RHODA RAPPAPORT, HISTORIAN OF GEOLOGY, 1935–2009

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Dr Rhoda Rappaport (photograph by courtesy of Irwin Primer)

In accepting the 2003 Sue Tyler Friedman Medal of the Geological Society of London, historian of science Rhoda Rappaport, wrote:

> Years ago, I had persuaded myself that the history of science could serve to bring together C. P. Snow's "two cultures," and I set out as a missionary. I would surreptitiously teach some science to non-scientists, showing them that the study of nature is but one aspect of human history.

Indeed, for nearly forty years (1961–2000) as a faculty member in the History Department at Vassar College, Professor Rappaport taught (among others) courses in Reformation Europe, history of cosmology, seventeenth-century intellectual history, the Enlightenment, and Darwinism. However, by her account, her Vassar students came chiefly from the science departments. During her years on the faculty and continuing through her retirement, she devoted her eminent career to the study of geological thinking in the seventeenth and eighteenth centuries—a critical period in which studies in the field of early-modern geology combined physical law with historical process.

Rhoda Rappaport was born and lived her early life in the Bronx, New York, where she attended public schools. From the seventh grade onward her education took place at all-female institutions, among them Walton High which was one of the first 'all-girl' schools in New York City. During her junior year at Walton, Rhoda's guidance counselor recommended that she apply for a new program established by the Ford Foundation. This program aimed to identify intellectually gifted girls and provide them full scholarships to study at Goucher College in Baltimore—at that time a women's college—at a relatively young age. Rhoda was one of fifteen girls selected by a nationally administered examination; and a month after her sixteenth birthday she left home to pursue her education.

At Goucher, Rhoda majored in mathematics, a subject that she had always enjoyed, as well as physics—a subject that was new to her. Her interest in what became her field began when she encountered history of science in a pioneering general course on the subject with Professor Dorothy Stimson, who at the time was President of the History of Science Society (1953–1957). Stimson, a Vassar graduate, clearly influenced Rhoda's early education and later professional life, helping her to discover the magic of studying the historical context of scientific investigations. After earning her

undergraduate degree in 1955, Rhoda did not immediately receive funding for graduate study. Therefore, she worked for a year in the business office of Hunter College, New York, and also took graduate courses with the noted medieval historian Pearl Kibre. Upon receiving a Boldt Fellowship from Cornell University the following year, she pursued graduate study in history of science (MA 1958, PhD 1964) with Professor Henry Guerlac who later became a lifelong friend. Her PhD thesis focused on the Guettard–Lavoisier–Monnet mineralogical survey and atlas of France. During the 1960–1961 academic year, before taking her position at Vassar, Rhoda was awarded a National Science Foundation grant and an American Association of University Women fellowship, which enabled her to live in Paris and continue her research. Returning to the US in 1961, when Vassar was still a women's college, she was hired as the institution's first historian of science, a fact that must have made her mentor, Dorothy Stimson, proud.

In her early investigations, Rappaport examined the then largely overlooked geological researches of the founder of modern chemistry, Antoine Lavoisier, focusing particularly on his pre-Revolutionary contributions to the geological and mineralogical surveys of France. She also investigated how Lavoisier explained the existence of what we now call Tertiary formations around Paris by invoking then-novel processes that geologists recognise today as transgressions and regressions of the sea. Additionally, she turned her attention to explanations of the Noachian deluge and Robert Hooke's theory of earthquakes. In awarding her the Sue Tyler Friedman Medal, the President of the Geological Society of London remarked that her papers had had an influence out of all proportion to their bulk. It is fair to say that she was among the leading authorities on geology's formative period in the seventeenth and eighteenth centuries.

Rappaport broadened her studies of early geological research to include scrutiny of work by naturalists Georges-Louis Leclerc (Comte de Buffon) and Jean-Étienne Guettard, cleric Jean-Louis Giraud Soulavie, amateur botanist Guillaume-Chrétien de Lamoignon de Malesherbes, and writer Bernard le Bovier de Fontenelle. On this basis, she crafted excellent articles for the *Dictionary of Scientific Biography* on several of these, and other, key French figures in the history of science of the period. Up until 2006, nearly every year—usually in June—and during extended sabbatical periods, Professor Rappaport travelled to France to pursue her research. She always stayed at the same Paris hotel in Montparnasse (l'Aiglon), where she was allowed to store some of her belongings, such as a typewriter, until her next visit. She loved Paris and knew it well.

