at the cutting edge and commit a continuous investment in order to stay there, and find models which guarantee access to those platforms that cannot be provided at an equal level of sophistication in-house. What has been common practice in physics for a long time is now becoming a reality in biology as well: platform sharing across institutes is a necessity to remain competitive in the frontline of life science. Moreover, it would benefit all partners: the technology provider is guaranteed that the critical mass needed to sustain the technology is available (by enlarging the customer base to several institutes), and the technology consumer gains access to platforms that the host institution cannot provide.

In order for the **capacity sharing across institutes** to work, the access to a core facility in another institute in another country has to be as easy as the access to a core facility in house. The access modalities and the costing and pricing systems would have to be consolidated between the partnering institutes, and each partner institute would need to assign a so-called "External Units Manager". This person would be the spokesperson for all the external platforms available, give advice on the technologies, and take care of the sample and data delivery. Furthermore, a legal framework needs to be established for sharing infrastructures between publicly funded research institutes in different countries, and contractual/IPR matters would have to be clarified and agreed upon.

Last but not least, **good funding systems for core facilities need to be implemented**. Usually, core facilities have to be implicated in research projects in order to gain access to extra-mural funding, and it is often hard to predict whether the involvement will truly generate resources or in fact eat up important parts of the capacity without generating a return for the facility. More funding schemes are needed that finance directly the infrastructures, as well as technology development and implementation without the need to focus on a research question.

Taken together, it is clear that there are still some hurdles to take to secure the well-functioning of core facilities over time, and that to do so it would be smart to join forces between institutes of high international standing, and ultimately to work towards a pan-European partnership.

4. A Pan European Core Facility Excellence Alliance

To explore the potential of bundling core facility expertise across institutes and countries, we propose to team-up with a number of selected research institutes with a validated track record in running cutting-edge core facilities. The proposed running name of this initiative is **"Core4Life, a core facilities excellence alliance"**.

The goals of Core4Life are:

1. Define best practices and common standards for:
    a. core facility management
    b. standard operation procedures
    c. quality control of samples and processes
    d. pricing policies
2. Scout for and validate emerging technology platforms with shared, non-confidential datasets.
3. Establish a training network for core facility personnel.
4. Develop a model for access sharing across institutes and countries (including technology sharing, technology specialization, fee-for-service agreements, IP sharing, etc.) with the aim to get privileged access for all scientists of the research institutes to all the platforms of the partners constituting the excellence alliance network. The goal is to legislate this model at EU level.
5. Lobby at EU (and national) level for increased funding opportunities for core facilities, shared equipment and core facility networks.
6. Explore over time the possibility to create a “European Association of Life Science Research Facilities”.

5. Action Plan

Since the benefits of such an excellence alliance would be manifold, the concept proposed by the core directors of VIB and CRG has been discussed recently in separate meetings with the core directors and facility leaders of i) EMBL Heidelberg, ii) IMP and the Campus Support Facilities GbmH in Vienna, iii) MPI-CBG Dresden, and iv) the FGCZ (a joint state-of-the-art research and training facility of the ETH Zurich and the University of Zurich) – all of which have expressed interest in joining the initiative. The proposal is therefore to nucleate **Core4Life** in this small circle of excellence, to work towards achieving some concrete goals as detailed below, and to explore the possibility of extending the alliance and incorporating additional partners at a later stage.

Concrete "things to do":

1. Best practise sharing

   Sharing of established SOPs/QC protocols between facilities with related technology platforms => Common server or email?

   - Sharing of costing and pricing models => Work group
   - Sharing of models for core facility management => Work group
     - research / technology development / service
     - participation in publications / acknowledgements
     - tracking user satisfaction
     - tracking future demand

2. Technology scouting
   - Exchange prior knowledge of the recent technology scouting activities among partners
   - Exchange information on on-going pilot studies/collaborations regarding emerging technologies with the possibility to include additional partners
   - Define common interests
   - Approach companies or foreign institutes as an alliance in order to get early or even beta-tester access to emerging technologies
     => Establish a joint work group that has regular phone/skype meetings
   - Organize joint technology seminars

3. Training
   - Identify unique knowledge/technologies/procedures in each institute
   - Identify training needs in each institute: i.e. type of technology/application/procedure, duration and type of training needed (course, hands-on practical, project collaboration)

- Exchange schedules of existing courses and hands-on trainings and see whether there could be overlapping needs
- Establish a schedule for specific training of core facility personnel in a partner institute
- Organize a joint summer school on bioinformatics, image processing and/or other topics

4. Capacity sharing
   - Make an inventory of available technologies per institute
   - Create a wish list of preferred future technologies per institute
   - Identify technologies that are highly attractive for a minority, though into which an individual institution will not invest. Eventually look for joint purchase options.
   - Identify technologies where sharing could make sense
   - Decide on one particular test case to exercise the sharing principle
   - Develop a model for sharing access
     - legal framework
     - IP issues
     - fees and invoicing
   - Define an operational roadmap that clarifies which particular services will be offered and – even more important – how they will be practically and financially facilitated.
   - Work towards legislating this model at EU level.

5. Lobbying at EU (and national) level for funding
   - Identify potential existing/fitting funding schemes => Work group
   - Work on a framework that is conform with the EU standard guidelines with respect to beneath aspects
     - legal
     - IPR
     - Financial

- Define strategy to approach EU policy makers => Work group
- Evaluate whether the current alliance network idea makes it attractive to start lobbying at national/regional level => Work group

6. Creation of a European Association of Life Science Research Facilities
   - Get insight into functioning/real value of the ABRF association
   - Push our alliance idea on the radar screen of ABRF board
   - Later on, evaluate potential value of opening up the nucleating excellence alliance to a real association

7. Next steps

1. Round table with Core Directors in Q2 2012 (May or June)
   - ⇨ agree on goals and define milestones
   - ⇨ agree on contributions from the partners and define concrete tasks
   - ⇨ decide about potential additional partners

2. Creation of a steering committee to follow up

3. Common (bi)annual retreat of core directors and facility leaders from all interested alliance partners in Q4 2012 (October-November)
   - ⇨ Possible format:
   - DAY 1
     - Arrival during the morning, joint welcome lunch
     - Afternoon: Introduction to the **Core4Life** concept and Pecha Kucha presentations (max. 5 min) by all facility leaders
     - Joint dinner
     - Assembly of work groups
   - DAY 2
     - Morning: Discussion groups per technology field
     - Afternoon: Work group meetings and core directors round table => define action plans; Wrap-up

   - Late afternoon/early evening: Departure

⇨ Additional time could be scheduled for institute-specific meetings.

4. Establish a yearly meeting schedule

⇨ Two Round tables per year by the Core Directors

⇨ Regular work group meetings

⇨ (Bi)annual joint retreat of all facility leaders

Summary

With the current position paper - and especially with the ideas and action steps mentioned – the ambition is to start a brainstorm within a small circle of excellence that ultimately can lead to the inception of a pan-European Core Facility Excellence Alliance.