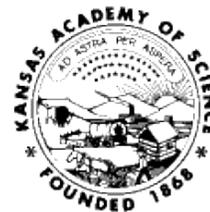


# KAS BULLETIN



## NEWSLETTER OF THE KANSAS ACADEMY OF SCIENCE

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February, 2021



### 153<sup>rd</sup> ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCE

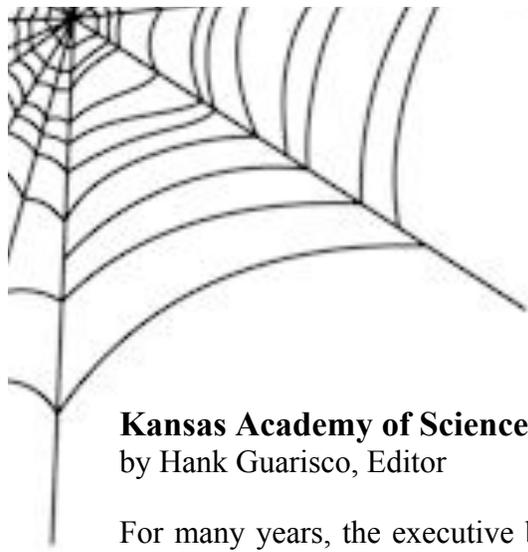
April 10<sup>th</sup>, 2021  
Via Zoom!



The 153<sup>rd</sup> annual meeting of the Kansas Academy of Science will be held virtually via Zoom on April 10<sup>th</sup>, 2021. Please check the KAS website for more information regarding abstract submission and registration. The schedule and Zoom link will be posted by the end of February.

The Saturday session will include oral and poster presentations.

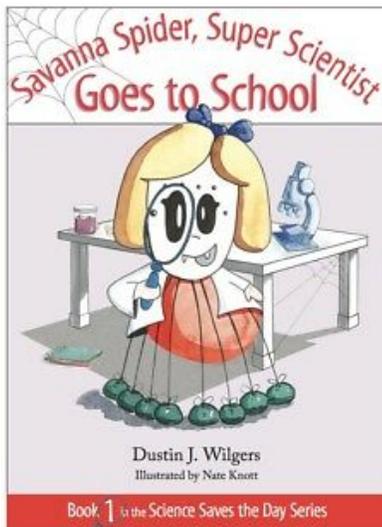
**WE LOOK FORWARD TO SEEING YOU  
ONLINE!**



## Kansas Academy of Science Outreach Program and Book Review

by Hank Guarisco, Editor

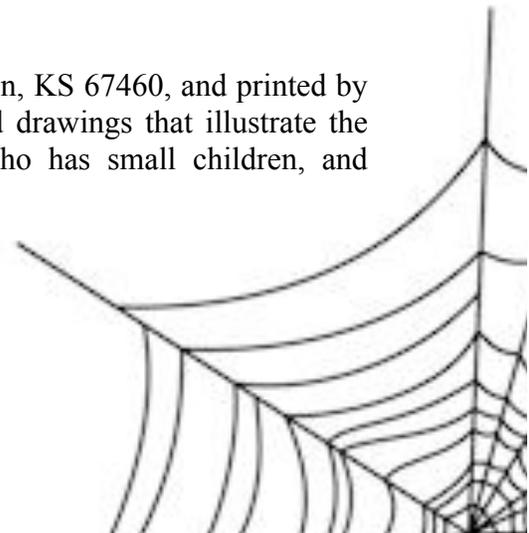
For many years, the executive board of the Kansas Academy of Science has mulled over different strategies to make our society more relevant to scientists, students, and the public at large. Our current president, Dustin Wilgers, a professor at McPherson College, has recently furthered this effort by securing a Chickadee Check Off grant from the Kansas Department of Wildlife, Parks, and Tourism to publish two children's storybooks involving a lead character who is a spider named Savanna.



The first book entitled, *Savanna Spider, Super Scientist Goes to School*, relates how Savanna goes to school at Arthur O. Pod Elementary for the first time and finds out where she belongs, namely in what class. She visits several classrooms occupied by different types of students. There is a class for millipedes, one for higher crustaceans, one for insects, and she finally meets the teacher of the Arachnid class, Mr. Vinnie Garoon. Facts about spiders are scattered throughout the story and highlighted by a small orb web. This leads the reader to a gray box with more information. The last section of the book, entitled “More Science Behind the Story,” presents a condensed discussion of classification and the characteristics of each of the four “classes” of arthropods Savanna encountered that day.

