Ancient buried treasure found in daisy seeds

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(Phys.org) —By tracing the evolutionary origin of a drug-like protein ring found in sunflowers, Australian and US scientists have discovered a diverse, 18-million-year-old group of buried proteins in daisy seeds.

Researchers at The University of Western Australia, working with academics from The University of Queensland, CSIRO, La Trobe University, The University of Tennessee and The University of Texas were able to unearth a new family of seed proteins as well as provide an explanation of how a protein could appear 'from scratch' - a process called 'de novo protein evolution'.

Associate Professor Joshua Mylne, an ARC Future Fellow in UWA's School of Chemistry and Biochemistry and ARC Centre of Excellence

in Plant Energy Biology, said researchers had used new genes to find the corresponding proteins in the seeds.

"This led to the discovery of a rapidly evolving family of tiny proteins that are super-stable and related to a protein discovered first in sunflowers and demonstrated subsequently to have potential as a drug for cancer," Professor Mylne said.

"Although this work is of interest to researchers by providing an understanding of how new proteins can evolve from scratch, it also provides a 'toolbox' of peptides that drug designers can use to stabilise drugs.

The study, published in the international journal *Plant Cell* showed how a sunflower gene called PawS1 that makes two proteins (a seed storage protein plus a small protein that blocks digestive enzymes) actually evolved more than 18 million years ago. In this time PawS1 genes have evolved an interesting family of protein rings that differ in sequence and structure.

Lead author Dr Alysha Elliott from the University of Queensland said the team had discovered a new family of seed proteins that it predicted would be found in as many 4,700 species of daisy. Professor Mylne led the team of Australian and US scientists that revealed this new family of proteins.

"Conventional wisdom is that new proteins usually arise gradually," Professor Mylne said. "Scientists are now beginning to realise that quite often, completely new proteins appear suddenly. Most of these studies are done with genes, but what we've done is work with the proteins the genes make too.

"What we've been able to do is propose the evolutionary steps that these

rings had to undergo in order to be born."

More information: "Evolutionary Origins of a Bioactive Peptide Buried within Preproalbumin." Alysha G. Elliott, et al. *Plant Cell* March 2014, tpc.114.123620

Provided by University of Western Australia