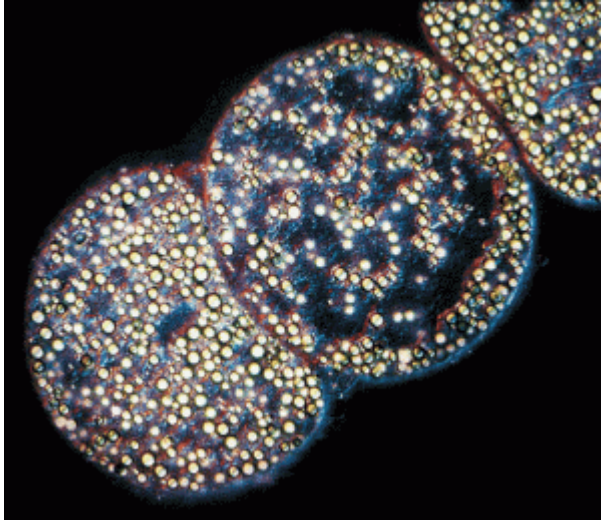




We might assume that because prokaryotes have been so intensively studied over the past years, no major surprises are left to be discovered. This, however, is far from the truth. In the mid-1990s, a large, peculiar-looking organism was even seen when the intestinal tracts of surgeon fish from both the Red Sea in the Middle East and the Great Barrier Reef in Australia were examined. This organism, named *Epulopiscium*, cannot be cultured in the laboratory. Its large size, 600µm long and 80µm

wide, which makes it clearly visible without any magnification, suggested that this organism was a eukaryote. It did not, however, have a nuclear membrane. A chemical analysis of the cell confirmed that it was a prokaryote and a member of the domain (group) *Bacteria*. This very long, slender organism is an exception to the rule that prokaryotes are always smaller than eukaryotes.

In 1999, an even larger prokaryote in volume was isolated from the sulfurous muck of the ocean floor off the coast of Namibia in Africa. It is a spherical organism 70 times as big in volume as *Epulopiscium*. Since it grows on sulfur compounds and contains glistening globules of sulfur, it was named *Thiomargarita namibiensis*, which means “sulfur pearl of Namibia”. Although scientists were initially skeptical that prokaryotes could be so large, there is no question in their minds now. In contrast to these large bacteria, a cell was isolated in the Mediterranean Sea that is 1µm in width. It is a eukaryote because it contains a nucleus and a mitochondrion, even though it is about the size of a typical bacterium.

On the other side of the coin, investigators are asking how small a living organism can be. Finnish scientists claim that they have discovered a new form of life, the nanobacteria, which are roughly the size of viruses, about 50 to 500 nanometers (nm) in diameter. These nanobacteria are coated with thick shells of minerals, which render them very resistant to

heat and chemicals. There is no good evidence that nanobacteria are living, however, and their apparent multiplication could result from crystal formation.

More recently, Australian investigators have observed fuzzy tangles of filament, 20 to 150 nm in length, projecting from sandstones retrieved from an oil-drilling site in the ocean off Western Australia. They appear to be another form of nanobacteria. The Australian researchers reported that the filament appear to reproduce quickly and form colonies, suggesting that they are alive.

Most scientists are very skeptical that “organisms” of such small size can live independent lives. The molecules required for life such as nucleic acid and protein-synthesizing machinery cannot be packed into “organisms” of this small size. If they are not free-living, might they be a part of a larger biological entity? Might they have a biological function? Although there is great skepticism about the biological significance of these extraordinary small “organism”, most microbiologists are convinced that many unusual microbes exist in nature that have not yet been discovered. Are nanobacteria one example?

(Culled from the microbiology textbook of Nester et al., 2004: *Microbiology, The Human Perspectives*)

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