

CURRICULUM VITAE

PART I: General Information

DATE PREPARED: June 1, 2010

Name

Mark Jude Tramo, M.D., Ph.D.

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Home Address

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Place of Birth

Education

1978, B.A., Yale College
1982, M.D., Cornell University Medical College
1998, Ph.D. (Neurobiology), Harvard Graduate School of Arts & Sciences

Postdoctoral Training

1982-1983, Intern in Internal Medicine, LA County - USC Medical Center
1983-1986, Resident in Neurology, The New York Hospital - Cornell University Medical Center
1985, Chief Resident, Neurology Ward, The New York Hospital
1986, Chief Resident, Neurology Ward, Memorial Hospital - Sloan-Kettering Cancer Center
1986-1987, Fellow (Cognitive Neuroscience), Dept. of Neurology, The New York Hospital - Cornell University Medical Center and Memorial Hospital - Sloan-Kettering Cancer Center

Academic Appointments

1987-1988, Assistant Professor of Neurology, Cornell University Medical College
1988-1992, Assistant Professor of Medicine (Neurology) and of Psychiatry, Dartmouth Medical School
1992-1998, Instructor in Neurobiology, Harvard Medical School
1999-2007, Assistant Professor of Neurology, Harvard Medical School
2000-2005, Faculty, Harvard-M.I.T. Speech & Hearing Bioscience & Technology Graduate Studies Program
2000-2009, Board of Honors Tutors, Department of Psychology, Harvard University
2000-current, Faculty Fellow, Mind Brain & Behavior Interfaculty Initiative, Harvard University
2002-2009, Teaching Affiliate, Department of Biology (Neurobiology), Harvard University
2008-2009, Associate Professor of Neurology, Harvard Medical School
2009-current, Visiting Professor of Ethnomusicology, Herb Alpert School of Music at UCLA

Hospital and Affiliated Institution Appointments

July 1987 – June 1988, Attending Neurologist, The New York Hospital, NY, NY
 July 1988 – June 1991, Attending Neurologist, Dartmouth-Hitchcock Memorial Hospital, Hanover, NH
 July 1988 – Sept 1991, Neurology Consultant, Franklin Regional Hospital, Franklin, NH
 July 1992 – Dec 2009, Attending Neurologist, Massachusetts General Hospital, Boston, MA
 July 1992 – June 2005, Neurology Consultant, McLean Hospital, Belmont, MA
 July 1996 – Dec 2009, Research Associate, Eaton-Peabody Laboratory of Auditory Physiology, Massachusetts Eye & Ear Infirmary, Boston, MA
 July 1996 – current, Research Affiliate, Research Laboratory of Electronics, Department of Electrical Engineering & Computer Science, Massachusetts Institute of Technology, Cambridge, MA
 July 1999 – June 2005, Associate Neurologist, Affiliated Staff, Brigham & Women's Hospital, Boston, MA
 Dec 2009 – current, Associate Neurologist, Affiliated Staff, Massachusetts General Hospital, Boston, MA
 Dec 2009 – current, Medical Director, Neurological & Rehabilitation Services, and Staff Neurologist, Good Samaritan Hospital, Los Angeles, CA

Other Professional Positions and Major Visiting Appointments

1998-current, Advisory Board, Songs of Love Foundation, New York, NY
 2000-2005, Advisory Board, BioMusic Program, National Musical Arts, Washington, DC
 2000, Consultant, Berkshire Hills Music Academy, South Hadley, MA
 2002-current, Scientific Advisory Board, Science Museum of Minnesota, St. Paul, MN
 2004-2007, Science Advisor, Morphonix, Inc., Sausalito, CA
 2003-current, Founding Director, The Institute for Music & Brain Science, Boston, MA
 2007-current, Advisory Board, National Center for Human Performance, Texas Medical Ctr, Houston, TX

Licensure and Certification

1983, Diplomate, National Board of Medical Examiners
 1983-current, Drug Enforcement Administration Certification, U.S.A.
 1983-1988, New York State Medical License
 1988, Diplomate in Neurology, American Board of Psychiatry and Neurology
 1988-1992, New Hampshire Medical License
 1991-current, Massachusetts Medical License
 1991-current, Massachusetts Drug Enforcement Administration Certification
 2009-current, California Medical License

Hospital and Health Care Organization Service Responsibilities

1986-1987, Fellow, then Attending, Stroke and Coma Team, The New York Hospital, NY, NY
 1986-1988, Staff Physician, Medical and Neurological Services, Burke Rehabilitation Center, White Plains, NY
 1987-1988, Attending, Neurology Consult Service, Behavioral Neurology Consult Service, Neurology Faculty Practice Group, and Neurology Residents Clinic, The New York Hospital
 1988-1991, Attending, Behavioral Neurology Consult Service and Neurology Residents Clinic, Mary Hitchcock Memorial Hospital, Hanover, NH
 1988-1991, Neurology Consultant, Franklin Regional Hospital, Franklin, NH
 1992-2009, Attending, Neurology Inpatient Service, General Neurology Consult Inpatient Service, and Cognitive/Behavioral Neurology Outpatient Unit, Massachusetts General Hospital, Boston, MA
 1995-2005, Neurology Inpatient and Outpatient Consult Services, McLean Hospital, Belmont, MA
 2009-current, Medical Director, Neurological & Rehabilitation Services, & Staff Neurologist, Good Samaritan Hospital, LA

