

## DOUGLAS GORDON STUART, PHD, DSC (HC): A BIOGRAPHICAL SUMMARY

Stuart, a naturalized (1961) US citizen, is a fourth-generation Australian of Scottish-N. Irish descent. He was born (1931) in Casino (population then ~5,000), and raised in Lismore (then ~13,000), rural towns of the far north coastal region of the State of New South Wales (NSW), about 500 miles north of Sydney, and 20 miles from the ocean. His father, Gordon (1900-33), became the Gundarimba Shire Clerk (1926-1933; USA equivalent, County Manager) at an early age for a small but agriculturally rich ~400 square mile area that extended south-southeast from Lismore. This shire was in existence from 1907 to 1976. His early-widowed mother, Martha (1901-1998), a 1922 graduate of Sydney Teachers' Coll. was a grade school teacher and, later, an elementary school principal. His elder brother, Ian (1929-2011), BS/MS, Univ. Sydney, AUS 1951/53, MS, Cambridge Univ., GBR, 1957, was an applied mathematician, formerly with an Australian federal research organization (CSIRO Wool Research Division) for the period 1948-1990.

Stuart graduated from Lismore High School in 1947. Next, he graduated in 1950 (at the age of barely 19 years) from Sydney Teachers' Coll. with a 3-year diploma in physical education. He was hired to teach physical education and organize sports at Hurlstone Agricultural High School, a state-supported boarding school for 12-18 yr-old boys on the S.W. outskirts of Sydney, for 3 years (1951-1953). He took it upon himself to also teach folk dancing and produce plays. In 1953, one of his productions with 15/16 year-old boys won a citywide competition (Stuart's 1-act version of Maxwell Anderson's 1935 "Winterset" on the Saccho-Vanzetti case).

Stuart was a track-and-field athlete (high jumper), and a member of the Australian team for the British Commonwealth Games (Auckland, NZL, 1950; Vancouver, CAN, 1954). He came to Michigan State Univ. (MSU, E. Lansing, MI) on a track scholarship in 1954 to complete his BS (1955) and MS (1956) in physical education with an emphasis on mammalian physiology and the physiology of exercise. It was at MSU that Stuart developed his interest and expertise in academe (including exposure to experimental neuroscience; his first venture involved testing the effects of fatigue on human reaction time); blossomed in public speaking (MSU sent him state-wide to promulgate interest in its foreign student program) and leadership (he co-ran a dormitory of 500 undergraduate and graduate students); met and subsequently married (1957) an American undergraduate (see below). Rather, with the guidance of an outstanding MSU teacher and mentor, Professor W. Duane Collings (1914-81), he opted to pursue a PhD in physiology at UCLA, where he began his studies in January 1957. Immediately prior, however, he returned briefly to Australia where, after failing to make the Australian track team, he designed and had built the scoreboards used for over a dozen sports (e.g., basketball, boxing, gymnastics, swimming) at the Olympic Games in Melbourne in November 1956. During this visit he was offered the opportunity to return to the USA as a member of the Australian Department of External Affairs by its then-minister, Richard Casey. By then, however, Stuart was firmly committed to an academic career in physiology.

Stuart relished graduate school at UCLA (January 1957- February 1961), where he was strongly influenced by leading neuroscientists. While a graduate student, three of his professors were elected to the National Academy of Sciences: Theodore Bullock (1915-2005) for invertebrate neurobiology; Horace Magoun (1907-1991) for neuroanatomy and the reticular

activating system; Donald Lindsley (1908-2003) for physiological neuropsychology. Shortly thereafter, Thomas Sawyer (1915-2006) was also elected for neuroendocrinology. Stuart's major professor was Allan Hemingway (1902-1972), a distinguished physicist/physiologist who was the first to record extracellularly from mammalian hypothalamic cells. Other of his UCLA professors included: Bernard Abbott (1920-2006), an AV Hill-trained muscle biologist; Earl Eldred, a Ragnar Granit-trained muscle spindle neurobiologist; John Green (1917-1964), the first to describe (with Geoffrey Harris, 1913-1971) the hypophyseal-portal circulation; Wilfred Mommaerts (1917-1994), an Albert Szent Gyorgyi-trained muscle biologist; Arnold Scheibel, a Golgi-staining neuroanatomist; and, Fritiof Sjostrand, a pioneering Swedish-trained electron microscopist. A particularly helpful person for Stuart's academic development was a postdoctoral trainee in Hemingway's group, Walter Freeman (1927-), a fourth generation USA clinician, who later became a leading authority on the EEG and a neuroscience philosopher at UC-Berkeley. Stuart subsequently worked with Eldred, first as a postdoctoral fellow (1961-63), and subsequently as an assistant research professor (1963-65).

