Available online at http://www.journalijdr.com

IJDR

International Journal of DEVELOPMENT RESEARCH

ISSN: 2230-9926

International Journal of Development Research
Vol. 06, Issue, 10, pp.9843-9849, October, 2016

Full Length Research Article

STRUCTURES OF EPITHELIA FOUND IN MARTIAN LAFAYETTE METEORITE

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ARTICLE INFO

Article History:

Received 16th July, 2016
Received in revised form
24th August, 2016
Accepted 19th September, 2016
Published online 31st October, 2016

Key Words:

Epithelial Structure;
Martian epithelium;
Martian Meteorite;
Lafayette Meteorite.

ABSTRACT

Structures of epithelia were found in two electron images of the Mars meteorite Lafayette. One image shows structures of pseudo stratified columnar epithelium, and the other image shows structures of simple cuboidal epithelium. These structures may not be biotic in origin if they are separately considered on the cellular level. However, inorganic material has not been reported to match these structures when integrated at the tissue level. No terrestrial minerals have been found in this meteorite. It is possible that epithelium structures were found in this meteorite because they were moved into the rock by water on Mars or because the rock originally solidified around the epithelium structures.

INTRODUCTION

The author read the following press release issued by the University of Leicester, U.K., on the internet:

Quote: Rare meteorites reveal Mars collision caused water flow.

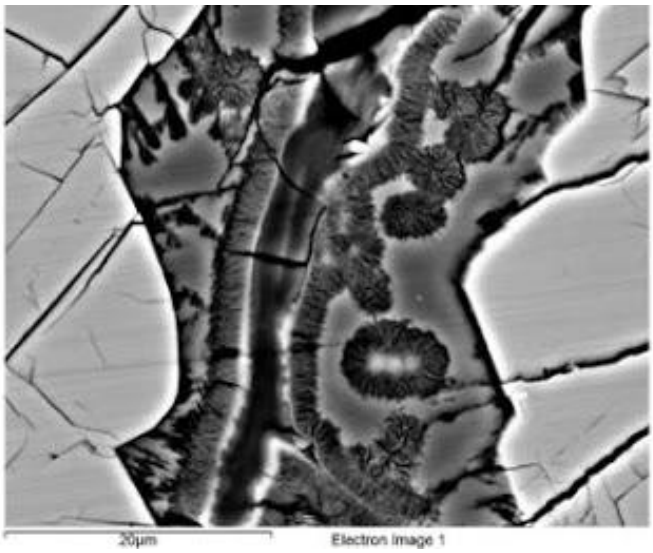

Fig. 1. A vein through which water flowed. Credit: University of Leicester. Issued by University of Leicester Press Office on 2 February 2011. Jpeg images available from pressoffice@le.ac.uk. Posted by pt91 on 2 February 2011 at 03:14 PM Permalink

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Exactly a century after the first discovery of a rare meteorite sample, a University of Leicester team is using this sample to reveal new insights into water on the red planet. Rare fragments of Martian meteorites have been investigated at the University of Leicester and have revealed one of the ways in which water flowed near the surface of Mars. Scientists at the university's renowned Space Research Centre, in the Department of Physics and Astronomy, examined five meteorite samples, including the very first nakhlite, found a century ago. Nakhlites are a form of meteorite known to have originated on Mars. They are named after the village of El-Nakhla, in Egypt, where the first meteorite was found in 1911. Findings from the research have been published in *Meteoritics and Planetary Science* (Changela&Bridges, 2010)." Unquote.

The author examined the image in the press release and found that it contains structures that have a similar appearance to those of organic tissue. The basis for the association was that the author had studied anatomy and dozens of fossils under microscopes. The author then contacted the press office of the University of Leicester and requested copies of the images shown in the press release. On Feb. 9, the author received the following image (Fig. 2) from the press office of the university:

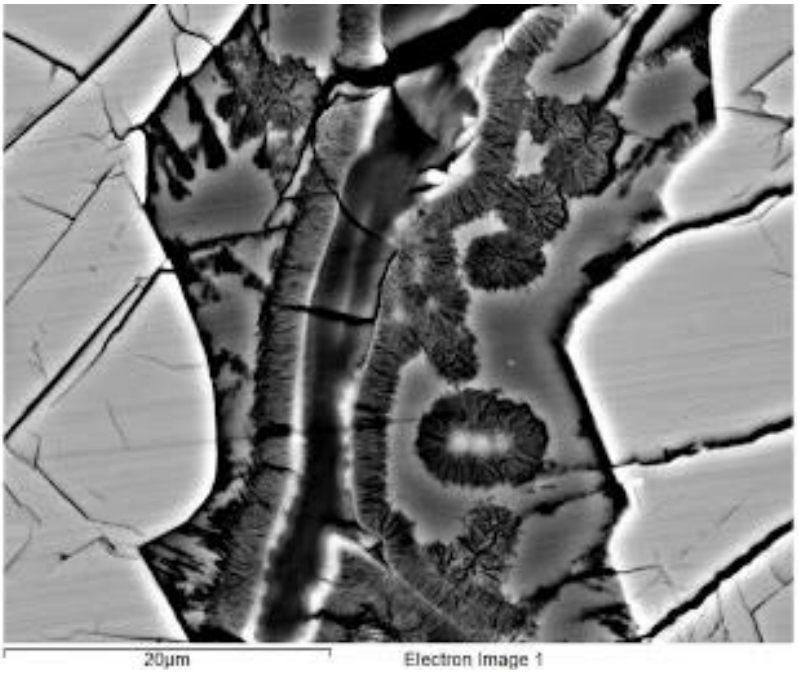

Fig. 2. Vein of Martian clay and carbonate. Image taken from a press release by the University of Leicester

The author then searched anatomy textbooks and Google images for similar images. He found the following micrograph (Fig. 3) on Wikipedia that appears to be similar to the structures in Fig. 2 above:

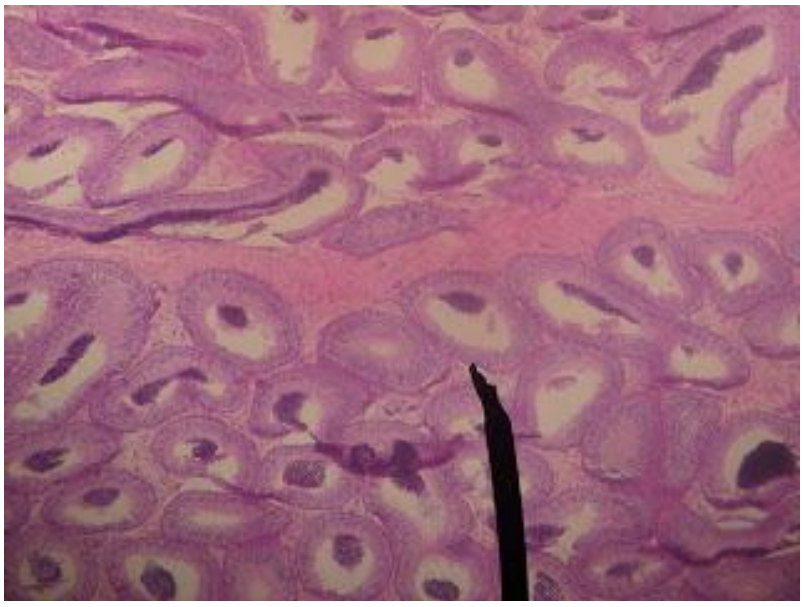

Fig. 3. Epididymis micrograph, taken from the epididymis Wikipedia article

Therefore, the author concentrated on searching for similar micrographs and purchased the research article (Changela and Bridges, 2010) mentioned in the press release. After he became familiar with the various cells associated with epithelium, the author began to identify some details in Fig. 2, and the results of his research are presented in the Results section.