Major Committee Assignments

1996-2000, Standing Committee on Neuroscience, Harvard University
 2000-current, Standing Committee on Mind/Brain/Behavior, Harvard University
 2002-2003, Subcommittee on Undergraduate Curriculum, Harvard Mind/Brain/Behavior Interfaculty Initiative
 2002, NIH National Institute on Deafness & Other Communication Disorders, Special Emphasis Review Panel, Exploratory/Developmental Research Program
 2003-4, 2008-9, NSF Grant Review Committee

2004-2007, Large Animal Users Group, Massachusetts General Hospital

2006-2009, Steering Committee, Mind Brain & Behavior Interfaculty Initiative, Harvard University

Professional Societies

1983-current, American Academy of Neurology, Member

1985-current, American Society for Composers, Authors, and Publishers, Writer Member

1986-current, Acoustical Society of America, Member

1989-current, Society for Neuroscience, Member

1991-1992, Stroke Council, American Heart Association, Fellow

1992-2007, American Association for the Advancement of Science

1995-current, Society for Music Perception & Cognition

1998-2008 Association for Research in Otolaryngology

2000-2008, New York Academy of Sciences

2006-7, Boston Music Research Association

2009-current, National Academy of Recording Arts & Sciences

Editorial Boards

1989-current, Reviewer, *Science*, *Nature Neuroscience Reviews*, *Neuron*, *Journal of Neurophysiology*, *Trends in Neurosciences*, *Journal of the Acoustical Society of America*, *Cerebral Cortex*, Oxford Press (partial list)

1994-1998, Consulting Editor, *Music Perception*

1997-2005, Associate Editor, *Journal of Cognitive Neuroscience*

2007-current, Advisory Board, *Journal of Interdisciplinary Music Studies*

Awards and Honors

1974-1978, Joseph Tauber Scholar, Yale University

1978, Bachelor of Arts *cum laude* with Honors in the Major (Biology), Yale University

1978-1982, Joseph Collins Foundation Scholar, Cornell University Medical College

1981-1982, Vincent Astor Scholar, Cornell University Medical College

1987-1988, National Research Service Award, Physiology, National Institute of Neurological & Communicative Disorders & Stroke, National Institutes of Health

1988-1991, Program Project Award, Co-Principal Investigator, National Institute of Neurological Disorders & Stroke, National Institutes of Health

1989-1991, Cognitive Science Award, Co-Principal Investigator, Office of Naval Research

1991-1992, National Research Service Award, National Institute of Mental Health

1992-1997, Clinical Scientist Development Award, National Institute on Deafness and Other Communication Disorders, National Institutes of Health

1992-1993, Sackler Scholar in Psychobiology, Harvard University

1993-1994, Alwin M. Pappenheimer Scholar, Harvard University

1997, Research Award, National Organization for Hearing Research

1997-1998, Provost's Award for Educational Innovation, Harvard University

1997-2002, Cognitive Neuroscience Program Award, McDonnell-Pew Foundation

1998-2002, FIRST Award, National Institute on Deafness and Other Communication Disorders, National Institutes of Health

2000-2001, Gordon and Llura Gund Research Award, Mind/Brain/Behavior Interfaculty Initiative, Harvard University

2002-current, Institute for Music & Brain Science

2009, Performing Arts Medicine Association Richard Lederman Award

2009-2010, Grammy Foundation Research Award

PART II: Research, Teaching, and Clinical Contributions

A. Narrative Report of Research, Teaching, and Clinical Contributions

Research contributions include:

- Experiments on auditory perception by stroke patients that corrected a 25-year old misconception, set forth by Neff and colleagues in the 1975 *Handbook of Sensory Physiology*, and hitherto widely held by auditory physiologists, psychologists, and audiologists, that auditory cortex is neither necessary nor sufficient for simple pitch discrimination and loudness discrimination (Tramo 1990; Tramo et al. 2002; Dykstra et al. 2008).
- Experiments on auditory perception by split-brain and stroke patients and event-related potential experiments on auditory perception by normal adults that elucidated (a) the functional role of auditory cortex in complex-pitch, harmony, and timbre perception; (b) the neuroanatomical dissociability of cortical mechanisms mediating the perception of harmony in its vertical vs. horizontal dimensions in the presence vs. absence of tonal context; and (c) the location of interhemispheric auditory projections in the human corpus callosum (Tramo et al. 1987, 1990b, 1991, 1993, 2005, 2008a,b; Tramo & Bharucha 1991; Tramo & Koelsch 2008);
- Experiments on the neural coding of tonal harmony via intra-axonal and extracellular microelectrode recordings of cat auditory nerve and inferior colliculus responses to complex-tones that: (a) elucidated peripheral and central representations of tonal consonance and dissonance; and (b) provided a biologically-based alternative to Helmholtz's counterintuitive theory, shared by many auditory physiologists and psychologists for more than a century, that the consonance of isolated musical intervals and chords is a negative percept, derived from the absence of tonal roughness; our neural data provide empirical evidence that consonance is a positive percept, built up from multiple, harmonically-related pitches, in keeping with the music-theoretic formulations of Rameau and others (Tramo et al. 1992, 2001, 2008a; McKinney et al. 2001);
- Experiments on auditory perception by neurological patients that elucidated the functional role of the auditory midbrain (inferior colliculus) in spatial localization, speech recognition, and music recognition (Litovsky et al. 2002; Tramo et al. 2008c);
- Experiments on the receptive field properties of macaque auditory cortex neurons via a novel alert preparation for microelectrode recordings that avoided the confounding effects of anesthesia and, consequently, uncovered a temporal response characteristics and spectrotemporal receptive field properties (Tramo 1998; Tramo et al. 1999a,b);
- Experiments on the neural coding of species-specific communication sounds in the primary auditory cortex of alert rhesus monkeys that revealed a candidate coding scheme based on the coarse temporal pattern of responses to different vocalization categories (Tramo 1998; Tramo et al. 1996, 1998);
- Experiments on auditory acuity and experience-dependent plasticity in musicians and non-musicians that supports the claim that high perceptual acuity for music-related auditory functions is universal, and that the "use it or lose it" principle applies to the effects of music experience (formal and informal) on high acuity (Tramo et al. 2008d);
- Experiments with premature infants supporting the claims that (a) music-related auditory functions are universal; and (b) controlled auditory stimulation with music ameliorates pain and stress caused by medical procedures (Tramo et al. 2006; Lense et al. 2008);
- Development of novel MRI-based morphometric methods for flat-mapping and measuring the surface of human cerebral cortex; application of the methods revealed prenatal influences on the morphology of gyral-sulcal patterns in monozygotic twins and pathoanatomical correlates in patients with amusia, dyslexia, and schizophrenia (Tramo et al. 1990, 1995, 1998; Jouandet et al. 1989; Green et al. 1991, 1999; Loftus et al. 1995).

Teaching contributions include:

- Founding the *Auditory Neurobiology* lecture course (Neurobiology 101) at Harvard College and Graduate School of Arts & Sciences (2007-current);
- Founding the *Music, Mind & Brain* seminar course (Psychology 987b, then MBB 98) at Harvard College as a Faculty Fellow of the Harvard University Mind/Brain/Behavior Interfaculty Initiative; this is the longest running course in the history of the MBB Initiative (1995-current);
- Sponsoring the Honors Theses and Research Awards of nine Harvard College students (1995-current);
- Sponsoring Research Assistantships for over a dozen Harvard College, HMS, MIT, and outside students (1994-current);
- Serving on thesis advisory and qualifying examination committees and sponsoring research and student laboratory rotations as a faculty member of the HST Speech & Hearing Bioscience & Technology Graduate Studies Program

- Co-Founding, Directing, and lecturing in the annual Harvard Medical School Continuing Medical Education course, *Dementia: A Comprehensive Update* (1997-current); during my turn as Director in 2001, I revised the course in collaboration with the Co-Directors and doubled its registration, thereby reversing a downward trend that caused some to consider discontinuing the course or changing the topic; since then, we have consistently received the Dean of the HMS Dept of CME's commendation as one of their highest rated courses; during my 2007 turn as Director we set a new record for registration.

- Co-founding the *Music Perception and Cognition* seminar course (HST 725) in the Harvard-M.I.T. Speech & Hearing Biosciences & Technology Graduate Studies Program (2004, 2007)

- Supervising laboratory research and independent studies for over two dozen undergraduate students, graduate students, medical students, and neurology residents from Harvard, M.I.T., and outside institutions (1994-current);

- Organizing symposia, serving on fellowship and grant application committees, and helping to build the MBB curriculum at FAS and GSAS as a member of the Harvard University Steering Committee on Mind/Brain/Behavior (2006-current) and the Standing Committee on Neuroscience/MBB (2000-current);

- Organizing the Cognitive/Behavioral Neurology teaching curriculum at Massachusetts General Hospital for second-year Partners Neurology Residents (1995-2006);

- Professional education via invited CME lectures and Neurology Grand Rounds (1998-current)

- Public education via my contributions to and recorded appearances in the science museum exhibit, *Wild Music!*, which is touring the United States through at least 2009, and through public lectures (e.g., Carnegie Hall, Lincoln Center), materials posted on The Institute for Music & Brain Science website, and interviews published by print, radio, television, and internet journalists around the world;

- Middle- and high-school education via my contributions to the interactive edutainment DVD, *Neuromatrix*, winner of the Robert Wood Johnson Foundation's 2007 Games for Health Competition.