Undoubtedly Rappaport's greatest contribution to our science's history is her book *When Geologists Were Historians, 1665–1750* (1997). According to Cecil Schneer, who reviewed her book for *Isis*, she consulted, remarkably, the works of more than eight hundred scholars to write the history of this period—when many naturalists, philosophers and theologians came to appreciate that since the Creation and during an extended past the Earth had changed, but at the same time had preserved a record of its changes in the form of physical evidence which could be studied empirically. The book's eight detailed chapters provide an invaluable account of this profound transformation of the European worldview. Readers encounter a detailed analysis of geological writings in the milieu of the 'Republic of Letters'—the institutions and modes of intellectual exchange connected with the growth of learned journals and societies beginning in the mid-seventeenth century. We also discover a thorough treatment of the dominant issues of early-modern geology: fossils, diluvialism, volcanoes, sedimentation, and subterranean heat, among others. Though clearly a major scholarly undertaking, writing the book was also a labour of love. In crafting it, Rappaport created a work that placed her alongside the leading scholars of the history of thinking in our field, such as Stephen Jay Gould, Martin Rudwick, and Jacques Roger.

When I arrived to join the faculty at Vassar in 1995, Professor Rappaport enthusiastically welcomed me, for she loved geology. And knowing that we shared a passion for its history, as she prepared to retire she presented me with the original hand-drawn poster that had hung on her office wall, which announced one of Gould's lectures at Vassar. Indeed, because I had worked closely with him as a teaching fellow in graduate school, Steve had written on my behalf when I applied for the Vassar position. When I was hired, he urged me to contact Rhoda, commenting that he greatly respected her work and expected that in her I would find a stimulating intellectual companion. Indeed I did. However, she became Emeritus faculty shortly after I began my career at Vassar and I didn't spend nearly the amount of time speaking with her that I would have liked. She was a private person who was nonetheless a friendly colleague and neighbor. And of course she was, at that point, spending considerable time working on her book.

When she received the Sue Tyler Friedman award, Rhoda was at work on a project examining early 'catastrophism'. Her interest in the subject stemmed from her long-standing concern with the Noachian Flood and the vocabulary of geological 'revolutions'. It had come to her attention that in the late eighteenth century, some French scientists had rebuked their predecessors by calling them catastrophists. To Professor Rappaport's mind, the label might have been intended as an accusation of bad science but also might have been, in her words, a meaningless polemic. She also aspired to produce a study that focused on questions of geological dynamics as well as geology and religion during the second half of the eighteenth century. Unfortunately for geologists and historians alike, she did not live to produce that volume.

Rhoda's colleagues remember her as helpful, encouraging, and generously sharing her knowledge. A candid, stern and constructive critic, she adhered to the highest scholarly standards. In expressing her gratitude for the recognition bestowed by the Geological Society of London, Rhoda commented: "What may surprise you, however, is that this award has at last reconciled me to the fact that geologists, not historians, are the natural audience for my research". Natural or not, geologists will undoubtedly utilise and remember appreciatively her contributions to the history of thinking in our science.

Acknowledgements

I am indebted to the following individuals—relatives, friends, and colleagues of Rhoda Rappaport—who shared their reflections and thoughts for this tribute: Jim Challey, Tom McGlinchey, Leslie Offutt, Blossom R. Primer, Irwin Primer, and Kenneth L. Taylor.

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BOOK REVIEWS

Edited by Vic Baker

GEOLOGY AT THE UNIVERSITY OF KANSAS: The First Century (1866–1966) and a Bit Beyond. Daniel F. Merriam, 2009. University of Kansas Department of Geology and Paleontological Institute, Special Publication 6. 210 pp. $25 plus mailing.

It is valuable for geologists and historians of science to have well-researched and well-illustrated overviews of the evolution of geoscience departments. It can be particularly helpful to have the narrative written by a graduate of the institution in question. William Brice's classic discussion (*Cornell Geology Through the Years*, 1989) is but one example. We now have a commendable new example of exactly that happy combination of elements. Daniel F. Merriam received his BS, MS, and PhD at the University of Kansas, as well as MSc and DSc degrees at the University of Leicester (England). In this superbly illustrated soft-cover book, Dr Merriam provides us with an excellent account of the evolution of one of the world's premier geology departments.

Many geologists, especially those trained in the middle years of the twentieth century, think of the linkage of Raymond Moore and Kansas geology. Merriam has already told that story (*Raymond Cecil Moore: Legendary Scholar and Scientist*, 2007), but in this account he fills in more than a century of truly significant contributions by students and faculty from the Jayhawk State. Many of the names will resonate with American geologists: John Harbaugh; Hollis Hedberg; John Imbrie; Raymond Moore; Norman Newell; Curt Teichert; William Twenhofel; Ellis Yochelson; and many others, including Merriam himself. Some players, such as the department founder Erasmus 'Daddy' Howarth, are less well known, but are critical to the Kansas story. With apologies to noteworthy persons not mentioned, the point can be made that the Department of Geology at the University of Kansas has a rich history, and one that should be of interest to many readers of this journal. Each faculty member of the Kansas geology department who was active in its first century receives a brief summary, including evocative headings such as 'The Geospellbinder', 'The Cosmopolitan Professor', or 'The Students' Professor'. (You will have to read the book to find out 'who's who'!)

