

2021 Newsletter of the U.S. National Committee on Theoretical & Applied Mechanics (USNC/TAM)

Chair's Welcome

Mechanics as a discipline has been front and center in 2021 for its role in determining and mitigating the pathways for transmission of the Covid virus. It has also featured heavily in grand societal challenges, such as the understanding and modeling of climate and extreme weather events, and in the thrilling commercial space launches of 2021. I hope this newsletter finds you broadly continuing to weather safely the ongoing Covid-19 pandemic, and specifically managing the challenges presented by the changes to in-person research, education and mechanics-based activities it has required.

The USNC/TAM has been evolving to embrace the challenges and opportunities presented by online activities, with events that have targeted and reached a broader swath of the mechanics community, as you will read below. Our efforts in this regard continue as we revisit our mission. The two stated goals of the committee reflect our objectives as well in 2021 as they did at the founding of the committee in 1946: to promote, coordinate and advance all aspects of research in the broad field of mechanics throughout the United States, and to represent the United States in the IUTAM and participate in its activities. However, the structure of the Committee must evolve in order to provide leadership on both the domestic and international stages and to reflect our commitment to diversity, equity and inclusion in all aspects of our activities. Stay tuned for developments in this regard in the coming year.

There are several ways to engage with the USNC/TAM: nominate an early career researcher as a USNC/TAM Young Observer, develop a topic for a Recent Trends in Mechanics report or propose an IUTAM symposium. The 19th US National Congress on Theoretical and Applied Mechanics will be hosted in June in Austin, TX. I encourage you to meet the extended January 31, 2022, abstract submission deadline (if you haven't already) and join us at this quadrennial celebration of US research in mechanics.

You can reach the members of the USNC/TAM Executive Committee via email at executivecommittee@usnctam.org. We welcome your comments and suggestions and look forward to working with you to promote the activities of the U.S. mechanics community. I wish you a happy and healthy 2022. It has been a privilege to serve as Chair of the USNC/TAM.

- Beverley McKeon (USNC/TAM Chair, 2020-2022)

In this issue

[Report from the Annual Meeting of the USNC/TAM](#)

[USNC/TAM Webinar on Art and Animation in Mechanics](#)

[USNC/TAM Young Observer Program](#)

[Recent Trends in Mechanics Reports](#)

[Report from the Special IUTAM General Assembly Meetings](#)

[Upcoming Dates, Deadlines and Calls](#)

[About USNC/TAM](#)

[Inaugural USNC/TAM Distinguished Lecture](#)

[The USNC/TAM of the Future](#)

[USNC/TAM Travel Fellowships Program](#)

[Successful ICTAM 2020+1 Conference](#)

[US National Congress on TAM, USNCTAM 2022](#)

[USNC/TAM Member Societies and Officers](#)

Report from the Annual Meeting of the USNC/TAM

The 2021 annual meeting of the USNC/TAM was held virtually on April 30 and May 1, 2021, due to COVID-19 related travel restrictions. The technical themes of the meeting were Mechanics in the Community, Filling the Mechanics Pipeline and Strategies for Engagement. We were honored to have Dr. Kendra Sharp, Head, Office of International Science and Engineering at the National Science Foundation kick off the meeting and share thoughts on plugging the leaky pipeline from under-represented groups into STEM fields. Profs. Jifeng Peng (U. Alaska) and Luciano Castillo (Purdue) described their dedicated efforts to make mechanics work for local communities, in talks entitled “Computational Fluid Dynamics and a Small Wind Energy Application in a Remote Alaskan Village” and “On the USA/Mexico Energy Corridor for Water Security and Migration in Latin America”, respectively. Prof. Sonya Smith (Howard) led off the session on broadening participation in STEM with a talk on “Catalyzing Participation and Innovation by Women in STEM in the US and South Africa”. Teniel Jones (Base 11) and Al Bunshaft (Dassault Systemes) presented “Empowering Next Frontier STEM Leaders of the 21st Century”, and Douglas Varela of DaVinci Camps presented his approach to “Cultivating Scientists Through Rigor, Culture and Interdisciplinarity”. We were very pleased to have Dr. Kimberly Douglas, Senior

Director of Research and Innovation at the Society of Hispanic Professional Engineers, and Roberta Rincon, Associate Director of Research, and Jennifer Scott, Executive Vice President for Partnership and Events, from the Society of Women Engineers present on their respective programs for broadening access to engineering and possible pathways for the USNC/TAM to engage. You can view all the informative and thought-provoking presentations from these technical sessions [here](#).

