

The Landscape of Physiology

Fifteen years into the 21st century, the landscape of opportunities for the physiological sciences within biology and medicine has become much clearer, and thankfully it is much brighter. This is an important development since, by contrast, the last 30 years of the previous century had become a pretty bleak environment for the more integrative fields of biology as university departments of physiology in various parts of the world changed name and focus, were absorbed into more basic departments, or even closed. Funding followed fashion, or was it the other way round? The fashion was that all would be revealed once we had read the “book of life,” the complete human genome. It took a mere decade of the present century for it to become clear that the “book” is an almost illegible “database” rather than a readable “program of life” that would automatically lead to advances in physiology and medicine. Ten years on, the leaders of the human genome project admitted that the outcome for human health is disappointing:

“But for all the intellectual ferment of the past decade, has human health truly benefited from the sequencing of the human genome? A startlingly honest response can be found on pages 674 and 676, where the leaders of the public and private efforts, Francis Collins and Craig Venter, both say ‘not much’” (1).

That is still broadly true, and the reasons are now becoming clear. On top of the 3 billion-long sequences of base-pairs lies a truly complex regulatory system, the epigenetic system, appropriately so-called since “epi-” means “above” and, as such, means that the genome is ulti-

mately controlled from above by the organism itself. This is where physiology will play a major role in helping to make sense of the molecular level discoveries. As the Nobel Laureate Barbara McClintock famously said, “the genome is an organ of the cell” (3). It is also an organ of the organism.

In consequence, one after another of the “dogmas” of 20th century biology has crumbled. We can no longer see the genome as “isolated,” as August Weismann did for the germ-line when Neo-Darwinism was born at the end of the 19th century and as its successor, the Modern Synthesis, proclaimed half a century later. On the contrary, evidence for trans-generational influences on health and disease has rapidly grown. Whole books now exist on trans-generational epigenetics (e.g., Ref. 5). In addition to epigenetic marking (control) of DNA itself, some of which has been shown to persist through multiple generations, there is epigenetic marking of the chromatins, the transmission of small RNAs, and behavioral marking of genomes in progeny. We may well have scratched only the surface of this physiological complexity: physiological because we will need to understand how these patterns of epigenetic control depend on the physiological state of the organism.

How is IUPS, as the international organisation representing the physiological sciences worldwide, responding to these momentous developments? This was a focus of a recent Council meeting held in Brazil at the time of the first meeting of the International Scientific Programme Committee for the next world Congress to be held in Rio de Janeiro in 2017. This editorial is based on the Officers' reports pre-

sented at that meeting of Council and the Council discussion of those reports. The detailed minutes of those discussions are available on the IUPS website (www.iups.org).

Activity of the President

The mission of the President, Denis Noble, was clearly stated in these extracts from his speech at the closing ceremony of the 2009 Congress in Kyoto, Japan:

“The responsibility that your Council, the new Council, has taken on board is a big one: to try to ride this change toward our discipline and to profit from it, and to do what many of my junior colleagues ask me sometimes: ‘What on earth does IUPS exist for?’ We need to give back to you, to the young and upcoming physiologists, the conviction that we are creating the environment in which our subject can flourish, and flourish effectively.

“So, the story, I think, is one of an upswing toward our subject, the need to find ways of riding that effectively, doing it in collaboration of course with our colleagues in the biochemical, molecular biological, and genetic and related disciplines, including I want to add the discipline of biology itself. Some of the most exciting areas I suspect in the next decade or two are going to be ways in which what we do can start to link back, as we once did, into the mainstream of biology in relation to areas like epigenetics, developmental biology, and evolutionary theory.”

Six years later, how much of that mission has been fulfilled? Those who attended the 2013 Congress in Birmingham, UK will know that, for the first time in decades, a symposium on physiology and evolution occurred. It was packed, as was the related opening lecture and other symposia on develop-

mental biology and epigenetics. A year later, a further outcome was a landmark special issue of the *Journal of Physiology*, referring to many other changes in the fundamentals of biology that have been highlighted in the “return of physiology to centre stage” (4). Many of the 50 or so authors of the articles in that issue are now featured on a website devoted to the new thinking about evolutionary and developmental biology, and the consequences for healthcare (<http://www.thethirdwayofevolution.com>).

