

REPORT ON THE 17TH GENERAL ASSEMBLY OF THE INTERNATIONAL MATHEMATICS UNION 2014

The Australian Academy of Sciences is Australia's adhering organisation in the International Mathematical Union (IMU). Earlier this year, Australia increased its commitment to the IMU, increasing our membership level from Group III to Group IV. We are thus entitled to four (voting) delegates — this year they were Julie Clutterbuck (Monash), Michael Coons (Newcastle), Nalini Joshi (Sydney), and Brendan McKay (ANU). Clutterbuck and Coons were supported by the Australian Academy of Sciences, AMSI and the Australian Mathematical Society. Cheryl Praeger (UWA) also attended as a member of the Executive Committee.

The 17th General Assembly of the IMU was held on the 10–11 August, 2014, in Gyeongju, Korea. The Agenda is attached to this report. One correction, which should be noted for us, is under Item 2.2; the chair of the Finance and Dues Committee was Nalini Joshi (Sydney), not de León as stated.

Most items on the Agenda were routine and provided very little discussion. Those worthy of note here are separated into five sections, which comprise the remainder of our report: Secretariat, Resolutions, Recommendation, ICM 2018, and IMU Leadership for 2015–2018.

SECRETARIAT

At the IMU GA in Bangalore in 2010, the Federal Republic of Germany and the State of Berlin successfully bid to host the stable Secretariat of the IMU. The Project was driven by the shared goal of the Weierstrass Institute (WIAS) and the IMU to improve mathematical research internationally. For the IMU a stable secretariat strengthens the efficiency of its administration. The agreement was that the WIAS, financed by the Land Berlin and the German Federal Republic, would support IMU to maintain a stable secretariat in Berlin. The Secretariat is now established and has been functioning for almost four years now.

RESOLUTIONS

The Resolutions Committee was chaired by Günter Ziegler (Germany). There were 14 resolutions presented, the first several expressing thanks for the hard work both Korea and the leadership of the IMU put into the ICM and for Korea's provision of funding for researchers from developing countries to take part in the ICM activities (the NANUM 2014 project).

Resolutions worth noting individually here are the following, in order of appearance:

- **Resolution 6.** The General Assembly requests that the Executive Committee review the instructions given to the ICM Program Committees concerning the following goals:
 - 1) to achieve gender and geographical balance among plenary and sectional speakers;
 - 2) to ensure that the structure of the program reflects the current state and development of all mathematical areas.

The GA asks that each ICM Program Committee present an interim report to the EC about issue 2) at the time it has a proposal for the structure of the program and for the division into "sections," and that the final report of the Program Committee to the EC about their work specifically address both issues 1) and 2).

- **Resolution 7.** The IMU AOs should be invited to make suggestions for possible members of the Program Committee.

- **Resolution 11.** The 2015–2018 EC should establish, in 2015, an ad-hoc committee that will consider possible adjustments of the rules governing the IMU prizes and medals. This committee, appointed by the EC and consisting of past chairs of IMU award committees (Fields, Gauss, Nevanlinna, etc.), could in particular formulate recommendations about

- 1) announcing the prize winners before the opening ceremony of the ICM,
- 2) the possibility of single awards being shared by several collaborators, and
- 3) changing or relaxing the currently specified age limits.

The committee should report on its work, including recommendations it wishes to make, to the EC prior to the 2016 EC meeting. Recommendations approved by the EC will be sent to the AOs in 2016, for their consideration, in preparation for voting by the AOs.

- **Resolution 12.** An IMU member will automatically lose its membership by the end of 2015 if at present (August 11, 2014) it is four or more years in arrears, and if the EC finds that two or more years of dues remain unpaid by December 31, 2015.

- **Resolution 13.** The General Assembly requests that the IMU Executive Committee study the feasibility of introducing a new category of “IMU Regional Member”.

Resolutions 6 and 7 are interesting as they appeal to the ICM Program Committee to consult (or at least confer) with the IMU and its adhering organisations. This is quite a change from the past ways the ICM Program Committee has run and could have a large potential impact on the ways things are run in the future.