The business meeting of the USNC/TAM took place on May 1, 2021. The committee had a sustained and thoughtful discussion on how to expand access to mechanics, how to strengthen the commitment of the USNC/TAM to diversity, equity and inclusion, and how to develop effective tools for outreach to the broad community interested in mechanics, leading to some of the initiatives you see described below. Society Representatives for each of the Member Societies also reported on mechanics-related activities and awards presented over the previous year.

Inaugural USNC/TAM Distinguished Lecture



We were delighted to host **Dr. Adam D. Steltzner** of NASA's Jet Propulsion Laboratory to give the inaugural USNC/TAM Distinguished Lecture via Zoom on Friday, April 31, 2021. Dr. Steltzner holds a Ph.D in Engineering Mechanics from UW-Madison and is perhaps most widely known for his engineering and outreach work related to the [Seven Minutes of Terror](#) associated with landing the Curiosity Rover on Mars in 2012. His wonderful lecture entitled "[Success and Failure on Mars: Mechanics in the Exploration of Space](#)" engaged members of the public, K-12 students, undergraduates, graduate students, academics and aerospace industry professionals alike, showcasing the role of mechanics on the frontier of human knowledge. Adam graciously fielded many questions after the event, inspiring the next generation of mechanicians.

In November 2019, the USNC/TAM proudly announced the launch of a new series of Distinguished Public Lectures on Theoretical and Applied Mechanics. The objective of this series is to convey the excitement, to stimulate interest, and to discuss opportunities in the mechanical sciences and engineering related to advances in infrastructure, automation, transportation, energy, bio-medicine, sustainability, exploration, and other areas. The targeted audience includes students and teachers interested in STEM fields at high schools across the nation and the general public. The lectures are free and open to the public. They will be streamed live and archived for future use. We look forward to the second lecture, planned for April 2022.

USNC/TAM Webinar on Art and Animation in Mechanics

The USNC/TAM continued our program of online events showcasing varying topics in mechanics with a July webinar entitled "[Art and Animation in Mechanics: Communicating Science and Engineering in the 21st Century](#)".



Kalina Borkiewicz (UIUC) and **Eitan Grinspun** (U. Toronto) gave exciting presentations on computer simulations for scientific animations and movies, entitled "Supercomputers, Big Data, and Scientific Visualizations" and "Computational Mechanics in Scientific Animations", respectively. In the second part of the program, **Felice Frankel** (MIT) and **Ozge Samanci** (Northwestern) inspired the audience with presentations on art forms to communicate science and engineering, entitled "More than Pretty Pictures" and "The Use of Art to Communicate Societal Grand Challenges", respectively. We are grateful to these researchers for sharing their creative and technical expertise and providing inspiration on state-of-the-art ways to present the beauty of mechanics.

The USNC/TAM of the Future

The USNC/TAM launched two Ad-Hoc Committees in 2021 with charges to assess our current means of operation and propose changes to help us better fulfill our two-fold mission to promote, coordinate and advance all aspects of research in the broad field of mechanics throughout the United States, and to represent the United States in the IUTAM and participate in its activities. The Ad-Hoc Committee on Virtual Activities of the USNC/TAM reported to the committee members in the 2021 annual meeting; stay tuned for further developments forthcoming from their recommendations. The work of the Ad-Hoc Committee on the Structure of the USNC/TAM is continuing into 2022 with the remit to make recommendations that strengthen our ability to serve the broad, evolving, and diverse mechanics community as the USNC/TAM approaches its 75th anniversary year in 2023.

