ANNOTATED BIBLIOGRAPHY

Researching *the Philosophy for the Future* has consumed much of my adult life. Grounded in my formal training in physics and mathematics, my sphere of interests expanded to philosophy (pragmatism, logic, epistemology and decision theory), the philosophy of science, biology and evolutionary theory, paleontology, human origins, consciousness and neuroscience, sociology, ethical theory, political theory and more. My career provides the engineering and technology dimensions. Throughout this journey, I have read prodigiously and synthesized that knowledge to produce this work. In this bibliography, I list the sources that were most influential in my thinking as well as sources cited or quoted directly.

Being a devoted bibliophile, most of these books reside in my personal library.

Chapter 1 Introduction

It is appropriate that I begin the book with a quote from one of the original American pragmatists, C. S. Peirce. Pragmatism is one of the overarching principles of *The Philosophy for the Future* and my version of pragmatism has much in common with the early American conception. The quote is from

J. Buchler, ed., *Philosophical Writings of Peirce* (New York: Dover Publications, Inc. 1955), p.229.

I found the quote in

John P. Murphy, *Pragmatism, From Peirce to Davidson* (Boulder, Colorado: Westview Press 1990), p. 12.

Item 6. The de Tocqueville quote comes from *Democracy in America*. Part I was originally published in 1835.

Alexis de Tocqueville, *Democracy in America* (London: Penguin Books 2003), p.67.

Item 14. Steven Weinberg's book *Dreams of a Final Theory* is one of my favorite popular physics books. Weinberg has a refreshing, common sense perspective and I agree with many of his philosophical views, notably his defense of reductionism.

Steven Weinberg, *Dreams of a Final Theory* (New York: Vintage Books 1992).

Item 16. Nietzsche has been tremendously influential in my thinking and development. I still have the copy of *The Will to Power* I took backpacking. Dog eared and yellowed, this collection of Nietzsche's notes has been a source of delight and puzzlement for years.

Friedrich Nietzsche, *The Will to Power*, Edited by Walter Kaufman (New York: Vintage Books1967).

Item 17. The quote is from Nietzsche's *Genealogy of Morals*, page 110.

Friedrich Nietzsche, *On the Genealogy of Morals,* Edited by Walter Kaufman (New York, Vintage Books 1989).

Chapter 2 Fundamentals

The first philosophical area I began to investigate (beyond my basic training in physics and wrestling with the philosophical issues modern physics engenders) was logic and mathematics. I encountered W. V. O. Quine early and enjoyed his clear thinking and prose. The first quote at the beginning of Chapter 2 is from Quine's essay *On What There Is*. It's contained in the volume *From a Logical Point of View*, page 16.

Willard Van Orman Quine, *From a logical Point of View* (Cambridge, MA: Harvard University Press 1980).

I also first encountered the pragmatist school and recognized an immediate affinity with the original pragmatists Peirce and James. The second quote is from James' book *Pragmatism* published in 1907, lecture two, page 27 in my copy.

William James, *Pragmatism* (Buffalo, NY: Prometheus Books 1991).

The third quote is from my explorations in the foundations of mathematics. It captures a pragmatic and scientific spirit in the foundations of mathematics that I think is important. It comes from Haskell Curry (1900–1982), an American mathematician and logician. The original quote is from

Haskell Curry, *Foundations of Mathematical Logic* (New York: McGraw-Hill 1963).

I found it in an essay by Imre Lakatos that was contained in

Thomas Tymoczko, *New Directions in the Philosophy of Mathematics* (Princeton, NJ: Princeton University Press 1998).

Item 3. Descartes musings on wax are contained in his *Meditations Concerning First Philosophy*, in particular, the second Meditation, *On the Nature of the Human Mind, and that it is More Easily Known than the Body*.

Item 17. Alfred Tarski's truth paradigm first appeared in his 1935 paper reprinted here

Alfred Tarski, 'The Concept of Truth in Formalized Languages', in *Logic, Semantics, Metamathematics*, 2d ed. (Indianapolis: Hackett 1983).

The Bertrand Russell quote referenced is from his *Introduction to Mathematical Philosophy*. The precise (and famous) quote is "A robust sense of reality is very necessary in framing a correct analysis of propositions about unicorns, golden mountains, round squares, and other such pseudo-objects." The William James quote is from *Pragmatism*, page 38.

Item 18. Hilary Putnam, an American logician and analytic philosopher, is one of the few modern philosophers to embrace the spirit of the early pragmatists. The interpenetration of fact and theory is a common theme in Putnam's work and is evident in his book *Pragmatism*:

Hilary Putnam, *Pragmatism* (Oxford: Blackwell 1995).

Quine's famous essay is contained in the collection *From a Logical Point of View*.

Item 19. I never actually read *The Critique of Pure Reason* or any other of Kant's works. I tried but found them obscure and opaque. My reference is from the common interpretation of his work found in most any philosophy overview. An example is *Modern Philosophy* by Roger Scruton. This book provided me an early overview of philosophic issues as I began this journey.

Roger Scruton, *Modern Philosophy* (New York: Penguin 1994).

Item 23. When I was researching and writing Chapter 2, I came across a popular book on fuzzy logic. Both the idea and the book's author, Bart Kosko, rubbed me the wrong way.

Bart Kosko, *Fuzzy Thinking, The New Science of Fuzzy Logic* (New York: Hyperion 1993).

I am somewhat gratified that the idea seems to have faded. I found and read with relish Susan Haack's dismissal in *Deviant Logic Fuzzy Logic*.

Susan Haack, *Deviant Logic Fuzzy Logic, Beyond the Formalism* (Chicago: University of Chicago Press 1996).

