contained chapters. The author(s) of each chapter provide an effective review of their respective topics. Overall this book is a good appraisal of a field that has made considerable advances in the last 20 years and as a consequence has become increasingly complex. Although this is still a rapidly evolving field, this is a good time to try to compile and synthesize the research due to its relatively recent expansion. *Low temperature biology of insects* is an impressive compilation of information and many will find it to be a valuable resource. It is a worthwhile book for students and workers in low temperature biology, including entomologists and physiologists. However, a more comprehensive review of these topics across different levels of organization is still needed to provide a clearer, more complete assessment of cold biology in insects. Still, the authors of this book do a good job documenting the considerable advances in this field and in many ways they help to set the stage for the many discoveries on the horizon in the field of insect cryobiology.

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Ecology, 92(1), 2011, pp. 262–264

Back to the future, darkly

Dilworth, Craig. 2010. **Too smart for our own good: the ecological predicament of humankind.** Cambridge University Press, New York. xiv + 530 p. $90.00 (cloth), ISBN: 978-0-521-76436-0; $29.00 (paper), ISBN: 978-0-521-75769-0; $24.00 (Adobe eBook), ISBN: 9780511687518.

Key words: ecological economics; environmental studies; group selection; population growth; Vicious Circle Principle.

It is a difficult time to be a human in a sea of nearly seven billion others, to be aware of ongoing environmental degradation and impending environmental catastrophes, and to feel powerless to do anything about it. Students, myself included, coming of age with the environmental movement of the late 1960s and early 1970s were optimistic, in hindsight perhaps naively, that we could change the world. We banded together in cooperative houses, we formed cooperative markets, we walked or rode our bicycles to work, and we recycled everything. Some of us found careers in social work and environmental justice, others became doctors, lawyers, engineers, or homemakers, and still others retreated to the woods to live off the land and off the grid. And some of us retreated up into our heads, building careers in education—K–6, middle or high school, or college and university teaching and research—where we hoped to contribute to the building of a sustainable society by enlightening future generations of students. More than 40 years on, what do we have to show for our efforts? According to Craig Dilworth, author of *Too smart for our own good*, not very much. And furthermore, he puts forth an extensive but unconvincing argument—based on sloppy scholarship, outdated sources, and discredited ideas—that we never should have been hopeful in the first place.

The publisher's blurb on the back cover asserts that *Too smart for our own good* is intended as "a compact encyclopedia covering the whole development of *Homo sapiens*. It would also suit many courses in the life and social sciences. Most importantly, [it] makes evident the very core of the paradigm to which our species must shift if it is to survive." Although Craig Dilworth might agree with the first part of this, he clearly doesn't agree with the latter. In fact, he concludes *Too smart for our own good* by claiming that:

> human civilisation—primarily Western techno-industrial urban society—will self-destruct, producing massive environmental damage, social chaos and megadeath. We are entering a new dark age, with great dieback. The only question that remains is whether we will survive this dark age, and if so, for how much longer.

Is this the message we want to send to our students, our colleagues, policy analysts, or decision makers who are interested in using ecological ideas to improve the world? Does it represent a paradigm shift that would allow for the survival of humankind?

The essence of *Too smart for our own good* is the identification and explication of what Dilworth calls the *Vicious Circle Principle* which results from a positive feedback between relentless population growth and unchecked faith in the power of technology to save us from the consequences of an ever-expanding population:

> [*T*]*he experience of need, resulting e.g. from changed environmental conditions, sometimes leads to technological innovation, which becomes widely employed, allowing more to be taken from the environment, thereby promoting population growth, which leads back to a situation of need* (italics in original).

In Dilworth's view, once set in motion, this positive feedback loop moved us from "noble savages" living in harmony with Mother Earth ("the quality of the lives of modern hunter-gathers is (or was) actually quite good ....") to modern technologically dependent disasters, living so far out of balance that we're on the fast track to extinction. Looking around the world in the first decade of the 21st Century makes it hard to disagree with this conclusion. But addressing the fundamental and pressing environmental issues of our time demands that we understand how we got ourselves into the mess we're in and using this understanding, together with centuries of experience, including natural history observations and decades of ecological research, to envision and build a more sustainable future.

Too smart for our own good focuses on the initial, crucial part of this recipe—the origin of the vicious circle and how we got into the environmental mess in the first place. The argument presented owes a large, well-acknowledged, and heavily footnoted (1755 footnotes for 454 pages of text) debt to the social theorists, neo-Luddites, and "small-is-beautiful-people" of the 1960s and 1970s, including Barry Commoner, Donella Meadows, Lewis Mumford, E. F. Schumacher, and Richard Wilkinson, whose many books we students of the 1960s and 1970s digested along with the hash brownies in our college co-ops. But these writers confined their theories to unique aspects of human affairs, including the sociological and economic ideas emerging at the time. In contrast, Dilworth makes a much greater leap, basing his *Vicious Circle Principle* on more general principles of biology and physics. This scientific patina, along with an apparent ignorance of the intellectual developments of the last 40 years in both the natural and social sciences ultimately leads *Too smart for our own good* through a series of naïve and unconvincing arguments.