Resolution 11 seeks to establish a committee that will form recommendations about the procedures surround the IMU prizes and medals. It seems that this has been talked about in the past (we have heard this from talks with former people involved in the IMU), and may not be as controversial as it seems at first glance. That said, it may be a smart media move to announce the prize winners before the ICM. This may provide much more media attention for the IMU and ICM, which would certainly be of benefit.

Resolution 12 directly applies to several countries and their continued involvement with the IMU. The countries that stand to loose membership in the IMU by the end of 2015 are:

- | | |
|--------------------------|--------------|
| • Bosnia and Herzegovina | • Cuba |
| • Bulgaria | • Montenegro |
| • Cameroon | • Peru. |

As a consequence of being more than two years in arrear, the following countries have lost their voting rights:

- | | |
|--------------------------|----------------|
| • Bosnia and Herzegovina | • Peru |
| • Bulgaria | • Saudi Arabia |
| • Cameroon | • Spain |
| • Cuba | • Venezuela. |
| • Montenegro | |

Resolution 13 could be used in several ways. If a category of “IMU Regional Member” came into being and was essentially the same as a standard Group x member, it would let smaller countries with similar interests participate in the IMU in more substantial roles. The possibility of larger countries coming together would also be interesting to think about. What if we decided that we should be in a Regional group with New Zealand? What kind of impact would that have? The details of the outcome of what this resolution asks for should be very specific. One must wait and see it seems.

RECOMMENDATION

This section pertains to Item 6 of the Agenda, *Recommendation “Evaluation of individual researchers in the mathematical sciences”*.

A committee chaired by Wendelin Werner produced the report **Recommendation on the evaluation of individual researchers in the mathematical sciences** (attached to this report). It purports to address questions of how best to rank individual mathematicians, and in particular states

Nothing (and in particular no semi-automatized pseudo-scientific evaluation that involves numbers or data) can replace evaluation by an individual who actually understands what he/she is evaluating. Furthermore, tools such as impact factors are clearly not helpful or relevant in the context of mathematical research.

The report, while making a strong philosophical stand against bibliometric measures, was disappointingly lacking in concrete responses to problems like journal rankings being used as a proxy for research quality. As a delegation, we voted against the recommendation, but it was endorsed by the General Assembly.

While we completely agreed with the content of such a document, there is essentially no practical use for it.

The existence of this document as a statement from the IMU is puzzling. As stated by the IMU Booklet, the objectives of the IMU are:

- To promote international cooperation in mathematics.
- To decide on the location and assist the organisation of the International Congress of Mathematicians.
- To support other international scientific meetings and conferences.
- To acknowledge outstanding research contributions to mathematics by awarding scientific prizes.
- To encourage and support other international mathematical activities considered likely to contribute to the development of mathematical science in any of its aspects, pure, applied, or educational.

The document in question does not fall into any of these objectives. The IMU is not a union in the traditional sense, like our own NTEU say, but more of an association of societies that strive to foster excellence and cooperation within mathematics on an international stage. Recommendation of this document, while well-intentioned, is well-outside of the purpose and objectives of the IMU.

ICM 2018

As voted on at this year’s General Assembly of the IMU, the 2018 International Congress of Mathematicians will be held in Rio de Janeiro, Brazil, in August 2018, preceded by the General Assembly of the IMU, which will be held in Sao Paulo, Brazil.

IMU LEADERSHIP FOR 2015–2018

New members of the IMU Executive Committee were voted in. Of note, Shigefumi Mori (Japan) will be the next IMU President, and will be the first IMU President from Asia, and Helge Holden (Norway) will be the next IMU Secretary. The complete IMU Leadership list for 2015–2018 is attached.

