



The Formation of Scholars: Rethinking Doctoral Education for the Twenty-First Century

By George E. Walker, Chris M. Golde, Laura Jones, Andrea Conklin Bueschel, and Pat Hutchings, Jossey-Bass, San Francisco. 2008, hardcover, 256 pages, ISBN: 978-0470197431

About 375,000 men and women are currently pursuing doctoral degrees in the United States. Unfortunately, about half of those will drop out and many of those who persist will find that they are ill-prepared for their chosen careers. These facts were the impetus for the Carnegie Initiative on the Doctorate (CID) – a project of the Carnegie Foundation for the Advancement of Teaching. The project was designed to support “academic departments’ efforts to improve the effectiveness of their doctoral programs” (p. 161).

As a result of the CID work, project team members co-authored *The Formation of Scholars: Rethinking Doctoral Education for the Twenty-First Century*. This book challenges us to reconsider traditional approaches to doctoral education. The book begins with an applicable quote attributed to Will Rogers: “Even if you are on the right track, you’ll get run over if you just sit there” (p. 1).

The CID effort encouraged participating departments to begin by asking and answering three foundational questions:

- 1) What is the purpose of the doctoral program?
- 2) What is the rationale and educational purpose of each element of the doctoral program?
- 3) What evidence aids in answering these questions?

These questions were intended to serve as “a kind of mirror, reflecting reality back to the department” (p. 46). In return, many of the departments were able to produce documents and guidelines that clarified their expectations for doctoral education. New ideas also surfaced, particularly with regard to the comprehensive exam. Instead of the traditional “data-dump,” many departments are now considering or using professional portfolios, designed to allow students to document their progress as emerging scholars.

Another tradition challenged by *The Formation of Scholars* text is that of apprenticeship. The authors do not propose abandoning apprenticeship entirely. Instead, they argue for an “apprenticed with” approach rather than “apprenticed to.” According to the authors, “too many of today’s professors are successful despite the mentoring they did (or did not)

receive, rather than because of it” (p. 115). Our goal should be to create and sustain an intellectual community, and that does not occur in a situation where a professor takes “ownership” of a student. Although one or two faculty members must take the lead, students are best served when they are mentored by several faculty members. Walker and his colleagues offer a number of resources to guide faculty members’ efforts to mentor graduate students.

In an effort to move doctoral students from a position of experience to one of expertise, Walker and his colleagues propose three principles for student formation. These include: “(1) progressive development towards increasing independence and responsibility, (2) integration across contexts and arenas of scholarly work, and (3) collaboration with peers and faculty in each stage of the process” (pp. 61-62). The need for these principles is reinforced by data that highlights the lack of proficiency that doctoral candidates have at the end of their program. In the primary areas of scholarly work (research and teaching), only about 75 % of doctoral students at the dissertation stage reported a high level of proficiency. When considering professional service, the percentage of students who had participated in any service activities was even less, ranging from 40 to 69 percent, depending on the discipline. The responsibility for improving these statistics rests with both the students and the faculty.

The CID surfaced many examples of effective processes and tools for improving doctoral education. Although these examples add value to the book, they are also available online at <http://gallery.carnegiefoundation.org/cid>. The real value of the book is in the questions that the reader is prompted to consider. The authors argue, “our message to readers is less about particular innovations, successful or not, than about a commitment to the ongoing process of improvement: deliberating about purpose, asking questions about effectiveness, gathering evidence to shape improvement over time, and taking action” (p. 142). The book’s usefulness extends beyond an administrative perspective; anyone engaged in doctoral education would benefit from this text.

Eric K. Kaufman
Virginia Tech

Grass-Fed Cattle: How to Produce and Market Natural Beef

By Julius Ruechel, Storey Publishing, 2006, 372 pages, soft cover

This narrative makes an excellent resource book. Written in lay person terminology, this easy reading handbook offers a non-conventional approach for raising cattle and marketing beef. To paraphrase Allan Nation who wrote the foreword, "Grass-Fed Cattle serves as an excellent how-to-guide for raising cattle on grass according to the philosophies embraced by those adhering to the concepts of natural, organic or pasture raised beef production." This book addresses the production and marketing of natural beef from a holistic perspective in that grass-fed is as much a lifestyle as it is a diet and perhaps more so than is suggested by the title of the book.

