BOOK REVIEWS

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The Eponym Dictionary of Reptiles. B. Beolens, M. Watson, and M. Grayson. 2011. Johns Hopkins University Press. ISBN 9781421401355. 296 p. $100.00 (hardcover).—With its emphasis on succinctness, precision, and logic, scientific literature provides little scope for revealing an author's personality. Only article titles and acknowledgments reveal such glimpses in most scientific disciplines. Taxonomic papers, however, provide a third area for personality to shine through, in the etymology of the created names. Many such names reflect aspects of the organism as seen through the prism of the author's mind. In other cases, species are named after people, usually real, but sometimes mythical or fictional. Sadly, while the people behind such eponyms are familiar to the authors themselves, and often to a wider range of people of that generation, with time the people concerned often fade into obscurity together with the papers themselves. Instead, subsequent generations of researchers and the non-professional community experience the names as seen in field guides, or in recent times the Web, leaving the reader to wonder who were the Storer and DeKay of *Storeria dekayi* and the Xantus and Rivers of *Xantusia riversiana*, and what their connections with the species were.

This book, a mammoth undertaking, provides readers with some of this information. It is the third foray by the authors into this field, with previous similar books on birds (Beolens and Watkins, 2003) and mammals (Beolens et al., 2009), and I believe a fourth volume on amphibians is in preparation. The coverage is extensive, with 4173 taxa (generic and/or specific names) representing 2330 people. Vernacular names are also covered. In most cases these vernacular names, generally coined by others subsequent to the original taxon description, either reflect the binomen itself (e.g., Jameson's Mamba, *Dendrosaspis jamesoni*) or the author of the binomen (e.g., Boulenger's Legless Skink, *Typhlosaurus vermis*, described by Boulenger). In a few cases, the vernacular eponym does not reflect the original eponym (e.g., Boulenger's Bow-fingered Gecko, *Cyrtodactylus loriae* Boulenger, 1897), which can lead to momentary confusion, although such names are covered under both eponyms.

The authors have obtained their binomial eponyms largely from the Reptile Database maintained by the J. Craig Venter Institute (www.reptile-database.org). I noticed relatively few omissions. Among the Australopapuan fauna, with which I am most familiar, omissions were the typhlopids *Ramphotyphlops becki* (Tanner, 1948) (named for D. Elden Beck, 1906–1967) and *Ramphotyphlops sylvia* Ingram and Covacevich, 1993 (alluding to both Hannah Sylvia Ingram, the mother of one of the describers, and Rhea Sylvia, mother of Romulus and Remus), the skink species *Lygisaurus sesbrauna* Ingram and Covacevich, 1988 (named for Ses Brauna), *Menetia koshlandae* Greer, 1991 (for Phyllis A. Koshland) and *Menetia sadlieri* Greer, 1991 (for Ross Sadlier), and the skink genus *Geomyersia* Greer and Parker, 1968 (for George Sprague Myers), although the latter two persons are covered in the book via other eponyms. Vernacular eponyms for North American, Mexican, and European reptiles were taken from published standard lists for those areas. However, no indication is given as to the source of the vernacular names for taxa outside of those areas. I suspect many of the latter vernacular names were sourced from web pages, and this has led to the inclusion of a number of names based on geographic or other features that have been incorrectly rendered into the vernacular (and which are noted as such). For some of these, the error in the vernacular name is obvious from the termination of the specific epithet (Andaman's Cat Snake, *Boiga andamanensis*; Andresen's Snake, *Coniophanes andresensis*, Darwin's Ground Skink, *Glaphyromorphus darwiniensis*; Kennedy's Lerista, *Lerista kennedyensis*; Oenpelli's Rock Python, *Morelia oenpelliensis*). In other cases, the error is not obvious, with the form of the epithet confusable with a personal eponym, but in reality named for the type locality (e.g., Baden's Pacific Gecko *Gekko badenii*, named for Nui Ba Den; Essington's Ctenotus *Ctenotus essingtoni*, for Port Essington; Fernand's Skink *Lygosoma fernandi*, for Fernando Po; Roper's Banded Snake *Simoselaps roperi*, for the Roper River; Stanley's Lobulia *Papuascincus stanleyanus*, for the Owen Stanley Range, and Stephen's Sticky-toed Gecko *Hoplodactylus stephensi*, for Stephens Island). However, in some cases, the cited "eponymic" vernacular name is unrelated to the binomen or author and is geographical (e.g., Bougainville's Scaly-toed Gecko, *Lepidodactylus mutahi*; Llanos Side-necked Turtle, *Podocnemis vogli*, Stewart's Sticky-toed Gecko *Hoplodactylus rakiurae*). For most geographic patronyms, the authors have simply noted that the name was based on the stated geographic feature without noting the original source of the geographic eponym, although they do provide such information for three patronyms, *Emydura macquarii*, *Diporiphora reginae*, and *Proablepharus reginae*. For completeness, it would have been simple to note the basis of the geographic name for the others as well.

There is also a small number of eponyms based on ships (*Saproscincus challengeri*, *Geckonia chazaliae*, *Nactus cheverti*, *Cryptoblepharus egeriae*, *Ramphotyphlops exocoeti*, *Brachymeles pathfinderi*, and *Sphaerodactylus rosaurae*, though overlooking *Cyclodomorphus casuarinae*) or institutions and organizations (*Anolis bicaorum*, *Atractus lasallei*, and *Proctoporus unsaacae*, though overlooking *Carlia amax*).

The authors state that they excluded eponyms created by Wells and Wellington in two contentious works (Wells and Wellington, 1984, 1985), but they do include four eponyms by these authors from equally contentious later papers (*Cyrtodactylus abrae* Wells, 2002a; *Pseudonaja gowi* Wells, 2002b; *Elseya jukesi* Wells, 2002c, and *Pseudechis weigeli* Wells and Wellington, 1987), as well as many (but not all) of the numerous names created by Raymond Hoser that have also been the subject of much criticism (*Aspidites melanocephalus adelynensis*, *Acanthophis barnetti*, *A. bottomi*, *A. crotalusei*, *A. cumingi*, *A. macgregori*, *A. wellsi*, *A. woolfi*, *Broghammerus reticulatus patrickcouperi*, *B. r. stuartbigmorei*, the genus *Katrinus*, *Morelia macburnei*, *M. mippughae*, *Pailsus pailsei*, *Pseudonaja elliotti*, and *Tropidechis sadlieri*). However, despite their claim to reject the Wells and Wellington names, Beolens et al. do list several species under four generic names coined by these authors (*Antaresia*, *Christinus*, *Glaphyromorphus*, and *Saproscincus*), and ignore a number of eponymous species that have been consistently accepted and validated by subsequent authors, such as *Cacophis churchilli*, *Cyclodomorphus michaeli*,

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Cyrtodactylus sadleiri, *Eulamprus heatwolei*, *Eulamprus martini*, *Egernia mcpheei, Pogona henrylawsoni*, *Saltuarius swaini*, *Saproscincus galli*, and *Saproscincus rosei*.

For the most part, the authors have not included synonymic eponyms, although there are a few exceptions (e.g., *Leiurus berdmorei*, *Philodryas carbonelli*, *Agama neumanni*, *Pantodactylus nicefori*, *Scincus philbyi*, *Sceloporus pilsbryi*, *Python schneideri*, and *Sceloporus thayerii*).

The inclusion of subspecies is less consistent. While about 240 subspecies are included worldwide, only two of 19 eponymic subspecies among the Australian fauna (counted from Cogger, 1996) are present (although another five people on the list are covered by species eponyms).

For each person, a short biographical sketch is provided, although the detail varies greatly. In some cases, the lack of detail simply reflects the little that is known of the person (the authors note that there are 15 names that they have been unable to identify). Often, but not always, there are years of birth and/or death and, where the person is based at an institution, the affiliation. If a person published, one publication is listed. The choice of such papers is often curious, with very obscure minor titles sometimes listed over major publications. For example, for Julian Ralph Ford, there is no mention of his several herpetological papers, but instead, a co-authored half-page note reporting a range extension for a bird is listed. For Sir Frederick McCoy, there is no mention of his major zoological work, the *Prodromus of the Zoology of Victoria*, but only his last publication, a two-page note on a fossil arthropod. For Francis John Mitchell, a three-page popular article is cited rather than any of his scientific publications. For Joan Beauchamp Proctor, there is only mention of a note reporting her display of a live Komodo Dragon at a meeting of the Zoological Society of London. Edgar Ravenswood Waite did not only write a short paper, ''Notes on Australian Typhlopidae,'' but later provided a full revision of this snake family in Australia.

