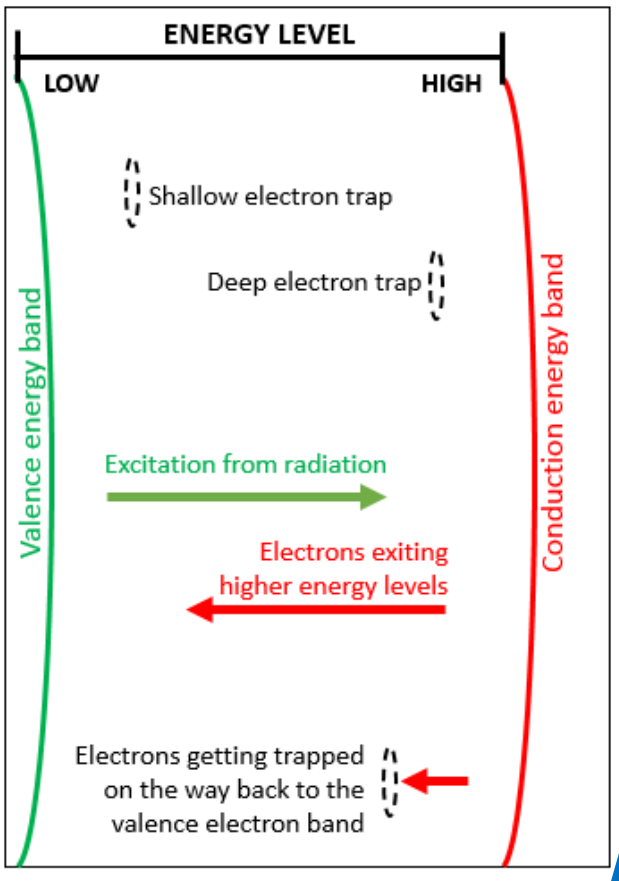
OSL Dating of the Mesolithic site Nilsvikdalen 7

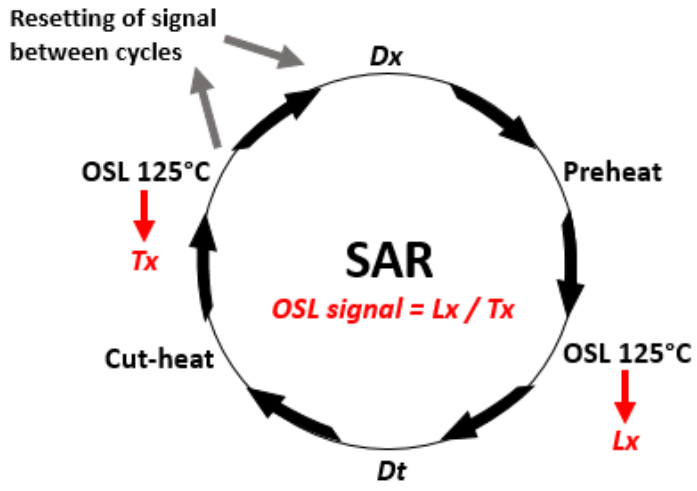
Archaeological Applications of Luminescence Dating

WHAT IS LUMINESCENCE DATING?

- Dating can be done on both ceramics and on sediments (mainly quartz and feldspar).
- It relies on the emission of a luminescence signal that has been built up over time by continuous exposure to radiation in their environment.
- The radiation will excite electrons from their natural energy level to a higher state. When they exit the higher energy state, some will get trapped in the crystal lattice (Preusser et al. 2008; Bateman 2019). See figure below.
- The signal will be reset by the exposure of light or heat, therefore making it possible to determine the burial age of the sediments (the last time they were exposed to sunlight or heat from a fire).



Modified from Preusser et al. (2008).