Item 24. To me the right way to handle uncertainty is via the concept of probability. Two classic works on the formal theory of probability are by Harold Jefferys and Andrey Kolmogorov.

Harold Jefferys, *Theory of Probability* (Oxford: Clarendon Press 1961).

Andrey Kolmogorov, *Foundations of the Theory of Probability* (New York: Chelsea 1956).

Kolmogorov's original manuscript was published in German in 1933. Despite the fact that my Ph.D. involved the extensive use of the mathematics of probability, my interest in the foundations of probability occurred after I was back working at Martin Marietta and I became peripherally involved with a project to develop a probabilistic risk assessment for a mission to fly a payload with a nuclear battery. One of our engineers devised a Bayesian based technique for the analysis and got me interested in Bayesian interpretations of probability and the foundations of probability in general. I found the above two books in the company library and made photocopies, which I still have in a binder.

Item 26. James' cash-value quip is used several times in *Pragmatism*, pages 26 and 34 for example.

Item 28. Richard Rorty is alleged to be the inheritor of the proud tradition of American Pragmatism. The original draft of this Chapter included an item characterizing Rorty's conception of pragmatism, some of which I actually agreed with. It ended up on the cutting room floor.

Item 30. James' quote is again from *Pragmatism*, Page 88.

Item 41. There are many books on formal systems and the foundations of logic. Some in my library include:

Willard V. O. Quine, *Elementary Logic* (Cambridge, MA: Harvard University Press 1980).

Elliott Mendelson, *Introduction to Mathematical Logic* (Princeton: D. Van Nostrand 1964).

Graeme Forbes, *Modern Logic* (Oxford: Oxford University Press 1994).

Sybil Wolfram, *Philosophical Logic* (New York: Routledge 1989).

Item 50. The reference to Holland et. al. is a major work by John Holland, Keith Holyoak, Richard Nesbett and Paul Thagard entitled *Induction*.

John Holland et. al. *Induction, Processes of Inference Learning and Discovery* (Cambridge, MA: The MIT Press 1989).

Item 53. The logicist thesis by Carnap is from a 1931 essay, *The Logicist Foundation of Mathematics*, which I found in *Philosophy of Mathematics*.

Paul Benacerraf and Hilary Putnam, editors, *Philosophy of Mathematics, Selected Readings* (Cambridge: Cambridge University Press 1996).

Item 55. Cantor's definition is from 1895. I found it quoted in an 1977 article by Charles Parsons, *What is the Iterative Conception of Set?*, contained in *Philosophy of Mathematics*. My main set theory reference is

Patrick Suppes, *Axiomatic Set Theory* (New York: Dover 1972).

Item 61. Gregory Chaitin's interesting work is summarized in his monograph:

Gregory Chaitin, *The Limits of Mathematics* (Singapore: Springer-Verlag 1998).

Item 62. Penrose's thought on the non-formalizability of human reasoning are explained in his book:

Roger Penrose, *Shadows of the Mind* (Oxford: Oxford University Press).

Penrose is a brilliant physicist, but I view his forays into conscious theory to be misguided. He is a consciousness mysterian in the vernacular of Chapter 6.

Item 75. Jefferys' axioms are contained in his *Theory of Probability*.

Item 78. There are many books on the Bayesian interpretation of probability and it's utility. Most influential to my thinking has been those by Edwin Jaynes, including his monograph

Edwin T. Jaynes, *Probability Theory, The Logic of Science* (Cambridge: Cambridge University Press 2003).

Richard Cox's work is summarized in his book:

Richard Cox, *The Algebra of Probable Inference* (Baltimore: Johns Hopkins University Press 1961).

Claude Shannon's original work on information theory is published in

C. Shannon and W. Weaver, *The Mathematical Theory of Communication* (Urbana, IL: University of Illinois Press 1949).

Item 83. Hume's famous quote is from his *Inquiry Concerning Human Understanding*.

Item 89. Leonard Savage wrote one of the first books on the personal or Bayesian interpretation of probability:

Leonard Savage, *The Foundations of Statistics* (New York: Dover 1972).

Item 92. Prospect Theory is explained in:

Daniel Kahneman and Amos Tversky, *Choices, Values and Frames* (Cambridge: Cambridge University Press 2000).

Item 95. Paul Thagard is one contemporary philosopher I admire for clear thinking. I found his ideas on inference-to-the-best plan online. A current reference is:

Thagard, P., & Millgram, E., *Inference to the Best Plan: A Coherence Theory of Decision*. In: A. Ram and D. B. Leake (eds.) *Goal-driven learning* (Cambridge, MA: MIT Press 1997).

Chapter 3 Science

With the pragmatic focus on ends and effects and the mathematical machinery of decision theory it seemed obvious to me that the best way to think about the scientific method was as an application of decision theory. The key was in devising the appropriate utility function.

The quotes at the beginning of the Chapter by Peirce and Carnap reflect the realist view shared by nearly all practicing scientists today. The Peirce quote comes from *Pragmatism, from Peirce to Davidson*. Carnap's is from

Rudolf Carnap, *An Introduction to the Philosophy of Science* (New York: Dover 1995).

It was originally published in 1966. The Feyerabend quote is a bit of playfulness, a contrarian view. It is from:

Paul Feyerabend, *Against Method* (London: Verso 1988).

Item 6. The original draft of this chapter contained a lengthy exposition of statistical model fitting methods like the AIC and BIC. Much about them can be found

online. There are Wikipedia articles and an internet search will pull up many scholarly articles.

