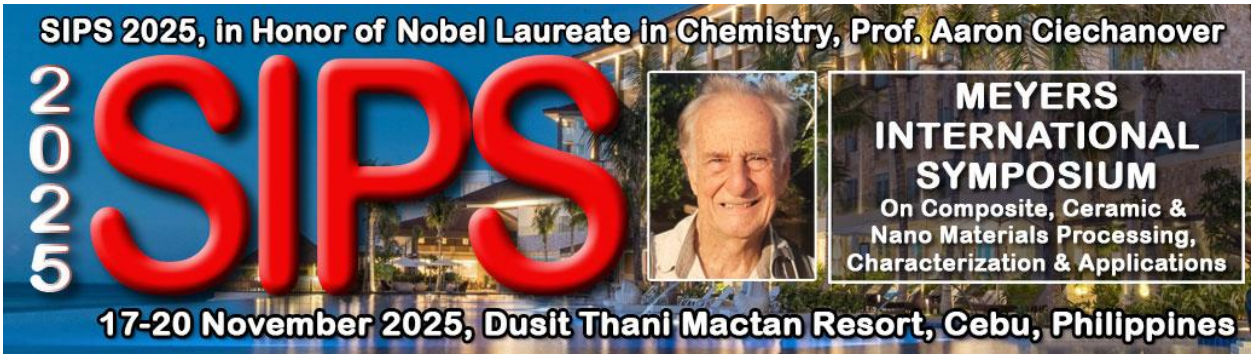

Curriculum Vitae of Marc Meyers

1. **Scientific and Technological Accomplishments**

Professor Meyers' major impact in materials science has been on the mechanical behavior, with focused long-term efforts in the dynamic behavior of materials, including dynamic synthesis and processing; deformation of nanocrystalline materials; and biological materials.

Dynamic behavior of materials comprises deformation, fracture, fragmentation, shear localization, chemical reactions under extreme conditions and processing (combustion synthesis; shock compaction; explosive welding and fabrication; shock and shear synthesis). The underlying unifying theme is the high rate at which events occur. He initiated this work in 1972 and dedicated forty-four uninterrupted years of research to this field. He made important strides to unify the field, by emphasizing the basic physical and chemical processes that the different phenomena have in common. Indeed, he has defined the field through his now classic book, **Dynamic Behavior of Materials** (1994, ~4,600 citations, google scholar), which is used globally and was translated in Chinese.

In recognition for his seminal contributions to shock compression, he was selected as the 2017 recipient of the Duvall Award of APS, a major recognition which is given every two years for fundamental contributions to shock compression science.

Approximately 56 Ph.D.'s and numerous M. Sc. degrees have been granted under his supervision, and more than ten Post-Doctoral researchers have worked with him, leading to ~500 papers, an ISI H index of 103 (115 in google scholar), and ~42,000 ISI citations (60,000 google scholar).

Figure 1 shows the quantitative ISI plot.

