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## Chapter X

# What the Future Holds: Trends in GIS and Academic Libraries

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## Introduction

Geographic information is ubiquitous, from MapQuest in Google to the use of global positioning systems on PDAs and automobiles. More people use geographic information on a daily basis, from directions and a review of a local restaurant to building new infrastructures for communities. Therefore, libraries and librarians should be planning on how best to obtain, market, and provide this type of information for their users' personal and professional needs. What are some of the emerging themes in geographic information systems, particularly for libraries? In the convergence of services and resources, emergent themes are cartography; platform/network development; "geoweb" services and resources; geodata management trends; and societal impacts. Sui (2004) postulates that GIScience research will be involved in "computational, spatial, social, environmental, and aesthetic dimensions" (p. 65), therefore "geocomputation, spatially integrated social sciences, social informatics, information ecology, and humanistic GIScience" are areas of research to watch (p. 65). This chapter will address these themes from both a GIS and libraries perspective.

## Getting From Then to Now

GIS has changed considerably since its introduction in the 1960s. Map data moved from a tangible medium, lines drawn on paper, to intangible media, digital values stored electronically. The early cartographic and spatial design vocabulary developed to automate the drafting of maps in the 1970s established today's geospatial conceptual and theoretical constructs. As computing evolved, so did GIS. The emergence of relational database management systems allowed numeric data to link with geospatial data. Although dual encoding data models (vector and raster) brought debate into the GIS community as to which was best, it was determined that the "nature of the data and the processing determines the appropriate data structure" (Berry, 2006, ¶ 10). As mentioned in previous chapters, the improvement in hardware and software applications, as well as the emerging information infrastructure, played an important role in moving GIS out of the back room into an everyday activity. Spatial statistics, which describe the geographic patterns of mapped data, are a direct extension of traditional non-spatial statistics. These are often used in data mining large quantitative datasets (LeSage & Pace, 2001) as well as in meteorological, geophysical, and public health analyses (Gould & Arnone, 2004; Härdle, Mori, & Vieu, 2007; Waller & Gotway, 2004). Spatial analysis uses statistical models that represent life or social phenomena in a mathematical or statistical way. Modeling real-life phenomena allows researchers to determine factors or variables that influence the behavior of the phenomena. It also allows prediction or forecasting of long-term behavior of the phenomena, by changing factors that influence them or by noting historical events. Anything that has a contextual component to it can be enhanced through the use of spatial analysis (Berry, Marble, & Joint Comp, 1968; Chou, 1997; Maguire, Batty, & Goodchild, 2005; Paulston, 1996; Worrall, 1991).

Berry (2006) notes that spatial mathematics has extended conventional mathematical concepts. Although "map algebra" uses logical sequencing of basic operations (e.g., addition, subtraction, exponentiation) to perform complex, multifactor map analyses, "mapematics" allows new operations specific to geographical applications, such as distance and optimal path routing (Berry, 2006). Further, geotechnology (comprising GIS, GPS, and remote sensing) was identified as one of the three fastest growing fields (the other two being biotechnology and nanotechnology) (Gewin, 2004). Since geographic information (GI) science research plays a large role in the growth of geotechnology, it is important to review how the theoretical constructs of GI science may influence the development of GIS.

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