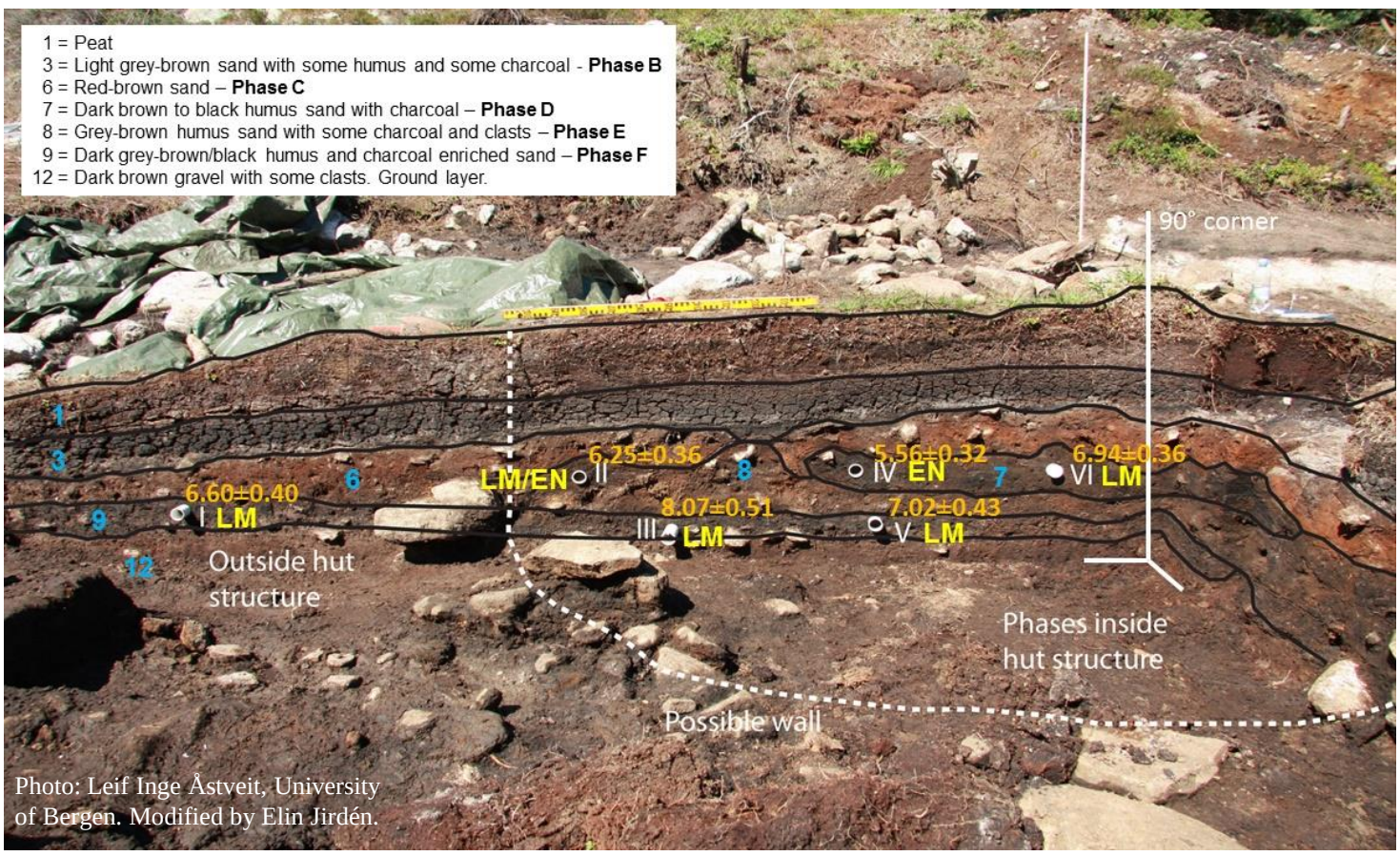
$L_0/T_0 \rightarrow L_1/T_1 \rightarrow L_2/T_2 \rightarrow L_3/T_3 \rightarrow L_4/T_4 \rightarrow L_5/T_5$

Natural dose | Regen. dose 1 | Regen. dose 2 | Regen. dose 3 | Zero dose | Regen. dose 1 repeat

OPTICALLY STIMULATED LUMINESCENCE

- The OSL ages are determined according to the simplified equation below.
- The Single Aliquot Regenerative (SAR) protocol (Murray & Wintle 2000; Murray & Wintle 2003) was used for OSL measurement. See the SAR procedure modelled after Murray & Wintle (2000) above.

$$\textbf{Luminescence age (ka)} = \frac{\textbf{Equivalent dose } D_e \textbf{ (Gy)}}{\textbf{Dose rate } \dot{D} \left(^{Gy}/_{ka}\right)}$$



OSL DATING OF THE NILSVIKDALEN 7 SITE

This study aims to increase the chronological knowledge of the Nilsvikdalen 7 site at Bjorøy, SW Norway, by use of OSL dating. Specifically, to OSL date six samples from the stratigraphy of an interpreted hut structure and address how they relate to existing radiocarbon dates. Lastly, it will also evaluate the potential contribution of luminescence dating to similar geoarchaeological settings.

OSL RESULTS

Sample	D_e (Gy)	Dose rate (Gy/ka)	Mean age (ka)
21001	28.04±0.48	4.25±0.25	**6.60±0.40**
21002	20.79±0.36	3.33±0.18	**6.25±0.36**
21003	28.50±0.73	3.53±0.20	**8.07±0.51**
21004	18.79±0.47	3.38±0.18	**5.56±0.32**
21005	24.62±0.56	3.51±0.20	**7.02±0.43**
21006	16.53±0.22	2.38±0.12	**6.94±0.36**

CONCLUSIONS

- The quartz dated was of very good quality.
- The OSL dating of Nilsvikdalen 7 was successful, producing ages ranging from Late Mesolithic (6500-4000 cal. BC) at the bottom layer to Late Mesolithic – Early Neolithic (4000-3300 cal. BC) for the middle and top layer dated.
- The OSL ages are in good agreement with the earlier site interpretation as well as with associated radiocarbon dates.
- Difficulties with dating the material mainly depended on the water content and for future implementations of OSL dating at archaeological sites it is recommended to take control samples of known age for comparison.
- For the planned future coastal Stone Age research in western Norway, OSL is a good alternative dating method where site stratigraphy permits.

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