Book Reviews

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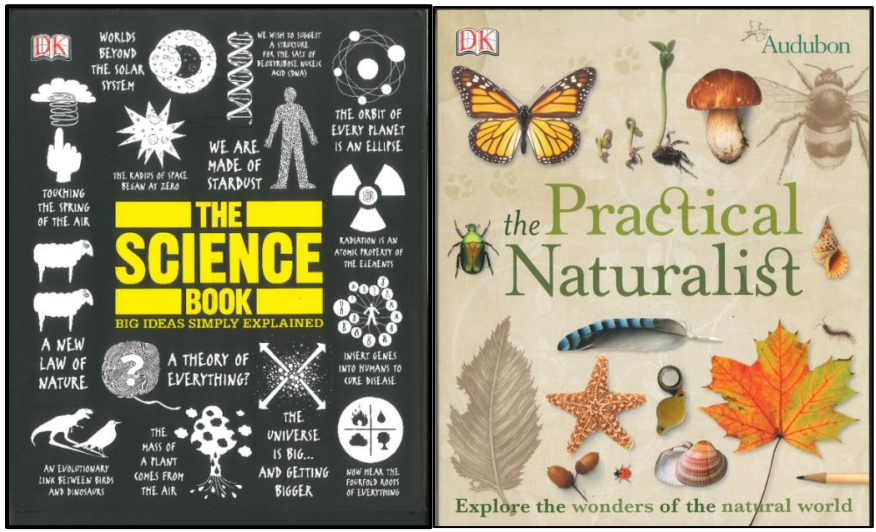
Who is not delighted to receive a gift one really wants? Although I have always been grateful for the good intentions, it is certainly a happy moment when the giver seems to know what is in one's heart and, it means a little extra when it is a wonderful surprise. Last month, a kind person gave me two books, both of them related to my long held interests in history of science and in natural history. Below, I review both of them highlighting topics that interested me



The Science Book: Big Ideas Simple Explained

By Adam Hart-David (Consultant Editor), John Farndon, Dan Green, Derek Harvey, Penny Johnson, Douglas Palmer, Steve Parker, and Giles Sparrow. 2014. DK Publishing. New York, NY, USA. 353 pp. ISBN:978-1-4654-1965-1 (hardbound, in English)

How many times have we wondered, "what is happening right now elsewhere?" and, likewise, particularly when realizing what we experience is so influenced by our immediate neighborhood, how were things done elsewhere in in space and time? History, and this is one of the reasons why I like it so much,

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helps us break with the naïve notion that things have always been the way they (allegedly) are, as if things were akin to some sort of universal laws.

The Science Book: Big Ideas Simple Explained briefly discusses major ideas in the history of science and does that in approximate chronological order. It is subdivided into major sections, such as *The Beginning of Science*, *Scientific Revolution*, etc., all denoted by large, visually impressive, bold print in red paper, followed by subsections, each designated by different colors. Subsections, for example, *A falling body* (pp. 42-43) and its standard bearer (e.g. Galileo Galilei 1564-1642), are generally organized approximately following a template. This approximate template generally includes placement of the topic in a historical context (before and after), diagrams, an image of the scientist and his/her key works, a brief topical concordance "See also", etc. The font was legible to this reader and the text as well as other materials did not feel crammed. Below, I highlight some of their viggettes – mostly those pertaining to biology - that captured my attention and divide this review in sections, reorganized and created by me, in *Italics*.

Early history of science. The book begins with small sections on *The scientific method*, *The first scientists* and *Stargazers*. How many times have I convinced my students that we are all scientists, at one moment or another! For instance, when we meet other people – I tell them – and someone looks at us, we may sometimes wonder, "does s/he like – or "dig" as some of my students say - me?" Wonder – as Confusius would have said – or doubt – as Descartes would have explained – are knocking at the doors of our consciousness. After rapidly putting together simple explanations and hopefully contrasting outcomes, called hypotheses, we follow up with an "experiment", as we may further interact with the other person. I had the priviledge of receiving an excellent high school education in the Puerto Rican public school system. Yet, our "home room", the history class, did not include the Middle Ages. History ended with Rome's ramsacking in 476CE and somehow it jumped to the Rennaissance. A few summers later, I got a hold of a seamingly arid Medieval history book that became a beautiful walk through a garden filled with flowers as it confirmed my suspiciouns that a lot had happened during that allegedly dark millenium. As a biologist, p. 23 of *The Science Book* has the first big bang for me, a quote by Nasir al-Din al-Tusi (1201-1274), "The organisms that can gain the new features faster are more variable. As a result, they gain advantages over other creatures." How much of our modern knowledge perhaps was already glimpsed by our predecessors centuries ago? This reminded me of the phrase "live long and prosper", which, sadly, is remembered mostly as the Vulcan's salute popularized by Mr. Spoke of the television series *Star Trek*. Yet, one of my former students, Ms. Melissa Baker Wredt, recently taught me, that centuries earlier, "Live, and be prosperous" were Romeo's last words to his servant, Balthasar before he entered Juliet's tomb to commit suicide (*Romeo and Juliet* 1597 by William Shakespeare 1564-1616, http://shakespeare.mit.edu/romeo_juliet/full.html).

