

KEYNOTE ADDRESS

AUTONOMOUS SYSTEMS

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ABSTRACT

Much of science is directed to increasing our understanding of the world's most advanced autonomous system—the human. This evening I invite you to join me on a journey to consider the question: Can we trust the world's most advanced autonomous system?

We have lived intimately associated with a most advanced autonomous system--ourselves. May I pose some questions about ourselves: what do we know about the ability to create and communicate thoughts; share emotions; monitor the integrity of our mind and body; organize to achieve goals; and if you've experienced it, the drive to reproduce another human. While science strives to understand these processes and many more that are the core of our human system, our experiences help give us confidence of what we can trust our autonomous system to accomplish.

Consider the process you are using to trust being in this room. Our human autonomous system has learned to assess our environment and compare it to our previous experiences. We trust such continual evaluation of our experiences to guide our actions.

The action that occurred in response to the need to take immediate action to avoid an atmospheric discharge at the Three Mile Island nuclear power plant illustrates the question of trusting an autonomous system. The operation of a nuclear power plant is complex and demanding. The need to take action occurred just after the transition from a manual to a computer controlled operating system. While the computer system correctly told the operators what should be done, the operators did not trust what they perceived to be just a simple computer system and chose to manually override the computer. Their manual actions led to a major loss in trust in our ability to safely operate nuclear power systems. The lack of trust in the integrity of providing nuclear power led to the critical loss of the investments necessary to continue the growth of nuclear power in America. Fortunately, the science and technology communities cooperated to develop the Probabilistic Risk Assessment Process to assure the integrity and trust of our nuclear power systems.

The human autonomous system is continuously adapting to its environment. However there are incidents in which the human system is unable to respond

without a loss in the integrity of the system. Science is continuing the development of innovative applications of technology to develop alternatives to replace those functions.

There is a great need to understand the ability of our mind to draw upon memories to condition current actions. The return of veterans has brought greater emphasis on understanding and treating Post-Traumatic Stress Disorders (PTSD). Differing from obvious physical changes, we are coming to better appreciate the complex and often uncharted world of the mind.

Increasingly we see examples of how individuals with paraplegic, quadriplegic, and whole body challenges are able to adapt their autonomous systems to regain functionality. Impressive progress has been made with the integration of implants to regain the ability to control functionality with the mind. Researchers advocate developing Cyborgs to be super human autonomous systems by physically linking the mind with access to global information.

While science continues to provide better understanding of the human autonomous system, it is important to remember that we are inherently driven to avoid those things that would harm us, obtain adequate nourishment, and strive for an acceptable quality of life. We are experiencing challenges with the increasing global population by over 80 million people a year. The now 7 billion people live in areas of great population density with environmental and economic disparity.

The increasing diversity in the levels of cultural, political, and religious extremism bring new meaning to the question: Can we trust the world's most advanced autonomous system?