

### 2015

#### 19th Conference on Microscopy of Semiconducting Materials

March 29–April 2, 2015  
Cambridge, UK  
<http://msm2015.iopconfs.org/home>

#### 2015 MRS Spring Meeting & Exhibition

April 6–10, 2015  
San Francisco, CA  
[www.mrs.org/spring2015](http://www.mrs.org/spring2015)

#### Biology of Regenerative Medicines

April 22–24, 2015  
Cambridge, UK  
[https://registration.hinxton.wellcome.ac.uk/display\\_info.asp?id=432](https://registration.hinxton.wellcome.ac.uk/display_info.asp?id=432)

#### EMAS 2015: Workshop on Microbeam Analysis

May 3–7, 2015  
Portoroz, Slovenia  
[www.microbeamanalysis.eu/events](http://www.microbeamanalysis.eu/events)

#### 15th Meeting of the European Light Microscopy Initiative (ELMI)

May 19–23, 2015  
Barcelona, Spain  
[www.elmi2015.eu](http://www.elmi2015.eu)

#### Inter/Micro 2015

June 8–12, 2015  
Chicago, IL  
[www.mcrl.org](http://www.mcrl.org)

#### Microscience Microscopy Conference

June 29–July 2, 2015  
Manchester, United Kingdom  
[www.mmc2015.org.uk](http://www.mmc2015.org.uk)

#### Microscopy & Microanalysis 2015

August 2–6, 2015  
Portland, OR  
[www.microscopy.org](http://www.microscopy.org)

### 2016

#### Microscopy & Microanalysis 2016

July 24–28, 2016  
Columbus, OH  
[www.microscopy.org](http://www.microscopy.org)

### 2017

#### Microscopy & Microanalysis 2017

July 23–27, 2017  
St. Louis, MO  
[www.microscopy.org](http://www.microscopy.org)

### 2018

#### Microscopy & Microanalysis 2018

August 5–9, 2018  
Baltimore, MD  
[www.microscopy.org](http://www.microscopy.org)

### 2019

#### Microscopy & Microanalysis 2019

August 4–8, 2019  
Portland, OR  
[www.microscopy.org](http://www.microscopy.org)

#### More Meetings and Courses

Check the complete calendar near the back of this magazine.

## Carmichael's Concise Review

# Microscopy Reveals That It's Written in Stone!

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The study of ancient art provides information as to when cognition first appeared in human evolution. Because of its durability, this is usually restricted to carvings on stone or other durable surfaces in habitable caves. One such cave was formed by intense wave action and is located on the Mediterranean coast of Gibraltar, a small promontory situated at the southern extreme of the Iberian Peninsula. Recently a large international group including Joaquin Rodriguez-Vidal, Francesco d'Errico, and Clive Finlayson determined that engravings in the stone of this cave were made by Neanderthals [1].

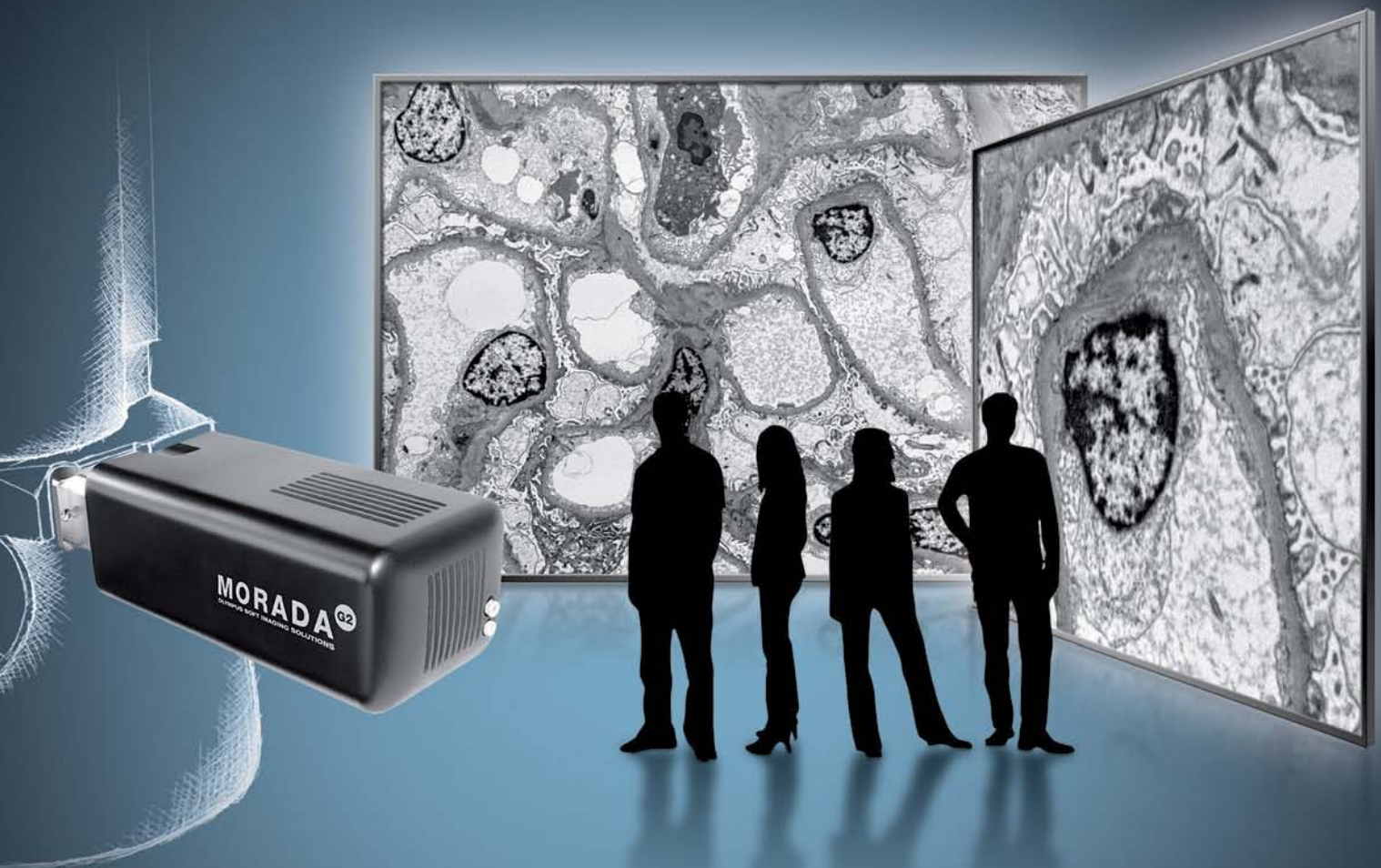
An engraving was found on a flat area of about 300 cm<sup>2</sup>. It consisted of eight deeply engraved lines forming an incomplete criss-cross pattern, obliquely intersected by short thin lines. The engraved pattern was strikingly different from natural fissures that were also found on exposed surfaces in the cave.