They represent all the major branches of biological science, in itself an indication of the modern need for cooperation between the different biological sciences. We will highlight this issue again when we discuss IUPS involvement in ICSU below. The journal Special Issue itself was further celebrated at an event at Experimental Biology 2015 in Boston (https://www.youtube.com/watch?v=A_q_bOWc8i0; see also the video referred to in the section on membership below).

The Council minutes record that

“A second mission of the president’s office was to strengthen relations between IUPS and its member societies. For this purpose, he has been making contact with society presidents or secretaries and having telephone conversations, or face-to-face meetings when feasible. He spoke to the presidents about the work of the IUPS, and of the new dues calculation system. He reported that the society presidents were very pleased with his call, and asked why it had not been done before. He suggested that yearly phone calls with society presidents become a regular occurrence.”

So far as we are aware, this is the first time such an initiative has been undertaken by IUPS. It was universally welcomed by the roughly 25 societies contacted in this way, comprising about half the total IUPS membership. During 2016, the remaining national societies and academies will be contacted. This has been a valuable opportunity to learn more about the concerns of physiologists in different parts of the world and what they expect from IUPS. Those concerns have consequences for finance and organisation to which we will return later.

Activity of the Secretary-General and the IUPS Office

A major change in the Secretariat of IUPS followed the retirement of IUPS Manager Leslie Price last summer and the hiring of Steven Webster. The primary duty of the IUPS Manager is to facilitate communication within the union by arranging meetings of IUPS officers and members. For example, the Executive Committee used to meet just once a year in person but now meets monthly via teleconference. This has allowed the committee to get more work done faster. Monthly meeting minutes are posted to the IUPS website as they are approved.

While these changes have invigorated the Executive Committee, work remains to be done to achieve the same for Council. One change already implemented is that Council will be invited to meet with the Executive Committee three times per year via teleconference. In addition, we are currently discussing the future role of Council in the light of two new developments: the creation of the Board of the General Assembly and discussions on the role of the Commissions. IUPS will be bringing proposals on those forward in the near future.

As Secretary-General, Walter Boron was appointed Co-Chair of the International Scientific Program Committee (ISPC) for the 2017 Congress. The IUPS contingent was comprised of chairs of the commissions and committees of IUPS to help strengthen their role in IUPS. Several members of Council were also members of the ISPC.

Walter Boron also was responsible for the recently successful negotiation of the contract for the 2017 Congress. Reform of the process for contracts with future Congress organizers will be implemented before the next bidding process at the 2017 Assembly. In the future, bidders will agree to a Memorandum of Understanding (MoU), stating the main principles of the contract. This MoU will be signed before bidders give their presentations to the Executive Committee and General Assembly, 8 years before the IUPS Congress in question. Future presentations will provide financial details. At the 4-year mark, following approval by the General Assembly, a contract is to be signed.

A major activity of the Secretary-General has been on activities with other unions. IUPS is a member of the bio-unions, a group of similar organizations working within the International Council of Science, ICSU. IUPS has been active in helping to focus ICSU more on the concerns of the Bio-Unions. It also has led the way in organizing joint meetings, an example of which was the Multi-Scale and Inter-Union Systems Biology satellite meeting in 2013 and which led to a Special Issue of a Journal (2). During their meeting in Auckland, NZ, the Bio-Unions expressed interest in a similar meeting at IUPS-2017. During the Auckland meeting, ICSU passed a resolution stating that the impact factors of journals should not be used as a criterion for hiring or promotion. This is part of a wider initiative to improve the way in which journal indexes are used or misused.

Activity of the Treasurer

Peter Wagner became Treasurer at the 2013 Assembly and took office from the beginning of 2014. The annual budget shows that the single highest expense for IUPS is the Manager’s salary. The other highest expenses were money to be paid to APS for the publication of *Physiology* and money for use in inter-union activities.

