In this issue . . .

Potential therapeutic target for early-onset preeclampsia

Preeclampsia is a major cause of maternal and neonatal mortality and can increase the risk of heart disease among mothers and offspring. Early-onset preeclampsia (PE < 34 wk), which occurs before 34 weeks of gestation, is thought to be triggered by oxidative stress tied to defective placentation, but the underlying molecular mechanisms are unclear. Hong Wa Yung et al. (pp. 18109–18118) explored the role of mitochondrial respiration in placentas from patients with PE < 34 wk. Compared with controls, PE < 34 wk placentas had a greater number of abnormal and swollen mitochondria with distorted inner-membrane folds as well as rounded, short mitochondria that suggested fragmentation. Respirometry analysis of mitochondrial function revealed that oxidative phosphorylation, the key energy-generating mechanism, was 60% lower in PE < 34 wk placentas, compared with controls; protein levels of almost all major complexes of the electron transport chain, the assemblage of energy-generating mitochondrial proteins, were largely unaltered in PE < 34 wk placentas, compared with controls. Subjecting trophoblast cells from the placenta to repeated bouts of oxygen limitation and reoxygenation mirrored the mitochondrial dysfunction observed in PE < 34 wk placentas. Additionally, mitochondrial respiration defects were tied to activation of a noncanonical stress response mechanism specific to mitochondria, called the mitochondrial unfolded protein response pathway, as well as reduced levels of the CLPP protease enzyme, implicated in the pathway. Activating the pathway or reducing CLPP levels reduced mitochondrial respiration in a placental cell line in vitro. According to the authors, the findings suggest that the mitochondrial unfolded protein response pathway may represent a therapeutic target in PE < 34 wk. — P.N.

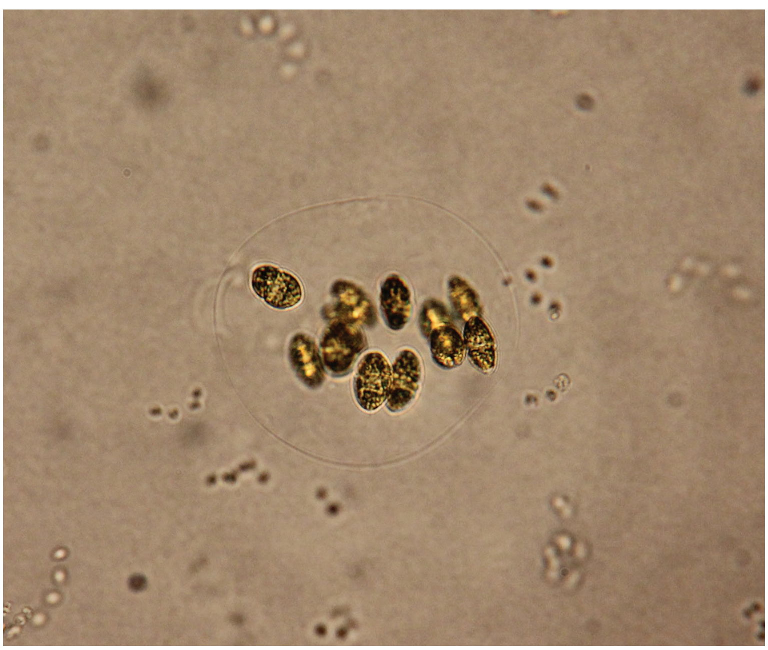
Mitochondrial stress response implicated in preeclampsia. Image courtesy of iStock/wir0man.