The second book, *Savanna Spider, Super Scientist and the Science-Fair Mystery*, is an interesting story of discovery. Savanna uses the scientific method to solve a puzzle: why her science experiment went so very wrong, and who was the culprit. Along the way, facts concerning how crickets make their characteristic sound, that vinegaroons can squirt vinegar from the base of their tails, female mosquitos and ticks feed on blood while male mosquitos sip nectar, arthropod growth and molting, are presented in a clear, simple fashion. The last section of the book explains the scientific method, and how Savanna used it to solve the mystery.

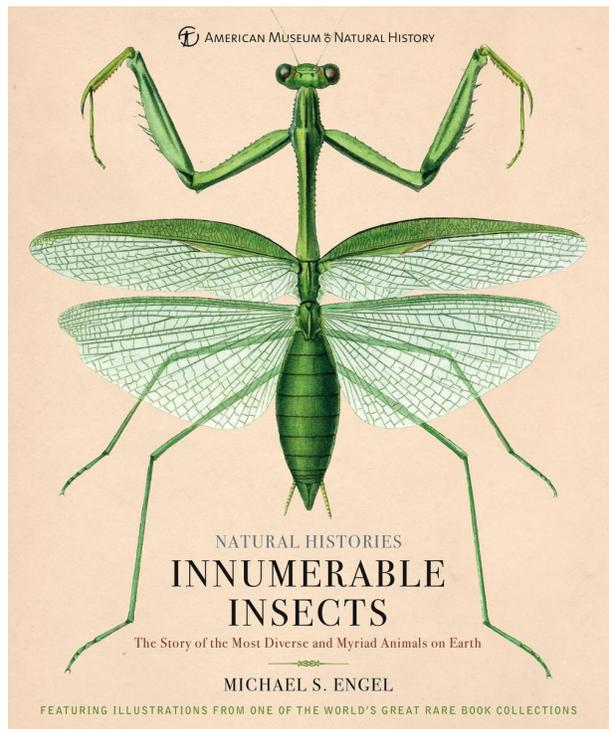
Both books, published by Author's Voice, 1315 East Euclid, McPherson, KS 67460, and printed by Mennonite Press, Inc., in Newton, are easy to read, and contain good drawings that illustrate the characters and parts of the story. I recommend them to anyone who has small children, and commend the author on his outreach efforts.



***Innumerable Insects* by Michael S. Engel 2018**  
**American Museum of Natural History Pub., 214 p.**  
Book review by Hank Guarisco, Editor.

This incredibly delightful book, written by eminent University of Kansas entomologist, Michael Engel, presents the natural history of insects. Its goal is eloquently expressed in the book's subtitle: "the story of the most diverse and myriad animals on earth." The text is amply illustrated with beautiful images taken from ancient entomological works found in one of the world's great rare book collections at the American Museum of Natural History.

A quote from the introduction adequately conveys the author's deep sentiments as well as his accomplished, fluid writing style: "Great works of the past, originals of which are now difficult to find, reveal to us the evolution of information dissemination and artistic representation in science, as well as our own perceptions and interpretations of our world, while simultaneously telling us of the grandeur of insect diversity. Unlike today, publishing in the past was difficult, and not for the faint of heart. ...The total process could take years depending on the number of images and the number of copies to be made. The results of these labors were works of great scholarship and sublime artistic expression. The images herein are not mere adornments, but unique sources of scientific information." "It is the fallacy of present ages to assume that old is synonymous with anachronistic or, worse yet, faulty and worthless. In reality, care of observation and accuracy of representation in texts and images one hundred or more years old may surpass anything that we produce today." Some of this information is sorely needed, even today, in spite of so many scientific advancements. The only surviving copy of a ninth-century book, *Medicinale Anglicum (Bald's Leechbook)*, contains a natural remedy against the methicillin-resistant strain of *Staphylococcus aureus* (MRSA).



We are surrounded by insects. They are truly ubiquitous. A famous quote is attributed to the biologist J.B.S. Haldane in answer to a question posed by the archbishop of Canterbury concerning what he had learned of the Creator from his study of creation. He replied that the Creator had an inordinate fondness of beetles. This may be an accurate statement since there are over 60,000 species of weevils alone! On many occasions, insect plagues and the diseases they have spread have altered the course of human history.

