ON THE IFToMM PERMANENT COMMISSION FOR HISTORY OF MMS

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ABSTRACT- In this paper we have outlined the historical development of the IFToMM Permanent Commission for History of MMS (Mechanism and Machine Science) by also looking at the recently established field of History of MMS with technical perspectives. The activity of the PC for History of MMS has been overviewed thought facts and efforts of the many members over the time. Subjects of History of MMS have been presented by using published results of historical investigations with modern technical reformulation.

KEYWORDS: MMS, History of TMM, History of IFToMM, History of PC for History of MMS

INTRODUCTION

The history of a discipline is usually considered to be a part of that discipline. Why is that so? One could argue that the history of a discipline is a source of entertaining stories. That is correct, but there is more. The history of a discipline is also a source of information with respect to who invented what and when. It enables us to give the credit for an invention to the right person. Moreover, the history of a discipline teaches us a certain modesty; it shows that what is considered to be a perfect solution today could be completely outdated tomorrow. The history of a discipline is finally a source of pedagogical ideas and it may suggest other and better solutions to the problems of the present.

Yet, there is a more important reason for the fact that the history of a discipline is considered to be part of the discipline. The reason is that the history of a discipline concerns the identity of the discipline. It is characteristic of man that he can think about

his own existence. That is why inevitably human beings ask themselves one day or another: Who am I? Where am I from? This is done by individuals but by groups and institutions as well. People who do not know the identity of their parents in the course of time often start a search for their parents. Obviously often there are much more urgent problems than the question: Where am I from? Survival always has priority. Yet, the fact that the history of a discipline concerns the identity of the discipline explains why the history of the discipline is a part of the discipline.

In this way the history of IFToMM is part of the identity of IFToMM, The International Federation for the Promotion of Mechanism and Machine Science (MMS) and the History of the Theory of Mechanisms and History of the Science of Mechanisms and Machines is part of this Science. To the engineers participating in IFToMM or merely working in the Theory of Machines and Mechanisms it can be put in a very personal way: We can say to them: the History of MMS and the History of IFToMM concerns your identity. Moreover, there are very good reasons to be proud of what was done in MMS in the IFToMM member countries since the foundation of IFToMM. It deserves to be studied.

Essentially this is why the IFToMM Permanent Commission for History of MMS was established in 1973 by strong support of the first IFToMM President, and because of the great motivation of the first PC chairman Jack Philips.

Between 1973 and the present two periods can be distinguished in the existence of the Commission for History. The first period is between 1973 and 1998. In that period Jack Philips (1973-1981), Elisabeth Filemon (1982-1989) and Teun Koetsier (1990-1997) chaired the Commission. In the second period Marco Ceccarelli (1998-present) chaired the Commission. The Chairpersons are shown in Fig.1.

In the first period there was a slow growth in the activities of the Commission. In this first period of the Commission's existence, after 1983 meetings of the Commission were held at IFToMM World Congresses.

When Marco Ceccarelli took over the chair of the Commission and at the same time the new millennium was approaching it was decided that a whole new start should be made in order to turn the Commission into body functioning satisfactorily.

Fig.1: Chairmen of IFToMM Permanent Commission for History of MMS at HMM00 Symposium in Cassino in May 2000 (from left to right): Teun Koetsier (1990-'97), Jack Phillips (1973-'81), Elisabeth Filemon (1982-'89), and Marco Ceccarelli (1998-2005). (The years in the brackets indicate the term of Chair mandate).

THE FOUNDATION OF IFTOMM

In 1965 the first World Congress on the Theory of Machines and Mechanisms was organized in Varna in Bulgaria. At that congress the Bulgarian delegation proposed the establishment of an international federation for the Theory of Machines and Mechanisms. Four years later, in 1969, in Zakopane in Poland IFToMM, the International Federation for the Theory of Machines and Mechanisms was established, Figs.2 and 3.

Fig.2: I. I. Artobolewskij (second from the right), first president of IFToMM, together with. L. Maunder, G. Bianchi at his left and A. Bessonov at his right, at the founding congress in Zakopane, Poland in 1969. (Courtesy of Kurt Luck).

Fig.3: F. R. E. Crossley, first vice-president of IFToMM, addresses the founding congress of IFToMM in 1969 in Zakopane in Poland. (Courtesy of Kurt Luck).

