

Genesis revisited

December

2 of this year became a memorable day in human history when NASA held a press conference to declare an epoch-making finding. Felisa Wolfe-Simon, a NASA astrobiologist at the US Geological Survey, led a team investigating a bacterium that can sustain its growth by replacing phosphorus with arsenic, an element generally harmful to living organisms. Her report was published online in the journal *Science* on the same day. Although the general public lost interest after the initial attention, if this finding holds up to scrutiny, it deserves to be recognized as a major discovery in the field of life science.

The golden rule for the basis of life is that living organisms are composed of six essential elements: carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus. There has been no exception to this rule known among the organisms of the earth before the second day of December, 2010. To confirm the possibility of chemical replacement in the building blocks of life, these scientists collected the bacterium from the bottom of Mono Lake in California, USA. Marvelously, they found that a strain from the Halomonadaceae family of Gammaproteobacteria, GFAJ-1, gradually swapped out the element of phosphorus in its own body for the atom of arsenic, which was notably included in its internal proteins and nucleic acids.

They dubbed this discovery an exchange of one of the major bio-elements and claimed that their finding may have profound evolutionary and geochemical significance. Although this bacterium seemed to be adapted

from the same lineage as all other familiar organisms on our planet, rather than being a new genesis of life, this is just like knocking one brick out of the wall. If alternate life forms can be thriving on our planet, they are more likely to be in existence elsewhere in the universe.

In the middle of selecting the papers for this issue of JPIS, I recalled the work of Charles Darwin's *On the Origin of Species*. Irrespective of his avoidance of the subject of human evolution, he was badly insulted by the Church. His theory, however, became a stimulus for modern biology, and the Vatican finally stated through a papal encyclical in 1950 that evolution was not inconsistent with Catholic teaching.

Professor Thomas Samuel Kuhn, who proposed the term "scientific revolution" to describe the process of scientific progress via overturning previous ways of understanding, not gradually modifying them, maintained that when a paradigm shift takes place, a scientist's world is qualitatively transformed and quantitatively enriched by fundamental novelties. Accordingly, we should appreciate Dr. Wolfe-Simon and her colleagues for revealing this revolutionary information because we will owe our rethinking the origin and elements of life to them from this point on.

Tae-II Kim

Editor

Department of Periodontology, Seoul National University School of Dentistry,
28 Yeongeon-dong, Jongno-gu, Seoul 110-749, Korea

E-mail: periopf@snu.ac.kr, Tel: +82-2-2072-2642, Fax: +82-2-744-1349