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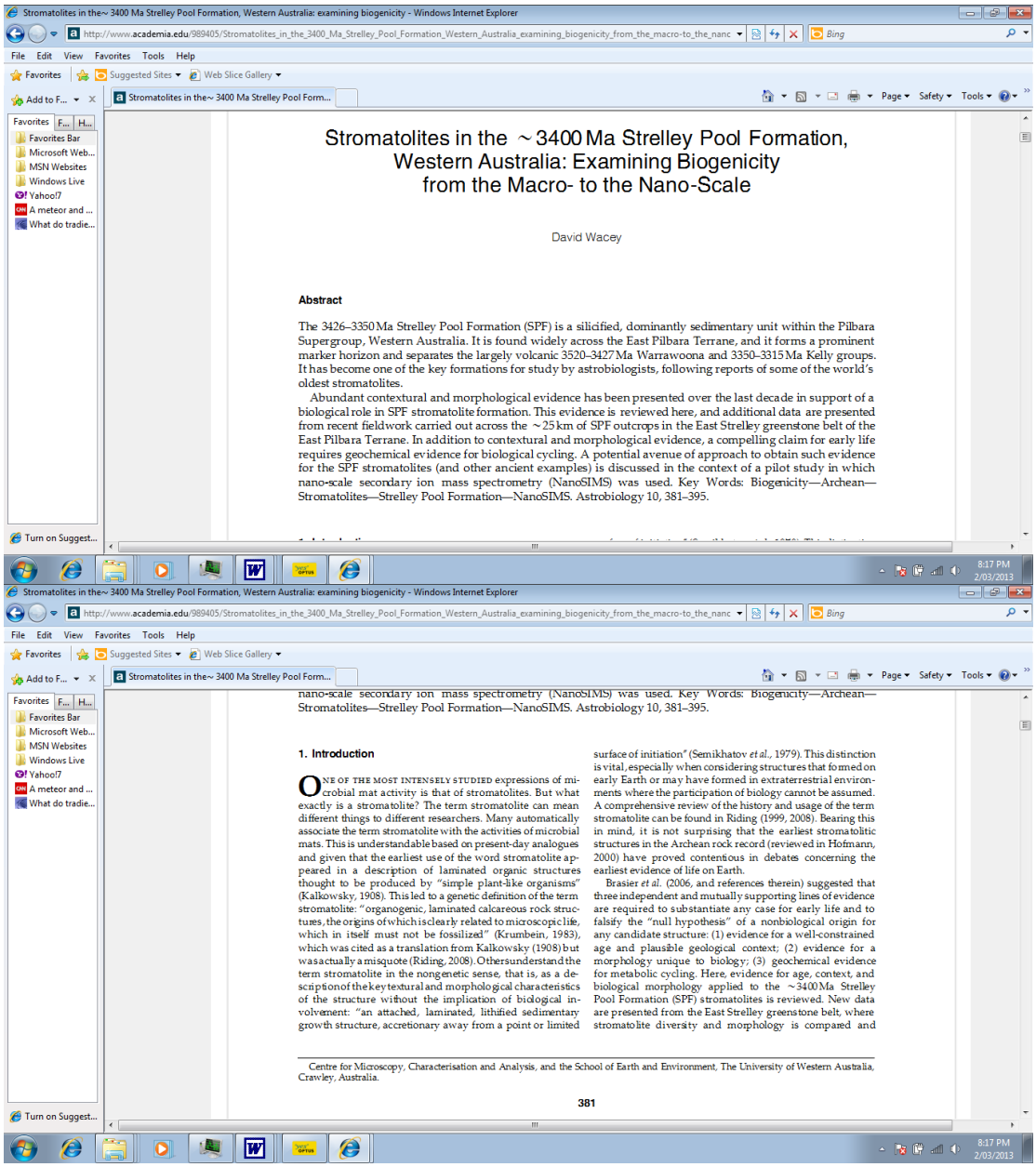

contrasted to that observed at the more widely studied Trendall locality in the Panorama greenstone belt. Nano-scale secondary ion mass spectrometry (NanoSIMS) data from stromatolites of Holocene to Archean age, including an example from the Trendall locality, are also presented, which highlight the technique as a promising new tool to obtain evidence for metabolic cycling within stromatolites.

