

**The Evolution of Scientific Knowledge: Vintage and Antique  
Textbooks of the Natural and Physical Sciences**

**A Collection by Laci Gerhart  
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## **The Evolution of Scientific Knowledge:**

### **Vintage and Antique Textbooks of the Natural and Physical Sciences**

My collection began by accident in the spring of 2006 as I approached the completion of my bachelor's degree in Ecology and Evolutionary Biology at the University of Kansas. At the time, I worked as a student hourly at the Institute for Educational Research and Public Service, a research grant management agency housed in the School of Education at KU. That May, my coworker, Nan, presented me with a gift from her personal collection of antique textbooks spanning a wide variety of disciplines. The gift was a 1939 textbook titled *Exploring Biology*, and Nan's accompanying card congratulated me on completing my degree and added "I hope that you enjoy exploring the contrasts between then and now."

Nan's gift reminded me how much I had enjoyed antiques as a child and inspired me to begin my own collection. As a child, I grew up surrounded by vintage and antique items of all kinds. The bulk of the furniture in my childhood home was from antique stores, junk shops, and estate sales and our house was nearly overflowing with antique books, vintage clothes, and antique accessories and household accouterments. Upon moving to college, I had unintentionally removed myself from virtually anything vintage or antique, but *Exploring Biology* reintroduced me to my love of antiques. Having always been interested in science from a very young age, and having just completed a degree in biology, I focused my collection on textbooks relating to the natural and physical sciences – primarily biology, geology and astronomy.

Though the books in my collection all focus on scientific knowledge, they can be separated into different groups. Some are geared towards inspiring an interest in science in young people, while others are college or professional textbooks. Some contain theoretical

knowledge and basic science, while others are more applied, dealing specifically with such industries as agriculture and livestock management. Many I found at antique malls and used bookstores, while others once belonged to close family and friends. All of them, however, show not only how scientific knowledge has changed through time, but also how our communication of scientific issues (especially to the public) has also changed. I am currently a PhD student in the Ecology and Evolutionary Biology Department at KU and am studying how climatic change (specifically increases in atmospheric carbon dioxide concentrations) affect plant physiology. Instead of focusing on future climate change, I am analyzing the effects of past changes, using 50,000-year-old tree remains to assess the impact of natural and anthropogenic climate change on plant physiology. In this way, my research is closely aligned with my collection; it is important to look to the past to understand the present and better prepare for the future.

During my time at KU, I have become highly interested in scientific outreach to the public. I believe it is the job of scientists to accurately and clearly convey scientific information to the general public and to policy makers. I also participate in a number of science instruction programs geared towards children, to instill early on an interest in science. I therefore, find it interesting that the textbooks in my collection that are geared towards the young are consistently the oldest books in the collection. I believe this reflects one of two things: 1) we no longer have a dedication to scientific education in children, or 2) we no longer have a dedication to children enjoying reading. The outreach programs with which I have been involved suggest that we as a scientific community are still attempting to reach young people, so perhaps the issue lies more with children's interest in books. This concerns me, as reading was one of my personal favorite pastimes as a child, and because reading is a fun and easy way to learn about the world around you, see new perspectives, and broaden your intellectual horizons.

Another shift this collection shows is the change in how scientific knowledge is communicated. Many books, particularly those from the turn of the 20<sup>th</sup> century, display heavy religious overtones in their descriptions of nature (for example, the chapter of one book titled “How Plants Marry” followed by “Various Marriage Customs”). Some also blatantly personify the plant community, describing for example how plants ‘eat’ and ‘drink.’ This is in direct contrast to science writing today, which is usually intentionally devoid of any religious references or anthropomorphizing language. On one hand, personification is a way to show similarities between human behavior and plant physiology; however, such language can often misrepresent the facts, and overlooks the differences that make plants unique and exciting.

Nearly every book also uses much more flowery and descriptive language than is common in science writing today. For example, the subtitle of one of the astronomy texts is “The Splendor of the Heavens Brought Down to Earth.” As a scientist, such verbiage sounds almost silly to me and not the type of language for serious scientific communication. Still, I think we scientists may have taken the seriousness of our writing too far. A little poetic phrasing keeps the reader’s interest and can be used judiciously without compromising the accuracy of the information conveyed. Writing style is one aspect of science where I think we can learn quite a bit from past strategies; while the older textbooks may have overused their poetic license, we today make the equal and opposite mistake of under using it.

