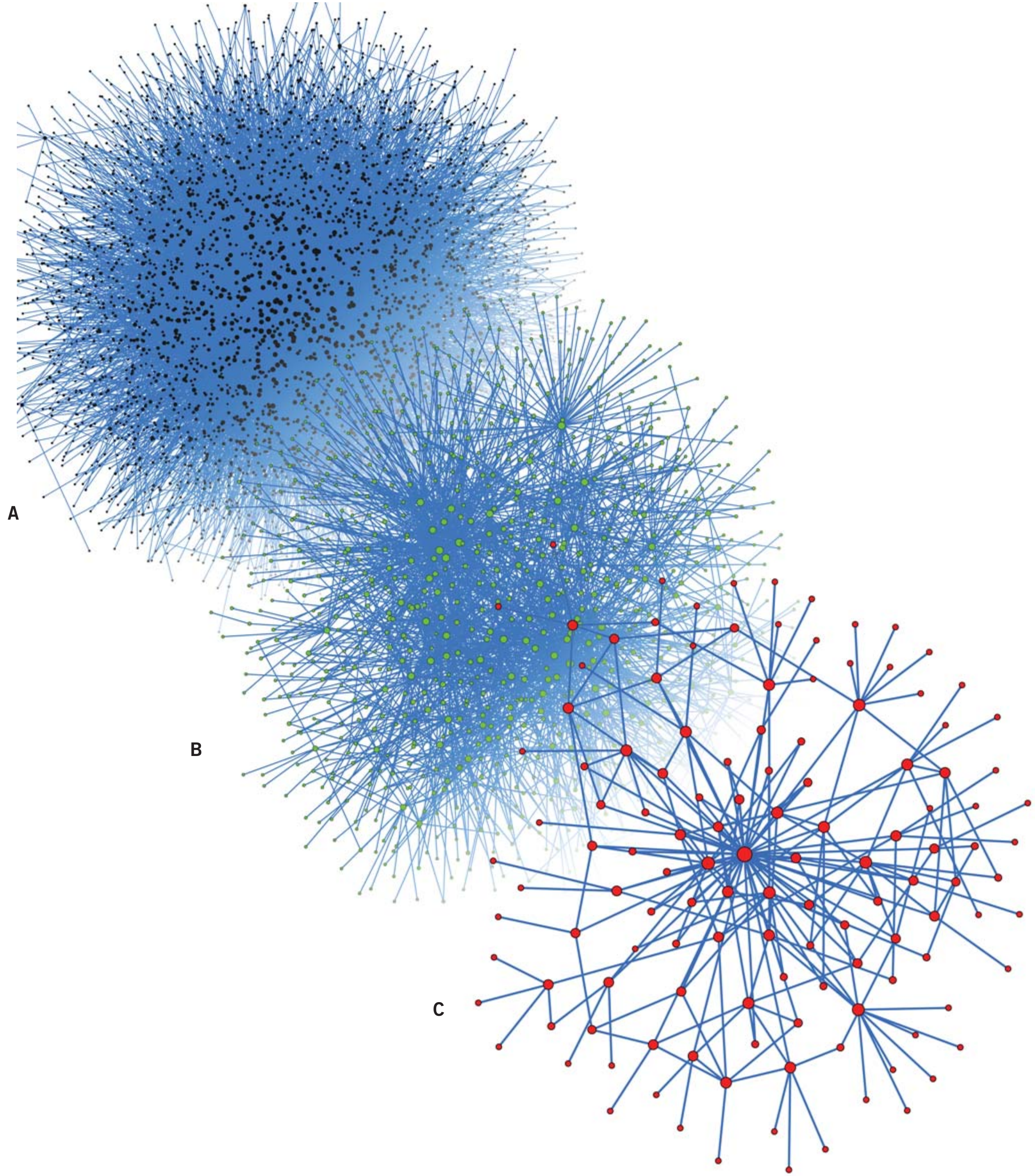

EVOLUTION OF THE NEW YORK GARMENT INDUSTRY

Manufacturers and contractors in the New York garment industry normally work together to produce items of clothing. The pattern of payments between firms provides a record of this large collaboration network, with two firms linked in a given year if one firm has paid another. From 1985 to 2003 (A-C) this network shrank dramatically under the pressures of globalisation. This allows us to study the more general question of how a network responds to severe environmental stress, and how it can decline without collapsing.