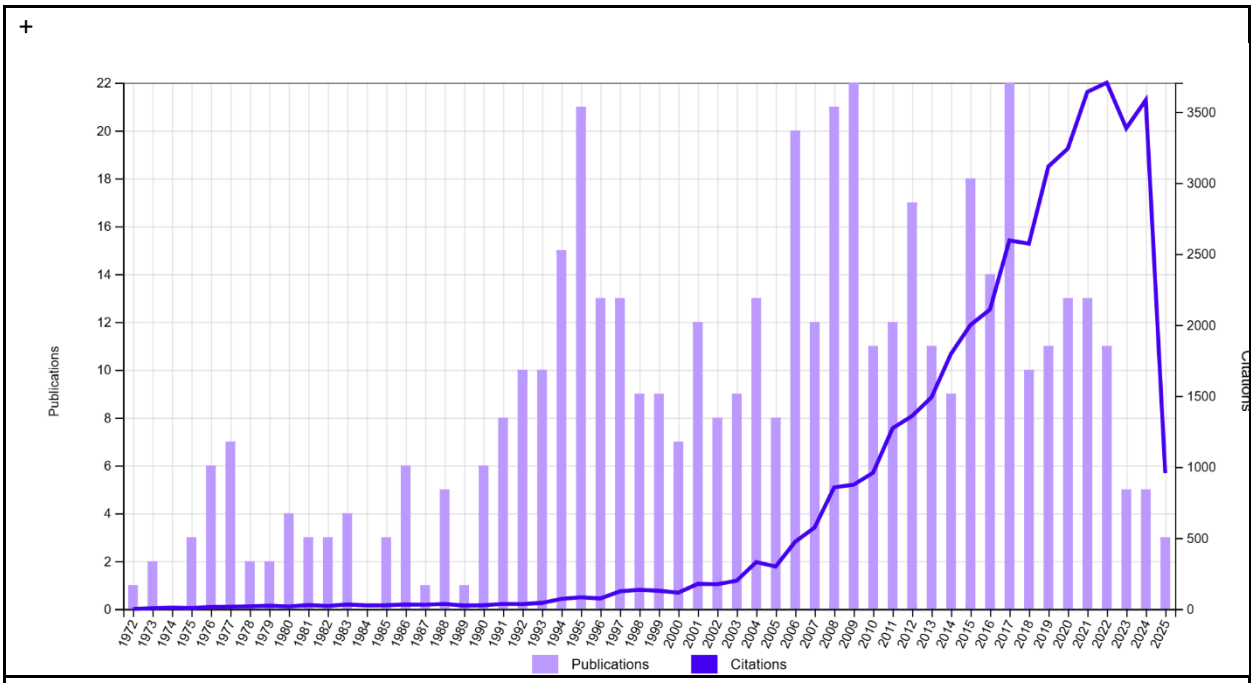

Figure 1. Yearly citations and publications; source ISI Web of Science, April 19, 2025

His work has been highlighted in National Geographic, and profiled on the Discovery Channel, Nova, and in the Modern Marvels program on History Channel (Sharp Objects). It also appeared in the New York Times, Economist, Spiegel, and Washington Post.

2. Key Contributions and Their Impact

His most recognized scientific and technological contributions are highlighted below:

a) Understanding of Shock-induced Mechanical, Physical, and Chemical Effects
Understanding has been critical for development of hydrocodes incorporating relevant deformation mechanisms and phase changes necessary for design of systems in Department of Energy and Department of Defense applications.

- He proposed that the shock front in polycrystalline aggregates showed **irregularities** in position and pressure due to elastic and plastic anisotropy. He quantified these predictions and this has subsequently verified.
- Postulated a model for **plastic deformation at the shock front** based on modified Smith interface in order to account for generation of dislocations and without the need for supersonic dislocations.
- Mechanism for **solid-liquid reactions in shock-induced chemistry** similar to the mechanism operating in intense shear and combustion synthesis was modeled analytically.
- An experimental method for the establishment of the **kinetics and nucleation time for martensite**. Using reflected stress waves, Meyers and his students were able to establish the kinetics of athermal martensitic transformations. This technique was extended to ultrashort times and the nucleation time was established (20-50 ns).
- He proposed a constitutive description of the **slip-twinning transition**; this transition is of utmost importance in the modeling of shock response of metals.

- Innovative use of **high-power pulsed lasers** has enabled accessing extreme regimes of pressure and strain rate no revealed new phenomena in materials, the most important being amorphization in boron carbide, silicon carbide, silicon, and germanium. These transformations have an important bearing on ballistic performance.

(b) Dynamic Failure of Materials; Shear Banding and Spall effects – Has provided key insight into mechanisms of dynamic failure of materials critical for design of weapons systems

- **Dynamic recrystallization at high strain rates**, This concept, initially received with considerable skepticism, has been recognized by the community as a significant contribution. It has important bearing on shear localization in metals and resistance to penetration.
- Experimental and analytical investigation of the **self-organization of shear bands** in metals, ceramics, and granular media, has been reviewed in books and stimulated investigations in China, Europe, and Israel.
- Proposed model for **formation of annealing twins** in metals, which is widely cited in the literature. Key researchers have carried out experiments and analyses to document evidence for this so-called "pop-out" mechanism.