Clinical contributions include:

- One General Neurology Inpatient Service rotation per year at Massachusetts General Hospital (1995-current);

- Outpatient Service in the Cognitive/Behavioral Neurology Unit at Massachusetts General Hospital (1992-current);

- Inpatient and Outpatient Behavioral Neurology Consults at McLean Hospital (1996-2005).

B. Funding Information

Research Funding

1987-1988, National Institute of Neurological & Communicative Disorders & Stroke, National Institutes of Health, Fellow, National Research Service Award (Physiology), "Metabolic Correlates of the Neglect Syndrome", NS08159

1988-1991, National Institute of Neurological Disorders & Stroke, National Institutes of Health, Co-PI, Program Project in Cognitive Neuroscience, Project III: "Cortical Networks in Auditory Pattern Perception" and Project VIII: "Core Neurology and Brain Imaging", NS17778

1989-1991, Office of Naval Research, Cognitive Science Program Award, "Brainprints: Straight-line two-dimensional maps of the human cerebral cortex in vivo", N00014-89-J-3035

1991-1992, National Institute of Mental Health, Fellow, National Research Service Award, Program in Neuroscience, MH18012

1992-1997, National Institute on Deafness and Other Communication Disorders, National Institutes of Health, PI, Clinical Scientist Development Award, "Functional Anatomy of Auditory Cortex", DC00071

1993-1995, National Institute of Mental Health, Consultant, Collaborative Biological Research in Schizophrenia, MH31154

1997-2002, McDonnell-Pew Foundation, PI, Cognitive Neuroscience Program Award, "Neural Coding of Communication Signals in Auditory Cortex", 97-25

1997-1998, National Organization for Hearing Research, PI, Research Award, "Physiology of Neuronal Responses to Vocal Communication Sounds in the Auditory Cortex of Awake-Behaving Macaques".

1998-2002, National Institute on Deafness and Other Communication Disorders, National Institutes of Health, PI, First Independent Research Support and Transition Award, "Physiology of Vocalization

Sensitivity in Auditory Cortex", DC03382
 2000-2001, Gordon and Llura Gund Research Award, Mind/Brain/Behavior Initiative, Harvard University, PI, "How the brain evolved speech representations: Field experiments, neurophysiology, and fMRI".
 2001-2006, Peabody Charitable Foundation, Co-Investigator, "Auditory Neurology"
 2002-current, The Institute for Music & Brain Science, Principal Investigator, "Program in Auditory Neuroscience"
 2009-current, Grammy Foundation Research Award, Principal Investigator, "Treatment of Iatrogenic Pain and Stress in Critically-Ill Premature Infants"

Education Funding
 2004-2006, National Institute for Mental Health Small Business Innovative Research Award, Morphonix, Inc., Consultant, "Neuromatrix: Interactive Neuroscience Education", MH066429
 2005-2009, National Science Foundation Informal Science Education Award, Consultant, "Wild Music!" Museum Exhibit and Tour, ESI-0211611
 2007-2008, National Endowment for the Humanities, Digital Humanities Grant, Consultant, "iTunes: Music 1.01", HD-50258-07

C. Report of Current Research Activities

I am currently active in data collection, data analysis, and/or manuscript preparation of original research with colleagues and students on: 1) effects of unilateral and bilateral auditory cortex lesions on virtual pitch perception and inharmonicity detection by stroke patients; 2) localization and latency of cortical auditory event-related potentials evoked by harmonic context violations during consonance judgments; 3) fMRI activation of auditory cortex subregions during aesthetic evaluation of harmonic progressions; 4) effects of film music on affective evaluation of facial expressions; 5) effects of controlled auditory stimulation with music, speech, and natural sounds on physiological and behavioral indices pain and stress in premature infants.

D. Report of Teaching

1. Local contributions

a. Medical School/Dental School/Graduate School

Cornell University Medical College

1987-1988, Third Year Clerkship in Neurology, Tutor, 4 students/yr, 20 hrs/yr

1987-1988, Fourth Year Neurology Elective in Cognitive Neuroscience, Tutor, 2 students/yr, 40 hrs/yr

1987-1988, First Year Student Faculty Advisor, 6 students/yr, 24 hrs/yr

Dartmouth Medical School

1989-1991, McDonnell-Pew Graduate Studies in Cognitive Neuroscience, Lecturer & Laboratory Instructor, 2 students/yr, 60 hrs/yr

1998-1991, Scientific Basis of Medicine: Neurology, Lecturer, entire class of 2nd yr students/yr, 10 hrs/yr

1989-1991, Fourth Year Elective in Cognitive Neuroscience, Tutor, 2 students/yr, 40 hrs/yr

Harvard Medical School, Division of Medical Sciences, and Division of Health Sciences and Technology

1993, Second Year Physical Diagnosis in Neurology, Tutor, 4 students/yr, 16 hrs/yr

1993, HST 722: Brain Mechanisms of Hearing and Speech, Lecturer, 12 graduate students/yr, 4 hrs/yr

1993, 1995, 1997, Neurobiology 208: The Visual System, Lecturer, 10 medical and graduate students/yr, 6 hrs/yr

