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Alfred Russel Wallace's 1886–1887 Travel Diary: the North American Lecture Tour.

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In her own work, Arthington has championed *benchmarking*, a top-down approach in which scientists measure change along gradients of flow regime alteration in order to evaluate the ecological risks associated with various water management scenarios. Quantitative benchmarking anchors the recently formulated Ecological Limits of Hydrologic Alteration (ELOHA) framework (Poff et al. 2010), to which Arthington dedicates a chapter that outlines its rationale, methodological steps, and recent applications.

An ongoing tension exists in management between the desire for widely applicable principles (e.g., predictable ecological responses to hydrologic change) and the highly variable nature of rivers. *Environmental Flows* similarly alternates between descriptions of broad concepts and methodological frameworks and specific examples that illustrate the dependence on context of flow alteration effects. Indeed, the text is rich in examples, many from Australia and Europe, which may be particularly informative to North American readers.

Most referenced publications are dated earlier than 2011, but Arthington points the way forward in a short chapter that touches on a range of challenges for developing predictive models of ecological responses to hydrologic change. These include incorporating thermal regimes and water chemistry into ecosystem flow models and linking population and community dynamics to flow alteration. Another major challenge clearly lies in extending concepts of ecological water management to groundwater-dependent ecosystems, which Arthington discusses in detail and with an especially clear description of what *groundwater* is, how it gets there, and why it is ecologically important.

Arthington dedicates her book to "river warriors everywhere," and *Environmental Flows* provides a solid starting point for those entering the fray over water. The book will help students of water management and policy, as well as engineers, educators, and environmentalists, understand why the question "How much flow should we leave in the river?" may not have a short answer.

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WALLACE IN AMERICA

Alfred Russel Wallace's 1886–1887 Travel Diary: The North American Lecture Tour. Charles H. Smith and Megan Derr, eds. Siri Scientific Press, 2013. 258 pp., illus. $45.00 (ISBN 9780956779588 paper).

The purpose of *Alfred Russel Wallace's 1886–1887 Travel Diary: The North American Lecture Tour* is to document a little-known chapter in the life of this British naturalist and codiscoverer (with Charles Darwin) of evolution by means of natural selection. This publication also marks the 100th anniversary of the death of Wallace (he lived from 8 January 1823 to 7 November 1913), who recorded many of his remarkable experiences in a two-volume autobiography (Wallace 1905). In the first decade of this century alone, four biographers have explored his life (Raby 2001, Shermer 2002, Fichman 2004, Slotten 2004), and the author of one of those (Michael Shermer) also wrote the preface to this volume. The first editor, Charles H. Smith, is a science librarian who runs the Web site *The Alfred Russel Wallace Page* at Western Kentucky University (*http://people.wku.edu/charles.smith/index1.htm*) and is the editor of both an anthology (Smith 1991) and an intellectual history (Smith and Beccaloni 2010) of Wallace.

History has provided Darwin with the lion's share of the credit for the theory of natural selection because of the 20 years of data he presented in *On the Origin of Species* (Darwin 1859). Wallace was fully supportive of Darwin's priority, pleased to be Darwin's colleague in raising the subject, and delighted that it was not his fate to explain evolution to the world. Darwin even wrote to Henry Bates, Wallace's good friend and traveling companion in the Amazon: "What strikes me most about Mr. Wallace is the absence of jealousy towards me: He must have a really good honest and noble disposition, a far higher merit than mere intellect" (Berra 2013). This nonproprietary attitude allowed Wallace to concentrate on biogeography (Wallace 1869, 1876) and eventually on spiritualism—in the form of a bizarre fixation with mediums and séances that began in 1866 and that adversely affected his scientific standing.