USNC/TAM Young Observer Program



The USNC/TAM welcomed **Prof. Arezoo Ardekani** (Purdue University) to the Annual Meeting as the 2021 USNC/TAM Young Observer. Prof. Ardekani is a renowned expert in the soft and active matter. The 2020 Young Observer, Prof. Sinan Ketan (Northwestern University) also joined the meeting, along with two early career researchers selected as Friends of the USNC/TAM for 2021, Prof. Sam Daly (UCSB) and Prof. Yong Zhu (NC State). We are delighted that all four of these researchers have been engaged in USNC/TAM activities this year.

The [USNC/TAM Young Observer Program](#) was launched in 2019-2020. The observers gain experience of national and international scientific coordination and diplomacy through exposure to the functions and responsibilities of the National Committee, as well as learning about opportunities for further engagement with USNC/TAM. A young professional is considered to be someone who is within 10-15 years of receiving his or her PhD and/or first professional appointment in an engineering or related field. The observer will attend the annual committee meeting and events associated with the committee meeting. The observer will be invited to have dinner with the Committee on the middle night of the meeting and the hotel accommodation for that night will be covered by the Committee.

The USNCTAM invites member professional societies to nominate an early career professional to be one of the 2022-23 Young Observers. Society Representatives should send their nominations to Linda Franzoni, Secretary of the USNC/TAM, at franzoni@duke.edu by January 15, 2022 (one nomination per society). A nomination package consists of the nominee's CV including the link to their webpage and a paragraph of nomination, explaining how the nominee has demonstrated leadership potential in mechanics and why the nominee would benefit from a term as a USNC/TAM Young Observer. The Committee anticipates selecting one Observer in Fluid Mechanics and one in Solid Mechanics each year. Nominees and nominators will be notified of the Committee's decision by February 15, 2022.

USNC/TAM Travel Fellowships Program

In June, the Travel Fellowships Subcommittee proudly announced the first five winners of the newly-established **Thomas J. R. Hughes Travel Fellows from the USNC/TAM** from a pool of early career researchers with an accepted presentation at the delayed ICTAM 2020+1 (more on the conference below). Congratulations to Nitesh Arora, PhD student in Mechanical Engineering at the University of Wisconsin-Madison; Dr. Masoud Behzadinasab, Postdoctoral Research Associate in the Mechanics of Solids Group at Brown University, PhD in Engineering Mechanics from University of Texas at Austin; Dr. Daniel Floryan, Postdoctoral Research Associate in Chemical and Biological Engineering at the University of Wisconsin-Madison, PhD in Mechanical and Aerospace Engineering from Princeton University; Dr. Ethan Pickering, Postdoctoral Associate in Mechanical Engineering at the Massachusetts Institute of Technology, PhD in Mechanical Engineering from the California Institute of Technology; and Alana Stempien, PhD student in Biomedical Engineering at the University of Wisconsin-Madison.

Thirty-one early career researchers were awarded Presenter Fellowships supported by the National Science Foundation to participate in ICTAM 2020+1 Conference, and a further twenty-one early career researchers received fellowships to participate in ICTAM 2020+1 with the goal of broadening access to the conference to those who would benefit from the experience of participating in this unique international event. The USNC/TAM also launched a limited childcare support scheme to reduce barriers to participation for parents during the pandemic.

All fellows were invited to join the series of USNC/TAM professional development events targeting early career researchers, beginning with a well-received, virtual Mentoring Event led by Prof. Wendy Crone (U. Wisconsin). Participants learned about the role of USNC/TAM on the domestic and international mechanics stages, heard a presentation on "Getting the mentoring you need", then participated in small group mentoring breakout sessions with senior members of the mechanics community in the U.S. We look forward to engaging this next generation of mechanicians in the activities of the USNC/TAM in the future!

A call for the next round of Travel Fellowships will be initiated in concert with the timeline of the 2022 U.S. National Congress on Mechanics, to be held in Austin, TX (see below for details).

