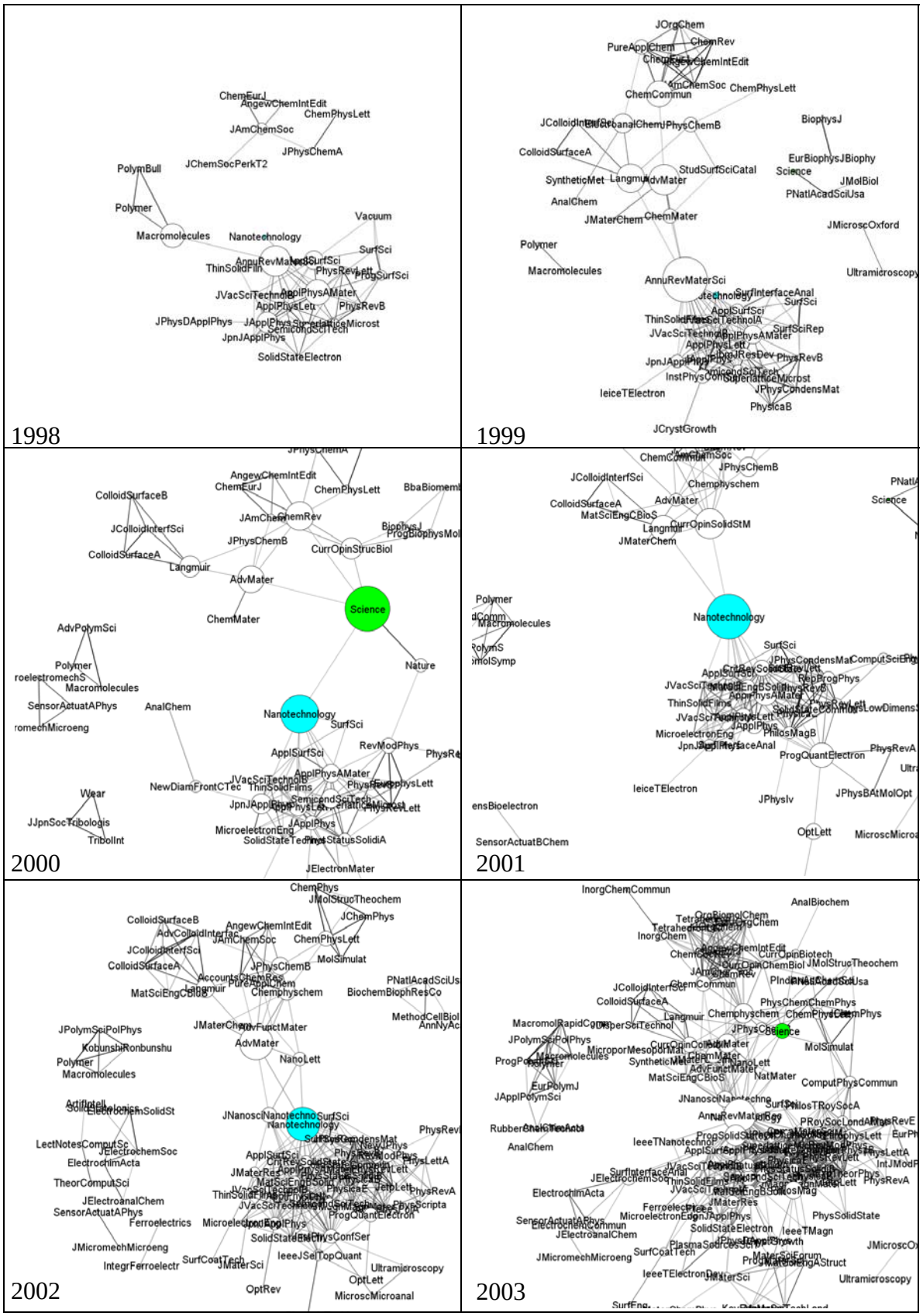
Journals
(in: David H. Guston, *Encyclopedia of Nanoscience and Society*. London: Sage, 2010.)