1994-current, Clinical Clerkship in Neurology, Examiner, 1 medical student/yr, 2 hrs/yr

1996, 1999, 2007, HMS/HDS Human Nervous System & Behavior, Lecturer & Tutor, 12-20 medical/dental students/yr 60 hrs/yr

1997, 1998, 2005 HST 799, Special Topics Research in the Speech & Hearing Sciences, 1 student/yr, 120 hrs/yr

1999-2000, Thesis Advisory Committee, HST Speech & Hearing Sciences, 1 graduate student/yr, 16 hrs/yr

2000, Thesis Qualifying Examination Committee, HST, Speech & Hearing Sciences, 1 graduate

student/yr, 4 hrs
 2004, 2007, HST 725, Music Perception & Cognition (Co-Instructor), 4-8 students/semester

b. Harvard College, Harvard Graduate School of Arts & Sciences, and the Harvard University Mind/Brain/Behavior Interfaculty Initiative

1995-2007, Psychology 985, Preparation for the Honors Thesis, 1 undergraduate every other yr, 50 hrs/student
 1995-current, Psychology 990, Honors Thesis Advisor, 1 undergraduate every other year, 100 hrs/student
 1997-2000, Psychology 910r, Supervised Reading/Research, 1 undergraduate every other year, 50 hrs/student
 1998, 2002 Biology 98r, Introduction to Research, 1 undergraduate/yr, 50 hrs/yr
 1998-1999, Biology 99, Honors Thesis Advisor, 2 undergraduates/yr, 100 hrs/student
 1998, 2000, 2001, Psychology 987b, Music, Mind, & Brain, 12 undergraduates/yr, 100 hrs/yr
 1999-2001, Mind/Brain/Behavior Thesis Workshop, 12 undergraduates/yr, 15 hrs/yr
 2000-20001, Psychology Honors Thesis Committee, 2 undergraduates/yr; 20 hrs/student
 2000-2001, Special Concentrations 99, Honors Thesis Advisor, 1 undergraduate/yr, 100 hrs/yr
 2001-2002, Special Concentrations 91r, Supervised Reading and Research, 1 undergraduate, 15 hrs/yr
 2002-2003, PhD Thesis Committee, Cory Miller, Psychology, 20 hrs/yr

c. Graduate Medical Courses

The New York Hospital - Cornell Medical Center

1986-1988, Neurology Outpatient Clinic, Attending, PGY 2-4 Neurology Residents, 48 hrs/yr
 1986-1988, Cognitive Neuroscience Seminar Series for Neurology Residents, Organizer and Lecturer, 36 hrs/yr
 1987-1988, Neurology Consult Service, Attending, PGY-3 Neurology Resident, 112 hrs/yr

Dartmouth-Hitchcock Medical Center

1988-1991, Neurology Outpatient Clinic, Attending, PGY 2-4 Neurology Residents, 60 hrs/yr
 1988-1991, Resident Research Elective in Cognitive Neuroscience, Tutor, 40 hrs/yr
 1989-1991, Behavioral Neurology Ward Rounds, 12 hrs/yr

Massachusetts General Hospital

1992-current, Neurology Ward or Consult Service, Attending, PGY 1, 2, and 4 Neurology, Psychiatry, and Physiatry Residents and Interns, 224 hrs/yr
 1992-current, Cognitive/Behavioral Neurology Unit, Attending, PGY 3 Neurology Residents, 48 hrs/yr
 1992-current, Neurology Residents Cognitive/Behavioral Neurology Seminar, Attending, 24 hrs/yr
 1994, 2000, Neurology Residents Neuroscience Seminar, Lecturer, PGY 2-4 Neurology Residents, 5 hrs/yr
 1995-current, General Neurology Residents' Clinic, Attending, PGY 2-4 Neurology Residents, 30 hrs/yr
 1998, 1999, 2001, Neurology Professor's Rounds, PGY 1-4 Neurology, Psychiatry, and Physiatry Residents and Interns, 2 hrs/yr
 1999, 2000, 2005, 2006 Behavioral Neurology Signs Rounds, PGY 1-4 Neurology, Psychiatry, and Physiatry 12 hrs/yr
 Residents and Interns, 2-4 hrs/yr
 2000-current, Mortality and Morbidity Conference, PGY 2-4 Neurology Residents, 18 hrs/yr

d. Invited Presentations

The New York Hospital - Cornell Medical Center:

1986-1988, Neurology/Neurosurgery Grand Rounds, Lecturer, 20 hrs/yr

Dartmouth-Hitchcock Medical Center:

1989-1991, Neurology/Neurosurgery Grand Rounds, Lecturer, 20 hrs/yr

Harvard Medical School

1992, Program in Neuroscience Seminar, Wood's Hole, Lecturer, 20 hrs
 1993, Neurobiology Department Seminar Series, Lecturer, 20 hrs
 2006, Medical Exchange Club, Lecturer, Harvard Club of Boston, 2 hrs

Harvard University

1994, Multiple Perspectives in Music Seminar Series, Music Department, Lecturer, 10 hrs
 1998, Psychology Department Seminar Series, Lecturer, 20 hrs

