

# **Temporomandibular Disorders (TMD): From Research Discoveries to Clinical Treatment**

## **Committee**

### **Enriqueta C. Bond**

#### **Chair**

Enriqueta C. Bond, Ph.D., M.A., served from 1994 to 2008 as the first fulltime president of the Burroughs Wellcome Fund (BWF), a private, independent foundation dedicated to advancing the medical sciences by supporting research and other scientific and educational activities. During her presidency, Dr. Bond guided BWF in its transition from a corporate to a private foundation. Prior to joining the BWF, Dr. Bond served as the executive officer for the Institute of Medicine (IOM) (now the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine). Dr. Bond currently is a founding partner of QE Philanthropic Advisors, which provides consulting services to philanthropic and non-profit organizations on program development, governance, leadership, organizational structure and function. Dr. Bond was chair of the National Research Council's Board on African Science Academy Development and a former member of the Forum on Microbial Threats. She is a past member of the National Academies' Report Review Committee as well as many other consensus study committees. Dr. Bond is the recipient of numerous honors, including the 2008 Order of the Long Leaf Pine award from the state of North Carolina—the highest honor the governor can bestow upon a citizen. This award was given to Dr. Bond for her efforts to improve science education for the children of North Carolina. In 1997, she was elected as a member of the IOM. In 2004 she was elected as a fellow to the AAAS for her distinguished contributions to the study and analysis of policy for the advancement of the health sciences. She received her bachelor's degree from Wellesley College, her M.A. from the University of Virginia, and her Ph.D. in molecular biology and biochemical genetics from Georgetown University.

## **Penney Cowan**

### **Member**

Penney Cowan is the founder and chief executive officer of the American Chronic Pain Association (ACPA). She herself is a person with chronic pain and established the ACPA in 1980 to help others living with the condition. The ACPA provides peer support and education in pain management skills to people with pain and their families. The ACPA also works to build awareness about chronic pain among professionals, decision makers and the general public. Since 1980, Ms. Cowan has been an advocate and consumer representative for pain issues. She was awarded the Jefferson Medal for Outstanding Citizen by the Institute for Public Service, Washington, and is listed in Who's Who in America, 24th Edition. The American Pain Society awarded her the 2005 John and Emma Bonica Public Service Award, Presidential Commendation, American Academy of Pain Medicine, 2013 and the Elizabeth Narcessian Award for Outstanding Educational Achievements, from the American Pain Society, 2013. She served as: Consumer Representative for the FDA/CDER Anesthetic and Analgesic Drug Products Advisory Committee (AADPAC) for 2012 and was appointed to Interagency Pain Research Coordinating Committee of the National Institute of Health from 2013 to 2015. Ms. Cowan began the Partners for Understanding Pain campaign in 2002 in an attempt to raise awareness about the need to better understand, assess, and treat pain. There are more than 80 partner organizations. The campaign, under the direction of the ACPA, successfully established September as Pain Awareness Month.

## **David Deitz**

### **Member**

David Deitz, M.D., Ph.D., is the principal of David Deitz & Associates, a consulting firm focused on helping clients design and implement strategies to obtain high-value health outcomes for patients and employers. Dr. Deitz is a nationally recognized expert with 25 years' experience in managed medical care, healthcare outcomes evaluation and reporting, and utilization management systems in both workers compensation and group health. In this role, he has worked with employers, labor, state regulators and lawmakers in over 20 states on reform efforts, and has served on a number of task forces and committees nationwide. He was engaged for many years as National Medical Director - Commercial Insurance Claims for Liberty Mutual Insurance, where he was responsible for medical review operations, medical networks and medical policy for workers compensation. Prior to joining Liberty Mutual, he worked in the private sector overseeing content development of managed care software and reporting systems that were successfully deployed at insurers nationwide. In addition to this work, Dr. Deitz spent two decades as a practicing physician in both emergency and internal medicine. He completed his post-graduate training at the University of Miami and Harvard Medical School, and is board-certified in Internal Medicine.

