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Reconstruction of walks in graphs

Can a network be reconstructed from all of its subnetworks in which one edge is missing? W.T. Tutte called such reconstruction problems in graphs the mathematical equivalent of an archeologist trying to assemble broken fragments of pottery to find the shape and pattern of an ancient vase. I will discuss reconstruction of the number of non-backtracking walks in a graph from all one-edge-deleted subgraphs, in relation to the Ihara zeta function and a measurable dynamical system on the boundary of the universal covering tree of the graph. (Joint work with Janne Kool).