



## Preface for the MUBO Special Issue on its 25th Anniversary

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The need for an international journal solely dedicated to multibody dynamics was clearly identified during a NATO Advanced Study Institute held in Tróia, Portugal in 1993. The event was attended by most of the active researchers in the area at the time. John McPhee and Jorge Ambrósio polled the attendees to ask the following two simple questions. In which journals do you publish your multibody dynamics research? And, what journals do you read for the latest research in multibody dynamics? Participants were also asked to rank in importance the journals they cited. The answers were surprising. Ten different journals were top ranked by different researchers, and many others were also used as a primary source of information. The conclusion, at the time, was simple. Multibody dynamics was an active area of research seeking consolidation. A primary scientific information resource was needed to disseminate its research, developments, and applications.

Two years later, in 1995, the theme of the IUTAM Symposium held in Stuttgart, Germany was Multibody Dynamics and Optimization. Because scientific meetings dedicated to multibody dynamics were becoming more frequent and well attended, the Kluwer Academic Publishers representative, Karel Nederveen at the time, asked Jorge Ambrósio if he thought a scientific journal specifically addressing multibody dynamics and optimization should be promoted. Considering the results of the poll taken two years earlier and having the list of participants for both the Tróia and Stuttgart meeting, a strategy was designed to survey the community and investigate the suitability of introducing a new multibody dynamics journal. The proposed new journal was nicknamed MUBO, as in MUltiBOdy dynamics.

At the time, internet and email were still in the early stages of public use, so all communication was carried out via (expensive) international phone call and (snail slow) mail. The community response was overwhelmingly positive, and as a result, Kluwer Academic Publishers decided to move forward. Werner Schiehlen and Jorge Ambrósio were invited to further develop and implement this new journal fully dedicated to multibody dynamics. They decided to call the journal Multibody System Dynamics, a name suggested by Werner Schiehlen.

The first editors were finally appointed late in 1995, and the contributing and advisory editorial boards were established shortly thereafter. An editorial office that was overseen by Mrs. Paula Jorge was opened in Lisbon. Paula has been supporting the journal with extreme professionalism and dedication ever since. The first call for papers was issued in 1996. The call coincided with the 19th ICTAM held in Kyoto, Japan, which helped to introduce the

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new journal and publicize the call. The first published papers were received, peer reviewed, and typeset that same year. The first printed issue of the journal of *Multibody System Dynamics* was finally released in June 1997 during the NATO Advanced Study Institute held in Varna, Bulgaria. That release was exactly 25 years before the call was announced for this commemorative 25th Anniversary Special Issue.

Established as a distinct area of computational mechanics, the *Multibody Dynamics* label was formally established by Kurt Magnus in late 1970 at the IUTAM Symposium on the Dynamics of Multibody Systems that was held in Stuttgart, Germany. The symposium was attended by most of the active researchers in the field at the time. The focus on multibody systems at the IUTAM Symposium and at following conferences, colloquia, and other meetings was fully justified by a substantial and growing body of innovative research and development carried out by researchers such as Thomas R. Kane, Pradip N. Sheth, Thomas R. Chase, Kurt Magnus, and Robert E. Roberson. Organizing conferences as dedicated forums to disseminate and discuss developments in multibody dynamics became the next normal step in the establishment of the new scientific community.

The first multibody dynamics textbook entitled “Dynamics of Multibody Systems” was written by Jens Wittenburg. This textbook, and others that followed afterwards, further demonstrated that solid and consistent foundations were being established for a multibody dynamics community. The introduction of the journal of *Multibody System Dynamics* was the next logical step.

The establishment in 2010 of the International Association for Multibody System Dynamics (IMSD), under the primary leadership of Werner Schiehlen and Aki Mikkola, was the follow-on step to further establish multibody dynamics as a recognized area of computational mechanics. The IMSD has been affiliated to IUTAM since 2014, and *Multibody System Dynamics* became the official journal of the IMSD in 2014.

Ever since the first printed issue of *Multibody System Dynamics* in 1997, publication has been continuous and always on time, thanks to a constant flow of submissions and strong support by the multibody community. In the beginning, the journal was published as a single volume of four issues accounting for about 20–25 papers/year. Due to an ever-increasing number of submissions and the high quality of the research, the number of volumes published per year increased from one to two and then to three, which is the number of volumes being published today. The journal of *Multibody System Dynamics* now accounts for 70–75 high-quality papers a year.

Although some other journals have been introduced with multibody dynamics in their scope and sometimes in their name, *Multibody System Dynamics* is still the only journal fully dedicated to the specifics of multibody dynamics. It maintains the most stringent criteria for the peer-review process, and only the highest quality papers are accepted for publication.

From 1996 through 2019, Werner Schiehlen, as Editor-in-Chief, and Jorge Ambrósio, first as Co-Editor and later as Editor-in-Chief, presided over the journal of *Multibody System Dynamics*. Replacing Werner Schiehlen, now a distinguished Honorary Editor, Aki Mikkola from LUT University in Finland took on the role of Editor-in-Chief in 2019. Working together, Jorge Ambrósio and Aki Mikkola, with the strong support of the *Multibody System Dynamics* editorial board and Springer publishing, represented by Nathalie Jacobs and her team, took steps to improve the efficiency and quality of the review process. One important development introduced was the concept of an Associate Editor for the journal, which has led to a significant reduction in the average time it takes to reach a first decision and to publish an accepted paper.

Although the foundation of multibody dynamics was established in the 1970s and 1980s, the discipline will likely continue to advance in accuracy, efficiency, and versatility. This

progress may involve the development of tailored formulations for specific applications, robust numerical methods, and advanced implementation techniques to handle larger and more complex dynamic systems. Such fundamental advancements are crucial when applying multibody system dynamics to high-fidelity modeling or computationally demanding scenarios such as real-time simulation.

The scope of multibody dynamics covers theoretical and computational methods in rigid and flexible multibody systems, their applications, and experimental procedures used to validate theoretical foundations. The research addresses issues of new formulations, solution algorithms, computational efficiency, analytical and computational kinematics, synthesis, flexibility, control, optimization, real-time simulation, parallel computation, workspace and path planning, reliability, and durability. Fields such as vehicle dynamics, aerospace technology, mechatronics, machine dynamics, crashworthiness, biomechanics, computer graphics, and system identification are also included as topics. Over the past 25 years, some topics have become more or less important, others have been renamed, and new topics and applications have emerged. Today, data-based methods, games, virtual reality, and artificial intelligence are all areas of increasing interest to multibody dynamics researchers.

Because 25 years of publication is an achievement to be respected and celebrated, the call for papers was announced for a commemorative 25th Anniversary Special Issue of Multibody System Dynamics. All former and current members of the journal's editorial boards were invited to submit representative works of their research or overviews that could represent the body of multibody dynamics research and development topics covered. Higher quality standards drove the peer review process for the manuscripts submitted, and the criteria for acceptance were more stringent.

This Special Issue dedicated to the 25th Anniversary demonstrates that the multibody dynamics discipline is applicable to a broad spectrum of scientific and technological domains. The future will certainly bring new paradigms, novel applications, and more integrated approaches to determine the interactions between multibody systems and associated physical phenomena such as fluid dynamics or electromagnetics. More and more comprehensive analyses and design optimizations will become a reality, and the journal is expected to remain the preferred vehicle for disseminating new multibody dynamics knowledge. And going forward, the journal of Multibody System Dynamics will steadfastly continue to help steer our community.

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