Using light optical microscopy and scanning electron microscopy, Rodriguez-Vidal et al. were able to determine that a series of grooves were made with unique movements of a stone tool tip (Figure 1). Experimenting with a series of likely stone tools, they estimated that the engraving would require about 200 deliberate blows of a hammer-like device on the stone tool. Specifically, some of the lines were engraved with a robust stone point by repeatedly passing the tool tip into the groove in the same direction. Remarkably it was apparent that no accidental marks were made outside the pattern, and there was only one place where the end of a line was fringed. This suggests that a reasonably skilled person, or group of people, made the engraving. Other experiments ruled out that the marks were made for a



**Figure 1:** Engraving made by Neanderthals in a Gibraltar cave required an estimated 200 strokes of a stone tool.

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utilitarian purpose, such as a stone where animal skins were processed.

Rodriguez-Vidal et al. estimated that the engraving was made about 39,000 years ago. This is the earliest time that this was done (*terminus ante quem* in anthropologic terminology), and at that time it is known that Neanderthals inhabited Iberian Peninsula and modern humans did not. The significance of this to the field of anthropology is enormous! The production of purposely made engraved or painted designs on cave walls is recognized as a major cognitive step in human evolution. This had been considered to be restricted to modern humans. The engraving in this cave represents the first directly demonstrable case in which a technically elaborated, consistently and carefully made non-utilitarian engraved abstract pattern, whose production required prolonged and focused actions, has been observed on the bedrock of a cave. For the first time, Rodriguez-Vidal et al. demonstrated the capacity of Neanderthals for abstract thought and expression.

### References

- [1] J Rodriguez-Vidal et al., *Proc Nat Acad Sci* 111 (2014) 13301–06.
- [2] The author gratefully acknowledges Professor Clive Finlayson for reviewing this article.

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## Senior Research Associate

### Permanent Scientific Staff Position

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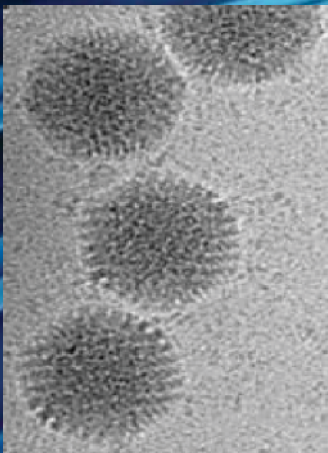
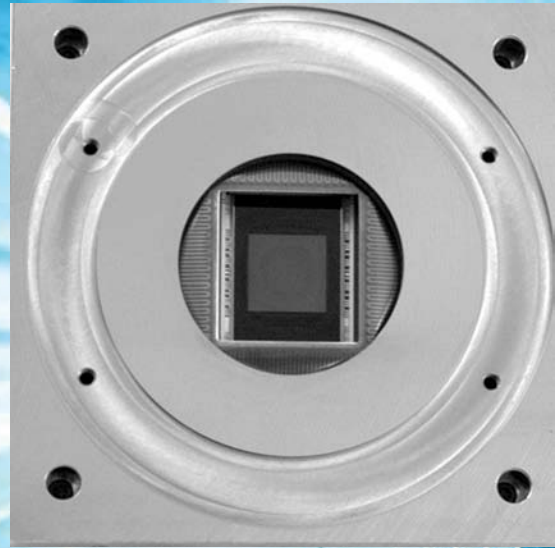
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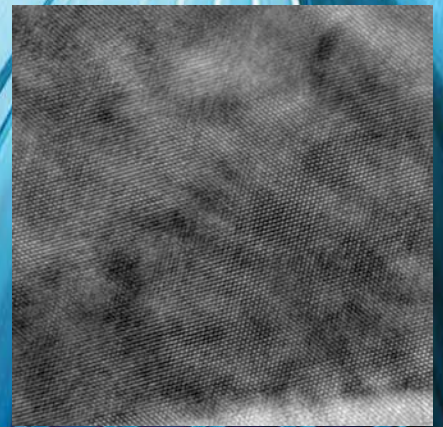
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