Analytics for a Networked World

William R. Pulleyblank
Professor of Operations Research, Class of 1950 Chair of Advanced Technology,
Dept. of Mathematical Sciences United States Military Academy

The decade from 1947 to 1957 was a transformative time for applied mathematics. George Dantzig invented the simplex algorithm, Ralph Gomory developed his cutting plane algorithm for integer programming and a broad range of analytics applications emerged. Some came from military objectives, some from accelerating industrialization and some came from optimization of logistics. Philip McCord Morse was a key player in these activities. In addition to his many scientific contributions, in 1952 he was a member of the group that formed ORSA, one of the two societies that joined to become INFORMS. He also founded the Operations Research Center at MIT in 1956 and served as its director for its first twelve years.

Now, sixty years later, the world has changed significantly. The services sector is becoming the largest component of the economy in developed countries. Monolithic organizations are being replaced with dynamic networks of smaller units. Problems that used to require days or weeks on the largest computers available can now be solved in seconds on a smart phone. Massive amounts of data are being collected from a variety of sources and being transmitted and shared globally. The traditional strategy-tactics-operations cycle is being replaced with forms of continual optimization. The role of analytics in decision making is going from being a boutique activity to the mainstream. This presents a suite of new problems for applied mathematics, operations research and management sciences. I will discuss several of these as well as the possible consequences of their solutions. These will include applications in healthcare, business management and making real-time decisions in the face of uncertainty. I will also discuss what I believe are some of the most critical research issues going forward.