As a predoctoral trainee supported by Magoun's NIH-supported mental health training program, Stuart developed his life-long interest in interdisciplinary neuroscience, and the advantages of exposing pre- and postdoctoral trainees to the very best of international science, both intellectually and socially. Magoun and Hemingway insured that innumerable leading USA and foreign neuroscientists worked and/or visited UCLA where they had substantial scientific and social interactions with the pre- and postdoctoral trainees. For example, for his PhD research, Stuart had the good fortune to work in 1960 with Yojira Kawamura, a neurosurgeon who at that time was the youngest (at 38 yrs. of age) full professor of physiology in Japan (Osaka Univ. Dental School). Kawamura had just published the world's first textbook of oral physiology and neurophysiology, thereby acquiring the Magoun-endowed title of "the Sherrington of the mouth!" Kawamura went on to train over 40 department heads of clinical dentistry, neuroscience, and physiology in Japan's twenty schools of dentistry. For this effort, together with his scientific accomplishments, Kawamura received an award from the Emperor of Japan and similar awards from many foreign countries.

In his academically supportive UCLA environment, Stuart advanced rapidly as an experimentalist. Seven refereed manuscripts in leading journal resulted from his hypothalamus/ temperature-regulation predoctoral experiments (using brain stimulation and lesions in anesthetized cats). Fourteen refereed manuscripts followed his four postdoctoral years of experimentation in his own UCLA-supported laboratory at the Long Beach Veterans' Administration Hospital. This work included studies on the extracellularly recorded firing patterns of cat hypothalamic cells, the genesis of various forms of tremor in cats and humans, and reflex testing in spinal-cord-injury patients. Throughout this 1961-1965 epoch, it was Magoun's custom to lunch on Thursdays with Stuart and other young neuroscientists, for discussion of wide-ranging neuroscience issues and their history. Stuart was awarded his first NIH RO1 grant at UCLA in 1964. Interestingly, this grant, with several name and emphasis changes, was funded for 38 years (1964-2002).

On the basis of his demonstrated independence and flair for collaborative research Stuart became an associate professor of physiological sciences with tenure at UC-Davis in May 1965, just 4 years after being awarded his PhD. At UC-Davis, Stuart had an extremely heavy teaching load with veterinary and graduate students. Nonetheless, he developed a sophisticated electrophysiological laboratory for spinal cord research with the assistance of a gifted young electronics/computer engineer, Robert Reinking, who remained with Stuart for 35

years before becoming a senior research engineer in the UA's Applied Mathematics Program. It was at UC-Davis that they, with the help of Sabura Homma and Koichi Ishikawa (Univ. Chiba, JPN) began to record intracellularly from mammalian spinal motoneurons. The 1963 Australian Nobel Laureate, Sir John Eccles (1903-1997), visited Stuart at UC-Davis in 1966, and subsequently incorporated Stuart and Reinking's then-unique, electromagnetic, servo-controlled muscle stretching apparatus into his own new laboratory set-up at the American Medical Association's short-lived Institute for Biomedical Research in Chicago, IL. Eccles felt that Stuart had insufficient training in the nuances of spinal cord neurobiology (particularly those introduced by Sherrington and refined subsequently by his trainees, including Eccles), so he personally recommended him to Anders Lundberg in SWE (see below). Eccles and Stuart remained close friends thereafter, with Eccles spending many hours describing to Stuart his perception of the history and strategy of neurophysiology and, in particular, the impact of Charles Sherrington (1856-1952) on the field.

At UC-Davis, Stuart found time for a type of university service that became a feature of his subsequent career: the pioneering of new multidisciplinary academic ventures. For example, he served on the first committees at UC-Davis for the establishment of (1) an inter-college PhD program in physiology, (2) a university-wide program in biomedical engineering, and (3) a university-wide strategy for the incorporation of computers into research. For his efforts, UC-Davis rewarded Stuart with a double-step promotion to step III associate professor, barely two years after his arrival.