Recent Trends in Mechanics Reports

Three proposals for reports on Recent Trends in Mechanics were accepted in 2021 on the following topics: Recent Advances in Hydrogen Reacting Fluid Mechanics; Recent Progress in the Mechanics of Dense Suspensions; and Research Trends in Brain Mechanics. This series has resulted in several reports since 1991 on topics ranging from general computational mechanics, fluid mechanics, mechanics and medicine, additive manufacturing as well as other topical areas. More information on previous reports is available at the [Reports website](#).

The USNC/TAM is pleased to invite proposals for the **Reports on Recent Trends in Mechanics** series. Researchers and research teams interested in the creation of a new report in a relevant topical area may submit a 250 word proposal to the USNC/TAM review subcommittee ([Thomas Pence](#), [Anne M. Grillet](#), [Richard Neu](#)) via email to all of the above by **March 15, 2022**. Proposals will be reviewed by the subcommittee and confirmed by the full USNC/TAM in June 2022. Full reports will be due six months later (December 31, 2022) and the full reports will be reviewed by the USNC/TAM prior to publication. Please contact one of the sub-committee members for additional information.

Successful ICTAM 2020+1 Conference

The rescheduled 25th Quadrennial **International Congress on Theoretical and Applied Mechanics**, ICTAM 2020+1, took place virtually from August 22-27, 2021. Papers and posters accepted for the original program in 2020 as well as new submissions for poster+short talks were presented: <https://www.ictam2020.org/>. The US once again made a strong showing, with over 300 abstracts from the US accepted for presentation. Of the sectional lectures, 3 out of 16 were given by US researchers; 5 mini-symposia had US co-chairs. The USNC/TAM offers its congratulations to **Prof. Lex Smits** of Princeton University, the winner of the 2020 Batchelor Prize on Fluid Mechanics. Prof. Smits gave a marvelous presentation on the structure of wall turbulence at very large Reynolds and Mach numbers, entitled "[Measurements in Wall Bounded Turbulence](#)".

Report from the Special IUTAM General Assembly Meetings and Other IUTAM News



International Union of
Theoretical and Applied Mechanics

Two special meetings of the IUTAM General Assembly were held virtually around ICTAM 2020+1. Besides voting matters pertaining to the Adhering Organizations of IUTAM, a new Treasurer was elected (Pilar Ariza Moreno, Spain). The first topic of discussion pertained to progress towards incorporating IUTAM as a legal entity. The Bureau continues the detailed work required to bring the Union to an accepted status congruent with its function.

The second major agenda item concerned a report from the Diversity Working Group, which was constituted in response to the concern expressed in the previous General Assembly meeting by the US delegation in cooperation with the Canadian, Mexican and French delegations that the proposed IUTAM Bureau lacked diversity in gender, age, and geographical representation. The Working Group proposed actions for consideration by the General Assembly. In response, the Bureau took on the task of proposing a path forward and has solicited input and best practices from the Adhering Organizations before taking actions to address this issue. The US delegation will continue to state the importance and value of engaging the most broad and diverse participation in mechanics to the future of the mechanics community at large.

In other IUTAM news, twenty IUTAM symposia are scheduled to take place in 2022, reflecting the proposals approved for 2022/2023 by the Fluids and Solids Symposia Panels, as well as those postponed from earlier years by the pandemic. Details are available at: <https://iutam.org/accueil/>. The call for new symposia proposals for the period 2024/2025 is now open. Please see Upcoming Dates and Deadlines for further information.

US National Congress on Theoretical and Applied Mechanics, USNCTAM 2022



The US National Congress of Theoretical and Applied Mechanics is held every four years under the auspices of the U.S. National Committee on Theoretical and Applied Mechanics (USNC/TAM) to foster and promote the exchange of ideas and information among the various disciplines of the TAM community around the world, and to chart future priorities in mechanics related research, applications and education. The 19th USNC/TAM will be hosted by the University of Texas at Austin, at the AT&T Executive Education and Conference Center from June 19-24, 2022.

Members of the theoretical and applied mechanics community are invited to submit abstracts for presentations of their work at the 19th USNCTAM, with an extended deadline of **January 31, 2022**. A listing of the symposia for the congress can be found at <https://www.usnctam2022.org/congressMS>. Abstracts are solicited in all areas of fluid and solid mechanics, including experimental mechanics, computational mechanics, dynamical systems, materials, data science, structural mechanics, and biomechanics.

