

# OLIVER M. O'REILLY

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## EDUCATION

Ph.D., Theoretical and Applied Mechanics, Cornell University, Ithaca, NY.

M.S., Theoretical and Applied Mechanics, Cornell University, Ithaca, NY.

B.E., Mechanical Engineering, National University of Ireland, Galway, Ireland.

## ADMINISTRATIVE AND LEADERSHIP EXPERIENCES

### **Vice Provost for Undergraduate Education, UC Berkeley (July 2022 to present, Served as Interim July 2021- June 2022)**

- Responsible for leading undergraduate education at UC Berkeley and implementation of the recommendations of the campus strategic plan and diversity initiatives in the areas of Student Experience and Enrollment.
- Providing executive oversight of several strategic initiatives and academic programs with an operating budget of \$30.7M, including [Berkeley Discover](#), [Berkeley Connect](#), [Berkeley Changemaker](#), the [Berkeley Collegium](#), and the [American Cultures Center](#), as well as major operating units such the [Athletic Study Center](#), the [Student Learning Center](#), and [Research, Teaching, and Learning Services](#) which provides support to faculty development through the [Center for Teaching and Learning](#).
- Serving as a liaison for academic units to campus administrative offices, and chair of multiple campus committees.
- Served as co-chair on the [Joint Senate-Administration Task Force on the First-Year Academic Experience](#). The task force report led to over 20 recommendations to improve the academic experience of students at UC Berkeley. Implementation of these recommendations, including the sourcing of improved tools for curriculum management and student advising, are in progress.
- Serving on the Recovery Management Task Force and the Instructional Planning Committee. These groups are charged with helping the campus navigate the COVID-19 pandemic.
- Partnering with the Vice Chancellor for Student Affairs and the Chief Information Officer to propose and implement a campus-wide [Instructional Resilience and Enhancement Fee](#). This course materials fee provides robust funding for instructional technologies and enhance students' academic experiences.
- Partnering with the Disabled Students' Program (DSP), the Vice-Chancellor for Equity and Inclusion, EECS faculty, and the Academic Senate to implement zoom-based remote proctoring for examinations and initiate the [DSP Faculty Liaisons Program](#).

- Partnering with faculty in the Division of Computing, Data Science, and Society and Tuskegee University in the development a data science program.
- Co-chairing the [University Athletics Board](#). This board is charged with advising the Chancellor on matters of policy related to Intercollegiate Athletics.
- Partnering with alumnae and the Department of Intercollegiate Athletics to create an online history of women's rowing at UC Berkeley. The intention is to complete the project in time for the 50<sup>th</sup> anniversary of the program in 2024 and to honor the 50<sup>th</sup> anniversary of Title IX in 2022.

### **Associate Dean for Graduate Education, Division of Computing, Data Science, and Society (CDSS), UC Berkeley (2020/21)**

- Led and coordinated the creation and campus review of a successful pre-proposal for the formation of a College of CDSS. Following review by the UC Berkeley administration and senate, the Office of the President of the University and the Systemwide Senate, approval for submission of a full proposal was granted in Fall of 2021.
- Created proposal for development of an innovative master's degree program in CDSS with several areas of interdisciplinary specialization.
- Served as the representative for CDSS on VCEI's Academic Chief Diversity Officers Group. Service on this group helped guide the DEIB vision and mission that was presented in the College of CDSS pre-proposal.
- Facilitated the established of a partnership on data science education between UC Berkeley and Tuskegee University.

### **Chair of the Berkeley Division of the Academic Senate, UC Berkeley (2019/20)**

- Responsible for representing the faculty in shared governance of the campus.
- Served as the representative of the UC Berkeley on the Council of the Systemwide Academic Senate. Initiated a UC-wide [Moment of Silence and Reflection](#) on June 4, 2020 at 11am.
- Co-Chair of the [Task Force on Instructional Resilience](#) (AY 2019-2020) charged with providing recommendations on how the campus would become instructionally resilient in the face of events or circumstances that disrupted on-campus instruction such as the fires in Fall 2019 and the pandemic in Spring 2020. Recommendations from this work were implemented in real time as the campus moved to remote instruction with two days of notice on March 10, 2021.
- Co-Chair of the [Task Force on Instructional Planning and Policy](#) (AY 2019-2020). This task force was charged with developing plans for three different instructional scenarios for Fall of 2020. One of these plans was successfully implemented.
- Co-Chair of the [Working Group on Online Examinations and Proctoring for the Spring Semester 2020](#). This working group was charged with supporting the abrupt pivot to remote examinations due to the necessity of remote instruction during shelter in place in March and April of 2020. The policies were then implemented for the remainder of the spring semester.

- Led the campus effort to expedite and approve (at both the Berkeley Division of the Academic Senate and the Systemwide Senate) [a revised grading policy for the Spring Semester of 2020](#) and the rapid development and coordination of [Instructor](#) and [Student](#) FAQs on the policy. The policy was designed to help the most vulnerable students and enable them to make academic progress despite the significant challenges and disruptions of the pandemic.
- Co-Chair Executive Committee for the [Celebration of 150 Years of Women at UC Berkeley \(150W\)](#) (2019/20 and 2020/21). Initiated concept, recruited leadership, and staff, faculty, student, and alumni volunteers to mark the 150<sup>th</sup> anniversary of the Regents Memorial Resolution on October 3, 1870, that “young ladies be admitted into the University on equal terms in all respects with young men.” On equal terms in all respect to young men.” This campus-wide collaboration has raised awareness and celebrated the important role that women have played in the history of UC Berkeley and the nation. The project resulted in the most comprehensive resource on the history of women, including staff, students, and faculty, at an institution of higher education: <https://150w.berkeley.edu/>. In Spring of 2020, the 150W celebration was featured on every offer of admission letter to the classes of 2022 and 2024, was a featured theme of Cal Athletics events in Spring of 2020 and was the intended theme for Cal Day in April 2020.
- Partnered with the Office of Faculty Equity & Welfare and the Disabled Student's Program (DSP) to improve faculty relations with DSP. The efforts included encouraging and helping in the development of a recently released online faculty training: [Disability, Accommodation, and Access in the UC Classroom](#).
- Partnered with the Office of Faculty Equity & Welfare and the leadership of the ASUC to establish the [Academic Accommodations Hub](#) on the campus's learning management system and a [revised auditing policy](#) for all courses on campus.
- Served on the Executive Committee of a Faculty Governance Consortium. This consortium had membership from Cal Tech, Stanford, the Ivies, MIT, NYU, Rice University and U T Austin, among others.