Stuart remained at UC-Davis for but 2 years, however. To aid the respiratory health of one of his children (then an 8-yr-old), it was necessary for the family to move to a drier climate. Most fortuitously, a position was available in a new medical college at the UA where Stuart began work in August 1967, as an associate professor of physiology.

At the UA, Stuart flourished in the academically supportive and collegial environment provided by the Head of Physiology, Paul Johnson (1928-), who remained in this position until 1987. Stuart also derived much academic satisfaction and social enjoyment from his interactions with the department's other initial faculty members: William Dantzler (1935-), Robert Gore (1939-), Raphael Gruener (1939), and George Hedge (1939-).

Stuart advanced to Professor in 1970, and Regents' Professor in 1990. His administrative duties have included Acting Department Head of Anatomy (1984-86) and Physiology (1974-5, 1987-8), Department Head of Physiology (1988-91), and Associate Dean for Research in the College of Medicine (1991-1996). He became a Regents' Professor Emeritus of Physiology on July 01, 2002.

In their UA teaching, Stuart and Reinking were the first in the world (Spring semester, 1968) to have all first-year medical students undertake intracellular recording in nerve cells (using the abdominal ganglion of *Aplysia Californica*) and to chronically implant electrodes into cat brains for subsequent stimulation of the awake animal. (They had first undertaken the latter experiment with veterinary medicine students at UC-Davis in 1965-66). From 1968 onwards, Stuart taught virtually all aspects of cellular and systems neuroscience to a wide variety of constituencies (e.g., upper and lower division undergraduates; graduate students in engineering and the life sciences; professional students in medicine, occupational and physical therapy; clinical residents in neurology, neurosurgery, and orthopedics; teachers of special education; members of the lay public). In addition to his substantial UA teaching, Stuart is the

only academician in the State University System who had regular teaching duties statewide. He was a yearly instructor at Northern Arizona Univ. (NAU, Flagstaff) for 16 years (biology and exercise-science students, 1991-2000; physical therapy students, 2001-2007) and he also taught at Arizona State Univ. (ASU, Tempe) in 1993-1998 (graduate bioengineering, biology, and exercise-science students).

In 1971-72, Stuart (by then a full professor) had the opportunity to work at the Univ. Göteborg, SWE with Anders Lundberg (1920-2009) and Elzbieta Jankowska (1930-), who, at that time, were clearly the world's leading workers in the field of spinal-cord neurobiology. As predicted by Eccles, Stuart was able to return from Göteborg to the UA with a far-more-complete armamentarium of spinal-cord techniques. Even more important was Lundberg's generous allotment of time (2-3 hrs. every Saturday morning for 6 months) to review the complete history of motor control science, and its prospects and possibilities. In 2008, Stuart paid tribute to Lundberg's stellar career in a review article written in collaboration with one of Lundberg's former PhD trainees, Hans Hultborn (Univ. Copenhagen, DEN).

A few years later (1977), Stuart undertook 6 months of microneurographic neurophysiological research with David Burke, Division of Neurology, Univ. New South Wales, Sydney, AUS. This division was headed at that time by James Lance, with whom Stuart had once shared an interest in the genesis of various normal and abnormal tremors in humans. With Burke and Lance, Stuart honed his experience in the optimization of the environment for interactions between fundamental and applied (clinical) neuroscientists. Burke (now Professor of Neurology and Associate Dean for Research, Faculty of Medicine, Univ. Sydney) had just returned from an intensive 2-year experience with Karl-Erik Hagbarth (1926-2005) at the Univ. Uppsala, SWE. Stuart helped Burke re-begin his microneurography research in his then *de novo* Australian laboratory, which subsequently became world-renowned.

Stuart has over 145 full-length publications in refereed scientific journals, and 80 chapters, reviews, and symposium volumes. The main themes of his body of work on the segmental motor apparatus include: 1) the arrangement and properties of spinal motoneurons and interneurons, muscle receptors and motor units, and their various interactions; 2) the nature and effects of locomotor movements on muscle receptors and motor unit function; 3) the neurobiology of muscle fatigue; 4) mechanisms underlying the repetitive discharge of motoneurons and interneurons in the generalized vertebrate spinal cord; and 5) historical aspects of movement neuroscience. Throughout their collaborative experimental career, Stuart and Reinking developed several new, relatively straightforward data recording and processing techniques, which they have shared with their colleagues on a worldwide basis. Among these, the best-known recent ones involve the use of personal computers in neurophysiological research, as developed in collaboration with Yiannakis Laouris (CYP), and Michael Nordstrom and Robert Gorman (AUS).