The biographical accounts are generally succinct and entertainingly written, and encourage browsing, making the book something to dip into and read rather than being just a dry reference work (as the lack of any illustrations might suggest on a first flick through). In most cases, the accounts give some indication as to the connection between the person and the eponym, although these are unfortunately lacking in some cases. What was the connection between the well-known palaeontologist Robert Broom and the two species bearing his name? The authors do not mention that before moving to South Africa, he practiced medicine in northern Australia and collected the reptiles there. Similarly, there is no mention of the connection between Heini Hediger and *Parapistocalamus hedigeri*, as the authors do not mention Hediger's fieldwork in the Bismarck Archipelago and Solomon Islands. While the authors note that Moritz Friherr von Leonhardi was based in Germany and conducted his anthropological work through intermediaries, they do not make it clear that von Leonhardi's Australian work was conducted through Carl Strehlow at Hermannsburg Mission, from whom the skink *Ctenotus leonhardii* was obtained. John Richardson's contributions as naval surgeon and Arctic explorer are mentioned, but not his supervision of the Museum at Haslar Hospital, from which John Edward Gray received and described several species.

The information in the accounts is generally accurate, although there are some unfortunate errors. Those that I have noticed are as follows, in order of appearance in the book.

While the authors speculate over for whom Joan Robb named *Cyclodina alani*, Gill and Whitaker (1996) note that the species was named after Robb's nephew, Alan Robb.

Lars Gabriel Andersson (Andersson's Leaf-toed Gecko) did not take part in Eric Mjöberg's expedition to Australia, but was co-author (with Einar Lonnberg) of the account of the herpetological collections made by Mjöberg.

Pseudemoia baudini was not named by Duméril and Bibron in 1839, but by Greer (1982). The error presumably arose because the authors have confused the New Guinean skink *Emoia baudini*, which was described by Duméril and Bibron, and the southwestern Australian skink *Pseudemoia baudini*.

Bavay's Keeled Skink (*Tropidophorus baviensis*) is not named for Arthur René Jean Baptiste Bavay, but for the type locality, Mt. Ba Vi in Vietnam.

Wenceslas (Wenzel) Bojer (1800–1856) (*Gongylomorphus bojerii*) could not have been director of the Botanic Gardens in Mauritius between 1948 and 1949. Also, most sources suggest he was born in 1795.

While Hyacinthe Yves Philippe Potentien, Baron de Bougainville (*Lerista bougainvillii*) may have been in Gray's mind when naming this species, it was probably not due to his visit to Australia during the voyage of the Thétis and Espérance in 1825, but his earlier visit to Australia during the Baudin expedition of 1800–1804. Gray took the name from the Paris Museum, where Duméril and Bibron published the name as new later in the same year, based on the same specimen. The latter authors noted that the type was collected by Peron and Lesueur, who were also on the Baudin expedition.

John Archibald Boyd (*Hypsilurus boydii*) was not primarily a professional natural history collector, but raised cotton and beef in Fiji, then sugar in Queensland, and collected natural history specimens as a hobby, although he did take on some collecting commissions in behalf of William Macleay. He was not an employee of the Australian Museum, but donated some of his material to that collection.

Séraphin Braconnier, while the source of some lizard specimens from New Caledonia in the Museum für Naturkunde, Berlin, was not known to have visited New Caledonia to collect them.

Rudolf Braun, born 1908, cannot have been the person for whom *Trachylepis brauni*, described in 1902, was named. Tornier stated that the species was named for Professor Braun of Königsberg, who is presumably Professor Maximilian Christian Gustav Carl Braun (1850–1930), professor of zoology at the Universität Königsberg from 1891.

I am unable to locate any record of a paper by Edward Burton (*Lialis burtonis*, *Nessia burtonii*) on ''fishes that Cuvier had described,'' although Burton did redescribe a species of *Monacanthus*, a genus erected by Cuvier.

While Glen Ingram may have had the Roman Emperor Caligula in mind when naming *Lampropholis caligula*, his etymology makes no such allusion, merely stating the species is named from the Latin *caligula*, a little Roman boot.

George Cann, brother of John Cann (*Chelodina canni*), died in 2001, while John, who ran their snake show alone since George's death, retired from the exhibition in 2010.

Cryptoblepharus carnabyi was not named after Keith Carnaby, but the grazier and amateur ornithologist Ivan Clarence Carnaby (1908–1974).

Irene Champion (*Phyllurus championae*) did not write a paper on python ascarid nematodes; the cited paper is by Brian Champion, an unrelated Sydney herpetoculturist.

Lerista christinae, as noted by the authors, is named for Dr. Christine Davidge, so the vernacular name should be Christine's Lerista, not Christina's Lerista.

The statement by the authors that Edward Drinker Cope requested in his will that his body be used as the holotype of

Homo sapiens, but that his skeleton was found to be unsuitable because of disease, perpetuates rumors of his death from syphilis, which were rejected by Davidson (1997), who also quoted from the codicil to Cope's will concerning the disposition of his remains, which does not mention anything about such a request.

John Dwyer (*Suta dwyeri*) is still alive.

Cyrtodactylus eisenmani was subsequently corrected to *C. eisenmanae*, being named after Dr. Stephanie Eisenman. While the authors have noted and commented on such corrections in other cases, they overlooked this one.

Dene Barrett Fry (Fry's Lerista) did not work at New South Wales University as a taxonomist and collector—that university did not exist at the time. He was employed as a cadet zoologist at the Australian Museum, and later as a demonstrator in biology at the University of Sydney.

Johann Caesar Godeffroy (*Hypsilurus godeffroyi*) did not ''forget to be sufficiently commercial''—his family business was severely affected by the financial crisis that was initiated by the Franco–Prussian War, leading to its eventual bankruptcy.

Philip Griffin (*Lerista griffini*) was employed as assistant to Storr at the Western Australian Museum at the time of description of the species, but he and Storr did not collaborate on any fieldwork in the Lake Eyre region.

It was explicitly stated by Duméril and Bibron that the skink *Lampropholis guichenoti* was named after Antoine Guichenot (or Guichenault) (d. 1817), gardener with the Baudin expedition of 1800–1804, rather than Antoine Alphone Guichenot (1809–1876), who was a herpetological assistant at the Museum d'Histoire Naturelle, Paris.

Gregory Harold (*Aprasia haroldi*, *Delma haroldi*, *Lerista haroldi*) is still alive.

David Robert Horton (Horton's Mabuya) is no longer at the University of New England, and has not been there for many years.

Boulenger explicitly noted that *Pseudonaja ingrami* was named after Sir William Ingram, not his son, the ornithologist Captain Collingwood Ingram. Sir William Ingram was co-owner of Alexandria station, from whence Wilfred Stalker collected the holotype.

Jean White (*Strophurus jeanae*), now Jean Thipthorp, is no longer at the Western Australian Museum.

Sphenomorphus kuehnei is not named for Victor Kühne, the alias of John Cheesman Thompson. As noted in the type description, the type series was obtained from a German dealer in 1905, and collected by a Herr Kühne from the Kei Islands. This is too early for Thompson's travels in Indonesia. Instead, the species is almost certainly named for Heinrich Kühn (d. 1906), a planter and natural history collector who was based in the Kei Islands, and who collected numerous bird skins for the Rothschild collection.

David Lindner (b. 1944) (*Pseudothecadactylus lindneri*) is not a herpetologist who works closely with Hal Cogger, but a former ranger with the Northern Territory Parks and Wildlife Service, now retired, who worked with Cogger in the 1960s and 1970s during surveys of the Port Essington and Kakadu areas.

Dr. John Mair (*Tropidonophis mairii*) was not the collector of the holotype of the snake during George Grey's expedition. The snake, donated by Mair, was described by John Gray in an appendix published in the report of Grey's expedition. Mair did not participate in the expedition, but sent snakes to the Chatham Museum, from where Gray described the species.

Adolf Bernard Meyer (Meyer's Emo Skink) is Adolf Bernhard Meyer (his original personal names were Aron Baruch).

Lerista nevinae: While Laurie Smith worked at the Western Australian Museum with Anne Nevin, Mark Adams is based at the South Australian Museum.

Professor Nicholls (*Lerista nichollsi*) was Professor George Edward Nicholls (1877–1953), Professor of Biology at the University of Western Australia, not Gilbert Ernest Nicholls (b. 1893).

Caledoniscincus orestes: The authors suggest that Ross Sadlier may have named this species in the sense of the Latin term ''orestes,'' meaning a mountain-dweller, rather than Orestes, son of King Agamemnon, but clearly did not read the type description of the species, which states the former explicitly.

Tropidonophis parkeri is not named for Hampton Wildman Parker, but for Fred Parker.

Ramphotyphlops robertsi is not named for Gregory Roberts, but Lewis Roberts.