Item 9. I believe the Laudan reference is from *Progress and its Problems*, but I have been unable to verify. I have several other Laudan books in my library.

Larry Laudan, *Progress and its Problems* (Berkeley: University of California Press 1977).

Lattice gauge theory was the subject of my Ph.D. thesis. Ken Wilson originally published the technique in Physical Review in 1974.

K. G. Wilson, *Confinement of Quarks*, Physical Review D, Volume 10, 2445–2459.

Item 14. Popper's ideas on the importance of refutability are explained in

Karl Popper, *Objective Knowledge* (Oxford: Clarendon Press 1979).

Item 17. Every so often I find a book that makes me wish I had written it. Such is the case with Wilson's *Consilience*. A consilient worldview based on science is one of the objectives of this book. I believe, to a great extent, I have achieved Wilson's vision. The quote is from page 266.

Edward O. Wilson, *Consilience, the Unity of Knowledge* (New York: Alfred Knopf 1998).

Item 18. Susan Haack is one of the few modern philosophers I admire. The crossword metaphor shows up in Chapter 1 of

Susan Haack, *Defending Science — within reason* (New York: Prometheus Books 2003).

Item 29. There is a rich literature on the theory of groups. My standard reference is

Wu-Ki Tung, *Group Theory in Physics* (Philadelphia: World Scientific 1985).

Item 36. Carnap's description of types of physical concepts is from his *Introduction to the Philosophy of Science*.

Item 43. I have many books on the mathematics of topology and differential geometry. Most I picked up during my graduate student days. There is a vast modern literature accessible to those interested. I will mention just one of my books that covers all the material in items 43 through 47:

Michael Spivak, *Differential Geometry*, Volumes I and II (Wilmington, DE: Publish or Perish Press 1979).

Item 55. The Laplace quote, about what has come to be known as Laplace's demon, originally appeared in *A Philosophical Essay on Probabilities*, published in 1820.

Item 65. Weinberg's quote comes from page 55 of *Dreams of a Final Theory*.

Item 69. This quote originally appeared in a 1936 article in the Journal of the Franklin Institute. I found it in:

Albert Einstein, *Ideas and Opinions* (New York: Crown Publishers 1982).

Item 72. Both Sagan quotes are from *The Demon Haunted World*, page 29, a great book with a hopeful message.

Carl Sagan, *The Demon Haunted World, Science as a Candle in the Dark* (New York: Ballantine Books 1996).

Item 74. Bacon's quote is from *Novum Organum*, originally published in 1620 and one of the most important books in the history of intellectual thought. It is on page 47 of my copy:

Francis Bacon, *Novum Organum*, Translated and Edited by Peter Urbach and John Gibson (Chicago, Open Court 1994).

Item 75. These quotes are also from *Novum Organum*. The first is on page 19; the second on page 43.

Item 83. For my generation, Kuhn was required reading for most college students in a technical field.

Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press 1970).

Item 85. Again from *Against Method*.

Item 86. The Lindley quote is from *The End of Physics*, page 10.

David Lindley, *The End of Physics, The Myth of a Unified Theory* (New York: BasicBooks 1993).

Item 87. Laudan's two theses are on pages 13 and 14 of *Progress and its Problems*. The last quote is on page 224.

Chapter 4 Physics

This chapter contains a distillation of much of my learning and thinking as a physics graduate student. It is fascinating to me that the issues at the foundations of QM

are still with us, decades after I first wrestled with them. I have kept up with progress in my originally chosen field as an educated layman.

The Einstein quote is found in his *Ideas and Opinions*, page 231. It originally appeared in an article written in 1919 for the London Times. To me, General Relativity is one of the most beautiful physical theories ever devised. I contrast its beauty with the ugliness of QM.

John Bell was one of the few physicists in the modern era to seriously question QM. As such he is one of my heroes. Most of his important work is contained in his book *Speakable and Unspeakable in Quantum Mechanics*, which I quote from liberally in this chapter. This first quote is on page 171.

John S. Bell, *Speakable and Unspeakable in Quantum Mechanics, Collected Papers on Quantum Philosophy* (Cambridge: Cambridge University Press 1993).

Weinberg's quote is from *Dreams of a Final Theory*, page 235.

Item 3. Thermodynamics and statistical mechanics were not my favorite subjects in graduate school. I have since developed a much greater appreciation for their importance and elegance. My standard references are:

Herbert Callen, *Thermodynamics* (New York: John Wiley & Sons 1960).

R. K. Pathria, *Statistical Mechanics* (Oxford: Pergamon Press 1984).

Item 7. The Augustine quote is from his *Confessions*, circa 397.

Item 8. Penrose's arrows are listed in an article entitled *Singularities and Time-asymmetry* that appears in a monumental collection compiled on the centenary of Einstein's birth. The list of contributors is a who's who in 20th century physics.

S. W. Hawking and W. Israel, editors, *General Relativity, An Einstein Centenary Survey* (Cambridge: Cambridge University Press 1979).

Item 10. The Lawrence Sklar quote is from *Time in Experience and in Theoretical Description of the World*, an article contained in

Steven F. Savitt, editor, *Time's Arrows Today, Recent Physical and Philosophic Work on the Direction of Time* (Cambridge: Cambridge University Press 1995).

I am unable to resurrect where I found the Richard Taylor quote. I'm sure it is in my files somewhere. This is one of the dangers of writing over such a long period.

Item 15. There are many good books on GR. My favorite is

Robert M. Wald, *General Relativity* (Chicago: University of Chicago Press 1984).