Wallace was a pallbearer at Darwin's funeral in 1882, along with James Russell Lowell, an eminent literary figure and the American minister to Britain at that time. The latter invited Wallace, then the world's most famous living naturalist, to lecture at the Lowell Institute, in Boston. Wallace accepted the offer in 1885 and began planning what was to become his North American lecture tour, his lectures eventually forming a substantial part of his major work, entitled *Darwinism* (Wallace 1889). Wallace arrived in

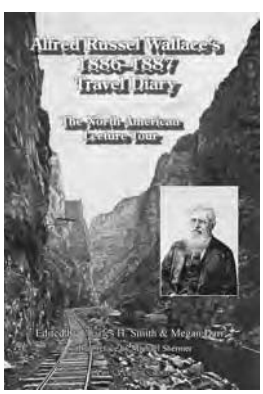
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New York on 23 October 1886, traveled to Boston 5 days later, then proceeded to Baltimore; Washington, DC; Toronto; Cincinnati; Bloomington; St. Louis; Kansas City; Salina, Kansas; Denver; and, eventually, San Francisco. The return trip included Salt Lake City, Colorado Springs, Sioux City, Chicago, and East Lansing, to name some of the 41 lecture stops. Like most ventures Wallace attempted, the lecture tour was not especially profitable. After expenses, the tour earned Wallace only £350.

The bulk of this travel diary contains the daily transcriptions of Wallace's journal, the original of which is owned by The Linnean Society of London. He gave his first lecture in Boston on 1 November 1886 to a full and appreciative audience; the topic was "The Darwinian theory." Other topics in his repertoire were "The origin and uses of the colours of animals"; "Mimicry, and other exceptional modes of animal colouration"; "The origin and uses of the colours of plants"; "The permanence of oceans, and the relations of islands and continents"; "Oceanic islands and their biological history"; "Continental islands: Their past history and biological relations"; and "The physical and biological relations of New Zealand and Australia." He illustrated his lectures with colored lantern slides. A newspaper account from the *Boston Evening Transcript* of his Darwin theory lecture stated, "The first Darwinian, Wallace, did not leave a leg for anti-Darwinism to stand on when he had got through his first Lowell lecture last evening. It was a masterpiece of condensed statement—as clear and simple as compact—a most beautiful specimen of scientific work. Mr. Wallace, though not an orator, is likely to become a favourite as a lecturer, his manner is so genuinely modest and straightforward" (Wallace 1905, p. 110).

Wallace met Asa Gray, the Harvard botanist and American Darwinian, on 5 November 1886. His other notable Boston contacts included Oliver Wendell Holmes and Alexander Agassiz. In addition to visiting major museums, Wallace attended séances (in which he experienced "materializations") including those run by the well-known medium Hannah Ross, who was eventually charged with fraud. Wallace thought that she was legitimate, however. In Washington, DC, he met Spencer Fullerton Baird, secretary of the Smithsonian Institution. Wallace became friends with Major John Wesley Powell, head of the US Geological Survey, with whom he visited the White House and met President Grover Cleveland on 4 February 1887.

Wallace gave three lectures in Sioux City, Iowa (2–4 May 1887), and was described by Charles (1906) as "polite, genteel, neat in dress, he stood six feet high and was built in proportion. At the time of his visit here, he was wearing a closely cropped beard.



"Wallace was not an orator, not even a smooth speaker. He spoke carefully, without notes, and always kept within bounds. His lectures were strictly scientific. It was what he said, rather than how, that attracted. He was a pleasing conversationalist, one not given at all to small talk. [Although] it was hard for him to get away from the subject of evolution, I do not remember that he spoke a single time while here concerning his own great part in the working out of the evolutionary hypothesis" (pp. 56–57). This last point often frustrated Darwin, who wanted Wallace to accept his fair share of credit for the idea of natural selection, but Wallace was content to be the person who stimulated Darwin to publish (Berra 2013).

While touring the American West, Wallace was greatly impressed with Yosemite Valley and its glacier-cut walls. The highlight of the western leg of his trip was a tour of the redwood and sequoia forests in the company of the budding conservationist John Muir. About the sequoias, Wallace wrote on 15 June 1877, "Of all the natural wonders I saw in America, nothing impressed me so much as these glorious trees.…These grand pines are often from two hundred to two hundred and fifty feet high and seven or eight feet in diameter at five feet above the ground."