## **Francesca Dwamena**

### **Member**

Francesca Dwamena, M.D. is professor and chair of the Department of Medicine at Michigan State University. Dr. Dwamena also is an adjunct professor of psychiatry and an attending physician for the Michigan State University Health Team and at Sparrow Hospital. She specializes in psychosocial medicine and has authored more than 40 published works on clinical and primary medicine, including on the identification of and treatment for medically unexplained symptoms. In addition to her clinical practice and research, she has held a variety of leadership positions and volunteer roles with various national and state-level professional societies and non-profit organizations, including Harvard Medical School, the Arnold P. Gold Foundation, Society of General Medicine, and the American College of Physicians. Additionally, she has served as a committee member for the National Academies of Sciences, Engineering, and Medicine consensus committee on Gulf War and Health: Treatment of Chronic Multi-symptom Illness. Dr. Dwamena received her M.D. from Howard University College of Medicine and her MS in epidemiology and a certificate in psychosocial medicine from Michigan State University.

## **Roger Fillingim**

### **Member**

Roger B. Fillingim, Ph.D., is a Distinguished Professor and Director of the Pain Research and Intervention Center of Excellence (PRICE) at the University of Florida. He served as President of the American Pain Society from 2012-2014, served as Co-Chair of the Federal Pain Research Strategy Disparities Workgroup, and is currently a member of the US Department of Health and Human Services Interagency Pain Research Coordinating Committee. PRICE provides resources in support of clinical and translational pain research and facilitates collaborations among UF pain researchers and other UF programs of research excellence. A clinical psychologist by training, he has had a longstanding interest in research to address the nation's most expensive public health problem, chronic pain. Dr. Fillingim's research program has focused on understanding the factors that contribute to individual differences in the experience of pain. He and his colleagues have shown consistent sex differences in pain responses, which may contribute to females' increased risk for chronic pain. In addition, his work has identified several genetic factors that contribute to pain perception and analgesic responses. His current grants include a MERIT Award from the National Institute on Aging, which investigates biological and psychosocial factors contributing to ethnic group differences in osteoarthritis pain. He also serves as the PI for the Florida site of the NIDCR-funded OPPERA (Orofacial Pain: Prospective Evaluation and Risk Assessment) Study, which endeavors to identify risk factors for development of temporomandibular disorders and related pain conditions. Dr. Fillingim has received several awards, including a University of Florida Research Foundation Professorship, as well as the 2009 Wilbert E. Fordyce Clinical Investigator Award and the Distinguished Service Award, both from the American Pain Society. He earned his doctoral degree in Clinical Psychology from the University of Alabama at Birmingham, followed by a post-doctoral fellowship in pain research at the University of North Carolina.

## **Margaret Heitkemper**

### **Member**

Margaret Heitkemper, Ph.D., R.N. is professor and chair of the Department of Biobehavioral Nursing and Health Informatics where she also is the co-director of the Center for Innovations in Sleep Self Management, and an adjunct professor in the Division of Gastroenterology, at the University of Washington. She received her BSN from Seattle University, Masters' degree in nursing from University of Washington, and PhD in Physiology and Biophysics from University of Illinois, Chicago. She leads an interdisciplinary team focused on the study of the pathophysiology and non-pharmacological management of individuals with chronic abdominal pain and irritable bowel syndrome (IBS). Her research in this area has included both descriptive and mechanistic studies focused on the role of general and lifestyle factors in chronic pain conditions. Dr. Heitkemper's research has included a focus on genetic and potential proteomic markers of chronic abdominal pain. Her team has also conducted randomized clinical trials of cognitive behavioral therapy for persons with IBS. She served on the Institute of Medicine committee that issued the report, *Relieving Pain in America*.