Perhaps most interesting to me personally, and reflecting the original intent of the collection, are the differences these books show in scientific knowledge between the dates of their publication and today. My favorite example of this is the 1947 book *A Textbook of General Botany*, which covers the classification of plants, as it was understood at that time. The advent of molecular genetic techniques, as well as simply 65 years of additional basic research, has

drastically altered the classification of many of the organisms included in this book, such as bacteria, fungi and slime molds, none of which are now classified as plants (see annotation for more information). The books in the collection that discuss climate, and changes in climate through time, are also quite telling. The study of past and future climate change is quite new (many of the foundational advances were made in the early 1990s), and so books from the 1930s or 1940s could not possibly reflect the depth of understanding we have today on the impacts of and controls over climatic processes. What is most interesting to me, however, is that even without much of the techniques we have today, scientists were interested in climate change and already trying to assess what sorts of changes are ‘normal’ and what are outside the natural range of variation. These are questions we will likely never be able to answer fully, but it is fascinating to see how such questions were formed and addressed so many decades ago.

The various fields of science are often very forward-thinking. Scientists pursue new knowledge, new ways of understanding, new techniques and new approaches that were not available or possible in the past. Past knowledge and strategies are often treated as out-dated and discarded, even if only a decade old. Science is fast paced, and it is easy to forget the value of ‘old’ information and ‘old’ styles of communication. My research focuses on learning from the past through sub-fossil plant remains, and this collection represents a way for me to more personally learn from the past. The books I have gathered together here remind me to take an active role in keeping young people interested not just in science, but also in reading; they remind me to not get bogged down in technical language, but remember that science can also be poetic; and they remind me that science does not exist in a vacuum, like all other things in this world it is a product of its own past, a past that must be remembered and celebrated.

## Bibliography

Alexander, G. *An Outline of General Zoology*, New York: Barnes & Noble, Inc., 1946.

Allen, G. *Stories of the Universe: The Plants*, New York: Appleton & Company, 1909.

This book is the perfect illustration of the difference in writing styles between the early 1900s and today. For example, this book is part of a series from The Library of Useful Stories. Chapter titles include “How Plants Eat,” “How Plants Marry” and “Various Marriage Customs.” The mish-mash of scientific descriptions and religious overtones is strange and amusing. Even so, I like the phrasing of describing how plants ‘eat’ and ‘drink’ even if it is somewhat inaccurate scientifically. In my teaching experience at KU, I frequently have to overcome the students’ assumption that plants are boring and ‘don’t do anything’ – which is patently false. They do eat and drink, just not quite the same way animals do. I doubt I would go so far as to say that plants marry, however.

Baker, R.H. *Astronomy: An Introduction*, New York: D. Van Nostrand Company, Inc., 1933.

In going through my grandfather’s house after his passing in 2004, I discovered a number of his old textbooks. I was especially excited about this one because amateur astronomy was a hobby that he and I shared. Due to his failing health, we had been unable to go stargazing together for many years. Even so, we frequently discussed my stargazing escapades and any exciting upcoming astronomical phenomena. He taught me so much about astronomy, and really is the reason I continue to be interested in the field today, and I love this book for instilling the same passion in him. The inside cover also contains the signature of the author, with an inscription to the book’s first owner.

Baker, R.H. *Astronomy for Everybody*, Garden City: Country Life Press, 1932.

Blaisdell, A.F. *A Practical Physiology*, Boston: Ginn & Company, 1897.

Blanchan, L. *Little Nature Library: Birds Worth Knowing*, Garden City: Doubleday, Page & Company, 1917.

Blanchan, L. *Little Nature Library: Wildflowers Worth Knowing*, Garden City: Doubleday, Page & Company, 1917.

Bonner, J.T. *The Ideas of Biology*, New York: Harper & Brothers, 1962.

Bradbury, R.H. *A First Book in Chemistry*, New York: Appleton & Company, 1922.

Brigham, A.P. *A Text-Book of Geology*, New York: Appleton & Company, 1906.

Conn, H.W., Budington, R.A. *Advanced Physiology and Hygiene*, New York: Silver, Burdett and Company, 1909.

Conte, J.L. (revised by H.L.R. Fairchild), *Elements of Geology*, New York: Appleton & Co., 1904.

Coulter, J.M. *Plant Studies: An Elementary Botany*, New York: Appleton & Company, 1910.

Dole, S.H., Asimov, I. *Planets for Man*, New York: Random House, 1964.

Gray, A. *Botany for Young People: How Plants Grow*, New York: Ivison, Blakeman, Taylor & Co., 1858.

At 154 years old, this book is the oldest in my collection, and in surprisingly good condition. I chose this book for two reasons: first, the cover displays a beautiful drawing of several children planting a garden, surrounded by an arbor of a variety of flowering plants. Second, it is one of several books in my collection geared towards children, and I love the idea of “textbooks” for kids. The book is simple in its descriptions, but uses technical botanical terms, which are accompanied by footnote definitions and detailed drawings. I believe it is never too early to introduce children to biology and the study of the natural world, and that it is possible to do so with the correct terminology and not have to ‘dumb down’ the information.