In the middle of the cold war IFToMM represented a highly remarkable example of successful cooperation between the East and the West. The first president of IFToMM was I. I. Artobolewskij (USSR) and the first vice-president was F. R. E. Crossley

(USA). M. S. Konstantinov (Bulgaria) became the first secretary-general.
Since 1969 the field of the Theory of Machines and Mechanisms TMM has undergone a spectacular development into what we now prefer to call Mechanism and Machine Science (MMS). In this development IFToMM has been the major forum for international scientific cooperation in MMS.

THE EARLY HISTORY OF THE COMMISSION
The first period of the Commission is between 1973 and 1998. In that period Jack Philips (1973-1981), Elisabeth Filemon (1982-1989) and Teun Koetsier (1990-1997) chaired the Commission with a slow growth of the activities. In this first period of the Commission's existence after 1983 formal meetings of the Commission started to take place at IFToMM World Congresses.
In April, 26-29, 1983 Elisabeth Filemon organized the first IFToMM Symposium on the History of TMM in Miskolc, Hungary, Fig.4. Representatives from different countries lectured on the History of TMM in their country. The lectures were not published. At the same time the first formal meeting of the Commission was held, also in Miskolc. The Commission consisted at the time of few members as listed in the Appendix A.2.

Fig.4: The first IFToMM Symposium on the History of TMM in 1983 in Miskolc, Hungary: Branko Gligoric (Yugoslavia) next to Teun Koetsier (on the right).

At that time slowly sessions on the History of TMM started to be organized on IFToMM World Congresses.
At the Seventh World Congress in Sevilla, Spain 1987, there was a session on History, pp.1887-1898 of (IFToMM1987), with two lectures:
- T. Koetsier: Some remarks on and around Burmester's work on the occasion of the centenary of his "Lehrbuch der Kinematik";
- M. K. Uskov & A.A. Parkhomenko: History of machines and mechanisms theory in the work of Soviet scientists.

At the Eighth World Congress in Prague, Czechoslovakia 1991 there was an invited lecture on History of IFToMM that can be considered the first historical overview of IFToMM over time:
- F. E. Crossley, The Early Days of IFToMM, pp. 3-8 of (IFToMM1991).

Moreover, at the same congress in Prague there was one full Session on History of

TMM, pp. 791-806 of (IFToMM1991), with the papers:

- T. Koetsier: A note on the early history of the Euler-Savary Theorem;
- T. Nakada, S. Nishijma: Applying Roller-Disc Integrator, the Ancient Chinese "South Pointing Chariot" can be converted to the Vehicle with Route-Log Recorder;
- Popescu: Des Mecanismes a Cames dans la Technique Populaire Roumaine;
- J. Muller & K. Mauersberger: CAM Mechanisms in Hydraulic Pumps - Technical-Historical Review.

At the Ninth World Congress on the Theory of Machines and Mechanisms 1995 in Milan there was again one full Session on History of TMM. Th following papers, (pp. 3187-3204 of [IFToMM1995]), were presented with an increased number of attendees:

- M. Ceccarelli: Screw Axis Defined by Giulio Mozzi in 1763;
- M. Cigola & M. Ceccarelli: On the Evolution of Mechanism Drawing;
- K. Luck: Some Remarks on the History and Future of the Theory of Mechanisms;
- Zeno Terplan: Die Auswirkung der industriellen Revolution auf die Maschinenbau-Wissenschaft in Ungarn.

In October 10, 1997 in Amsterdam T. Koetsier organized a small Symposium on "The Role of Mathematics in the Formation of Mechanical Engineering as an Independent Discipline" with the following presentations that were not published.:

- " The Role of Mathematics in Applied Mechanics Teaching to French Engineers in XIXth Century" by Bruno Belhoste (Paris);
- " On the Historical Development of Mechanisms Drawing" by Marco Ceccarelli (Cassino);
- " On the Mathematization of Kinematics of Mechanisms" by Teun Koetsier (Amsterdam);
- " Die Entwicklung des wissenschaftlichen Maschinenbaus in Deutschland im Spannungsfeld von visuellem Denken und mathematisvche Abstraktion" by Klaus Mauersberger (Dresden);
- " What is so Applied about Applied Mechanics?" by Gerard Alberts (Nijmegen)
- "On the Increasing Role of Fluid Mechanics in Engineering: J.M. Burgers and his Work on Pumps" by Fons Alkemade (Amsterdam)

Yet, although the interest in History of MMS within IFToMM was growing, the work of the Commission did not gain enough momentum. The members did not meet between IFToMM World Congresses. Plans suggested by the chair or during world congresses often did not work out.