Julie Clutterbuck
Michael Coons
September 11, 2014

AGENDA

SUNDAY, AUG. 10

08:15 – 09:00 Group photo, *Convention Hall (B1F), Hyundai Hotel, Artificial Waterfall*

09:00 – 10:30 GA meeting, 1st session

1. Opening of the 16th General Assembly ([I. Daubechies](#))
 - 1.1. Welcome ([I. Daubechies](#) and local hosts)
 - 1.2. Approval of agenda and guide through the GA documents ([M. Grötschel](#))
 - 1.3. Countries in arrears: Decision on voting rights ([M. Grötschel](#)), *Bulletin 64, No. 3.3*
2. Appointment of the following Subcommittees, *Bulletin 64, App I, No. 1*
 - 2.1. Credentials Committee ([C. Praeger](#))
 - 2.2. Finance and Dues Committee ([M. de León](#))
 - 2.3. Election Committee ([R. Piene](#))
 - 2.4. Resolutions Committee ([C. Rousseau](#))
 - 2.5. Tellers Committee ([Y. Long](#))
3. Review of the activities of the Union
 - 3.1. Overview on Union activities (report of the IMU EC) ([I. Daubechies](#), [M. Grötschel](#)), *Bulletin 64, No. 2.1, 2.2., 4.1; Bulletin 64, App II, No. 1*
 - 3.2. IMU Circle ([C. Rousseau](#))
 - 3.3. CDC presentation, including introduction of MENAO ([S. Kesavan](#)), *Bulletin 64, No. 4.3, 4.3.1; Bulletin 64, App II, No. 2*

10:30 – 11:00 Coffee/tea break

11:00 – 12:30 GA meeting, 2nd session

4. IMU Awards
 - 4.1. Review of Fields Medals rules ([L. Lovász](#))
 - 4.2. Making IMU Prize winners public ([L. Lovász](#)), *Bulletin 64, App I, No. 2 (D)*
 - 4.3. Leelavati and Ramanujan Prizes ([V. Srinivas](#))
 - 4.4. Overview of award selection procedures ([M. Grötschel](#))
5. Diversity in excellence in IMU activity (UK proposal) ([T. Lyons](#)), *Bulletin 64, App I, No. 2 (A)*
6. Recommendation “Evaluation of individual researchers in the mathematical sciences” ([W. Werner](#)), *Bulletin 64, App I, No. 3*

12:30 – 13:50 Lunch

13:50 – 15:45 GA meeting, 3rd session

7. Review of the activities of the Union (cont’d)
 - 7.1. CEIC presentation, WDML, CEIC Terms of Reference 2015-2018 ([P. Olver](#)), *Bulletin 64, No. 4.5., 4.5.1*
 - 7.2. ICMi overview ([F. Arzarello](#)), *Bulletin 64, No. 4.2*
 - 7.3. ICHM aspects and Joint Committee Guidelines ([C. Praeger](#)), *Bulletin 64, App I, No. 2 (B), 4; Bulletin 64, No. 4.4*
 - 7.4. Presentation of the GA, ICM Bidding, Handling Conflicts of Interest, Archiving, and IMU Membership Guidelines ([M. Grötschel](#)), *Bulletin 64, App I, No. 5, 6, 7, 8, 9*
 - 7.5. IMU finances/dues ([A. Mielke](#)), *Bulletin 64, No. 3*
 - 7.5.1. presentation of the proposal on reserves, *Bulletin 64, App I, No. 2 (C)*

15:45 – 16:15 Coffee/tea break

16:15 – 18:15 GA meeting, 4th session

8. Nominating Committee ([R. Piene](#))
 - 8.1. Introduction of the Nominating Committee, explanation of the nominating process
 - 8.2. Presentation of slates proposed by the Nominating Committee, *Bulletin 64, No. 2.5*
 - 8.2.1. IMU President
 - 8.2.2. IMU Secretary
 - 8.2.3. IMU Vice Presidents and IMU EC Members-at-Large
 - 8.2.4. President, Secretaries and Members-at-Large of CDC
 - 8.2.5. IMU Representatives to ICHM
 - 8.3. Very brief presentations of the nominated persons present at the GA
 - 8.4. Nominations from the floor
 - 8.5. Changes of the timeline of the nomination process (item 4. of the Procedures for the Election ...) ([I. Daubechies](#))
9. Office Committee report and discussion ([J. Toland](#)), *Bulletin 64, No. 4.8*