## **Francis J. Keefe**

### **Member**

Dr. Keefe, Ph.D., is a Professor in the Department of Psychiatry and Behavioral Sciences at Duke University Medical Center and a member of the Cancer Prevention, Detection, and Control Program of the Duke Comprehensive Cancer Center. Dr. Keefe is Director of the Duke Pain Prevention and Treatment Research Program, an active NIH-supported clinical research program concerned with the behavioral assessment and treatment of patients having acute and persistent pain. Dr. Keefe played a key role in the development of clinical pain services and pain research programs at Duke Medical Center. For 20 years he directed the Pain Management Program and was a leader in the development of Duke Medical Center's multidisciplinary pain programs (both out-patient and in-patient.) Dr. Keefe has developed and refined a number of treatment protocols for persistent pain conditions (e.g. cancer, arthritis) including spouse and partner-assisted pain coping skills training interventions. He has conducted a number of randomized clinical trials testing the efficacy of these and other behavioral interventions (e.g. aerobic exercise protocols, yoga based interventions, mindfulness-based interventions, forgiveness-based interventions, loving kindness meditation, and emotional disclosure). Dr. Keefe has served on numerous study sections and has chaired two NIH study sections (BMIO, PRDP). Dr. Keefe has published over 370 papers, as well as 60 book chapters, and three (3) books on topics ranging from pain during mammography to the assessment and treatment of cancer pain at end of life. He currently serves as the Editor-in-Chief of the journal *PAIN*, the leading journal in the field of pain research. In 2012 he was awarded the John D. Loeser award for excellence in clinical pain research by the International Association for the Study of Pain. In 2016 he was awarded the Distinguished Scientist Award by the Society of Behavioral Medicine.

## **Kate R. Lorig**

### **Member**

Kate Lorig, Dr.P.H. is professor emerita (acting) at the Stanford University School of Medicine, and past Director of the Stanford Patient Education Research Center. She has a masters in nursing and a doctorate in public health with a specialty in health education. For more than four decades, using a public health approach, she has developed and evaluated community-based patient education programs in English and Spanish for people with chronic conditions including arthritis, heart disease, lung disease, diabetes and AIDS. In recent years, this work has been extended to similar programs offered via the Internet. Her present research includes the development and evaluation of programs for cancer survivors and as well as for caregivers of people with PTSD, traumatic brain injury and other cognitive impairments. These programs are offered largely over the Internet. Most recently, she has been involved in studying how to translate programs from the academic setting to the larger community.

## **Sean Mackey**

### **Member**

Sean Mackey, M.D., Ph.D. is Chief of the Division of Pain Medicine and Redlich Professor of Anesthesiology, Perioperative and Pain Medicine, Neurosciences and Neurology at Stanford University. Dr. Mackey received his BSE and MSE in Bioengineering from University of Pennsylvania and his Ph.D. in Electrical and Computer Engineering and his M.D. from the University of Arizona. Dr. Mackey directs the Stanford Systems Neuroscience and Pain Laboratory with a broad range of pain research on understanding the mechanisms of pain and improving patients' quality of life. The lab's research includes mapping the specific brain and spinal cord regions that perceive and process pain and development of a multidisciplinary treatment model that translates basic science research into innovative therapies to provide more effective, personalized treatments for patients with chronic pain. Dr. Mackey is author of over 200 journal articles and book chapters in addition to numerous national and international lectures. Dr. Mackey has served as the principal investigator for multiple NIH and foundation research grants investigating chronic pain and novel analgesics for acute and chronic pain. He is past president of the American Academy of Pain Medicine. In 2011, Dr. Mackey served as a member of the Institute of Medicine committee that issued the report, Relieving Pain in America. He was co-chair of the Oversight Committee for the NIH/Health and Human Services National Pain Strategy (NPS), an effort to establish a national health strategy for pain care, education, and research. In the last two years he has received the American Pain Society Wilbert E. Fordyce Clinical Investigator Award; the AAPM Pain Medicine Fellowship Award and the Distinguished Service Award, and the NIH Directors' Award for his efforts on the NPS.