2000, Mind/Brain/Behavior Faculty Fellowship Seminar Series, 20 hrs
 2001, Harvard University Mind/Brain/Behavior Advisors' Dinner, Lecturer, 21 Club, New York, 5 hrs
 2001, The Harvard Club of Boston, A Saturday of Symposia, Music, Mind, and Brain (invited)
 2001, Mind/Brain/Behavior Advisory Board Seminar, 20 hrs
 Massachusetts General Hospital
 1997, 2001, Neurology Grand Rounds, Lecturer, 10 hrs/yr
 Brigham & Women's Hospital
 1994, Behavioral Neuroscience Seminar Series, Lecturer, 20 hrs
 Beth Israel Hospital
 1993, Neurology Grand Rounds, Lecturer, 1993, 20 hrs
 Cambridge Hospital
 2000, 2001, Neurology Lecture Series, 10 hrs/yr

e. Continuing Medical Education Courses

Cornell Medical College
 1988, Review of Internal Medicine, Lecturer, 20 hrs
 Harvard Medical School
 1997-2000, 2002-2006, Cognitive and Behavioral Neurology: Focus on Dementia, Co-Director and Lecturer, 40 hrs/yr
 2001, 2007 Dementia: A Comprehensive Update, Director and Lecturer, 100 hrs

f. Advisory and Supervisory Responsibilities

Cornell Medical College
 1987-1988, First Year Student Faculty Advisor, 6 students/yr, 24 hrs/yr
 Massachusetts General Hospital
 2006-2007, Mentor, Senior Neurology Resident (1), 50 hrs/yr
 2004-8-current, Preceptor, Neurology Residents Clinic (200 hrs/yr)

2. Regional, national, or international contributions

a. Presentations

1985, Session on Multiple Sclerosis: Clinical Investigation and Therapy, 37th Annual Meeting of the American Academy of Neurology
 1987, Cerebrovascular Disease II: Poster Presentations, American Neurological Association 114th Annual Meeting
 1988, Session on Cerebral Metabolism, 40th Annual Meeting of the American Academy of Neurology
 1989, Behavioral Neurology Poster Session, American Neurological Association 114th Annual Meeting
 1989, Interhemispheric Relations Poster Session, Society for Neuroscience 19th Annual Meeting
 1989, McDonnell Foundation Summer Institute in Cognitive Neuroscience Faculty and Lecturer (invited)
 1990, Second International Conference on Music and the Cognitive Sciences, Cambridge University, Lecturer (invited)
 1990, Human Behavioral Neurobiology Poster Session, Society for Neuroscience 20th Annual Meeting
 1990, First Annual McDonnell-Pew Program in Cognitive Neuroscience Investigators' Workshop, Lecturer (invited)
 1990, Behavioral Neurology Poster Session, American Neurological Association 115th Annual Meeting
 1990, McDonnell Foundation Summer Institute in Cognitive Neuroscience Faculty and Lecturer (invited)
 1991, Functional Aspects of Auditory Cortex Symposium, Lecturer, International Brain Research Organization Third World Congress of Neuroscience, (invited)
 1991, Music and the Brain Session, Lecturer, Second International Conference on Music Perception and Cognition, UCLA (invited)
 1991, Central Auditory Physiology Poster Session, Society for Neuroscience 21st Annual Meeting
 1991, Cognitive Neuroscience Session, Co-Chair and Lecturer, 2nd International Conference on Epilepsy and the Corpus Callosum (invited)
 1991, Scientific Session, Lecturer, Society for University Neurosurgeon (invited)
 1991, Neurology Grand Rounds, Lecturer, Yale School of Medicine Neurological Study Unit and Yale-New Haven Hospital (invited)
 1992, Central Auditory Physiology Slide Session, Society for Neuroscience 22nd Annual Meeting
 1992, Music and the Brain Symposium, Lecturer, Art Institute of Chicago (invited)