Item 16. There are myriad books describing Einstein's quest for the General Theory of Relativity. The quotes used in this item come from the MacTutor History of Mathematics Archive, a great general source located here

http://www-history.mcs.st-and.ac.uk/index.html

A recent biography of Einstein I greatly enjoyed is

Walter Isaacson, *Einstein, His Life and Universe* (New York: Simon and Schuster 2007).

Item 27. A good (but now getting dated) survey of cosmology is

Stuart Clark, *Towards the Edge of the Universe, A Review of Modern Cosmology* (New York: John Wiley & Sons 1997).

A nice popular book is

Neil deGrasse Tyson and Donald Goldsmith, Origins, *Fourteen Billion Years of Cosmic Evolution* (New York: W. W. Norton 2005).

Item 28. The foment around the subjects of dark matter and dark energy is such that the only way to keep current is browsing online papers or reading the occasional news story in *Science* or *Nature*. It's quite exciting.

Item 32. Chaos theory entered the main stream consciousness with the publishing of James Gleick's popular exposition:

James Gleick, *Chaos, Making a New Science* (New York: Penguin Books 1987).

A good technical description of non-linear dynamics is

S. Neil Rasband, *Chaotic Dynamics of Non-linear Systems* (New York, John Wiley & Sons 1990).

Item 36. Mandelbrot's original book is definitely worth owning.

Benoit Mandelbrot, *The Fractal Geometry of Nature* (San Francisco: Freeman 1982).

Item 40. Similarly to chaos theory, complexity theory entered the mainstream through a popularization and glorification of the Santa Fe Institute:

M. Mitchell Waldrop, *Complexity, The Emerging Science at the edge of Order and Chaos* (New York: Simon and Schuster 1990).

Item 50. There are literally hundreds of books on the history of Quantum Theory. Two of the best popular accounts are by John Gribbin.

John Gribbin, *In Search of Schrödinger's Cat* (New York: Bantam 1984).

John Gribbin, *Schrödinger's Kittens and the Search for Reality* (Boston: Back Bay 1995).
Almost all of the original papers are contained in
John Wheeler and Wojciech Zurek, editors, *Quantum Theory and Measurement* (Princeton: Princeton University Press 1983).

Item 56. Lindley's quote is from *The End of Physics*, page 74.

Item 63. Edwin Jaynes is another one of my heroes. In addition to possessing the best philosophic understanding of probability I have encountered, Jaynes was not shy in taking on the Quantum orthodoxy as they committed violence to probability concepts. The quote is from his paper *Probability in Quantum Theory* presented at the Workshop on Complexity, Entropy and the Physics of Information in Santa Fe 1989.

Item 69. The original draft of this chapter had much more on the idea of quantum information. Those interested can consult Fuchs' papers available online, for example
Christopher Fuchs, *Quantum Mechanics as Quantum Information (and only a little more)*, arXiv: quant-ph/0205039 v1.
Or a recent interview
Christopher Fuch, *Interview with a Quantum Bayesian*, arXiv: quant-ph/1207.2141v1 (http://arxiv.org/abs/1207.2141).
It also appears in
Maximilian Schlosshauer, editor, *Elegance and Enigma, The Quantum Interviews* (Berlin: Springer 2011).

Item 72. Original references for the de Broglie and Bohm theories are:
Louis de Broglie, *Tentative d'interpretation causale at non-linéaire de la méchanique ondulatoire* (Paris: Gauthier-Villars 1956).
David Bohm, *Phys. Rev.* 85, 166, 180 (1952).
Everett's original paper is reprinted in *Quantum Theory and Measurement*.

Item 74. Bell's papers are in *Speakable and Unspeakable*.

Item 75. Bell's quote is from his paper *The measurement theory of Everett and de Broglie's pilot wave*, contained in *Speakable and Unspeakable*, page 96.

Item 76. Zurek's original dechoherence paper appeared in Physical Review:
Wojciech Zurek, Phys. Rev. D 241516 (1981). A more recent survey is

Maximilian Schlosshauer, *Decoherence, the measurement problem, and the interpretation of quantum mechanics*, arXiV: quant-ph/0312059v4.

Item 77. Janyes' quote is again from his paper *Probability in Quantum Theory*. Bell's quotes can both be found in Speakable and Unspeakable. The first is from the paper *Subject and Object*, page 41. The second is from the paper *The theory of local beables*, page 52.

Item 79. One of the best books on QED is still Feynman's classic.

Richard P. Feynman, *Quantum Electro-dynamics* (Reading, MA: Benjamin/Cummings 1961).

Item 80. My first book on gauge field theories was

J. Leite Lopes, *Gauge Field Theories, An Introduction* (Oxford: Pergamon 1981).

Item 83. My Ph.D. thesis was in the area of lattice gauge theory. My bible as I learned the basics was this great little book:

Michael Creutz, *Quarks, Gluons and Lattices* (Cambridge: Cambridge University Press 1983).

Item 86. A popular description of string theory and its potential implications is

Brian Greene, *The Elegant Universe* (New York: W. W. Norton 1999).

An interesting account of some of the accompanying mathematics is

Shing-Tung Yau and Steve Nadis, *The Shape of Inner Space* (New York: Basic Books 2010).

Chapter 5 Evolution

Being trained as a physicist and mathematician, learning evolution theory was a great journey of discovery. I had been an occasional reader of Stephen Gould's natural history essays. I read almost everything by Dawkins and really enjoyed *Darwin's Dangerous Idea* by Daniel Dennett, a philosopher. Dennett was able to connect the importance of the evolutionary idea with the rest of the philosophical edifice. To me evolution resonates at the very deepest level. It demonstrates the pragmatism of the natural forces that created us.

The first quote is from Darwin's Dangerous Idea, page 60, as a summary to Chapter 2.

