Joseph K. Berry and the Web of Knowledge in the GIS World

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I first became interested in Dr. Joseph K. Berry when my thesis professor, Bill Cooke, loaned me a copy of his book *Spatial Reasoning for Effective GIS* (1995). Much of what I had read about Geographical Information Systems (GIS) until then consisted of either cook-book-style manuals or detailed, piece-by-piece puzzle analysis (such as the comprehensive and informative but semantically dense *GIS and Multicriteria Decision Analysis* (1999) by Jacek Malczewski), and Berry's warm and conversational writing style was a pleasant contrast. Reading Joseph Berry is like having an articulate and enthusiastic friend sit down at your desk with you and talk you through some pretty complex ideas and applications. Written in 1995, *Spatial Reasoning* is fairly outdated in terms of software descriptions, but its discussion of the basic concepts of map analysis and modeling are illuminating, especially to the relative newcomer, and his anticipation of the many developments in graphical user interface, especially in the ArcMap environment, over the next fifteen years, imbues the book with a sort of prophetic energy that I found exciting.

Dr. Joseph K. Berry is certainly a luminary in the GIS world. He was present at the beginning of the development of the technology and is still active today. He was mentored by individuals who played important roles in the development of remote sensing technology in the mid-twentieth century and has mentored many more who are applying expertise in geospatial sciences to a broad constellation of related fields. He is not the "master weaver" but a bright thread in a nexus of connected ideas and personalities forming a tapestry that aspires to represent a comprehensive and legible understanding of the spatial patterns of the earth and atmosphere for humankind.

Dr. Berry currently serves as the Keck Scholar in Geosciences at the University of Denver and as an Adjunct Faculty member in Natural Resources at Colorado State University. In addition to *Spatial Reasoning,* he is the author of the books *Map Analysis* (2007), *Beyond Mapping* (1993) *Analyzing Precision Ag Data* (2002), *Analyzing Geo-Business Data* (2003), *Analyzing Geo-Spatial Resource Data* (2005), *The Precision Farming Primer* (1999), and *Beyond Mapping III* (2007). These last two titles are available online in their entirety at Dr. Berry's website, www.innovativegis.com. *Beyond Mapping* and *Beyond Mapping III* are comprised of columns written for GeoWorld magazine, which is also available online. In addition to his writing and academic responsibilities, Dr. Berry is the principal of the GIS consulting and software development firm Berry and Associates // Spatial Information Systems (BASIS).

Although Dr. Berry's commercial website is extensive and includes a Curriculum Vita along with hundreds of links to publications, presentations, conference papers and workshop sessions, additional biographical information about his collegial associations and mentoring experiences is difficult to find. When contacted by e-mail, Dr. Berry graciously answered a few biographical questions and his responses, along with several online biographical sketches of his colleagues, are the sources for much of what follows.

Joseph K. Berry was an undergraduate at the University of California at Berkeley from 1964 to 1969, where distractions included "free speech, filthy speech, lava lamps and love-ins." Dr. Robert Colwell hired Berry as a research assistant while he was still an undergraduate, allowing him to observe and participate in some of the very early development of remote sensing as it moved toward satellites and computer processing. Dr. Colwell is a very interesting figure and deserves some attention of his own in this

paper. He received a B.S. degree in forestry at Berkely in 1938 and was one of the first plant scientists to explore the use of radioactive tracers in tree-breeding studies. When the United States joined the Second World War, Colwell was commissioned in the U.S. naval reserve and, as an air combat intelligence officer, quickly developed a talent for interpreting aerial photography. He worked as an instructor of the Navy's Photo Intelligence School and by the end of the war was in charge of the Navy's training programs in photo interpretation and photogrammetry. His innovative methods for identifying tropical vegetation and measuring water depth based on aerial photographs were crucial to mission success in the Guadalcanal and Okinawa campaigns. He was awarded a Bronze star for his service.

Colwell was appointed to the faculty of UC Berkeley in 1947, where he taught and did research until well after his retirement in 1983. Most of his research focused on remote sensing and photograph interpretation in forestry. According to his obituary on the university website, Colwell

> "had a rare knack for getting students to perform up to their full potential. This was particularly evident at the graduate level; many students, inspired by Colwell's teaching, found their intellectual and professional home in the field of remote sensing and were highly successful in their subsequent careers. Colwell was the consummate mentor who was concerned with the welfare of his student and research associates."

He was the director of a popular summer forestry course where he earned the nickname "Bullet Bob" for his ability to lead field classes up steep mountain slopes at great speed.

