Rapid emergence of lifes hown by discovery of 3,700-million-year-old microbial structures

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Biological activityis a major factor in Earth'schemicalcycles, includingfacilitating CO_2sequestration and providingclimatefeedbacks. Thus a keyquestion in Earth'sevolutioniswhendidlifearise and impacthydrosphere–atmosphere–lithospherechemicalcycles? Untilnow, evidencefortheoldestlifeonEarthfocusedondebatedstableisotopicsignatures of 3,800–3,700 millionyear (Myr)-oldmetamorphosedsedimentaryrocks and minerals[1, 2] fromtheIsuasupracrustalbelt (ISB), southwest Greenland[3]. Herewereportevidenceforancientlifefrom a newlyexposedoutcrop of 3,700-Myr-old metacarbonaterocks in the ISB thatcontain 1–4-cm-high stromatolites—macroscopicallylayeredstructuresproducedbymicrobialcommunities. The ISB stromatolitesgrew in a shallow marine environment, as indicatedbyseawater-likerare-earthelement plus yttrium trace elementsignatures of themetacarbonates, and byinterlayereddetritalsedimentaryrockswithcross-lamination and storm-wave generatedbreccias. The ISB stromatolitespredateby 220 Myrthepreviousmostconvincing and generallyacceptedmultidisciplinaryevidenceforoldestliferemains in the 3,480-Myr-old DresserFormation of thePilbaraCraton, Australia[4, 5]. Thepresence of the ISB stromatolitesdemonstratesthe establishment of shallow marine carbonate productionwithbiotic CO_2 sequestrationby 3,700 millionyearsago (Ma), nearthestart of Earth'ssedimentary record. A sophistication of lifeby 3,700 Mais in accordwithgenetic molecular clockstudiesplacinglife'sorigin in theHadeaneon (>4,000 Ma)[6].