Atoms and Molecules. Enormous advances in our understanding of the molecular basis of life and how to use it for the benefit of humankind, including horizontal gene transfer (pp. 318-319)gene therapy (pp. 322-323), and biotechnology (pp. 324-326), etc. are described on the last pages of *The Science Book.* In introductory biology courses, we typically begin with atoms and molecules. Yet, sadly, 83 years after subatomic particles were discovered, our introductory books still tend to tell us that everything is protons, neutrons, and electrons (http://www.particleadventure.org/).

Cell Biologyy. Robert Hooke (1635-1703), of *cellula* fame, appears on p. 54 of *The Science Book.* Antonie van Leeuwenhoek (1632-1723, gets it place (pp. 56-57) but not without a mention of predecessors who used magnifying devices well before he did (see also http://www.ancient-wisdom.com/optics.htm). Whenever I prepare for class, I look deeper into so-called facts, particularly their origins, and, from time to time, I find a potential gem of potential historical interest. In this case, there appears to be some controversy as to the real originators of the concept of the cell theory that became a fact of biology in the second part of the 19th century. Jan Ingenhosz (1730-1799) discovered photosynthesis, the mechanism that generates the mass of the plants. Yet, before him, importantly Jan Baptist Van Helmont (1580 - 1644) had observed that the vast majority of the mas of a plant comes from air. If one googles "where do trees get their mass" and click on videos, one will be launched to videos that clarify this common misconception. Another important contributor to early botanical studies was Charles Bonnet (1720-1793), a deaf blind naturalist, who discovered that aquatic plants produce gas bubbles when illuminated. For decades, the later has been a common exercise in introductory biology laboratory exercises.

Evolution. Some of the most interesting advances in science have been those involving inferences of things one cannot "see". In other words, the concept of "observation" goes beyond seeing something with our unaided eyes. Luigi Galvani (1737–1798) suggested that life had something to do with electricity (ca. 1780) when a recently-killed frog could still twitch its legs when touch by metals. This created a flurry of "galvanism" in Europe. Sometimes ideas that are in the cultural "air" are coopted by scientists; other times is the reverse. It appears that Mary Shelley's *Frankenstein* has an indirect influence from Galvani's bioelectricity. Spurred by the need of fueling the expanding Bristish Empire, the geological map of part of the UK was generated by William Smith (1769-1839). Discoveries of fossils by Mary Anning (1799-1847) and many others strongly suggested that Earth had been a very different place eons ago. Further blurring the artificial boundaries between life and non-life, Friederich Wöhler (1800-1882) synthesized urea, a compound found in urine believed to be made only by living things, from inorganic compounds. And Leo Bakeland (1863-1944) further transformed organic compounds into larger, artificial, and useful polymers, such as plastic (pp. 140-141).

Ecology. Also during high school, something got inside me that compeled to see science movies. I asked my parental grandfather, Julio, to drive me to a vault of videos aat that time located in the Department of Public Instruction in Santurce, a suburb of San Juan. Then, I got to see a re-creation of Gaspard-Gustave De Coriolis' (1792-1843) simulations. The result of placing a ball in a merry-go-round is that the ball, representing the winds or ocean currents, are deflected (p. 126), a phenomenon that received the name of "Coriolis Effect". Later on, *The Science Book* teaches us that Captain Robert FitzRoy (1805-1865), had subsequent professional lives following the famous *Voyages of the Beagle* that took Charles Darwin around the globe. He became head of the British Meteorological Office greatly contribution to the idea that short-term weather can be prognosticated. Ironically, as I write these comments, in a beautiful sunny yet cold mid January day, I remember that it was supposed to be much colder and possibly snowy. The idea of interactions among all living and non-living things is introduced with Alexander von Humboldt (1767-1835) as the standard bearer (pp. 132-135), one of the largest vignettes in the entire book. Interestingly, while those interactions are not of equal importance, Humboldt was one of the first who pointed the connectedness of everything. This idea influenced the Gaia hypothesis some 200 years later. Although Humboldt was one of the most celebrated naturalists in westen Europe during the first half of the 19th century, his fame waned (http://news.nationalgeographic.com/2015/09/150913-humboldt-south-america-nature-book-talk-simon-worrall-andrea-wulf-darwin-orinoco/). Humboldt's most memorable work was the multivolume opus, *Kosmos*. At times, I have wondered how much of Humboldt's attitude towards knowledge and discovery there was Carl Sagan and in his *Cosmos*.

A small Directory of some of the many worthy scientists who did not make it into the main text, the preceeding 300 pages. It must have been a difficult process to decide who to include and the many that surely needed to be left behind. A modest Glossary and an Index close the book. Wholeheartedly, I recommend this book to anyone wishing to become familiarized with some of the highlights in the history of science.