Stuart's reviews, symposium volumes, and research monographs have had a major impact on the field of segmental motor control. In these contributions, Stuart and his co-authors have challenged themselves and their peers to address key unresolved issues, and employed a "user-friendly" style to the benefit of pre- and postdoctoral trainees, the next generation of movement neuroscientists. Among these contributions, the best-known are his: 1) reviews on the need to effect a stronger interface between neurophysiology and biomechanics (with then-UA colleagues, Roger Enoka and Ziaul Hasan) and to address as-yet-unexplored aspects of the proprioceptive contribution to the control of movement (with Hasan); and 2) a research

monograph (with Enoka, Univ. Colorado, Boulder, CO; Simon Gandevia, Univ. New South Wales, Sydney, AUS; Alan McComas, McMaster Univ., Hamilton, CAN; Christine Thomas, Univ. Miami, Miami, FL) on the neurobiology of muscle fatigue which was dedicated to the research contributions of Brenda Bigland-Ritchie (New Haven, CT). This latter effort was compiled electronically in Stuart's UA laboratory, and required the dedicated editorial efforts of his long-time (1979-2006) research assistant and technical editor, Patricia Pierce.

With Sten Grillner (Karolinska Institute, Stockholm, SWE) and Paul Stein (Washington Univ., St. Louis, MO), Stuart has made a truly exceptional service contribution to the study of locomotion, and the need therein to incorporate findings made on invertebrates, non-mammalian vertebrates, mammalian tetrapods, non-human primates, and humans. (It was Stuart who coined the term, "interphyletic awareness"). They were co-organizers of three international conferences that brought together workers on these various species; all followed by widely read symposium volumes. The local organizers for these conferences were: Richard Herman (also conference chair; now with the Good Samaritan Medical Center, Phoenix, AZ) for the Valley Forge, PA meeting in 1975; Grillner (also conference chair) for the Stockholm, SWE meeting in 1985; and, Stuart for the UA meeting in 1995 (conference chair, Stein; co-organizer, Allen Selverston, UC-San Diego, CA). The 1986 volume focused on a comparative approach toward vertebrate motor systems, whereas the 1976 and 1997 volumes had a broader perspective, with comparative emphases for both invertebrate and vertebrate systems. The three volumes share common concepts: neuronal networks generate motor behavior, and comparisons of model systems distributed throughout the animal kingdom provide insights into general principles of motor control. More recently, Stuart has co-edited two further symposium volumes: one with Simon Gandevia and Uwe Proske (Monash Univ., Melbourne, AUS on sensorimotor control in movement and posture (2002), and the other with Shigemi Mori (National Institute of Physiological Sciences, Okazaki, JPN) and Mario Wiesendanger (Univs. Berne and Fribourg, CHE) on brain mechanisms for the integration of posture and movement (2004).

Stuart had studied the work of the Moscow Motor Control School (Victor Gurfinkel, Maurice Shik, Grigori Orlovsky, Yuri Arshavsky, and several others) prior to meeting Gurfinkel and Shik in person in Munich, GER in 1971. (Stuart and Lundberg discussed their contributions, and those of Gurfinkel's mentor, Nicolai Bernstein (1896-1966), during their 1971-72 interactions). The 1975, 1985 and 1995 locomotion symposiums, and subsequent symposium volumes emphasized these Russians' work, as did the reviews of Stuart in 1972 (with Rebecca Gerlach and Carter Mosher), 1976 (with Mary Wetzell), and 1998 (with Jennifer McDonagh). The international motor control community has gained much from the efforts of Grillner, Herman, Selverston, Stein, and Stuart to give full credit to this remarkable group of Russian workers, who labored so effectively under the most difficult and taxing of socioeconomic and political conditions.