DEVELOPMENTS IN 1998--2003

In January 1998 Marco Ceccarelli started his work by appointing as new members in the new Commission only three persons, namely Teun Koetsier (the Netherlands), last Andreas Dimarogonas (USA), and Hong-Sen Yan (China-Taipei). The idea was to have members, with great interest in History of MMS, although not necessarily experts on it, although those first three members have repute on History of MMS. But the idea was to have who members would be available to promote activity in the field of History of MMS. Indeed this first group was very active and rapidly the Commission received requests for additional nominations. Even past members have asked to be involved in the re-new activity of the Commission, like Elizabeth Filemon (Hungary) and the late

Joseph Duffy (USA). Thus, on July 1999 at IFToMM World Congress in Oulu the members were 23 and year by year the number of members has increased with more and more interested persons up to the current number of 48, as listed in Appendix A.4. The increased attention and interest on the PC for History of MMS has brought also an increase of activity so that it has been thought convenient to have sub- commissions for different activities. The chairmen (or women) of the sub-commissions are qualitate as the vice-chairmen of the PC for History of MMS.

Thus, in 2001 the following sub-commissions have been established and are currently formed as:

- Sub-Commission for Africa; aim: to promote and organize activity (publishing of papers, workshops, lectures, local meetings) in the field of History of MMS in African countries; members: not enough available members;
- Sub-Commission for Asia; aim: to promote and organize activity (publishing of papers, workshops, lectures, local meetings) in the field of History of MMS in Asian countries; members: Zhen (Vice Chairman), Rao, Seo, Yan, Ang;
- Sub-Commission for Oceania; aim: to promote and organize activity (publishing of papers, workshops, lectures, local meetings) in the field of History of MMS in Oceania countries; members: not enough available members;
- Sub-Commission for Europe; aim: to promote and organize activity (publishing of papers, workshops, lectures, local meetings) in the field of History of MMS in European countries; members: Cuadrado (Vice Chairman), Golovin, Havlik, Kerle, Popescu, Tolocka;
- Sub-Commission for America; aim: to promote and organize activity (publishing of papers, workshops, lectures, local meetings) in the field of History of MMS in American countries; members: Gosselin (Vice Chairman), Lopez-Cajùn, Mavroidis, Carvalho;
- Sub-Commission for IFToMM Archive; aim: to promote and facilitate the collection, and circulation of material and information in the field of TMM for the IFToMM Archive at CISM, Udine, Italy; members (a member will be the Chairman of the PC for History of MMS): Koetsier (Vice Chairman), Shoham, Golovin, Mavroidis, Kerle, Ceccarelli;
- Sub-Commission for the Web page; aim: to define, accept and update the contents of a Web Page on the History of MMS; members: Merlet (Vice Chairman), Cuadrado, Havlik, Kopey, Mavroidis;
- Sub-Commission for the HMM Symposium; aim: to promote, organize and hold HMM International Symposia on the History of Machines and Mechanisms; members: (the Chairman of the PC for History of MMS chairs this Sub_Commision): Ceccarelli (Vice Chairman), Koetsier, Zhen, Rao, Yan, Takeno, Golovin, Lopez-Cajùn;
- Sub-Commission for Relations; aim: to promote, establish, and work cooperation with other IFToMM Commissions and other Institutions working on History of MMS; members: Yan (Vice Chairman), Zhou, Dai, Merlet, Carvalho.

The activity of the PC started in 1998 with small activities like lectures but main efforts were spent to promote interest and future works in subjects of the History of MMS.

First positive results have been obtained with the submission of 12 papers at the IFToMM World Congress 1999 in Oulu, Finland. There it was possible to have a full oral session on History of MMS and even an additional poster session with the accepted

papers, as published in pp.37-85 of (IFToMM 1999). The oral session was well attended with more than 80 attendees, who have expressed great satisfaction for the presented papers. This positive result has been confirmed with the submission of 13 papers at the IFToMM World Congress 2003 in which we have had two sessions with the 12 accepted papers, (IFToMM2003).