A problem with IUPS finance is that it takes time to recover the dues to be paid by member societies and academies. One solution that we have begun to implement is a gradual shift of the dues due-date from the end of the calendar year to the beginning of the calendar year, as required by our Constitution and By-laws.

The Treasurer has been working with the Chair of the Board of the General assembly, Mike Spyer, to develop a proposed revision of the dues system based on a rational set of parameters. Given the huge global differences in physiological emphasis and funding, this has been challenging. When ready, this will be brought to the 2017 Assembly for approval.

Other Activities

Regional activities. Following a very successful meeting with African physiological scientists at the Birmingham Congress, IUPS has continued to liaise with

both anglophone and francophone Africa, including participation in recent regional congresses. This will continue during 2016 with Denis Noble being President of the next AAPS Congress in Lagos, Nigeria from September 5 to 8, 2016. There also will be participation in the next Congress of the Société Africaine de Physiologie et Physiopathologie in Abidjan, Ivory Coast, February 17–19, 2016. The President will also be representing IUPS at the joint meeting of FEPS and the French Physiological Society in Paris June 29 to July 1, 2016. The FAOPS council meeting was held in Bangkok during the 8th FAOPS Congress from November 22 to 25, 2015. Julie Chan, as First Vice-President of IUPS, reported to FAOPS Council Members on IUPS activity and progress in the preparation for IUPS 2017 Congress in Rio de Janeiro. Penny Hansen, as Second Vice-President, represented IUPS at the successful Pan-American Congress in 2014. IUPS has therefore maintained and developed connections with all the regional associations.

Membership. The links with the Democratic People's Republic of Korea, which sent two delegates for the first time to the Birmingham Congress, have continued, with IUPS issuing an invitation to the Academy of Sciences in Pyongyang to join IUPS. We hope to announce further expansion of IUPS membership worldwide at the Brazil Congress, to extend the successes announced at the Birmingham Congress (see *The Expansion of Physiology* at <http://www.voicesfromoxford.org/video/the-expansion-of-physiology/464>). This video is also relevant to the mission described above since it explains what

the Nobel Laureate, Sir James Black, meant in his famous prophetic phrase at the 1993 IUPS Congress: "The progressive triumph of physiology over molecular biology."

Liaison with the board of the general assembly. As the First Vice-President, Julie Chan is in charge of liaising with the BGA in its function to increase and expand the ability of the GA to play continuing, active roles in the management and operation of IUPS. Her role is executed through attendance at regular teleconference meetings with the BGA members. Major issues currently discussed in the BGA include dues restructure and regionalism of IUPS.

Physiome and systems biology committee. IUPS is working with its Physiome and Systems Biology Committee to explore the launch of a new journal that would cater to the physiological and systems biological modeling communities by supporting the use of modeling standards for reproducibility of models.

Constitution and By-Laws. The Second Vice-President, Penny Hansen, is working with the various groups of IUPS to develop and refine their terms of reference, bringing them in line with IUPS's Constitution and By-Laws. These new documents are expected to clarify the roles and responsibilities of commissions, committees, Council, and the officers and manager.

Education committee. The 21 members of this committee, chaired by Robert Carroll, work with their colleagues in every continent to develop and hold regional workshops and other events focused on development of expertise in teaching and

learning. Vice-Chair Maria da Rocha is leading planning for a 4-day Teaching Workshop to be held in association with the 2017 IUPS Congress in Brazil.

Looking Forward to Brazil 2017

The Executive and Council meetings were held in Brazil, in the summer of 2015, in parallel with extensive discussions about IUPS 2017 with its Brazilian Organizers and to visit the Congress site in Rio de Janeiro. At this stage, we can report that we have been excited by the clear enthusiasm of the Brazilian organizers, and particularly by the success that the Brazilian Society has had in reaching out to the young scientists. Many of the posters at their annual meeting were presentations of work done as projects by undergraduates. We are confident that Rio will continue the great tradition of IUPS Congresses with its theme *The Rhythms of Life*. See you in Rio!! ■

No conflicts of interest, financial or otherwise, are declared by the author(s).

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