Subcommittee meetings in the evening by individual appointment

19:00 – 21:30 Gala Dinner at Gyeongju Hyundai Hotel, hosted by the Local Organizing Committee and supported by the provincial government, Gyeongsangbuk-do

MONDAY, AUG. 11

08:30 – 09:30 Subcommittee sessions

09:30 – 11:00 GA meeting, 5th session

10. Presentation of the Election Committee's proposals and Elections ([Chair of the Election Committee](#))
 - 10.1. Executive Committee (EC) of IMU
 - 10.2. Commission for Developing Countries (CDC)
 - 10.3. International Commission on the History of Mathematics (ICHM)
 - 10.4. Election of the 2015-2018 EC, CDC, and ICHM officers
11. Finance and Dues Committee ([Chair of the Finance and Dues Committee](#))
12. Balloting on 10. and 11. (written) ([Chair of the Tellers Committee](#))
13. ICM 2014
 - 13.1. Report of the ICM 2014 Program Committee ([C. Kenig](#))
 - 13.2. Report of the ICM-EOC ([H. Park](#))

11:00 – 11:30 Coffee/tea break

11:30 – 13:30 GA meeting, 6th session

14. Affiliate IMU Members and IMU related Organizations
 - 14.1. ICSU ([J. Ball](#))
 - 14.2. ICSU-IMU relations (e.g., ROLAC, ROAP, ROA) ([M. de León](#))
 - 14.3. ICIAM ([R. Jeltsch](#))
 - 14.4. AMU ([D. Makinde](#))
 - 14.5. EMS ([M. Sanz-Solé](#), [J. Kramer](#))
 - 14.6. SEAMS ([E. Tri Baskoro](#))
 - 14.7. UMALCA ([J. Seade](#))
 - 14.8. Friends of IMU ([I. Daubechies](#))
 - 14.9. MPE 2013 ([C. Rousseau](#))
15. Presentation of Resolutions Committee ([Chair of the Resolutions Committee](#))

13:30 – 14:30 Lunch

14:30 – 16:40 GA meeting, 7th session

16. Ballot results of Elections, Finance and Dues voting (Chair of the Tellers Committee, I. Daubechies)
17. Resolutions balloting (Chair of the Resolutions Committee)
18. ICM 2018
 - 18.1. IMU EC Site Recommendation for ICM 2018 (M. Grötschel), *Bulletin 64, No. 4.7*
 - 18.2. Presentation of the Committee for Rio de Janeiro ICM 2018 (M. Viana), *Bulletin 64, App II, No. 3*
 - 18.3. Location of ICM 2018 balloting (Chair of the Tellers Committee)
 - 18.4. Meeting of the 18th IMU General Assembly (M. Viana)
 - 18.5. ICM 2022, invitation to announce interest to bid
19. IMU Membership, *Bulletin 64, No. 2.3, 2.4*
 - 19.1. New Members (M. Grötschel)
 - 19.2. Group changes (M. Grötschel)
 - 19.3. Applications for Membership/Associate Membership, Presentations of new members (Representatives of applicants), *Bulletin 64, No. 2.6*
 - 19.4. Membership applications balloting (Chair of the Tellers Committee): Papua New Guinea, Senegal
20. Miscellaneous (I. Daubechies)
21. Any other item with the permission of the President (I. Daubechies)

17:10 Meeting Time for Farewell Dinner, Lobby of Hyundai Hotel

17:30 Depart Time for Short guided tour for the Cheomseongdai and the Daereungwon before the Farewell dinner, busses leave from Hyundai Hotel

19:00 – 21:30 Farewell Dinner at Gyeongju East Palace Garden, hosted by the Local Organizing Committee and supported by Gyeongju City