New developments in the sciences can be expected to lead to the publication of new journals. As a new development finds its shape, a set of journals will increasingly be considered as specifically relevant and therefore cited. Interdisciplinary journals (e.g., *Science* and *Nature*) connect different journal groups in terms of citations, but citation traffic is most dense in groups of specialist journals. Aggregated journal-journal citation relations are available in the *Journal Citation Reports* of the *Science Citation Index*; this data enables us to map developments in considerable detail (Price, 1965). Using these methods, we can show an interdisciplinary reorganization between applied physics and chemistry during the years 1995-2005. The journal *Science* played an important role in this process of shaping nanoscience and nanotechnology as a new specialism (Leydesdorff & Schank, 2008).

Figure 1 is based on an animation of the citation impact environment of the journal *Nanotechnology*. The journal *Nanotechnology* began publishing in 1990; it was included in the *Science Citation Index* in 1996. The animation of its citation impact environment in terms of neighboring journals (based on a dynamic version of multi-dimensional scaling and made available at http://www.leydesdorff.net/journals/nanotech/index.htm) shows that this journal was first embedded in a field of "applied physics" journals, but then towards the end of the millennium provided an increasingly central focus of attention within this specialty. In the period 2000-2003, nanotechnology became a priority funding area in most advanced nations (Zhou & Leydesdorff, 2006; Kostoff *et al*., 2007).

At the level of aggregated journal-journal citations, the "nano revolution" led to a reorganization of the interface between applied physics and relevant specialties in chemistry. The journal *Nanotechnology* played an important role in this reorganization. First, the attention of citing journals in the field of applied physics was focused on this journal. Thereafter, chemistry journals began to pay increasingly attention to this field. In 2001, *Nanotechnology* as a specialist journal took over the interdisciplinary role at the interface from *Science*, which had made this connection in 2000. The catalyzing role of the journal during the transition period can be analyzed in terms of the development of its "betweenness centrality" in this network (Wasserman & Faust, 1994). Before and after the transition, the journal was firmly embedded and did not play a role at an interdisciplinary interface. During the period of transition, however, the journal reflected the turmoil in its citation environment. Betweenness centrality in its environment increased to 27.5% in 2001. After the transition period, this interdisciplinary role was taken over by a number of nanoscience journals that had emerged in the meantime (Leydesdorff & Wagner, 2009).

> **Figure 1**: The construction of a relation between Chemistry and Applied Physics in terms of aggregated journal-journal citation relations. (The sizes of the nodes are proportionate to their "betweenness centrality" in the network.)


1998
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New journals emerged in the years thereafter, among them *Nano Letters*, published by the influential American Chemical Society since 2001, which took the lead in terms of impact factors among specialist journals at the interface between applied physics and chemistry. In more recent years, the multidisciplinary journal *Science* began to participate in the fine-grained citation environment of these specialisms. After 2003, the nano-field has developed as an increasingly integrated specialty. In 2004, the *Science Citation Index* introduced a new subject category in the database entitled "nanoscience and nanotechnology" that included 46 journals by 2007. *Nature Nanotechnology* began publishing in 2006, to be included in the *SCI* in that same year. The intellectual fields of applied physics and relevant chemistry have undergone reorganization during the period under study, but have stabilized increasingly into a new disciplinary structure of structure specialized in nanoscience and nanotechnology.

Interdisciplinary developments in terms of inter-journal relations are rare events. Proponents of new developments often proclaim that the existing disciplinary structures do not sufficiently honor the potential benefits of intellectual synergy in interdisciplinary projects. Policy-makers are sympathetic to these claims, since integration and problem-orientation is emphasized as opposed to differentiation and specialization (Guston, 2000). In terms of output, however, scholars are reputationally embedded in existing networks, associations, and journals. The latter also function as mechanisms of quality control. In this case, however, the development was intellectually initiated by contributions that went all the way up to *Science* in the hierarchy of journals. Note that citations can be considered as a delayed indicator. Policy-makers followed the intellectual developments reflexively by formulating priority programs from 2000 onwards.

SEE ALSO: Bibliometrics, History-in-the-Making, Interdisciplinarity, Multidisciplinarity, Transdisciplinarity, *Nanotechnology (Journal)*, *Nature Nanotechnology*, Science Policy.

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