

how these diverse slides might possibly be related. When Professor Hutchinson gave his lecture, I wondered how I could have missed the obvious connections between the slides. I had the same reaction when I flipped through and then read *Too Smart for Our Own Good: The Ecological Predicament of Humankind* by Craig Dilworth. The book is a most effective undertaking in demonstrating the tremendous value of consilience ([literally, 'a leaping together'] as used in E. O. Wilson's 1998 book *Consilience*), which discusses the reconnections between the disciplines that are occurring now and the new insights the connections provide).

Dilworth's book is an exceptionally 'good read' and is a synthesis of many important components (ecological, social, and technological) that are commonly treated in isolation from each other. Information is provided in a systematic and orderly way, and the flow from one idea to the next is almost seamless. The book also has a wealth of useful references. The unifying theme is the vicious circle principle (p. 110): 'Humankind's development consists in an accelerating movement from situations of scarcity, to technological innovation, to increased resource availability, to increased consumption, to population growth, to resource depletion, to scarcity once again, and so on.'

Although hunter-gatherers drove much of the megafauna of their era to extinction, they did manage to keep their populations within the region's carrying capacity. They knew the food resources available to them and used abortion, infanticide, sexual abstinence, war and male fear of too frequent contact with women to keep populations from outgrowing their resource. Due to the comparative abundance and great nutritional value of their food, they apparently had greater health and longevity than the agrarian culture that followed. Less social inequality existed then than in the 21st century. They had few possessions, more time per person for socialization, and exhibited a strong sense of territoriality and a detailed knowledge of a territory's boundaries.

Dilworth covers the patterns of today in Chapter 6 (p. 356): 'And so the vicious circle of the development of humankind churns on, and does so with ever greater momentum due to the constantly increasing consumption of fossil fuels and metals, with only the tiniest sign of resistance in the form of the efforts of environmental organizations and green political parties.' The situation is dire and public concern is inadequate. Any plan of societal redirection must be based on this information.

Chapter 7 (p. 393) also covers resistance to change: 'The fundamental problem as regards to the continuing existence of the human species is that, while we are 'smarter' than other species in our ability to develop technology, we, like them, follow the reaction, pioneering and overshoot principles when it comes to dealing with situations of sudden, continuous or great surplus. In keeping with this, and also like other animals, we are not karyotypically built so as to care about coming generations, other than those with which we have direct contact. . . . To react directly to our surroundings is how we instinctively react; it is built into our karyotype, just as it is built into the karyotypes of other species. And if it were at all possible to overcome this predilection, it would seem that we, as a species, would have to act on the basis of that very intelligence that has landed us in this situation in the first place. Overcoming our instincts with our intelligence would be a difficult task to say the least; however, as is evident from the fact that we haven't made the least effort to do so despite being well aware of the problem for many years.'

The book is well written and should be important to anyone interested in the future of civilization and *Homo sapiens*. Such breadth and depth in a single book are rare.

Reference

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Groundwater Economics

BY CHARLES A. JOB

xxv + 661 pp., 26 × 18 × 3.8 cm, ISBN 978 1 4398 0900 6, US\$ 125.00, Boca Raton, FL, USA: CRC Press, Taylor Francis Group, 2010

Groundwater Economics is the latest addition to a growing number of books on diversified topics on groundwater resources and their management (for example Griebler *et al.* 2001; Quevauviller 2008). Charles A. Job's well researched and comprehensive book deals with different economic aspects of groundwater in detail that usually is not the common knowledge of the engineer, hydrologist, hydrogeologist, biologist, ecologist or the conservationist. Broad in scope, it is written for advanced undergraduates, graduate students and professional researchers. From the very beginning, it is assumed that economics through its skill to use a unique language of commensurability and calculation can be understood by readers varying from groundwater specialists to politicians. But economic arguments can also speed decisions in case of acceptance of vital projects dealing with groundwater systems under stress, with environmental management and/or environmental conservation themes.

The book is organized into five parts with 16 chapters, and part six includes several case studies to cover text topics. The book begins with a general overview of groundwater as both ecosystem and as a body of natural resource available for multiple usages. This sets the stage for the following chapters to introduce economic aspects with respect to resource consumption. The adoption of the idea that a groundwater body is an ecosystem networked to other terrestrial and aquatic systems, where humans are also members of those large ecological structures, interfering in many ways with the processes which act on the groundwater quality and/or quantity, is very attractive and increases the interest of the reader for the treatment of various topics in the next chapters.