The book is well organized, consisting of 30 chapters divided into four sections. Part One: The Fundamentals of Grass-Based Beef sets the tone for the message conveyed throughout the book. The book offers a non-traditional approach for raising cattle and producing beef, apparently based on the author's personal experience and lifetime observations. A basic premise adhered to throughout the chapters is that a grass-fed enterprise mimics nature and the natural life-cycle of animals (particularly cattle, bison, etc.) in the wild. Fundamental, scientific principals are referenced and serve as the basis of the guidelines recommended for raising cattle. However, the applications of these scientific principals are frequently interpreted with a biased definition of what is sustainable or natural. It is unfortunate that from the author's perspective grass-fed cattle production does not (or cannot, as an option) include technology based tools such as diet balancing, herbicides, parasitic de-wormers, etc.

The concepts of production techniques for grass-fed, natural and organic beef are interwoven without real separation throughout the narrative until Part Three – Business Planning and Marketing, where-in these three concepts are defined and separated. While not specifically addressed in the book, it seems the definition for sustainability, which is an underlying basis of the fundamental approach embraced, is one of niche production. That is, sustainability implies small enterprise based without the use of technology as opposed to a definition that includes science based technological advances. For example, Chapter 10 recommends culling as the first practice for successful disease prevention as opposed to, perhaps, medical (vaccination) or nutrition approaches.

Some of the information provided in the book as fact represents a lay person's perspective that is not necessarily scientifically proven, such as "grass-fed animals should yield slightly higher than grain-fed animals of the same weight." This statement is based on the perception that grass fed cattle are leaner than grain-fed cattle (may be true) and leaner cattle are heavier muscled than fatter cattle (not necessarily

true), therefore, muscle affects dressing percent or yield more than fat, which is not true. The four primary factors affecting dressing percent (yield) in order of importance are rumen (gastro-intestinal tract) fill, fat deposition, muscle content and amount of external hide covering (mud, manure, etc.). Such statements by the author are not false but they may not be true. The author's statements reflect a perception or interpretation and not necessarily scientific fact. If recognized by the reader, accordingly, these interpretations can provide valuable insight for raising cattle more successfully.

The last 10 chapters of the book, Part Four: Your Business Plan: Putting Principals into Practice, are excellent regardless of the reader's perspective for raising cattle and producing beef. The topics covered (setting goals, recognizing market opportunities, financial preparedness, crisis management, etc.) and organizational strategies recommended are pertinent to a variety of cattle management scenarios, not just grass-fed beef.

This book is one that both the novice and experienced cattle person will read, ponder and remember. While the book seems to be written for the novice, the content of the book offers a fresh, back-to-basics approach many experienced cowboys, ranchers and cattlemen should re-learn or learn for the first time. For instructors, the book has great value as a reference book. The book is not recommended as a textbook – though I do not perceive that was the intended purpose for writing the book. For the person with a desire to pursue a grass-fed, natural or certified organic production system for raising cattle and producing/marketing beef, this book is a "must read".

Reviewers Personal Comment –As a person immersed in the science of animal production, I do not agree with all the statements presented within the narrative. However, as a trained animal husbandryman, I embrace many of the concepts upon which the book is written. I greatly enjoyed reading the book and find the book a valuable addition to my reference shelf.

Paul Walker
Professor Animal Science
Illinois State University, Normal

Crisis & Opportunity - Sustainability in American Agriculture

By John E. Ikerd, University of Nebraska Press, 2008, 325 pages, softbound

Family farms and rural communities are on the decline while corporate farming is growing and contributing to environmental degradation, American agriculture is in crisis. But this crisis provides us the opportunity to rethink agriculture in sustainable terms. Here one of the most articulate and influential proponents of sustainable agriculture explains what this might mean. These interesting

Book Reviews

essays describe what sustainable agriculture is, why it began, and how it could prosper. Together these essays comprise a clear and persuasive image for rebalancing the ecological, economic, and social magnitude of agriculture to meet the needs of the present without compromising the future.

