

Internet Appendix A7: Illustrative Pitch Example in Chemistry

Figure A7.1 Topic: Paleobiogeochemistry/Geochemistry

Pitcher's name	Marita Smith
(A) Working Title	Molecular biomarker records of Australian sea-surface temperatures over the past five centuries
(B) Basic Research Question	What is the change in temperature of Australia's oceans using biomarker records?
(C) Key paper(s)	<ul style="list-style-type: none"> • Brassell, S. C., Eglinton, G., Marlowe, I. T., Pflaumann, U. & Sarnthein, M. (1986). Molecular stratigraphy: a new tool for climatic assessment. <i>Nature</i>, 320, 129 – 133. • Hendy, E. J., Gagan, M. K., Alibert, C. A., McCulloch, M. T., Lough, J. M. & Isdale, P. J. (2002). Abrupt Decrease in Tropical Pacific Sea Surface Salinity at End of Little Ice Age. <i>Science</i>, 295, 1511 – 1514. • Schouten, S., Hopmans, E. C., Schefuß, E. & Sinninghe Damsté, J. S. Distributional variations in marine crenarchaeotal membrane lipids: a new tool for reconstructing ancient sea water temperatures? <i>Earth and Planetary Science Letters</i>, 204, 265-274
(D) Motivation/Puzzle	The few climate records available show major differences in the timing of climate changes between the northern and southern hemispheres over the last millennium. Instrumental records in the southern hemisphere are only available for the last century, and reconstructed records are based on ancient core samples taken near Antarctica or the equator. None of these provide relevant climate information for the last several centuries. There is a distinct need to analyse new climate data for the Australian region to assess global climate changes.
THREE	Three core aspects of any empirical research project i.e. the “iDioTs” guide
(E) Idea?	<p>The ‘hockey-stick’ temperature increase of the 20th century has instigated concern for a global warming trend. In order to investigate this temperature increase, it is necessary to derive high-resolution temperature records that span the last several centuries. Currently, data from this period is sourced almost exclusively from the Northern Hemisphere, predominantly from terrestrial records. There is a considerable lack of temperature records for the Southern Hemisphere, making analysis of hemispheric and global trends in temperature changes difficult. The lipids of specific haptophyte marine algae (alkenones) and marine Thaumarchaeota (glycerol dialkyl glycerol tetraethers) in the sedimentary record are biomarkers that may be converted to sea-surface temperature (SST) via the UK'37 and TEX86 proxies, respectively. Recently, the lipids of some eustigmatophyte algae (long chain diols) have been proposed as an additional measure of SST via the LDI proxy.</p> <p>These proxies have never been used together to provide new records of temperature. These records would provide an important means of palaeoenvironmental inference for hemispheric and global climatic trends during this period.</p>
(F) Data?	<p>- Data will be sourced from the continental sea-shelf around Australia using the CSIRO RV <i>Southern Surveyor</i> and a specially constructed multiple corer. A month-long voyage from Fremantle to Brisbane circumnavigating the southern part of Australia will be undertaken to sample the sea floor at key positions.</p> <p>- Samples will be analysed for specific organic composition and dated using radionuclides</p>

	- Ultimately, a biomarker record of sea-surface temperature would be generated for south-east Australia using three independent biomarker records.
(G) Tools?	Physical apparatus will be necessary, including sampling equipment on-board ship (in particular, the multiple corer device) and analysis equipment (Gas Chromatograph-Mass Spectrometer and Liquid Chromatograph-Mass Spectrometer). Records of specific organic compounds will be generated using laboratory work and chromatograph software used to provide raw data for generating biomarker records as per literature formulas.
TWO	Two key questions
(H) What's New?	There are no existing climate records for the Australian region over the last few centuries. This project will generate three independent measures of sea-surface temperature to provide important data for analysis of climate change to rectify this gap. This is the first project to combine these biomarker proxies. Thus, it provides an important means of palaeoenvironmental inference for period. The DATA will be completely new, and provide avenues for further research that can be compared to the results of this project.
(I) So What?	Currently, data for climate change models is a hot commodity. New data, particularly in Australia, will provide completely novel records of temperature change to rectify a gap in the scientific literature. This data will inform future management of Australia's oceans and potentially affect policy on carbon emissions and trading.
ONE	One bottom line
(J) Contribution	Primary source of the contribution: Raw and processed data in the form of biomarker temperature records is the primary contribution. Changes in temperature over the past several centuries will be assessed from a climatic standpoint in relation to world-wide fluctuations.
(K) Other considerations	Is Collaboration needed/desirable? -Idea: no; -Data; yes – multi-disciplinary and multi-institutional -Tools; yes – CSIRO, representatives and funding from various institutions Target journals – <i>Nature</i> , <i>Nature Climate Change</i> “Risk” assessment: -“no result” risk: Extremely low. With three independent sources of biomarker records, it is extremely unlikely that no results would be obtained. Even if all three records indicated minimal temperature change, this would be an important result to indicate that northern hemisphere rates of warming are non-comparable to southern hemisphere -“competitor risk”(i.e. being beaten by a competitor): Low. Only the ANU has the facilities for this kind of research in Australia, and there is a distinct lack of Australian core samples. Thus, no available study material means no competition. -risk of “obsolescence”: Low. Climate change is a hot topic, with demand for new, modern records of temperature change world-wide.