### **Vice-Chair of the Berkeley Division of the Academic Senate, UC Berkeley (2018/19)**

- In an effort to improve faculty engagement with the Senate and increase transparency, initiated “[The Fortnightly](#)” – a digest of news and developments from the Academic Senate in Fall of 2018.
- Served as lead faculty participant on the Academic Funding Working Group charged by the EVCP to propose a more transparent, equitable, and sustainable funding model for academic units across campus.
- Chaired Division of Data Science and Information Faculty Working Group. This group was charged with establishing governance bylaws for the Data Science Commons, guidance on curriculum in data science, and processes to guide faculty affiliations.
- Initiated efforts to improve faculty relations with the Disabled Students' Program, the Department of Intercollegiate Athletics, the California Alumni Association, and

University Development and Alumni Relations. These efforts continued during O'Reilly's service as chair.

### **Vice-Chair for Graduate Study, Department of Mechanical Engineering, UC Berkeley (2009-2013)**

- Responsible for management and oversight of a graduate program with over 300 MS and PhD students on the UC Berkeley campus.
- Led efforts to completely revise the admissions processes for the department to improve diversity and recruitment of MS/PhD students. These efforts included increasing the yield of Chancellor's and Berkeley fellows to 40% and 66%, respectively, completely reorganizing prospective graduate student visit day, communicating weekly with major field advisors, presenting [seminars](#) on graduate school admissions to UC Berkeley students, and improving the yield on accepted admissions offers from 66 MS/PhD students in 2012 to 92 MS/PhD students in 2013.
- Led efforts to continually improve the graduate program through consultations and regular communications with faculty and graduate students. These efforts led to the creation of a graduate student lounge on the 5<sup>th</sup> floor of Etcheverry Hall and the introduction of a (equity) supplemental stipend for GSIs in the department so their salaries would be comparable to GSRs.
- Led the department in writing the department's Self Review Report in preparation for the campus's review of the academic program in 2012.

### **PERSONAL INTERESTS**

Professor O'Reilly is a father (Anna, 20), stepfather (Deme, 34; Elliott, 16; and Milena, 14) and husband (Christina). He is an avid cyclist and masters rower. He enjoys history, films, supporting Cal Athletics and Irish rugby teams, and serving as the faculty fellow (liaison) for the Cal Men's Rowing team.

### **ACADEMIC INTERESTS**

Professor O'Reilly has collaborated with faculty, postdoctoral assistants, and students on the development and analysis of mathematical models for a wide range of mechanical and biomechanical systems: <https://dynamics.berkeley.edu>. The development of the models employs a wide spectrum of theories of deformable media including directed rods and rigid bodies and the analyses employ dynamical systems theory. Applications of the modeling and analyses that O'Reilly's research has considered includes soft robots, MEMS resonators and switches, brake squeal, the dynamics of toys, motorcycle navigation, axially moving media, the dynamics of artificial and natural satellites, spinal kinematics, and vehicle collision dynamics. Novel applications include the dynamics of toys such as the [Dynabee](#), the [BB-8 robot](#), and [Hoberman's sphere](#), and mechanics-based models for the [cooking of spaghetti](#) and [plant growth](#).

O'Reilly has co-authored over 100 archival journal articles, written three books, coauthored a book, and is a co-inventor on two patents. Eighteen PhD students and 26 MS students have completed their degrees under his supervision. His textbooks are available for free to students and instructors and his research has been discussed in over 100 publications including [The New York Times](#), [The Economist](#), [Der Spiegel](#), [Nature](#), [Science News for Kids](#), [Scientific American](#), [BBC Ideas](#), and [Food & Wine](#). He is also the co-founder and editor of a free online instructional resource on mathematical representations for rotations: <https://rotations.berkeley.edu/>. Curiosity is the primary inspiration and instruction is the primary motivation for O'Reilly's research program. Among the most significant contributions of his research program are the widely accepted explanation for the [failure of a shoelace knot](#), the seminal [article on brake squeal](#), a highly cited model for the [lumbar spine](#), and the promotion of, and instruction on, a differential geometry-based explanation for formulations of the equations of motion of mechanical systems. The latter work, which has taken nearly 30 years to complete, is summarized in his 2020 textbook [Intermediate Engineering Dynamics: Newton-Euler and Lagrangian Dynamics](#).

His primary area of undergraduate and graduate instruction is the dynamics of mechanical systems with special emphasis on the dynamics of systems of particles and rigid bodies. He also teaches courses on the dynamics of rods and strings and soft robots, and seminars on rotations, the mechanics behind movies, and, most recently, the history of women and men's rowing at UC Berkeley. Based on end-of-semester evaluations, O'Reilly's courses have been ranked amongst the highest in the Department of Mechanical Engineering for over two decades. He has received multiple departmental teaching awards and the campus's Distinguished Teaching Award in 1999.

O'Reilly's research activities in biomechanics with UCSF Professors Jeffrey Lotz and Brian Feeley led to the founding of [Bioniks](#). This company seeks to integrate new analytical tools into the clinical care pathway for musculoskeletal and neurologic diseases. O'Reilly serves as a board member and Chief Science Officer.

## **DIVERSITY, EQUITY, AND INCLUSION INTERESTS AND CONTRIBUTIONS**

One of O'Reilly's main priorities in his position as interim Vice Provost for Undergraduate Education is to improve access and accommodation for students. He is particularly interested in developing and promoting efforts to educate all campus instructors on accessible instructional materials and improving the interface between instructors and the Disabled Students' Program. Given its privileged role in undergraduate education, he believes it is imperative for UC Berkeley to become a national leader in instructional materials that are accessible to, and assessment methods that accommodate, all students.