The first few chapters of the book involve the historical and more recent classification of arthropods, and the currently recognized class Hexapoda, which include the insects and the primitive, flightless Entognatha, such as collembola, diplurans, and proturans. Chapter three provides an in-depth look at these primitive arthropods via text and beautiful color, and black and white images. The following two chapters depict flying insects, with large, stunning pictures of mantids, walkingsticks,

dragonflies, and a host of others. Chapter six treats pest insects, such as fleas, lice, tsetse flies, and mosquitoes and the diseases they cause. The historical accounts presented are quite fascinating.

Moving on to social insects, the author recounts early works on honey bees, such as the observations of Spanish apiculturist, Luis Mendez de Torres in 1586, and Charles Butler's seminal work entitled *The Feminine Monarchie* written in 1609. However, "The first animals to evolve complex societies were the termites, having done so by the late Jurassic, or at least 145 million years ago, a time in which *Stegosaurus*, *Apatosaurus*, and *Allosaurus* roamed over Colorado and Wyoming..." Without skipping a beat, the author then segues to modern times: "Despite the success and hardiness of these societies, it is sobering to watch how vulnerable they have been to the effects of human-induced climate change and habitat destruction." The remainder of chapter seven is devoted to the amazing diversity of nest structures created by honey bees, paper wasps, and mound-building termites of western Africa. Mike Engel also notes, "While we like to think ourselves clever for having developed crop species and domesticated livestock, social insects evolved agriculture and animal husbandry eons before we did so in the Neolithic." "Ants, termites, and beetles have each evolved agricultural systems, cultivating crops of fungi from which they derive their nourishment. Unlike us, for millions of years these insects have practiced sustainable agriculture, while we struggle to adopt such methods in the cultivation of our crops."

Beginning with a quote from Wittgenstein, "The limits of my language mean the limits of my world," chapter eight continues with an interesting treatment of insect communication. The flashes of fireflies (which are actually beetles), the underground chambers of mole crickets built to amplify the occupant's mating calls, the deafening sounds of periodical cicadas, chemical pheromones alerting nest mates to danger, and a host of other means of insect communication are discussed. The waggle dance of the honey bees is especially interesting because it contains complex information about a food source or even a potential new nesting site. This information includes its location, quality, and distance from the hive!

Of course, insects have a host of potential predators, and therefore have evolved a myriad array of defenses, including camouflage, crypsis, and mimicry. Stick insects and praying mantids are prime examples of insects "hiding in plain sight." Others, such as the monarch and viceroy butterflies, that resemble one another gain protection because each are bad-tasting to birds.

The next chapter presents data on the importance of insects as pollinators. The honey bee contributes about \$15 billion dollars to the American economy because this species pollinates 75% of our important food crops. The book ends with beautiful images of Morpho butterflies and examples of unusual pollinators, such as a fly with a proboscis that is 4 to 5 times the length of its body, which coevolved with long-tubed flowers in South Africa.

I highly recommend this book for its wealth of information, beautiful images, and the author's adroit, facile writing style.

## **Kansas Board of Regents Passes Policy That Hampers Higher Education**

by Dustin Wilgers, Ph.D.

President of the Kansas Academy of Science

In January 2021, the Kansas Board of Regents passed a temporary policy that allows universities across the state an easier path to let go tenured professors. This policy, which expires in December 2022, is supposed give relief to universities hurting from the pandemic. Instead, this policy eliminates shared governance in the operation of the university by reducing the faculty's ability to defend their position. While most of the state universities have decided against using this policy, the University of Kansas has not ruled out enabling these extreme measures. At our recent board meeting, the KAS officers felt this action was unacceptable and hampered one of the true goals of academia, scientific discovery. We unanimously voted that the society would sign the solidarity statement in support of the University of Kansas faculty objecting to the new regents' policy. I have signed this letter individually as well, and encourage you to investigate this issue on your own and sign if you wish. Please go to the following website:<https://sites.google.com/view/kufacultydemands/no-to-kbor-policy>

## ***The Green New Deal and Beyond* by Stan Cox. 2020**

**City Lights Books, San Francisco. 167 p.**

Book review by Hank Guarisco, Editor.