Beyond individual names there is the evolution of institutions and ideas. Merriam illuminates the development of a celebrated geology department in the years after the American Civil War, leading into the twenty-first century. He also provides a sketch of the development of the Kansas Geological Survey. And, of course, he devotes time to the birth and evolution of the *Treatise on Invertebrate Paleontology* (TIP), the world-famous compendium born and bred in Kansas. We also witness the Mid-continent maturing of stratigraphy, geophysics, water-resources, and the use of field-geology as a pivotal teaching aid. It is also helpful to have a chapter focused on computers and mathematics applied to geology—written by one of the key contributors to the discipline.

The audience for such a book should extend well beyond those directly associated with the University of Kansas. Anyone interested in the trajectory of geoscience education in American academic institutions will find relevant material in the text. Those concerned with the history of geological surveys will also find helpful information about one of the country's premier surveys. And geologists or historians desirous of knowing more about the people and products of a first-tier department of geology will enjoy Merriam's account of almost a century and a half of faculty and student interaction and research productivity. One of my few quibbles is that Figure 89, a valuable synoptic view of the history of the Kansas Geological Survey, includes seemingly significant items (*e.g.*, 'Upheaval', 'Firing of Math Geology') that cry out for explication but receive no comment in the text. The book may not be presented in the thrill-a-minute mode of best-selling novels, but the narrative is clear and many readers may wish to pursue particular topics as interest dictates.

Specific applause is due to the author's exceptional use of illustrations. All are black and white and within the text. The graphics, generated by the author's son James D. Merriam are informative and add to the visual impact. Historians will recognize the time and effort required to scour archives in order to portray critical aspects in the evolution of the department and the survey. Geologists will enjoy the evocative photographs of well-known colleagues, field activity, and historic settings for museums and laboratories. The photographs, creative graphs, and informative tables have merit beyond decoration, as they are used to carry the narrative forward in a helpful way. A small picture heads each chapter and highlights the topic to be developed in the text. The production elements are

excellent: quality of paper; legibility of printing; clarity of illustrations (aside from some small print in a few cases); and strength of binding. The major debit for many readers will be the lack of an index, especially given the wealth of names and topics treated.

The book is modest in size but contains a wealth of information. The illustrations alone convey a rich story. No matter how distant one may be from Kansas, this account provides a rewarding portrait of an institution and its place in the history of contemporary geology.

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ROCKNOCKER; A GEOLOGIST'S MEMOIR. George Devries Klein, 2009. British Columbia, Canada: CCB Publishing. 431 pp. Paperback, $23.95.

George Klein reviews his life in *Rocknocker: A Geologist's Memoir*, naming names and sparing nobody—from university presidents to departmental secretaries—telling things exactly as he thinks they happened. Beginning with his early childhood in The Netherlands, he progressed through a stint in Australia and ultimately wound up in the United States, where he graduated from Wesleyan University.

Thereafter, readers are treated to a dramatic, intensely detailed, far more-than-frank review of his graduate student career at Johns Hopkins, Kansas, and Yale. After briefly reviewing his short stint at the Sinclair Research Laboratory, Klein continues with a history of pernicious academic gamesmanship at the Universities of Pittsburgh, Pennsylvania and Illinois. He also gives an account of his short, tumultuous reign as Director of the New Jersey Marine Science Consortium and, finally, of his life as a solitary consultant. Excepting Sinclair, all the organizations he worked for appear to have been burdened with outmoded and unproductive staffs, an inability to reform, and a reputation for being hotbeds of Machiavellian intrigue—which Klein valiantly attempted to correct before his ultimate departure—voluntary or otherwise. Finally, these organizations are described as remaining sadly mired in ooze after his departure. Klein's didacticism is featured in a series of 'Lessons Learned' attached to every chapter that has the air of Polonius's famous advice to Laertes.[1] He also briefly summarizes the academic and professional careers of almost everyone mentioned in his book. Degrees earned, colleges attended, geologic specialties, and positions held appear in parentheses directly following the first appearance of a person's name.

It is important to note that Klein doesn't, in fact, tell all. Indeed, at Illinois, where we were colleagues throughout his stay, I remember many equally interesting stories that he chooses not to remember. Also Klein presents one version of hotly contested issues, there was always another, or several other, sides to these conflicts. The book closes with overviews of his first and fourth marriages, but he never even mentions Wives 2 and 3. Those who wish may speculate.

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[1] Give thy thoughts no tongue,
Nor any unproportion'd thought his act.
Be thou familiar, but by no means vulgar;
The friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel;
But do not dull thy palm with entertainment
Of each new-hatch'd, unfledg'd comrade. Beware
Of entrance to a quarrel, but, being in,
Bear 'it that th'opposed may beware of thee.
Give every man thine ear, but few thy voice;
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy; rich, not gaudy;
For the apparel oft proclaims the man.
Neither a borrower, nor a lender be;
For loan oft loses both itself and friend,
And borrowing dulls the edge of husbandry.
This above all: to thine own self be true,
And it must follow, as the night the day,
Thou canst not then be false to any man. (DRO's reminder!)