3. Evaluation of Individuals

Recommendation on the evaluation of individual researchers in the mathematical sciences

endorsed by the IMU General Assembly on August 11, 2014

I. Introduction

The question of how to evaluate and rank the work of academics or scientists has been a recurrent theme since the early days of universities. This issue is closely entwined with questions about the role of scientists in society and the role of education, so that it is difficult to discuss it without considering the wider contexts as well. A number of the aspects of an evaluation process are not specific to mathematics or mathematicians: Each scientific discipline faces similar issues. Hence, interdisciplinary working groups have been producing documents/guidelines on these questions for many years. The present document deliberately does not focus on the rather timeless and important issues that have been often and thoroughly discussed (rules about conflict of interests etc.), nor what is common to all sciences. Rather its goal is to address the following two specific questions:

- * What aspects of evaluation are specific to mathematics? A reason for focusing on this issue is that mathematics often needs to be treated somewhat differently from those sciences where teamwork and funding play significantly different roles. Mathematicians have often found it difficult to make this point on interdisciplinary panels, with unfortunate outcomes from their scientific standpoint. The present document aims to help with discussions involving colleagues from other disciplines.
- * What is new, i.e., what are the important side-effects of recent developments (internet, internationalization, the growing scientific community, economic constraints, generalization of audit rules) on the way in which mathematicians are evaluated, and which have had strong negative effects that need to be corrected or counterbalanced.

When stressing the specificities of mathematics, one should not forget that a large and important part of the mathematical community is, for obvious and good reasons, working a little differently from the more academically inclined mathematician. In such cases, the “standard” (but specific) evaluation criteria that we will discuss (mostly based on a detailed study of research papers) in the next section of the present document have to be adapted again. For instance, for applied mathematicians involved in projects with confidentiality clauses and/or industrial applications and/or software development, for mathematicians involved in interdisciplinary work or in mathematical education, one needs a different perspective. This document is therefore divided into two parts: The first part, which deals with “generic” academic mathematicians, and a second part commenting on aspects of evaluation in several other important cases.

An important preliminary statement: The evaluation of the performance of an academic is used for many purposes (hiring, promotion, grants etc.) and in most cases the assessment of research activity is only one of many parameters. Many other aspects are essential for a well-functioning academic environment, and are important factors to take into account when such decisions are made. **The present document is commenting only on the part of the evaluation dealing with the research activity; in the appendix, we give some examples of other criteria that can be taken into account in the academic evaluation of individuals.**

II. The case of the “generic” academic mathematician.

Generalities, specificities of mathematics, dangers of semi-automatized evaluations:

Assessment criteria are not universal and uniformity of evaluation criteria is not necessarily a goal. For example:

- * University systems in different countries are different, and the variety of individuals with different academic backgrounds is part of the richness for our international community.
- * The evaluation of the work of mathematicians when choosing the recipient of an international prize is not the same as when deciding whom to hire for a junior faculty position.
- * National communities may seek to take special measures, for example where they perceive potential weaknesses (possibly, a lack of innovation and originality in some areas or a lack of rigour and clarity in others) that they wish to correct, and therefore take them into account when making decisions.

It is standard nowadays for an evaluation committee to examine:

- * an individual’s publication list (including the names of journals; co-authors; the number of published pages);
- * a research statement in which the individual describes the research in a more general context;
- * one or several evaluation letters written by specialists, who are supposed to have read the individual’s papers.

These specialists may, or may not, belong to the committee, and their contribution is essential. Indeed, a proper evaluation of the significance of research papers requires a close examination by an expert who is actually able to understand them. The use of semi-automatized quantitative evaluations based on journal factors can easily lead to mistakes. At first glance these methods look objective, scientific, and not subject to manipulation or controversy. However this is not so, and they can have some very negative side-effects:

- * High-level research is driven by originality, invention and risks (one starts an ambitious project without any guarantee of success). All these aspects would be penalized by a standardized evaluation based on bibliometric data alone.