RESULTS

This section contains seven figures. Figs. 4 and 5 show epithelial cell structures. Figs. 6 and 7 show terrestrial epithelial cells and sperm cells for comparison. Figs. 8 and 9 show structure of cuboidal epithelial cells. Fig. 10 shows terrestrial epithelia of a testis for comparison. These seven figures are listed and interpreted in details below:

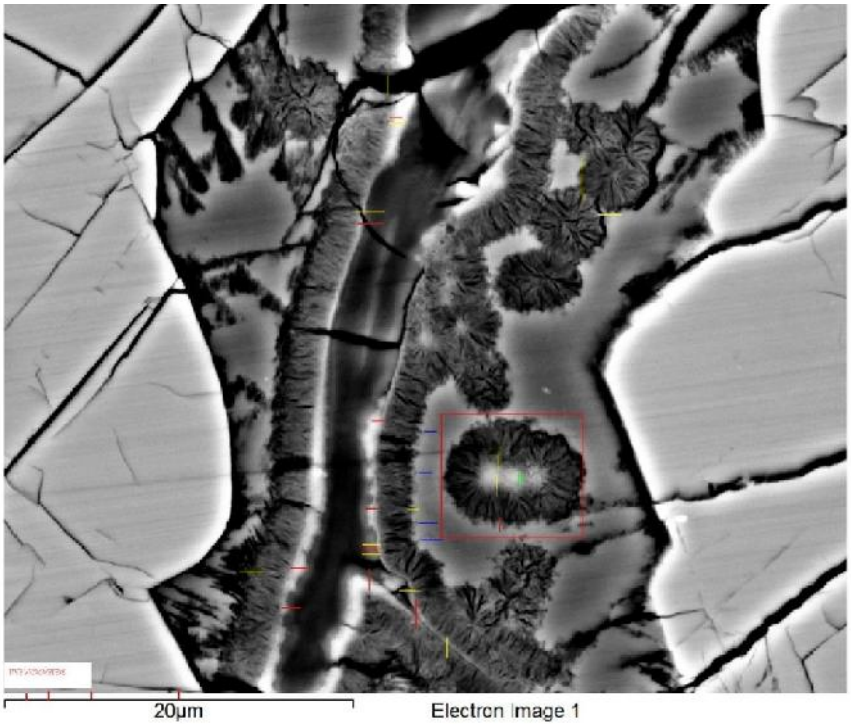

Fig. 4. Original size

http://4.bp.blogspot.com/-gEtKgG_xY5Y/UiGyGYc2ITI/AAAAAAAAAJg/3OpR58Ap1Io/s1600/Fig.+3.JPG

Fig. 4. Epithelium structure in a Nakhlite meteorite. Image taken from a press release by the University of Leicester, U.K. The following are interpretations of and notes for Fig. 4. Marked at the center are cellular structures of pseudostratified columnar epithelium. The locations of the principal cells in the epithelia are marked with yellow lines, and the locations of basal cells are marked with red lines. Stereocilia structures are marked with blue lines. Sperm structures are marked with green lines in the red rectangle. The nuclei of epithelial cells are the black dots on the principal/basal cells. The author enlarged the original Fig. 2 by 200%, drew colored lines in the enlarged image, and saved it as Fig. 4 above. As Fig. 4 is quite wide, the author cropped the central area of Fig. 4 and saved it as Fig. 5 below:

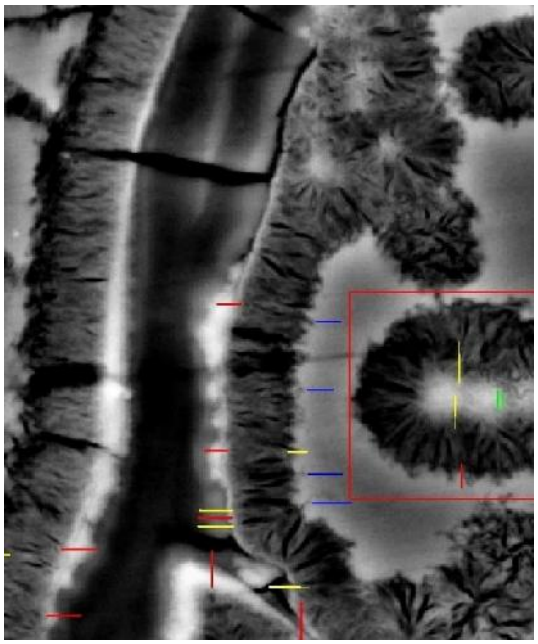

Fig. 5 original size: http://3.bp.blogspot.com/-5EjxDfEMThA/UiGynwrXNvI/AAAAAAAAAJo/Re7R9OufNBc/s1600/Fig.4.JPG

Fig. 5: Epithelium structure expanded from the central area of Fig. 4. Image taken from a press release by the University of Leicester, U.K. The following are interpretations of Fig. 5. The cellular structures of pseudo stratified columnar epithelium are marked. The principal cells in the epithelia are marked with yellow lines, and the basal cells are marked with red lines. Stereo cilia are marked with blue lines, and sperm is marked with green lines. The nuclei of cells appear as black dots on the cells. Fig. 6. is presented below for comparison with Figs. 4 and 5 above Figure 7 (below Figure 6).