Klein also claims to have written the book entirely from memory while recuperating from hip surgery. This appears extremely doubtful given that literally hundreds of stories, ranging from the trivial to the highly significant, are crammed into 431 pages. Klein was notorious for maintaining a dossier on his colleagues, correspondents and associates. In any event, the apparently unedited book contains many minor errors of fact and remains marred by repetition. There is no index—a big drawback in a book replete with so many names and discrete events. The bibliography is limited to four references and there are no text references to other sources.

The book does present a valuable picture of *Realpolitik* in geological academia or, perhaps more probably, academia in general. It also sheds light on the evolution of sedimentology during the last half of the twentieth century. Finally, psychologists and behaviorists may find it interesting.

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ADAM'S ANCESTORS; RACE, RELIGION & THE POLITICS OF HUMAN ORIGINS. David N. Livingstone, 2008. Baltimore: The John Hopkins University Press. 301 pp. Hardcover, €40.00

The assumption that human beings existed before Adam was anathematic in the Jewish, Christian and Islamic worlds, safely and comfortably founded on the Mosaic record as narrated in the opening chapters of Genesis. In these religions it became standard doctrine that all mankind was directly descended from Adam and Eve by natural processes of generation. Differences between human races were traced back to the three sons of Noah. People's sense of themselves, created in the image of God and master over all things divinely created and ordered, rested on the assumed literal truth of the biblical narrative.

But already early fleeting thoughts emerged that questioned that doctrine. In the fourth century, the Roman Emperor Julian the Apostate reverted from Christianity because amongst other things he saw variations in human customs and cultures as a sign that the human race was descended from more than one original couple. Gregory of Nyassa, a pupil of Origen, opined that Adam's physical body, derived from animal forebears, only became human because a rational soul was added to a vegetal one (found in plants) and an animate one (found in animals).

In the Renaissance, further doubts arose about the Adamic narrative through the increased availability of 'pagan chronicles' with diverse legends about human origin. The assumed presence of monstrous races at the fringes of the known world raised questions about how to fit them into the Adamic story. The discovery of a 'New World' created tensions with the Mosaic record. Increased interest in Antiquity, one of the dominant traits of the Renaissance, triggered West European theologians and philologists to attempt to calculate the chronology of worldly and biblical events. The Huguenot scholar Josephus Scaliger (1540–1609) acknowledged that Egyptian dynasties predated the calculated dates of the biblical flood and the Creation narrative. Chinese and Egyptian evidence was uncovered that broke through Christian time frontiers and posed profound challenges to biblical chronology. For some time, such ancient and foreign cosmologies were denied, but ultimately doubt about the validity of the Christian estimated age of the Earth of some 6,000 years crept in.

In 1655, Isaac La Peyrère (1596–1676) published the controversial book *Praeadamites*, which within a year was denounced as heretical. It attracted severe criticism but also attracted some support from various savants and gave expression to the lingering uncertainty about the descent of man. One important trigger for publication was La Peyrère's detailed geographical/ethnographical work on Greenland and Iceland, in which he discussed the origin of the inhabitants. Iceland's Norwegian descent was well documented but he drew attention to the pre-existence of local inhabitants in Greenland before Icelanders arrived there, and wondered where these people came from and how they fitted into the Mosaic record. In addition, La Peyrère drew attention to a number of irritating inconsistencies in Genesis: *e.g*. whence did Cain get his wife after being driven from Eden, and in the land of which people did he settle? To the chagrin of Christian authorities, evidence from old chronological records, new geographic findings and internal biblical exegesis seemed to support La Perère's claim on the existence of pre-Adamites.

In the eighteenth century, the political significance of a putative polygenetic origin of humans reasserted itself with great force in the ongoing, closely interwoven, scientific inquiries of linguistic diversification, moral philosophy (in particular in connection with slavery), race relations, and cultural policies. To explain the rapid spread of Adam's offspring, Edenic hyper-fecundity was invoked, along with child bearing continuing many years longer than occurs in modern times. In addition, it was supposed that people occasionally could have reached ages of 900 years. Influential savants like Montesquieu, Blumenbach, and Oliver Goldsmith claimed that climate influenced human racial variations and some used this to explain the descent of both black and white people from a single original couple. Others, however, argued that climate did not make races, but races spread according to climate. Some reached the heterodox conclusion that God created 'various first couples' in different climatic regions, which might explain the occurrence of different races. Questions about human origins spread well into the realms of national politics, social relations and moral philosophy, in relation to the foundations of civil society such as marriage, family, agriculture, and rituals. The opinion that there were groups of non-Adamic people and that mankind was created as one genus but developed as different species with different capacities and powers, gradually led to a distinction between 'higher' and 'lower' racial groups, which opened the possibility of exploiting this line of reasoning in defence of slavery. The Jamaican plantation owner Edward Long (1734–1813) justified the enslaving of Africans, who were considered to be a subhuman inferior species. He exploited human diversity to its fullest possible extent by even including the orang-utan as a 'savage man' into the human family.