Summarizing, in the period 1998-2003 the following important results have been obtained:

- having a Commission with several active members;
- reinvigorating interest History of MMS with papers in the IFToMM World Congress and in the IFToMM journal Mechanism and Machine Theory (MMT), and even elsewhere;
- re-establishing the IFToMM Archives, (IFToMM Archives);
- establishing the HMM Symposium Series on History of Machines and Mechanisms;
- intense lecture activity, even within the frame of small Workshops;
- a continuous investigation activity on History of MMS;
- periodical meetings and annual meetings of the Commission.

Several meetings have been organized at which the members could meet each other, exchange opinions and experiences, establish collaborations, and program further activities. Unfortunately it was impossible to have all the members always present, as shown in the photos of Figs.5, 6 and 7, due to the fact that most of the members serve on personal economic capability or in combination with programs of technical projects. This is because funds are not yet available in the IFToMM Community for working on History of MMS.

Details on the above-mentioned activity that has been carried out by members of the PC in the period 1998-2003 can be found in the PC reports that are available at IFToMM Archives in CISM, Udine, (IFToMM Archives 2003), but also in the PC web page (PC WebPages 2002).

Fig.5: Members of IFToMM Permanent Commission for History of MMS at the meeting 1999 in Oulu during the IFToMM World Congress: From left to right: Hanfried Kerle, Zhen Lu, Moshe Shoham, Bohdan Kopey, Lihua Zhou,Teun Koetsier, Marco Ceccarelli, Marek Kujath, Elisabeth Filemon, Joseph Duffy, Hong-Sen Yan and Jian S. Dai.

Fig.6: Members of IFToMM Permanent Commission for History of TMM at the meeting in Cassino on 12 May 2000 (from left to right): Carlos Lopez-Cajun, Marco Ceccarelli, Ignacio Cuadrado, Hanfried Kerle, Jean-Pierre Merlet, Elisabeth Filemon, Teun Koetsier, Yuri Soliterman, Manfred Husty, Jammi S. Rao, Alexander Golovin, Lu Zhen.

Fig.7: Members of IFToMM Permanent Commission for History of MMS at the meeting in Seoul on 21 May 2001 (from left to right): Moon Hwo *Seo, Moshe Shoham, Joao Carlos Mendes Carvalho,* Jae-Kyung *Shim, Hsing-Hui Huang (representingHong-Sen Yan), Marco Ceccarelli, JeanPierre Merlet, Manfred Husty, Vicente Mata (representing Ignacio Cuadrado), Marcelo Ang.*

The so-called IFToMM field of History of MMS (or TMM) has been established in technical sense by stating in the Introduction of HMM2000, (HMM2000): "the goal was to stimulate experts in TMM (MMS) with some feeling for history, people who can understand, appreciate, and refresh past works in TMM (MMS) to write a historical technical paper".

a) *b)*

Fig.8: Members of IFToMM Permanent Commission for History of MMS at the meetings in 2002 (from left to right): a) at Admont Worshop in October 20-26: Librarian, *Manfred Husty, Marco Ceccarelli, Ignacio Cuadrado Teun Koetsier, Austrian attendee, Atsuo Takanishi, Hanfired Kerle; b) at ASME DETC02 in September 2002:* Jae-Kyung *Shim, Moshe Shoham, Manfred Husty, Marco Ceccarelli, Carlos Lopez-Cajùn, Clement Gosselin.*

Indeed, the History of MMS should be understood as an independent discipline both within MMS and the History of Science, with a specific character consisting in treating past technical developments and personalities with the aim to give historical track of Techniques but understand at the same time the technical details with an eye on modern applications. The IFToMM field of History of MMS differs from History of Science since the goal of History of MMS is to investigate in depth the technical details in order to refresh, reformulate, and reuse the knowledge and achievements of the past in modern terms.

Because of the above-mentioned identification of the field, History of MMS has attracted more and more attention, mainly in the IFToMM technical Community.

Thus, since 2000 History of MMS has been recognized as a suitable technical topic also for regular publication in the IFToMM Journal Mechanism and Machine Theory.

In the IFToMM World Congress 1999 in Oulu, lectures and papers have been presented in different subjects regarding also different periods as in the following topics, (IFToMM 1999): review of past works and formulations; historical developments of topics of MMS; ancient mechanism designs; past personalities and their works.

Again, in the IFToMM World Congress 2003 in Tianjin, lectures and papers have been presented (IFToMM 2003) as dealing with: past machines and mechanisms; people and their work; recent past mechanism designs; re-formulation of past theories; historical overviews.