In his teaching and research, O'Reilly strives to create a supportive community where students are treated with respect and fairness while receiving a first-class education. Due in part to his experiences as an immigrant, father, and stepfather to children with special needs, husband to a Latina first generation college graduate, educator, and serving member on campus committees, O'Reilly's perspectives on inclusion and diversity have evolved and deepened during his 30 years at UC Berkeley. He is keenly aware of the social injustices in our society and the need for UC Berkeley to change to address them. In response, he led the campus's work in the Spring of 2020 to develop a default P/NP grading policy to accommodate the campus's most vulnerable students and the campus's development of an ADA-compliant auditing policy in the Fall of 2019. O'Reilly also supports the campus's efforts to become a Hispanic Serving Institution (HSI) and is eager to lead the campus's efforts to be more supportive and welcoming incoming students, particularly students from under-represented minorities and disadvantaged backgrounds.

In addition to his teaching and research programs, O'Reilly's primary contribution to equity and inclusion has been his participation in the [Celebration of 150 Years of Women at UC Berkeley \(150W\)](#). In his role with the Academic Senate, he was honored to be able to propose this celebration to the Chancellor in the spring of 2019 and served as co-chair of the task force charged to plan the celebration and the subsequent executive steering committee. This work culminated in building grass roots support from across campus that launched the celebration in January 2020. The result from 150W include over 50 dedicated webpages on campus dedicated to the history of women, a remarkable history of women on the UC Berkeley campus, and an acknowledgement of the extraordinary contributions of women in the face of adversity and discrimination on the campus and beyond.

## ACADEMIC EXPERIENCE

- 2021-Present Distinguished Professor, Department of Mechanical Engineering, UC Berkeley.
- 2015-2020 Visiting Professor, School of Mechanical and Materials Engineering, University College Dublin, Ireland.
- 2009-2013 Vice Chair for Graduate Study, Department of Mechanical Engineering, UC Berkeley.
- 2003-2021 Professor, Department of Mechanical Engineering, UC Berkeley.
- 1998-2003 Associate Professor, Department of Mechanical Engineering, UC Berkeley.
- 1992-1998 Assistant Professor, Department of Mechanical Engineering, UC Berkeley.
- 1990-1992 Postdoctoral Assistant, Institut für Mechanik, Swiss Federal Institute of Technology, Zürich, Switzerland.
- 1986-1990 Research and Teaching Assistant, Department of Theoretical and Applied Mechanics, Cornell University, New York.

## HONORS

- 1995 Hellman Family Faculty Fund Award
- 1997, 1998 Pi-Tau-Sigma Excellence in Teaching Awards
- 1999 University of California, Berkeley Distinguished Teaching Award
- 2003 Pi-Tau-Sigma Professor of the Year Award
- 2006 Graduate Women of Etcheverry Faculty Award for Excellence in Graduate Student Mentoring
- 2007 Science Foundation Ireland, E.T.S. Walton Research Visitor Award, Department of Applied Mathematics, University College Cork, Ireland
- 2013 Tau-Beta-Pi Outstanding Faculty of the Year Award
- 2015 ASME Fellow, Elected
- 2019 Liviu Librescu Memorial Lecturer at Virginia Tech
- 2021 Berkeley Faculty Service Award (Citation can be found [here](#))
- 2023 University of Galway, Alumni Award for Engineering, Science and Technology

**UNIVERSITY SERVICE**

- 7/2022-Present Vice Provost for Undergraduate Education
- 7/2022-Present Faculty Athletics Representative
- 7/2021-6/2022 Interim Vice Provost for Undergraduate Education
- Fall 2021 Co-Chair Joint Administration-Senate [Task Force on the First-Year Undergraduate Academic Experience](#)
- 2020-2021 Associate Dean for Graduate Education, Division of Computing, Data Science, and Society
- 2019-2020 Chair of the Berkeley Division of the Academic Senate
- 2019-present Faculty Fellow Cal Men's Rowing
- 2018-2019 Vice Chair of the Berkeley Division of the Academic Senate
- Spring 2020 Co-Chair Joint Administration-Senate [Task Force on Instructional Resilience](#)
- Spring 2020 Co-Chair Joint Administration-Senate [Task Force on Instructional Planning and Policy](#)
- Spring 2020 Co-Chair Joint Administration-Senate [Working Group on Online Examinations and Proctoring for the Spring Semester 2020](#)
- 2019-2020 Chair Division of Data Science and Information Faculty Working Group
- 2019-2021 Co-Chair Executive Committee for the Celebration of 150 Years of Women at U. C. Berkeley
- 2018-2019 Co-Chair Task Force for the Celebration of 150 Years of Women at U. C. Berkeley
- 2016-2018 Chair Student Information Systems (SIS) Faculty Advisory Committee
- 2016-2018 Chair Academic Senate's Committee on Teaching
- 2005-2007
- 2013-2015 Elected Member of Divisional Council of the Berkeley Division of the Academic Senate
- 2008-2010
- 2007-2008 Co-Chair Academic Senate's Committee on Teaching
- 2007-2009 Co-Chair Joint Administration-Senate Task Force on Teaching Evaluations
- 2013-2016 Member On the Same Page Advisory Committee



- 2012-2013 Member College of Letters & Sciences Advisory Board for College Writing Program
- 2007-2008 Member Reading and Composition Task Force
- 2003-2005 Member Academic Senate's Committee on Teaching  
2008
- 2002 Member Academic Senate's Graduate Student Instructor Teaching and Mentoring Task Force
- 2000-2016 Member KALX Radio Policy Advisory Board
- 2000-2001 Member Academic Senate's Steering Committee of the Center for Faculty Leadership and Outreach
- 1999-2001 Chair Academic Senate's Committee on Special Scholarships
- 1998-1999 Member Academic Senate's Committee on Special Scholarships

#### **DEPARTMENTAL & COLLEGE SERVICE**

- 2016-2019 Chair Committee on Web & Communication
- 2017-2018 Chair Committee on Faculty Awards
- 2017-2018 Member Committee on Seminars
- 2017-2018 Member Committee on ABET and Undergraduate Study
- 2009-2013 Vice Chair for Graduate Studies
- 2003-2004 Chair Drake Scholarship Committee  
2001-2002  
1998-1999
- 2008-2009 Chair Student Prizes Committee  
2007-2008
- 2009-2013 Chair Graduate Study Committee
- 2016-2018 Secretary of the College of Engineering Faculty
- 2011-2013 Member College of Engineering Graduate Study Committee  
2009-2010
- 2009-2010 Member College of Engineering Student Relations Committee
- 2000-2001 Member Policy Committee
- 2008-2009 Member Drake Scholarship Committee
- 1993-1995 Member Committee for Undergraduate Study

- 2016-2017 Member Committee on Undergraduate Admissions  
1994-1995
- 2005-2006 Chair Committee for Preliminary Examinations  
1997 Member Committee for Preliminary Examinations  
1993-1994

## PROFESSIONAL SERVICE

Founding co-editor and contributor to the online resource on mathematical representations and applications of rotations: <https://rotations.berkeley.edu/>

Served as a member of the Western Association of Schools and Colleges Senior College and University Commission (WSCUC) review team for reaffirmation of the accreditation of UCLA ([Report of the WSCUC team](#)).