(c) Materials Processing – Shock Compaction and Strengthening, and Combustion Reaction Synthesis – Has provided the fundamental mechanisms of processes that are key to the design of techniques and approaches for materials fabrication

- He developed a new method for the **densification of combustion synthesis products** involving a high-speed forging process which enables ceramics to be deformed while still hot from the exothermic reaction. This method is being used in China.
- He developed novel explosive techniques for compacting hard powders (metals, ceramics, and intermetallics).

(d) Nanolevel Mechanical Properties: Ultrafine and Nanocrystalline metals—Has conducted the first experiments demonstrating biocompatibility of UFG titanium; clinical trials in progress.

- He proposed a mechanism for the **growth of voids** preceding tensile failure using a new type of dislocation shear. It is interesting to notice that, although voids have been studied at great length, their growth by dislocations had not heretofore been explained.
- Conducted the first experiments demonstrating that **ultrafine grained titanium** can be used in **dental implants**. Experiments done on rabbits in 2008 have been subsequently applied to humans. Clinical trials in progress.
- A mechanism for **effect of grain size on yield stress of metals** was extended to the **nanocrystalline** domain and predicts the decrease in the HP slope in the nanocrystalline domain. .

(e) *Understanding of mechanical behavior of biological materials---Unraveling of hierarchical structures of natural materials and their correlation with different functionalities will help create and design new materials for customized and multifunctional applications*

- His work on **biological materials, of a pioneering nature,** has involved highly developed experimental and characterization capabilities, to yield significant new information that is indeed enriching biology and expanding the frontiers of materials science and engineering.
- The discoveries made by his group on **abalone shell, toucan beak, crab exoskeletons, fish scales, seahorse tails, turtle shells, feathers,** and other natural materials are revealing the hierarchy of their structure in a manner not heretofore investigated, and are inspiring new design principles to synthetic materials. These discoveries have received broad coverage in the media.

These accomplishments were enabled by his global network of collaborators, which is presented in Figure 2.