Daniel Dennett, *Darwin's Dangerous Idea* (New York: Simon & Schuster 1995).

When I first read Dawkins' quote in *The Selfish Gene*, I loved it. I understand, as many have not, exactly what he's getting at. This passage has been roundly and frequently criticized as the worst example of genetic determinism. But properly understood, it is simply the reductionist (in Weinberg's sense of the end of explanation) perspective of the underpinning causes of the evolution of all life on earth. *The Selfish Gene* was originally published in 1976 and, in my mind, is still a classic. The quote is on page 19 of my copy.

Richard Dawkins, *The Selfish Gene* (Oxford: Oxford University Press 1989).

Item 3. I encountered genetic algorithms in my professional work as I was exploring new and better methods to optimize launch vehicle trajectories. The realization that these were the very algorithmic process used by nature (as pointed out by Dennett) was my inspiration for this section. Beginning the discussion of evolution by explaining the logic of Darwinism is (I think) a great way to segue from the math and physics of Chapters 2, 3 and 4 to biology and the messier human sciences that will occupy the rest of the book.

Item 17. There are many popular works on the history of evolutionary theory and Darwinism. Two of my favorites are:

Michael Ruse, *Darwin and Design, Does Evolution have a Purpose* (Cambridge, Ma: Harvard University Press 2003).

Steve Jones, *Darwin's Ghost* (New York: Ballantine 2000).

Item 19. Darwin's quote is from his Autobiography, page 88. It's available online at http://darwin-online.org.uk/

Item 26. An excellent book on the history of life as displayed by the fossil record is

Richard Fortey, *Life, A Natural History of the First Four Billion Years of Life on Earth* (New York: Vintage 1997).

Item 33. The origin of life is a fascinating field. One of the first books I read on the subject was

Christian de Duve, *Vital Dust, the Origin and Evolution of Life on Earth* (New York: Basic 1995).

A more up to date survey is

Pier Luigi Luisi, *The Emergence of Life: From Chemical Origins to Synthetic Biology* (Cambridge: Cambridge University Press 2006).

Item 42. Williams' quote is from

George C. Williams, *Sex and Evolution* (Princeton: Princeton University Press 1975).

I found it in Mark Ridley's textbook, page 285.

Mark Ridley, *Evolution* (Cambridge, MA: Blackwell 1996).

The so called problem of the evolution of sex and the factor of two cost seems so obviously wrong to me. Am I missing something?

Item 48. Darwin's quote is from the *On the Origin of Species*, first paragraph of Chapter 4. E. O. Wilson edited a nice compendium of the four major works of Darwin including *Origin*. The others are *The Voyage of the Beagle*, *The Descent of Man* and *The Expression of the Emotions in Man and Animals*.

Edward O. Wilson, editor, *From So Simple a Beginning* (New York: W. W. Norton & Sons 2006).

Item 58. Mayr discusses speciation in Chapter 8 of

Ernst Mayr, *Toward a New Philosophy of Biology* (Cambridge, MA: Harvard University Press 1988).

Item 60. Gould exhaustively defends punctuated equilibria in his major work

Stephen Gould, *The Structure of Evolutionary Theory* (Cambridge, MA: Belknap Press 2002).

Item 63. Gould's quote is from the *New York Review of Books*

Stephen J. Gould, *Darwinian Fundamentalism, part 1*. New York Review of Books. June 12, pp. 34–37, 1997.

Dawkins' acerbic critique of Gould in *Unweaving the Rainbow* begins on page 193.

Richard Dawkins, *Unweaving the Rainbow* (Boston: Mariner 1998).

His more conciliatory words are in *A Devil's Chaplain*, page 187.

Richard Dawkins, *A Devil's Chaplin* (Boston: Mariner 2003).

Item 68. There is some sense in Gould's argument, but it misses the point.

Stephen Gould, *Full House* (New York: Three Rivers 1996).

Item 69. Darwin's beautiful and famous tangled bank metaphor is the penultimate paragraph of *Origin*.

Item 76. E. O. Wilson's sociobiology is still very worth reading. My version is Edward O. Wilson, *Sociobiology, the Abridged Edition* (Cambridge, MA: Belknap Press 1980).

Chapter 6 Humans

The unique evolution of the human species is a uniquely fascinating subject. Given our direct relatedness to archaic humans, I find myself almost obsessed with trying to understand what is was like for them. What and how did they think? Did they have the same cares, hopes and dreams as we? Delving into the science and speculation surrounding this vast topic was and continues to be a true joy.

This famous Darwin quote is from the last paragraph of *The Descent of Man*. The Richard Leakey quote is from the first paragraph of his book *Origins*, a true classic in the field. *Origins Revisited* is also worthwhile.

Richard E. Leakey and Roger Lewin, *Origins* (New York: E. P. Dutton 1977).

Item 9. I read a lot about human origins, and this section is a synthesis, but two books deserve mention as being incredibly well organized and authoritative, in addition to having fabulous illustrations and photos.

Ian Tattersall and Jeffrey Schwartz, *Extinct Humans* (Boulder, CO: Westview 2001).

Donald Johanson and Blake Edgar, *From Lucy to Language* (New York: Simon & Schuster 1996).

Item 13. The (potential) discovery of a recently extinct new variety of hominid was really exciting to me. I followed the news (and scholarly) articles avidly. Rather than referencing online resources that will soon become obsolete, I urge the interested reader to do their own research.

Item 17. Two popular books that brought the wizardry of mDNA and genetics in understanding human origins to the public consciousness were

Bryan Sykes, *The Seven Daughters of Eve* (New York: W. W. Norton 2001).