Served as one of the six members of the steering committee for the University Governance Consortium. This consortium of faculty governance leaders from a select group of 16 private and public universities, including Cal Tech, the Ivies, Stanford, the University of Chicago, University of Michigan, and the University of Texas at Austin, held regular biweekly meetings during the pandemic to help share best practices and raise issues as campuses throughout the nation dealt with the pandemic.

Associate Editor, *ASME Journal of Applied Mechanics* (July 2001-June 2008).

Associate Editor, *Nonlinear Dynamics* (July 2017 - Present).

Contributing Editor, *Nonlinear Dynamics* (December 2014-April 2016).

Member of the Editorial Boards of the journals *International Journal of Nonlinear Mechanics*, *Nonlinearity*, *Regular and Chaotic Dynamics*, and *Nonlinear Dynamics and Mobile Robotics*.

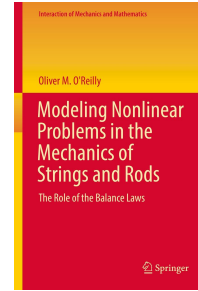
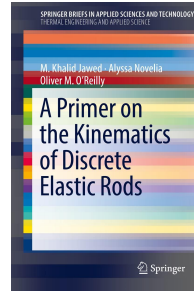
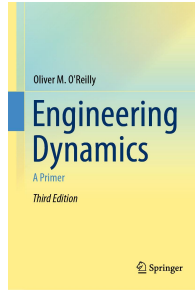
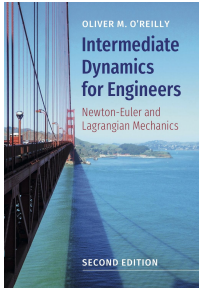
Co-Organizer of *Symposium on Time-Varying Systems*, ASME 16<sup>th</sup> Biennial Conference on Vibration and Noise, Sacramento, CA, September 1997.

Co-Organizer of *Symposium on Nonlinear Dynamics and Stochastics*, ASME Winter Annual Meeting, November 1997.

Service as an reviewer for over twenty journals including *Acta Mechanica*, *Journal of Elasticity*, *ASME Journal of Applied Mechanics*, *International Journal of Solids and Structures*, *International Journal of Nonlinear Mechanics*, *Nonlinear Dynamics*, *Journal of Sound and Vibration*, *Journal of Vibration and Control*, *ASME Journal of Vibration and*

*Acoustics, Mathematics and Mechanics of Solids, ZAMP, Proceedings of the Royal Society of London, Mechanics Research Communications, Journal of Vehicle System Dynamics, Communications in Mathematical Physics, Journal of Nonlinear Science, and Quarterly Journal of Applied Mathematics and Mechanics.* O'Reilly has also served on several panels charged with reviewing proposals for the U.S. National Science Foundation, the Science Foundation of Ireland, and the Israel National Science Foundation.

## PUBLICATIONS



## BOOKS

1. O. M. O'Reilly, *Engineering Dynamics: A Primer*, Springer-Verlag, New York, 2001.
2. O. M. O'Reilly, *Engineering Dynamics: A Primer, Second Edition*, Springer-Verlag, New York, 2010. The first edition of this book appeared in 2001.
3. O. M. O'Reilly, *Intermediate Engineering Dynamics: A Unified Approach to Newton-Euler and Lagrangian Dynamics*, Cambridge University Press, New York, 2008. A Russian translation of this book was published in 2011 and can be accessed at <http://www.rcd.ru/>
4. O. M. O'Reilly, *Modeling Nonlinear Problems in the Mechanics of Rods and Strings: The Role of the Balance Laws*, Springer-Verlag, New York, 2017.
5. M. K. Jawed, A. Novelia and O. M. O'Reilly, *A Primer on the Kinematics of Discrete Elastic Rods*, Springer-Verlag, New York, 2018.
6. O. M. O'Reilly, *Engineering Dynamics: A Primer, Third Edition*, Springer-Verlag, New York, 2019.
7. O. M. O'Reilly, *Intermediate Engineering Dynamics: Newton-Euler and Lagrangian Dynamics, Second Edition*, Cambridge University Press, New York, 2020.

## PATENTS

1. B. L. Bircumshaw, A. P. Pisano and O. M. O'Reilly, *Radial Bulk Annular Resonator using MEMS Technology*, U.S. Patent No. 6,894,586 (Issued May 17, 2005).
2. B. L. Bircumshaw, O. M. O'Reilly and A. P. Pisano, *MEMS Resonator and Method of Making Same*, U.S. Patent No. 6,940,370 (Issued September 6, 2005).