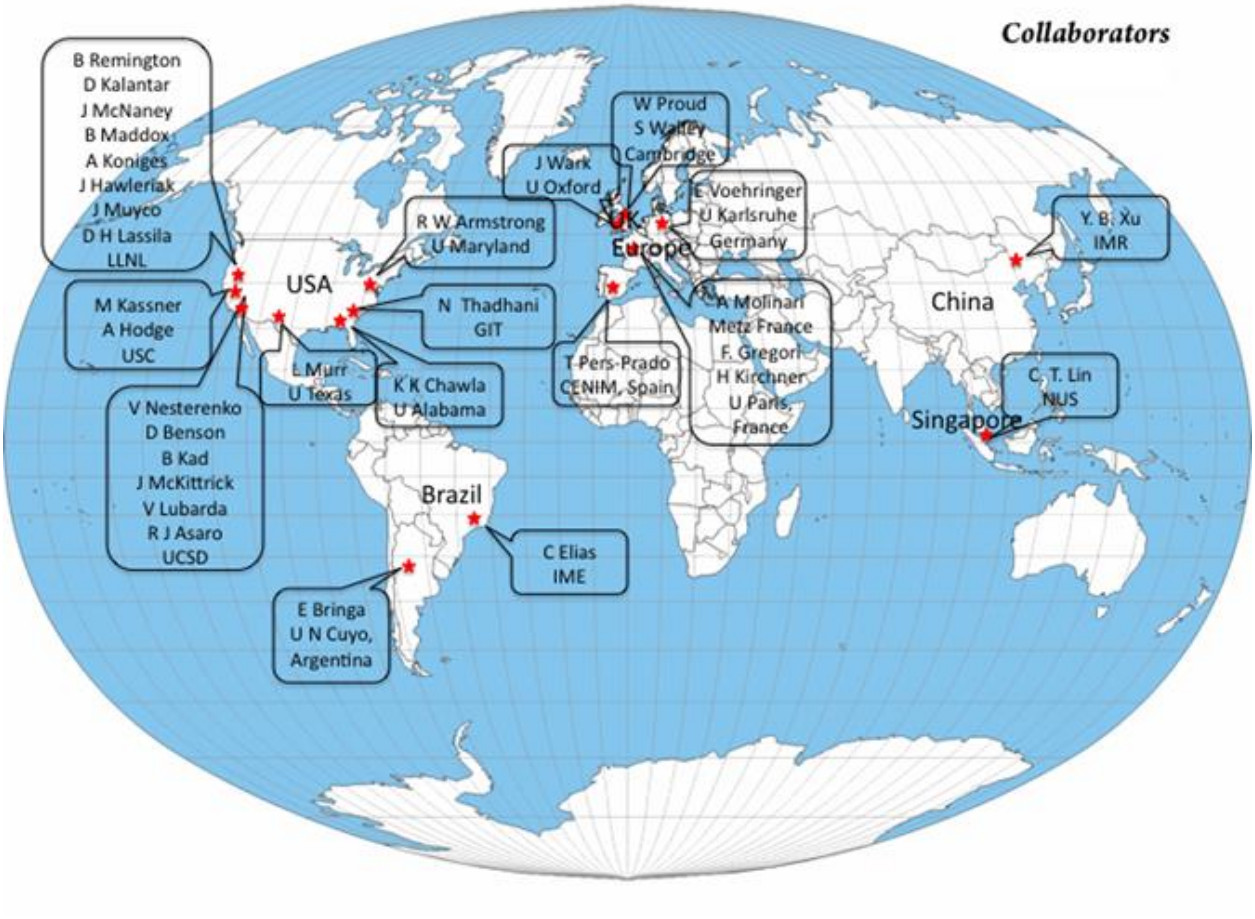

Figure 2. Global network of collaborations

3. **Contribution to Education**

Throughout his professional career, Marc Meyers has been involved in education as a teacher, author of books, and innovator. In addition to his university classes, he taught a class at the Institute for Metal Research, China, and several Short Courses for the community at large. He

is the co-author of **Mechanical Behavior of Materials** (Prentice Hall, 1999; second edition CUP, 2009, third edition under preparation; 4,400 google scholar citations), with K. K. Chawla, which is being used as a senior and graduate text at a number of universities (Over 10,000 copies sold); the book was translated into Chinese and was released in 2017. The first edition was sold out.

He is also the co-author (with K. Chawla) of **Mechanical Metallurgy** (Prentice Hall, 1984) and its predecessor, '**Principios de Metalurgia Mecanica**', (Blucher, 1982), also translated into Chinese.

In 2014, he published **Biological Materials Science** (CUP, 2014, with P. Y. Chen). This book is being highly successful and is being translated into Chinese.

He co-organized and co-chaired four International Mechanics and Materials Summer Schools, funded by the Institute for Mechanics and Materials, an NSF venture intended at bringing together, in a synergistic fashion, these two communities. This resulted in the co-editing of the book **Mechanics and Materials: Fundamentals and Linkages**, (with R. W. Armstrong and H. O. K. Kirchner, J. Wiley). This book contains chapters by the foremost mechanics and materials authorities (J. Rice, R. Ritchie, A. Argon, J. Weertman, J. Gilman, J. Willis, J. Knott, and others) and the summer schools educated students globally.

In the realm of extreme materials response, Marc Meyers authored, as mentioned above, **Dynamic Behavior of Materials** (Wiley, 1994; 4,600 google citations). This book was translated into Chinese ands is considered a classic in the field.

At New Mexico Tech, he organized and hosted the conference series **Frontiers in Materials Technologies,** which was offered to the scientific community of New Mexico (LANL, SNL, Kirtland AFB). The resulting book co-edited with O. Inal (Prentice Hall, 1985), has chapters from global leaders (G. Olson, N. Grant, M. Cohen, A. Kelly, J. Gilman, A. Heuer, G. Thomas, A. Heeger, and others).

The EXPLOMET conference series, which he co-founded with L. E. Murr, led to the publication of five **Explomet conference proceedings** published by major publishers (Plenum, Elsevier). One of the proceedings was translated into Russian.