Steve Olson, *Mapping Human History* (Boston: Mariner Books 2002).

The incredible findings of the gene mapping of Neanderthals is best researched online.

Item 26. The control system analogy is in an important connection I have not seen made explicitly very often. It yields great insight. My knowledge of control theory comes from my engineering focused career.

Item 27. One very useful reference for understanding the architecture of the brain is

Rita Carter, *Mapping the Mind* (Berkley: University of California Press 1999).

Item 29. The question of what drove the adaptation of conscious intelligence is much debated. There are a number of books that explore this and related question. Some that have influenced me include:

William H. Calvin, *A Brief History of the Mind* (Oxford: Oxford University Press 2004).

Ian Glynn, *An Anatomy of Thought* (Oxford: Oxford University Press 1999).

Terrence Deacon, *The Symbolic Species, The Co-evolution of Language and the Brain* (New York: W. W. Norton 1997).

Paul Ehrlich, *Human Natures, Genes, Cultures, and the Human Prospect* (Washington: Shearwater 2000).

Item 38. Steven Pinker is one of the most lucid writers about the mind and it's workings. I have read with relish almost all of his books. The quote comes from page 21 of

Steven Pinker, *How the Mind Works* (New York: W. W. Norton 1997).

Item 41. A good reference for how human memory works is

Daniell Schacter, *The Seven Sins of Memory* (Boston: Houghton Mifflin 2001).

Item 47. Jeff Hawkins' little book is a refreshing (for me) change from the writings of neuroscientists. He focuses on explaining the working of the pragmatic point of intelligence, making predictions. The quote is from page 6 of

Jeff Hawkins, *On Intelligence* (New York: Times Books 2004).

Item 49. Pinker's classic work on human language is

Stven Pinker, *The Language Instinct, How the Mind Creates Language* (New York: HarperCollins 1994).

Item 52. I first read about Phineas Gage in

Antonio Damasio, *Descartes' Error, Emotion, Reason, and the Human Brain* (New York: Avon Books 1994).

Item 58. The literature on consciousness is vast. The first major work I read was Daniel Dennett's *Consciousness Explained*. It's a wonder I didn't give up at that point.

Daniel Dennett, *Consciousness Explained* (Boston: Little, Brown & Company 1991).

I have been more influenced by the naturalists like Crick and Koch.

Francis Crick, *The Astonishing Hypothesis, The Scientific Search for the Soul* (New York: Charles Scribner's Sons 1994).

Christof Koch, *Consciousness* (Cambridge, MA: The MIT Press 2012).

A good compilation of the more influential papers is

Ned Block, Owen Flanagan and Güven Güzeldere, editors, *The Nature of Consciousness, Philosophical Debates* (Cambridge, MA: The MIT Press 1997).

Item 64. Damasio's hierarchical model of consciousness is almost certainly right, as far as it goes.

Antonio Damasio, *The Feeling of What Happens* (San Diego: Harcourt 1999).

Item 66. Damasio's conversation with David is related on page 114 of *The Feeling of What Happens*.

Item 69. Giulio Tononi's ideas are related in his book, *Phi*.

Giulio Tononi, *Phi* (New York: Pantheon 2012).

Item 72. Pinker's list is on page 558 of *How the Mind Works*.

Item 78. My original game theory reference was (originally published in 1957)

R. Duncan Luce and Howard Raiffa, *Games and Decisions* (New York: Dover 1989).

Item 79. Axelrod describes his tournament in

Robert Axelrod, *The Evolution of Cooperation* (New York: Basic Books 1984).

I first read about it in an article entitled *Cooperation: The Ghost in the Machinery of Evolution* by John Casti in

John Casti and Anders Karlqvist, editors, *Cooperation and Conflict in General Evolutionary Processes* (New York: John Wiley & Sons 1995).

An updated treatment of the evolution of cooperation in humans is

Samuel Bowles and Herbert Gintis, *A Cooperative Species, Human Reciprocity and its Evolution* (Princeton: Princeton University Press 2011).

Item 83. Memes are introduced in Chapter 11 of Richard Dawkins' *The Selfish Gene*. Susan Blackmore's book explores memes to a great depth.

Susan Blackmore, *The Meme Machine* (Oxford: Oxford University Press 1999).

Item 90. Pascal Boyer's ideas are explained in his excellent book

Pascal Boyer, *Religion Explained* (New York: basic Books 2001).

Item 95. I found Johnson and Earle's book extremely helpful.

Johnson and Earle, *The Evolution of Human Societies, from Foraging Group to Agrarian State* (Stanford: Stanford University Press 2000).

Item 99. Two of my references for the specific history of the emergence of civilization are

T. Douglas Price and Anne Birgitte Gebauer, editors, *Last Hunters First Farmers* (Santa Fe: School of American Research Press 1995).

Michael Cook, *A Brief History of the Human Race* (New York: W. W. Norton 2003).

My father was avidly interested in archeology, especially ancient architecture and methods of construction. I inherited his interest. Archeological sites are always on my travel agenda.

Chapter 7 Power

Power is the crux of *the Philosophy for the Future*. This is the part of the book that is most uniquely mine, where the creativity is.

The conception of power developed in this chapter is mine, but the original inspiration was Nietzsche. The quote comes from *Thus Spoke Zarathustra,* Second Part, *On Self-Overcoming*. My version of *Zarathustra* is contained in *The Portable Nietzsche* which I bought while in high school. It is now falling apart. To date myself, the price on the cover is $2.85.

Walter Kaufmann, *The Portable Nietzsche* (New York: Viking Press 1968).