Hall, E.R. *Handbook of Mammals of Kansas*, Topeka: Ferd Voiland Jr. State Printer, 1955.

Hardin, A.M. *Astronomy: The Splendor of the Heavens Brought Down to Earth*, Garden City: Garden City Publishing Company, Inc, 1935.

Hooker, W. *Children’s Book of Nature in Three Parts, Part I: Plants*, New York: Harpers & Brothers Publishers, 1874.

Though not the oldest book in the collection, this book is in very delicate condition, which I like to believe is because it has been read and appreciated many times in its nearly 140 years of existence. This is another book in my collection geared towards children, and in its preface explicitly urges parents to read the book as well, and learn about the natural world with their children. When I was young, many of my family vacations were at state and national parks and focused on hiking and camping, and just “being in nature;” the kinds of experiences and interactions that this book promotes. I believe these family nature outings are largely responsible for my choosing to pursue a career in biology.

Hunt, T.F., & Burkett, C.W. *Soils and Crops*, New York: Orange Judd Company, 1915

Hunter, G.W. III, & Hunter, F.R. *College Zoology*, Philadelphia: W.B. Saunders Company, 1949.

This book is also one I discovered amongst my grandfather’s things after he passed away. My grandfather attended KU following his military service during World War II. This book was one of his textbooks during his time at KU. He and my grandmother remained in Lawrence for nearly 60 years, and continued to follow KU news and athletics, and I know he loved his time as a Jayhawk. Though he never completed his degree, his dedication to science and life-long learning contributed to our close relationship.

Kansas State Board of Agriculture. *Thirty-First Biennial Report of the State Board of Agriculture, Kansas*, Topeka: Kansas State Printing Plant, 1939.

As someone born and raised in Kansas, and now researching the impacts of climate change on plant physiology, it is not surprising that I am also interested in the agricultural impacts of future climate change. This textbook is particularly fascinating as it reflects the climatic, political and social complexities surrounding one of the most difficult times in Kansas' agricultural history. The 1930s saw some of the hottest and driest years on record in Kansas, and this book highlights the struggles of the Kansas farmer during this time, but also emphasizes what few positives existed: the adaptive management strategies farmers were attempting to employ, the few crops that maintained high yield (even if low market prices still reduced farmer's profits), and even personal profiles of successful farmers throughout the state.

Perhaps the most interesting section is the chapter titled "Is the Climate of Kansas Changing?" This section highlights our inability to look at long-term trends, and lists a number of popular fallacies of what causes droughts, including increased plowing of land, disturbance by radio broadcasting and (my personal favorite) "a general lowering of moral conditions." The overall tone of the argument is that climate follows natural oscillations of warmer/drier and cooler/wetter trends and that the extensive drought of the 1930s was only a severe oscillation in an otherwise 'normal' pattern. This argument is evidenced in the quote "Science so far has found no way of determining the ultimate cause of droughts or how long they may last, but it is able to assure us there has been no apparent change in the cosmic order of the universe that will interrupt the irregular pattern of dry and wet cycles we have always experienced." While this statement was true in 1939, I would argue that science today has clearly documented a significant change that will interrupt (or some would argue, already has interrupted) the current climate pattern. Future climate change projections show Kansas as being one region that is especially dynamic and difficult to predict with much certainty what kind of changes in weather and climate we can expect to see over the long term. Future Kansas farmers may find themselves in a similar quandary as those during the 1930s – caught up in a complex mix of climatic anomalies, volatile market behavior and political strife.

Prescott, S.C., & Winslow, C.-E.A. *Elements of Water Bacteriology*, New York: John Wiley & Sons, Inc., 1915.

Raymond, P.E. *Prehistoric Life*, Cambridge: Harvard University Press, 1939.

Rogers, J.E. *Little Nature Library: Trees Worth Knowing*, Garden City: Doubleday, Page & Company, 1917.

Schmucker, S.C., *The Study of Nature*, Philadelphia: J.B. Lippincott Company, 1908.

Sharpe, R.W. *A Laboratory Manual for the Solution of Problems in Biology*, New York: American Book Company, 1911.

Smith, E.T. *Exploring Biology*. New York: Harcourt, Brace and Company, 1939.

*Exploring Biology* was the first book in my collection, and was a gift from my coworker upon my graduation from KU with my bachelor's degree in 2006. She had maintained a collection of old books on a variety of topics for many years, and had taken this book out of her

collection as a gift to me. My favorite part is a note from one of the original owners on the inside cover that reads “turn to page 519” – on page 519 is an illustration of two dinosaurs in what was not intended to be a suggestive pose, thus showing that students in 1939 were not all that different from students today....

Smith, G.M., Gilbert, E.M., Evans, R.I., Duggar, B.M., Bryan, G.S., Allen, C.E. *A Textbook of General Botany, 4<sup>th</sup> Edition*, New York: The Macmillan Company, 1947.