## **Richard Ohrbach**

### **Member**

Richard Ohrbach earned a D.D.S. (University of North Carolina—Chapel Hill), certificate in pain management (University of California—Los Angeles), M.S. in Oral Sciences and Ph.D. in Clinical Psychology (University at Buffalo), and a post-doc in behavioral epidemiology (University of Washington). One primary research objective has been the development of new diagnostic standards for temporomandibular disorders (TMD). The new standards, development supported by NIDCR and now internationally recognized, for both researchers and health professionals comprise (1) an improved screening tool to identify painful TMD; (2) validated diagnostic criteria grounded in supportive scientific evidence that more readily differentiate the most common forms of TMD; and (3) improved psychosocial assessment tools. The other primary research objective, via OPPERA, has been cross-sectional and longitudinal analyses related to incident cases with TMD as well as chronic TMD, and on physical-psychological interactions relevant to the development and persistence of pain disorders. Dr. Ohrbach is a member of the American Academy of Orofacial Pain, American Pain Society, International Association for Dental Research, International Association for the Study of Pain, and INfORM. From 2003 to 2006, he served as the director of the International RDC/TMD Consortium, now INfORM, an IADR Scientific Group/Network that he co-founded.

## **Amanda C. Pustilnik**

### **Member**

Amanda Pustilnik, J.D. is a professor of law at the University of Maryland School of Law and faculty at the Center for Law, Brain & Behavior at Massachusetts General Hospital. Her work focuses on the intersections of law, science, and culture, with a particular emphasis on the brain. In 2015, she served as Harvard Law School's first senior fellow on law and applied neuroscience. Her collaborations with scientists on brain imaging of pain and addiction led to her recent work on opioids on behalf of the Aspen Institute. Prior to entering the academy, Professor Pustilnik practiced litigation at Sullivan & Cromwell, clerked on the Second Circuit Court of Appeals, and worked as a management consultant at McKinsey & Co., in New York. She attended Harvard College, Yale Law School, and the University of Cambridge, where she studied history and philosophy of science. Her work has been published in numerous law reviews and peer-reviewed scientific journals, including Nature.

# **Srinivasa N. Raja**

## **Member**

Srinivasa N. Raja, M.D. is Professor of Anesthesiology and Neurology and Director of Pain Research at the Johns Hopkins University School of Medicine. Dr. Raja received his residency training in Anesthesiology at the University of Washington, Seattle, and post-doctoral training at the University Of Virginia School Of Medicine in Charlottesville. Dr. Raja's clinical interests include management of chronic neuropathic pain states, such as persistent post-surgical pain, postherpetic neuralgia, complex regional pain syndromes, and post-amputation pain. His recent research efforts are aimed at understanding the peripheral and central mechanisms of neuropathic pain and in identifying novel peripheral targets for alleviating chronic neuropathic pain. Dr. Raja joined the editorial board of the journal Anesthesiology as an Associate Editor in 1993 and subsequently served as an Editor from 1998-2006. Dr. Raja was a Section Editor for the journal, PAIN, from 2012- 2014 and a member of the FDA scientific advisory panel for CDER (Center for Drug Evaluation and Research). Dr. Raja served as a member of the Scientific Advisory Committee for the World Congress on Pain from 2008-12 and was nominated as the Chair of the Scientific Program Committee for the 15th World Congress on Pain in Buenos Aires in 2014. He was the Chair of NeuPSIG, the neuropathic pain special interest group of the International Association for the Study of Pain, and the Secretary of the International Association for the Study of Pain, from 2014-16. He was appointed as a member of the Federal Pain Research Strategy Steering Committee, 2015 that is charged with coordinating the research efforts in the field of pain across all US federal funding agencies. Dr. Raja and his collaborators have received funding from the National Institutes of Health for their research for nearly 30 years, and have published more than 200 original articles in peer-reviewed journals. He is an author of 25 editorials, over 60 book chapters, and an editor of five textbooks related to pain medicine. Dr. Raja has been invited as a Visiting Professor to several institutions, including the Benjamin G. Covino Lecture at Harvard University (2007) and the John J Bonica Lecture at the University of Washington (2008). He was the recipient of the Wilbert E. Fordyce Clinical Investigator Award from the American Pain Society (2008) and the prestigious John J. Bonica Award from the American Society of Regional Anesthesia and Pain Medicine in November (2010). He was the recipient of the Donlin M. Long award from Johns Hopkins in 2011 and the James Heavner Basic Science Lectureship Award from the Texas Pain Society, 2016. He was invited as a Plenary Speaker at the annual meeting of the American Pain Society in 2018.