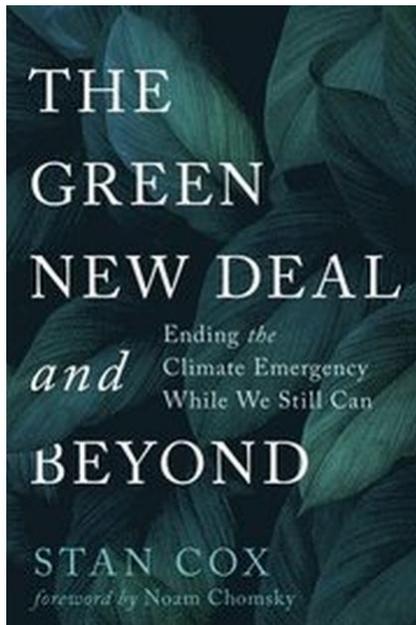
The subtitle of this book, "Ending the Climate Emergency While We Still Can," says it all. It is important to realize that what is happening to our world is not just a noticeable regional shift in the weather that is adversely affecting polar bears and the Inuit people, and perhaps striking fear in the hearts of native peoples of the Pacific Region who inhabit low-lying islands. This is a global **climate emergency**, caused predominantly by industrial societies burning fossil fuels for the last several hundred years. The result is a build-up of greenhouse gases, such as carbon dioxide (CO<sub>2</sub>), which has led to significant warming of the earth, shrinking of the polar ice caps, destabilizing the permafrost, and killing coral reefs around the world. If these planetary processes continue, the earth will warm at an accelerating rate due to less ice cover to reflect sunlight, and thereby release large quantities of methane (CH<sub>4</sub>) from the melting permafrost. Methane happens to be more than an order of magnitude better at trapping the sun's heat than CO<sub>2</sub>. In the not-to-distant future, a positive feedback loop between these processes and warmer temperatures, could push the temperature to levels where the ocean level would significantly rise, and parts of the planet would be uninhabitable.

When confronting this crisis, it is important to ask the right questions and pursue potential remedies that will significantly correct the problem. The author presents these questions and potential solutions in the Introduction. The Intergovernmental Panel on Climate Change (IPCC) predicted wide-spread ecological damage and human suffering if global temperatures rise above 1.5°C. However, under current conditions the temperature is projected to increase 3.2°C by the end of this century. Therefore, remedies must include: "directly eliminating fossil fuels from the economy..." The author goes on to explain that "Fossil fuels cannot be suppressed solely through the expansion of non-fossil energy or through market interventions such as carbon pricing; eradicating emissions will require a statutory limit on all fuel extraction..." We must realize that these goals are not compatible with unlimited economic growth. Adding renewable energy sources to the mix will not

automatically decrease use of fossil fuels. This will just add to the energy sector and fuel economic growth. Therefore, we must institute a mandatory impervious cap on the amount of fossil fuels entering the economy. Many half-measures and indirect approaches have been tried in other countries. Some of these include: taxing fossil fuels based on carbon emissions they produce, pressuring banks to disinvest in these industries, banning leases on public land, and cap and trade of carbon emissions.

In pursuing this issue, we must not lose sight of the main question: “What actions must be undertaken to eliminate greenhouse emissions in time?” There is no time to enact corporate-friendly policies and wait to see if they work. What is politically feasible is a moving target. Just look at the enormous stimulus packages the government proposed in the wake of the Corona Virus pandemic.

Chapter One recounts the policies of the New Deal, enacted during the Dust Bowl and World War II. Although many of us may be aware of the Works Progress Administration (WPA) and the Civilian Conservation Corps (CCC) which employed more than 11 million people to build infrastructure projects, plant trees and prevent erosion during the 1930s, we may not know that the federal government’s Office of Price Administration prevented runaway inflation by enforcing price ceilings



on most goods. The War Production Board (WPB) restructured the economy and controlled what would be produced by industry. Instead of cars, factories produced tanks and other military vehicles. Sales of refrigerators and air conditioners to civilians were outlawed. Most major items were regulated, including: lumber, coal, chemicals and stoves. During 1942-1943, many goods were rationed, so that all Americans would be able to receive necessary items including: coffee, sugar, meat, shoes, bicycles, cars, etc. The rationing system was well accepted because it was a response to a national crisis.