The Australian monitor *Varanus rosenbergi* is not named for Baron Carl Benjamin Hermann von Rosenberg, the German naturalist and geographer, who had collected in Indonesia and died almost 70 years before, but for the Hamburg herpetologist Hans Rosenberg, who showed Mertens the first (live) specimens of the species.

Dr. Rurk (*Ristella rurkii*) did not send the holotype of the species to John Edward Gray, who was based at the British Museum. It was described from a specimen in the Museum of the Army Medical Service at Chatham, so Rurk must have been a medical officer in the British Army.

Pygopus schraderi is not named for Carl Wilhelm Otto Schrader, the German explorer and naturalist. Boulenger does not give a specific etymology, but notes that the holotype was from the collection of a Mr. P. Schrader, after whom he presumably named the species.

Mabuya stanjorgeri, as suggested by the authors, is a misspelling. It seems to have first appeared on various websites, attributed to Gray in 1845, but Gray did not publish any such name. He published *Mabuya* (now *Chioninia*) *stangeri* in 1845.

Adolfus vaueresellii and *Buhoma vauerocegae* were not named (at least in full) by Gustav Tornier after people with the names Vaueresell and Vauerocega, but were named in accordance with formulae that represented taxonomic allocation. ''Eselli'' represents Sauria, Lacertidae and ''ocegae'' represents Ophidia, Colubridae, Geodipsadinae. In the same vein, ''vauer'' is likely to represent Vertebrata, Reptilia.

John Randall Weigel (*Pseudechis weigeli*) did not discover a toad in the Kimberley region of Western Australia, but a myobatrachid frog.

Richard C. Wells (*Acanthophis wellsi*) has the middle name Walter.

Stephen Karl Wilson (*Strophurus wilsoni*) was not sole author, but co-author with Gerry Swan, of *A Complete Guide to Reptiles of Australia*, which was published in 2003, not 2004.

In three cases, the authors suggest eponymy for generic names proposed by John Edward Gray. However, none of these (Friedrich Boie for *Bolyeria*, one of two Gerards for *Gerarda*, and the obscure Dutch physician and helminthologist Murk van Phelsum, who had died 46 years before the description of *Phelsuma* and 21 years before Gray's birth) are supported by any direct evidence, and it is just as likely that they are three more of the numerous herpetological generic names coined by Gray that are meaningless but euphonious combinations of letters (e.g., *Aprasia*, *Bachia*, *Carlia*, *Chioninia*, *Dasia*, *Delma*, *Egernia*, *Elgaria*, *Feylinia*, *Gehyra*, *Lialis*, *Liasis*, *Lipinia*, *Menetia*, *Morelia*, *Morethia*, *Nessia*, *Odatria*, *Riopa*, *Ristella*, *Saiphos*, and *Tiliqua*).

Despite this rather lengthy list of errata, given the very large number of persons covered, this is a relatively small error rate (46/2330, or 2.0%), although almost certainly a significant underestimate given my lesser familiarity with eponyms outside the Australopapuan region. An alternative estimate of error rate can be gained from a comparison of the names and years of birth and/or death provided by Applegarth (2007) with those by Beolens et al. (2011). While Applegarth's compilation of names and dates was primarily concerned with taxonomic authorship rather than eponymy, it does have extensive overlap with this book, and is cited as a useful reference by Beolens et al. and so presumably seen by them. I count 883 persons who are covered by both texts. Of these, there are 179 persons where there is some difference between the two sources in either the name, year of birth or year of death (excluding minor differences in spelling or order of names, or the year of death for those who died post 2007). Many of these cases are one or more personal names or years that are excluded by one or the other source, and the additions/exclusions are roughly evenly balanced between the two sources, although it would have been hoped that Beolens et al., as the later work, would have been more complete or accurate than Applegarth. There are 35 names where there is an inconsistency between years of birth and/or death provided. I have been able to independently check 26 of these, and in 17 cases (Brian Francis Barnett birth, François-Marie Daudin birth and death, Paulus Edward Pieris Deraniyagala death, Edward Arthur Fitzgerald death, Frederick William Fitzsimons birth, Peter (Per) Forsskål birth, Joseph-Paul Gaimard birth, Rudolf Albert von Koelliker death, Fritz Nieden death, Gustavo Orcés-Villagomas birth, Hugo George Rodeck birth and death, Henri-Émile Sauvage birth, Marie Jules César leLorgne de Savigny birth, Thomas Say death, James Emerson Tennent death, Dao van Tien birth, Gustav Tornier birth), the years provided by Applegarth are correct, while in nine cases (George Edwards birth, John Cann birth, Constantine John Philip Ionides birth, Robert Christopher Tytler death [Applegarth has the wrong Tytler], Leslie Desmond Edward Foster Vesey Fitzgerald birth, Francisco Hernández birth, William Elford Leach birth, Patrick Russell birth, John Lort Stokes birth), Beolens et al. are correct.

My major concern with the book is that while it provides much information that is difficult to obtain from other sources, it is something of a dead end for the researcher. The very short bibliography is largely just a list of journals with years of publication (41/66 references), the publications cited in the accounts are title and year only, and the introduction suggests just six other publications for further reading. Thus, while the researcher will find some information here, they will generally find it difficult to assess the accuracy of the information, or use the information to extend their research. As is evident from the nature of some of the errata noted above, the authors sometimes cannot have checked original descriptions, but may have sourced their information from search engines, although they do not specifically indicate the sources for any of their biographical information. As academics keep emphasizing to students, while the Internet is useful as a starting point, it is always important to check the information from the original sources! This warning is particularly pertinent in this instance, as the information in Boelens et al. currently comes up as the first hit in a Google search of many of the names, due to its availability through Google Books.

