Research Article

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Two critical books in the history of loess investigation: ‘Charakteristik der Felsarten’ by Karl Caesar von Leonhard and ‘Principles of Geology’ by Charles Lyell

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Abstract: The two critical books, launching the study and appreciation of loess, were ‘*Charakteristik der Felsarten*’ (CdF) by Karl Caesar von Leonhard, published in Heidelberg by Joseph Engelmann, in 1823-4, and ‘*Principles of Geology*’ (PoG) by Charles Lyell, published in London by John Murray in 1830-3. Each of these books was published in three volumes and in each case the third volume contained a short piece on loess (about 2-4 pages).

These two books are essentially the foundations of loess scholarship. In CdF Loess [Loefs] was first properly defined and described; section 89 in vol. 3 provided a short study of the nature and occurrence of loess, with a focus on the Rhine valley. In PoG there was a short section on loess in the Rhine valley; this was in vol.3 and represents the major dissemination of loess awareness around the world.

A copy of PoG3 (*Principles of Geology* vol. 3) reached Charles Darwin on the Beagle in Valparaiso in 1834; worldwide distribution.

Lyell and von Leonhard met in Heidelberg in 1832. Von Leonhard and Heinrich Georg Bronn (1800-1862) showed Lyell the local loess. These observations provided the basis for the loess section in PoG3. Lyell acknowledged the influence of his hosts when he added a list of loess scholars to PoG; by the 5th edition in 1837 the list comprised H.G. Bronn, Karl Caesar von Leonhard (1779-1862), Ami Boué (1794-1881), Voltz, Johann Jakob Noeggerath (1788-1877), J. Steininger, P. Merian, Rozet, C.F.H. von Meyer (1801-1869), Samuel Hibbert (1782-1848) and Leonard Horner (1785-1864); a useful list of loess pioneers.

Keywords: First books on loess; *Charakteristik der Felsarten*; *Principles of Geology*; Karl Caesar von Leonhard; Charles Lyell

The loess is a type of ground that has only recently been established, and it seems, the peculiarity of the Rhine region, and of a very general but inconsistent spread.” H.G. Bronn 1830

1 Introduction

Two books characterise the beginnings of the study of loess: *Charakteristik der Felsarten* (CdF) by Karl Caesar von Leonhard [1], and *Principles of Geology* (PoG) by Charles Lyell [2]. Each was published in three volumes, and in each case vol.3 contained a short piece on loess. The two books had completely separate aims, reflecting the distinctive nature of their authors. CdF was essentially a catalogue, a definitive list of ground materials, naming and defining and describing. It provided an authoritative listing and it was this air of authority that made it so useful from the loess point of view; loess joined a large set of acceptably defined materials. PoG, on the other hand, was a book of philosophy and argument. Lyell was attempting to press a particular point of view on the world, he was arguing a case and much of the book is concerned with argument and explanation. Having encountered the loess in 1832 (and possibly before) he offered a theory of formation, as well as some preliminary descriptions.

2 Charakteristik der Felsarten (CdF)

Von Leonhard was 43 years old in 1823 (Figure 1). He was professor of Mineralogy at the University of Heidelberg.

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He was one of the editors of *Neues Jahrbuch für Mineralogie*. He ran a successful business supplying geological and mineralogical specimens [3, 4]. He was a well established professor in a famous university. In 1824 he named and validated loess.

Figure 1: Karl Caesar von Leonhard in 1823.

He gave several synonyms for the material for which he confirmed the name of Loess: Loesch, Schneckenhausel-Boden, Mergel (im Badischen Oberlande), Briz. The term 'Briz' is interesting; this was the term used by Steininger- but examination of the Steininger text shows that he actually called his material 'Britz'. His work, published in Old German type, used double letters, one of which was the double letter for *tz*, which looks very like a single *z*. It seems odd that Leonhard should have misread the Steininger text. It was a very small-scale usage. Mergel was more widely used, and Schneckenhausel-Boden was more descriptive, but loess, given the imprimatur by Karl Caesar von Leonhard became the accepted usage.