## **Cory Resnick**

### **Member**

Cory M. Resnick, M.D., D.M.D., F.A.C.S. is an assistant professor of oral and maxillofacial surgery at Harvard Medical School and the Harvard School of Dental Medicine, and practices pediatric oral and maxillofacial surgery at Boston Children's Hospital. His clinical practice emphasizes the surgical management of craniofacial anomalies and syndromes, orthognathic (jaw) surgery, pediatric obstructive sleep apnea, and temporomandibular joint disorders. Dr. Resnick is an active member of the multidisciplinary Craniofacial and Vascular Anomalies teams. In addition to Dr. Resnick's busy clinical practice, he is dedicated to innovation and improvement of his field through research and education. Dr. Resnick is the author of many publications in peer reviewed journals within and outside the scope of oral surgery, and chapters in multiple textbooks. He lectures to medical and dental students at the Harvard Medical School and Harvard School of Dental Medicine, and he mentors oral and maxillofacial surgery residents through the Massachusetts General Hospital residency program. Dr. Resnick received his undergraduate and dental degrees from the University of Pennsylvania and his medical degree from Harvard Medical School. He then received general surgery and oral and maxillofacial surgery residency training at the Massachusetts General Hospital. Dr. Resnick is certified by the American Board of Oral and Maxillofacial Surgery and was inducted as a Fellow of the American College of Surgeons.

## **Antony Rosen**

### **Member**

Antony Rosen, M.B. Ch.B., B.Sc. (Hons) was an Osler resident and rheumatology fellow at Johns Hopkins Hospital before joining the faculty at Johns Hopkins, where he was appointed a professor in 2002. He has been director of the Division of Rheumatology since then, overseeing a substantial expansion in the fellowship program and building the faculty from 14 to 32, and has been the Vice Dean for Research since 2013. Dr. Rosen received his medical degree from the University of Cape Town in South Africa in 1984 with first-class honors. After completing his internship in medicine & surgery and a year of postdoctoral study in medical biochemistry, he joined Dr. Alan Aderem at the Rockefeller University to pursue postdoctoral studies in immunology and cellular biology. He currently serves as Professor of Medicine and Vice Dean for Research at Johns Hopkins University School of Medicine.

## **Kathleen A. Sluka**

### **Member**

Kathleen Sluka, Ph.D., PT is a professor of physical therapy and rehabilitation sciences at the University of Iowa Carver College of Medicine and a member of the Pain Research Program at the University of Iowa. Dr. Sluka has published over 200 peer-reviewed manuscripts and book chapters, as well as an evidence-based textbook entitled *Pain Mechanisms and Management for the Physical Therapist*, which covers basic science mechanisms, physical therapy treatments, interdisciplinary care, and pain syndromes. Dr. Sluka's translational research laboratory focuses on the neurobiology of musculoskeletal pain and non-pharmacological treatments using animal models and translation of mechanisms to human subjects, clinical trials for non-pharmacological treatments for chronic pain, and implementation of effective non-pharmacological treatments to clinical practice. Her research methods include cell culture, molecular biology, genetic manipulations, behavioral pharmacology, clinical trial methodology, and implementation science. She has received numerous awards, including the Marian Williams Award for Research in Physical Therapy and the Catherine Worthingham Fellow Award from the American Physical Therapy Association, and the Kerr Basic Science Research Award from the American Pain Society. She received a physical therapy degree from Georgia State University and a Ph.D. in Anatomy from the University of Texas Medical Branch in Galveston.