In addition, a relevant impulse in the development of the field of History of MMS has been achieved through HMM2000, the International Symposium on History of Machines and Mechanisms. Because of its success it has established itself as a Conference series for presentation and discussion of more and more subjects belonging to the History of MMS. In fact, at HMM2000 interesting papers have been presented in the following topics, (HMM2000): history of IFToMM by past Presidents; past

mechanical designs; ancient machines; people in TMM and their work; historical national overview; history of teaching; history of mechanical Engineering; automata and robots.

In many of the published papers the historical content has been organized in sections with historical information of a humanistic type on life and environment of past authors. But most of the content of these papers is devoted to the technical arguments that have been revised and even reformulated and discussed for modern interpretation and even practical current applications. Significant examples of this kind of papers are the papers (Ceccarelli and Vinciguerra 2000) and (Shoham 1999).

In (Ceccarelli and Vinciguerra 2000) the Chebyshev approach for designing approximate circle-tracing mechanisms has been reformulated into current terminology and mathematical means that have permitted even an extension of the design procedure to more general design problems by reducing the model constraints.

In (Shoham 1999) Clifford's formulation for bi-quaternion has been re-formulated in a modern form not only to show the current feasibility but even to deduce modern results through Clifford's derivation when bi-quaternions are used in their rotational sense rather then as ratio of two vectors.

Even TMM personalities have been investigated to stress their technical contributions, like in (Husty 2002) in which the life of prof. Walter Wunderlich is illustrated by looking at his achievements in Mechanism Kinematics.

Another interesting result of the increasing interest can be considered the study of past designs and machinery with attempts of interpretation and formulating design procedures that have been used for them in the past. Significant examples are the papers that are referenced as (Yan 1999) and (Bautista Paz et al. 2000).

In (Yan 1999) a legendary ancient Chinese walking machine has been investigated by presenting a possible design and discussing its functions though historical documents and a modern mechanism analysis.

In (Bautista Paz et al. 2000) the so-called dancing machine for water pumping up hill, is re-discovered as a mechanism design of Spanish Engineering of XVIth century by looking at historical technical documents that illustrate its design, construction, installation, and use. The mechanics of the complex mechanism was astonishing for that time and it is examined with a modern view to stress the current significance yet.

Strongly related to a technical historical interest can be considered the renewed attention for the collection of past models for basic mechanisms or scaled machinery, not only for museum purposes but even for technical teaching and investigation purposes. Since always, teachers of machinery have helped the understanding of mechanism design and operation by showing scaled models of mechanisms to the engineering students. The models were made of wood, iron, or bronze and recently they are made of plastic and light material alloy. Even rapid prototyping is used to make them. Usually, those models are built and used for one-teacher's own purposes, as one can find mechanism models in any office of University professors working in mechanisms. But, there are also collection of mechanisms that were built for the market and they are sometimes available in the Universities and even in some Science Museums. Relevant is the mechanism collection (800 mechanism models of which 300 were available also for the market) that was prepared by Franz Reuleaux and built by

the firm Gustav Voigt MechanischeWerkstatt of Berlin in 1876. Part of this successful collection is still available in many Universities, like for examples in Dresden (Germany), in Ithaca (USA), and in Turin (Italy). Indeed, this collection has been also a stimulus for enlarging and completing the collection with new mechanisms, like for example in the Bauman Moscow University. Scaled models of mechanisms, built in the past, can be seen also in Science Museums, like for example at the British Museum in London and the Science Museum in Milan. Past models are shown in the hall of many Universities to attract interest and deserve memory of past technical achievements, like for example at the Technical University of Catalunya in Barcelona, the Technical University in Turin, and the Bauman Moscow University, as shown in Fig.9. Even recent past modern systems are shown as pieces of History of MMS, like for example in Tokyo at Waseda University and in Palo Alto at Stanford University where pioneer robots are shown in a proper corners of building entrance halls, as shown in Fig.10.
Another development can be considered the attention to the evolution of technical knowledge in the past with attempts to discover motivations, correct and incorrect reasoning that can be still of great importance for today's advances. Significant examples are the papers (Zhen and Xuan 2000) and (Ceccarelli 2000).
In (Zhen and Xuan 2000) the authors have studied water powered machines in ancient China in order to discuss properties, capabilities, and working principles for a correct understanding of those mechanisms that are an important example of the evolution of Chinese Technology of mechanisms.
In (Ceccarelli 2000) a survey is given of the History of Theory of Screw by looking at the early works since the XVth century. Giulio Mozzi is credited to have defined first in 1763 the screw axis and motions by treating its kinematics and dynamics in a rigorous mathematical form in his work (Mozzi 1763). Other fundamental works are revised to remark the evolution to a modern approach and to stress that beside Michel Chasles also Gaetano Giorgini in 1831 formulated in a modern way the Screw axis and its fundamental kinematics. The paper (Ceccarelli 2000) has stimulated somehow further attention on these early works, like for example the republishing of the papers by Chasles and Rodriguez that have been translated in (Baker and Parkin 2003) as example of cooperation of a PC-member, Ian A. Parkin, with another kinematician.

