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## Complexity in Ribosomal Evolution – A Case Study of an Evolutionarily Divergent Recent Insertion In The 5S RNA

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**Introduction:** All three kingdoms of life share a significant portion of the ribosomal machinery [1,2], which catalyzes the peptide bond formation. Thus understanding ribosomal evolution is central to understanding origins of translation dating back to the RNA world and therefore could help understand better, the ‘origins of life’ as we know it. The ribosome has undergone additions and deletions of many components, through evolution [3]. The 5S rRNA of the ribosomes of some extremely halophilic archaea, contain an unusual insertion of 108 nucleotides, thereby increasing the size of that RNA to 228 residues, which is not shared by many close archaeal relatives or bacteria or eukarya [4]. Understanding the structural accommodations of such insertions is important towards delineating the evolution of the translation machinery. In order to elucidate how this insert is accommodated, we are in the process of visualizing its position in the 5S rRNA using cryo-electron microscopy.

Results: At 7.5Å resolution, the images obtained suggest the accommodation of about 40 nt of the 108 total in a single 20 bp double helix perpendicular to the underlying 5S and the insert extending away from the 30S subunit as visualized using 50S particles alone.

### References:

[1] Olsen GJ and Woese CR (1997) *Cell*. Jun 27;89(7):991-4. [2] Woese CR (2000) *Proc Natl Acad Sci U S A*. Jul 18;97(15):8392-6. [3] Greber BJ et al. (2012). *Journal of Mol. Biol.* 418:3–4,145–160. [4] Luehrsen KR et al. (1981). *Nature* 293:755-756.