The author goes on to recount the oil crisis of 1973, and mentions a book entitled, *The Limits to Growth*, which at that time was “about as welcomed as a bowl of prune soup to a potluck.” In response to the oil shortages of the 1970s, president Carter proposed major investment in alternative energy. He also recognized selfishness and fragmentation had afflicted society, and that human identity was defined by possessions rather than

one’s occupation. An abrupt 180 degree turn in policy was pursued by the next president. Reagan proposed to “make America great again” by deregulating oil, encouraging capitalism, shrinking the government, and disregarding conservation and alternative energy.

In 1988, CO<sub>2</sub> levels, which had risen to 350 ppm, became a global concern that prompted the formation of the aforementioned Intergovernmental Panel on Climate Change (IPCC). However, in 1992, president George H. W. Bush remarked at the Earth Summit in Rio de Janeiro that America has the right to sustain growth without regard to global ramifications: “The American way of life is not up for negotiation.” The next president, Bill Clinton, signed the Kyoto Protocol, a global emissions-cutting treaty, but congress would not approve it. When President, G. W. Bush came into office, he erased Clinton’s signature. In 2015, president Obama significantly weakened the Paris Agreement on climate by substituting the word “should” for “shall” in reducing emissions. In 2017, then President Trump withdrew the U.S. from the Paris Agreement.

The next chapter recounts the next four years: how Trump, a climate change denier, removed the term, “climate change from government documents, enacted legislation to increase the use of fossil fuels; and the subsequent backlash in the form of a resurgence of environmental awareness, and the rise of climate movements, such as the Sunrise Movement and the Green New Deal. The Green New Deal gained traction because it did not include approaches that threatened corporate America with carbon pricing, regulation, and international obligations. Because it was “a hybrid climate/economic plan that gave priority to fairness and inclusion, it was able to draw enthusiastic support from young people and many different social justice movements.” However, the author notes that “it does not include an effective strategy for directly and rapidly reducing greenhouse emissions through fossil fuel restrictions. There was only an implicit assumption that public investment in technology and infrastructure would energize market forces to automatically drive down emissions.”

The transition to renewable energy will take time. Removing fossil fuels entirely by 2030 seems unrealistic because it would require the construction of renewable infrastructure at 33 times the current rate. Some proposals reflect a fundamental lack of understanding regarding humanity’s connection and dependence upon the natural environment. The California-based Breakthrough Institute put forward an “Ecomodernist Manifesto” in 2015 which denies physical boundaries to human consumption, and believes that, “Cities both drive and symbolize the decoupling of humanity from nature, performing far better than rural economies in providing efficiently for material needs while reducing environmental impacts.”

Stan Cox continues to examine a variety of paths meant to avert climate and ecological disaster, and is particularly critical of electric vehicles because of the resources needed to create them. He concludes that “People don’t want to talk or think about having less energy. And that’s what we need.” Given our world population, we must take a long, hard look at what we need to live a happy, productive life. The treadmill of consumption is an ever-widening spiral that will lead to destruction of our home, planet earth. Half-measures will not do. “We must ask the most important question of all: What is now ecologically and morally necessary?” To succeed, we must do three things at once: eliminate harmful emissions, adapt society to a smaller energy supply, and “ensure fair, equitable access to resources and economic security.”

In chapter four, entitled, “Off Ramp Ahead,” the author envisions what going on an energy diet would entail. Since increased labor productivity has resulted in overproduction, and widened the wealth gap between rich and poor, he advocates for a shorter work week with full pay, as well as work sharing. Imagining a future society where ecological stability has been restored and greenhouse gases eliminated, the author predicts that private transportation and air travel will be severely regulated. Affordable, energy efficient housing would be located near public transportation and work places. Other choices, such as eating no meat, installing either home or community solar energy, and buying a lot less stuff will go a long way to establishing a sustainable society. Encouraging these changes will involve both individual and collective efforts. Preaching the message will not do much good, unless we live according to what we preach. “Natural ecosystems can maintain themselves for countless millennia using only solar flows, while cities draw down millions of years of concentrated energy in a relative blink of an eye. Which model provides a standard for our future”

“The first, most crucial action will be to put an impervious cap on the nation’s total supply of fossil fuel.” The government would issue yearly permits to companies to extract a certain amount (barrels of oil, tons of coal, cubic feet of gas) of fossil fuel. No exceptions or modifications, no cap and trade,

rather we will have to cap and cope. This will not be easy, and Big Oil, Big Coal, and the utility companies will balk at such a proposal. Therefore, the author muses that the government will likely need to nationalize the fossil fuel industries, and states would convert the for-profit utility companies into locally controlled public utilities. He further outlines a “Victory Plan,” to phase in renewable energy, reforest degraded land, and heal the oceans; with a government ration plan, similar to the one used during World War II. However, to really solve this problem, we need a new definition of prosperity. While the Green New Deal aims to build our wealth as a nation, the author realizes this will drive demand for resources even higher.

