**Making a Nodule**

Many plant cells are endopolyploid owing to the duplication of their genome in the absence of mitosis—a process known as endoreduplication. In the legume *Medicago trunculata*, the nitrogen-fixing root nodules show particular high amounts of endopolyploidy and may have 64 times the usual complement of chromosomes. Vinardell *et al.* examined the role of the protein CCS52A, an anaphase-promoting complex activator, in the formation of endosymbiotic nitrogen-fixing nodules. CCS52A is produced after the nodule primordium forms and is required for the final stages of nodule maturation during which the cells become polyploid. Earlier stages in nodule development, involving proliferation of meristem cells, are not affected by CCS52A. CCS52A probably promotes endoreduplication in maturing nodule cells through degradation of mitotic cyclins that would otherwise promote entry into mitosis. Cells deficient in CCS52A did not undergo endoreduplication and are refractory to infection by rhizobial bacteria. Development of mature nitrogen-fixing nodules requires a balance between plant cell endoreduplication, bacterial infection, and host-cell growth concomitant with intracellular bacteroid proliferation. — PJH

www.sciencemag.org  SCIENCE  VOL 301  26 SEPTEMBER 2003  1815
achieved for the gas- and liquid-phase processes, respectively. — MSL


CHEMISTRY

Higher Order Electron Transfer

Electron-transfer reactions often occur directly from donor to acceptor, and their rates tend to be linear with reactant concentration, or at most second order when metal atoms act as promoters. Yuasa et al. now report an example of third-order kinetics in which Sc$^{3+}$ ions are needed to self-assemble a competent electron-acceptor complex. No reaction was observed between an Ir(2-phenylpyridine)$_3$ donor to a p-benzoquinone (denoted “Q”) acceptor, which would have had to drive the electron more than 1 volt uphill. However, addition of Sc$^{3+}$ ions formed a structure in which three Sc$^{3+}$ ions are sandwiched between two Q molecules, as determined by electron spin resonance. The one-electron reduction that forms the Q–3 Sc$^{3+}$–Q complex is third order in Sc$^{3+}$ and second order in Q. — PDS


CELL BIOLOGY

Breaking the Nucleus, Making Mitosis

In animal cells at the onset of mitosis the nuclear envelope breaks down, releasing the condensed chromosomes into the cytosol where they encounter the mitotic spindle. The breakdown of the nuclear envelope involves the disassembly of the nuclear lamina and nuclear pores and the redistribution of the envelope membranes to the endoplasmic reticulum.

Salina et al. now show that several components of the disassembled nuclear pore complexes associate with chromosome-associated kinetochores— the parts of the condensed chromosomes that must interact with the mitotic spindle during chromosomal congression and partitioning. The assembly of these kinetochores together with nuclear pore components is essential for the correct function of the kinetochore in chromosome partitioning. In particular, one nuclear pore protein, Nup358, plays an essential role in the integration of nuclear envelope breakdown and kinetochore maturation and function, and lack of Nup358 can cause mitotic arrest. — SMH


A Matter of Taste

Mating in Drosophila involves a stereotyped series of courtship behaviors in which the male fly successively orients toward the female, taps her with his foreleg, “sings,” licks her, and finally attempts to copulate; courtship efficiency determines mating success. Courtship behavior is triggered by specific sensory cues, but the molecular mechanisms by which sensory stimuli are translated into behavioral responses remain unclear.

Bray and Amrein have now identified a male-specific receptor expressed in chemosensory foreleg neurons that appears to be required for efficient courtship. One gene, Gr68a, was selectively expressed in chemosensory neurons of male-specific foreleg taste bristles. Inactivation of synaptic transmission from these neurons led to reduced courtship intensity, decreased mating efficiency, and lack of success in mating when competing with wild-type males. Knockdown of the GR68a receptor through RNA interference had similar effects. By quantifying performance of the steps involved in Drosophila courtship, the authors determined that the behavioral deficit occurred after orienting but before singing. Thus, GR68a appears to be required for the recognition of the nonvolatile pheromones found on the abdomen of female Drosophila, and input from these pheromones during tapping appears to be required for successful completion of courtship behavior. — EA