One cannot disagree with fundamental physics—conservation of matter and energy, the law of thermodynamics—nor can one disagree with the observation that "maintaining an expansive economy means eventually starving from a dearth of resources or choking on a superabundance of garbage"; see also the Position of the North America section of the Society for Conservation Biology on the steady state economy as a sustainable alternative to economic growth (adopted 2004, ⟨http://www.conbio.org/sections/namerica/NAS-SCBPositionOnEconomicGrowth.cfm⟩). The fundamental problem that humanity has yet to confront is that resources on Earth are finite, but we behave as if they are infinite. However, the crux of Dilworth's argument is that the current human condition is biologically determined—not only in our genes, but in our *karyotype*, which biologists will be surprised to learn is "the chromosomal structure of a species that determines, in conjunction with particular genes and the environment, that species' phenotype").

The bulk of the book weaves together arguments from five intellectual disciplines—evolutionary biology, ecology, anthropology, archaeology, and economics—into an incoherent whole. From evolutionary biology, Dilworth draws heavily on early (V. C. Wynne-Edwards era) group selectionist arguments ("A species is the *form* a population takes, a form determined by its karyotype; or, since species are conceptually primary, we should say that the (total) population of a species is the *phenotypic manifestation* of the species' karyotype" [italics in original]; "The reason for the existence of ... instinct is to support the continuing existence of the species"). From ecology, Dilworth draws on Barry Commoner, Herman Daly, and the first edition of Paul Colinvaux's *Introduction to ecology* (1973. Wiley and Sons, New York). The defining "principle for the discipline of *ecology* ... [is] that: "*populations of living beings constitute open systems, each of which tends to be in dynamic equilibrium with the other systems constituting its environment*" [italics in original]. This synthesis of ecological thought is encapsulated in a unique mash-up of Clements, Wynne-Edwards, and Elton, held together with Ehrlich's rivets and seasoned with a sprinkling of misanthropic deep ecology:

> [A] state of affairs in which the number of species and the biomass of an ecosystem has reached its practical limits is said to constitute a *climax* ecosystem, *all* ecosystems being such before being affected by humans, and *none* being so after. The fact that a climax ecosystem contains a great number of species gives it greater stability, since the loss of any one species will tend to have less impact on the system as a whole, and the complexity of the system will better allow it, e.g., through mutations, to fill the gap. Thus a climax ecosystem and an ecosystem experiencing the most stable form of equilibrium are essentially the same thing (pp. 20–21; italics in original).

Contemporary ecologists and evolutionary biologists will be hard-pressed to find any evidence in *Too smart for our own good* that classic ecological textbooks like Colinvaux's have been updated to reflect intellectual growth in evolutionary ecology, complexity theory, or sociobiology.

Dilworth's readings in social sciences are similarly dated; he leans heavily on what he calls "new" (mid-20th Century, small-is-beautiful) developments in anthropology, archaeology, and economics. This new anthropology combines group selection, Marxism, and a gender-based division of labor into a cheerful vision of modern-day hunter-gatherers (including the !Kung of the Kalahari Desert and the Hadza of Tanzania) in which:

> both hunting and gathering are rewarding for those involved: they are appreciated by the other members of the group as providing a service necessary for the group's existence; and the people are not alienated from the products of their efforts. More than this, men at least get to experience the thrill of the kill, while the excitement had by women is more likely to be on the level of finding an unexpectedly large root.

Similarly, the new archaeology is used to support the idea that the development of agriculture "was basically the result of population pressure; and technological advance has essentially been the result not of our seeking a better life, but of people's simply trying to survive." But this survival has come at great cost:

> Defying conventional wisdom, mummy studies revealed that when Andean civilization shifted to agriculture, health did not improve but declined. Hunter-gatherers were not stricken with many of the illnesses that plagued their descendants, and early cultures had a child-mortality rate roughly half that of later populations. As nomadic groups settled into sedentary societies, sanitation problems led to an increase in tuberculosis, pneumonia, and intestinal parasites.

Finally, Boulding's "spaceman economy" is conjoined with Schumacher's "economics of survival" and Georgescu-Roegen's "metabolic flow" of resources and waste through human systems to yield an idealized

> closed economy of the future [in which] there will be no unlimited reservoirs of anything, either as sources or as sinks, and humans will have to find their place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy.

Dilworth terms the overall synthesis of these "new" views of anthropology, archaeology and economics the "*ecological perspective*" that provides the intellectual foundation of the *Vicious Circle Principle*.