This book is the one of the best examples in my collection of how much scientific knowledge has changed over the years. This is primarily because this book is organized taxonomically – instead of grouping chapters on processes (reproduction, respiration, photosynthesis), this book groups chapters by species groups. Taxonomy and phylogenetics (the fields of naming/grouping species, and determining their evolutionary relatedness) are highly dynamic fields of biology and species groupings are constantly being updated. For instance, this book on plants contains a chapter on bacteria, several chapters on various types of fungi, and even a chapter on slime molds! Bacteria are now classified in their own domain (the highest classification level), while fungi make up their own kingdom, separate from the plant and animal kingdoms, though all are within the domain Eukaryota. Slime molds are even more confusing – they were once in Kingdom Protista, which is a catch-all kingdom of organisms that do not neatly fit in any other kingdom. Kingdom Protista is highly contested amongst scientists as a grab-bag of ~50 groups that we do not really understand is not a solid foundation for a phylogeny. Slime molds are now classified in Kingdom Amoebozoa, which is thought to be more closely related to animals and fungi than to the plant kingdom. I am sure that in 60-70 more years, the above paragraph will be equally inaccurate. And that is why I love science – there is always more to learn, always new methods and techniques to understand the world around us, which means that we are always revising and updating our knowledge.

Sokal, R.R., & Rohlf, F.J. *Biometry*, San Francisco: W.H. Freeman & Company, 1969.

This is one of the newer books in my collection, though I did not choose it for its age. My first year of graduate school, I took Biometry, the textbook for which was the third edition of this book (published in 1994). One of the reasons I started this collection was to see how much knowledge has advanced over the decades. It is not unusual for biology textbooks to issue new editions every 2-3 years; however, the field of statistics does not require such frequent updates. The only major differences between this edition and the one I used in class is the technology – the 1969 edition describes how to perform certain calculations on your ‘electronic desk calculator’ or early computers; the 1994 edition covered differences in common software packages. The math, however, is still the same.

Storer, T.I. *General Zoology*, New York: McGraw-Hill Book Company, Inc., 1943.

Tarr, R.S. *First Book of Physical Geography: Kansas Edition*, New York: The Macmillan Company, 1897.

Thompson, L.R. *Introduction to Microorganisms*, Philadelphia: W.B. Saunders Company, 1944.

Timbie, W.H. *Elements of Electricity for Technical Students*, New York: John Wiley & Sons, Inc., 1910.

Twenhofel, W.H. & Shrock, R.R. *Invertebrate Paleontology*, New York: McGraw-Hill Book Company, Inc., 1935

United States Department of Agriculture, *Climate and Man: Yearbook of Agriculture*, Washington D.C.: United States Government Printing Office, 1941.

My dissertation research focuses on the effects of climate change on plants, so naturally, when I saw this book on the shelf at a used book store, the title immediately caught my eye. I wondered what a government organization would have to say on the relationship between climate and man in 1941. Obviously the book does not deal with any issues surrounding human-caused climate change, as this was not a topic of discussion in 1941. Still, the book does cover in detail how climate has changed through time (as it was understood at this time, at least), and how climates differ between regions of the world, focusing on the impact these differences have on agriculture and the strategies farmers have developed to overcome these challenges. Though my research does not focus on agricultural species, my research does have implications for agriculture. Also, having grown up in Kansas, I am personally interested in the impact of climatic change on agriculture and farming communities. This book reminds me that such concerns are not new, regardless of the political debates surrounding such a controversial topic.

von Bertalanffy, L. *Problems of Life*, London: Watts & Co., 1952.

This book is another great example of amusing phrasing in older textbooks. I found this book in a second hand store and the title quickly caught my attention. "Problems of Life, eh?" I thought, and opened the book to the contents page and scrolled down the chapter titles. Funny... I did not see any chapters on dating, or dealing with overbearing parents, or any of the other 'problems of life' I had experienced! Instead, the titles include "Evolution: The Tibetan Prayer-Wheel," "The World of Supra-Individual Organizations," and "The Nervous System: Automaton or Dynamic Interaction?" which are somewhat amusing in themselves.... Even now, when I scan over the books on my shelf, I still chuckle at this title.

Walter, H.E. *Genetics: An Introduction to the Study of Heredity*, New York: The Macmillan Company, 1919.

Weed, C.M. *Little Nature Library: Butterflies Worth Knowing*, Garden City: Doubleday, Page & Company, 1917.

Wells, H.G., Huxley, J.S., Wells, G.P. *The Science of Life*, Garden City: Country Life Press, 1934.

Wertheim, E. *Introductory Organic Chemistry*, Philadelphia: The Blakiston Company, 1942.