For those who wish to search for more information about certain people, full names and dates of birth or death can provide useful starting points for genealogical searches. While these are generally provided in Beolens et al., there are some accounts where I can provide further information for future workers. Eric R. Alfred (*Dibamus alfredi*) is Eric Ronald Alfred. Mrs. P. C. Allan (*Lerista allanae*) is Maria Marjory Alberta (Maida) Allan (née Mould) (1884–1950) (see Covacevich and Couper, 1997, for a short biography). Nicholas T. Allen (*Ctenotus alleni*) is Nicholas Timothy Allen. Sewell L. Avery (*Micrurus averyi*) is Sewell Lee Avery. John F. Bransford (*Anolis bransfordii*) is John Francis Bransford. Dennis E. Breedlove (*Anolis breedlovei*) is Dennis Eugene Breedlove. Andrew A. Burbidge (*Ctenotus burbidgei*) is Andrew Arnold Burbidge. P. M. (Paddy) Byrne (*Diplodactylus byrnei*) is Patrick Michael Byrne (1856–1932) (Mulvaney et al., 2000, provide an extensive biography). Brian T. Clay (*Ctenophorus clayi*) is Brian Tolcher Clay (b. 1928). William J. Clench (*Sphaerodactylus clenchi*) is William James Clench. Albert John Coventry (*Niveoscincus coventryi*, *Egernia coventryi*) died in 2007. Alvin J. Cox (*Sphenomorphus coxi*) is Alvin Joseph Cox (1875–1966). John P. Cregoe (*Typhlosaurus cregoi*) is John Plomer Cregoe (b. 1845). Charles G. Danford (*Lacerta danfordi*) is Charles George Danford. Athol M. Douglas (*Egernia douglasi*, *Glaphyromorphus douglasi*) is Athol Mardon Douglas (1915–2006). Harald F. W. Ehmann (*Ctenotus ehmanni*) is Harald Frederich Wilhelm Ehmann. Walter R. Erdelen (*Ceratophora erdeleni*) is Walter Rudolf Erdelen. Ellwood C. Erdis (*Oxyrhopus erdisii*) is Ellwood Charles Erdis. Harold S. Ferguson (*Rhinophis fergusonianus*) is Harold Stuart Ferguson. C. L. Groundwater (*Amphiesma groundwateri*) is Charles Lamont Groundwater (d. 1935). G. Y. Grum-Grzimailo (*Phrynocephalus grumgrzimailoi*) is Grigory Yefimovich Grumm-Grzhimaylo. Robert M. Grey (*Anolis greyi*) is Robert Melrose Grey (1861–1948). C. F. Hemming (*Trachylepis hemmingi*) is Christopher Francis Hemming. E. G. Herbert (*Lygosoma herberti*) is Edward Grevile Herbert. Robert B. Humphries (*Lerista humphriesi*) is Robert Blair Humphries. A. H. Jiear (*Lialis jicari*) is Army Henry Jiear (d. 1934). H. W. Joynson (*Oligodon joynsoni*) is Horace William Joynson (1884–1944). As suggested, Kate Couper (*Saltuarius kateae*) is the wife of Patrick Couper. Peter G. Kendrick (*Lerista kendricki*) is Peter Graeme Kendrick. Darrell J. Kitchener (*Emoia kitcheneri*) is Darrell John Kitchener. K. L. Koch (*Phelsuma madagascariensis kochi*) is Karl-Ludwig Koch-Isenburg (1906–1994). P. F. Kraal (*Typhlops kraali*) is Paul François Kraal (1836–1889). Kristin Alys Sadlier (*Strophurus krisalys*) is Ross Sadlier's daughter. Pierre Lepesme (*Lacertaspis lepesmei*) was born 1913 and died 1957. General Vicente R. Lukban (*Brachymeles lukbani*) is General Vicente Lukbán y Rilles. Roy D. Mackay (*Anomalopus mackayi*) is Roy David Mackay. The Lieutenant Mawe of the Royal Navy who collected the holotype of *Dermatemys mawii* is Lieutenant Henry Lister Maw (or Mawe), RN (1801–1874), the first Englishman to cross South America, and who wrote a book about the crossing (Maw, 1829). Lieutenant-Colonel C. G. Nurse (*Leptotyphlops nursii*) is Charles George Nurse (1862–1933). Burger W. Oelofsen (*Cordylus oelofseni*) is Burger Wilhelm Oelofsen. A. E. Palfreyman (*Niveoscincus palfreymani*) is Audubon Eric Palfreyman (1911–1999). Granville A. Perkins (*Oligodon perkinsi*) is Granville Akers Perkins (1891–1985), a chemist, who was on the staff of the Bureau of Science, Philippines, during Taylor's work there. François P. L. Pollen (*Amphiglossus polleni*) is François Paul Louis Pollen. W. and W. Poole (*Aipysurus pooleorum*) are William Henry and Wilfred James Poole. Marie Jacques Achille Raffray (*Scaphiophis raffreyi*) died in 1923. Ernest F. Reimschiissel (*Emoia reimschiisseli*) is Ernest Felix Reimschussel, who died in 2001. F. W. Riggenbach (*Mehelya riggenbachi*) is Fritz Wilhelm Riggenbach. G. D. Trevor-Roper (*Chamaeleo roperi*) is George Dacre Trevor-Roper (1862–1915). I can confirm that Shona Sadlier (*Graciliscincus shonae*) is the former wife of Ross Sadlier. Kenneth R. Slater (*Egernia slateri*) is Kenneth (Ken) Robert Slater. I can confirm that Lieutenant Alexander Smith, the donor of the holotype of *Oligosoma smithi*, collected it during the voyage of the Erebus and Terror. Smith was part of that expedition, and only ever visited New Zealand during that expedition (he later became a politician in Victoria, Australia). Charles Snell (*Vermicella snelli*) is Charles Alfred Snell (1923–2005). While Gray did not make it explicit who *Gonocephalus sophiae* was named for, it was probably Sophia Elizabeth Gray (b. 1813), his step-daughter (John Edward Gray married the widow of his uncle, Francis Edward Gray, who had two daughters by her first husband). Gray named two other Asian agamids, *Calotes emma* and *Calotes maria*, after his wife in the same publication. Hope Sworder (*Cyrtodactylus sworderi*) is Gerald Hope Sworder (1888–1959). Gunner Tovell (*Ramphotyphlops tovelli*) is Trevor Raymond Tovell (b. 1920). J. Aspinall Turner (*Pachydactylus turneri*) is James Aspinall Turner. Lieutenant E. Y. Watson (*Cyrtopodion watsoni*) is Edward Yerbury Watson (d. 1897). Charles George A. Winnecke (*Diporiphora winneckei*) is Charles George Alexander Winnecke. John C. Wombey (*Diplodactylus wombeyi*) is John Charles Wombey. H. C. Wood (*Alsophis vudii*) is Horatio ''C'' Wood (1841–1920). C. Worontzow (*Siphlophis worontzowi*) is Cesar Worontzow.

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Catalogue of the Neogene Bony Fishes of California. A Systematic Inventory of All Published Accounts. Harry L. Fierstine, Richard W. Huddleston, and Gary T. Takeuchi. 2012. Occasional Papers of the California Academy of Sciences 159:1–206. ISBN 0068-5461. $28.00 USD (softcover).—California is endowed with an abundance of Neogene marine sedimentary deposits that have been exposed by sprawling development along its coast or by diatomite mining. Many of these deposits formed in deep offshore basins and include laminated sections of fine sediment in which articulated fossil fishes can be abundant, beautifully preserved, and well articulated. Because of the depth at which these deposits formed, they often entombed fishes from a wide range of water depths and habitat types. In the early 1900s, David Starr Jordan and his collaborators were among the first ichthyologists to study these extraordinary fossil fishes, mostly from marine diatomite mines in Lompoc. Lore R. David published a small number of important papers that summarized previous findings and added several new species from a larger set of localities in southern California (David, 1943).

Despite the potential created by Jordan's and David's frequently flawed but valuable descriptions, the Neogene fishes of California have been largely ignored for the past seven decades. Notable exceptions to this generalization include contributions of John E. Fitch on fossil otoliths from Pleistocene and Pliocene shell beds, Robert R. Miller and Gerald R. Smith on fossil freshwater fishes in southeastern California (Smith, 1981), and Harry L. Fierstine, the senior author of the volume under review, who published several papers on fossil billfishes (Xiphioidei). The quality, quantity, and diversity of fossil teleosts from California have grown dramatically since David's (1943) synthesis because of extensive development in California.

In this catalogue of published records, Fierstine et al. (2012) create a solid foundation on which new research on California fossil fishes can be built. The volume opens with introductory remarks that briefly review the history of research on California fossil fishes, describe the purpose, methodology, and organization of the catalogue, and present an overview of its listings. Extensive acknowledgments reflect the broad advice the authors sought from taxonomic specialists and geologists and the assistance they received from museum staff members to help locate fossil fishes in their collections and provide new images of important specimens.

More than three quarters of the volume is occupied by the Systematic Inventory, which generally follows Nelson's (2006) classification of fishes and includes a separate section of "Erroneous Accounts" to correct errors in the age attributed to fossil fishes in published records. The 12 pages of citations will be a valuable resource to many readers, particularly because they are linked to specific taxa. An appendix that follows the classification in the Systematic Inventory lists the institutions in which type specimens are deposited, whether they come from marine or fresh water, their geological age, and whether the taxon is extant. The volume closes with indices of taxa and of geographic and stratigraphic names. Thus, this volume contains several useful tools to initiate new research on the Neogene fishes of California.

The Systematic Inventory is the core of this volume. It allows taxonomic specialists to quickly find the described fossil fishes of interest for their research. However, resolution of systematic errors was beyond the scope of this work, and conclusions from most recent taxonomic revisions are accepted. The species accounts have a consistent format: Selected Synonomy & References, Type Specimen, Type Locality, Referred Specimens, and Remarks. Some entries include the distribution of species within and outside California and may be accompanied by one of 102 figures. Listings of specimens include the publications in which they appeared, the institution in which they are deposited, if they have been lost (or if no specific specimens were cited), and the nature of the fossil material. The remarks sections expand on taxonomic problems, discuss subsequent research since taxa were described, or note a wide range of errors concerning geographic and geological sources of specimens. Updated geological age estimates for specimens are a valuable feature of the Systematic Inventory. The Erroneous Accounts section highlights errors in the reported ages of specimens. It would have been useful if this section had a brief introduction to explain why these taxa were singled out, since similar errors are discussed within the main listing in the Systematic Inventory.

The volume appears to contain few errors, but two of them are whoppers. Identical images labeled as different species appear in figures 89 and 90 and in figures 96 and 97, but *errata* will be provided with the printed and PDF versions of the monograph to correct these errors (H. L. Fierstine, pers. comm., 2012). The specimens appearing in figures 23, 26, and 44 are printed upside down (a common error in published images of fossil fishes). Otherwise, I noticed only a few minor errors in the text.

This volume comprehensively summarizes the fossil record of Neogene bony fishes from California. However, it could not and does not attempt to describe the great diversity and abundance of Neogene fossil fishes lying undescribed and unstudied in museum cases. Neglect of this extraordinary research resource during the past half century is a major loss for the ichthyological community. These fossil fishes could provide important insights into paleobiogeography, paleo-oceanography, and patterns of character evolution. For example, the paradoxical occurrence of fossil threespine stickleback, a boreal or temperate species, with tropical fish species and cold-water microfossils was inexplicable (Bell et al., 2009), but could be clarified by greater knowledge of the fossil fish assemblage of the Monterey Formation. Crane's (1966) elegant study of fossil viperfishes (*Chauliodus*) from southern California exemplifies the potential of California fossil fish assemblages for analysis of character evolution. Crane (1996) compared ossification of anterior vertebrae in several specimens of *Chauliodus eximius* from the Miocene over a wide range of body sizes to the timing of their ossificaiton in extant congeners. He found that ossification was retarded in extant species, implicating paedomorphosis in the lack of ossification of their anterior vertebrae. More generally, the diverse fossil fishes from California could provide unique information to calibrate divergence-time analyses for many phylogenies of marine fishes (see Near et al., 2005). The *Catalog of the Neogene Bony Fishes of California* will facilitate research by systematic ichthyologists, paleoecologists, and paleo-oceanographers that can incorporate Neogene fishes of California. More importantly, it offers a new foundation to exploit the vast, undescribed, and underutilized collections of superb fossil fishes that await study in museum collections.