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Data courtesy of Brian Uzzi (Northwestern University)
Image courtesy of Serguei Saavedra (University of Oxford)

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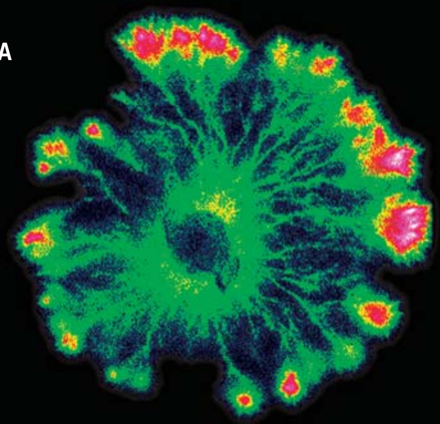
A



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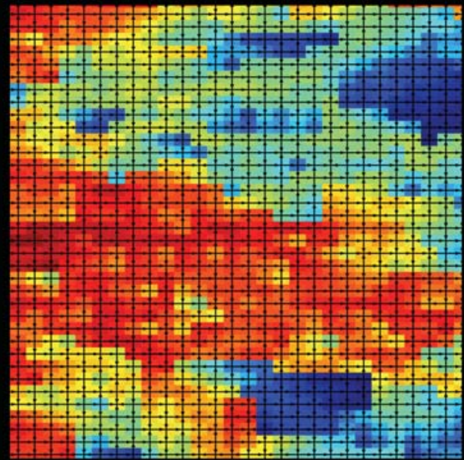

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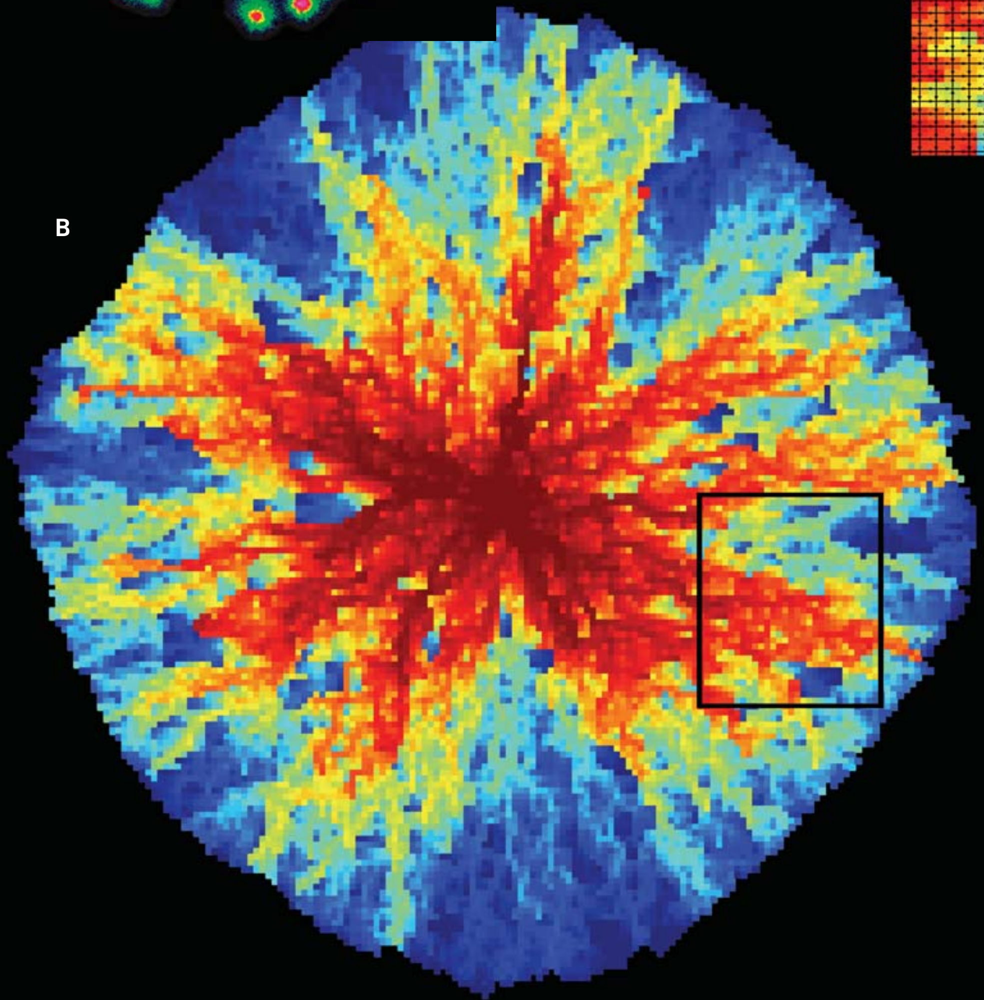

BIOLOGICALLY INSPIRED NETWORK MODELS

Inspired by Phanerochaete Velutina (A), the main image, B, depicts a toy model of fungal growth. The toy model uses local rules to specify the evolution of a network and the redistribution of resource around the network such that the evolution of the structure and functional aspects are linked. The colouring depicts the amount of resource on a node – red indicating a relatively high amount and blue a low amount. The network structure is illustrated in the inset plot C.