The USNC/TAM will be leading a special mini-symposium on the legacy of Theodore von Karman in mechanics (solids and fluids) on the 100th anniversary of the Innsbruck meeting that led to IUTAM, spanning his impact on research, education and international collaboration.

Upcoming Dates, Deadlines and Calls

January 15, 2022	Nominations for Young Observers due to Linda Franzoni, Secretary of USNC/TAM
January 31, 2022	Abstract submission deadline, 19 th USNCTAM https://www.usnctam2022.org/
TBD	Application deadline for travel fellowships to 19 th USNCTAM
June 19-24, 2022	19 th USNCTAM, Austin, TX.
March 31, 2022	Individuals interested in proposing IUTAM symposia for the 2024/2025 period should contact Prof. Linda Franzoni, Secretary of the USNC/TAM , for assistance in developing such proposals.
ICTAM 2024	The 26th International Congress on Theoretical and Applied Mechanics, ICTAM 2024, will be held in Daegu (South Korea)! Check out the promotional video on Youtube . Abstract deadline TBD.

USNC/TAM Member Societies and Officers

Executive Committee (2020-2022)

Chair	Beverley McKeon (Caltech)	Vice Chair	Horacio Espinosa (Northwestern)
Secretary	Linda Franzoni (Duke)	Past Chair	Krishnaswamy Ravi-Chandar (University of Texas at Austin)

Member societies and current representatives

AAM American Academy of Mechanics	[Open]
AIAA American Institute of Aeronautics & Astronautics	Paul Palies (U. Tennessee Space Institute)
AICHE American Institute of Chemical Engineers	Patrick Underhill (RPI)
AMS American Mathematical Society	Edriss Titi (Texas A&M)
APS American Physical Society	Beverley McKeon (Caltech)
ASA Acoustical Society of America	Robert Koch (Naval Undersea Warfare Center)
ASCE American Society of Civil Engineers	Jose Andrade (Caltech)
ASME American Society of Mechanical Engineers	Yonggang Huang (Northwestern University)
ASTM International	Richard Neu (Georgia Tech)
SEM Society for Experimental Mechanics	Wendy Crone (University of Wisconsin, Madison)
SES Society of Engineering Science	Vicky Nguyen (Johns Hopkins University)
SIAM Society for Industrial & Applied Mathematics	Maria Emelianenko (George Mason University)
SOR Society of Rheology	Shelley Anna (Carnegie Mellon University)
USACM U.S. Assoc. for Computational Mechanics	Yuri Bazilevs (Brown University)
Members-at-Large	Tom Pence (Michigan State University)
	Anne Grillet (Sandia National Laboratory)
	Tarek Zohdi (University of California, Berkeley)
	Nicole Sharp (FYFD)

Ex officio members

Ellen Arruda (University of Michigan)	Nadine Aubry (Tufts University)
L. Cate Brinson (Duke University)	Anne Karagozian (UCLA)
Theresa Kotanchek (Evolved Analytics LLC)	Chad Landis (University of Texas at Austin)
Gareth McKinley (MIT)	Robert McMeeking (UCSB)
Kathleen Stebe (University of Pennsylvania)	

National Academies Staff

Senior Program Officer: Ana Ferreras	BISO Director: Kathie Bailey
Staff Support: James Manning	

About USNC/TAM

The U.S. National Committee on Theoretical and Applied Mechanics (USNC/TAM) represents the United States in national and international activities related to the broad science of mechanics, including related sciences, engineering and mathematics. It serves as a focal point for charting future priorities in mechanics related research, applications and education. It represents the United States in the [International Union of Theoretical and Applied Mechanics \(IUTAM\)](#). For more information regarding USNC/TAM, please refer to the [committee website](#). The USNC/TAM was formed in 1948 and came under the umbrella of the National Academies in 1966. Please send newsletter ideas and suggestions to vicechair@usnctam.org.