

The Erdős Number and the Bacon Number:

Who is at the
Heart of the Network ?

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In my area of research, relationships among researchers can be expressed with the Erdős number. This describes how many connections among scientists a researcher has with mathematician Paul Erdős based on coauthored papers. For example, a researcher who coauthored a paper with Erdős has an Erdős number of 1. A researcher coauthoring with someone with the Erdős number of 1 has an Erdős number of 2. Incidentally, I have an Erdős number of 2. Inspired by the tremendous number of papers he published during his lifetime, which exceeds 1,500, his research fellows humorously devised this number. Noteworthy in connection with it is that a large majority of active mathematicians have Erdős numbers of 6 and below.

A similar idea is found in Hollywood – the Bacon number. Actors and other professionals who have worked with Kevin Bacon in movies or on TV are given a Bacon number of 1. A professional who has worked with someone with a Bacon number of 1 has a Bacon number of 2. A notable point in connection with it is that the vast majority of Hollywood and TV professionals have Bacon numbers of 6 and below.

Paul Erdős was among the greatest mathematicians of the 20th century and he engaged in joint studies with numerous researchers; thus, it is natural to define the Erdős number in the world of mathematics and science. However, why Kevin Bacon and not Jack Nicholson in Hollywood? It may be rude to Bacon to point this out, but we can think of many actors who are more famous than he is. However, it appears that no actor has worked with more movie and TV professionals than he has. Hollywood superstars may have certain crew members they prefer to work with, so they may not end up working with a great number of professionals. Kevin Bacon, on the other hand, is presumed to be someone who works with anyone, without that “constancy.”

The Erdős and Bacon numbers represent networks of people at relatively short distances from the central person in the science and show business worlds, respectively. Social networks such as Twitter and Facebook are known to have similar structures. Yet it is by no means easy to identify the central person in the network who corresponds to Paul Erdős and Kevin Bacon. Identification of this person would pave the way for quick communication from him/her to the entire network in the case of an emergency like the Great East Japan Earthquake. Is this person an authority like Paul Erdős? Does s/he work with anyone, like Kevin Bacon does? Or does s/he have other characteristics? Identification of the central person in a social network needs to be studied in the future in network analysis.

(Paul Erdős [1913-1996] was a Hungarian mathematician.)