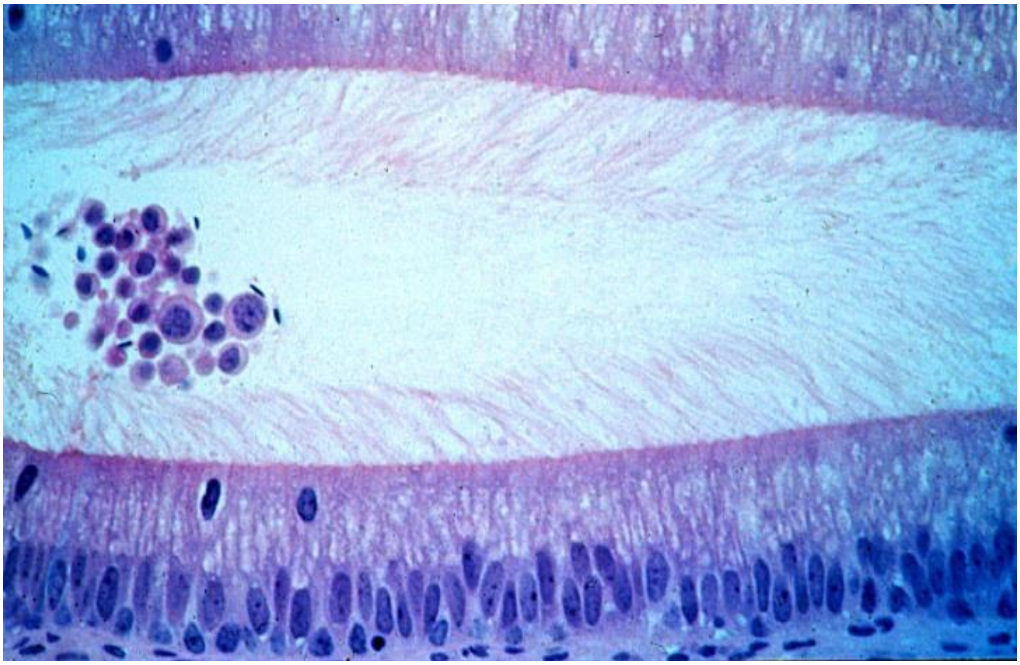

Fig. 6. Terrestrial epididymis cross-section. Image taken from Boston University's Histology Learning System http://www.bu.edu/histology/p/16902lba.htm

