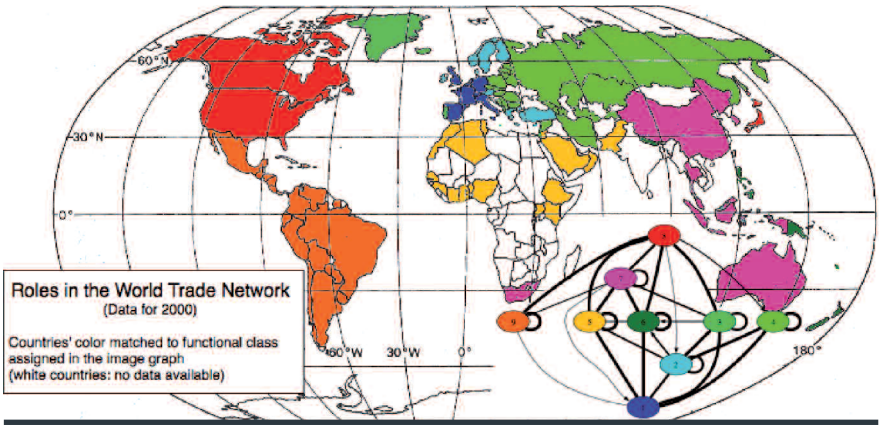
HIGHLIGHTS FROM EUROPEAN JOURNALS

Representing complex network structure through relational quasi-equivalence classes

The functional roles played by interactive agents lead to specific patterns in the link structure of their interaction network. Understanding complex multi-agent systems from the social life, or biosciences requires understanding of the complex topology of the underlying network. To identify sets of role-equivalent agents we combine ideas from spin glass physics and social network analysis to develop a framework for automatically decomposing (''block-modeling'') the functional classes of agents in a (multi-relational) network. The functional classes and their patterns of connectivity are represented in a resulting image graph, depicting a large network as a small one in a quasi isomorphic way. Our cost function finds the optimal image graph and simultaneously maps agents into functional classes. The method handles directed and undirected two- and one-mode data, weighted networks, finds an optimal number of roles, and is computationally efficient and non-parametric. Applied to the world trade network, countries are grouped into classes with similar commodity bundles of trade relations with others. The image graph shows preferred links where the trade volume exceeds the expectation value given countries' total import and export volume. ■

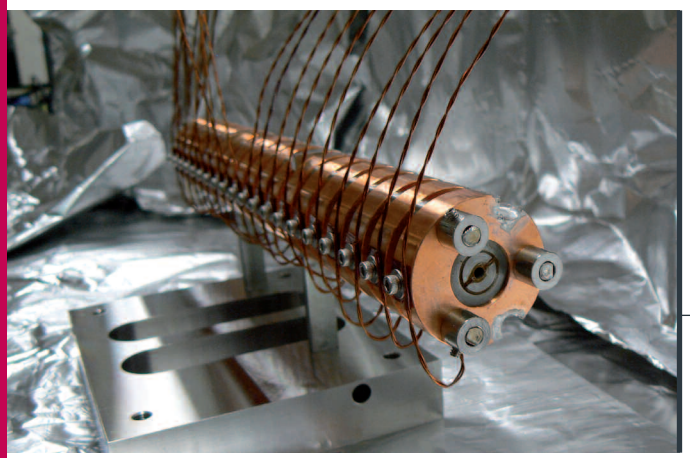


▲ **Representation of the world trade network as found by our block-modeling procedure. Countries are grouped into 9 functional classes with two opposing centers (North America/Japan and the European Union), parallel sub-centers in South East Asia and smaller European Countries, and two large peripheries in South America and Eastern Europe. A change in the cost function that regroups the image to include parallel symmetries (regular equivalences) in the graph has the potential to show the three symmetric layers of core, sub-center, and periphery in the image graph that reproduce the three-tiered structure of the world economy (D. Smith and D. White 1992 Structure and Dynamics of the Global Economy: Network Analysis of International Trade 1965-1980. *Social Forces* 70:857-894).**

J. Reichardt and **D.R. White**, "Role Models for Complex Networks" *Eur. Phys. J. B*, **60**, 217 (2007).

Stopping atoms with pulsed magnetic fields

This paper reports the experimental demonstration of a new method to produce cold and trapped atoms, which should be widely applicable to most of the periodic table. While the standard method to control atomic motion has been laser cooling, this approach only works for a small set of atoms in the periodic table that have a closed two-level transition that is accessible with a tunable laser. The starting point for the current work is the supersonic beam of noble-gas atoms, a source that provides a high flux of atoms that is very cold in the co-moving frame but also very fast. These atoms are emitted in bunches as a valve is opened for a short time. Other atoms or molecules can be introduced into the flow by seeding or entrainment near the output of the nozzle. A series of magnetic field coils is timed with the firing of the valve, and slows the atoms by making them climb a magnetic hill and then removing the hill before they have time to roll off. The group will apply these methods to trapping of atomic hydrogen isotopes for precision spectroscopy, and tests of fundamental physics of beta decay of tritium. ■



◀ **The assembled atomic coil-gun used to slow atoms, before it was put into a vacuum chamber.**

E. Narevicius, C.G. Parthey, A. Libson, J. Narevicius, I. Chavez, U. Even and **M.G. Raizen**, "An atomic coil-gun: using pulsed magnetic fields to slow a supersonic beam", *New Journal of Physics*, **9**, 358 (2007)