a) b)

Fig.9: Past mechanism models shown at: a) Technical University in Turin; b) Bauman Moscow University.

a) b)

Fig.10: Recent past modern systems shown as pieces of History of MMS at: a) Wabot robots of the 70's and 80's at Waseda University in Tokyo (Courtesy of Waseda University); b) Stanford arm of 70's at Stanford University in Palo Alto (Courtesy of Stanford University).

A novelty can be also considered the study of the very recent past with a historical view in order to fix the historical significance of recent results that are promising for future technical developments and achievements. This attention has been addressed both to technical fields and teaching aspects, as outlined for examples in the references (Bansevicius and Tolocka 2000) and (Crossley 1988).
In (Bansevicius and Tolocka 2000) the use of piezoactive materials is illustrated in the evolution of their application in mechanisms and in integrated machine design, by referring to national experiences in Lithuania.
In (Crossley 1988) Crossley has written his memories in teaching mechanisms since 1943 by illustrating conditions, subjects, and evolutions in the field of University curricula as he experienced personally. He also recognizes several personalities who met as visitors or in conferences or in meetings for organizing events and Journal of Mechanisms (now MMT). He also gives his view of how IFToMM was started being one of the main promoters together with Artobolevski and Konstantinov.
The recent past has been also studied by evolving one-view interpretation or memory to exhaustive examination. Regarding this aspect, of relevant significance is the overview of the History of IFToMM that has been attempted sometimes by singular personal views. Relevant are the cases by Ereskin F. Crossely and Adam Morecki in keynote speeches of IFToMM World Congresses in 1991 and 1999 respectively, that are reported in pp.3-8 of (IFToMM 1991) and in pp.30-36 of (IFToMM 1999). Crossley has described the activity in the first meetings in which IFToMM was founded by recognizing the founding fathers. Morecki has presented general remarks concerning early days of IFToMM and development of its activity and tracks the near future of IFToMM. But then, History of IFToMM has been outlined and discussed in its many aspects by all the IFToMM Past Presidents in a common frame for a specific Chapter of the HMMM2000 Proceedings, (HMM2000). Indeed, the participation of the Past IFToMM Presidents at HMM2000 can be recognized as recognition of the established significance of both History of MMS and History of IFToMM in the IFToMM

Community yet.
The study of several historical aspects has also stimulated attempts of overviews of the evolution of Mechanical Engineering at large. Interesting examples can be considered the papers (Koetsier 2000) and (Ceccarelli 2001). In (Koetsier 2000) the author has presented an outline of the pre-twentieth history of investigations on the Kinematics of machines in order to identify the main developments but the identity of the modern Mechanism and Machine Science as well. In (Ceccarelli 2001) the historical developments of MMS are overviewed by illustrating and discussing through few very significant examples the basic concepts and facts that have enhanced Mechanism design over the time.
The above-mentioned outline of the evolution of interests in the newly established field of History of MMS has been limited to few main aspects that the authors consider significant to characterize the work done by the PC for History of MMS but even to stimulate further activity. Therefore, the references have been restricted to the few examples that have been published within the frame of IFToMM or even more specifically within the sphere of activity of the PC for History of MMS.

FUTURE ACTIVITY AND CHALLENGES FOR THE COMMISSION

What have we learned from the past for the future of the PC and the field of History of MMS?
The answer to this question can be argued from different viewpoints and even with different motivations from person to person. Indeed, this is because the History of MMS can be even be viewed as a personal background that can motivate awareness, activity, and future actions not only in the field of History of MMS.
In particular, the future activity for the PC for History of MMS can be outlined as an extension and improvement of the past and current results.
A very important aspect is clearly the need for a wider awareness of the past, in the IFToMM Community both in terms of technical aspects and IFToMM History.
Specific activity for the PC can be expected:

- to manitain an active Commission with members from all over the world
- to solicit papers on History of MMS for Conferences and Journals
- to circulate information on the Commission
- to exchange opinions among the members of the Commission, mainly by e-mail
- to organize lectures and/or workshops on History of MMS
- to establish collaboration for historical investigations
- to maintain the IFToMM Archive
- to re-publish and re-consider past works and theories on MMS.