- * Bibliometric evaluation leads to an increase in the number of published papers, because it favours publication of series of papers where results are improved step by step. For the sake of mathematics research in general, it is more important that papers are well-written and in final form. One highly innovative paper is usually more important in the long run for our community than ten technical but routine papers, regardless of the journal in which they are published. In fact, prepublication servers should make it possible nowadays to post prepublications that are not submitted to publications, but will be incorporated in a longer/cleaner/more definite paper that will be published later.
- * Impact factors: It is not uninteresting to look at the data that measures how much a given paper has been cited by other papers (such data is made available by the mathematical community itself, for instance by the AMS in MathSciNet), but a lot of care is needed when handling it. First, some fields of mathematics tend to publish many more papers than others, so that one cannot compare such data for a person working in one field (say, category theory) with someone working in another (e.g., biostatistics). Second, it is very easy to artificially create a blow-up of bibliometric data (for instance by cross-referencing etc.) and to manipulate impact factors.

It is therefore important to encourage mathematicians who serve on panels to explain to scientists of other disciplines that bibliometric evaluation is particularly inappropriate for mathematicians. We hope that the present document can help in making this point. It is worth stressing that mathematicians are not advocating that other sciences should change their specific evaluation criteria; IMU does not claim that it knows the best way to evaluate chemists or economists. The conclusion of this paragraph is the following somewhat obvious statement, which is the core of the present document:

Nothing (and in particular no semi-automatized pseudo-scientific evaluation that involves numbers or data) can replace evaluation by an individual who actually understands what he/she is evaluating. Furthermore, tools such as impact factors are clearly not helpful or relevant in the context of mathematical research.

It might look tempting to produce alternative bibliometric tools (keeping in mind that most impact factors are produced by commercial companies for whom it is a business), but this is not something that IMU wishes to be involved with, given the intrinsic negative side-effects of such tools.

The “audit” philosophy and science, explosion of evaluation activities.

The role of “evaluation” has become more and more important in recent decades. The concept of “auditing”, probably first developed in a business context (accounting and then management), has now permeated many parts of Western societies. It is based on the belief that uniform, comparable, objective, evaluations of almost anything, people, organizations, companies, products etc., are possible. In particular, many funding bodies are now so convinced of the importance and universality of the evaluation of scientific activities that they tend to insist on using their evaluation rules, often based on semi-automatized “objective” criteria such as Key Performance Indicators (KPI), even though most experts agree on the fact that these methods are not well-adapted to science in general, and to mathematics in particular.

Another negative side effect of this “generalized audit philosophy” is the proliferation of evaluation activities, which arise because each layer of decision-making wishes to perform its own evaluation. While it is clear that some level of evaluation activity is useful, and that every active mathematician could in principle devote some of his/her time to evaluation of others’ work (this starts with the most important and essential part, which is the refereeing of research papers submitted for publication), it is also essential that they keep as much time as possible free for their own research. The proliferation of evaluation activities is a real danger. Moreover it induces a change in the perspective of scientists themselves, i.e., in the way they do and present their own research. The primary goal of research is not to get a good grading at an evaluation, but to simply make progress in understanding things. Shifting these goals would have again very negative consequences.

Smaller scientific communities.

How can all scientific communities get access to a sound and sensible evaluation procedure, and in particular to appropriate evaluators? Smaller countries, or those with very heterogeneous research activities, can find it very difficult to obtain reliable and objective information about the level and quality of their research output. The alternative often seems to be a choice between two poor options: rely on the local community (with the obvious danger of self-evaluation and conflict of interests -- clearly to be prohibited), or a semi-automatized bibliometric system as discussed above, which cannot be viewed as a positive long-term way of dealing with this issue. Another solution is certainly desirable.

There may be a case for *creating a supra-national structure* to help in such evaluation activities and it is reasonable to ask whether it is IMU's role to implement such an idea. Arguments in favor include the question “who else?”. The main argument against it is that IMU's main goal should be to bring mathematicians together, and not to be a source of tensions that such evaluation activities inevitably create. The dangers that could arise if the IMU gets directly involved in such activities seem to outweigh the benefits.

III. Additional specific comments

Multi-disciplinary and industrial mathematics.

As stated above, the assessment of mathematicians should be based on careful evaluation of their scientific work and not on semi-automatic KPI of any kind. In this paragraph, we draw the attention to special issues arising in the evaluation of mathematicians who are strongly involved in multidisciplinary projects, either in academia or in industry.

Attention is restricted here to mathematicians who have developed novel mathematics *and* used it to solve an applied problem, motivated by challenges from other sciences and industrial (or other) applications. This workflow, modelling-research-development-application, that is of major importance is of a somewhat different nature than the one discussed above. We stress again that work that only involves direct applications of already existing mathematical tools or techniques is not discussed in the present paragraph (this latter type of work can be assessed by the criteria relevant to the applications area only).

Because of the extreme diversity of publication cultures in multidisciplinary projects and in industry, it is even more crucial to base an assessment of this type of research activity on expert evaluation, which can be a very demanding but necessary one. Given the importance of such activities, both in terms of applications as well as for mathematics itself, it is of particular importance to perform this difficult task well.

While the previous general remarks about the evaluation of the mathematical novelty remain true, additional criteria should be used to recognise some additional and specific challenges:

- * The benefit of the mathematical perspective to the community of the “problem owner” is very important. Therefore it is allowable that some lack of complete mathematical details or theoretical importance (not to be confused with lack in rigour or novelty) is compensated for by relevance to the “partner” community, in which other indicators can be significant. For example, in publications in other sciences, the first nominated author has a strong meaning, while the alphabetical order is the tradition in mathematics papers. So to conclude this paragraph: Assessment in such activities can include criteria used in other sciences, but **in addition, not as a substitute**, to the relevance on mathematics itself.
- * Additional issues arise for mathematicians working in industry or in industrial projects. Here special restrictions may prohibit full publication of the scientific work, either by intellectual property restrictions or (more often) by a lack of time to develop full detailed proofs. Panels or evaluators have of course to take this also into account.
- * A related issue is the fact that the “end-product” of such research and development activity is not necessarily a research paper: It can be for instance a software, the development and implementation of which is a very fundamental and time-consuming aspect that can be also of mathematical nature. This example illustrates the variety of possible important contributions that should be taken into account when performing an evaluation.

Mathematics Education.

What follows are some brief comments on the evaluation of researchers in mathematics education. This is a community that is organised very differently from one country to another. For instance, its members are sometimes part of the formal academic/university community, sometimes affiliated to teacher's associations, and sometimes part of the Ministry of Education. Moreover it is a field with a great diversity in aims, foci, methodologies and programmes, ranging from the epistemological analysis of parts of mathematical knowledge to be taught (usually in an academic context), to the design and analysis of a short term classroom experiment (typically involving teachers), to the design and analysis of teacher education programmes, or to large research studies carried out in collaboration with schools. Sensitivities to different categories of students (from low achievers to gifted), or different social and cultural backgrounds, are also factors and require inputs from cognitive and social sciences. All these disciplines are necessary for achieving the ultimate aim, which is to improve the quality of mathematics teaching and learning at all levels.

This area therefore involves some mathematics, but has very significant inputs from all the above-mentioned fields. Hence, evaluating contributions on this topic requires a blend of criteria that are suited to each of these fields.

Appendix: A non-exhaustive list of aspects that can or should be used in evaluation:

All these familiar aspects of academic life are essential and our community needs them to be performed properly. They can also contribute in indirect, but significant ways to high-level research. Note that this is quite a long list, and that no individual is supposed to tick all boxes

(writing computer software does for instance only concern a fraction of the mathematical community, not all researchers have teaching duties, etc.).

- * Research articles in international journals;
- * Research monographs, textbooks, classroom notes;
- * Applications, production of software, programming code;
- * Special programs organized, especially in institutions where such activities are selected through competitive evaluation of proposals;
- * Conferences and seminars organized, especially in institutions where such activities are selected through competitive evaluation of proposals;
- * Courses taught, new courses created, teaching awards;
- * Refereeing;
- * Academic awards;
- * Supervision of students: PhDs, masters, undergraduates, future teachers;
- * Elected membership in learned societies and other academic institutions;
- * Advisory activities, including editorial work for international journals;
- * Outreach activities: popularization articles, public lectures, lectures or competitions in schools, role in teachers associations, etc.
- * Administrative duties;
- * Efficiency and reliability.

This document was prepared by a committee set up by the Executive Committee of the International Mathematical Union, composed of the following mathematicians:

- * *Mariolina Bartolini Bussi (nominated by the International Commission on Mathematical Instruction (ICMI))*
- * *Carlos Cabrelli (nominated by the Commission for Developing Countries (CDC))*
- * *Andreas Schuppert (nominated by the International Council for Industrial and Applied Mathematics (ICIAM))*

and chaired by

- * *Wendelin Werner (IMU Executive Committee).*

IMU Leadership 2015 – 2018

IMU Executive Committee (EC) 2015 – 2018

Shigefumi Mori	IMU President	Japan
Helge Holden	IMU Secretary	Norway
Alicia Dickenstein	IMU Vice President	Argentina
Vaughan Jones	IMU Vice President	New Zealand/USA
Benedict H. Gross	IMU EC Member-at-Large	USA
Hyungju Park	IMU EC Member-at-Large	Korea
Christiane Rousseau	IMU EC Member-at-Large	Canada
Vasudevan Srinivas	IMU EC Member-at-Large	India
John Francis Toland	IMU EC Member-at-Large	UK
Wendelin Werner	IMU EC Member-at-Large	Switzerland
Ingrid Daubechies	IMU EC Ex-officio Member (Past President)	USA

Commission for Developing Countries (CDC) 2015 – 2018

Wandera Ogana	CDC President	Kenya
C. Herbert Clemens	CDC Secretary Policy	USA
Srinivasan Kesavan	CDC Secretary Grants	India
Mama Foupouagnigni	CDC, African Member	Cameroon
Polly Sy	CDC, Asian Member	Philippines
Alf Onshuus	CDC, Latin American Member	Colombia
N.N.	CDC Member appointed by IMU EC	
N.N.	CDC Member appointed by IMU EC	
N.N.	CDC Member appointed by ICMI EC	
Shigefumi Mori	CDC Ex-officio Member (IMU President)	Japan

International Commission on the History of Mathematics (ICHM) 2015 – 2018

Ciro Ciliberto	ICHM	Italy
Shrikrishna G. Dani	ICHM	India

International Commission on Mathematical Instruction (ICMI) 2013 – 2016

Ferdinando Arzarello	ICMI President	Italy
Abraham Arcavi	ICMI Secretary-General	Israel
Cheryl E Praeger	ICMI Vice President	Australia
Angel Ruiz	ICMI Vice President	Costa Rica
Catherine P. Vistro-Yu, Ed.D.	ICMI EC Member-at-Large	Philippines
Jean-Luc Dorier	ICMI EC Member-at-Large	Switzerland

Roger Howe	ICMI EC Member-at-Large	USA
Yuriko Yamamoto Baldin	ICMI EC Member-at-Large	Brazil
Zahra Gooya	ICMI EC Member-at-Large	Iran
William (Bill) Barton	ICMI EC Ex-officio Member (Past President)	New Zealand
Shigefumi Mori	ICMI EC Ex-officio Member (IMU President)	Japan
Helge Holden	ICMI EC Ex-officio Member (IMU Secretary)	Norway

Committee on Electronic Information and Communication (CEIC) 2015 – 2018*

Olga Caprotti	CEIC Member	Jul 1, 2008 – Dec 31, 2016	Finland
Tim Cole	CEIC Member	Jan 1, 2013 – Dec 31, 2016	USA
James Davenport	CEIC Member	Jul 1, 2008 – Dec 31, 2016	UK
Carol Hutchins	CEIC Member	Jul 1, 2008 – Dec 31, 2016	USA

Further members to be
appointed

* CEIC terms of membership are staggered.

Persons representing IMU in various organizations

To be appointed