James Burnett, Lord Monboddo (1714–1799), a brilliant Scottish controversialist and polymath, and well-known deist, argued that, anatomically, orang-utans could be capable of speech. In addition, they lived socially in groups like human societies. Thus, he concluded, orang-utans, like certain African human groups, though bereft of speech, "belonged to a barbarous nation which has not yet learned the use of speech" and both groups were in the "orbit of humanity". Based on this proto-evolutionary account of the emergence of articulate speech for which "there was no reason to assume that it was invented only by one nation on one part of the earth", he showed his polygenetic leanings.

In defence of a monogenism and orthodox theology, the American religious minister–philosopher and Professor of Moral Philosophy at Princeton (College at that time), Samuel Stanhope Smith (1751–1819), argued that the unity of the human species was not only good science but also good theology—and even better, good moral philosophy. He insisted that climatic factors and social conditions together could fully explain racial variations and he therefore rejected polygenism. At base, Smith's fundamental concern was management of moral economy because science and theology alike were directly implicated in matters of social policy and maintenance of social order. He argued that, if there were different species of humans, they would be subject to different laws, both in the physical and moral constitution of their nature.

In the nineteenth century, pre-Adamic hypotheses gradually harmonised with evolving science and religion. The rejection of pre-Adamism by the Church was increasingly challenged by developments in geology, ethnology and philology; and evolving Darwinism encouraged harmonising these sciences with pre-Adamism. Pre-Adamite vocabulary was used w2ith increasing frequency in the dialogue between scientific theory and religious conviction. There appeared to be a growing need for ways to read the Bible while accommodating results and speculations of evolving science. Consequently, two groups emerged: one fiercely defending biblical orthodoxy; another applying hermeneutic manoeuvres of a labyrinthine nature to fit in pre-Adamism.

In the mid-nineteenth century, geology had evolved to the extent that pre-Adamic worlds could be shown at the Great Exhibition in London (1851) and in numerous lithographed books depicting, in the words of Martin Rudwick (1992) "scenes from deep time". The primeval Earth was reconstructed and mankind's place therein tentatively fixed. Based on the first two chapters of Genesis a putative double creation story of the Earth and of man was employed to explain the nature of pre-Adamic inhabitants on the Earth that were variously interpreted as fallen angels or demons. When increasing amounts of archaeological artefacts and human remains were found they were referred to as indications of a primitive previous population of our globe. With ingenious reasoning the Reverend James Gall (1808–1894) offered a compromise 'solution' between a choice of polygenism (several Adams) and monogenism (one Adam) by claiming that all pre-Adamites were swept form the planet prior to the coming of Adam from whom all present-day mankind were descended. Remains of the material bodies of the degraded pre-Adamite race that had lived in a savage state of society under the

influence of satanic forces were gradually found in Denmark, England, and France and became a topic of study for the emerging sciences of prehistory and archaeology.

But present-day human racial diversity and linguistic differences were also the focus of attention and were used in the evolving science of ethnology to explain the findings of physical anthropologists, and (if possible) in line with biblical exegesis. Louis Agassiz, also known as the exponent of the hypothesis of Ice Ages, explained and defended animal and human geographical distributions in terms of climatic zones. In his view 'races were made for places'. He emphasised that monogenism was not explicitly stated in Genesis and that creating one pair of any living being only raised a number of knotty problems (*e.g*., how the lion might feed if only one pair of gazelles was created). He claimed that various races were created independently from each other and analysed racial types with a strong racial bias. His theories led to sharp theological comments.

Edward William Lane (1801–1876), an orientalist and Professor of Archaeology at University College, London), aimed at demonstrating compatibility between archaeology and anthropology on the one hand, and Christianity on the other. He used his expertise in Semitic languages to carry out this intention by following some labyrinthine exegeses of various obscure passages in Genesis and merging the results with current trends in textual criticism. He urged a case for two separate human creations, one pre-Adamic the other Adamic. The conclusion that man was far more ancient than generally assumed in his time was based on flint arrows discovered in cave deposits from the Pliocene alongside teeth and bones of extinct species. In contrast to the Reverend James Gall (1808–1894), known for his book *Primeval Man Unveiled* (1871) in which he sought ways to accommodate traditional faith to both geology and Darwinian evolution, Lane argued that pre-Adamites continued to exist during and after Adam's time and interbred with Adamic stock. He considered that the 'first Creation' took place in the valley of the Upper Nile, whence humans spread through Africa and Asia, and branched out into a range of racial types resulting in the various current racial types. This he supported with an involved treatise on the development of languages, which evolved from primitive (monosyllabic sounds) to complex (agglutinated and amalgamated sounds). Lane's work, as well as that of the Irish judge Dominick McCausland (1806–1873), was laced with racist interpolations, all boiling down to the superiority of the Adamic Caucasians and the inferiority of pre-Adamic stock.