The future developments of the activity of the PC for History of MMS can be considered as a challenge since the great specialization of expertise in technical fields allows less and less interest or availability for the History of MMS.

CONCLUSIONS

In every discipline its history, dealing the maintenance of awareness and knowledge of past activity, can be recognized as a part of that discipline, the aim being not only to keep memory of past achievements, efforts, and personalities alive, but also to guide

future developments.. These goals have been recognized as fundamental in the IFToMM Community since the beginning of its activity. In fact, a Permanent Commission for History of MMS (Mechanism and Machine Science) has been established in 1973 to serve as the historical memory of IFToMM but also to work for tracking the technical developments of MMS over the time. Indeed, only recently the PC for History of MMS has achieved its maturity with a promising future through a well-organized activity of several representatives of the IFToMM members, after having had a quite long starting process. The growing interest and participation in the activity of the PC are strongly related to the technical study and re-consideration of past achievements and personalities in the field of MMS and Mechanical Engineering at large. Results in terms of republishing and research papers can and will be obtained not only in the IFToMM Community by so-called Historicians (that is coined as fusion of the words Historian and Kinematician). They will address attention mainly to technical contents and developments in past activity in fields that are related or included in MMS.

REFERENCES

Baker J.E. and Parkin I.A. 2003, Fundamentals of Screw Motion: Seminal papers by Michel Chasles and Olinde Rodrigues (A Translation), The University of Sydney.

Bansevicius R. and Tolocka R.T. 2000, Modern history of piezomechanics in Lithuania, HMM2000, pp.225-231.

Bautista Paz et al. 2000, The dancing machine: the secret of raising water uphill, HMM2000, pp.119-125.

Ceccarelli M., 2000, "Screw Axis defined by Giulio Mozzi in 1763 and Early Studies on Helicoidal Motion", Mechanism and Machine Theory, Vol.35, pp.761-770.

Ceccarelli M., Vinciguerra A. 2000, Approximate Four-Bar Circle-Tracing Mechanisms: Classical and New Synthesis, Mechanism and Machine Theory, 2000, Vol.35, n.11, pp.1579-1599.

Ceccarelli M. 2001, The Challenges for Machine and Mechanism Design at the Beginning of the Third Millenium as Viewed from the Past, Proceedings of COBEM2001 Brazilian Congress on Mechanical Engineering, Uberlandia, 2001, Invited Lecture, Vol.20, pp.132-151.

Crossley F.E. 1988, Recollection from forty years of teaching mechanisms, ASME Jnl. of Mechanisms, Trans., and Auto. In Design, Vol.110, pp.232-242

Koetsier T. 2000, Mechanism and Machine Science: its history and its identity, HMM2000, pp.5-24.

HMM2000, Proceedings of HMM2000 International Symposium on History of Machines and Mechanisms, Kluwer Academic Press, Dordrecht, 2000.

Husty M. 2002, prof. Wunderlich and his work, CD Presentation Volume of Admont Workshop on History of Mechanical Engineering, IFToMM Archives, Udine.

IFToMM 1987, Proceedings of 7th IFToMM World Congress on the Theory of Machines and Mechanisms, Bautista E. et al.. (Eds.), Seville, September 17-22, 1987, Pergamon Press, Oxford.

IFToMM 1991, Proceedings of 8th IFToMM World Congress on the Theory of Machines and Mechanisms, M.Okroulik and L. Pust (Eds.), Prague, August 26-31, 1991, Society of Czechoslovak Mathematicians and Physicians, Prague.