## ARCHIVAL JOURNAL ARTICLES

1. N. N. Goldberg and O. M. O'Reilly, *A Material Momentum Balance Law for Shells and Plates with Application to Phase Transformations and Adhesion*, **Acta Mechanica**, vol. 233, pp. 3535-3555 (2022).
2. N. N. Goldberg and O. M. O'Reilly, *Electrostatically Actuated MEMS in the Post-Touchdown Regime: The Thin-Dielectric Limit and a Novel Reduced-Order Model for Release Dynamics*, **International Journal of Solids and Structures**, vol. 252, pp. 111812 (2022).
3. N. N. Goldberg and O. M. O'Reilly, *New Representations for the Curvature Tensor of a Surface with Application to Theories of Elastic Shells*, **Journal of Elasticity**, vol. 148, No. 2, pp. 199-206 (2022).
4. T. E. Honein and O. M. O'Reilly, *The Geometry of Equations of Motion: Particles in Equivalent Universes*, **Nonlinear Dynamics**, vol. 104, No. 4, pp. 2979-2994 (2021).
5. T. E. Honein and O. M. O'Reilly, *On the Gibbs-Appell Equations for the Dynamics of Rigid Bodies*, **ASME Journal of Applied Mechanics**, vol. 88, No. 7, pp. 74501 (2021).
6. N. N. Goldberg and O. M. O'Reilly, *Pervasive Nonlinear Vibrations Due to Rod-Obstacle Contact*, **Nonlinear Dynamics**, vol. 103, No. 3, pp. 2169-2181 (2021).
7. E. G. Hemingway and O. M. O'Reilly, *Continuous Models for Peristaltic Locomotion with Application to Worms and Soft Robots*, **Biomechanics and Modeling in Mechanobiology**, Vol. 20, pp. 5-30 (2021).
8. N. N. Goldberg and O. M. O'Reilly, *On Contact Point Motion in the Vibration Analysis of Elastic Rods*, **Journal of Sound and Vibration**, vol. 487, 115579 (2020).
9. E. G. Hemingway and O. M. O'Reilly, *On a Planar Theory of a Discrete Nonlinearly Elastic Rod*, **Acta Mechanica**, vol. 231, pp. 1217-1250 (2020).
10. N. N. Goldberg and O. M. O'Reilly, *Mechanics-Based Model for the Cooking-Induced Deformation of Spaghetti*, **Physical Review E**, vol. 101, No 1, pp. 013001 (2020). This paper was an "Editors Suggestion" for **Physical Review E** and featured in [Physics](#).
11. H. -T. Kim and O. M. O'Reilly, *On the Delicate State of Instability of a Vertical Riser Transporting Fluid*, **Journal of Fluids and Structures**, vol. 29, p. 10281 (2020).
12. A. Bronars and O. M. O'Reilly, *Gliding Motions of a Rigid Body: The Curious Dynamics of Littlewood's Rolling Hoop*, **Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences**, vol. 475, issue 2169, p. 20190440 (2019).
13. N. N. Goldberg, X. Huang, C. Majidi, A. Novelia, O. M. O'Reilly, D. A. Paley, and W. L. Scott, *On Planar Discrete Elastic Rod Models for the Locomotion of Soft Robots*, **Soft Robotics**, vol. 6, no. 5, pp. 595-610 (2019).
14. H. -T. Kim and O. M. O'Reilly, *Instability of Catenary-Type Flexible Risers Conveying Fluid in Subsea Environments*, **Ocean Engineering**, vol. 173, pp. 98-115 (2019).

15. P. Akella, O. M. O'Reilly, and K. Sreenath, *Controlling the Locomotion of Spherical Robots or why BB-8 Works*, **ASME Journal of Mechanisms and Robotics**, vol. 11, iss. 2, p. 24501 (2019).
16. E. G. Hemingway and O. M. O'Reilly, *Perspectives on Euler Angle Singularities, Gimbal Lock, and the Orthogonality of Applied Forces and Applied Moments*, **Multibody System Dynamics**, vol. 44, iss. 1, p. 31–56 (2018).
17. C. A. Daily-Diamond, A. Novelia, and O. M. O'Reilly, *Dynamical Analysis and Development of a Biologically Inspired SMA Caterpillar Robot*, **Bioinspiration and Biomimetics**, vol. 21, iss. 5, p. 56005, (2017).
18. J. K. Nichols, M. Sena, J. L. Hu, O. M. O'Reilly, B. Feely, and J. C. Lotz, *A Kinect-Based Movement Assessment System: Marker Position Comparison to Vicon*, **Computer Methods in Biomechanics and Biomedical Engineering** vol. 20, iss. 12, pp. 1289–1298 (2017).
19. K. M. de Paynebrune and O. M. O'Reilly, *On the Development of Rod-Based Models for Pneumatically Actuated Soft Robot Actuators: A Five-Parameter Constitutive Relation*, **International Journal of Solids and Structures**, Vol. 120C, 226–235 (2017).
20. C. A. Daily-Diamond, C. E. Gregg and O. M. O'Reilly, *The Roles of Impact and Inertia in the Failure of a Shoelace Knot*, **Proceedings of the Royal Society of London**, Vol. 473, No. 2200 (2017).
21. J. K. Nichols and O. M. O'Reilly, *Verifying the Equivalence of Representations of the Knee Joint Moment Vector from a Drop Vertical Jump Task*, **The Knee Journal**, Vol. 24, No. 2, 484–490 (2017).
22. K. M. de Payrebrune and O. M. O'Reilly, *On Constitutive Relations for Rod-Based Models of a Pneu-Net Bending Actuator*. **Extreme Mechanics Letters**. Vol. 8, Is. C, 38–46 (2016).
23. A. Novelia and O.M. O'Reilly, *On Geodesics of the Rotation Group  $SO(3)$ . Regular and Chaotic Dynamics*, Vol. 20, No. 6, 729–738 (2015).
24. X. Zhou and O. M. O'Reilly, *On Adhesive and Buckling Instabilities in the Mechanics of Carbon Nanotube Bundles*. **ASME Journal of Applied Mechanics**, Vol. 82, No. 10, 101007 (2015).
25. C. A. Diamond, C. Q. Judge, B. Orazov, Ö. Savaş and O. M. O'Reilly, *Mass-Modulation Schemes for a Class of Wave Energy Converters: Experiments, Models, and Efficacy*. **Ocean Engineering**, Vol. 104, 452–468 (2015).
26. X. Zhou, C. Majidi, and O. M. O'Reilly, *Soft Hands: An Analysis of Some Gripping Mechanisms in Soft Robot Design*. **International Journal of Solids and Structures**, Vol. 64–65, 155–165 (2015).
27. X. Zhou, C. Majidi, and O. M. O'Reilly, *Flexing into Motion: A Locomotion Mechanism for Soft Robots*. **International Journal of Nonlinear Mechanics**, Vol. 74, 7–17 (2015).

