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SEMINAR SERIES ENVIRONMENT & BIODIVERSITY

Guest Lecture

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Host: Dr. Daniel Remias



Sexual Reproduction in Zygnematophyceae, the closest sister to Land Plants – a benefit for terrestrialization?

Zygnematophyceae, a class of streptophyte green algae are the immediate sister group to land plants and emerging model systems. Vegetative stress tolerance has been extensively studied and tolerance against desiccation and temperature has been reported in mature cells, termed akinetes. Upregulation of stress induced transcripts was observed in field samples¹ or experimentally stress treated cells. Recently the genome of the multicellular *Zygnema* became available illuminating signalling network evolution². Sexual reproduction was less investigated and occurs by conjugation, a process resulting in the formation of resistant zygospores. Zygospores of *Zygnema vaginatum* were investigated by focussed ion beam scanning electron microscopy (FIB-SEM)³ and *Spirogyra* sp. by serial block-face (SBF-SEM)⁴ resulting in 3D reconstructions (Fig.1). Zygospore walls are composed of three layers, cellulosic endo- and exospore and a mesospore with aromatic compounds as demonstrated by Raman spectroscopy. In *Zygnema* the mesospore is thick and sculptured (Fig. 1B). In *Spirogyra* sp. cellulose microfibrils are arranged in an helicoidal pattern. Storage compounds are rearranged during zygospores ripening in both genera. Lipid droplet (LD) production is increased during maturation (50% of volume in *Spirogyra*, 20% in *Zygnema*), in contrast, starch grains of the pyrenoids degrade. We suggest, that the unique cell wall architecture and accumulation of LDs as reserves in zygospores promoted the shift of Zygnematophyceae to terrestrial habitats marked by frequent episodes of dryness.

¹Rippin et al. (2019) *Envir Microbiol* doi: 10.1111/1462-2920.14788

²Feng et al. (2024) *Nature Genetics* doi: 10.1038/s41588-024-01737-3

³Permann et al. (2023) *Physiol Plant* 175:e13988. doi: 10.1111/ppl.13988

⁴Antreich et al. (2024) *Front Plant Sci* 15:1358974. doi: 10.3389/fpls.2024.1358974

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Friday, March 28, 2 PM

NLW-Faculty, Room 414, 1st floor





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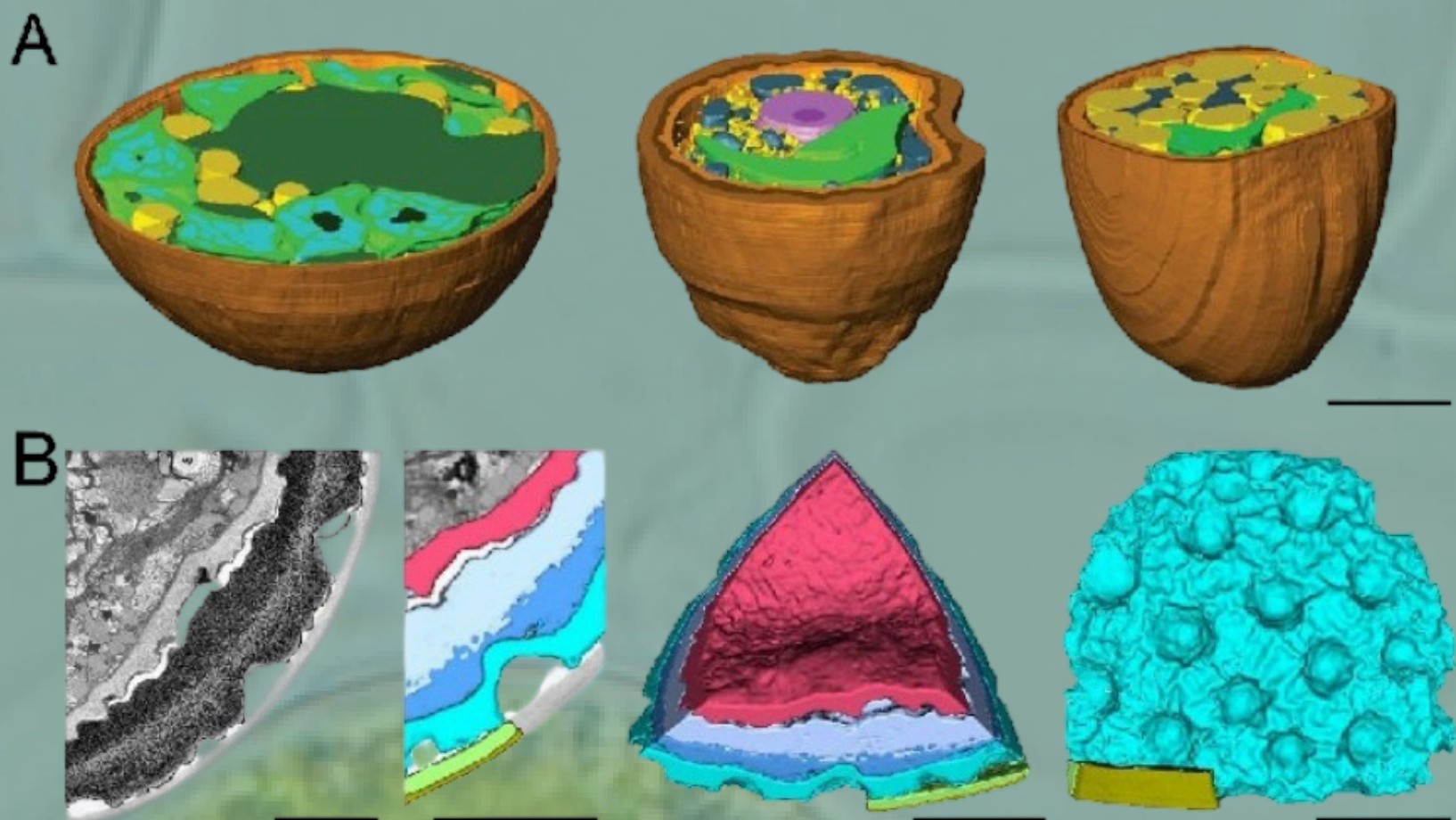


Figure 1 3D reconstruction of A) *Spirogyra* sp. zygospores (left young, middle, right mature, yellow: lipid droplets, blue: vacuole, purple: nucleus) and B) *Zygnema vaginatum* zygospore wall (green: exospore, turquoise and blue: mesospore, red: endospore). Scale bars A