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Images courtesy of Mark Fricker and David Smith (University of Oxford)

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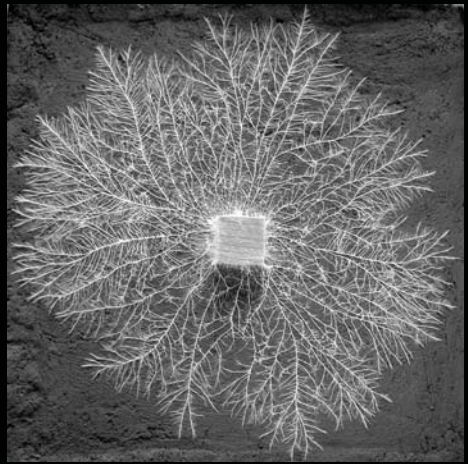

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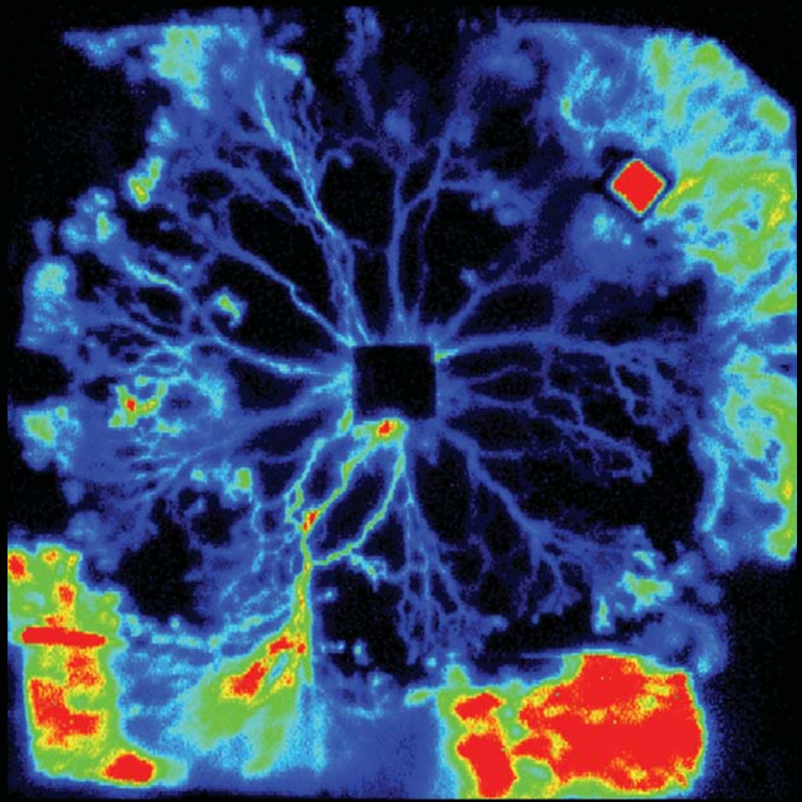

FUNGAL NETWORKS: BIOLOGICAL SOLUTIONS TO TRANSPORT NETWORK DESIGN

Transport networks are vital components of multicellular organisms, distributing nutrients and removing waste products. This is illustrated in the transport of a non-metabolised, radioactively labelled amino acid within a foraging woodland fungi (left). Fungal Networks demonstrate that intermediate, decentralized systems can yield highly adaptive networks. Understanding how these relatively simple organisms have found effective transport networks through a process of natural selection may inform the design of man-made networks.