After Darwin had published the *Origin of Species* many people thought that the 'death of Adam' had come. But those that wanted to retain human continuity and accept evolution suggested that Adam was born of pre-Adamic parent or, in other words, Adam had both a navel and ancestors. This made a monogenetic form of pre-Adamism possible, but this evolutionary solution raised a number of theological problems: *e.g.* the metaphysical question how the dualism of body and soul was handled. Did Adam's ancestors undergo physical evolution to the point that a hominid body became suited to receive a human soul or did pre-Adamites coexist with Adamic stock and what was then the relationship between these groups? This revisionist pre-Adamism appeared to be transformative both to scientific developments and theological beliefs. Once adopted monogenetic pre-Adamism—like its polygenetic predecessor—channelled intellectual and political energies along explanatory roads to reorient both theology and science. The second half of the nineteenth century was full of examples of this reorientation, of which the work of the American Alexander Winchell (1824–1891), a leading geologist and Methodist layman, is a good example. His efforts were directed to mediate between science and religion, which gave him simultaneously both acclaim and notoriety. His main works emphasised that the derivation of species should be accepted and that the derivative descent of animal and vegetal forms represented the truth. Palaeontology, empirical evidence of species, variability and development embryology all conspired to render plausible the evolution theory. But this stance in favour of evolution met with the disapproval of the governors of his university, Vanderbilt, who dismissed him. Winchell found it likely that a pre-Adamic population preceded the current Adamic one and that the time when the pre-Adamics lived (the anthropological history) must have been very long and preceding Adamic human history. He also believed that the common progenitor of black, mongoloid, and other races was placed far back in time, well before the biblical Adam appeared. In summary, Winchell emphasised human unity and all human varieties are traced back to an original pre-Adamic stock. The descendents of this primitive stock dispersed across the Earth long before the Adamic family first appeared. Adam was the immediate progenitor of the nations that figure in biblical history and does not reflect all of mankind's primitive ancestors.

Throughout the time in which pre-Adamism evolved from polygenism to monogenism in response to Darwinian transformations, the theories' potential to serve the politics of racial ideology was being fully exploited. Supremacists were haunted by fears of racial amalgamation in the aftermath

of black emancipation and found refuge in pre-Adamist themes. They reinterpreted original sin as being the outcome of Eve's miscegenation and supported scientific anthropologists who upheld primitive polygenism. By identifying pre-Adamism they found a position that justified their anxieties scientifically and theologically. By identifying Adamic and pre-Adamic bloodlines, white supremacists constructed a bio-biblical dogma allowing traditional loyalties to the Bible to draw on a mélange of scientific specialities.

Pre-Adamism had its heyday in the second half of the nineteenth century but it continued into the twentieth century in certain 'ecological niches'. The idea only attracted those for whom a historic Adam retained some significance, religiously or scientifically. This is rather ironic, as the idea was originally conceived as a heterodoxy and grew in 'profanity', but finally came to reside amongst religious conservatives and fundamentalists. It shows that the theory's versatility and its capacity to perform different functions have remained characteristic. For some, it made possible a rapprochement with Darwinian biology and a rereading of the Mosaic narrative; for others its potential virulent racism remained attractive through which it has been recast as a pillar supporting some branches of nationalism. Thus the pre-Adamist shadow continues to fall on questions of human origins up to the present day.

The future of pre-Adamism is uncertain, but its varied past invites any serious student of the history of sciences to contemplate and study its tenets. In addition to the main text, the book has twenty-nine pages of notes and a bibliography of thirty pages. It is compulsive reading and is wholeheartedly recommended both to technical scientists and historians.

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THE HISTORY OF GEOCONSERVATION, edited by C. V. Burek and C. D. Prosser. 2008. Geological Society of London, Special Publication 300. 312pp. Hardcover, 60/$120

Germany's *Baumannshole* was discovered in the fifteenth century, and was first mentioned in literature in 1565. Guided tours were taking place by 1646, and it was scientifically investigated in the 1650s. Duke Rudolf August issued a decree in 1668 controlling access to the cave—perhaps the first measure of formal protection given to a geological site. (A competing claim, that the 1709 discovery of Pompeii represents "possibly the earliest . . . example . . . of conservation of a geologically important site", seems less convincing—one would expect that at Pompeii the geological evidence would have to be destroyed in the process of revealing the archaeology, but this point is not clarified.)