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Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles. J. B. Losos. 2009. University of

California Press. ISBN 9780520255913. 508 p. $95.00 (hardcover).—The iguanian lizard genus *Anolis* was once divided into several subgenera (Savage and Guyer, 1989), most of which proved not to be monophyletic. The present book stresses the phenomenal species richness of this apparently monophyletic clade of arboreal lizards (Nicholson et al., 2005), which by Losos's count consists of about 361 currently recognized species (others will doubtlessly be described). (As of 22 February 2012, The Reptile Database [http://www.reptile-database.org/] listed 391 valid species.) Although several subgenera (*Chamaeleolis, Chamaelinorops, Norops*) appear to be monophyletic, Losos chooses to place all in a single genus, *Anolis*, using subgeneric names between generic and specific names where necessary. Anoles have undergone a massive adaptive radiation in the West Indies, where many island endemics occur, and in Central and South America. A few are bizarre: one heavy bodied slow-moving Cuban species (*A.* [*Chamaeleolis*] *chamaeleonides*) plus a few close relatives has converged on the chameleon phenotype, and another species from Ecuador (*A. proboscis*) sports an elongate proboscis on its snout. This book is an instructive compendium of everything you always wanted to know about anoles, but were afraid to ask.

The late Ernest Williams and his students, especially Stan Rand and Tom Schoener, pioneered studies of Caribbean anoles (Rhodin and Miyata, 1983). Rand (1964) developed the useful concept of the structural niche: a combination of perch diameter and perch height. Williams (1983:326) invented and championed the idea of ecomorphs, defined as ''a set of animals showing correlations among morphology, ecology, and behavior, but not lineage.'' Noting that ecomorphs had evolved independently on different islands in the Greater Antilles, Williams identified six ecomorphs among anoles. Grass–bush anole species are small and slender, occurring close to the ground on narrow perches, whereas trunk–ground species are heavier bodied and medium-sized using tree trunks as perches from which they forage on the ground. Trunk species are also medium in size but are typically found higher up on tree trunks. Twig species are very small and slender, occurring well above ground where they seldom leave narrow perches. Trunk–crown species are large and are found high up on tree trunks and in the low canopy. As their name implies, crown giants are huge and dwell in the tops of trees. All of these ecomorphs occur repeatedly among different islands in the Greater Antilles, but some are missing from some islands. Williams (1983) also recognized sun- and shade-seeking anole species. Sun species actively thermoregulate by basking, whereas shade species are passive thermoconformers with body temperatures close to ambient air temperatures (Huey, 1974). The latter species are threatened by global warming (Huey et al., 2009).

Anoles are typical iguanian lizards in many ways. Most are gray, brown, or green (*A. gorgonae* is bright blue!), and they can change color. Most have a uniform color pattern but some are blotched or striped. Females are often drab compared to males. Like most other iguanians, most anoles are small- to medium-sized ambush predators, hunting visually from perches, and they are largely insectivorous with relatively generalized diets (a few eat snails). Body size, relative limb length, and tail length are quite variable among species.

However, anoles differ from most other iguanians in several ways: they have a fixed clutch size of one, most have a prominent extensible dewlap, and they sport sticky subdigital toepads that greatly facilitate climbing. The fixed clutch size of one in anoles has been suggested to be a mass-reduction adaptation that facilitates climbing (Andrews and Rand, 1974); nevertheless, female anoles compensate by pumping out eggs contralaterally at a high rate. Dewlaps vary in size and color and are used in social displays and species recognition. Losos identifies their adhesive toe lamellae as the primary ''key innovation'' that allowed diversification of anoles. Adhesive toe lamellae have evolved independently at least three times among lizards: in anoles, geckos (probably several times), and a small group of arboreal New Guinean skinks (*Lipinia leptosoma* and three species of *Prasinohaema*). Toe pads of gekkonine geckos have many more subdigital lamellae than anoles, which likely make geckos better climbers than anoles. Geckos as a group are species rich with more than 1200 species: one clade, the *Phelsuma* day geckos, has undergone a conspicuous adaptive radiation. Found primarily on Madagascar, Mauritius, and other islands in the Indian Ocean, *Phelsuma* are arboreal, diurnal, mostly green lizards that exhibit some similarities to anole assemblages (Harmon et al., 2007).

Anoles have many predators, especially birds, but also snakes and other lizards, even other larger anoles. They rely largely on cryptic coloration to escape notice: when a potential predator is nearby, they hug their perch and slowly rotate around and away to get out of view. They can also jump and change perches. If really threatened, some launch themselves off their perch and fall to the ground. Others run across streams, their bodies supported by the surface tension of the water.

While an undergraduate at Harvard, working with Williams and his last graduate student Greg Mayer, Losos completed his honors thesis on social behaviors of *Anolis*. During graduate school at the University of California, Berkeley, sponsored by Harry Greene, Losos explored possible dissertation projects on several other lizard groups (monitors, geckos, and chameleons) before succumbing to his destiny and returning to anoles. (I recall receiving a message from Losos as he was heading to Australia announcing, ''I am going to do what you should have done, and watch *Ctenotus* skinks.'' I responded advising him that *Ctenotus* were much too cryptic to watch. He returned with some observations on the most abundant and conspicuous agamid *Ctenophorus isolepis* [Losos, 1987], but never published on *Ctenotus* skinks.)

The first chapter of *Lizards in an Evolutionary Tree* likens studying evolutionary biology to a detective's investigation, trying to elucidate what happened in the past from elusive information available in the present day. History is singular but exceedingly difficult to reconstruct. Essentially, a phylogenetic framework offers evolutionary biologists a sort of time machine (provided the phylogeny is accurate) with which probable ancestral traits can be inferred from those of extant species (e.g., Huey and Bennett, 1987). True phylogenies are almost never known and estimated trees are hypotheses that may not always be accurate. If ancestral states can be correctly postulated, the polarity of trait changes can be reconstructed. Stressing that reconstruction of ancestral traits may not be reliable for traits that evolve rapidly, Losos exploits phylogenetic trees (hence the play on words in the book's title) in multiple such attempts to ascertain the probable course of past evolutionary events.

Chapter 2 reviews anole biology, with descriptions and discussion of dewlaps, toepads, eyes, reproduction, headbobbing and dewlap displays, reproductive isolation, phylogenetics, and geographic distribution and diversity.

Using cluster analysis and multivariate principal components, Chapter 3 is devoted to a detailed discussion of anole ecomorphs in the Greater Antilles (Cuba, Jamaica, Hispaniola, and Puerto Rico plus some nearby smaller outlying islands). Losos critically evaluates ecomorphs and concludes that Williams's choice of six is correct. Losos argues that they provide an exceptionally powerful and unique system for the study of evolution, especially with regard to replicated adaptive radiations (i.e., Williams's ecomorphs). The separation of ecomorphs on body size, structural niches, and height above the ground is a great example of resource partitioning that should reduce competition between species. Sun- versus shade-anole species have diverged along a different niche dimension: microclimate. Prey sizes differ among sympatric anole species on Bimini (Schoener, 1968), potentially reducing interspecific competition. Chapter 3 concludes with an interesting appendix on the history of studies on ecological morphology in anoles.

Chapter 4 describes unique non-ecomorph anoles from the Greater Antilles as well as those occurring on smaller land-bridge and oceanic islands, including the Bahamas. The species–area relationship of West Indian anoles and faunal relaxation are briefly discussed. Successful colonization appears to have been infrequent. The Lesser Antilles are the chain of small islands stretching from east of Puerto Rico to Grenada just north of South America—each of these small islands supports only one or two anoles, which do not fall neatly into ecomorph categories and typically exhibit intraspecific geographic variation. If an island has two species, one is large and the other small. Such size differences between sympatric anole pairs in the Lesser Antilles could be examples of character displacement to reduce or avoid interspecific competition. This chapter concludes with a brief description of little known "mainland" anoles in central and South America, where anoles are generally far less abundant (and much less well studied) than they are on Caribbean islands. Several of these mainland anoles are aquatic.