The sub-title of CdF was 'Für Akademische Vorlesungen und zum Selbststudium'. Volume 1 (1823) was entitled 'Ungleichartige Gesteine; volume 2 was 'gleichartige und scheinbar gleichartige Gesteine; and the critical volume 3 (1824, see Figure 2) was 'Trümmer-Gesteine, Lose Gesteine, Kohlen'. Volume 3 essentially dealing with unconsolidated

sediments/ disaggregated systems; pages 599 to 772 including sections 64 Grauwacke to 93 Vulkanische Asche, via 89 Loess [Loefs]. Volume 3 contained the index for all three volumes; Loess appeared once, on p.722.

Figure 2: The title page of *Charakteristik der Felsarten*, vol.3.

"Loess is a loamy, dirty, yellowish-grey material, an earthy mixture of clay, chalk and pebbles and of very small mica particles. The fine dusty parts are connected into a loose corporeal mass" CdF3 (*Charakteristik der Felsarten* Vol. 3), p.722.

3 Principles of Geology (PoG)

The *Principles of Geology* occupied Lyell for all his life; it was always a work in progress. He adjusted the successive editions to take into account the current advances in geological sciences. By the time of his death in 1875 there had been eleven editions. The first volume of the first edition appeared in 1830, published by John Murray in London.

In 1833 Lyell was 36 years old; the Wright portrait (Figure 3) shows him in 1836.

Figure 3: Charles Lyell in 1836; portrait by J.M.Wright (National Portrait Gallery, London). In 1836 the current edition of the *Principles* was the 4th, published in 1835.

In the short loess section in PoG3 he listed the contemporary loess scholars; in 1835 they appeared as Bronn, von Leonhard, Boue, Voltz, Noeggerath, Steininger, Merian, Rozet, von Meyer and Hibbert. Horner was added in 1837, for the 5th edition. The list is interesting and worthy of a brief consideration. It is rather surprising that Horner had to wait until the 5th edition before inclusion in the list. We think that the action by Lyell in 1837 was in response to a publication by Horner [5], the much delayed paper on the geology of Bonn, which gives a full discussion of loess in the Bonn region.

A list being compiled today would put Von Leonhard first as the significant loess pioneer but Lyell gives first place to Bronn. We speculate that Bronn and Lyell (being of a similar age; Bronn was 32 in 1832, and Lyell was 35) had a closer relationship than Lyell and the older Von Leonhard. von Leonhard was very much the Professor & Geheimrat, a

senior figure in the world of the earth sciences. We suggest that there are no notable figures on the list (from the narrow loessic point of view) apart from Von Leonhard, Bronn, Hibbert and Horner.

PoG began to be published in 1830; the first volume appeared in January (see Figure 4), and the second in January 1832.

Figure 4: The title page of *The Principles of Geology*, vol.1, published in 1830. The figure includes the famous and iconic picture of the Temples at Serapis, the frontispiece which came to characterise the work.

Before the third volume appeared, in May 1833, a second edition of the first and second volumes had been published. A third edition, in four volumes, was published in May 1834, and a fourth edition, also in four volumes appeared in 1835. In this fourth edition Noeggerath and von Meyer joined the loess list. The fifth edition, also 4 volumes, appeared in 1837, and Horner joined the loess list. The loess section, from vol.4 of the 4th edition was reprinted by Loess Letter [6] and is sometimes (rather confusingly) cited as a 1986 publication.

“Loess of the valley of the Rhine. A remarkable deposit of calcareous loam, containing land and fresh-water shells of recent species, occurs here and there, in detached patches, throughout the valley of the Rhine, between Basle and Cologne, and on the flanks of the hills bordering the great valley. The deposit is provincially termed “loess” by the Germans, and in Alsace - “lehm”.

PoG3 p.676

4 Editions

Some editions need to be noticed; now that PoG is seen as a classic there are critical views and appendages to be recorded and assessed. The Penguin edition [7] (in the Penguin Classics series), with an introduction by James Secord, covers all three volumes. Unfortunately in the abridgement process the loess section has been lost. The Second commentary is impressive, but the loss of loess is to be regretted.