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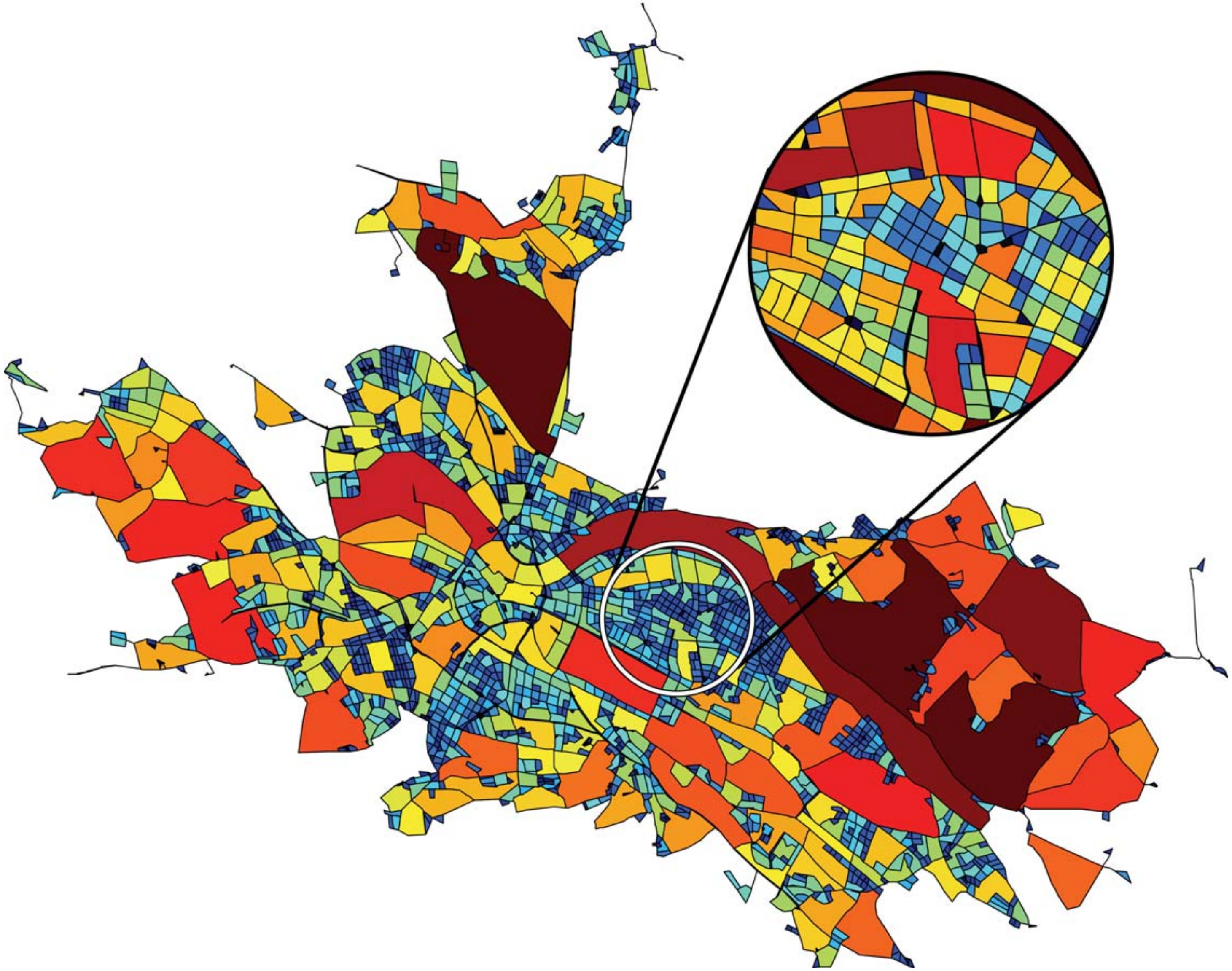
Image courtesy of Mark Fricker (University of Oxford)



URBAN ROAD NETWORKS

The urban road networks of the 20 largest German cities have been analysed, based on a detailed database providing the geographical positions as well as the travel-times for network sizes up to 37,000 nodes and 87,000 links. As the human driver recognises travel-times rather than distances, faster roads appear to be ‘shorter’ than slower ones. The resulting metric space has an effective dimension $\delta>2$, which is a significant measure of the heterogeneity of road speeds. We found that traffic strongly concentrates on only a small fraction of the roads. The distribution of vehicular flows over the roads obeys a power law, indicating a clear hierarchical order of the roads. Studying the cellular structure of the areas enclosed by the roads, the distribution of cell sizes is scale invariant as well.

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Image courtesy of Karsten Peters
(Technical University of Dresden)

