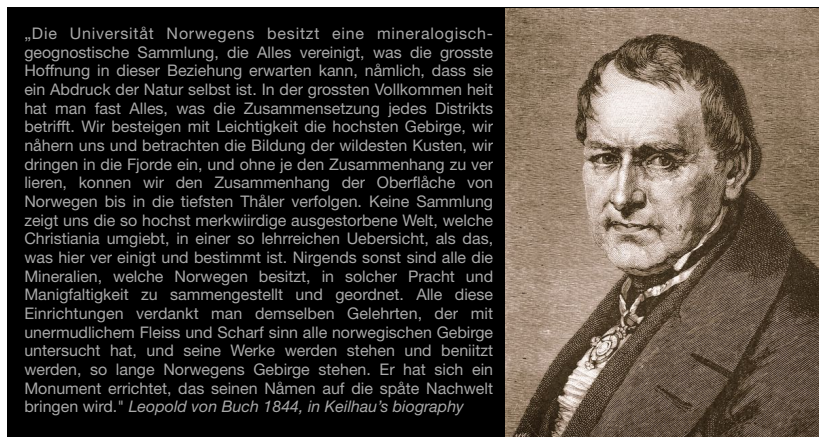A major research question with an impact on our understanding of science in the romantic era, is whether it could make do without mathematics as it separated itself from philosophy. What is the contribution of the mathematical *exposé* in establishing a culture of science, based on demonstration?

What was the role of technology in its broader field of application (that is, the kinds of technologies that were used in field-research: including *drawing skills*, that were part of the polytechnical repertoire at the time)? How could the power of demonstration move from field-research to exhibitions?

The technological vehicles of discovery, and the mathematical power of demonstration were both present in the entourage of Norwegian geologist Keilhau: N. H. Abel in the Physiographic Society (1820s), and Leopold von Buch in his appreciation of a geological exhibit by Keilhau in 1844.

„Die Universität Norwegens besitzt eine mineralogisch-geognostische Sammlung, die Alles vereinigt, was die grosste Hoffnung in dieser Beziehung erwarten kann, nåmlich, dass sie ein Abdruck der Natur selbst ist. In der grossten Vollkommen heit hat man fast Alles, was die Zusammensetzung jedes Distrikts betrifft. Wir besteigen mit Leichtigkeit die hochsten Gebirge, wir nåhern uns und betrachten die Bildung der wildesten Kusten, wir dringen in die Fjorde ein, und ohne je den Zusammenhang zu ver lieren, konnen wir den Zusammenhang der Oberflåche von Norwegen bis in die tiefsten Thåler verfolgen. Keine Sammlung zeigt uns die so hochst merkwiirdige ausgestorbene Welt, welche Christiania umgiebt, in einer so lehrreichen Uebersicht, als das, was hier ver einigt und bestimmt ist. Nirgends sonst sind alle die Mineralien, welche Norwegen besitzt, in solcher Pracht und Manigfaltigkeit zu sammengestellt und geordnet. Alle diese Einrichtungen verdankt man demselben Gelehrten, der mit unermudlichem Fleiss und Scharf sinn alle norwegischen Gebirge untersucht hat, und seine Werke werden stehen und beniitzt werden, so lange Norwegens Gebirge stehen. Er hat sich ein Monument errichtet, das seinen Nåmen auf die spåte Nachwelt bringen wird." *Leopold von Buch 1844, in Keilhau's biography*

I recently carried out an experiment of exploring a mathematical concept in a seminar devoted to environmental humanities. Since the seminar was packed with contributions there was no time to discuss. For this reason, I do not know how this particular point of my contribution was received.

This point was to see if the epistemic framework of mathematics in literary *exposé*—a discussion of mathematical principles denied the use of formulas—still is a valid currency. The point being that discussion mathematics in the genre of *verbal causerie* was a hallmark of the romantic era.

I have not had access to manuscripts from of exposés of this kind that I expect Niels Henrik Abel to have ventured in the Physiographic Society, where when members spoke of their scientific ventures with peers from other disciplines. How would he have spoken of e.g. his Abelian groups?

A document I studied in detail, however, is Felix Klein's inaugural lecture (1872): the Erlangen Programme. This lecture demands some effort from the public, but contains no mathematical formulas. It constitutes an example of mathematics explained to an educated audience of non-mathematicians.

In the discourse of romanticism, it would seem imperative to move beyond the philosophical ideas in the romantic era, since this was a period during which sciences departed from philosophy to make their own way. Especially, if interested in *other* trends than those subservient to industrialism.

How did real scientific achievements distinguish themselves from mundane conversation, in other terms than those that made scientific results available to enterprise? How did enterprise interact with the world of science? This question is as important as the divorce between science and philosophy.

Back to the 1820s: how would an exposé of Abelian groups have impacted geological research at that time? How would Abel's and Keilhau's ideas about transformations—in mathematics and geology—have cross-fertilised each other? What was the unity between sciences without philosophy?

Of course, the last question may lack answers, if it indeed was the big ideological *trompe l'œil* of the romantic era (the legacy of Goethe and Alexander von Humboldt). Another possibility is that making *discoverable* connections between sciences *somehow* made their unity *demonstrable*.

That is, the relation between part and whole—*mereology*—would reveal itself through empirical study, through discovery, and shared with a community of peers through demonstration (as an alternative to philosophical argument). The merit of a geological exhibition was its demonstration-value.

To the *natural historians* of romanticism, there was no watershed between science and humanities. Can it be held that the link between mathematics and natural history existed for as long as the practice of the mathematical *exposé* was sustained? Could the romantic *episteme* survive without it?