2. Regional Geology of the Pilbara

The Pilbara Craton of Western Australia (Fig. 1) contains some of Earth's best preserved stratigraphic successions of early Archean rocks, including some of the oldest indisputable carbonates and sandstones (*e.g.*, Lowe, 1983). The craton comprises an Archean proto-continent (Smithies *et al.*, 2005), which was formed by mantle plume events and consists of granitic bodies emplaced into and overlain by the Pilbara Supergroup (Van Kranendonk *et al.*, 2001). The oldest part of the craton is the East Pilbara Terrane, which comprises ~3650 to ~2850 Ma granitic bodies and an almost contemporaneous ~3520–3000 Ma volcanogenic carapace and associated sediments (Pilbara Supergroup) now preserved as several greenstone belts (Van Kranendonk, 2006).

The Pilbara Supergroup contains four unconformity bound stratigraphic groups—the ~3520–3427 Ma Warrawoona Group, ~3350–3315 Ma Kelly Group, ~3240 Ma Sulphur Springs Group, and the ~3200–3000 Ma Soanesville Group (Fig. 2). Each of these groups consistently dips away from the domal granitic complexes; dips gradually decrease with time, which suggests deposition as thickening wedges adjacent to the growing granitic diapirs (*e.g.*, Hickman, 1984; Van Kranendonk *et al.*, 2002). The Strelley Pool Formation previously widely termed the "Strelley Pool Chert" occurs across 11 greenstone belts and a depositional area in excess of 30,000 km^2 in the East Pilbara Terrane. It comprises a distinctive assemblage of sedimentary facies within the otherwise predominantly volcanic Pilbara Supergroup, and the most recent review of mapping and lithostratigraphic evidence established the SPF as an important marker formation between the Warrawoona and Kelly groups (Hickman, 2008). In addition to the stromatolites of the SPF, older *ca.* 3490 Ma stromatolites occur in the Dresser Formation of the Pilbara Supergroup (Walter *et al.*, 1980; Van Kranendonk *et al.*, 2008). These structures were reviewed by Buick *et al.* (1981) in a study that attempted to define universal stromatolite biogenicity criteria and concluded that the Dresser stromatolites were "probable or possible" biogenic stromatolites. These structures will not be discussed further here.

3. SPF Stromatolite Pioneers

The SPF stromatolites came to prominence with the description of conical forms by D. Lowe in 1980 from the "Strelley West" locality (now formally named McPhee Creek, Wacey *et al.*, 2010) of the East Strelley greenstone belt (ESGB) (Fig. 3). These structures were originally interpreted as bio-

Stromatolites in the~ 3400 Ma Strelley Pool Formation, Western Australia: examining biogenicity - Windows Internet Explorer
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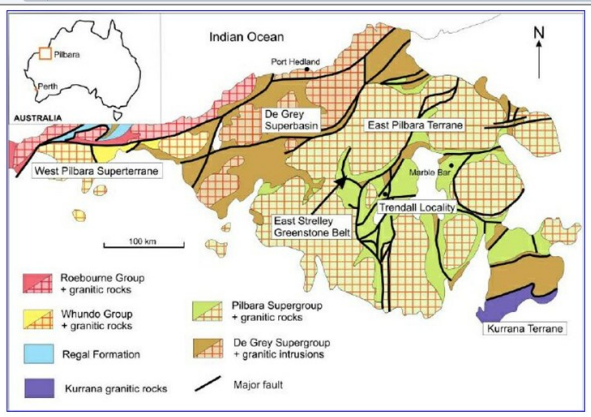

FIG. 1. Geological map of the Pilbara Craton in Western Australia (modified from Van Kranendonk *et al.*, 2007). The best-preserved stromatolite outcrops are found around McPhee Creek in the East Strelley greenstone belt and around the Trendall locality in the Panorama greenstone belt. Color images available online at www.liebertonline.com/ast.