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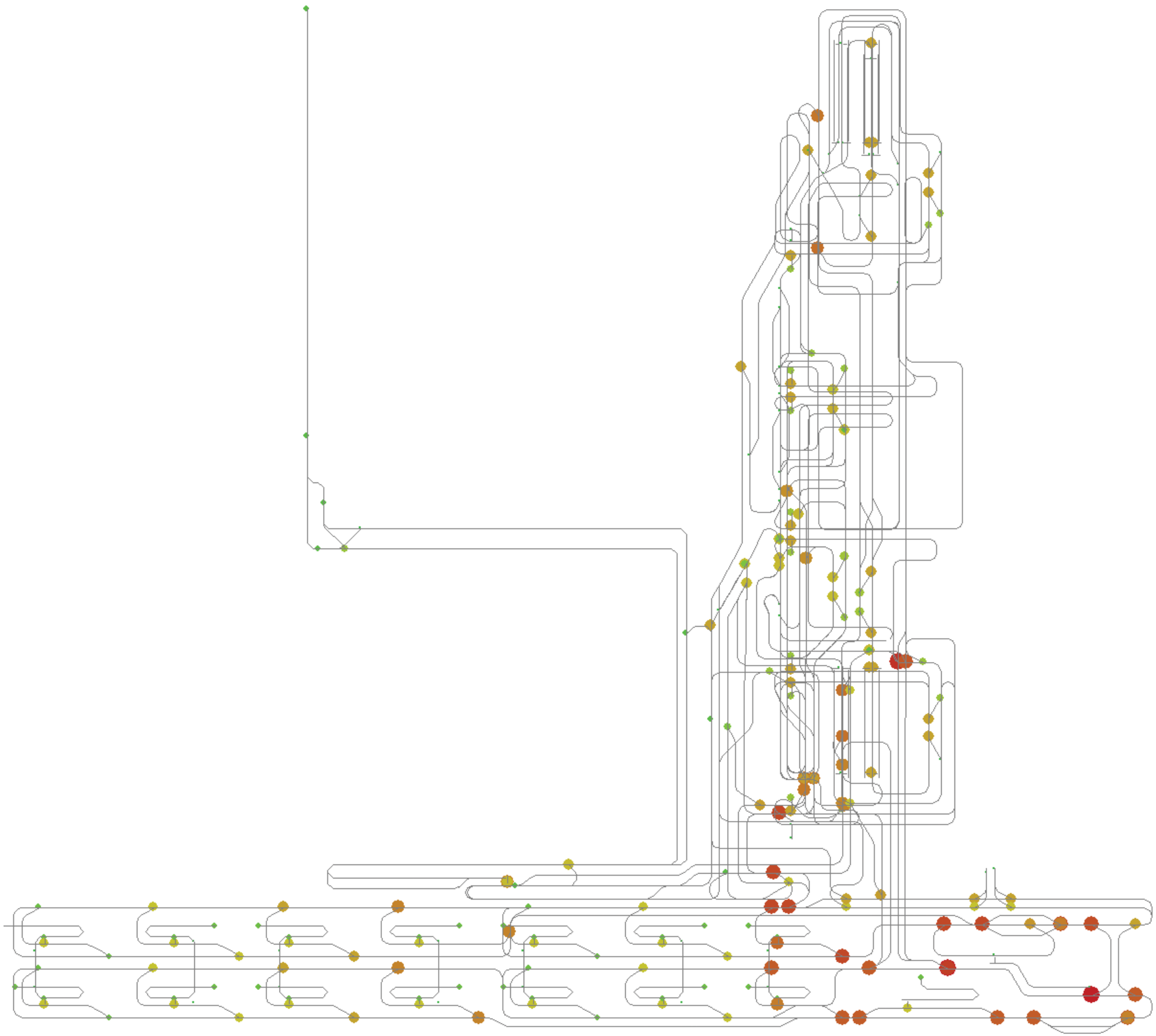

AIRPORT BAGGAGE HANDLING

Network of the baggage handling system in a medium sized airport: The different shaded points indicate the flowrates at the network nodes. One goal of this research is the optimization of these very complex materials handling systems.

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Image courtesy of Karsten Peters (Technical University of Dresden)