The Practical Naturalist. Explore the Wonders of the Natural World

Audubon. By Chris Packham (Consultant Editor), Steve Backshall, David Chandler, Chris Gibson, Robert Henson, Rob Hume, James Perry, Katie Parsons, Elizabeth White, and Steve Kress. 2010. DK Publishing. New York, NY, USA. 245 pp. + additional pages, including Glossary, Index, etc.
ISBN:978—0-7566-9899-1 (softbound, in English)

When I opened the book I felt reminded of the words attributed to Socrates (Athens, ca. 470/469 – 399 BCE), "to wonder is the beginning of wisdom". This

marvelling at the wonders of nature is how I begin my never ending parth of dicovery that makes me feel like going to work is about the joy of opening presents and telling others what I have found out that day.

Copiously illustrated, *The Practical Naturalist* by Packham and collaborators introduces readers to the natural world throught (sometimes too) tightly packed vignettes with color illustrations. Instead of cutting across nature taxonomically, this beautiful book is organized by location, from the web of life through the weather and skies to simplified versions of biomes, or the broad strokes vegatational organization of the land masses on Earth. The authors also discuss habitats that are more heavily affected by humans, such as their immediate dwellings and farms. Important biological concepts, such as the hierarchical organization of life, emphasizing the portion at and above the level of the individual. are clearly explained and illustrated. Successes of humans in bring species back from extinction, such as the California Sea Otter, are emphazised. In other words, in spite of the grave, global ecological problems of the 21st century, not all is gloom and doom.

A significant portion of *The Practical Naturalist* is devoted to physical sciences and the book is packed with great tidbits on astronomy, metereology, earth sciences, etc. Once the major setting is laid out, off we go to nature in our imagination, bit we need to pack some field gear and, as usual, the authors illustrate what we need and those pages will, I hope, reduce our lamentations about the piece of equipment we left at home, far aways to get it.

As we contemplate creatures closer to us in our homes and in farms, such as orb weaver spider, we are reminded of the magnifescence of nature's architecture and of the colorful dresses that angiosperms "wear" from time to time, the flowers, many of which are represented in *The Practical Naturalist.* After reading Godfrey's paper (p. 213 this issue), a spider web is no longer a place where spiders – and often, a host of other organisms – thrive, but also an incredible tough material from which humans have tried to make bandage-look alikes and, at times, canvases for paintings and fabrics. Images of our feathered friends reminded me of the over 50 species of birds we have seen in our little urban backyard in southern Pennsylvania over the years. I suspect that planting a hyperdiverse garden in constant change – yes, we are kept busy - have made a big difference that brings joy into our hearts. Because I have been priviledged to see nature with the powerful science tools that allows us to "see" nature beyond what what our eyes allow, I have found the wisdom in the words, "See how the flowers of the field grow. They do not labor or spin. Yet I tell you that not even Solomon in all his splendor was dressed like one of these." (Matthew 6:28-29, New International Version). As editor of scientific venues for over 15 years, some of the papers I have enjoyed the most receiving and sending out for peer-review are those written by so-called amateurs. These colleagues often devote countless hours in a labor of love, researching nature without remuneration other than their inner satisfaction.

And unto the forest beyond our homes and farms we go! As in *The Practical Naturalist*, every time I have stepped in a seeminly "simple" forest or little creek, I never ceased to be amazed at the enormity of the diversity and the joy my students seem to be experiencing by simply paying attention and becoming aware. My first visit to a real forest was in the company of one of my most memorable professors. This is how it happened. This faculty member was a little different from most others I have had before or after. He asked the handful of survivors that early in the semester, "who wants to ride with me". As I had only seen before in episodes of *The Three Stooges*, I was the only one not man enough to take a step back. Off I went with him on an orange "thing" feeling I was saluting death at every turn on the road. In the black mangrove, as we were surrounded by pnematophores, he asked us not to on the pneumatophres ("por favor, no pisen los pneumatóforos") forest. And in the linstone hill forests, when we saw a fence made out of rotting wooden poles and cut chicke wire, he alterted us that it could be electrified, "tengnan cuidado, puede estar electrificada". Yet, in both places, we went onwards and I learned. I have returned to the same sites and many others, over and over, always enjoying what I do and being happy what I learn. Research question after research question scream in front of us, begging to be answed. Often, it does not take lots of money but motivation, persistence, and using our heads, these days called "critical thinking". If we see a cut woody portion of a tree, we may see the rings and, with that, a glimpse into the past. With some polishing, a good microscope, and very precise ruler, one can measur eteh width of the rings and say something about the local climate. Other natural specimens, fossils, and modern tools allow us to see far deeper into the vastness of the past. The same professor encouraged me to pursue a summer course in marine biology and, as in *The Practical Naturalist*, inspired me to continue pursuing a never-ending voyage of discovery I hope to continue enjoying ans sharing with others in years to come.