By the way, I really admire Walter Kaufmann. All of his Nietzsche translations are superb. One of my favorite philosophy books is

Walter Kaufmann, *Critique of Religion and Philosophy* (Princeton: Princeton University Press 1958).

The Bertrand Russell quote comes from his little book, *Power*, first published in 1938, which other than the quoted physics metaphor has little in common with my conception.

Bertrand Russell, *Power* (London: Routledge 1960).

Bacon's quote is from *Novum Organum* and was used already in Chapter 2, item 75.

Item 5. The Tooby and Cosmides evolutionary psychology primer is still online.

John Tooby and Leda Cosmides, *Evolutionary Psychology, a Primer*,
http://www.cep.ucsb.edu/primer.html

I also found the textbook by David Buss to be useful.

David M. Buss, *Evolutionary Psychology, The New Science of the Mind* (Boston: Allyn and Bacon 1999).

Pinker's *The Blank Slate* is a more popular treatment.

Steven Pinker, *The Blank Slate, The Modern Denial of Human Nature* (New York: Penguin Books 2002).

Item 13. The Zarathustra quote is from the first part, the speech entitled *On the Thousand and One Goals*. The second quote is from *Beyond Good and Evil*, section 23, Originally published in 1886. My yellowed copy is

Friedrich Nietzsche, *Beyond Good and Evil* (New York: Vintage 1966).

Item 14. The Zarathustra quote is from the second part, *On Self-Overcoming*. The first *Will to Power* quote is from section 685; the second from section 634.

Item 22. This quote is from *Vital Dust*, page 254.

Item 28. The view from nowhere is the title a thought provoking book by Nagel.

Thomas Nagel, *The View from Nowhere* (Oxford: Oxford University Press 1986).

Item 29. Daniel Dennett has written extensively and intelligently about the free will problem. The varieties of free will worth wanting is the subtitle of his book *Elbow Room*.

Daniel Dennett, *Elbow Room* (Cambridge, MA: MIT Press 1984).

Like me, Dennett believes free will is compatible with determinism. He makes a nice argument based of evolution in

Daniel Dennett, *Freedom Evolves* (New York: Penguin Books 2003).

Item 31. Carnap's explication of the compatibilist position is in his *Introduction to the Philosophy of Science*, page 220.

Item 34. The mathematical definition of an agent's power came to me one day as I was daydreaming in my cubicle at work. (Now I have a huge Vice President's office). I had been thinking for several weeks about how to make the concept of power precise so it could be used to define a proper utility. It was October 29, 1997.

Item 45. Russell's analogy is part of the quote cited at the beginning of the Chapter.

Item 48. I am a prodigious consumer of history. I love the stories, the role of contingency, imagining myself at a vastly different time and place, the patterns and flows, the human drama, the accomplishments and failures. I inherited a copy of Will Durant's *Story of Civilization* from my parents. Someday I hope to have the time to read all ten volumes.

Item 58. Both Jefferson quotes come from his first presidential inaugural address in 1801. It is available online.
http://jeffersonpapers.princeton.edu/selected-documents/first-inaugural-address-0

Item 60. Fukuyama is a contemporary writer who is thought provoking, but whom I agree with only some of the time.
Francis Fukuyama, *The End of History and the Last Man* (New York: Avon Books 1992).

Item 64. I have spent a good deal of my career practicing systems engineering. I led the systems engineering and integration team for the development of the Atlas V launch system, a multi-billion project.

Item 69. Paley's quote is a classic of pre-Darwinian thinking. Richard Dawkins' rebuttal is also classic. Some express trepidation at Dawkins' severe reductionism. I relish it. Reductionism is simply true in the sense of Weinberg's convergence of explanation. Paley's quote can be found on page 5 of:
Richard Dawkins, *The Blind Watchmaker* (New York: W. W. Norton 1987).

Item 70. Basalla's thoughtful book nicely traces the history and causes of the change in artifacts through time.
George Basalla, *The Evolution of Technology* (Cambridge: Cambridge University Press 1988).

Item 73. Norm Augustine is my former boss, many level above. I have had the pleasure of interacting with him in several capacities, most recently when he served as

the head of a Presidential commission examining human spaceflight. His ages of engineering is from the Fall 1994 edition of the magazine of the National Academies of Engineering, *The Bridge*. The article is entitled *Socioengineering (And Augustine's Second Law Thereof)*, adapted from remarks presented before the University of Colorado Engineering Centennial Convocation held in Boulder, Colorado October 1, 1993.

Item 76. This begins an important and meaty section. Ethical theory has long been held as that discipline most resistant to inroads by science. In a sense, that remains the case. There is a logical distinction between the explanatory-predictive function of science and the determination of rules of action for human agents. But principles of action can be informed by science and made coherent with the scientific worldview. That is what I have attempted.

My education in the philosophy of ethics has been influenced by many works. In keeping with the pragmatic spirit of my thinking, utilitarianism as first introduced by Bentham and Mill resonated. But I never could accept happiness as the measure of utility. I found *A Companion to Ethics* helpful as a guide to the myriad philosophical perspectives on the subject.

Peter Singer, editor, *A Companion to Ethics* (Oxford: Blackwell 1993).

Item 78. Donald Brown's list of human universals appears in his book

Donald Brown, *Human Universals* (New York: McGraw-Hill 1991).

I found it in

Michael Shermer, *The Science of Good and Evil* (New York: Henry Holt 2004).

Item 79. Hobbes' quote comes from Chapter XIII of the *Leviathan*, the first few sentences of the section: Out of Civil States, There is always Warre of Every One Against Every One.