Chapters 5 and 6 are devoted to phylogenetic inference, describing methods of plotting traits on trees and inferring probable ancestral states. Anole phylogeny and taxonomy are briefly discussed. The biogeography, probable dispersal events, and origin of anoles are also covered. In the next chapter, the probable sequences of evolution of ecomorphs on Jamaica and Puerto Rico are once again reconstructed using these methods. Some ecomorphs are perplexingly missing from some islands. A principal component analysis clearly separates ecomorphs.

Anole life history and population biology are described in detail in Chapter 8 ("Cradle to Grave"), including reproduction, growth, dispersal, survival, predators, parasites, population density and fluctuations, foraging mode, and diets. Usually, anoles appear to be food limited, but predation pressures are probably heightened in mainland habitats where they could be important. A detailed analysis of sexual dimorphism, sexual selection, and social behavior ensues. Most species of anoles are sexually dimorphic, with larger males defending territories occupied by usually smaller females and juveniles. Large males can defend larger territories and thus have access to more females. Larger males copulate more frequently than smaller males. Females do not appear to exhibit much evidence of mate choice, but further studies are needed. The degree of sexual dimorphisms in size and shape varies among ecomorphs with twig species showing the least dimorphism and trunk–crown and trunk–ground species being most dimorphic (crown giants are not exceptionally dimorphic in size, but do show extreme dimorphism in shape).

Habitat use and thermoregulation are reviewed next. Ecomorphs differ little in active body temperatures. Island anoles have higher body temperatures when active than most mainland species, which tend to occur in shadier microhabitats. Most anoles sleep on leaves or the ends of branches higher up and on narrower perches than those used during the day, probably as a means of avoiding predators—if a predator causes the branch to vibrate, anoles can jump off to evade predators. Some snakes catch anoles at night by approaching from an unconnected branch.

Anoles partition resources along three primary niche dimensions: structural microhabitat, thermal microhabitat, or prey size. Some mainland anoles also separate out along a habitat dimension. Species or size/sex classes similar along one niche dimension usually differ along another dimension. Such complementarity of niche dimensions (Schoener, 1968) presumably reduces competition, facilitating coexistence. Removal and introduction experiments and subsequent niche shifts, especially in habitats and microhabitats, strongly support this interpretation.

Following statistical removal of the effects of body size, relative leg length across species of *Anolis* is correlated with perch diameter. Moreover, at least one species exhibits developmental plasticity: *A. sagrei* raised in cages with broad surfaces grew relatively longer hind legs than those raised in cages with narrow perches. Lengths of forelimbs, hind limbs, and tails correlate positively with sprint speed, jump distance, and clinging ability. Long legged species are more prone to jump and run, whereas short-legged species walk more frequently.

Adaptive radiations of other organisms such as Galápagos finches, African rift lake cichlid fishes, *Phelsuma* geckos, Japanese *Mandarina* snails, and Hawaiian *Tetragnatha* spiders, are briefly considered. Strangely, in all probability the second-largest adaptive radiation among lizards, Australian skinks of the genus *Ctenotus* with about 100 currently recognized species (Rabosky et al., 2007), is not mentioned.

The book concludes with brief discussions of conservation biology, climate change, habitat destruction, invasive anoles, and the uncertain future facing these interesting lizards. The International Union for the Conservation of Nature lists 23 species of *Anolis* as threatened: two are critically endangered, 14 endangered, and seven are vulnerable (IUCN, 2011.2).

Bravely, Losos does not shy away from speculation, opening himself up for criticism by telling "adaptationist stories" (Gould and Lewontin, 1979:581). Indeed, he uses concepts like "historical contingency," "ecological opportunity," "empty niches," "disparity," and "evolutionary constraints" freely, and coins new words for concepts as elusive as "modularity," and "evolvability." Losos identifies numerous directions for fruitful future research on anoles, inviting others to join in their study. This thoughtful and informative book is written in a very friendly conversational style with hundreds of footnotes. Every lizard ecologist will want to read it.

As usual, the University of California Press has done a splendid job on this book, which won the Daniel Giraud Elliot Medal. However, their copy editors overlooked a minor error in the references section: a citation to their own coffee table book *Lizards: Windows to the Evolution of Diversity*, coauthored by myself and L. J. Vitt has the order of authorship reversed!

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Reptilian Cytogenetics and Genomics. E. Olmo (ed.). 2010. Karger Press, ISBN 9783805594905. 226 p. $164.00 (hardcover).—Genomics is a field in constant flux, as new technologies for genome sequencing and techniques for cytogenetics offer increasingly detailed views of the genome. This book, an edited volume consisting of a 2009 special issue of Cytogenetic and Genome Research (Vol. 127, No. 2–4), is an attempt to give an overview of the state of our knowledge of cytogenetics and genome evolution in reptiles (in the traditional sense of squamates, archosaurs, and chelonians). The book is divided into sections covering major areas of cytogenetic and genomic evolution research, with contributions on Genome Composition, Molecular Evolution and Phylogeny, Chromosomal Evolution and Phylogeny, Chromosome and Genetic Mapping, Sex Chromosomes, Parthenogenesis, and Chromosome Dynamics. As each section is written by different investigators, the tone varies from chapter to chapter, but the overall presentation is clear and readable. Accordingly, the techniques covered range from cutting-edge sequencing to more traditional methods such as FISH and immunofluorescence staining, and the scope of the material ranges from genome evolution across squamates to detailed genome mapping of single species (e.g., *Crocodylus porosus*, *Sphenodon punctatus*). There is thus a mixture of process-based evolutionary analyses and pattern-based descriptions of cytogenetic and genomic arrangements, though both have their place in an overview such as this. Highlights include Castoe et al.'s review of mitochondrial genome evolution in squamates, Hall's overview of chromosome evolution in *Sceloporus*, O'Meally et al.'s cytogenetic map of the tuatara (*S. punctatus*), and Fujita and Moritz's overview of parthenogenesis in lizards. There are also data on an interesting system of tissue ploidy diversity, with both diploidy and triploidy within individuals and among members in some Surinam populations of the turtle *Platemys* (Bickham and Hanks).

The primary question when dealing with a review volume in such a rapidly changing field as genomics is not how timely the data are, as many of the articles will inevitably be out of date as soon as they are printed, but how well the contributions capture the current state of the field, as well as future directions. Indeed, early chapters lament the paucity of genomic sequence data, as only the genome of *Anolis* and draft of the genome of *Chrysemys* had been completed by that point, while there is now at least one snake genome (Castoe et al., 2011). In addition, many phylogenetic hypotheses upon which comparative analyses are based are outmoded given recent developments in molecular systematics. The final chapter even uses the genus name *Natrix* for species now placed in *Xenochrophis*. However, overall the contributions give an expansive view of the state of cytogenetics and genome evolution, which is no small feat considering the breadth of material covered. There are in-depth reviews of evolution in structure and function of both nuclear and mitochondrial genomes in squamates, as well as sex-determination mechanisms, the origins of parthenogenesis, and the evolution of sex chromosomes. Detailed genetic maps and chromosome ideograms are given for archosaurs and rhynchocephalians. Many of these chapters will be invaluable starting points for anyone interested in studying genomics, and because these are contributed papers, the literature cited with each contribution is extensive and varied.

As our knowledge of the reptilian genome and cytogenetic variation increases, many of the questions posed by this book will be answered, some of the hypotheses corroborated, and likely some conjectures disproven. However, as a summary of the field, the book succeeds. The development of phylogenomics in both senses (i.e., using genomes to infer phylogenetic histories and phylogenies to infer genome histories) will require increased amounts of data on species-level cytogenetic and genomic attributes to harness the power of those data for reconstructing evolutionary histories. Karyotypes, for instance, have only been produced for approximately 1000 of the >9300 reptile species. Similarly, data on sex-determination mechanisms is lacking from many groups. The need for these data is made clear in the volume, which sets a strong foundation for future work. The book does have one flaw, which is the lack of any synthetic introduction or end matter; there is very little setup for the contributed papers, and nothing at the end tying everything together and laying out a clear vision for the future of the field. However, the individual authors have done an admirable job of this on their own. This book would be a worthy addition to the library of anyone interested in squamate evolution; not just the cytogenetic and genomic aspects, but physiological, developmental, and phylogenetic components as well.

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Amphibians and Reptiles: An Introduction to Their Natural History and Conservation. M. L. Crump. 2011. McDonald & Woodward Publishing Company. ISBN 9781935778202. 272 p. $29.95.—"Sea turtles can swim as fast as our best Olympic swimmers!" (p. 46). "African egg-eating snakes swallow bird eggs that are three times the width of their heads. That's equivalent to you swallowing a large watermelon—whole!" (p. 8). "How much longer will amphibians and reptiles be around to serve as critical components of ecosystems?" (p. 48). "What might happen if there were no frogs left to eat mosquitoes and other disease-carrying insects?" (p. 86). "YOU can be part of the solution" (p. 216).