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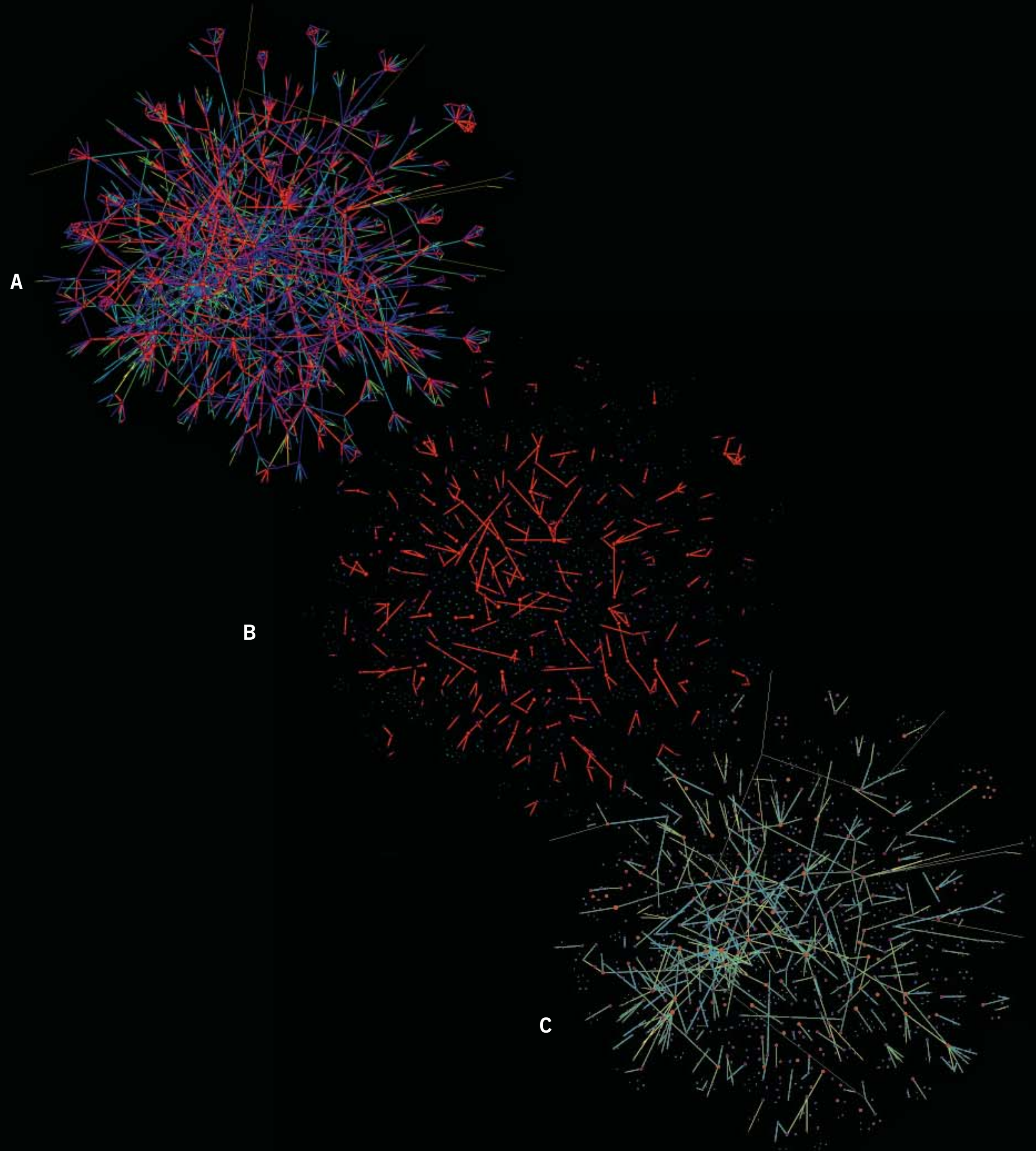
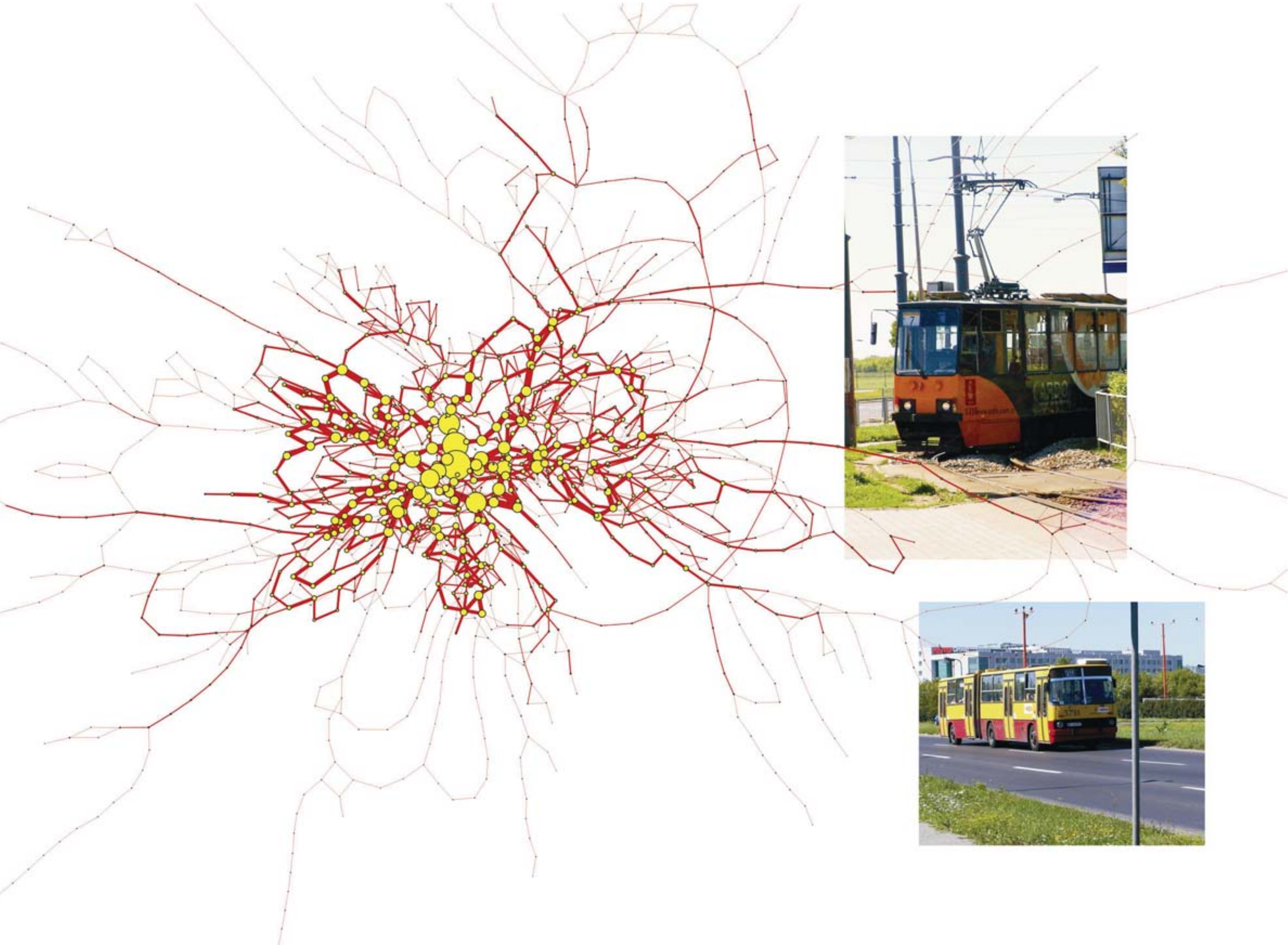