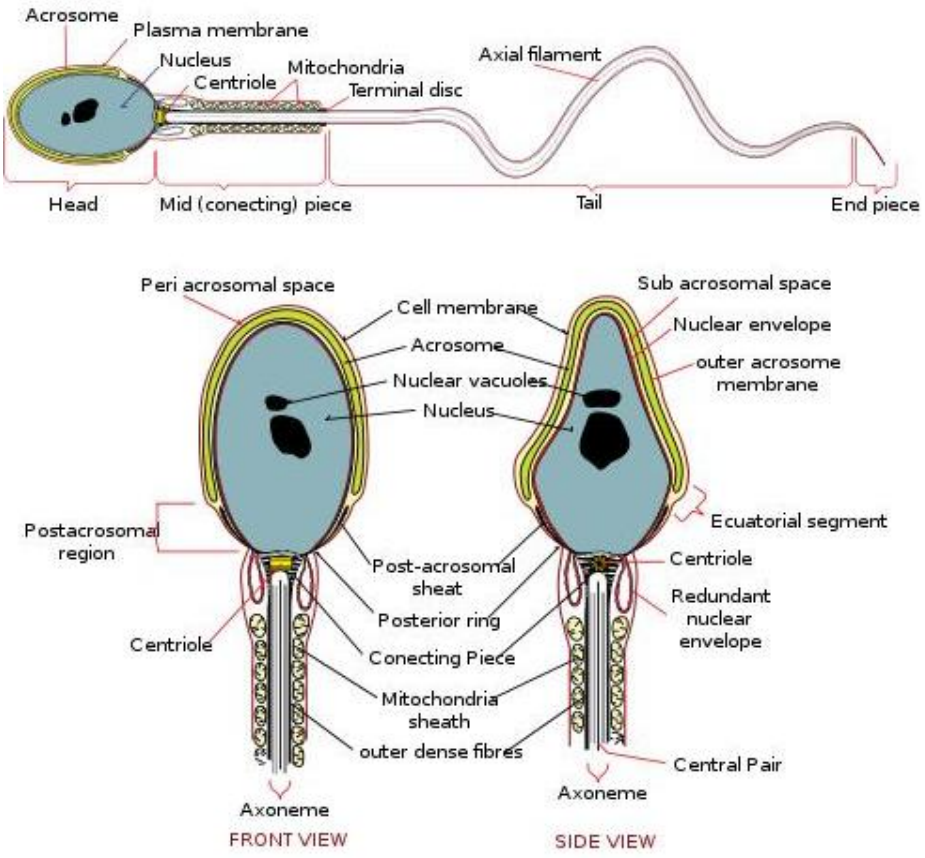

Fig. 7. Diagram of sperm, taken from the Wikipedia article on sperm. Note that the head of a sperm can be triangular when viewed from the side

Moreover, a structure of cuboidal epithelial cells is found in Fig. 2 of the article (Changela and Bridges, 2010) mentioned in the press release. That figure is displayed below as Fig. 8:

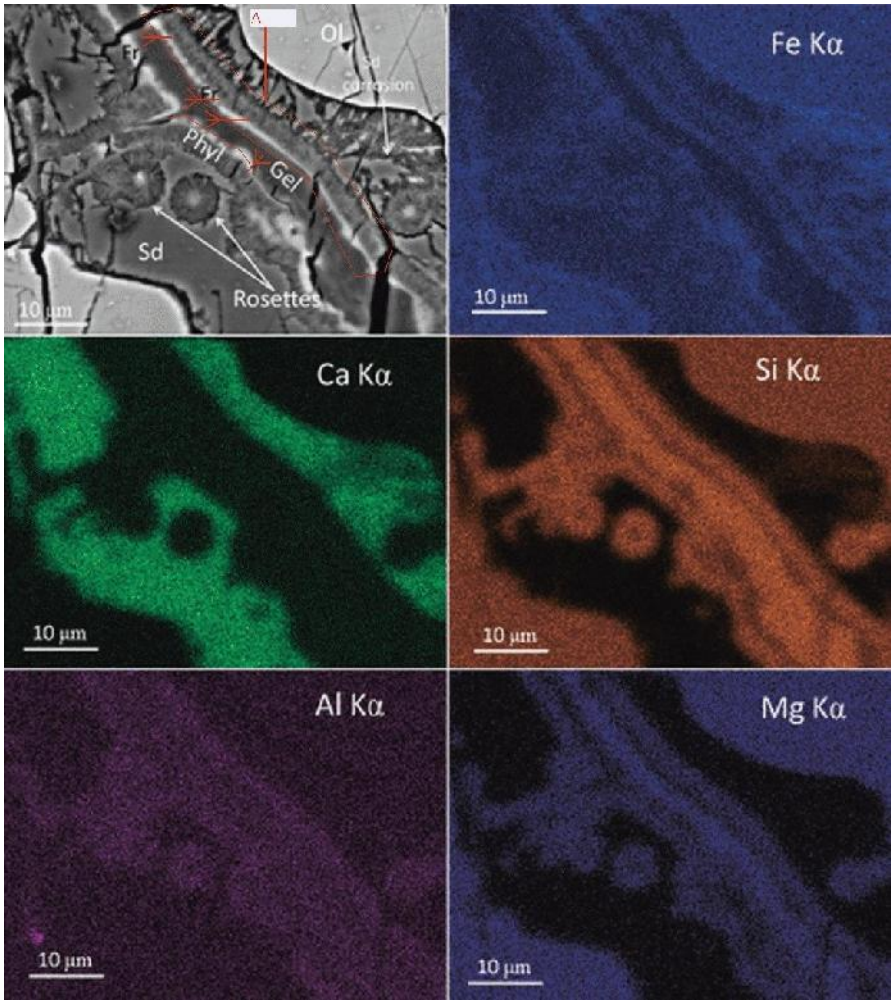

Fig. 8. Structure of cuboidal epithelial cells in the nakhlite meteorite Lafayette. Image taken from *Meteoritics*, 45, Nr 12, 1847–1867

The following are interpretations of and notes for Fig. 8. Red arrows in the top-left image point to structures of cuboidal epithelial cells of one to two microns across in the Lafayette meteorite, which is a member of the nakhlite group of Martian meteorites. These structures are not phyllosilicates, as they exhibit black dots at their centers. Fig. 8 is taken from Fig. 2 of the article by Changela and Bridges (2010).

To show the cellular structures more clearly, the image was cropped and expanded into Fig. 9

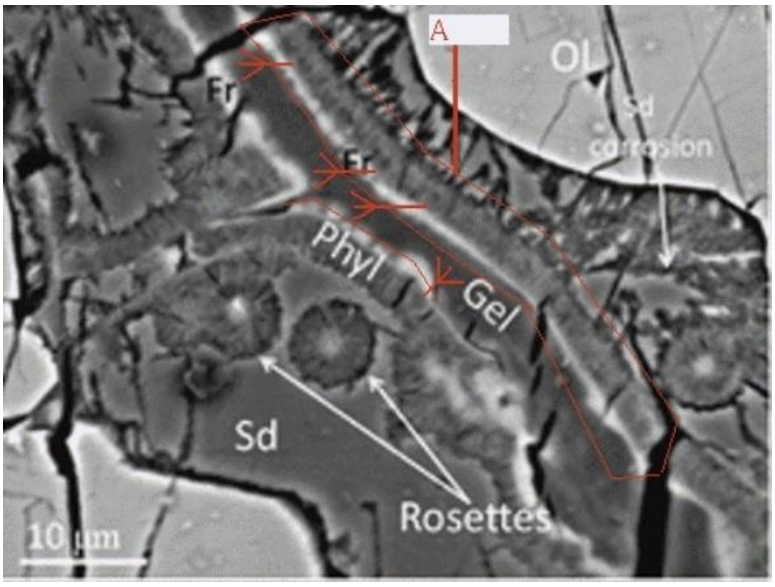

Fig. 9. Cuboidal epithelial cell structures expanded from those in Fig. 8. Image taken from *Meteoritics*, 45, Nr 12, 1847–1867

In Fig. 9, red arrows point to the simple cuboidal epithelial cell structures, which measure one to two microns across. To facilitate a comparison of these structures with those of terrestrial epithelia, Fig. 10 is presented below