4. **Leadership and Service to Community**

In the area of leadership and service to the community at large, Marc Meyers has had a long involvement. He has been active in professional societies in the US, Europe, and Brazil. His primary society is TMS and he has chaired several committees (Met. Trans. A and Biomaterials) and organized over ten symposia, primarily in dynamic behavior of materials and biomaterials. Indeed, he launched these two symposia series and they are now firmly entrenched in the TMS programming. He has also been involved with APS, MRS, and ASM.

Upon receiving his doctorate, he took a position of Associate Professor and Researcher at the Military Institute of Engineering, Brazil, and set up the first laboratory for shock waves in Latin America. His long association with New Mexico Tech led to the founding of the EXPLOMET conference series (in 1980) and of the Center for Explosives Technology Research, of which he was Associate Director. This center attracted researchers from the entire globe and provided a fertile environment for both industrially oriented and fundamental research. He served for two years in the Army Research Office and oversaw the research activities in the mechanical behavior of materials. In this position, he organized a symposium bringing together all the ARO grantees and Army scientists working on dynamic behavior of materials. At UCSD has was

successively Associate Director and Director of the Institute for Mechanics and Materials and in this capacity was involved in the organization of numerous symposia and workshops.

He co-founded and co-chaired the Pan American Materials Conferences (2010, 2014, and 2017) and is working towards the establishment of a Federation of American Materials Societies.

Upon invitation by Elsevier, he chaired the Sixth International Conference on Mechanics Biomaterials and Tissues (2015). He was the co-chair of the seventh conference of the series (2017).

He has served and serves in important committees, such as the National Academies US Army Research Laboratory Technical Advisory Committee and the Hopkins Extreme Materials Institute. He created, with L. E. Murr, the John Rinehart Award to recognize excellence in the field of dynamic behavior of materials. This award, given at the EXPLOMET conferences, was later transferred to the European DYMAT Association and is a global recognition given every three years, at the occasion of their main meeting. This is an important accolade, with past recipients from Europe, Asia, and the US.

From 2014 to 2017, he led an expedition through the Brazilian Amazon to celebrate the heroic feat of the Roosevelt-Rondon Scientific Expedition on its centennial. The team used the same means of transportation and followed the same trajectory, motoring up the Paraguay River, traversing the Parecis Plateau on mules and by foot and descending the Roosevelt River by canoe and kayak. As a result of this feat, he has lectured extensively including the New York Explorers Club, of which he was elected a Fellow National.

5. HONORS

The following awards were received by M. Meyers:

- 2025 Acta Materialia Gold Medal
- 2024 Hubertus Colpaert medal, Brazilian Society for metals, materials, and Mining
- 2023 Robert Moskovic Award, European Structural Integrity Society
- 2023 Establishment of the Marc A. Meyers Award on Ceramic, Composite, and Polymeric Materials, ABM Brazil
- 2021 Leadership Award, TMS
- 2019 Grand Prix en Sciences, Luxembourg Academy of Sciences (Institut Grand Ducal) ; this is the highest science prize in Luxembourg
- 2017 George Duvall Shock Compression Science Award, AP
- 2016 Charles Barrett Silver Medal, Rocky Mountain ASM Chapter
- 2015 Albert Easton White Award, ASM International (one of the three principal materials societies in the US)

