

***In Vivo* Communications and Networking ---- A New Direction for Wireless**

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Wireless communication has been the fastest growing technology in history. Now that we have experienced four generations of wireless evolution, many people are asking “what’s 5G”? The conventional view of 5G is that of heterogeneous wireless internetworking, higher frequencies, and perhaps outer space. An unconventional view is to consider inner space as a new rich, high-impact domain for the application of wireless technology. Wireless technology has the potential to synergistically advance healthcare delivery solutions by creating new science and technology for *in vivo* wirelessly networked cyber-physical systems of embedded devices that use real-time data to enable rapid, correct, and cost-conscious responses in chronic and emergency circumstances. Of course, there are many challenges in domains other than wireless to realizing this vision. For *in vivo* wireless systems, the research opportunities are abundant and include: (1) modeling of the *in vivo* wireless channel, (2) inventing new communications solutions for embedded sensor and actuator devices of limited complexity and power (think *MIMO in vivo*), (3) meeting the high bit rate and low latency requirements of many surgical applications (e.g., HDTV), (4) networking devices that are more limited than any devices that have ever been networked by human-created means, and (5) new approaches to privacy and security for wireless devices of limited processing capabilities.

This talk will describe our current research in the above areas, including initial laboratory experiments with porcine subjects. A natural evolution of this research is into the emerging field of nanoscale and molecular communications.

RICHARD D. GITLIN is a State of Florida 21st Century World Class Scholar, Agere Chair and Distinguished Professor of Electrical Engineering at USF. After a 32-year career at Bell Labs, where he was Senior VP for Communications and Networking Research, he was a visiting professor at Columbia University, where he received his doctorate in 1969. Later he was CTO of Hammerhead Systems, a Silicon Valley networking startup. Since joining USF in 2008, he has focused on the synergies between advanced communications/networking technologies and biomedical systems by investigating networking of *in vivo* wirelessly communicating and controlled devices to enable a paradigm shift in Minimally Invasive Surgery (MIS).

Dr. Gitlin is a member of the National Academy of Engineering, a Fellow of the IEEE, and a Bell Laboratories Fellow. He is a co-recipient of the 2005 Thomas Alva Edison Patent Award the S.O. Rice prize, co-author of a graduate Data Communications text, published more than 100 papers, and holds 44 patents (co-inventor of DSL).