Item 86. Mill's utilitarian theory has been very influential to my thinking. It connects ethics to decision theory, a very natural connection in my mind. My copy of his *Utilitarianism* is

John Stuart Mill, Utilitarianism (New York: Barnes and Noble 2005).

The quote is on page 7.

Larry Niven's *Ringworld* series is one of my all time favorites. Much to my delight he has recently come out with a series of prequel novels.

Item 89. Brad Hooker mounts an excellent defense of rule utilitarianism in

Brad Hooker, *Ideal Code, Real World*, (Oxford: Oxford University Press, 2000).

Item 96. This item begins a brief foray into practical ethics. One modern philosopher who had written much about practical ethics is Peter Singer. See for example:

Peter Singer, *Practical Ethics, Second Edition* (Cambridge: Cambridge University Press 1993).

Item 102. Rawls quotes are from *Justice as Fairness*, a hugely influential book with which I mostly disagree. The first quote is from pages 33-34, the second from pages 42-43.

John Rawls, *Justice as Fairness, A Restatement* (Cambridge, MA: Harvard University Press 2001).

Nozick's quote is the very last paragraph of

Robert Nozick, *Anarchy, State and Utopia* (New York: Basic Books 1974).

Item 104. The United Nations Charter can be found on their website.

Item 105. Hume's famous quote comes from *A Treatise on Human Nature*, Book III, Part I, Section I.

Item 110. This interesting perspective comes from page 7 of

Mary Midgley, *Beast and Man, Revised Edition* (New York: Routledge 1995).

Chapter 8 Vision

My vision is not unique in its broad outline. The uniqueness is the grounding and the anchoring to a goal. Carl Sagan shared this vision and was a superb spokesman. It was easy and natural to include his quotes for this penultimate chapter. The first quote comes from

Carl Sagan, *Cosmic Connection, an Extraterrestrial Perspective* (Cambridge: Cambridge University Press 1973).

The second Sagan quote is from his outstanding *Cosmos* series, first episode (chapter). The hardcover copy in my library was inherited from my dad.

Carl Sagan, *Cosmos* (New York: Random House 1980).

It is also fitting that Nietzsche is included here. One of my favorite Nietzsche quotes comes from the *Antichrist*, one of his last works, completed in 1888.

The Wilson quote is from the last paragraph of:

Edward O. Wilson, *On Human Nature* (Cambridge, MA: Harvard University Press 1978).

Item 7. This Nietzsche quote is from *The Will to Power*, section 383.

Item 15. I enjoyed Fukuyama's End of History. Very thought provoking.

Francis Fukuyama, *The End of History and the Last Man* (New York: Avon Books 1992).

Adam Smith's summary of capitalism is from Chapter II of *The Wealth of Nations*, published in 1776.

Item 16. Nietzsche introduces the idea of the overman in section 3 of the Prologue to the First part of *Zarathustra* (first quote). The German word is *übermensch*, sometimes rendered as Superman. I prefer Kaufmann's translation, overman. The second quote is from section 4 of the Prologue.

Item 25. The definition of Torino impact hazard scale can be found on the website of NASA's near earth object program: http://neo.jpl.nasa.gov/index.html.

Item 26. The doomsday argument was originally posed by in the late 1980's. My refutation (which seems to have settled the argument) was published in *Mind* in 2002.

George Sowers, "The Demise of the Doomsday Argument," *Mind*, Volume 111, Number 441, pages 37-45 (Oxford: Oxford University Press 2002).

Item 27. After I got the *Mind* article published, had a lively email exchange with Nick Bostrom. He was tough to debate. I think I won, but he never admitted defeat. Based on that debate, I probably would have revised my paper in detail but not conclusion. His book on the anthropic principle (including a discussion of the self sampling assumption) is probably more than should ever have been said on the subject.

Nick Bostrom, *Anthropic Bias, Observation Selection Effects in Science and Philosophy* (New York: Routledge 2002).

Item 28. The quote is from page 6 of

John Horgan, *The End of Science* (New York: Broadway Books 1996).

Item 31.

Hernando de Soto, *The Mystery of Capital* (New York: Basic Books 2000).

Item 34. Despite some flaws, Garreau's book provides a framework for discussion.

Joel Garreau, *Radical Evolution* (New York: Broadway Books 2006).

For a time, I was a member of the transhumanist association. I wrote an article about space for them. But many of the other members seemed obsessed with cryogenic storage of their bodies.

McKibben's position is described in his book:

Bill McKibben, *Enough, Staying Human in an Engineered Age* (New York: Henry Holt 2003).

Item 41. Barnet's excellent book is the best description of the current security situation in the world I've seen. After 9 years, it's still mostly relevant.

Thomas Barnet, *The Pentagon's New Map* (New York: Berkley Books 2004).

Item 42.

Thomas Friedman, *The World is Flat, a Brief History of the Twenty-first Century* (New York: Picador/Farrar, Straus and Giroux 2007).

Item 47. I've read most of Jared Diamond's books. The messages of Collapse are definitely worth thinking about.

Jared Diamond, *Collapse, How Societies Choose to Fail or Succeed* (New York, Penguin Books 2005).

Item 55. Much of this section and the subsequent few comes from the article I wrote for the transhumanists. The Boorstein quote is from the preface of his book *The Discoverers*.

Daniel Boorstein, *The Discoverers* (New York: Vintage Books 1983).

I found Turner's quote in Bob Zubrin's *The Case for Mars*, pages 295-296.

Robert Zubrin, *The Case for Mars* (New York: Touchstone 1996).

Item 59. Nikolai Kardashev first explained his scale in a 1964 article published in the journal *Soviet Astronomy*.