28. A. Novelia and O. M. O'Reilly, *On the Dynamics of the Eye: Geodesics on a Configuration Manifold, Motions of the Gaze Direction and Helmholtz's Theorem*, **Nonlinear Dynamics**, Vol. 80, No. 3, 1303-1327 (2015).
29. O. M. O'Reilly, *Some Perspectives on Eshelby-Like Forces in the Elastica Arm Scale*, **Proceedings of the Royal Society of London**, Vol. 471, p.30140785 (2015).
30. O. M. O'Reilly and A. R. Srinivasa, *A Simple Treatment of Constraint Forces and Constraint Moments in Rigid Body Dynamics*, **ASME Applied Mechanics Reviews**, Vol. 67, No. 1, 014851 (2015).
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32. O. M. O'Reilly, *On the Formulations of Cost Functions Featuring Components of Generalized Torques*, **Automatica**, Vol. 50, No. 10, 2723-2725 (2014).
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#### TECHNICAL REPORTS AND EDITED PROCEEDINGS

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## COURSES AND SEMINARS TAUGHT

### **ME24-2: Mechanics and Movies**

This freshman seminar was created by O'Reilly to spark an interest in first year students on the spectrum of mathematical methods that can be used to explain a wide range of phenomena. The seminar examined the portrayal of, and analysis of, various scenes in movies from a mechanics perspective. The films included *Twister*, *Apollo 13*, *The Hustler*, *Tomorrow Never Dies*, and a wide range of documentaries. The realism of action sequences is of particular interest as is the inherent difficulties encountered in numerically simulating and animating certain scenes.

### **ME24-2: Bears in Boats: A History of Women and Men's Rowing at UC Berkeley**

This seminar was created by O'Reilly to explore the celebrated history of women and men's rowing at UC Berkeley. The seminar includes oral histories from the Bancroft Library and a wide range of books and online sources on the history of UC Berkeley, the history of rowing, gender equity, and Title IX. O'Reilly is using this seminar as a springboard for an archive of the history of women's rowing at UC Berkeley that will be completed in time for the 50<sup>th</sup> anniversary of the program in 2025.

### **ME 104: Engineering Mechanics II**

This is a sophomore/junior level course on the engineering dynamics of particles and rigid bodies. O'Reilly has taught this class on a regular basis since 1992 and transformed the context to incorporate numerical methods and simulations. These changes are reflected in the textbook that he has written for the class (O. M. O'Reilly, *Engineering Dynamics: A Primer*, Third Edition, Springer-Verlag, New York, 2019). The textbook is available to students at no cost.

### **ME 170: Engineering Mechanics III**

This course is suitable for first year graduate students and seniors studying mechanical engineering. The course provides students with the tools needed to be able to model and simulate mechanical systems modeled using systems of particles and rigid bodies. O'Reilly taught this class in the 1990s and 2000s and substantially revised the course to include simulations, animations, and comprehensive treatments of rotations.

### **ME 175/271: Intermediate Dynamics**

This course is suitable for first year graduate students and seniors studying mechanical engineering. In terms of pedagogy, it uses differential geometric methods pioneered by O'Reilly collaborating with Jim Casey (UC Berkeley), Arun Srinivasa (Texas A&M), and several graduate students (Evan Hemingway (UC Berkeley PhD 2020), Theresa Honein (UC Berkeley MS 2021), Nur Adila Faruk Senan (UC Berkeley PhD 2011), Alyssa Novelia (UC Berkeley PhD 2018), and Peter Varadi (UC Berkeley PhD 1999)), to show the equivalence of Newton-Euler, Lagrange, Gibbs-Appell, Boltzmann-Hamel (and several other) equations of motion for systems of particles and rigid bodies. The course also covers material on rotations and simulations. O'Reilly has taught this class since the 1990s has continually revised the course to ensure that it is one of the best



dynamics classes in the nation. O'Reilly's textbook for this class (O. M. O'Reilly, *Intermediate Engineering Dynamics: Newton-Euler and Lagrangian Dynamics*, Second Edition, Cambridge University Press, New York, 2020) is freely available to students. The first edition of this textbook also been translated into Russian. Working with three former graduate students, O'Reilly has also led the creation of a supplemental online resource on rotations: <https://rotations.berkeley.edu/> The free resources for ME175/271 can also be used with ME170.

### **ME 271: Calculus of Variations and Optimal Control**

This graduate-level course on calculus of variations and optimal control introduces students to the calculus of variations and, with the help of Pontryagin's maximum principle the applications to optimal control.

### **ME 275: Advanced Dynamics**

This advanced graduate-level course is the sequel to ME104 and ME175. The course covers methods for the analysis of equations of motion for mechanical systems. These methods include stability and bifurcation analysis and simulations. Hamilton and Routh's equations of motion and Hamilton-Jacobi theory are also discussed.

### **ME290A: Nonlinear Dynamics of Continuous Systems**

This advanced graduate-level course was developed by O'Reilly to help educate students in his graduate group. The course covers the development and analysis of rod-based models for a variety of mechanical systems and is unique in providing the student with a hierarchy of directed (or Cosserat) models and an introduction to the latest research in the application of rod theories to plant growth, adhesion in MEMS switches and gecko adhesion, chain fountains, and the buckling of columns. The textbook for the course (O. M. O'Reilly, *Modeling Nonlinear Problems in the Mechanics of Strings and Rods*, Springer-Verlag (2017)) is freely available to students and complements existing courses in the Department of Mechanical Engineering.

### **ME298A: Mathematical Representations of Rotations with Application to Biomechanics, Continuum Mechanics, Navigation, Rigid Body Dynamics, Robotics, and Vehicle Dynamics**

This graduate-level seminar was developed by O'Reilly to help educate students on the topic of rotations and their application to navigation and mechanics. The seminar uses an online resource that was developed by O'Reilly in partnership with two former graduate students, Daniel Kawano and Alyssa Novelia: <https://rotations.berkeley.edu/> Applications include the kinematics of orthopedic joints (such as the intervertebral joint and the knee joint) and measure strategies to estimate rotations in biomechanical applications and strapdown navigation schemes for vehicles. Many of the examples highlighted in the course were taken from research performed by the instructor and his research group.

