第 50 回岩手大学 COEフォーラム

岩手大学 21 世紀 COE プログラム「熱ー生命システム相関学拠点創成」では、関連分野において国内外で活発に研究をされている方をお招きしてフォーラム（セミナー）を開催しています。今回は、オーストラリア Wollongong 大学の Robinson 博士と、同じくオーストラリア Adelaide 大学の Watling 博士の２名の研究者お招きし、地球規模の気候変動が南極大陸に生育する生物種に及ぼす影響、及び、ハスの発熱メカニズムに関する最新の成果についてご講演をしていただきます。お忙しいとは思いますが、多くの方々にご参加いただきますようお願い申し上げます。

第 50 回担当・農学部附属寒冷バイオシステム研究センター

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日時：2007 年７月５日（木）16:45～18:45
場所：岩手大学農学部２番教室

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How will climate change affect Antarctic moss species?

Ozone depletion above the Antarctic has resulted in large increases in springtime UV-B radiation since the 1970s and recovery of ozone over this region is not expected until 2060 (*1*). In addition, climate change is warming West Antarctica and changing water availability over much of the continent (*2*). Our work focuses on the impact of climate change on the flora of the Windmill Islands of East Antarctica over the last 10 years. This region supports some of the most extensive and best-developed vegetation on Continental Antarctica, but the flora is limited to algae, lichens and bryophytes, since all species must be able to tolerate desiccation and freezing in this polar desert. We have shown that climate change is likely to have more negative effects on the endemic moss species, *Schistidium antarctici*, than on two co-occurring cosmopolitan species *Ceratodon purpureus* and *Bryum pseudotriquetrum*. This is illustrated by the species relative abilities to screen UV-B radiation and thus withstand UV-B induced damage to pigments and DNA, (*3-5*) and in their response to desiccation stress (*6-8*). *Ceratodon purpureus* shows the highest tolerance of desiccation and UV-B radiation, *B. pseudotriquetrum* is intermediate in tolerance, but also shows most plasticity in its responses to stress, whilst *S. antarctici* is the least tolerant. This is also reflected in moss distribution patterns with *C. purpureus* found in the driest areas, *S. antarctici* in the wettest, and *B. pseudotriquetrum* distributed across both areas. Our results suggest that the endemic species, *S. antarctici*, is more vulnerable to climate change with consequences for future Antarctic biodiversity.

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The role of the alternative oxidase in heating the floral ovens of sacred lotus.

Thermogenic activity has been reported in the reproductive organs of a diverse range of plant taxa. Respiratory heat production in most plants is unregulated, however, in a small number of species, such as *Philodendron selloum*, *Symplocarpus foetidus* and the sacred lotus *Nelumbo nucifera*, heat production is regulated so that a constant temperature is maintained, across a wide range of ambient temperatures (*1*). These species are thus capable of thermoregulation, sensing external temperature changes and generating heat at the cellular level. Heat production in these species could occur through the action of either the alternative oxidase (AOX) or plant uncoupling proteins (pUCPs), but to determine which is responsible requires measurements using stable O_2 isotopes. Recently, using such methods, we confirmed that in the sacred lotus receptacle, alternative pathway flux increases significantly with heating, while there is no relationship between COX flux and heating (*2*, and Grant et al. submitted), suggesting that pUCPs do not play a significant role in heating in this species. We have also investigated relationships between heat production and AOX flux in other lotus floral tissues during development and characterised changes in AOX, COX and Porin protein content in these tissues. The shift from pre-thermogenic buds to thermogenic flowers coincided with increases in respiration rates, flux through the AOX, and AOX protein content in all floral tissues. In contrast, there were no changes in COX flux, or COX and Porin protein content. We are now working on a second thermoregulating species, *P. selloum*.

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