Another major international scientific service of Stuart involves the Bulgarian International Symposium on Motor Control. This symposium was held 9 times between 1969 and 2004. Its main purpose was to foster collegiality, cooperation, and scientific interactions among the international motor control community, including the means for young Eastern European and Soviet faculty and trainees to have close, person-to-person contact with leading investigators from the West. Stuart attended these meetings from 1981 to 2000, and made 4 major contributions to the continued success of the venture: 1) he secured US Academy of Science funds to lead a 9-person delegation of leading US workers to the 1985 symposium (Emilio

Bizzi, MIT, Boston, MA; Dudley Childress, Northwestern Univ., Chicago, IL; Thomas Hamm, Barrow Neurological Institute [BNI], Phoenix, AZ; Richard Herman, Good Samaritan Hospital, Phoenix, AZ; John Hollerbach, then with MIT, Boston, MA; Gerald Loeb, then with NIH, Bethesda, MD; Lewis Nashner, then with the Neurological Sciences Institute, Portland, OR; Andras Pellionisz, then with New York Univ., New York, NY); 2) he secured an NSF award to undertake a 6-person exchange (1986-1989) of motor control scientists between the UA/BNI and the Bulgarian Academy of Sciences ; 3) he was a member of the 4/5-person international advisory commission for the symposium for the period 1985-2000; and 4) in an extraordinarily time-consuming effort, he had the 1993 symposium expanded into a volume that was edited and compiled in his own laboratory, again working with Pierce, but in addition, soliciting the editorial help of the entire UA/BNI motor control group and many extramural peers. The result was a volume in which all of the Eastern Bloc authors' contributions (63/94 chapters were presented in polished English such as to optimize their subsequent interactive possibilities with their Western colleagues. This emphasis on helping his foreign colleagues with their usage of English was also a feature of the Japanese chapters in the 2004 volume he co-edited with Mori and Wiesendanger, and his editing of the third and last volume of Masao Ito (2011) on the cerebellum.

One of Stuart's more recent contributions to international neuroscience was his co-editing (with Michael Zigmond, Univ., Pittsburgh, PA and Pierce) of a special 2006 issue of *Progress in Neurobiology*. It is comprised of 10 chapters on the contributions of Eccles to contemporary neuroscience, including a chapter by Stuart and Pierce on Eccles' academic lineage: who trained him, whom he then trained and with whom he collaborated, and the subsequent impact of his trainees and collaborators on neuroscience and other areas. He has also co-written a 2009 historical article about his long-time friend and colleague, Jacques Paillard (1920-2006), a pioneer in the field of motor cognition (co-authors, Francois Clarac and Jean Massion). Another historical project was published in 2011 as a special issue of *Brain Research*. It includes 5 chapters on paths of discovery in motoneuron neurobiology, beginning in antiquity and ending with the current state-of-the-play. Stuart's collaborators for this project included Jean-Gael Barbara and Clarac (FRA), Robert Brownstone (CAN), Jacques Duchateau (BEL), and Enoka (USA).

Stuart has been an outspoken and forceful member of key UA committees for improving undergraduate and graduate education (e.g., Graduate Education and Research Board; President's Task Force on Undergraduate Education), recruitment of key administrators (e.g., Provost; Deans of Agriculture, Engineering, Medicine, Nursing). Even more importantly, he has been an unusually effective strategist in devising the means whereby large sums of State money (indeed millions of dollars) have been spent to establish two internationally recognized main campus neuroscience units: the Division of Neurobiology, which focuses on invertebrate studies; and, the Division of Neural Systems, Memory and Aging, which has ties to cognitive science and psychology. (Stuart's role was primary for the former unit, and secondary, but critical, for the latter). Similarly, Stuart has been a driving force in the development of Univ.- and statewide neuroscience programs. He was a co-founder and co-director (1986-2002; with James Bloedel, BNI; later with Iowa State Univ.) of the Arizona Movement Neuroscience Group, which held an NIH-funded (1987-2003) pre- and postdoctoral program in interdisciplinary motor control neurobiology that has strengthened ties between the physical- and life sciences, and between the BNI, ASU, NAU, and the UA. Between 1987 and 2003, this program (with a training faculty that progressively increased to 33) mentored over 100 predoctoral and 120 postdoctoral trainees. Currently, Stuart is the informal archivist of this

program, and maintains contact with its completed trainees. In 1994, Stuart organized a statewide conference on interdisciplinary fundamental biomedical science, and a series of 11 statewide workshops in selected areas of medical and biological engineering. Each of these efforts has had far-ranging effects throughout the Arizona State Univ. System. He was also active (1990-1996) in Arizona's various statewide networking strategies for economic development, particularly in high-technology areas that pertain to bioindustry (e.g., he was a founding board member and the first secretary-treasurer of the UA Science and Technology Park).