NASA appointed Dr. Colwell as co-investigator for the first dedicated space multiband photographic experiment aboard Apollo IX. His research on reflectance and multispectral reconnaissance was influential in the selection of spectral bands and sensors

for the Landsat program. In 1969 He developed the Forestry Remote Sensing Laboratory (FRSL) at the Space Sciences Laboratory at Berkeley, one of the first research centers to apply the use of satellite imagery to forest and agricultural research. It seems that if one wanted to become a significant contributor to the field that would one day become GIS, standing behind Dr. Robert Colwell and looking over his shoulder in Berkeley in the late nineteen-sixties would be a very good place to start.

After graduation from Berkeley, Joseph Berry served briefly as a first lieutenant in the US Army Signal Corps, and then went on to graduate school in both the Business and Natural Resources Colleges at Colorado State University. Although pursuing a business career in the forest industry, Berry was pulled further into the machine processing side of remotely sensed data by another mentor, Dr. James Smith. Dr. Berry recalls Dr. Smith's "boundless enthusiasm" and "deep keel in mathematics, physics and computers." The computing environment of the time involved "boxes of cards passed through a glass window and time for a couple of cups of coffee before you got a result," according to Berry, who adds that "because our model was so outrageously greedy, we had to run outside of normal hours on a CDC Cyber mainframe computer costing several million dollars so we could have 256K memory and access to more than a megabyte off line memory (well beyond normal user limits)."

Dr. Berry assisted Dr. Smith in the development of a stochastic model of light interaction in plant canopies that was advanced for its day and was used by NASA and DOD in a variety of ways. Dr. Smith eventually left Colorado State and has had a distinguished career at NASA. He is currently a staff scientist in the Laboratory for Terrestrial Physics at the NASA Goddard Space Flight Center where he is modeling and

monitoring ecosystem processes and patterns as a co-investigator in the Forest Ecosystem Dynamics project. In addition, he is an Adjunct Professor in the Department of Information Systems at the University of Maryland at Baltimore County, teaching courses in modeling and simulation and neural networks, and serves as associate editor for the journal *Transactions on Geoscience and Remote Sensing.*

After receiving his Ph.D. in 1976, Dr. Berry joined the faculty at Yale University, where he worked with Kenneth Reed on ecosystem modeling and software development and later collaborated with David Buckley on several complex application models. He became part of a community of minds that were enthralled with the potential of map analysis and modeling, essentially doing GIS before the phrase GIS was ever commonly used. In 34 years of teaching, Berry has observed the breadth of GIS research widening well beyond the traditional bounds of remote sensing, cartography and global positioning systems. In his email interview he presents examples of students doing research on public health applications in Ethiopia and micro-finance application in Cambodia. He is noticing more non-GIS majors and even non-Geography majors in his graduate classes.

Dr. Berry served as major advisor for C. Dana Tomlin's doctorate at Yale in the early 1980's, although he states that, as with most doctoral student / major professor relationships, it is difficult to say who was mentoring whom. Currently a professor of Landscape Architecture at University of Pennsylvania School of Design, Tomlin has also taught at Ohio State University, the Harvard Graduate School of Design, and the Yale School of Forestry and Environmental Studies. Tomlin's contributions to the world of GIS are substantial. He wrote a major book: *Geographic Information Systems and Cartographic Modeling* (1990), and, perhaps more significantly, he developed the Map

Algebra language that is embodied in most of today's raster-based geographic information systems. According to Tomlin's "Hall of Fame" biography at the website of the Urban and Regional Information Systems Association (URISA), throughout his career, and even as a graduate student, Tomlin developed a number of different concepts and analytical processes that were eventually used in software packages by industry leaders such as ESRI, ERDAS and AutoCAD. One reason for the wide range of Tomlin's influence is that before the term "open source" became widely used, Tomlin donated his source code, documentation and other materials to anyone who asked.

This spirit of generosity and enthusiastic energy seems characteristic of Joseph K. Berry's web of teachers and lifelong learners. Critics of GIS question whether the technology is oversold, promises too much, or ties users to computer screens at the expense of an experiential understanding of the physical environment. Readers are unlikely to find any such skepticism, or likewise any probing of the ontological status or philosophical foundations of GIS, in the writings of Joseph K. Berry. I get a sense that Dr. Berry generally leaves it to others to point out the limitations of GIS, and then, in consultation with colleagues, formulates ways to get around those limitations. In the article "GIS: Tool or Science?" (1997) Wright et al. mention that GIS is perceived by some as "positivism's second coming" and by others as "a last-ditch rally by positivism's battered survivors." While researching the life of Dr. Berry, I have found the proponents of GIS to be neither starry-eyed acolytes nor battered survivors, rather just a bunch of really bright people who have developed (and are still developing) a really cool tool for exploring the earth. And Dr. Joseph K. Berry in particular has perfected a colloquial idiom for expressing what the tool is really all about.

Sources:

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