The second part very effectively makes a case for understanding the importance of groundwater in the ecosystem as an essential commodity for much of the world's population. It provides a context for the necessary economic analysis. This part begins with a description of the hydrological cycle, followed by brief sections on groundwater in nature, availability, quality, flow, human activity and ecosystem vulnerability with emphasis on costs and benefits which are in turn closely connected with a number of constraints such as access to the resource, supply, demand and scarcity, water quality, waste disposal and legal considerations. Part three provides a short list of significant features from Part two and a summary of current data on indicators of competition for groundwater and subsurface environment. Part three describes the microeconomic and macroeconomic processes related to the use of

groundwater and subsurface waste disposal while Part four focuses on groundwater policy development and its economic analysis using neoclassical economics and other economic instruments. Part five is focused on groundwater use and management in the future with reference to sustainable development, transboundary and climate change considerations. The ecological capacity of groundwater systems, and their occurrence and usage, are analysed through macroeconomic models when regional or continental aspects are dealt with and through microeconomics in case of specific local situations. This treatment approaches the question of political decision for groundwater affairs again at two different levels, those dealing with large ecological and societal systems and those of more reduced size of special interest to local communities. It is worth mentioning that the author stresses in this context the need for additional research dealing with applied groundwater topics. Unfortunately economic aspects related to the need for stronger investments in groundwater research and protection of groundwater ecosystems are not dealt with. Another slight weakness of the book is the lack of discussion about economic aspects related to public education in perceptions of groundwater systems and exploitation of groundwater resources. These omissions do not diminish the value of the book, which is remarkable, reflecting the unusual interdisciplinary approach the author chosen, deviating from traditional economic texts to present complex problems associated with groundwater development, management and its sustainable use, analysing them using economic fundamentals. The book will be invaluable to economic analysts, improving evaluation of the complex and/or subtle groundwater issues, and make non-economist engineers, hydrologists, hydrogeologists, environmental biologists and ecologists more familiar with economic fundamentals. Additionally to the book aids both planners and decision makers working on environmental conservation projects.

The book makes a valuable contribution to groundwater science and we are confident that it will be widely used.

References

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Treasures of the Earth: Need, Greed, and a Sustainable Future

BY SALEEM H. ALI

xiii + 289 pp., 18 figs, ISBN 978 0 300 14161 0, New Haven, CT, USA and London, UK: Yale University Press, 2009

Oil, gas and mining projects are among the most significant challenges to the conservation of biodiversity worldwide. The penetration of extractive industries into areas valued from their biological and/or cultural significance raises challenging questions about the nature of development, the scarcity and sustainability of resources, and the most effective way of ensuring material standards of living for many of the world's poorest people. *Treasures of the Earth* is a highly readable book that examines these and other big questions surrounding mineral extraction. Saleem Ali, Professor of Environmental Studies at the University of Vermont, takes aim at what he sees as an unwarranted polarity in discussions about the Earth's natural resources, where the extraction and use of non-renewable resources is too often represented as only either virtue (development) or vice (exploitation and degradation). The author's goal is not critique, however, but constructive intervention: to put contemporary debates over the extraction and consumption of resources onto a new footing by providing a nuanced account of the social and cultural roles played by minerals.

The book is made up of nine chapters, plus an introduction and short epilogue and is divided into three whimsically titled parts. 'The pleasure of treasure' highlights the cultural mystique that surrounds many minerals (think diamonds, amber or gold), the desires that motivate individuals and groups to acquire materials which have high social value, and how the search for mineral wealth has driven technological and social innovation and the creation of new economies and geographies of settlement (think Johannesburg, San Francisco or Melbourne). 'Toil and treasure' outlines the material economy of resource mobilization, and the environment and development challenges associated with extraction. Ali is particularly critical of the resource curse literature for a 'fatalistic rhetoric' that 'exonerate(s) cultural factors and nuances of development' by not giving full consideration to the social context through which resources (and the revenues they generate) are managed. The final part, 'Measure for measure', closes the loop by considering the opportunities for material recycling and the restoration of extractive landscapes, and how the desire for materials might be creatively re-tooled. *Treasures of the Earth* is impressively interdisciplinary in scope, and perhaps necessarily so. The author draws on intellectual traditions as diverse as chemistry, psychology and philosophy to express the complexity of a material world in which 'attempts at building human order out of random natural chaos require us to manipulate material in a myriad ways.' There is a similarly expansive fluidity to the book's historical and geographical scope, with plentiful use of examples and vignettes that go beyond the standard fare of familiar cases and which capitalize on the author's rich experience.

For some, the account of mining and mineral consumption that Ali provides will be too relentlessly even-handed: it pulls its punches when it should be landing them and, in bending over backwards to undo the stigma that has become attached to extractive resources, it inevitability over-reaches. This willingness to consider all perspectives and suspend the calling of villains and saints may be the necessary result of the author's broader project, one that prioritizes a politics of engagement and deliberative dialogue over one of judgement (the author founded the *ecominerals* listserv a few years ago which engages mining firms and activist non-governmental organizations alike, and which will be familiar to some readers). Indeed, the book's analytical register is strikingly different to either the statistical abstractions or muscularly structural accounts of exploitation that are normally associated with work on 'need and greed' around mining. Ali casts oil, gas and other mineral resources as an 'intimate relationship' between humans and materials centred on what he terms 'the treasure impulse'. This term refers to the psychological and cultural