- 1992, International Conference on the Psychophysiology and Psychopathology of the Sense of Music, Lecturer (invited)
- 1993, Central Auditory Physiology Slide Session, Society for Neuroscience 23rd Annual Meeting
- 1994, Central Auditory Physiology Poster Session, Society for Neuroscience 24th Annual Meeting
- 1996, Functional Aspects of Auditory Cortex Workshop, Lecturer, XXVIth International Congress of Psychology (invited)
- 1996, Auditory Cortex Physiology - Primates Poster Session, Society for Neuroscience 26th Annual Meeting
- 1997, Music and the Brain Symposium, Lecturer, International Computer Music Conference, (invited)
- 1997, Pedagogical Session: Neurobiology, Lecturer, International Conference on Complex Systems (invited)
- 1998, Press Conference on Music and the Brain, Moderator, Society for Neuroscience 28th Annual Meeting (invited)
- 1998, Auditory Cortex Physiology - Complex Sounds Poster Session, Society for Neuroscience 28th Annual Meeting
- 1999, Auditory Cortex Slide Session, 22nd Association for Research in Otolaryngology Midwinter Meeting
- 1999, Central Auditory Physiology: Spectrotemporal Coding Poster Session, Society for Neuroscience 29th Annual Meeting
- 2000, Biological Foundations of Music, Lecturer, New York Academy of Sciences (invited)
- 2000, The Music of Nature and the Nature of Music, Lecturer, Smithsonian Institute, National Musical Arts, National Academy of Sciences (invited)
- 2000, Association for Research in Otolaryngology: Inner Ear: Normal Structure or Function Poster Session
- 2001, Auditory: Coding, Tuning and Perception Poster Session, Society for Neuroscience 31st Annual Meeting
- 2001, Berklee College of Music, Music Therapy Symposium, Music & The Brain (invited)
- 2002, Learning & The Brain Symposium, Music Education, & The Brain. Cambridge, MA (invited)
- 2002, Hudson Theatre, Beth Abraham Music Therapy Program, Music Cognition. NY, NY (invited)
- 2002, Auditory Neuroscience Seminar Series, University of Connecticut at Storrs, Effects of Auditory Cortex Lesions on Music Perception (invited)
- 2003, Neuroesthetics Symposium, University of California at Berkeley, Widely Distributed Neural Systems for Musical Aesthetics (invited)
- 2004, Linda and Jack Gill Center for Biomolecular 2004 Symposium and Award, Indiana University (invited)
- 2004, Jill S. Titus Lecture, Institute for Mind, Body & Spirituality, Lesley College (invited)
- 2004, Special Session of the 50th Annual Meeting of the Acoustic Society of America, Musical Acoustics: Neurophysiology of Musical Instrument Playing, New York (invited)
- 2004, Carnegie Hall Concert and Symposium, Beautiful Minds, Beautiful Music, New York (invited)
- 2005, Neurosciences & Music Symposium, Leipzig, Germany (invited)
- 2005, Leibniz Institute, Magdeburg Germany (invited)
- 2005, Harvard Club of Fort Lee, FL (invited)
- 2005, Roland M. Pinkham Annual Memorial Lecture, Swedish Medical Center, Seattle, WA (invited)
- 2006, Neurosciences Institute, LaJolla, CA (invited)
- 2006, Arts in Medicine Series, Memorial Sloan-Kettering Cancer Center (invited)
- 2007, National Center for Human Performance, Houston, TX (invited)
- 2007, Center for Performing Arts Medicine, Methodist-Cornell Medical Center, Houston, TX (invited)
- 2007, Cold Spring Harbor Interdisciplinary Symposium on Memory in Neuroscience & the Humanities (invited)
- 2008, National Academy of Sciences Annual Meeting, Koshland Science Museum, Music and the Brain: Performance and Discussion, Washington, DC (invited)
- 2009, Cleveland Clinic, Keynote Lecture. Music and the Brain Symposium, Cleveland, OH (invited)
- 2008, Duke University, Opening Lecture, Music and the Brain Symposium, Durham, NC (invited)
- 2009, Shepherd School of Music, Rice University, Exploring the Mind Through Music Symposium, Houston, TX (invited)
- 2009, Barrow Neurological Institute, Neurology/Neurosurgery Grand Rounds, Phoenix, AZ (invited)
- 2009, International Mind Brain & Education Society Meeting, Panel: Advances in the cognitive neuroscience of music: Implications for education, Philadelphia, PA
- 2009, International Mind Brain & Education Society Meeting, Panel: Emotion, learning, & the brain: Insights from experimental neuroscience & educational approaches to children with neurological disease, Philadelphia, PA

2009, Brigham & Women's Hospital and Massachusetts General Hospital, Michael Ty Memorial Lecture, Boston, Massachusetts
 2009, Performing Arts Medicine Association, Richard J. Lederman Keynote Lecture, Snowmass, CO
 2009, Lincoln Center, Music and the Brain Symposium, Closing Lecture, New York, NY

3. Teaching Awards

1997-1998, Harvard University Provost's Award for Educational Innovation
 2000, Harvard Medical School Class of 2000 Faculty Award for Excellence in Clinical Teaching

4. Description of major curriculum offerings and innovative programs

Founded interdisciplinary Harvard College course, "Music Mind & Brain" (Psychology 987b; Mind/Brain/Behavior Interfaculty Initiative) in 1995. Eleventh offering this coming Spring Term of 2007-2008 Academic Year.
 Proposal for new undergraduate Auditory Neurobiology course recommended for approval by the FAS Standing Committee on Neurobiology in the Fall Term of the 2006-2007 Academic Year; final approval by FAS pending for initial offering in the Fall Term of the 2007-2008 Academic Year as a Neurobiology course administered by the Department of Molecular and Cellular Biology.
 Sponsored seven Harvard undergraduate honors theses in Biology, Psychology, and Special Concentrations from 1996-2006, with one additional student actively working on her 2008 thesis in Human Evolutionary Biology.
 Founded the world's first non-profit organization, The Institute for Music & Brain Science, devoted to basic and clinical research on music, science, and medicine, in collaboration with four Harvard Medical School colleagues, The Beatles' producer, Sir George Martin, and several colleagues from academia, the arts, and industry.
 Appointed principal tutor of MGH Cognitive Neurology Unit in 1995, revised teaching curriculum
 Recipient of the Harvard Provost's Award for Educational Innovation, 1997-1998 Academic Year.