### **MAS-E-264A: Modeling and Analyzing the Dynamics of Locomotion and Gripping in Soft Robots**

This one-unit online graduate-level course discusses the development, analysis, and simulation of mathematical models for soft robots. The course materials are based on research papers from O'Reilly's research group over the past decade. Through case studies, self-assessments, and a capstone project, students develop skills in, and an appreciation for, the wide range of possible modeling techniques and analyses available with which to explore the dynamics of soft robotic devices.

### *Berkeley Engineering Masters Preparatory Course: Module II Systems*

This one-unit introductory graduate-level course was developed by O'Reilly to help prepare students for professional masters' programs. The course contents include a self-contained review of linear algebra and mechanics of discrete and continuous systems.

### **TEACHING EVALUATIONS**

COURSE	SEMESTER	TEACHING EFFECTIVENESS (?/7.00)	COURSE WORTH (?/7.00)
ME175	FALL 2020	6.88 [5.88]	6.29 [5.64]
ME271	FALL 2020	6.23 [5.88]	6.08 [5.64]
ME175	FALL 2018	6.75 [6.54]	6.27 [5.66]
ME290A	SPRING 2018	6.5 [5.89]	6.25 [5.74]
ME104	SPRING 2018	6.53 [5.55]	5.99 [5.29]
ME175	FALL 2017	6.83 [5.68]	6.57 [5.64]
ME275	SPRING 2017	6.73 [5.99]	6.0 [5.74]
ME175	FALL 2016	6.43 [5.93]	6.0 [5.79]
ME104	SPRING 2016	6.6 [5.4,1]	6.5 [5.2,1]
ME290A	SPRING 2016	6.2 [6.1,13]	6.6 [6.1,6]
ME175	FALL 2015	6.8 [5.9,1]	6.6 [5.9,1]
ME275	SPRING 2015	6.9 [5.8,1]	6.3 [5.8,9]
ME104	SPRING 2015	6.6 [5.3,1]	6.5 [5.1,1]
ME175	FALL 2014	6.7 [5.8,1]	6.7 [6.0,1]
ME175	FALL 2013	6.6 [6.1,3]	6.3 [6.1,4]
ME104	FALL 2012	6.3 [5.1,2]	5.9 [5.1,3]
ME175	FALL 2012	6.8 [5.5,2]	6.6 [5.7,2]
ME275	SPRING 2012	6.7 [6.1,4]	6.5 [5.8,6]
ME175	FALL 2011	6.6 [5.8,1]	5.9 [5.8,5]
ME104	SPRING 2011	6.5 [5.2,1]	6.2 [5.0,1]
ME275	FALL 2010	6.8 [5.89,1]	6.7 [5.88,2]
ME175	FALL 2009	6.7 [6.0,1]	6.5 [6.0,2]
ME104	SPRING 2009	6.6 [5.4,1]	6.4 [5.3,1]
ME275	SPRING 2009	6.4 [5.7,2]	5.9 [5.7,8]
ME175	FALL 2008	6.6 [5.7,2]	6.4 [5.6,1]
ME290A	SPRING 2008	6.8 [5.4,1]	6.4 [5.5,1]

ME175	FALL 2007	6.8 [5.49, 1]	6.7 [5.64, 1]
ME104	FALL 2007	6.6 [5.41, 1]	6.6 [5.34, 1]
ME170	FALL 2006	6.5 [5.4, 1]	6.5 [5.5, 1]
ME175	SPRING 2006	6.7 [5.6, 1]	6.5 [5.6, 1]
ME104	FALL 2005	6.5 [5.1, 1]	6.3 [5.0, 1]
ME290A	SPRING 2005	7.00 [5.95, 1]	6.5 [5.82, 1]
ME170	FALL 2004	6.00 [5.69, 3]	5.8 [5.8, 5]
ME175	SPRING 2004	6.6 [5.92, 1]	6.5 [5.92, 1]
ME275	SPRING 2004	6.5 [5.83, 2]	6.2 [5.88, 4]
ME104	FALL 2003	6.4 [5.28, 1]	6.2 [5.42, 1]
ME170	FALL 2002	6.2 [5.78, 2]	6.0 [5.83, 2]
ME290A	FALL 2002	6.3 [5.86, 3]	5.0 [5.75, 12]
ME175	SPRING 2001	6.8 [5.5, 1]	6.4 [5.7, 2]
ME104	FALL 2000	6.6 [5.2, 1]	6.2 [5.3, 1]
ME170	FALL 2000	6.1 [5.6, 2]	5.8 [5.6, 4]

Numbers in [ ] indicate departmental average (/7) and (when available) the ranking of this course compared to comparable courses taught in the Department of Mechanical Engineering at U. C. Berkeley during the same semester. Summaries of (anonymous) written comments and evaluations prior to 2000 available upon request. Starting in Fall 2016, end-of-semester course evaluations were conducted using an online system. Comparative rankings were not made available.

## MASTERS STUDENT'S COMMITTEES CHAIRED

Carlos Casarez (MS conferred 2016)

Miguel Christophy (MS conferred 2010)

Christopher Diamond (MS conferred 2013)

Paul Drazin (MS conferred 2013)

Nur Adila Faruk Senan (MS conferred 2008)

Nathaniel Goldberg (MS conferred 2019)

Evan Hemingway (MS conferred 2016)

Theresa E. Honein (MS conferred 2021)

Wayne Huang (MS conferred 2006)

Avery J. Jutkowitz (MS conferred 2003)

Eva A. Kanso (MS conferred 1999)

Patrick "Patch" Kessler (MS conferred 2004)

Elaine Kwan (MS conferred 2019)

Nathan M. Kinkaid (MS conferred 2001)

Todd A. Lauderdale (MS conferred 2001)

Tom Libby (MS conferred 2012)

David Aaron Moody (MS conferred 2009)

Brian Muldoon (MS conferred 2021)

Thomas R. Nordenholz (MS conferred 1995)

Alyssa Novelia (MS conferred 2015)

Jeun Jye Ong (MS conferred 2003)

Bayram Orazov (MS conferred 2007)

Daniel Martinez Peters (MS conferred 2009)

Benjamin L. Thoma (MS conferred 2000)

Timothy N. Treserras (MS conferred 2006)

Peter C. Varadi (MS conferred 1996)