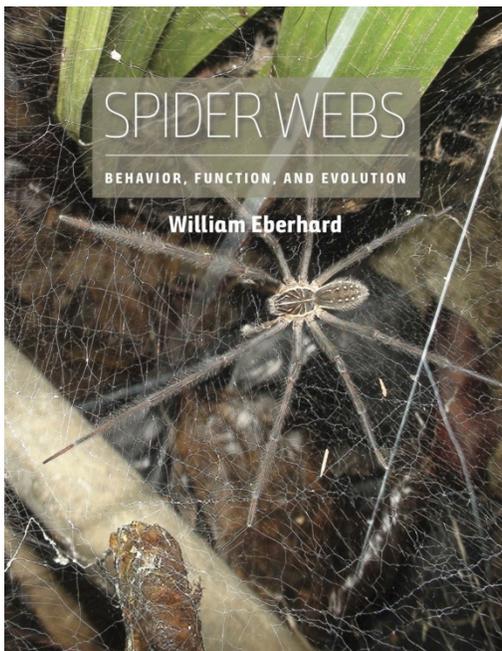
Therefore, we must look at the limits “of lifestyles that treat shopping as the main way to form identity, community, and culture.” “In an ecologically rational economy, production must be reduced and redirected, not redoubled.” To achieve this goal, taxes on the rich need to be much greater, deep cuts to the military budget implemented, and government subsidies for the poor enlarged.

I will end this review with pertinent words of the author:

“Within a neoliberal vision, the range of acceptable actions addressing any environmental or social problem is limited to those that benefit ‘the economy.’” “We have arrived at a point where continuing to ignore the intensifying climate emergency for the sake of short-term economic growth will itself meltdown ‘the economy’ in the medium or long term.”

***Spider Webs, Behavior, Function and Evolution* by William Eberhard. 2020  
University of Chicago Press, Chicago and London. 816 p.**

Book review by Hank Guarisco, Editor.



This hardback volume, entitled: *Spider Webs, Behavior, Function and Evolution*, is an opus that represents the culmination of the author’s life-time inquiry into the lives of spiders and the webs they weave. From ancient times, humanity has been fascinated by spiders webs, especially the orb web. Dr. Eberhard presents a thorough review of the pertinent literature and critically examines what has been learned about spider behavior and their webs. In addition to poetry, the beauty and symmetry of a spider web leads to complex questions of protein chemistry, behavior, sensory physiology, ecology, and evolution.

Beginning with the basic hardware necessary to produce a web, such as silk glands, spinnerets and leg morphology, the author explores how spiders avoid sticking to their own web. The function of a web is to capture prey. Although there is a “typical” orb web structure, there are so many variations in many aspects of this design, including: number and spacing of radii and sticky spirals, asymmetry, ontogenic changes, microhabitat adaptations, and differences among species. A few orbs are equipped with elongated mesh ladders that function to capture moths more effectively. How visible are webs to both prey and potential predators? Airborne

“plankton,” such as pollen, adheres to sticky lines, and in some instances comprises up to 25% of the diet of juvenile spiders. What is the function of the stabilimentum and other web ornamentation?

There are two chapters on the building behavior of both orb weavers and non-orb weavers, and an equally in-depth chapter on the cues directing web construction. These cues can change in response to learning, maturation, temperature, and hunger level. Is there inter or intraspecific competition, and how is it measured? Other aspects of web ecology and web site selection are also explored.

In the final two chapters, the author examines evolutionary patterns across the broad spectrum of this arachnid order. Web construction, which can be traced back 400 million years, has evolved high diversity as well as rampant convergence. The wealth of new information over the past 50 years has complicated the phylogenetic study of web evolution. There are many intermediate forms, as well as extreme modifications, such as the webs of the eresid spider, *Seothyra henscheli*, which are built in the “thermally and mechanically forbidding dunes of loose sand in Namibia.”

I highly recommend this book because it is such a monumental treatise on the subject, and will remain a cornerstone of our evolving understanding of spiders and the webs they build. It is certainly worth the \$75 asking price.





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