Stuart's neuroscience accomplishments have made him an international figure in movement neuroscience, not only for his research and research-training contributions, but also for his promulgation of international co-operation and collegiality. For example, for the International Union of Physiological Sciences, he has been a member of the US National Committee (chair, 1989-1992) and for many years he was a member of the 4-person Motor Control Commission (Chair, Grillner). Since the early 1970s, Stuart has undertaken a substantial amount of N. American and international reviewing of physiology and neuroscience programs. As a committed internationalist, he has also played a supportive role in the careers of innumerable young motor control scientists in N. America and abroad. He has presented his ideas on motor control in seminars at 69 institutions in 19 foreign countries, and at over 40 institutions in the USA.

Among Stuart's former trainees and younger collaborators, two are now institute directors (Yiannakis Laouris, Cyprus Neuroscience and Technology Institute, Nicosia, Cyprus; Chun-Su Yuan, Alternative Chinese Medicine, Univ. Chicago, IL), and several hold professorships at leading research universities in the USA and abroad. These include: Anne Atwater, UA (emeritus); Marc Binder, Univ. Washington, Seattle, WA; Robert Callister, Univ. Newcastle, AUS; Kenneth Campbell, Washington State Univ., Pullman, WA; Roger Enoka, Univ. Colorado, Boulder (Head, Dept. Integrative Physiology), CO; Jayne Garland, (Head, Physical Therapy, Univ. British Columbia, CAN; Michael Joyner, Mayo Medical School, Rochester, MN; George Goslow, Brown Univ., Providence, RI (retired); Ziaul Hasan, Univ. Illinois-Chicago Circle, IL; Seichi Sasaki, Ibaraki Univ. Health Sciences, Ibaraki, JPN (Head, Dept. Physiology); John Stephens, Univ. College, London, GBR; Douglas Watt, McGill Univ., Montreal, CAN; Mary Wetzel, UA (retired); and Masao Yamashita, Nara Medical Univ., Yagi, JPN (Head, Dept. Physiology). Others are associate professors: Barry Botterman, Univ. Texas Health Sciences Center, Dallas, TX; William Cameron, Oregon Health & Sciences Univ., Portland, OR; Thomas Hamm, UA (primary appointment at the BNI); George Hornby, Univ. Illinois-Chicago Circle, IL; Koichi Ishikawa, Univ. Southern California, Los Angeles, CA (retired); Jennifer McDonagh, Arizona School of Health Sciences, Mesa, AZ (retired); Michael Nordstrom, Univ. Adelaide, AUS (retired); and, Edward Stauffer, Univ. Minnesota-Duluth, MN (retired). Still others are Univ. administrators, assistant professors, lecturers, and research fellows, all with valuable research and/or teaching emphases: Leslie Bevan, Oregon Health & Sciences Univ., Portland, OR (retired); Lucinda Rankin, UA; Grant Robinson, Duke Univ., Durham, NC; and Sharyn Vanden Noven, McGill Univ., Montreal, CAN and Hong Kong Polytechnical Univ., HKG (deceased). Former trainees in the private sector include: Edward Gilliam, neurology/neurosurgery nurse practitioner, Tucson, AZ; Debra Gordon, biotechnology patent law attorney, Tucson, AZ; Robert Gorman, research engineer for biomedical devices, Sydney, AUS; Walther Koehler, neurologist, Bonn, GER; Carter Mosher, neurologist, Sacramento, CA; William Nemeth, medical administration (former orthopedic surgeon), Austin TX; Kenneth Ott,

neurosurgeon, San Diego, CA; Dennis Roscoe, co-director, MPACS-LLC (a biomedical data processing company), Madison, WI; and, John Spielmann, anesthesiologist, Buffalo, MN.

Stuart has held: an NIH Special Research Fellowship (1971-1972) for spinal cord studies with Lundberg and Jankowska at Göteborg Univ., SWE; a Guggenheim Fellowship (1976-77) for clinical neurophysiology studies with Burke at the Univ. New South Wales, Sydney, AUS; and, a Senator Jacob Javits Neuroscience Investigator Award (1984-91) for his research on the segmental motor system. In 1995, he was the recipient of the John Marley Leadership Award from the Research Section of the American Physical Therapy Association for his fostering of movement neuroscience in this profession. In 1998, he received special recognition from the UA for "outstanding contributions in teaching, research, and service in neuroscience." In 2011, the UA honored him for his interdisciplinary efforts to foster university-wide neuroscience and biomedical engineering, with the awarding of an honorary doctorate in science.