STRUCTURE AND TIE STRENGTHS IN MOBILE COMMUNICATION NETWORKS

Removal of weak links from a mobile communication network sample (A) causes a phase transition from a global network to a collection of unconnected “islands” (B), whereas global connectivity is maintained if strong ties are removed (C).
These findings support the qualitatively different global role played by weak and strong ties in large-scale social networks. Adapted from “Structure and tie strengths in mobile communication networks” by J.-P. Onnela, J. Saramäki, J. Hyvönen, G. Szabó, D. Lazer, K. Kaski, J. Kertész, and A.-L. Barabási, PNAS 104 7332 (2007).

Image courtesy of Jukka-Pekka Onnela
(University of Oxford)



WARSAW PUBLIC TRANSPORT NETWORK

Data from public transport authorities taken in a form of timetables are mapped into a network. We are investigating relations between times of getting from one stop to another and the number of buses and trams leaving those stops. The main point is to compare it to other real-world examples and models where the network is created from a flow of some quantity.

The image comprises over 1500 bus and tramstops in Warsaw and about 4500 links between them. The size of the link is proportional to the total number of buses and trams going through that link during an hour and the size of the node is proportional to the total number of departures from that node during an hour.

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Image courtesy of Janusz Holyst
(Warsaw University of Technology)

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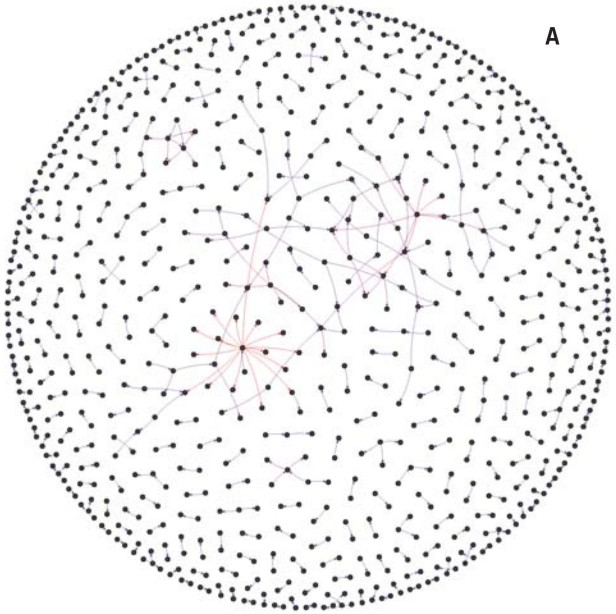

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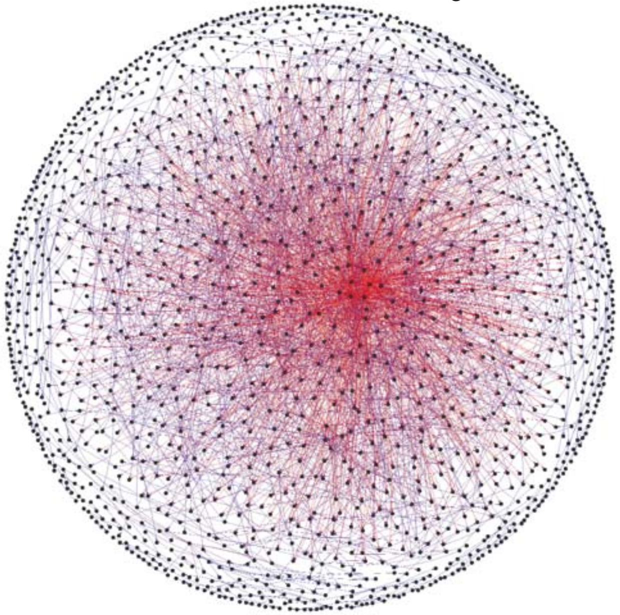

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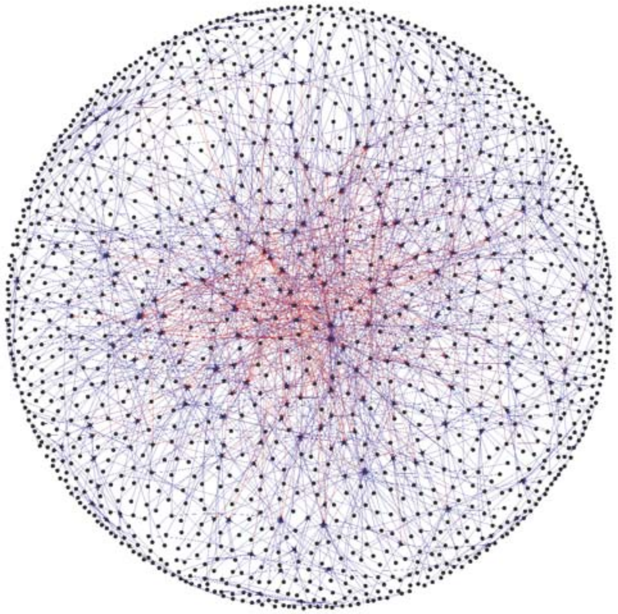

STOCK MARKETS: WHO OWNS WHOM?

