

Kenneth I. Appel Biography

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Biography

The American mathematician Kenneth I. Appel was born in Brooklyn, New York on October 8, 1932. He earned a B.S. degree from Queens College in 1953, then served in the U.S. Army for two years following his graduation. In 1955, he enrolled in graduate studies at the University of Michigan, subsequently earning his M.A. and Ph.D. degrees there in 1956 and 1959, respectively. In 1959, he married Carole Stein.

Between 1959 and 1961, Appel was on the technical staff of the Institute for Defense Analyses. In 1961, he joined the faculty of the Mathematics Department at the University of Illinois as Assistant Professor, later being advanced to Associate Professor in 1967, and to Professor in 1977. In 1993 he became Chairman of the Department of Mathematics at the University of New Hampshire.

In 1976, Appel and a colleague, **Wolfgang Haken**, succeeded in proving that any map in a plane or on a **sphere** can be colored with only four colors in such a way that no two neighboring countries are of the same color.

When Appel came up with his **proof**, mathematicians had been attempting to prove the **theorem** for over a hundred years. In 1852, Francis Guthrie had written to his brother asking him whether he knew of any proof that four colors are always sufficient. The brother relayed the question to the noted British mathematician **Augustus De Morgan** (1806-1871), but De Morgan did not know the answer. In 1878, the Cambridge mathematician **Arthur Cayley** (1821-1895) brought the problem before the London Mathematical Society. Very soon thereafter, Alfred Bray Kempe published a proof that the conjecture is true. But in 1890 Percy John Heawood discovered a flaw in Kempe's proof. The theorem thus remained unproven until Appel and Haken came up with their proof in 1976.

Appel and Hagen's proof, which required a very large amount of computer time, was described in the book-length article by Appel and Haken entitled *Every Planar Map is Four Colorable*, Contemporary Mathematics, vol. 98, American Mathematical Society, 1989. A summary of the proof and a history of work on the problem was given in an article by Appel and Haken entitled: *The Solution of the Four-Color-Map Problem*, Scientific American, vol. 237, No. 4, pp. 108-121 (1977).

In 1979, Appel was awarded the Fulkerson Prize in Discrete Mathematics by the American Mathematical Society and Mathematical Programming Society.