Early attempts to protect and conserve local geological resources are also linked with geological tourism. The Giant's Causeway in Northern Ireland was being visited as early as 1692, and many other sites were attracting tourists in the eighteenth century. In 1720 Daniel Defoe dismissed the wonders of the peaks and caverns of Derbyshire as overrated, but by 1813 Jane Austen's Elizabeth Bennett was attracted by chance to pick up "a few petrified spars". By mid-nineteenth century, the first geological 'theme park' had been constructed at the Crystal Palace in 1854, and pioneer British efforts had identified and protected Edinburgh's Salisbury Crags (1819), and the Carboniferous fossil forests of Sheffield (1875) and Glasgow (1887). Elsewhere, several national parks with geological features had been established in the USA and Canada before 1900.

When Britain made a major leap forward in nature conservation after World War II, geology was included in principle, and many sites of geological interest came to be protected because they provided habitats for rare plants or nesting sites for birds. However, sites mainly of geological interest received less attention. Only Wren's Nest (a complex site offering rich Silurian fossils including the famous Dudley trilobite, *Calymene*, with historic quarries and tunnels providing canal access) achieved the status of a National Nature Reserve in 1956.

Despite these early beginnings, the main thrust of activity documented here has taken place since 1970, so that much of the history is here described directly by its pioneers. We are told of development of new terminology for a complex of related ideas (geocon-servation, geodiversity, geoparks, geosites, and geotourism), together with a variety of criteria for site selection, the drafting and passing of legislative tools; the development of institutions to establish and administer sites and

teach geoconservation, and the important role of amateur geologists in providing data and public support.

This volume originated in a conference of the UK's History of Geology Group (HOGG), held in conjunction with other organizations in 2006. It was held in Dudley (near Birmingham) to celebrate the fiftieth anniversary of the Wren's Nest National Nature Reserve. Additional papers have been contributed which broaden the regional scope of the original conference. Of the twenty-two papers here published, six discuss the origins and development of geoconservation, geodiversity and geotourism. Five more present aspects of that history in the UK, focusing on particular organizations, legislation and policy, or practice. Six further papers are case histories; focusing on regional issues in Wales, the Isle of Wight, and Warwickshire; on the Wren's Nest reserve, cave conservation in the Yorkshire Dales, and the Crystal Palace geological 'theme park'. Perspective is broadened by papers on geoconservation in Ireland, Europe, and Tasmania (a leader in the field), and a review of geological sites in the World Heritage system. The book is enlivened with more than 120 illustrations, including maps, engravings and photographs of sites, portraits, and reproductions of title pages and ephemeral documents.

While there is recognition of the importance of museums and the geological collections they hold, the focus here is almost entirely on the conservation of sites. Over-collecting is raised as early as 1860 (p. 91), and controversies over fossil collecting are mentioned in passing, but there is no detailed discussion of this widespread problem. There is almost no reference to the area in which geoconservation overlaps cultural heritage—the expression of the lives and work of geologists and their organizations in buildings, monuments and residences.

As the authors have brought individual treatment to their topics, the reader can savour many intriguing details that might have been lost in a more structured volume. We learn that Adam Sedgwick, Cambridge's first professor of geology, contributed geological notes to the poet Wordsworth's guide to the Lake District (but, alas, there is no reference to his granite boulder memorial in Dent). We are told how Irish geoconservation efforts suffered from both an increase of the Civil Service (which displaced the geological galleries in the Natural History Museum) and a freeze (which did not permit staff to be added to do the work when the principle was established by the Government). The Wren's Nest story is full of fascinating incident, such as of the formation of an early geological society at Dudley (1841) whose first museum was in a public house! The national nature reserve has been subject to more than the usual level of problems, including plans to use it for dumping nuclear waste; the necessity to stabilize the surface by filling in historic quarries; use of the area as the only green space for neighbouring housing leading to the accidental death of a local teenager; and an arson attack on the interpretive centre. Promotion of the site has used innovative means, perhaps inspired by the licensed museum, for it has inspired the development of special beer marketed as 'trilobitter'.

This reviewer has only a few quibbles. It is difficult to gain an overview of the progress of geoconservation in a chronological way as key dates are buried in each paper; so a table collecting key events in an appendix would have been very helpful. So also would have been an index of acronyms, which are extensively used, and blur together in the mind after a while. On a smaller scale, clarity could easily have been improved in a number of instances: *e.g*., the three-page Table 1, beginning on p. 63, "The Voluntary Army", does not seem to be structured by alphabet, date, membership or any other obvious criterion; while the map of European Geoparks would have been usefully accompanied by a list of the numbered sites!

An interesting issue was brought to my attention by a remark in the Tasmanian paper that "[t]he aboriginal inhabitants . . . were . . . resettled onto remote islands in Bass Strait". While this was the case, it applied to only a small (residual) part of the population and was apparently fatal for most of them, so it struck this reviewer as an inadequate summary of the complex and controversial fate of the Tasmanian natives. (See for instance, David Quammen's accessible account in *The Song of the Dodo*).