Following the journal entries are Wallace's notes on expenses. In addition, the editors have provided 97 pages of useful appendices such as lists of lectures given, places seen, and plants collected. *Alfred Russel Wallace's 1886–1887 Travel Diary* is well illustrated and well produced by a small publisher of short print runs of titles that might be overlooked by larger publishers. This explains the rather high price. For those who consider themselves Wallace aficionados, this book is essential; it is authoritative and trustworthy, and it describes a little known part of the Wallace story.

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PLANT PORN

Green Universe: A Microscopic Voyage into the Plant Cell. Stephen Blackmore. Papadakis Publisher, 2012. 256 pp., illus. $60.00 (ISBN 9781906506216 cloth).

Green Universe: A Microscopic Voyage into the Plant Cell presents a panoramic overview of the morphology and anatomy of the plant kingdom, from algae to angiosperms. The format is large (the volume measures 25 × 25 square centimeters), the pages are black and shiny, and the photographs are splashy. Some photos span an entire spread; others take up a full page. Flipping through the pages of this book, anyone with a coffee table will be intrigued and impressed by the intricacy and splendor of plants.

Author Stephen Blackmore, regius keeper of the Royal Botanic Garden Edinburgh, is an accomplished botanist and palynologist who has published both scientific monographs and generalist books. The latter range from field guides to a manual for sustainable gardening. For *Green Universe*, he took many of the photographs himself. The book's images are mainly of three kinds: macroscopic images of whole plants or organs, micrographs of cells or tissues taken with a scanning electron microscope, and light micrographs of prepared slides. Each image has a cursory caption identifying the species and stating a salient fact.



As the book's subtitle suggests, micrographs (both light and electron) are its cynosure. Of them, the scanning electron micrographs are original and uniformly stunning. As a researcher, Blackmore was an early adopter of the scanning electron microscope in biology and has used it incisively. Arguably, these micrographs are worth the cost of the book. The nonmicroscopic photographs, although they are typically of more familiar subjects (e.g., leaves or flowers), provide context and have been taken with sensitivity and grace. However, the light micrographs, although they display the layout of cell walls within an organ strikingly, often show a shriveled cytoplasm, denoting poor preparation. Furthermore, Blakemore includes few—if any—fluorescence or Nomarski micrographs. This is a pity insofar as both techniques reveal cellular structures at high contrast, including in living material. Except perhaps for their size, the images of mitosis might have been published by E. B. Wilson a century ago.

Oddly, for what is ostensibly a photographic voyage, *Green Universe* contains a great abundance of text. Whereas some spreads are occupied entirely by a photograph, most of them have a photograph on one page and a swath of text on the other, and quite a few spreads have text on both pages, with photographs relegated to the margins.

The text is not only long, but it is difficult to read: set in a repellant sans-serif font at a size that verges on the microscopic and usually printed in a pastel color on a black background. Accessibility is further diminished by the chapters' comprising dozens of pages while being devoid of headings. Compounding the unfriendliness of the typography is an apparent carelessness of editing. A more careful editor might have found some of the book's mistakes. To pick out a few, the word *flagellae* is a solecism, malate is not a product of decarboxylation in C_4 photosynthesis, and the formula given for resolution in the light microscope is wrong. More important, a more careful editor would have helped to channel the text, whose page-long paragraphs tend to wander through topics like a child exploring the seashore.

For all this abundance of text, who is the target audience? *Green Universe* could be written for nonscientists, a suggestion supported by introductory treatments of concepts in biology, such as DNA and mitosis, that are given essentially from first principles. But I worry about such a reader. A painstaking account of DNA comes after a description of synthetic biology. Is it reasonable to expect nonscientists to cope with designer genomes before learning the facts of DNA? Moreover, I estimate the length of the text to be 50,000 words—a substantial number for a book whose large size and glossy pages make even the act of reading a challenge. In fact, the text is a reasonably complete primer on botany, treating the cellular and reproductive structures of many groups of plants in considerable detail, but it presents this complexity with neither diagram nor direct reference to any of the marvelous photographs. Without reference to a diagram, it strains credulity that a nonscientist could follow, for example, the peculiarities of gnetalian sex.

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