With this new book, Marty Crump revised her award-winning *Amphibians, Reptiles, and Their Conservation* (2002) to complement changes in the science curriculum of middle school students and update discussion of the causes of amphibian population declines (including the chytrid fungus, as one of many factors). The resulting volume will satisfy the thirst of young readers eager to soak up juicy tales of the interesting and bizarre ways that amphibians and reptiles defend themselves, court mates, care for young, and hunt prey. Offering 16 pages of color photographs, Crump's book nicely illustrates the diversity in form and function, ecology, and conservation issues of amphibians and reptiles.

An extensive discussion on the varied reproductive modes of amphibians and reptiles highlights the fantastic diversity of these lineages. Her writing is clever and acrobatic—she likens the extensively webbed feet of frogs to the flippers used by SCUBA divers and describes how the toxins of some salamanders, exuded in self-defense, can leave a garter snake (*Thamnophis*) predator stuck in knots. Yet, Crump goes beyond the fanciful and superficial descriptions of amphibian and reptile diversity that too often haunt popular accounts. Here readers learn how sound is conducted through the tympanum of frogs, how smells are transmitted through the vomeronasal organ of lizards and snakes, and how pit vipers use heat-detecting loreal pits to locate endothermic prey. Her extensive use of scientific terminology, of Latin and Greek words—all defined in the text and glossary—reflects her deep respect for the capable and insatiable minds of middle school students. Her description of how to distinguish crocodiles from alligators, for example, mirrors material taught in college herpetology courses.

Crump underscores the important roles of amphibian and reptiles in food webs. She applies concepts in community ecology and ecosystem function to issues in herpetological conservation by asking the reader to ponder the consequences of one missing link (via population extirpation) on other organisms in the web. In an example of how human-mediated changes in the local abundance of frogs destroyed the balance of the food web in India, Crump integrates food-web dynamics and conservation action and litigation. "In areas where huge number of frogs were collected for restaurants, insect pests destroyed crops. Since 1987 India has banned the export of frog legs. The country now appreciates the value of frogs and wants to keep them around" (p. 87–88).

The emphasis in *Amphibians and Reptiles*, as its subtitle suggests, is on natural history and conservation. It's not an exhaustive taxonomic reference to amphibians and reptiles, though an extensive reference list is provided. Crump does, however, discuss major patterns of biogeographic distribution and taxonomic diversity, as well as highlight key aspects of ecomorphology, behavior, physiology, and anatomy for all major groups. My bet is that thanks to a wealth of newly discovered facts, the young herpetological enthusiast will devour this book.

A predominant focus in the book is on the conservation value, threats of extinction, and future of amphibian and reptiles. The number of species on the IUCN list is sky-rocketing, making the expanded discussion of the value of conservation research, political action, and public education in the latter part of the book extremely relevant to the biodiversity crisis. Crump reminds us that while amphibian population declines receive disproportionately high coverage in popular press, the loss of reptile species and populations is also a serious threat demanding attention.

Though it would be easy to feel depressed and discouraged by the grim future of amphibians and reptiles after learning about the human-mediated causes of population declines and species extinctions (including chapters titled "We're Taking Too Many," "We Kill Them Indirectly, Too," "Who Turned Up the Heat?" and "Attack of the Killer Fungus!"), Crump's final two chapters crescendo optimism and hope. "What Else Can Be Done" tells success stories of population survival through reestablishment of wild populations (e.g., tortoises and marine and land iguanas on the Galápagos Islands; spinytail iguanas on Utila Island, Honduras) and the maintenance of captive populations of Green Iguanas in Costa Rica and Nile Crocodiles in Africa, which releases pressures associated with over-harvesting wild populations for human consumption and the pet trade. I was particularly impressed by the final chapter "What Can YOU Do to Help?" Here, Crump puts the power in the hands of the young reader with an easy-to-do and accomplishable list of *Dos* and *Don'ts*. The *Do* list encourages active participation in herpetological and conservation societies and citizen-science projects such as "Build a Pond," while the *Don't* list reminds the reader not to buy crocodile boots, eat soup brewed with endangered turtles, destroy habitat, or release exotic animals.

While Crump chooses to use the Linnean classification, she hints at evolution over geological time—"Like the turtles, crocodilians watched the dinosaurs go extinct and they survived. They haven't changed much through the millions of years since'' (p. 59). A suggestion for the next edition of this book is to discuss amphibian and reptile diversity from a more explicitly phylogenetic perspective. For example, Crump describes differences in the egg as a key distinction between amphibians (jelly-like) and reptiles (hard shells). Here is an opportunity to expand upon discussion of the evolution of frogs from lobe-finned fishes (p. 46) to include all tetrapods. A more complete Tree of Life perspective would enable a discussion of unique features of each lineage, as well as patterns of convergence in such things as locomotion and reproduction. For example, the shelled egg characterizes amniotes and viviparity evolved once in Mammalia and more than 100 times in squamate reptiles.

With *Amphibians and Reptiles*, one of our most widely experienced and distinguished herpetologists reaches out to inquisitive young readers with an engaging and information-packed book. She thereby inspires the next generation of conservation biologists, policy makers, and responsible citizens, and challenges us all as teachers to do the same.

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Saving Sea Turtles: Extraordinary Stories from the Battle Against Extinction. J. R. Spotila. 2011. Johns Hopkins University Press. ISBN 0801899079. 226 p. $24.95 (hardcover).—This compact book offers a significant contribution to the literature of marine turtles. It is not the first in the field; important sea turtle books extend as far back as Lacepède (1788), Deraniyagala (1939), Carr (1952), and other pioneers. Indeed, Spotila has already authored an excellent book on sea turtles of the world (Spotila, 2004), and various recent works by others exist, including *Sea Turtles: An Ecological Guide* (Gulko and Eckert, 2004) and *Sea Turtles* (Witherington, 2006), and others. So why another sea turtle book? The answer is that, throughout the history of sea turtle books, the emphasis has shifted progressively. The earlier works drew attention to the basic biology of the species, their nesting habits, diet, and usefulness to humankind. Later, considerations of conservation and good management became more prominent than basic anatomy. In recent years, and especially in the popular press, the prefix ''endangered,'' has often slipped into the vernacular names, despite the uneven survival status of the various sea turtle populations scattered around the world. This has resulted in the ''endangered Green Sea Turtle,'' or ''the highly endangered Kemp's Ridley,'' etc.

Interestingly, *Saving Sea Turtles* follows in the shoes of another important sea turtle book, with the rather similar name of *Conserving Sea Turtles* (Mrosovsky, 1983). The two books have a somewhat similar appearance: comparable dark blue covers and both bear the author's name prominently in white letters. Moreover each book is authored by a leading figure in sea turtle biology and conservation, namely Nicholas Mrosovsky and James Spotila. But at that point the two books diverge sharply. Mrosovsky's philosophy of sea turtle management recommends finding ways in which resources of value to humans—meat, eggs, etc.—can be obtained without overharvesting or destroying the resource. Spotila's new book takes it as a given that turtles need cautious protection at all times, and good conservation is expressed in terms of protection of nesting beaches, elimination of beachfront lighting, use of TEDs (turtle excluder devices on fish and shrimp trawls), operation of hatcheries where necessary, phasing out direct resource exploitation (with the exception of the managed harvest of Olive Ridleys at Ostional in Costa Rica), etc. Thus, Spotila emphasizes common ground with indigenous and other peoples who may live near nesting beaches, play a part in turtle exploitation, and be persuaded to join the ranks of those seeking protection of turtles and their eggs.

In recent decades, it has gradually become evident that sea turtle populations of the world are not static. Population monitoring (generally effected by counting nesting females) suggests that some populations are increasing, while others remain about the same or show evidence of disappearing. So whose technique is right? Unfortunately, neither Mrososky nor Spotila is in charge of turtle conservation throughout the world, so no comprehensive global assessment has been attempted. However, there are several turtle populations, especially in the Atlantic, that have increased significantly in recent years, sometimes even in the face of heavy exploitation (as with Green Sea Turtles at Tortuguero National Park, Costa Rica). Likewise, the Rancho Nuevo Beach (Tamaulipas, Mexico) population of Kemp's Ridley's has been increasing and reports indicate that there is a massive nesting colony of Leatherbacks in Gabon, West Africa. Yet other populations, most notably East Pacific Leatherbacks, have undergone dramatic declines. Some populations have shifted to nest on other beaches. For example, the east coast of Florida is no longer just a Loggerhead nesting area; in recent years nesting by both Green Sea Turtles and the Leatherbacks has increased as well.

So whose philosophy has guided us to these contrasting outcomes? They probably both have a share in the truth. The passage of time, in general, would seem to favor Spotila's approach, but does not nullify Mrosovsky's. Both the hands-on and the hands-off management approaches may yield good results.