Aboriginal populations are also involved in the story of the US Government's acquisition of the Devil's Tower in Wyoming (part of the Black Hills, and sacred to the Sioux—but not the one in Arizona which is illustrated, and the only one indexed). When gold was discovered, the Government sent in an expedition "in direct violation of treaty rights" and attempted to buy back the area, but the natives refused. Following the Custer/Sitting Bull confrontation, "the dispute over the sacred lands was resolved by . . . redrawing the Indian Reservation boundary to leave the Black Hills outside of it!

Devils' Tower was now owned by Congress". In due course it became the country's first National Monument.

Today, it is becoming more usual to take account of the views of aboriginal peoples on conservation issues. The countries primarily featured in *The History of Geoconservation* are the colonizers, not the former colonies, which is perhaps the reason why this complex issue is not discussed. Nevertheless, this issue is an essential concern of conservation, for instance, in North America.

Although focused on history, this volume is also to some extent a call for action. A network of Geoparks is being established in Europe and China—and clearly this is likely to extend into other regions. And Patrick Boylan's fascinating analysis of the origins of the World Heritage Site System and the inadequate representation of Earth Sciences is forthright, showing that "there is no provision for associated historical or other intangible importance within the natural heritage criteria", and wondering why the International Commission for the History of Geology (INHIGEO) was neither involved in the initial development of the World Heritage Convention, nor in any aspect of its subsequent operation since 1972".

Wider international expansion of geoconservation will have to meet the needs of the countries concerned. Even in Ireland, so closely associated historically with the UK, a smaller population and strong cultural differences have hindered the ready adoption of models from elsewhere. The (British) RIGS ('Regionally Important Geological and Geomorphological Site') system, we are told "does not translate well into the different social, legal and geographic situation in both jurisdictions of Ireland". If geoconservation is to expand successfully throughout the world, in countries with very varied histories and cultures, the widely differing experiences described here will help other countries adapt the international ideals to their own cultural needs.

This is an important book, which not only brings together much historical information of value to anyone interested in the Earth Sciences, but also points the way towards extending the network of protected sites worldwide, and developing wider understanding of Earth Sciences through the involvement of local populations and international geotourism. Let us hope it will stimulate the production of similar volumes giving more attention to North America (where many advances in geoconservation unmentioned here have been made), as well as other areas of the world.

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David Branagan is an Honorary Research Associate, School of Geosciences, Sydney University, where he taught for thirty years, following ten years in government and the mining industry. In recent years he has concentrated largely on the history of Australian geology and mining, publishing, *inter alia*, a biography of the geologist Sir T. W. Edgeworth David. He is a foundation and Honorary Life Member of the Geological Society of Australia and a former President of the International Commission on the History of Geological Sciences. In 2007, he was awarded an Honorary DSc by the University of Sydney.

Diane Buhay is Librarian and Head of Access and Research Services at Ward Chipman Library at the University of New Brunswick Saint John campus. She has a background in science and information studies and has pursued research in the area of early geological science in New Brunswick for more than twenty years. Her research and published works in this area concern the activities of the Natural History Society of New Brunswick.

Barry Cooper is a geology graduate from the University of Melbourne, Australia and The Ohio State University, USA. He has spent most of his career at the Geological Survey of South Australia, where he was first encouraged in his interest in the history of geology. In 1983, Barry assisted the formation of the 'Earth Sciences History Group' within the Geological Society of Australia. He has also been a member of INHIGEO since 1989 and is currently Secretary General. Barry's initial research focus was in palaeontology and stratigraphy. Over recent decades this has shifted to the history of geology and building stones. Since retirement, Barry has been an adjunct staff member at the University of South Australia.

R. Bruce McMillan (PhD Colorado 1971) is currently an adjunct Professor of Anthropology at the University of Missouri. He is Director Emeritus of the Illinois State Museum and holds the title of Research Associate. His research interests are environmental archaeology and landscape history, focusing on the interplay between humans and their environment. He has had a long-term interest in fossil-bearing springs beginning with his direction of an NSF-sponsored research program exploring spring deposits in the upper Osage River basin in Missouri in the 1970s.

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Artur Svansson was born in Chicago but is a Swedish citizen. He studied under the meteorologist and oceanographer Carl-Gustav Rossby at the Meteorological Institute of Stockholm University, where he started scientific work in oceanography, his doctoral dissertation being on sea-level changes. From 1957 to 1985 he worked at the Swedish Board of Fisheries. He then moved to what is now the University's Department of Earth Sciences where, after his retirement as Associate Professor Emeritus, he has been researching the history of Swedish oceanography. In 2006, he published a biography of Otto Pettersson (*Otto Pettersson: Oceanografen, Kemisten, Uppfinnaren*), who initiated the first oceanographic international conference, from which developed the International Council for the Exploration of the Sea.

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Good, Gregory A. (ed.). 1998. S*ciences of the Earth: An Encyclopedia of Events, People, and Phenomena*. 2 vols. New York and London: Garland Publishing Inc.

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Wolter, John A. 1975. The Emerging Discipline of Cartography. PhD dissertation, University of Minnesota.

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