- 2014 Heyn Medal, German Materials Society (Highest award by DGM).
- 2013 Educator Award, TMS (one of the three principal materials societies in the US)
- 2011 Fellow Award, TMS.
- 2011 Fellow, American Physical Society.
- 2011 Albert Sauveur Award, ASM International, USA.
- 2010 Acta Materialia Materials and Society Award. This is an important accolade that has been bestowed, in the past years, to highly visible researchers occupying positions of leadership in laboratories. The criteria for nomination and selection are either outstanding career contributions to understanding of the relations between materials technology and societal interests or contributions to materials technology that have had major impact on society. The award will not necessarily be made in alternate years on the "understanding" and "impact" criteria and the judges may recognize a combination of qualifications in both areas. All past recipients are members of their respective national academies. They include Dr. Hecker (past Director, LANL), Dr. A. Romig (CTO, SNL), Dr. B. Rath (Associate Director of Research, Naval Research Office), Dr. P. Chaudhari (Director for Research, IBM), and Dr. D. Apelian (past president, TMS).
- 2010, Best Paper Award in Structural Materials, JOM/TMS (paper title: the Role of Dislocations in the Growth of Nanosized Voids in Ductile Failure of Metals; authors: Marc A. Meyers, Sirirat Traiviratana, V.A. Lubarda, David J. Benson, and Eduardo M. Bringa
- 2009-The John S. Rinehart Award bestowed by the Dymat Association (centered in Europe). This has been a global award for research in the field of dynamic behavior of materials. Prof. John Field, Cambridge U. and Prof. Meyers are the 2009 recipients. This award was given at the triennial meeting, in Brussels (Sept. 7, 2009).
- Visiting Distinguished Professor, Chinese Academy of Sciences
- 2008-Honorary Professor, Harbin Engineering U., Harbin, China
- 2008-Lee Hsun Lecture Award, Institute for Metal Research, Chinese Academy of Sciences, China
- 2008-Distinguished Service Award, Structural Materials Division, The Metals, Minerals, and Materials Society (TMS).
- 2008-Honorary Citizen, João Monlevade, Minas Gerais, Brazil
- 2003-Distinguished Materials Scientist/Engineer Award, Structural Materials Division, The Metals, Minerals, and Materials Society (TMS).

- 999 TMS Annual Meeting Tutorial Lecture: Dynamic Behavior of Materials

- 1997 Humboldt Senior Scientist Award, Germany. This is a very prestigious international award. Approximately one hundred and twenty Senior Scientist Awards (in all areas of science and from the entire world) are given annually by the Humboldt Foundation of Germany. This award was given in the field of Metal Physics.

- 1996- Fellow, ASM International

- 1974 - Philipson prize (best student), Dept. of Chem. E. and Met., University of Denver.

- 1969 - Top tenth graduate, Federal University of Minas Gerais, Brazil.

- 1966 - Top tenth graduate, R.O.T.C., Minas Gerais, Brazil.

- 1964 - First Prize, Alliance Française, Belo Horizonte, Brazil.

Additionally, Professor Meyers has given numerous invited and keynote lectures. Some of these are highlighted below:

2015 Plenary Talk, Sixth International Conference on Mechanics of Biomaterials and Tissues, Hawaii (Elsevier)

2014 Plenary talk, Hopkinson Centennial Symposium, Cambridge, UK

2014 Midwest Mechanics Seminar series

2011 Keynote talk, Fourth International Conference on Mechanics of Biomaterials and Tissues, Hawaii (Elsevier)

1997-2014 –Seventeen Invited Talks, TMS/AIME Annual Meetings

2010-Plenary Lecture, NanoSPD 5, Nanjing, China

2012- Midwest Mechanics Lecture Series Speaker

2009-Keynote Talk, Third International Conference on Mechanics of Biomaterials and Tissues, Clearwater Florida (Elsevier)

2009: Invited talk, APS Topical Conference on Shock Compression in Condensed Matter

2007-Invited Talk, Pacific Rim Conference on Materials, Jeju Island, S. Korea

1994, 1997, 2000, 2003 - Member, Advisory Board, DYMAT Journal

2002, 2007, 2008- Invited Keynote Talks, Annual Meeting, Brazilian Society for Metals and Materials

2001-Invited Talk, Fourth International Symposium on Impact Engineering Impact Conference, Kumamoto, Japan

1997-Invited Talk, Second Euroconference and International Symposium on Material Instabilities in Deformation and Fracture, Tessaloniki, Greece.

1994 - Invited Lecturer - EURODYMAT 94, Oxford, and Member of Intl. Advisory Board.

1992 - Invited Speaker, 2nd Intl. Symp. On Intense Dynamic Loading and Its Effects, June 9-12, Chengdu, China.