After another chapter further developing the theoretical background of the *Vicious Circle Principle*, Dilworth scans the entire seven million year history of hominids in 170 pages (nearly 40% of the book) that comprise an interminable series of examples of the principle at work. My personal favorite is in his dated discussion of Neanderthals, especially their development of equipment in which to carry food and their social interactions:

> Humans carried the food acquired in the hunt in their hands, and what was more important for the evolution of social behaviour, like earlier hominids they carried their children around them as well. From this, one can imagine that if wolves had been as intelligent as us so as to have developed technology, their being so would also have involved their

becoming bipedal so as to be able to carry their weapons. The reason this ability evolved in humans rather than wolves was largely because of primates' use of their forelimbs for swinging from branches—which developed interactively with an increase in their intelligence.

One can only imagine a world of bipedal wolves running caribou in vicious circles to extinction.

But all we appear to have are our genes, our phenotype, and our Dilworth-defined karyotype locking us into a death-spiral of massive environmental damage, social chaos, and mega-death. In this hopeless vicious circle, of what use is this book? Perhaps it's a modest contribution to carbon storage, but I'm sure that it took far more energy to produce this book (on non-recycled paper at that) than is stored in its 1.22 kg per copy (hardback). Perhaps it's the catharsis of speaking truth to power, even if power isn't listening.

Even if Dilworth's conclusion proves ultimately to be correct, clearly understanding and articulating the process(es) behind the *Vicious Circle Principle* is equally important if *Homo sapiens* ever gets the chance to try again. In the nearly half-century that has passed since most of Dilworth's primary sources were published, the Earth's population has more than doubled, the pace of technological change has accelerated, and resource use has grown apace. Dilworth is to be applauded for linking population growth, ever-increasing resource use, and technological hubris to the many environmental problems that we face. But in the same time interval, ecology, evolutionary biology, anthropology, archaeology, and economics, have developed and moved on, and we have amassed a wealth of observations and data that cannot be ignored. *Too smart for our own good* is an infuriating, if at times amusing, mash-up of inchoate theories put forth by well-meaning idealists, long discarded interpretations of incomplete data, and hopeless genetic determinism. But a paradigm-shifting, road-map for the future that will ensure the survival of humanity? I don't think so.

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Ecology, 92(1), 2011, pp. 264–265

Social and biological dimensions of invasive species management

Perrings, Charles, Harold Mooney, and Mark Williamson, editors. **Bioinvasions and globalization: ecology, economics, management, and policy.** Oxford University Press, New York. xviii + 267 p. $140.00 (cloth), ISBN: 978-0-19-956015-8; $70.00 (paper), ISBN: 978-0-19-956016-5.

Key words: climate change; ecosystem services; globalization; invasion biology; invasion economics; invasive species management

As modern invasion biology has grown since its inception in the 1980s, the dominant threads—ecology and management—have developed quite separate literatures, with key journals and books tending to focus in one direction or the other. More recently, the advent of invasion economics has again led to a distinct literature, primarily in resource economics journals. Publications on policy related to invasions are more scattered, mainly in several edited volumes on invasions. Recent monographs in invasion biology tend to emphasize ecology, discuss management in some detail, and acknowledge the importance of economics and policy without substantial treatment. In light of these divisions, in 2009, Reuben Keller and colleagues compiled and edited *Bioeconomics of invasive species: integrating ecology, economics, policy, and management* (Keller, R. P., D. M. Lodge, M. A. Lewis, and J. F. Shogren, editors. Oxford University Press, New York), aiming to encourage integration of the ecological and social aspects of invasions to produce better policy and management. *Bioinvasions and globalization*, from the same publisher and with a partially overlapping roster of authors, has a very similar goal. Economic models are more heavily represented than in the previous work (six of 16 chapters), and the mathematical modeling is far more complicated. In fact, much of the mathematics in the chapters on economics will be inaccessible to many ecologists, although the results are explained in the vernacular of invasion biology. As its title indicates, the current volume deals more explicitly than the earlier one with the global scope of invasion issues, with three chapters focusing on globalization.

The editors' introductory chapter sketches the interaction of social (including economic) and biological factors in generating invasion problems and forcefully makes the case that effective policy and management must deal simultaneously with the social and biological dimensions. Five chapters follow on drivers of invasions, including two on the portents of climate change. Particularly useful is an excellent summary of the uncertainty associated with climate models underpinning forecasts of future ranges of various invaders. Two chapters are closely related to traditional ecological treatments yet pose interesting questions that have only recently begun to be addressed. Petr Pyšek and coauthors employ extensive data on plant invasions of various Czech habitats to distinguish between levels of invasion of different habitat types (determined at least partly by extrinsic factors such as propagule pressure) and inherent invasibility of these habitat types. Mark Williamson uses a variety of data, primarily on plant invasions in Europe, to seek patterns in the rates of spread of invaders beyond the frequently noted linear increase in the square root of area occupied.

The central section, on economics, consists of heterogeneous chapters, each based on manipulating a different model to attempt to answer a particular question: If invasions are seen as a form of biotic pollution, should "polluters" pay, and, if so, how? Given limited information, to what extent should resources be devoted to inspection and management so as to minimize