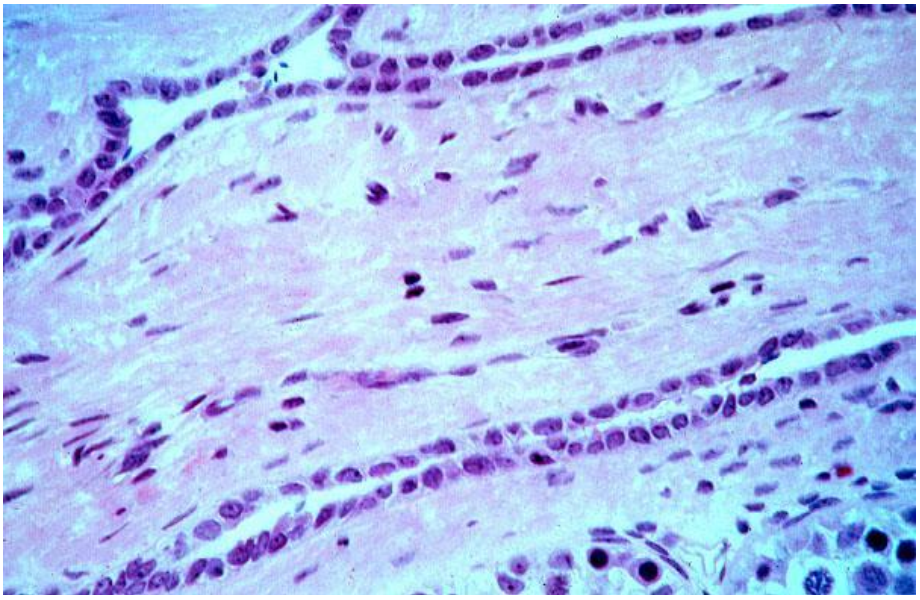

Fig. 10. Terrestrial cuboidal epithelia in a testis. Image taken from Boston University Histology Learning System (http://www.bu.edu/histology/p/17102loa.htm)

Fig. 10 shows that terrestrial simple cuboidal epithelia in testes resemble the Martian structures of cuboidal epithelia marked in Figs. 8 and 9.

DISCUSSION

The subject material originated on Mars, as indicated both in the press release of the University of Leicester and in the article "Alteration assemblages in the nakhlites: Variation with depth on Mars" (Changela and Bridges, 2010), which describes the geology of the subject material in detail. This article focuses instead on the origin of the structures marked in the figures above. The epithelial cell structures marked in Fig. 4 are approximately 200 to 400 nanometers across. Some terrestrial rats possess similar-sized epithelial cells in their efferent ducts (Hansen et al., 2004) between the testis and the head of the epididymis. The cuboidal epithelial cell structures marked in Fig. 8 are one to two microns across. The above cellular sizes are all larger than nanobes, the smallest creatures on Earth, which were discovered by Dr. Phillippa Uwins of Australia (Uwins *et al*., 1998). The smallest of the nanobes measures only 20 nanometers in diameter, which is smaller than the cell structures marked in Figs. 4, 5, 8, and 9.

The following list provides reasons as to why these structures originated from Martian biology:

- The structures of 29 cells are marked in Figs. 4 and 8. Because Martian water flowed through the veins between these structures (Changela and Bridges, 2010) before they landed on Earth, they could not have originated on Earth. They cannot be artifacts, as they were located inside the meteorite fragment before they were exposed for imaging.
- The structures marked in Figs. 4 and 8 did not originate from minerals or other inorganic material for the following reasons:
  - Although phyllosilicates, clay, and asbestos may resemble these structures at the nano level, they have not been reported to be arranged in shapes that are similar to the pseudostratified columnar epithelium and simple cuboidal epithelium of Figs. 4 and 8. These two figures show past life on three levels: on the tissue level (epithelium), on the cellular level (basal cells, principal cells, cuboidal cells, and sperm cells), and on the molecular level (nuclei in basal/principal/cuboidal/sperm cells).
  - Other minerals may have a similar appearance to the epithelial tissues of Figs. 4 and 8, but such minerals do not exhibit the shapes of the epithelial cells or the sperm of Figs. 4 and 8 on the nano level. Another possibility is that they are non-minerals, such as amber, frozen carbon dioxide, and man-made fibers, that are inorganic. However, non-minerals have not been reported to resemble epithelia on both the nano and micron levels simultaneously. Therefore, the structures marked in Figs. 4 and 8 could not have originated from inorganic material.
- Figs. 4 and 8 are interpreted as showing structures of epithelia because the structures marked therein resemble those of the modern epithelial cells and tissues shown in Figs. 6 and 10.

Conclusion

Structures of Martian animal epithelium have been found in a nakhlite meteorite fragment. As most Martian meteorites are igneous rocks, other meteorites of sedimentary rocks may also contain structures of animal fossil cells, because terrestrial fossils

were found mostly in sedimentary rocks rather than in igneous rocks. The meteorites ALH84001, Ivuna, Orgueil, and Lafayette (a nakhlite meteorite) may be just a few of many meteorites that contain fossilized cell structures.

Acknowledgements

The author wishes to thank Dr. H. G. Changela and Dr. J. C. Bridges for their article on nakhlite meteorites, the University of Leicester for its press release, the *Meteoritics & Planetary Science* journal for publishing the article, Boston University School of Medicine for their Histology Learning System, and Wikipedia for their articles on epididymis and sperm.

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