Stock markets as networks of shareholders and quoted companies. The “backbone” of the network is where 80% of the market is concentrated. Its structure reflects variations with legal and cultural settings of the country. Illustrated are A – France, B – Italy and C – Great Britain.

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Images courtesy of Frank Schweitzer (ETH Zurich)

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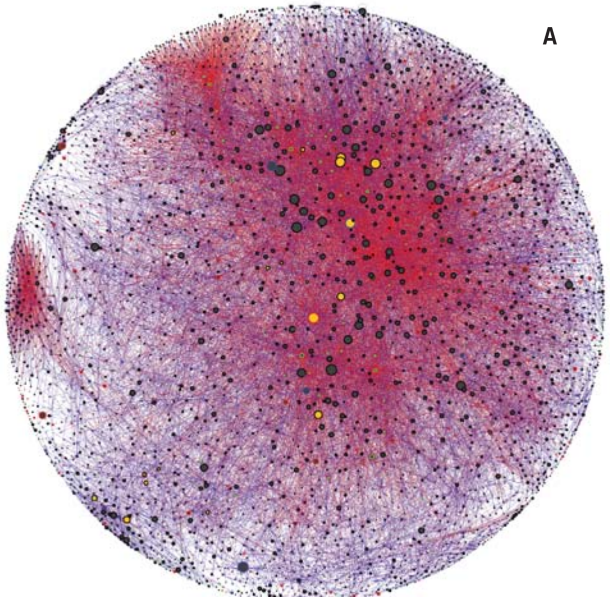

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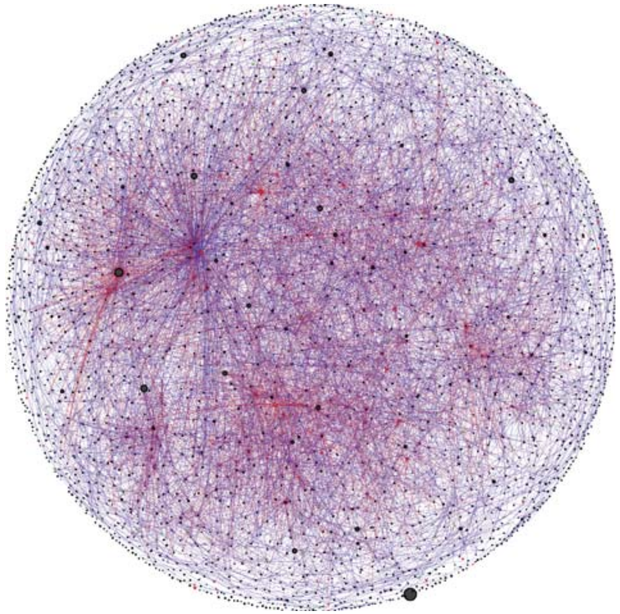

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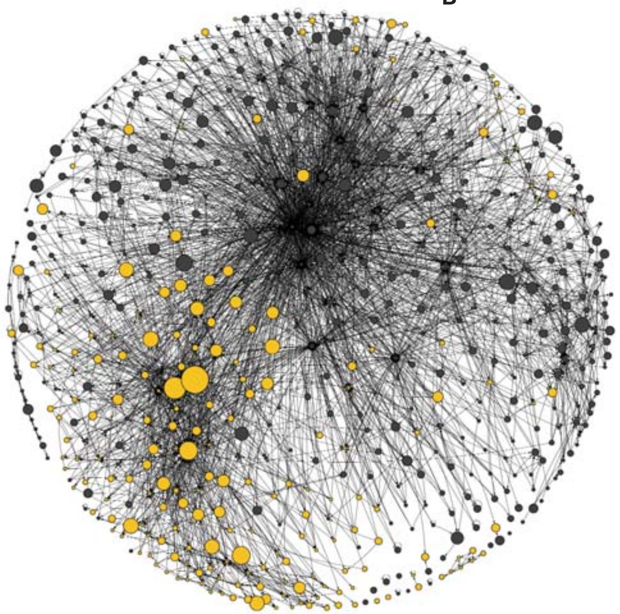

OPEN SOURCE SOFTWARE: WHO CALLS WHOM?

These are not phone calls but software calls! The network of dependencies among Java classes in some popular open source projects. Illustrated are A –Azureus, B – Jung and C – Jeditpics.

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Images courtesy of Frank Schweitzer (ETH Zurich)

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