TURBULENT LIFESTYLE: CYANOBACTERIA ON EARTH’S SANDY BEACHES - TODAY AND 3 BILLION YEARS AGO. Nora Noffke, Old Dominion University, Department of Ocean, Earth & Atmospheric Sciences; Norfolk, Virginia, USA.

Cyanobacteria are photoautotrophic microorganisms that are very well adapted to the harsh hydraulic conditions of sandy tidal environments. The microorganisms form large, carpet-like microbial mats that significantly affect the prevailing physical sedimentary dynamics of waves and currents. If deposited by sediment, the mobile microbes move towards the new depositional surface, however, during periods of high erosive stress, the microbes respond by biostabilization. In modern sandy deposits, this microbial-physical interaction originates characteristic traces that are termed ‘microbially induced sedimentary structures (MISS)’. Examples for such MISS are ‘multidirected ripple marks’, ‘erosional remnants and pockets’, ‘oriented grains’, and many others. The structures do not resemble stromatolites, but come in a great variety of shapes and morphologies. Therefore the MISS are classified as own, separate group of sedimentary structures. MISS occur not only today in modern tidal flats. In systematic studies, we explored their occurrence in shallow-marine sandstones of all Earth ages. The oldest structures were found in the 3.2 Ga old Moodies Group, South Africa, an early Archean rock succession, where the MISS record widely distributed, photoautotrophic microbial mats. However, a recently detected stratigraphic section in the 2.9 billion years old Archean Pongola Supergroup, South Africa, includes exceptionally preserved MISS widely distributed in an ancient tidal flat. Those structures record microbial mats not only of an astonishing high diversity. Detailed comparison of the ancient MISS in the Pongola with modern MISS of the today’s tidal flats along the North Sea coast, allows us the exciting conclusion that the nearly 3 billion years old microbial mats are of the same types like those colonizing our modern tidal flats today! Our comparative study shows that the MISS in the Pongola Supergroup are of identical morphologies to those of the modern MISS in present tidal areas. The fossil MISS show a pattern of distribution identical to the pattern of distribution of the modern MISS. That is the same structures occur in exactly the same tidal zones in both modern and ancient tidal flats. However, also the microscopic close-up reveals this spectacular similarity of both fossil and modern microbial mats. The MISS in the ancient Pongola tidal flats include the same microscopic filament-like textures of endobenthic and epibenthic microbial mats we know from modern tidal environments. Most probably, the exceptionally well preserved microbial mats of the Pongola Super-