## DOCTORAL STUDENTS SUPERVISED

Christopher Daily Diamond (PhD conferred 2017)	<i>Rapid Onset Impulsive Loading: Three Dynamical Case Studies</i>
Paul Drazin (PhD conferred 2017)	<i>Modeling and Analysis of Elements in Structural Mechanics</i>
Carlos Casarez (PhD conferred 2018)	<i>Tail-Augmented Self-Righting and Turning of a Dynamic Legged Millirobot</i>
Nur Adila Faruk Senan (PhD conferred 2011)	<i>The Intervertebral Joint as a Stiffness Matrix: Theory, Practice, and Application</i>
Nathaniel N. Goldberg (PhD conferred 2022)	<i>On the Inherently Nonlinear Dynamics of Unilateral Contact</i>
Evan G. Hemingway (PhD conferred 2020)	<i>Cosserat Curves: Descriptions of Peristalsis and a Discrete Model</i>
Patrick Kessler (PhD conferred 2007)	<i>On the Encirclement of Curves</i>
Hyung-Taek Kim (PhD conferred 2019)	<i>The Dynamics of Flexible Risers Transporting Fluids in Subsea Environments</i>
Nathan M. Kinkaid (PhD conferred 2005)	<i>On the Nonlinear Dynamics of Disc Brake Squeal</i>
Todd A. Lauderdale (PhD conferred 2005)	<i>An Electromagnetic Rod Theory with MEMS Applications</i>
David A. Moody (PhD conferred 2011)	<i>A Quantification of Deep Core Trunk Muscles Impact on Lumbar Lordosis and Spine Stability</i>

Thomas R. Nordenholz (PhD conferred 1998)	<i>The Stability of Steady Motions of Pseudo-Rigid Bodies</i>
Alyssa Novelia (Ph. D. conferred 2018)	<i>Discrete Elastic Rods for Simulating Soft Robotic Limbs</i>
Bayram Orazov (PhD conferred 2011)	<i>A Novel Excitation Scheme for an Ocean Wave Energy Converter</i>
Daniel M. Peters (PhD conferred 2011)	<i>Nonlinear Stability Criteria for Elastic Rod Structures</i>
Timothy N. Tresieras (Ph. D. conferred 2009)	<i>Modeling Plant Growth Using a Modified Elastica Theory</i>
Jeffrey S. Turcotte (Ph. D. conferred 1996)	<i>Approximate Theories of Elastic Rods with Applications</i>
Peter C. Varadi (Ph. D. conferred 1999)	<i>On the Nonlinear Stability of Rotating Rods</i>
Xuance Zhou (Ph. D. conferred 2015)	<i>Models and Analysis of Locomotion and Gripping in Soft Robots</i>

## RESEARCH GRANTS

1. **Hellman Family Faculty Fund:** *A Feasible Investigation of Satellite Dynamics*. This was a one-year grant which started in June 1995.
2. **California PATH:** *Models of Vehicular Collision: Development and Simulation with Emphasis on Safety*. This was a three-year grant which started in December 1995. Professors Oliver M. O'Reilly and Panos Papadopoulos were the Co-Principal Investigators.
3. **National Science Foundation:** Grant No. CMS0084808 *Mechanics of Contact with Application to Brake Squeal and Axially Moving Media*. This was a four-year grant that started on August 15, 2000. The grant monitor was Dr. Alison Flatau. Professors Oliver M. O'Reilly and Panos Papadopoulos were the Co-Principal Investigators.
4. **U. S. Army Research Office:** MEMS Strain Sensor for Roller Bearings. This was a multi-year grant which began on June 1, 2002. Oliver O'Reilly and Albert P. Pisano were the Co. PIs.
5. **Bavarian Motor Works (BMW):** *The Development of an Inertial Measurement Unit and a Human-Machine Interface for Motorcycle Navigation Systems*. This is a three-year grant which began on January 1, 2001, and ended on December 31, 2003. J. Karl Hedrick is the original PI on this grant. O'Reilly was added as a Co-Principal Investigator in June 2002.
6. **U.C. Berkeley Center for Pure and Applied Mathematics:** *Building/Designing a Pseudospectral Mechanism*. One-year grant for \$20,000. Professors Maciej Zworski and Oliver M. O'Reilly were the Co-Principal Investigators on this award.

7. **National Science Foundation** Grant No. CMMI-0726675 *A Framework for Studying the Dynamics of the Human Spine with Application to Clinical Treatments for Back Pain*. This is a four-year grant which began on August 1, 2008. The grant monitor was Dr. Eduardo Misawa. Professors Oliver M. O'Reilly and Jeffrey C. Lotz (Department of Orthopedic Biomechanics at U.C.S.F.) were the Co-Principal Investigators on this award.
8. **KAUST-UCB Academic Alliance** *Novel Wave Energy Converters*. This is a one-year grant which began on August 1, 2008. Professors Oliver M. O'Reilly and Omer Savas were the Co-Principal Investigators on this award.
9. **National Science Foundation** Grant No. CMMI-1000906 *On the Dynamics of a Novel Ocean Wave Energy Converter*. This is a four-year grant which began on August 1, 2010. The grant monitor was Dr. Eduardo Misawa. Professors Oliver M. O'Reilly and Omer Savas along with Professors Carolyn Judge (US Naval Academy in Annapolis) and Professor N. S. Namachchivaya (University of Illinois at Urbana Champaign) were the Co-Principal Investigators on this award.
10. **Army Research Office** Grant No. W911NF-16-1-0242 *ARO-Nonlinear Dynamics and Distributed Control for Soft Robot Locomotion*. This is a three-year grant that began on May 1, 2016. The program manager was Dr. Sam Stanton. Professors Oliver M. O'Reilly along with Professors Derek Paley (University of Maryland) and Professor Carmel Majidi (Carnegie Mellon University) were the Co-Principal Investigators on this award.
11. **National Science Foundation** Grant No. DUE-1915714 *Undergraduate Data Science Education at Scale*. This is a five-year grant that began on October 1, 2019. IVPUE replaced VCUE Cathy Koshland on this grant in December 2021. Professors David Harding is the Principal Investigator and Professors Cathryn Carson, John DeNero, Oliver M. O'Reilly, and Rodolfo Mendoza-Denton are the Co-Investigators.