1992 - Co-organizer and co-editor (with R.W. Armstrong, R. Batra, and T.W. Wright) Symposium "Shear Instabilities and Viscoplastic Theories," SES, Sept. 1992, published as Vol. 17, Mech. of Matls., pp. 83-327 (1994).

1989 - Technical Program Committee Member and Invited Speaker, American Physical Society Topical Conference on Shock Waves in Condensed Matter.

1989 - Member, International Advisory Committee, X International Conference on High-Energy Rate Fabrication, Yugoslavia.

1987 - Member, International Scientific Board, International Conference on Impact Loading and Dynamic Behavior of Materials, Bremen, Germany, May.

1986 - Member, International Advisory Committee, IX International Conference on High-Energy Rate Fabrication, Novosibirsk, USSR, August.

6. Representative Recent Publications (total of ~540; pdfs provided in separate file: Papers (PDFs)

1. P. Niksiar, F. Y. Su, M. B. Frank, T. A. Ogden, S. E. Naleway, M. A. Meyers, J. McKittrick, M. M. Porter, External Field Assisted Freeze Casting, Ceramics, Vol. 2, Issue 1, 2019.

2. V. R. Sherman, N. A. Yaraghi, D. Kisailus, M. A. Meyers, Microstructural and geometric influences in the protective scales of Atractosteus spatula, J. R. Soc. Interface, Vol. 13, Issue 125, 2016.

3. A. Pissarenko, W. Yang, H. Quan, K. A. Brown, A. William, W. G. Proud, M. A. Meyers, Tensile behavior and structural characterization of pig dermis, Acta Biomaterialia, Vol. 86, Issue 1, Pages 77-95, 2019

4.W. Yang, M. A. Meyers, R. O. Ritchie, Structural architectures with toughening mechanisms in Nature: A review of the materials science of Type-I collagenous materials, Progress in Materials Science, Vol. 103, Pages 425-483, 2019

5. T. N. Sullivan, M. A. Meyers, E. Arzt, Scaling of bird wings and feathers for efficient flight, Science Advances, Vol. 5, Issue 1, Pages eaat4269, 2019.

6. Z. Li, S. Zhao, R. O. Ritchie, M. A. Meyers, Mechanical properties of high-entropy alloys with emphasis on face-centered cubic alloys, Progress in Materials Science, Vol. 102, Pages 196-345, 2019

7. B. Wang, T. N. Sullivan, A. Pissarenko, A. Zaheri, H. D. Espinosa, M. A. Meyers, Lessons from the Ocean: Whale Baleen Fracture Resistance, Advanced Materials, Vol. 31, Issue 3, Page 1804574, 2019

8. P. Miranda, A. Pajares, M. A. Meyers, Bioinspired composited segmented armour: Numerical simulations, Journal of Materials Research and Technology, in press, 2018

9. H. Quan, W. Yang, E. Schaible, R. O. Ritchie, M. A. Meyers, Novel Defense Mechanisms in the Armor of the Scales of the "Living Fossil" Coelacanth Fish, Advanced Functional Materials, 1804237, 2018.

10. A. Velasco-Hogan, J. Xu, M. A. Meyers, Additive Manufacturing as a Method to Design and Optimize Bioinspired Structures, Advanced Materials, 1800940, 2018.

11.M. A. Meyers, Z. Li, S. Zhao, B. Wang, Y. Liu, P. K. Liaw, Shear localization of fcc high-entropy alloys, DYMAT, 2018.

12. S. Zhao, B. Kad, E. Hahn, L. Chen, Y. Opachi, K. More, B. Remington, C. Wehrenberg, J. LaSalvia, W. Yang, H. Quan, M. A. Meyers, Shock-induced Amorphization in Covalently Bonded Solids, DYMAT, 2018.

13. M. A. Meyers, M. S. Schneider, O. Voehringer, The Onset of Twinning in Plastic Deformation and Martensitic Transformations, Nano and Microstructural Design of Advanced Materials, Pages 221-231, 2003.

14.S. Zhao, R. Flanagan, E. N. Hahn, B. Kad, B. A. Remington, C. E. Wehrenberg, R. Cauble, K. More, M. A. Meyers, Shock-induced amorphization in silicon carbide, Acta Materialia, Vol. 158, Pages 206-213, 2018.

