



**Human
Factors
and
Ergonomics
Society**

FELLOW PROFILE

Name: Raja Parasuraman

Degrees, certifications, etc.: BSc (1st Class Honours), MSc, PhD

Current status: University Professor, George Mason University



Home page: <http://archlab.gmu.edu/people/rparasur/>

Biography (How you got involved in the field, your major career activities and milestones):

Members of the Human Factors and Ergonomics Society typically have degrees in either psychology or engineering. One possible definition of human factors is the application of psychological knowledge to the engineering of systems and work environments. I therefore count myself to be fortunate in having received training in both engineering and psychology. Although I no longer consider myself an engineer, the combination of the two has benefitted me enormously over the years, not only in my human factors research, but in other areas as well.

I knew little of human factors or ergonomics as an undergraduate in the early 1970's, when I pursued a degree in Electrical Engineering at Imperial College, University of London. The curriculum at Imperial was unusually broad for an engineering school. I was exposed to eclectic courses in communications, brain theory, and quantum physics by such luminaries as Colin Cherry, Fritzhof Capra, and Dennis Gabor. For my final year thesis I had to design and build an analog-to-digital conversion system and multiplexer for the quantification of human electrophysiological signals (EKG and EEG). I started reading papers on these signals and discovered that psychologists occasionally used them as measures of attention and alertness. That got me interested in psychology and neuroscience. I therefore applied to the graduate program in Applied Psychology at Aston University, Birmingham, which was then one of the leading Departments in the UK in ergonomics. (The Head of the Department, Tom Singleton, was internationally known and received the Human Factors and Ergonomics Society's Distinguished Foreign Colleague Award).

It was at Aston that I received training in psychological methods under the mentorship of the late Roy Davies, and where I made the transition to being a human factors psychologist. I did my graduate thesis research on vigilance and attention, with a focus on signal detection theory methods. However, I maintained my interest in electrophysiology by conducting EEG and ERP studies, something I have continued to do to this day. This early exposure to both behavioral and physiological methods of analysis is one reason why I was motivated several decades later to combine them in the form of neuroergonomics.

My twin interests in human factors and cognitive neuroscience have coalesced in recent years with the development of this area. Neuroergonomics is witnessing extensive growth. For example, many Government agencies have new funding programs on this

topic and there are academic positions in neuroergonomics popping up throughout the world. At George Mason University we recently set up the Center of Excellence in Neuroergonomics, Technology, and Cognition (CENTEC), under funding from the Air Force. It is quite gratifying to see the development of this new area of work, and I am happy that CENTEC will train the next generation of students in neuroergonomic methods. However, I am not at all invested in the term neuroergonomics or its establishment as a sub-discipline. The main point of neuroergonomics is that we can do better ergonomics by also considering the human brain in investigating mental or physical work; in time, the "neuro" prefix may no longer be needed.

Following the award of the Ph.D. degree in 1976, I spent a couple of years in teaching positions at small colleges in the UK. My goal was an academic appointment at a research university, but I was singularly unsuccessful, whether I applied to positions in the UK or in the US. Current graduate students take note: Do not be discouraged if you are initially not able to find good positions in academia or industry. Between 1976 and 1980 I applied for an academic position to over 50 Universities and was invited for about 10-15 interviews, none of which lead to an offer! I was about to give up and go back to engineering when I was offered a part-time postdoctoral position with Jack Beatty at the University of California, Los Angeles. I spent four years there before obtaining my first tenure-track position at the Catholic University of America, Washington DC, in 1982.

My career in human factors began with research on vigilance and attention but later expanded to issues in automation, aviation, and aging. A dominant theme in much of this work was how general theoretical principles of human interaction with systems can be applied to the solution of practical problems. My early work on human-automation interaction was considerably inspired by conversations with Earl Wiener, who came to visit me at UCLA in 1980 during his sabbatical work at NASA Ames Research Center. Research grants from NASA helped spur further research on automation and air traffic control. Meetings and workshops with prominent human factors researchers such as Tom Singleton, Chris Wickens, Peter Hancock, and Neville Moray further cemented my interest in issues related to humans and automation, something I continue to be actively involved in today.

Employment History (List top 5 positions):

Lecturer, Lanchester Polytechnic, UK, 1976-77

Lecturer, Wolverhampton Polytechnic, UK, 1977-78

Postdoctoral Fellow and Assistant Research Professor, University of California, Los Angeles, 1978-1982

Associate to Full Professor, Catholic University of America, 1982-2004

Professor to University Professor, George Mason University, 2004-present

What were your significant contributions to the field?

1. Development of a taxonomy of vigilance tasks
2. Application of signal detection theory to parsing sources of vigilance decrement
3. Empirical studies on automation trust and complacency
4. Analysis of human-automation performance benefits and costs
5. Development of a model for human-automation design (with Sheridan and Wickens)
6. Adaptive automation theory and empirical studies
7. Development of neuroergonomics
8. Chairing the Committee on Human Factors (now the Board on Human-Systems Integration) of the National Research Council, National Academy of Sciences
9. Mentoring 25 Doctoral and over 50 Masters graduate students, many of whom have gone on to distinguished careers in human factors and ergonomics in academia, government, and industry

Did you receive any notable awards or recognition during your career?

2010: Admiral Kollmorgen Spirit of Innovation Award for Contributions to Neuroergonomics, Augmented Cognition Technical Group, Human Factors and Ergonomics Society.

2010: Inaugural Raymond S. Nickerson Award, Best Paper in Vol. 15 of the *Journal of Experimental Psychology: Applied*, American Psychological Association, "Detecting threat-related intentional actions of others: Effects of image quality, response mode, and target cueing on vigilance."

2009: State Council for Higher Education for Virginia (SCHEV) Outstanding Faculty Award.

2008: "Pivotal Article" chosen for review in 50th (Golden) Anniversary Special Issue of the Human Factors and Ergonomics Society, "Humans and automation: Use, misuse, disuse, abuse", *Human Factors*, 1997.

2006: Paul M. Fitts Education Award, Human Factors and Ergonomics Society

2004: Franklin V. Taylor Award for Lifetime Achievement in Applied-Experimental and Engineering Psychology, American Psychological Association (Division 21)

2001: Jerome H. Ely Award for Best Article in Vol. 42 of *Human Factors*, Human Factors and Ergonomics Society, " Fuzzy signal detection theory: Basic postulates and formulas for analyzing human and machine performance"

1997: Jerome H. Ely Award for Best Article in Vol. 38 of *Human Factors*, Human Factors and Ergonomics Society, "Effects of adaptive task allocation on monitoring of automated systems"

1994: Best Article Award for Vol. 1 of *Ergonomics in Design*, Human Factors and Ergonomics Society, "Human factors in intelligent travel systems"

Which articles in the journal *Human Factors* would you say were the most influential to you and your research or practice?

Israel et al. (1980)

Wickens et al. (1981)

Hancock & Warm (1989)

Gopher et al. (1994)

Endsley (1995)

Lee & See (2004)

Meyer (2004)

Please provide any links to your online articles, essays, blogs, Wikipedia pages, etc., that pertain to your research, publications or practice.

<http://archlab.gmu.edu/people/rparasur/>

<http://centec.gmu.edu>

What advice would you give someone considering HF/E as a profession?

If you are a psychology student, become familiar also with engineering approaches. If you are in an engineering program, learn more about basic psychology. Get as much experience in industry as you can through internships and talking to HF professionals at

meetings. Above all, be passionate in wanting to help develop theory and knowledge that can guide the design of technologies and environments for people.