Stuart was a member of an NIH Study Section (Applied Physiology and Biomedical Engineering; 1974-78), the Scientific Advisory Committee, Muscular Dystrophy Association (1987-89), and the editorial boards of the American Journal of Physical Medicine (1975-87), the Journal of Neurophysiology (1979-84), and Experimental Neurology (1982-87). Since the early 1970s, he has refereed worldwide innumerable journal articles and promotion and research applications. In 1998, an international symposium was held in his honor at the UA, with a subsequent 1999 volume published in the Elsevier Progress in Brain Research series (no. 123; M.D. Binder, editor). In January 2007 the Society for Integrative and Comparative Physiology held a Phoenix, AZ international symposium in Stuart's honor entitled "Recent Developments in Neurobiology". The speakers included Keir Pearson and Arthur Prochazka (Univ. Alberta, Edmonton, CAN), Roger Enoka (Univ. Colorado, Boulder, CO), Richard Levine (UA), Richard Satterlie (Univ. North Carolina-Wilmington, NC) and Stuart.

Finally, it is appropriate to comment on Stuart's family life, which, together with the laboratory efforts of Reinking and Pierce, has been the mainstay of his academic endeavors. Stuart's wife, Jean (nee Rassbach) was born (1935) and raised (until 15) in Philadelphia, PA. Her mother, Evelyn (1901-1992) was a native of Gettysburg, PA, and a home economics graduate (1924) of the Carnegie Institute of Technology (Pittsburgh, PA). Her father, Phillip (1901-1970) was raised in Washington, DC, before graduating from the same institution as his future wife (1925; BS in metallurgical engineering). He subsequently had a distinguished career in the steel industry: first (1925-50) with Midvale Steel (Philadelphia, PA), where he rose to general manager and developed a US patent on low-chromium steel; and subsequently, with Union Carbide (1951-70) where he became Director of the Metals Division, and provided substantial service to the post WWII rebuilding of the Japanese steel industry.

Jean Rassbach Stuart is a 1953 graduate of New Trier High School, Winnetka, IL, Michigan State Univ. (BA in child guidance and development, 1957) and the UA (MA in educational counseling, 1972; certificate in gerontology counseling, 1990). For 24 years, she was a teacher and guidance counselor in CA (Los Angeles, 1957-58; Davis, 1965-67) and AZ (Pima County Guidance Project, 1972-78; Tucson Unified School District I, 1978-1993). The Stuarts have 4 children with intriguingly diverse occupations. Michael (Monty) Stuart (1957-; married to Deborah Murphy, a former office manager; 1 child) is a former stuntman, and now horse-trainer, wrangler and stunt coordinator in the Los Angeles TV/movie industry. (See: <http://www.imdb.com/name/nm0835811/>). His TV credits include stunt co-ordination of *The*

*Young Riders*. His movie credits number over 50, including *All the Pretty Horses*, *Wyatt Earp*, *Sea Biscuit*, *3:10 to Yuma*, the second version of *True Grit*, and *"Django Unchained (Dec., 2012)*. Kathryn (1959-; married to Thomas Lohse, a Tucson businessman; 3 children) is a UA graduate (BA, 1980; MA, 1998), a former bilingual (English/Spanish) grade school teacher and now a program coordinator with Tucson Unified School District. Daniel (1961-; married to Nuria Morgado from Barcelona, Spain and an Associate Professor of Spanish Literature, State Univ. New York-Staten Island; 1 child) is a well-known musician, song and music writer, and bandleader (first *Green on Red*, then *The Slummers* and now *The Dan Stuart Band*). (See: [http://en.wikipedia.org/wiki/Dan\\_Stuart](http://en.wikipedia.org/wiki/Dan_Stuart)). His first novel will be published in June 2014. Cynthia (1963-; married to Michael Sadowsky, a Tucson businessman; 2 children) is a pre-school teacher, previous inventor (US patent for sunglasses for growing babies) and now writer of books and poems for young children. The Stuarts have a particularly active family life in Tucson with their 2 daughters and their spouses, and 2/7 grandchildren who are still in Tucson.

NOTE: Thomas J. Hixon (1940-2009), UA Professor of Speech and Hearing Sciences (1976-2009) and Dean of the Graduate College, wrote the original version of this biography in the early 1990s. It has subsequently been updated iteratively in relevant parts, including Stuart's publications, his trainees' positions, and his family's accomplishments.