15. T. P. Remington, E. N. Hahn, S. Zhao, R. Flanagan, J. C. E. Mertens, S. Sabbaghianrad, T. G. Langdon, C. E. Wehrenberg, B. R. Maddox, D. C. Swift, Spall strength dependence on grain size and strain rate in tantalum, Acta Materialia, Vol. 158, Pages 313-329, 2018.

16. A. Zaheri, J. S. Fenner, B. P. Russell, D. Restrepo, M. Daly, D. Wang, C. Hayashi, M. A. Meyers, P. D. Zavattieri, H. D. Espinosa, Revealing the Mechanics of Helicoidal Composites through Additive Manufacturing and Beetle Developmental Stage Analysis, Advanced Functional Materials, Vol. 28, Issue 33, 2018.

17. J. Jung, A. Pissarenko, N. A. Yaraghi, S. E. Naleway, D. Kisailus, M. A. Meyers, J. McKittrick, A comparative analysis of the avian skull: Woodpeckers and chickens, JMBBM, Vol. 84, Pages 273-280, 2018.

18. T. N. Sullivan, Y. Zhang, P. D. Zavattieri, M. A. Meyers, Hydration-Induced Shape and Strength Recovery of the Feather, Advanced Functional Materials, Vol. 28, Issue 30, 2018.

19. A. M. Marquez, Z. Li, C. H. Braithwaite, T. P. Weihs, N. M. Krywopusk, D. J. Gibbins, M. A. Meyers, Fragmentation and mechanical performance of tailored nickel-aluminum laminate compacts, Materials Science and Engineering A-Structural Materials Properties Microstructure and Processing, Vol. 727, Pages 123-132, 2018.

20. Z. Li, S. Zhao, S. M. Alotaibi, Y. Liu, B. Wang, M. A. Meyers, Adiabatic shear localization in the CrMnFeCoNi high-entropy alloy, Acta Materialia, Vol. 151, Pages 424-431, 2018.

21. M. J. Chon, M. Daly, B. Wang, X. Xiao, A. Zaheri, M. A. Meyers, H. D. Espinosa, Lamellae spatial distribution modulates fracture behavior and toughness of african pangolin scales, JMBBM, Vol. 76, Pages 30-37, 2017.

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23. Y. Yu, W. Yang, M. A. Meyers, Viscoelastic properties of alpha-keratin fibers in hair, Acta Biomaterialia, Vol. 64, Pages 15-28, 2017.

24.D. X. Liu, X. Pang, D. L. Li, C. G. Guo, J. Wongsa-Ngam, T. G. Langdon, M. A. Meyers, Microstructural Evolution and Properties of a Hot Extruded and HPT-Processed Resorbable Magnesium WE43 Alloy, Advanced Engineering Materials, Vol. 19, Issue 11, 2017.

25. T. N. Sullivan, M. Chon, R. Ramachandramoorthy, M. R. Roenbeck, T. Hung, H. D. Espinosa, M. A. Meyers, Reversible Attachment with Tailored Permeability: The Feather Vane and Bioinspired Designs, Advanced Functional Materials, Vol. 27, Issue 39, 2017.

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28.S. Zhao, B. Kad, C. Wehrenberg, B. A. Remington, E. N. Hahn, K. L. More, M. A. Meyers, Generating gradient germanium nanostructures by shock-induced amorphization and crystallization, Proceedings of the National Academy of Science of the United States of America, Vol. 114, Issue 37, Pages 9791-9796, 2017.

29. T. N. Sullivan, B. Wang, H. D. Espinosa, M. A. Meyers, Extreme lightweight structures: avian feathers and bones, Materials Today, Vol. 20, Issue 7, Pages 377-391, 2017.

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31.H. Quan, W. Yang, M. Lapeyriere, E. Schaible, R.O. Ritchie, M.A. Meyers, Structure and Mechanical Adaptability of a Modern Elasmoid Fish Scale from the Common Carp, Matter, Vol. 3, Pages 842-863, 2020.

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