In *Crisis and Opportunity*, John E. Ikerd outlines the physical and environmental cost of agricultural industrialization, and then points out methods that can be used to restore ecological soundness, economic viability, and social responsibility to our agricultural system and thus make sure sustainable agriculture is the foundation of a sustainable food system and a sustainable society. These essays represent some of the soundest thinking on the topic of sustainability of agricultural systems. This is an in your face call to come to our senses about our own future health and well-being as well as that of our communities and the planet that sustains us.

Crisis and Opportunity is a must read for those who want to research what agriculture is all about, past and present. Ikerd's book is a thoughtful source of information, perception, and motivation. Ikerd argues against the efficiency model of agriculture and presents a more balanced path that leads to opportunities in agriculture and the culture.

The book is divided into five units each with a unique general topic covered. Each topic has several essays which are very informative and thought provoking. The book is well written and easy to read, it forces the reader to a higher order of thinking.

The book could serve as an excellent resource text for both undergraduate and graduate students. It would fit very well into a course where discussion and higher thinking skills are being developed and expanded. The book will make you think and rethink American agriculture from various views points and theories. A must read for students involved with sustainable agricultural systems.

Michael K. Swan
Washington State University
Pullman, WA

Plant Tropisms

Edited by Simon Gilroy and Patrick H. Masson, Blackwell Publishing/ John Wiley & Sons, 2008, 207 pages, hardbound, ISBN 13:978-0-8138-2323-2

In the past decade alone, there must be more than 200 pages of scientific articles that deal with tropisms (directional growth response to an external stimulus), and this short book has nicely summed up advances in the understanding of the processes that underlie a wide array of tropic responses. While responses to unidirectional light (phototropism), gravity (gravitropism), touch (thigmotropisms) are the principal foci of the book, a chapter on other tropisms (hydro-, electro-, chemo-, thermo-, oxy-, and traumatropism) brings a broader perspective to the

reviews, which are contributed by 22 authors. Additionally, the responses of single cells and algae have contributed to knowledge about sensing and responding to gravity and the signal transduction pathways involved.

The audience for this book is more likely to be the plant scientist looking for a fast update on plant tropisms than an undergraduate plant physiology class, especially with its price. However, it could provide a stimulating segment of a graduate plant physiology course and should find a place as a resource in university libraries.

The first chapter reinforces the more than a century old hypothesis of statolith (amyloplast) sedimentation in gravity-perceptive cells, calling it widely accepted as the major gravity sensing mechanism. Some deficiencies in knowledge of just how this works are noted, such as how the amyloplasts interact with the cytoskeleton to produce a chemical signal. Regulation of gravitropism via tactile stimulation of the root cap cells to allow roots to grow around barriers, timing of the appearance of gravistimulation in germinating seed coincident with amyloplast maturation, and the opposite response to gravity of the gynophore of peanut are among the phenomena collected in support of the sedimentation explanation. An alternative explanation for gravitational responses is gravitational pressure (the weight of the protoplast), but it is not ruled in conflict with what is viewed as overwhelming evidence supporting sedimentation.

It is not surprising to find the *Arabidopsis* plant and its genome referenced many times in the chapters on gravitropism since the proteins involved in auxin transport are crucial to the transduction of the gravity signal. Chapter 2 succinctly summarizes the evidence gathered from physiological and genetic studies for the different responses in above-ground and below-ground organs. Here the authors discuss mechano-sensitive ion channels that may alter Ca²⁺ regulatory proteins involved in gravitropism, but recognize that such channels have not been specifically identified. Other secondary messenger molecules come in for mention, but the genetic approaches win out in the end although some interactions are suggested as a way to complicate the mechanisms. One interesting digression involves plagiotropism, the horizontal growth of rhizomes and stolons.

The third chapter involves a lot of gene shorthand in discussing transport of auxin and its influx and efflux protein complexes. Given the many studies utilizing IAA, IBA, and synthetic auxins in different plant systems, the pathway to enlightenment can be difficult to follow. Introducing the complex interactions with flavonoids, Ca²⁺, inositol 1,4,5-triphosphate, and ethylene makes one realize that the gravitational response is not simple. The expression of large numbers of gene changes in response to auxin application and the differences in responsiveness of shoots and roots further complicates the tale.

Diagrams and illustrations help (a section of pages provides them in color), but an overall scheme, however hypothetical would have been welcome. As with the multiple sequels to movies, it appears that the explanation that parts of the response may be auxin-independent and that signaling mechanisms may also be regulatory, and another chapter will have to be written as we learn more.

