CHAPTER OVERVIEW

The “invisible college,” which consists of a small group of highly productive and networked scientists and scholars, is believed to be responsible for the growth of scientific knowledge. By analyzing the scholarly publications of these researchers using select content analysis, citation network analysis, and information visualization techniques, “knowledge mapping” can reveal this interconnected invisible college of scholars and their ideas. In this chapter, we discuss online resources that are often used for such analyses, including: abstracts and indexes, commercial full-text articles and digital libraries, free full-text articles and e-prints, citation indexing systems and services, electronic theses and dissertations, patents, and business and industry articles and reports. These resources can be used to identify important authors and inventors, publications and publication outlets, institutions, countries and regions, and subject and topic areas over time.
1. INVIZBLE COLLEGES AND KNOWLEDGE MAPPING

In Diane Crane’s seminal book, *Invisible Colleges: Diffusion of Knowledge in Scientific Communities* (Crane, 1972), she suggests that it is the “invisible college,” a small group of highly productive scientists and scholars, that is responsible for growth of scientific knowledge. Crane shows that many scientific disciplines go through similar stages of initiation, growth, expansion, maturation, and decline. The productive scientists and scholars form a network of collaborators in promoting and developing their fields of study. The presence of an invisible college or network of productive scientists linking separate groups of collaborators within a research area has been evident in many studies (Chen, 2003; Shiffrin & Börner, 2004).

“Knowledge Mapping” or “Science Mapping,” based on content analysis, citation network analysis, and information visualization, has become an active area of research that helps reveal such an inter-connected, invisible college or network of scholars and their seminal publications and ideas.

According to Chaomei Chen in his book, *Mapping Scientific Frontiers* (Chen, 2003), science mapping helps “depict the spatial relations between research fronts, which are areas of significant activity. Such maps can also simply be used as a convenient means of depicting the way in which research areas are distributed and conveying added meaning of their relationships... By using a series of chronically sequential maps, one can see how knowledge advances. Mapping scientific frontiers involves several disciplines, from the philosophy and sociology of science, to information science, scientometrics, and information visualization.”

In a National Academy of Sciences colloquium entitled “Mapping Knowledge Domains” (Shiffrin & Börner, 2004), the term “mapping knowledge domains” (or knowledge mapping) was used to “describe a newly evolving interdisciplinary area of science aimed at the process of charting, mining, analyzing, sorting, enabling navigation of, and displaying knowledge.”

Two forces are contributing to the rapid development and overwhelming interest in knowledge mapping (we will use the term to encompass science mapping in the rest of the book). First, the availability of online publications, from scientific abstracts and indexes (A&I), full-text articles, and online preprints to digital dissertations, multimedia (e.g., videos and audios) magazine and journal articles, and multilingual Web-accessible patent filings, has made it possible to more systematically examine the scientific output of members of the invisible colleges. Secondly, the recent advances in