Spotila's book has 15 chapters, broken down into a series of key topics. All are presented with a very personal style and display a far-reaching interest in questions of morality and ethics, at both personal and public levels. In contrast to similar volumes, this book is not laid out species by species, but rather the chapters provide accounts of important events and findings in the biology of sea turtles and their conservation: ''Life in the Egg,'' ''Race to the Sea,'' ''The Ostional Story,'' ''Global Warming,'' ''Sea Turtles and Satellites,'' and many more. Although Spotila is somewhat geographically limited in that his own work is done mostly in the USA and Costa Rica, these are both important sea turtle countries (perhaps exceeded only by Australia), and he was ''on site'' when an extraordinary number of important scientific findings about sea turtles were made. He is also particularly generous in giving credit to a great many assistants, coworkers, graduate students, and so on.

Saving Sea Turtles is packed with information, some of it well known to those of us who have chased turtles for decades, but for those who are new to the profession, they will be extremely well versed in marine cheloniology after just one read of this excellent book. I am particularly pleased that Spotila shares my recognition of Archie Carr as the father of sea turtle conservation, and I am very gratified that Spotila and his team continue to be the main force behind protection of the somewhat embattled Baulas

National Park, an important but now declining nesting ground for Leatherbacks on the Pacific coast of Costa Rica.

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Reptile Biodiversity. Standard Methods for Inventory and Monitoring. R. W. McDiarmid, M. S. Foster, C. Guyer, J. W. Gibbons, and N. Chernoff (eds.). 2012. University of California Press, ISBN 9780520266711. 412 p. $95.00 (hardcover).—When I began my herpetological career, the science of conservation biology was in its infancy, and most treatises on biodiversity conservation took the formula of Red Data Books that highlighted more about what was not known than what researchers knew of the status of reptiles. Even in ecological studies, most of us selected our study sites and sampled reptile populations as Rick Shine states in the Preface (p. ix) to *Reptile Biodiversity*: ''I'd just go out there, look for snakes, find some, catch them, and then write down anything that seemed useful. And somehow, or other, once I'd been doing that long enough, I'd have a data set that could then tell all kinds of interesting stories about the biology of the creatures in question.'' Fortunately over the last 30 years, the selection of sites, the types of data taken, and the research techniques available for studying reptile populations has left the era of the early Red Data Books long behind.

Reptile Biodiversity proceeds from a perspective that inventorying and monitoring is rigorous science, not just an addendum put into a conservation agreement to satisfy a bureaucratic requirement. As such, researchers and natural resource managers require a wide-ranging background in how to sample species and in how data should and should not be interpreted. The way sites are selected and surveyed determines the extent and rigor of statistical inference and thereby the confidence researchers take in testing hypotheses and in the development of conservation and management programs. Sampling biases matter, and the recognition and understanding of biases and limitations allows researchers to avoid making the Type I and Type II errors common in data interpretation. Inventory and monitoring combine the interdisciplinary rigor of fieldwork and knowledge of animals in their habitats with the complexity of trends, population, and landscape analyses. The basic statistical background information in *Reptile Biodiversity* should be required reading for anyone undertaking biological field studies, regardless of taxa surveyed.

The book is organized into four parts: Introduction, Planning a Diversity Study, Sampling Reptile Diversity, and Conclusion. Each part contains from one to eight chapters (for a total of 17) that were overseen by one or more chapter coordinators. The chapter coordinators then assigned sections to be written by experts in the specific topic to be covered, much the same way as in the companion volume on amphibians that appeared nearly two decades ago (Heyer et al., 1994). Because of the great diversity of reptiles, there are a great many topics to discuss, and the individual section authors (a total of 70) do an admirable job of introducing their topic and generally covering it without excessive verbiage. For example, chapter 4 (''Dealing with Associated Data,'' coordinated by M. S. Foster and R. N. Fisher) is broken down into eight topics, each written by from one to three authors: Overview; Climate Data and Seasonality; Describing Microhabitats; Diversity, Distribution Maps, and Atlas Production; Automated Data Acquisition; Handheld Computers for Digital Data Collection; Databases, Metadata, and Integrated Data Management; Data Quality Assurance and Quality Control. These sections then contain extensive subtopics to be discussed, and some chapters have additional Boxes highlighting important topics, such as ''Relational Databases'' in the aforementioned chapter. As is evident from these headings, this book is about much more than how to dig pitfall traps, although such information is included.

Black-and-white figures and photographs illustrate how sampling technology is constructed and deployed. At the end of the book, there are two appendices, one focused on selected institutions with significant reptile collections and the other on websites of interest. The websites cover a wide range of subjects, from general conservation to computer software (much of it available for free downloading) to equipment vendors. As the editors note, it is best to use a search engine to find websites, as URLs seem to change frequently. Citations are placed at the end of the book, which reduces the necessity for duplicate listings. I did not count the references, but they cover 41 pages of small type in two columns. References are current as of late 2010, which is good considering the amount of time it takes from manuscript submission to publication. Author addresses are at the end of the book, followed by both taxonomic and subject indexes.

While it may be true that no single book can cover the entire scope of reptile field and analytical techniques (e.g., there are sea turtle techniques manuals, some covering a single region, that are hundreds of pages long: Eckert et al., 1999), *Reptile Biodiversity* comes the closest to comprehensive coverage of any methods book yet published, regardless of taxa. Reptiles have such divergent lifestyles, from fossorial skinks to globe-traveling sea turtles, that inventory and monitoring techniques are vastly different for different taxa. Despite this, the authors do an admirable job of covering everything from sea turtle beach and pelagic surveys to digging terrestrial pitfall and trapping arrays, and from how to preserve reptiles to the use of species accumulation curves to assess richness and the effectiveness of sampling. The authors provide an extensive coverage of statistical methods, including sections on closed model mark–recapture studies, the latest use of occupancy models, life tables, and the use of models on exploited species. In this regard, the editors have clearly recognized that the focus of field studies should not be simply catching reptiles, but in the repeatability, analysis, and rigorous interpretation of data. It is as vital to know what the results do not tell a researcher as it is to know what they reveal of the biology of species under study. Planning is key to successful inventory and monitoring research, and Chapter 3 (''Study Design and Sampling'') is a must read for every beginning graduate student to seasoned professor.

Everyone who has undertaken a project of the scale of *Reptile Biodiversity* fumes when a reviewer makes nitpicking remarks. I suggest that the editors and authors take the following in the context of minor suggestions for future editions. *Reptile Biodiversity*'s intended audience is worldwide, and the use of citations mostly in English allows for universal reader access. However, there are many inventory and monitoring papers and manuals that are not in English or do not originate from North American or Australian authors. Most citations in *Reptile Biodiversity* focus on North America, and it would have been useful to reference published work outside of the English-speaking world. I suggest adding a short appendix to include some of the most important published work in other languages not referenced (e.g., Henle and Veith, 1997; Hachtel et al., 2009). Likewise, it would have been beneficial to include examples from diverse studies. Why reference only long-term studies at one southeastern U.S. locality, when a diverse set of examples could have been used (e.g., Bjorndal et al., 2001; Madsen et al., 2006)? Of course, this may be an author's personal choice, but adding a few international citations is not that hard these days. In a few instances, what I might consider important papers were not cited (e.g., the satellite telemetry papers of Yasuda and Arai [2005] and Witt et al. [2010]; the reptile species-accumulation curve papers of Thompson et al. [2003, 2007]), but to be fair to the authors and editors, *Reptile Biodiversity* is not intended as a literature review.

Aside from a few minor word uses (e.g., using the word ''poisonous'' when ''venomous'' is the proper term on p. xi), my only practical concern involves the usefulness of the index. For example, I tried looking up *satellite telemetry*, but neither word appears in the subject index. I found *radiotelemetry* listed under *tagging* and *turtles*, and only by going to this section could I find out about satellite transmitters. Because of the wealth of information in this book, it may be difficult to quickly locate a specific section of interest by using the index alone.

In the Preface, the editors set forth the premise of *Reptile Biodiversity*: to develop a comprehensive and rigorous book, using standardized methods, for the scientific inventory and monitoring of reptile populations. They have certainly succeeded. At a time when some researchers feel that books soon will be obsolete (a feeling I do not share), *Reptile Biodiversity* will be seen as a classic in ecological, behavioral, and conservation-related studies. By using a combination of specialists writing in clear and concise language, the editors have ensured that the methods of thought and analysis that go into inventory and monitoring projects are just as well articulated as the descriptions of the techniques themselves. In conjunction with previous books on amphibians (Heyer et al., 1994; Dodd, 2009), conservation research will be seen as vital in illuminating intriguing ecological and evolutionary questions. The editors and authors should be justly proud of their accomplishment. Finally, I hope the publisher will consider versions in other languages, particularly Spanish.

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