Introduction:
It is well known that the gametophytes of most mosses and some simple thalloid liverworts possess strands of elongate, hydrolyzed cells that are hypothesized to function in water conduction and/or storage (Tansley & Chick 1901). Characterization of these cells has mostly utilized sectioning techniques, which have not completely resolved the differences observed among strand cell morphologies, particularly as regards wall architecture and pit anatomy.

Past studies of strand cells in the Pallaviciniaceae have been equivocal, especially with regard to pit structure. Smith (1966) and Hébant (1977) describe the pits as wall perforations, with pore dimensions of 1500-2500 nm. According to Frey et al. (1996), these pits comprise unthickened areas of the walls and are not actually perforated. Most recently, Ligrone et al. (2000) described the pits of Symphyogyna and Pallavicinia as being rarely perforated, except for a small plasmodesmata-sized pore. The debate over pit anatomy frames the larger question of whether or not the central strands of taxa in the Pallaviciniaceae evolved independently (Ligrone et al. 2002) or were derived from the more basal Haplomitrium.

Materials:
- Plagiomnium cuspidatum - Illinois, USA
- Haplomitrium blumii - Genting Highlands, Malaysia
- Hattorianthus erimonus - Nara, Japan
- Pallavicinia lyellii - Louisiana, USA
- Pallavicinia longispina - Sri Lanka
- Greeneothallus gemmiparum - Tierra del Fuego, Chile
- Jensenia connivens - South Island, New Zealand

Methods:
* Thallus midrifs were sectioned transversely to locate central strand(s).
* Hand dissected central strands were macerated using Jeffrey’s solution of 10% nitric/10% chromic acids for 2 1/2 hours.
* Some cells were stained using toluidine blue O or aqueous Jeffrey’s solution of 10% nitric/10% chromic acids for 2 1/2 hours.
* After mounting on stubs, specimens were sputter-coated and examined with the SEM.

Results:
Three types of strand cell anatomy are found in the Pallaviciniaceae, including the Haplomitrium-type.

Conclusions:
These data confirm that Pallavicinia type strand cells resemble those of the Haplomitrium type in having pits that are clearly perforated, with an average perforation size of 500 nm in both. The perforations likely are formed by the dissolution of the plasmodesmata during cell dehydrolysis, and not by dissolution of wall material. Thus, the only major difference between these two types of central strand cells is the presence or absence of secondary wall thickenings.

Our findings further suggest that the Pallavicinia type is derived from the Haplomitrium type, as also supported by molecular phylogenetic reconstructions (Fig. 7). The Hattorianthus type is unique within the Pallaviciniaceae, but supports the placement of Hattorianthus with Moerckia, a taxon that also has strands that lack pits (Hébant 1977).

References: