Recent Advances and Challenges in the IFToMM PC for History of MMS

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Abstract. The paper presents a brief account of the evolution of the IFToMM Permanent Commission (PC) for History of MMS in terms of activities and people involved in order to illustrate the evolution of the commission with its peculiarities, problems, results, and the possibility of satisfying the constitution purposes of the commission in terms of keeping memory of the history of the IFToMM and of the thematic areas of the MMS (Mechanism and Machine Science) with evaluations and interpretations of historical-technical nature. The examination of these activities is centred on the developments of the last twenty years referring to an activity of the commission with an increasing impact not only within the IFToMM community. The conference, editorial, and social activities are reported with chronicle outlines, including the interaction among the members of the commission, with particular reference to the HMM Symposium on history of mechanisms and machines started in 2000 and the book series of History of MMS started in 2007.

Keywords: History of IFToMM · History of MMS · History of PC history of MMS · History of HMM symposium · History of book series on history of MMS

1 Introduction

The history of a community, even specific to a commission, can be considered significant to outline not only the development of issues of interest to that community but also to trace the involvement of people with their specific activities at the service of the community, as stressed in (Koetsier 2000).

In general, historical studies of communities refer to much broader areas and only recently, also thanks to the IFToMM PC (Permanent Commission) on the history of MMS (Mechanism and Machine Science), attention has been directed to tracing the historical evolution of even specific communities of a more modest associative dimension.

In particular, the history of the commission was analyzed in a first work (Ceccarelli and Koetsier 2004) which outlined its characteristics and evolutionary ideas in the first years of activity up to a maturation period from which this historiographical work centers its focus. The history of the PC for history of MMS also hinges on the activities of the

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entire IFToMM world community, contributing to its identity and historical development as reported in wide-ranging papers like for example (Artobolevski 1976; Morecki 1995; Angeles et al. 2004; Ceccarelli 2015) and also in papers on the experience of individuals in various roles at the service of the technical-scientific community, such as for example (Ceccarelli 2014b and 2022).

This paper is intended to be a report of the successful activities carried out in the last twenty years by the PC for History of MMS with commitment and success by all its members, but it has also the aim of indicating the need for attention to specific aggregation for the commission future with its purposes of monitoring, research, and interpretation of the historical developments of the whole IFToMM community and of its technical-scientific issues relating to MMS. Particular attention is paid to the commission's own identity and historical development through this survey.

2 A Short Outline of the History of the PC

Figure 1 summarizes the historical development of the commission with an indication of the main facts that characterized its evolution. In particular, the historical development can be outlined in three phases, namely a first pioneering phase of initiation and consolidation of the commission within the IFToMM structure in the years 1972–1985, a second phase of rooting of the commission with a first activity in the history of engineering at the level of interest for the IFToMM community in the years 1986–2000, and finally a third phase of reached maturity of the commission with substantial activity in research and publication not only within the IFToMM community in the years 2000 onwards. The historical development of these three phases was also characterized by the leadership of the commission chairs who, with their vision and activities, allowed and guided the development in the commission as it is now recognized both at the level of a substantial IFToMM community and at the level of specific interests in the technical-scientific history of mechanical engineering with particular interest in the MMS.

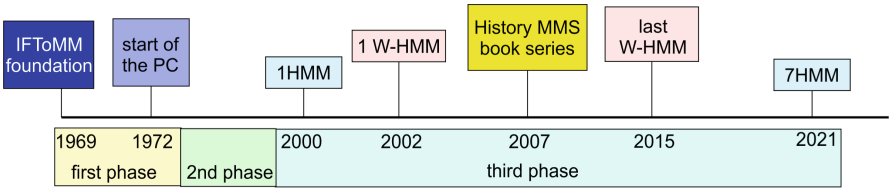


Fig. 1. A timeline of the historical evolution of the PC for History of MMS

In particular, the milestones in Fig. 1 refer to the most significant decisive events for the development of the commission. In 1972 the commission was created following the proposal of Professor Jack Phillips who, with a pioneering vision, recognized the importance of the history of the community and of the discipline that can be worked out from a technical-historical point of view, also and above all. To track the developments of the IFToMM Federation and the MMS.

After a long incubation period in which the commission chairs have rooted their interest in the history of the disciplines and of the Federation, in the year 2000 the HMM symposium series began following a documented maturity of the commission with an ever-increasing number of publications especially in the IFToMM world congresses. The HMM 2000 symposium, (Ceccarelli 2000), established a specific congress area for the commission on a regular basis and with an international organization that achieved regular success with events on all continents and with the seventh symposium the frequency of the event was reduced from four to two years. Furthermore, the success of the HMM symposium has led to the possibility of proposing and therefore launching the HMMS book series at the international publisher Springer in 2007, (Ceccarelli 2007a, b). To date, the series counts the publication of 39 volumes including conference proceedings and monographs referring to studies and historical evaluations of various disciplines of the MMS. No other milestones are highlighted in the timeline in Fig. 1, especially in order not to diminish the continuous development and obtaining concrete results that have determined a consistent community of the commission with an ever more significant commitment and impact both in the disciplinary areas of the history of science and technology as within the international community of the IFToMM Federation. In the following paragraph some of the main activities will be indicated with their most significant results.

The indications of the chair of the commission with their temporal mandate is useful to indicate the plurality and internationalization that the commission has always had since the first days: Jack Phillips (1972–1981) from Australia, Elisabeth Filemon (1982–1990) from Hungary, Teun Koetsier (1991–1997) from Netherlands, Marco Ceccarelli (1998–2002) from Italy, Hong-Sen Yan (2003–2006) from China-Taipei, Hanfried Kerle (2007–2010) from Germany, Thomas Chondros (2010–2013) from Greece, Olga Erogova (2014–2017) from Russia, and Alessandro Gasparetto (2018-present) from Italy.

In the first phase, the research activities in the history of mechanical engineering were very limited and sporadic, with one or two papers in the IFToMM world conferences, as well as in the second phase but with a greater impact also documented by the identification of the topic of history of engineering within the topics of interest for IFToMM congresses and especially in the IFToMM World Congress. The history of the first two phases is therefore characterized by a limited activity at the level of publications but it was nevertheless fundamental in establishing the interest in the discipline of the technical-scientific history of mechanical engineering and not only in the history of the IFToMM community. As initially established for the purpose of the commission in 1972, as reported in (Ceccarelli and Koetsier 2004). The third phase that can be identified with the start of the HMM symposium, IFToMM International Symposium on History of Machines and Mechanisms, in the year 2000, is characterized not only by a commission with a large number (more than 45) of active members but above all by a considerable activity both at the congress and editorial levels also with the start of the publication of a specific book series on the history of mechanical engineering.

3 Recent Advances

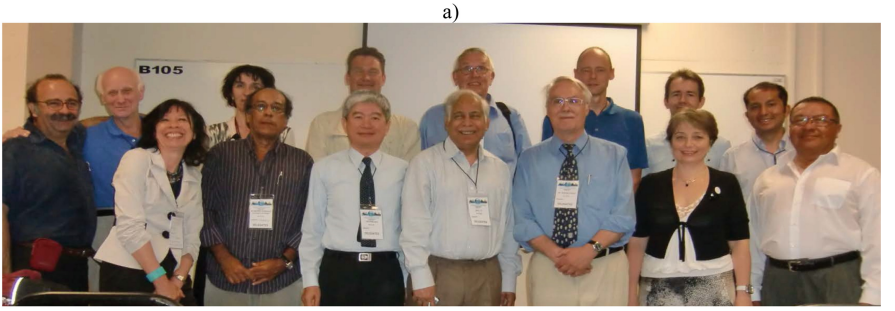
In particular, the aspect of growth of the consistency of the commission in terms of number of members and its international representation can be summarized considering that at the start of the third phase the PC had just 4 members (prof T. Koetsier from Netherlands, prof. A. Dimarogonas from USA, prof.H. S.Yan from China-Taipei, and prof. M. Ceccarelli from Italy) and already in 2005 it had 45 until reaching 60 members in 2015 representing almost all 44 countries that are represented in the IFToMM community (see Appendix for current members). The aggregation of people to the PC was possible due to the interest in the subjects of the activities of the PC and thanks to the regular organization of committee meetings not only as prescribed by the IFToMM constitution but also as a meeting forum for mutual knowledge and discussion of programming for the PC. Figure 2 shows photos as examples of the PC meetings to which generally not all the members have participated but to which all have referred. However, the photos shown also represent an alternation of participation by members in these meetings. In addition to the institutional meetings of the PC, since 2002 the Workshop HMMS was also instrumental with its two-year schedule and location that facilitate the participation of PC members:

- ADMONT 2002 by prof M. Husty and M. Ceccarelli
- DRESDEN 2004 by prof Corves and dr Kerle
- MOSCOW 2005 by prof Golovin
- QUERETARO 2005 by prof C. Lopez-Cajùn
- ITHACA 2006 by prof F. Moon
- BANGALORE 2007 by prof A. Ghosal and prof J.S. Rao
- PORTO ALEGRE 2009 by prof A. Oliveira
- BEIJING 2010 by prof B. Zhang
- ATHENS 2013 by prof T. Chondros
- PALERMO 2013 by prof. F. Sorge and M. Ceccarelli
- TIANJIN 2014 by prof J. Dai and T. Huang
- St PETERSBURG 2015 by prof. A. Evgrafov and O. Egorova

The HMM symposium also had a similar function of meeting, since it was celebrated regularly going around the world in different cities and in the last period, also thanks to the success of participation with authors form more than 15 countries at each event, has seen a reduction in the frequency of programming with the events listed below:

- HMM 2000 in Cassino by M. Ceccarelli, (Ceccarelli 2000)
- HMM 2004 in Cassino by M. Ceccarelli, (Ceccarelli 2004)
- HMM 2008 in Tainan by H.S. Yan, (Yan and Ceccarelli 2008)
- HMM 2012 in Amsterdam by T. Koetsier, (Koetsier and Ceccarelli 2012)
- HMM 2016 in Queretaro by C. Lopez-Cajùn, (Lopez-Cajùn and Ceccarelli 2016)
- HMM 2018 in Beijing by B. Zhang and Y. Cheng, (Zhang and Ceccarelli 2019)
- HMM 2021 (postponed to 2022) in Jaén by R. Lopez-Garcia

a)



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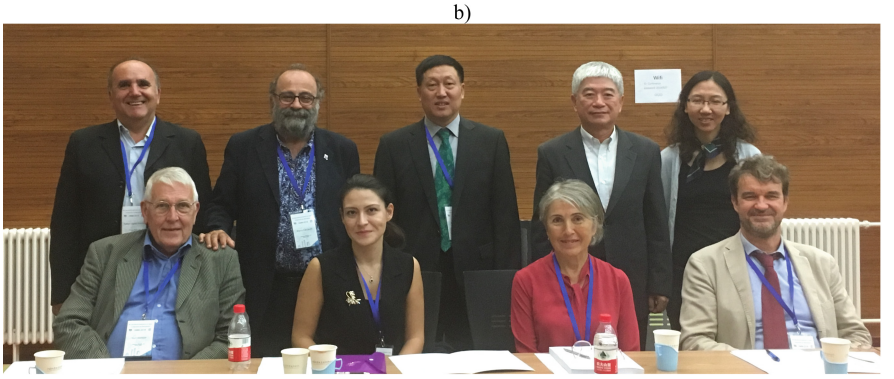


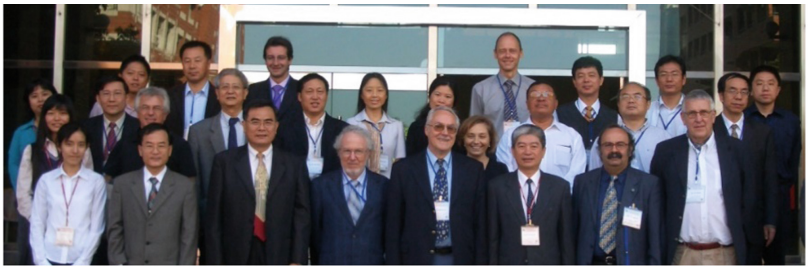
c)

Fig. 2. Examples of PC meetings: a) in 2004 at WC in Tianjin (China); b) in 2011 at WC in Guanajuato (Mexico); c) in 2018 at HMM in Beijing (China)

Fig. 3. Examples of Proceedings of HMM symposium: a) in 2000 by Kluwer; b) in 2004 by Kluwer; c) in 2016 by Springer; d) last one in 2018 by Springer

Figure 3 shows the cover pages of the Proceedings of HMM symposium over the years with the last title characterization through the name 'Explorations'.

Figure 4 shows examples of participants though the group photos that are regularly taken at the HMM symposia both for historic records and personal memory of the



a)

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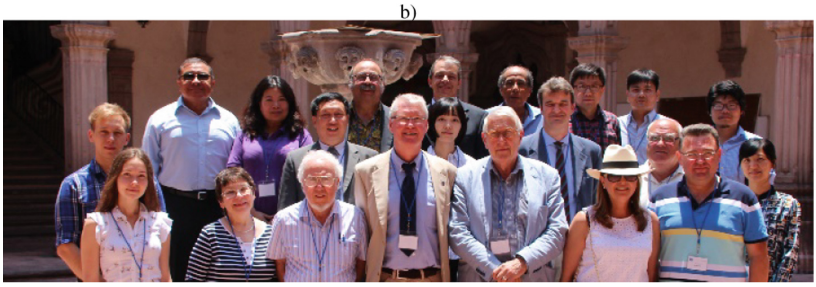

c)

d)

Fig. 4. Participants at HMM symposium over the years: a) in 2008 in Tainan; b) in 2012 in Amsterdam; c) in 2016 in Queretaro; d) in 2018 in Beijing

participants. It is to note that at the HMM symposia participants come also from other communities permitting a very multidisciplinary program dealing with historical aspects with viewpoints from mechanical engineers (as most of the PC members), engineers from other fields, historians, architects, archaeologists, philosophers and so on. Figure 5 shows a group photo of the members of the International Scientific Committee (ISC) for HMM who are PC members with the will to support and organize the event not only in their countries but also looking at new communities for sharing results for the significance of the history of MMS and mechanical engineering with technical understanding for a modern revalorization. With such a goal, Best Paper Awards were planned since the second event and even with an interest from the published Springer, as shown in Fig. 6.

Fig. 5. The meeting of ISC for HMM in 2012 (from left: H.S. Yan, M. Ceccarelli, T. Koetsier, C. Lopez-Cajun, A. Golovin, and H. Kerle)

The most significant activities in terms of impact and productivity of the PC can be summarized in the HMM symposia and HMMS book series which are the two reference initiatives, respectively in terms of conference event and editorial context. The outcome of the symposium with the first two events in 2000 and 2004 made it possible to convince the publisher Kluwer, later merged into Springer, to start in 2007 a specific book series for the subjects of history with also technical aspects that are the characterization both of the symposium and of the volumes published in the series. This characteristic differentiates the PC community from the traditional fields of history of science and technology as the interests and results of the investigations refer to complementary historical analyses when they are better focused on technical contents for a modern interpretation and re-evaluation of past achievements and figures in mechanical engineering. The HMHS series on the history of MMS was launched in 2007, (Ceccarelli 2007) with a wide-ranging vision of all issues referring to historical investigations such as theory, design, practice, and use of machines, including attention on how machines have evolved over time in the history of social and technological evolution.

The particularity of the approach for the book series is also summarized by the logo chosen for the series shown in Fig. 7 as a synthesis of the images used in the Call for Papers of the HMM symposium of 2000 and 2004. In particular, this logo represents, at this right, the image of a model for analysis and synthesis of a mechanism by Lorenzo

Fig. 6. Best Paper Awards at HMM symposium: a) the first one to prof. K. Kerle in 2004; b) the first Springer Award at prof B. Zhang in 2012; c) first student and regular Awards in 2018

Allievi in his book Cinematica della Biella Piana of 1895th is used as an idealization of the mechanisms that move progress being the evocative image of a human figure in advance and combining it with a portion of the table catalog of mechanisms proposed in Monge's analysis in Lanz and Betancourt's book of 1808.

A particular aspect has been dedicated from the beginning, as the first volume of the series demonstrates in Fig. 8a), to identifying the personalities who have contributed most to technical development also with reference to the specific IFToMM community. The aim is not only to recognize the significant figures in the fields of MMS over time, but to create a sort of specific Dictionary of Who-is-Who with special attention to the technical-scientific contributions in the fields of MMS that could be of reference and inspiration for the future generation of MMS scientist.

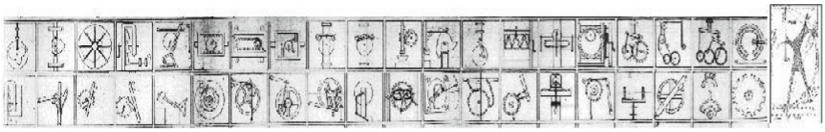

Fig. 7. Logo of the book series on History of MMS

In this context, a series of volumes has also been launched as dedicated specifically to the study and memory of those personalities (Ceccarelli 2007, 2010, and 2014a, b; Ceccarelli and Fang 2020), presenting not only biographical information that can justify the interest and passion of these figures but also addressing attention to technical

investigations on the value of the contributions that they made as worthy of being a historical and technical reference for the community. An example of those volumes is shown in Fig. 8.

a) b)

Fig. 8. The series in Distinguished Figure in MMS: a) first volume in 2007; c) last volume in 2020

The book series HMMS (http://www.springer.com/series/7481) is nowadays recognized as an important frame also by other communities as proven by several volumes that are published by authors not belonging to the PC nor to the IFToMM community. Up today the book series contains 39 volumes that all are still of great interest to a wide community as demonstrated by the several citations and downloads they receive. Examples of such a variety and success can be outlined by indicating the 2010 conference proceedings celebrating 23 centuries of Archimedes legacy (Paipetis and Ceccarelli 2010), book on Homeric machines (Paipetis 2008), book on Greek and Roman machine technology (Rossi and Russo 2017), book on Chinese ancient mechanism (Hsiao and Yan 2014), and more ahead on time history the book on Russian mechanism collection (Golovin and Tarabarin 2008) up to modern time with the book on rotating machines (Rao 2011) and the book on intelligent machines (Koetsier 2019).

Summarizing, the PC has been advanced in the third phase of his history from a small group of interested MMS scientists to a community addressing and attracting interest on the history of MMS and mechanical engineering at large in all its aspects with a variety of initiatives among which the most significant ones are the HMM symposium and the Springer HMMS book series.

4 The Future of the PC

The IFToMM PC for History of MMS, as it has been highlighted in the previous sections, has an established and successful history; however, it faces major challenges in the near future. In this section we will highlight the strengths, weaknesses, opportunities and threats of the PC for HMMS. A strong point of the PC is that of being a community with a consolidated organization and a strong core, made up of researchers who are very interested in historical issues and who have been carrying out research on the history of mechanics for decades.

It should also be noted the existence of consolidated events organized by the PC (such as the HMM Symposium), as well as the contribution to renowned publication sites (such as the Springer series, Advances in Historical Studies journal).

Coming to the critical aspects, the main one is that the average age of the PC for History is high: many of its members are over 60 years old, and therefore it is necessary to foresee the entry of new forces into the PC, to replace the members who will retire in the next coming years. A campaign to raise awareness and interest for the PC among young researchers in the mechanical sector has already been launched: however, it is not always easy to find availability from young people, because the consolidated academic paths are based upon a frenetic activity of the young researchers on issues strictly inherent to their technical-scientific discipline, while the historical aspects are considered less impactful in relation to the career of the researchers themselves. To remedy this, one could consider the involvement in the PC of young researchers from other disciplines (thus not necessarily of Mechanics), who are interested in carrying out research relating to the history of machines. This interdisciplinary synergy between different disciplines would certainly enrich the PC and will allow it to recruit new members. One can think, for example, of the research sector known as "Digital humanities", where technological devices are employed to serve goals related to humanities: within this context, it would be possible to find applications (just to mention an example: robotics at the service of cultural heritage) that may be of interest to the PC.

The SWOT Table 1 summarizes strength, weaknesses, opportunities and threats of the PC for History of Mechanisms and Machine Science.

Table 1. A SWOT analysis for the PC HMMS

STRENGTH Strong core of researchers, consolidated organization, consolidated conferences and publication sites	WEAKNESSES High average age of the PC members, difficulty in recruiting young people
OPPORTUNITIES Possibility of intercepting synergies with humanistic sectors and more	THREATS Tendency of the "scientific-technical" sectors to neglect historical research in assessing the researchers' careers

5 Conclusions

The History of the IFToMM PC for History of MMS is outlined in this paper referring to the second period of complete maturity of the activities with the HMM symposium and the Springer book series on History of MMS, also considering a considerable participation of members, who have gradually increased in representation of the entire world-wide IFToMM community. In the last twenty years it can be noted that the commission has found its organizational efficiency not only in institutional roles according to the IFToMM constitution but also as a cultural reference in the history of science and technology with particular interests in mechanical engineering aspects. Despite the success that has emerged with growing results in the last twenty years, problems are emerging for the future, especially linked to the fact that the currently active community needs a generational change that hopefully will take place with consolidation and even innovation of the commission's activities.

Appendix

Members of the IFToMM OC for History of MMS as in January 2022

ACEVEDO Mario (Mexico)
ANDRIENKO Pavel A. (Russia)
ASLAN SEYHAN, Irem (Turkey)
CARVALHO M. João Carlos (Brazil)
CECCARELLI Marco (Italy)
CHEN Yu-Hsun (China-Taipei)
CHONDROS Thomas G. (Greece)
CORVES Burkhard (Germany)
CUADRADO Juan I. (Spain)
DAI Jian (United Kingdom)
EGOROVA Olga Vladimirovna (Russia)
EVGRAFOV Alexander (Russia)
FANG Yibing (China-Beijing)
FERRANDO PIERA Francesc (Spain)
FORTES GARRIDO Juan Carlos (Spain)
FRANCO Walter (Italy)
LÓPEZ-GARCÍA Rafael (Spain)
GASPARETTO Alessandro (Italy)
Gökdoğan, Melek Dosay (Turkey)
HUSTY Manfred L. (Austria)
KOETSIER Teun (Netherlands)
KOZLIKIN Denis (Russia)
KUROKI Hidetaka (Japan)
LIN Tsung-Yi (China-Taipei)
LU Zhen (China-Beijing)
MIMMI Giovanni (Italy)
MOON Francis (USA)
OLIVEIRA Agamenon (Brazil)
PAPADOPOULOS Evangelos (Greece)
PENNOCK Gordon (USA)
PISANO Raffaele (France)
RAVANI Bahram (USA)
SEO Moon Hwo (Korea)
SHIM Jae Kyung (Korea)
TARABARIN Valentin (Russia)
TOLOCKA Rymantas Tadas (Lithuania)
WAWRZECKI Janusz (Poland)
WOJNAROWSKI Józef (Poland)
YAN Hong-Sen (China-Taipei)
ZHANG Baichun (China-Beijing)
ZHANG Nong (Australia)
ZIELINSKA Teresa (Poland)
ZRNIC Nenad (Serbia)

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