Chapter 4 transitions us to phototropism and its relation to gravitropism. Yes, gravitropism can be modulated by light effects, but the receptors for light are better characterized, and the light responses of organs such as roots, are generally smaller than their responses to gravity. The typical plant physiology book nod to cryptochromes as the blue light-absorbing pigments involved in phototropism is updated with the introduction of phototropins, a pair (at least) of kinases asymmetrically localized to the plasma membrane and that are the primary photoreceptors responsible for initiating phototropic responses. Cryptochromes are now sharing the role with phototropins to modulate the phototropic pathway. The unknowns lie downstream of the receptors, include some proteins of uncertain genetic origin, and finally culminate in the differential elongation growth of the plant organ. Gravity comes into play as phototropic responses develop with different signaling pathways, kinetics, and magnitude of curvatures changing over time, but the point(s) in the pathway where modulation occurs have not been clearly identified. One might have expected a longer treatment of phototropism than the 7 ½ pages accorded this chapter, given the lengthy treatment of gravitropism, but, as the authors note, the classical Cholodny-Went model for auxin transport has not been unseated, while the connection between receptors and the auxin leg has yet to be elucidated.

The mechanical responses of plants such as the closing of the Venus flytrap, the twining of tendrils, and the closing of leaflets of the sensitive plant are nicely reviewed in Chapter five. Touch sensitivity or thigmonastic movements are described as rapid responses to comparatively light stimuli, while thigmotropic and thigmomorphogenetic responses occur over time, leading to adaptive changes in growth. A number of possible mechanisms are discussed with the authors tending to favor ion channels as playing a central role in the transduction of external forces to intracellular signals. While aboveground organs must support themselves and are most likely to be sensitive to touch, roots are embedded in their substrate and continuously in contact, thigmotropism still exists with gravitropism as the default directional cues. The authors point out that the molecular identity of the plant mechanosensors is one of the major questions facing these lines of research.

The recurring theme of other external influences impacting the gravitropic responses of plants is carried out in a chapter on other tropisms and their

relationship to gravitropism. Single cell gravitropism, especially free-swimming flagellates, but also the tip cells of mosses, ferns, and algae have provided a variety of experimental approaches as the signaling pathways are short and all phases occur in a single cell, thus allowing for biochemical and molecular analyses. The use of single celled organisms opens vistas to understanding gravitropism uncomplicated by the rest of a plant body. The authors of this chapter summarize data on the nature of the gravity sensing apparatus and the complex components that comprise the pathways of response to gravity. Statoliths come back into play in these analyses as do ion channels and secondary messenger molecules.

Microgravity, as found in space, is typically 10⁻³ to 10⁻⁶ g, and some scientists have been able to acquire time and resources to send plant subjects into space to study the effects of this low gravity environment. Chapter eight provides accounts of some of these studies.

A final chapter on plants for space exploration projects that an expanding understanding of how plants respond to their environments will allow manipulation of plant growth and development to sustain a human presence in space. The authors of this chapter sustain the case for the capacity of plants to support human life, but suggest exploitation of their DNA replication and protein synthesis systems for other objectives. Perhaps coupled with nanotechnology, plant and microbial gene-based sensors could precisely monitor changes in the human/plant biosphere, perhaps even providing instructions to external electronic devices, and potentially responding to signals transmitted from such devices to manufacture specific products. Such blue-skying stimulates the scientist to think beyond the "simple" bending of Darwin's grass coleoptiles to more "what if?" scenarios. It would be interesting to return to this book in 50 years to see what has evolved.

The authors who prepared these review chapters have been involved in a variety of tropism research studies. Many of the literature citations are of their own work, but they also cite contrasting views as well. Most of the citations date from the last 20 years into 2007, so this book has not been sitting at the publishers long awaiting an editor to see it through. An index makes it easy to find the various topics and key concepts. In my simplistic way, I would like to have seen some summary flow charts suggesting pathways as part of the concluding paragraphs, but the complexity of the pathways might have meant a messy and unsatisfying portrait.

Richard A. Criley
Tropical Plant and Soil Sciences
University of Hawaii
Honolulu, HI 96822