

Favorite Books
Earl F. Burkholder – May 2021

My youngest daughter gave me a Christmas present in 2020 in which she provides weekly questions for me to answer. At year's end the responses will be aggregated into a single volume to be part of our "family history." Most of the questions are more personal but I'm happy to share my answer to the question, "What are some of your favorite books?"

1. "Longitude" by Dava Sobel, 1995, Walker Publishing Company

This book describes development of the Harrison (1693-1776) chronometer which was used to solve the problem of finding longitude at sea. William Harrison (1693-1776) was a talented clockmaker who, over a period of 40 years, competed successfully with the best scientific minds of the day to solve a problem of enormous impact to the end user. The book and documentary of same name are both quite interesting and provide insight into foundations of modern practice. There are parallels in the life story of John Harrison and his clock and my efforts to promote the use of a 3-D model for 3-D digital geospatial data.

2. "The Measure of all Things: The seven-year odyssey and the hidden error that transformed the world," by Ken Alder, 2002, The Free Press

Geometry was a "favorite" high school topic. Geometry involved both math and logic for constructing useful theorems. As I've had the opportunity in my career to earn a decent living doing what I enjoy, it should be no surprise that I gravitated to surveying and that my career also included teaching. I feel most comfortable beginning with underlying fundamentals and building a body of knowledge by adding proven methods and procedures. Extensive testing is often part of the process.

The physical Earth is fundamental to surveying and location. Geodesy is the science of determining the size and shape of the earth and understanding the forces of nature which have given rise to its shape. The relationship between science and the underlying causes of the French Revolution in the 1790s fostered a new system of weights and measures based upon the length of the meridian quadrant from the Equator to the Pole. The expenditure of resources and physical effort involved in determining that quadrant distance makes for a fascinating story which includes science, history, politics, and surveying. Professional integrity and scientific "exactness" are an enormous part of the story.

3. "Descartes' Secret Notebook" by Amir D. Aczel, 2005, Broadway Books

Rene Descartes (1596-1650) was a mathematician and philosopher credited for, "I think, therefore, I am." Descartes gave us the Cartesian coordinate system and formalized applications of Euclidean geometry in his "Discourse on the Method" published in 1637. He was independently wealthy, and his background included both Catholic and Protestant indoctrination. He participated in various military endeavors and died at the young age of 54 while in personal service to the Queen of Sweden – supposedly he was poisoned by a jealous castle rival. The book contains intrigue – religious, social, professional, and political.

Given his connection with both Catholics and Protestants, it was deemed unwise for Descartes to identify as a Rosicrucian - a secret group of intellectuals who challenged the authority of the church.

Although not specifically listed as a member, Descartes had known affiliations with those who were. Hence some writings of Descartes were written in "code" which took years after his death to decipher. After his death, a crate of personal affects was shipped back to Paris. While being transported in a boat from the ship in the port up the river to Paris, the boat capsized, and the crate lay submerged for 3 days. The crate was retrieved and materials (including 16 pages of the 'secret notebook') were laid out to dry. In 1676 the mathematician, Leibniz from Germany was permitted to review the document. He made copious notes but was denied time to complete his review. The notes Leibniz made are the only surviving portion of the 16 pages of the Secret Notebook. Ultimately, the code in the manuscript was broken and the concepts described in code by Descartes are the foundation of what is now known as "topology."

4. "Night comes to the Cretaceous" by James Lawrence Powell, 1998, Harcourt Brace & Co.

This book was recommended to me by my geologist daughter. I have a related interest in geology, but the more fascinating feature of this book is the careful accumulation of evidence that challenged accepted "scientific" thought and shows unequivocally that a meteor impact brought about the end of the dinosaurs about 65 million years ago. That new geologic interpretation for the demise of the dinosaurs was not popular. Yes, science is "messy!" Seeing that others have prevailed in the face of opposition by the status quo gives me hope that the 3-D concepts I've championed since the mid-1990s will ultimately be adopted worldwide. Even if not adopted in my lifetime, 3-D is a legacy I leave.

5. "The Structure of Scientific Revolutions" 3rd Ed, by Thomas S. Kuhn 1962, 1970, 1996, The University of Chicago Press.

I was self-employed from 1993 to 1998. During that time, I formalized the definition of the global spatial data model (GSDSM), incorporated Global COGO, Inc., and obtained a trademark, BURKORD(TM), which applies to software developed by Global COGO and to the design of a BURKORD(TM) data base for storing 3-D digital spatial data (coordinates and stochastic information). I was optimistic that, coming to teach at NMSU, a "research institution," I would be able to find an appropriate partner for promoting the GSDM. It was not to be.

After I had been at NMSU for several years, my Department Head scheduled an interview with the Associate Dean for Engineering Research. It was a non-starter except that the Associate Dean told me I needed to read Kuhn's book, 'The Structure of Scientific Revolutions.' I did. Not only did I read it, I studied it carefully. That book describes why the "system" is reluctant to embrace new ideas and why it takes generational change for new ideas to be adopted. For my part, I've been patient and persistently promoting the GSDM for 25 years. I am now retired and 3-D remains my hobby.

6. "Innovators: How a group of hackers, geniuses, and geeks created the digital revolution," by Walter Isaacson, 2014, Simon & Schuster.

I've had a front-row seat to the digital revolution since graduation from high school in 1964. This book provides an excellent overview of that history and describes the players - many who lived in my lifetime. It is fascinating to read about them and their contributions. A prominent theme in the book is showing how progress is made through the collaborative efforts of many persons (with significant government funding) as opposed to singular individual efforts - examples are included. He also looks at the balance of "open source" development versus enforcing copyrights and patents. Many examples are provided.

But, in my opinion, Isaacson captures an important underlying theme of the analog/digital transition in the following passage.

So, he [Paul Baran 1926-2011]] tried to convince AT&T to supplement its circuit-switched voice network with a packet-switched data network. "They fought it tooth and nail," he recalled. "They tried all sorts of things to stop it." They would not even let RAND use the maps of its circuits, so Baran had to use a leaked set. He made several trips to AT&T Headquarters in lower Manhattan. On one of them, a senior engineer looked stunned when Baran explained that his system would mean that data could go back and forth without a dedicated circuit remaining open the whole time. "He looked at his colleagues in the room while his eyeballs rolled up sending a signal of his utter disbelief," according to Baran. After a pause, the executive said, "Son, here's how a telephone works," and proceeded with a patronizing and simplistic description.

AT&T balked at considering a whole new type of data network because it was so heavily invested in traditional circuits.

Hindsight confirms that AT&T has since embraced the digital revolution. The challenge to using 3-D digital spatial data in the global spatial data model (GSDM) is parallel in that:

1. The federal government (including many agencies) is a behemoth compared to AT&T.
2. The vested commercial interest (software and practice) in continued use of separate horizontal and vertical datums is huge!

The following items are evidence that progress is being made in eventual adoption and implementation of a 3-D model for 3-D data.

- Rebuttal of challenge to Local Accuracy - see www.globalcogo.com/validation.pdf.
- Artificial intelligence & machine learning will be driving forces – www.globalcogo.com/SamePageGeometry.pdf.

Note to surveyors – the concepts and procedures used in the GSDM are not as complicated and are easier to learn than those needed to use geoid modeling and low-distortion projections. My goal is to enhance the productivity of the practicing surveyor. The key is learning and using geometrical concepts as opposed to memorizing how to use software written by others.

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