5. Public Education (partial list)

1995, *NBC Nightly News with Tom Brokaw*, The New York Times *Science Times*, Boston Magazine
 1996, BBC 4 Television, Los Angeles Times, Atlanta Journal-Constitution, Young Students Learning Library Science Yearbook, American Psychological Association Monitor
 1997, The Washington Post, The Boston Globe *Quotes of Note*, Fox News Channel
 1998, *NBC Today Show*, *PBS Healthweek*, CBS National Radio, Public Radio International, New England Cable News, KCBS Radio San Francisco, WAV-FM Radio Tokyo, ZIP-FM Radio Nagoya, LA Times, USA Today
 1999, Lifetime Channel, Discovery Science Channel, NPR *Living On Earth*
 2001, National Geographic TV, WBZ-TV Boston, WCVB-TV Boston, Discovery Channel, NPR *The Connection*, US News & World Report, Discover Magazine, The New York Times *Science Times*, The Boston Globe *Health/Science*
 2002, WCVB-TV Boston, Canadian Broadcasting Corporation Radio *Ideas*, People Magazine, ABCnews.com, NPR *Infinite Mind*
 2003, The New York Times, Harvard Medical School Alumni Bulletin, Neurology Today, Edmonton Journal
 2004, Journal of the American Medical Association, PBS-TV *Closer To Truth*, WiredNews.com, Discover
 2005, CBS-TV Sunday Morning, National Public Radio, Chicago Tribune, Seattle Times
 2006, The Wall Street Journal, US News & World Report, NPR, St Louis Post-Dispatch
 2007, Washington Post
 2008, *Nightline*, WABC-TV
 2009, *All Things Considered*, NPR

E. Report of Clinical Activities

1. Description of Clinical Practice

I am a general adult neurologist (board certified in 1988) with fellowship training and 20 years of outpatient and teaching experience in the subspecialty of Behavioral Neurology, which deals with disorders of memory, language, attention, auditory cognition, visual cognition, perceptual-motor integration, reasoning, learning, and

emotion caused by stroke, neurodegenerative disease, head trauma, systemic diseases, and developmental diseases.

2. Patient Load and Complexity

I see up to eight patients every other week in the MGH Cognitive Neurology Outpatient Unit. I typically serve as the Attending on one of the Neurology Inpatient Services one month per year, with 10 days per month of Emergency Room coverage during that month.

PART III.

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76. Tramo MJ, Cariani PA, Delgutte B Neurobiological and psychophysical foundations of Western tonal harmony.
77. Tramo MJ, Chen K, Koh CK, Rekdahl AJ, Dykstra AD, Braidia LD Activity dependent auditory acuity: Harmony perception.
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B. Educational Material

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2. Tramo MJ Psychology 987b, Music, Mind, and Brain, 1998-2006, Course syllabus, Harvard College
3. Tramo MJ, Functional organization of the cerebral cortex. In: *Dementia: A Comprehensive Update*, 2001-7 Course syllabus, Harvard Medical School Department of Continuing Medical Education

C. Thesis

1. Tramo MJ Neural representations of acoustic information in relation to music and voice perception. Harvard University, Cambridge, MA, Ph.D. Dissertation, 1998

D. Nonprint Material

1. www.BrainMusic.org, The Institute for Music and Brain Science
2. www.myspace.com/MenWithTales

PART IV. Copyrights, Performances, & Credits (Musical and Dramaticomusical)

Top of the Pop, World's Fair, New York, NY, 1965

Apotheosis of a King Who Lost His Kingdom, Script, Lyrics, & Music ©1974 Tramo

Apotheosis of a King Who Lost His Kingdom, Sound Recording ©1976 Tramo

Dynamite Tonight, Yale Repertory Theatre, 1975

Creating for the Musical Theatre, Yale Music School (Lehman Engel), 1975

Dramatic Technical Production, Yale Drama School & Repertory Theatre (John Hood, Walter Jones), 1975

Alice in Wonderland, Louis Barton, Yale Music School

Benefit, Men With Tales, Yale University, 1977

In Concert, Men With Tales, Yale University, 1978

Siren, Words & Music ©1981 Tramo & Schiller

Living In a Fantasy, Music & Lyrics ©1981 Tramo & Schiller

Leslie, Music & Lyrics ©1981 Schiller & Tramo

Men With Tales, Sound Recording ©1981 Frost, Schiller, Singleton, Tramo & Trombetta

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Saw You In My Dream, Sound Recording, Music & Lyrics ©1988 Tramo

Hold Me, Music & Lyrics ©1991 Tramo

Few of Many, Sound Recording, Music & Lyrics ©2002 Tramo

For Your Heart, Sound Recording, Music & Lyrics ©2002 Tramo