Personality traits and entrepreneurship

Startups and other nascent business ventures are comprised of people in a variety of roles, including entrepreneurs, operations leaders, inventors, and support employees. Little is known, however, about the interplay of personalities in various startup roles. Sari Pekkala Kerr et al. (pp. 17712–17716) surveyed 5,645 people at 4 coworking office spaces. The participants were categorized as entrepreneurs, nonfounder CEO/leaders, inventor employees, or noninventor employees and asked to self-rate on questions pertaining to general and entrepreneur-specific personality traits. As an incentive to complete the survey, and as a test of risk tolerance, the authors also offered participants either a $5 Amazon gift card or an entry into a drawing for a $2,000 gift card of their choice. The survey found that entrepreneurs showed the highest affinity for general and financial risk as well as self-efficacy, defined as a belief in one's ability to complete tasks. In general, entrepreneurs rated themselves highest in personality traits among the startup roles, inventor employees rated themselves lowest, and CEO/leaders rated themselves in the middle. High risk tolerance predicted participation in the drawing. According to the authors, the study provides profiles of a spectrum of personalities in entrepreneurial organizations. — P.G.

How plastids originated

As eukaryotic cells became increasingly complex, they incorporated other cells through a process called endosymbiosis, leading to the origin of organelles such as mitochondria and plastids. To determine how plastids originated, Elisabeth Hehenberger et al. (pp. 17934–17942) conducted a deep-transcriptomic analysis of the Antarctic Ross Sea dinoflagellate (RSD). In a process called kleptoplasty, RSD appropriates and temporarily retains the photosynthetic plastid of its algal prey. The authors compared RSD and its prey-derived kleptoplast with dinoflagellate relatives with a closely related plastid that is fully integrated. The analysis revealed that RSD is genetically complex and partitions its functions between an ancestral plastid and the kleptoplast. Many genes for kleptoplast-targeted proteins were found to be obtained via horizontal gene transfer and were also present in dinoflagellate relatives with fully integrated plastids, suggesting that systems to acquire and target plastid genes originated

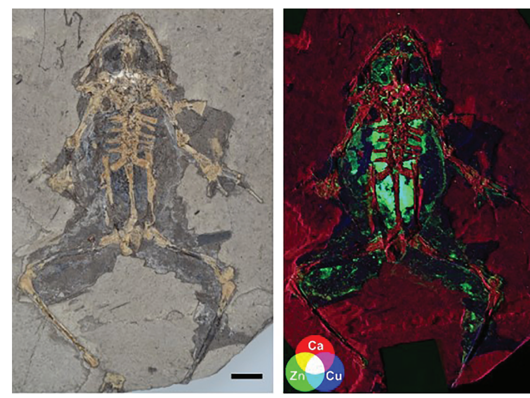


Dinoflagellate cells within the matrix of *Phaeocystis* colony isolated from Ross Sea, Antarctica.

before the organelle's fixation. Unlike prey-encoded homologs, expression of kleptoplast-targeted genes was unaffected by various light and temperature conditions, suggesting that the horizontally transferred genes have adapted to the host's transcriptional regulation. The findings suggest that the host genetically integrates the plastid and controls its functions before the plastid is fixed in the cell, and the study provides key insights into the origins of plastids, according to the authors. — S.R.

Melanin variation among species throughout time

The pigment melanin, aggregated into melanosomes in vertebrates, produces skin coloring. However, the discovery of melanin in nonskin tissues of both living and fossil vertebrates hints at other roles for the pigment. Valentina Rossi, Maria McNamara, et al. (pp. 17880–17889) sampled melanosomes from 15 living vertebrate groups and from preserved soft tissue in fossils. All tissues from living species



10-million-year-old frog from Libros, Spain, with false-color X-ray fluorescence map showing elevated zinc and copper. Image courtesy of Valentina Rossi and the Trustees of the Natural History Museum, London, licensed under CC BY 4.0.

contained melanin, with more melanin present in the organs of amphibians and reptiles than in the organs of birds and mammals. Melanosome size and geometry differed between taxa and also between organs within a species. Skin melanosomes, for instance, were generally smaller than melanosomes from other tissues. The authors also found elemental variation among the melanosomes, particularly in concentrations of iron, calcium, and zinc between organs. Melanosomes sampled from fossils also differed significantly in size, geometry, and chemistry depending on body region. The pigment's affinity for metals suggests that melanosomes may play a role in metal metabolism. According to the authors, the variation in melanosomes helps identify organs and other internal anatomical features of fossilized soft tissue and can also help reconstruct the evolutionary history and functions of melanosomes in vertebrates. — P.G.