The Chicago University Press edition of PoG3 (see Figure 5) has a bibliography by Martin Rudwick appended. He listed all the works consulted by Lyell during the composition of PoG. Hibbert [8] is cited. There is a glossary which does not contain the word 'loess'. Given the significance of loess appearing in PoG3 as a new word it is surprising that it is not in the glossary [9].

Figure 5: Front cover of the Chicago University Press reprint of *Principles*, vol.3.

CdF has benefitted from the rise of 'print on demand' publishing. For many years difficult of access and impossible to own, it is now readily available- from a variety of publishers. There appears to be a concentration on CdF3, perhaps because it is a relatively small volume. Attempts to acquire CdF1 or CdF2 should be made with great care.

The Online Computer Library Center (OCLC) WorldCat has several entries for CdF - there is obviously confusion. CdF has at least two OCLC numbers (840601865 and 781233529). But confusion does readily arise; Jovanovic *et al.* [4] has five entries in WorldCat - each one supplied by a different database.

After the 5th edition loess does not feature in PoG; argument totally takes over from observation. But the message had been delivered. The early editions of PoG carried the news of loess to the farthest corners of the world. A copy reached Charles Darwin on the Beagle in 1834 when the great expedition reached Valparaiso. Copies were shipped to New Zealand and Australia; word reached Julius von Haast in Canterbury and the loessic endeavour expanded in New Zealand.

In his memoir '*Aus unserer Zeit in meinem Leben*' [10] von Leonhard covers the year 1832 but his thoughts are turned to larger matters and he does not mention loess, or the visit of the Lyells to Heidelberg; he does quote Thomas Carlyle but neglects geology.

Heidelberg (Figure 6) plays a key role in the development of loess investigation [3]. Von Leonhard was there, that was the key fact. Loess deposits were accessible from Heidelberg, and in fact the deposit at Haarlass has become the Locus Typicus for loess. Charles Lyell arrived in July 1832 and Von Leonhard and H.G. Bronn showed him the loess. Bronn [11] had described the neighbourhood.

The meetings in Heidelberg went well. Lyell wrote:

"... the diary from Heidelberg, which we stayed at on the 18th [July 1832]. Leonhard was very attentive, showed me part of his collection, and begged his wife to take mine to a fine view from a neighbouring hill; then went with us to the castle, showing me by the way some geological sections, which, added to my short excursion to the Felsenmeer, have enabled me to obtain something like a fair notion of the Odenwald, both its scenery and geology. I then introduced Mary to Bronn, Professor of Natural History, and learnt some geology from him of the country in a different department from Leonhard's. Next day, the 19th, to Carlsruhe, making a delightful detour on the road, up a small valley leading from the plain up into the Odenwald hills, where I went to see a singular deposit, called 'loess' ..."

Lyell to his sister Eleanor; letter dated 20 July 1832; see K.M.Lyell [12].

Figure 6: Heidelberg University - coat of arms. Heidelberg is critical to the story of the development of loess studies. Lyell and von Leonhard met there in 1832, there was discussion and viewing of the loess.

5 Discussion & Conclusions

Neither CdF3 or PoG3 had a picture of loess. We think that the first published sketch of loess was that by Horner (1836) showing Rhine valley loess near Rhondorf, at the Bruckersberg (Figure 7). Horner provided some exposure to the idea of loess and his paper, presented to the Geological Society in London in 1833 was probably the first public discussion of loess in the UK [5].

Figure 7: Loess “near Rhondorf, at the Bruckersberg” from Horner [5]. This is an early representation of loess in the landscape; possibly the first.

No doubt that CdF and PoG were the key documents in the initiation of the process known as loess scholarship. Leonard Horner probably deserves a passing mention in the discussion of pioneering activity. He was the first loess ‘enthusiast’ he quickly saw the scientific potential of loess; he was scrambling about with Lyell in the crater of the Roderberg in 1833. He wanted to go and study with von Leonhard in Heidelberg. Had he not been dragged away by the call of duty and the desperate needs of the working classes of the UK he would probably have been a great herald for the study of loess [13].

Horner claimed that the best contemporary description of loess was by Bronn [11]. Bronn and Horner support the great loess pioneers: Karl Caesar von Leonhard and Charles Lyell.

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