## **Barbara Vickrey**

### **Member**

Barbara G. Vickrey, M.D., M.P.H. specializes in translating clinical evidence into improvements in routine medical practice that benefit patients' health. Her wide-ranging accomplishments include demonstrating that collaboration among health care systems, community organizations, and caregivers can improve quality of care and outcomes for dementia patients. She also designed health care delivery innovations ranging from better control of post-stroke risk factors in underserved populations to new ways to care for veterans with Parkinson's disease. Dr. Vickrey was elected to the Institute of Medicine (now the National Academy of Medicine) of the National Academies in 2011. Dr. Vickrey leads a multi-year, stroke prevention/intervention research program in health disparities funded by the National Institute of Neurological Disorders and Stroke. She serves on the Science Committee of the American Academy of Neurology and is immediate Past President of the American Neurological Association. Dr. Vickrey served for 25 years on the faculty of the University of California, Los Angeles (UCLA), where she was Professor of Neurology and Director of the departmental Health Services Research Program. She was also Associate Director for Research at the Greater Los Angeles Veterans Administration Parkinson's Disease Research, Education and Clinical Center. Dr. Vickrey earned her M.D. at Duke University School of Medicine and her M.P.H. at the UCLA School of Public Health. She completed postgraduate clinical training in medicine and neurology at the University of Washington in Seattle, and then research fellowships in the Robert Wood Johnson Clinical Scholars Program at UCLA and the RAND/UCLA Center for Health Policy Study.

## **Robert Weyant**

### **Member**

Robert Weyant, DMD, Dr.P.H. is the Associate Dean for Public Health and professor and chair of the Department of Dental Public Health at the University of Pittsburgh School of Dental Medicine. He is also professor of epidemiology in the Graduate School of Public Health and on faculty of the Clinical and Translational Sciences Institute. Dr. Weyant is a former Navy Dental Officer and VA dentist and has been a diplomate of the American Board of Dental Public Health since 1987. Dr. Weyant is a past president of the American Association for Public Health Dentistry and is the current editor-in-chief of the Journal of Public Health Dentistry. Dr. Weyant's research involves general and social epidemiological research related to oral health disparities and oral disease etiology. He is presently PI or co-PI on several NIH-funded studies of oral disease etiology and the project director of a HRSA funded training grant for dental students. Dr. Weyant teaches and conducts research in evidence-based practices and has authored four systematic reviews and associated clinical practices guidelines. Dr. Weyant has served on numerous local, state, and national committees aimed at reducing oral health disparities, improving evidence-based practice, increasing the dental workforce, and improving access to oral care. He received his MPH and his dental degree from the University of Pittsburgh and his doctorate in epidemiology from the University of Michigan.

## **Hai Yao**

### **Member**

Hai Yao, Ph.D., is the Ernest R. Norville Endowed Chair in Biomedical Engineering at Clemson University and associate chair of the Clemson University-Medical University of South Carolina Joint Bioengineering Program. He is also the director of the NIH Center of Biomedical Research Excellence for Translational Research Improving Musculoskeletal Health. Dr. Yao's Tissue Biomechanics Laboratory focuses on the biomechanics and mechanobiology of the temporomandibular joint in order to understand the pathophysiology of TMJ degeneration to facilitate earlier diagnosis and management of TMD. In 2013, Dr. Yao participated in the NIH TMJ roundtable, which provided research recommendations to the NIH as well as the broader scientific community. Dr. Yao received his Ph.D. in Biomedical Engineering from the University of Miami.