IFToMM 1995, Proceedings of 9th IFToMM World Congress on the Theory of

Machines and Mechanisms, Rovetta A. (Ed.), August 29 - September 2, 1995, Politecnico di Milano, Milan.
IFToMM 1999, Proceedings of 10-th IFToMM World Congress on the Theory of Machines and Mechanisms, Leinonen T. (Ed.), June 20-24, 1999, University of Oulu. Oulu.
IFToMM 2003, Proceedings of 11-th IFToMM World Congress on the Theory of Machines and Mechanisms, Huan T. (Ed.), April 1-4, 2004, University of Tianjin, Tianjin.
IFToMM Archive 2003, IFToMM documents over time, Archives at CISM, Udine.
Mozzi G. , 1763, "Discorso matematico sopra il rotamento momentaneo dei corpi", Stamp. di Donato Campo, Napoli.
PC Webpage 2003, http://www-sop.inria.fr/coprin/IFTOMM/History/.
Shoham M. 1999, A note on Clifford's derivation of Bi-Quaternions, IFToMM 1999, pp.43-47.
Yan H.-S. 1999, A design of ancient China's cattle machine Chu-Ko Liang's wooden ox and glinding horse, IFToMM1999, pp.57-62.
Zhen L. and Xuan G. 2002, The development of water-powered machines of China in 10-14-the century, HMM2000, pp.129-134.

APPENDICES

A.1 LIST OF MEMBERS IN 1973

List not available in official IFToMM documents.

A.2 LIST OF MEMBERS ON APRIL 1983 BY ELIZABETH FILEMON

A.P. Bessonov, USSR; G. Dizioglu, Germany; G.F.R., J. Duffy, U.S.A.,; E. Filemon, Hungary; B. Gligoric, Yugoslavia; P. Genova, Bulgaria; A. Jakubovich, Poland; K. Luck, G. D. R.; J. Muller, GDR; J. Philips, Australia; J. Rees-Jones, UK; A. Vinciguerra, Italy.

A.3 LIST OF MEMBERS ON 1997 BY TEUN KOETSIER

A.P. Bessonov, USSR; Fl. Dudita, Romania; G. Dizioglu, G.F.R.; J. Duffy, U.S.A.; E. Filemon, Hungary; B. Gligoric, Yugoslavia; P. Genova, Bulgaria; A. Jakubovich, Poland; T. Koetsier, The Netherlands (Chair); K. Luck, G. D. R; J. Muller, GDR; J. Philips, Australia; A. Vinciguerra, Italy.

A.4 LIST OF MEMBERS ON JULY 2003 BY MARCO CECCARELLI

Juan Ignacio Cuadrado Iglesias (Vice Chairman for Europe), Spain; Clement M. Gosselin (Vice Chairman for America), Canada; Jean Pierre Merlet (Vice Chairman for Web page), France; Teun Koetsier (Vice Chairman for IFToMM Archive), The Netherland; Zhen Lu (Vice Chairman for Asia), China-Bejing; Hong-Sen Yan (Vice Chairman for Relations), China-Taipei; Mario Acevedo, Mexico; Jorge A. C. Ambrosio (observer), Portugal; Marcelo H. Ang Jr, Singapore; Roque Calero Perez, Spain; Thomas G. Chondros, Greece; Jian S. Dai, U.K.; G. Reg Dunlop (observer), New Zealand; Elisabeth Filemon, Hungary; John A. Gal , Australia; Alexander A. Golovin, Russia; Sergey Jatsun, Russia; Stefan Havlik, Slovakia; Manfred Husty, Austria; Hanfried Kerle, Germany; Yaroslav T. Kinitsky, Ukraina; José Ignacio López Soria

(observer), Perù; Franz Otto Kopp, (obsrever)Germany; Bohdan Kopey, Ukraine; Marek Kujath, Canada; Carlos S. Lopez Cajùn, Mexico; Francis Moon (obsrever), U.S.A.; Klaus Mauersberger , Germany; Constantinos Mavroidis, U.S.A.; João Carlos Mendes Carvalho, Brazil; Agamenon R.E. Oliveira, Brasil; Ben Fathi Ouezdou, France; Evangelos Papadopoulos, Greece; Ian Parkin, Australia; Iulian Popescu, Romania; Jammi S. Rao , India; Bahram Ravani, U. S. A.; Alberto Rovetta, Italy; Moon Hwo Seo, Korea; Moshe Shoham, Israel; Jae-Kyung Shim, Korea; Yuri Soliterman, Republic of Belarus; Atsuo Takanishi, Japan; Junichi Takeno, Japan; Rymmantas Tadas Tolocka, Lithuania; Ching-Huan Tseng, China-Taipei; Janusz Wawrzecki, Poland; Teresa Zielinska, Poland; Lihua Zhou, China-Bejing.