

School of Geography and Environmental Science

Honours Topics and Projects for 2010

Ian McNiven, Bruno David: Indigenous archaeology of coastal southern Papua New Guinea or of a ritual dugong bone mound from Torres Strait (*also available: 6 week summer scholarships to undertake analyses, paid \$400/wk*).

Jason Beringer, Nigel Tapper, Amanda Lynch: urban climatology, eco-climatology, climate change and variability, surface-atmosphere interactions and mesoscale circulations, applied climatology (*see detailed list of projects attached; please note that JB is not available semester 1*)

Peter Kershaw, Kale Sniderman: projects in environmental change / palaeoecology / biogeography, including projects on pollen/diatom records from late Pleistocene of Lake Surprise, Mt Eccles Lava Flow; high resolution Holocene record from Caledonia Fen; long-term climate reconstruction and dynamics of Australia; the recent Western Victorian drought and its impact (*see details attached, including 4 week summer scholarships*)

Haripriya Rangan, Christian Kull, Craig Thorburn, Bruce Missingham: political ecology, international development, politics of natural resource management (like fire, invasive species, deforestation, and protected areas), community-based development and conservation, social movements, economic geography and urban and regional planning (HR), South Africa, Indian Ocean rim, Southeast Asia (*no specific projects announced – open to student initiative and discussion*)

Stephen Legg: Historical geography; regional history; environmental history; environmental management; economic development; forestry and farming (*no specific projects announced – open to student initiative and discussion*)

Lauren Costello: Cultural and feminist geography; politics of identity; difference and diversity; urban activism; urban housing (*no specific projects announced – open to student initiative and discussion*)

Wendy Stubbs: corporate sustainability (*no specific projects announced – open to student initiative and discussion*)

Rebekah Brown: environmental management; sustainable urban water management; organisational development and community capacity building (*no specific projects announced – open to student initiative and discussion*)

David Dunkerley: Fluvial environments and processes; hydrology and process geomorphology of arid regions; paramaterisation and numerical methods in geomorphology (*no specific projects announced – open to student initiative and discussion*)

Xuan Zhu, Jim Peterson: Geographical information systems. Projects include: 3D visualisation of landscapes for park management with GIS (XZ); adoption of on-line plan lodgement: an indicator of the rate of the diffusion of eGovernment policies in Victoria, Australia (JP)

Additional topics available in consultation with research-only staff in school; please consult staff list on School of GES website. For more information, please contact individual staff members or the Honours Coordinator, Christian Kull (christian.kull@arts.monash.edu)

Potential honours projects in Environmental Change – palaeoecology (please contact Prof. Peter Kershaw)

1. A high resolution pollen (and diatom) record from the late Pleistocene of Lake Surprise, Mt Eccles Lava Flow, SW Victoria.

Documentation of conditions during the Last Glacial Maximum (LGM) and the Late Glacial is important globally for determination of the nature and causes of extreme and abrupt events that may inform existing climatic circulation patterns and contribute to future climate change scenarios. Currently, there is debate over the extent to which changes during this period result from Northern Hemisphere (North Atlantic) or Southern Hemisphere (Antarctic) forcing with data from New Zealand suggesting also an early onset of the LGM, a possible Antarctic Cold Reversal (ARC) but no Younger Dryas event. It is important to determine whether this New Zealand pattern is hemispheric in extent or of only local significance. Lake Surprise is probably the best site outside NZ, in having a high and constant sedimentation rate through this period and being well dated, to test this pattern at a similar latitude. The existing pollen record needs to be refined to allow detection of events and rates of change to be determined. There are no diatom or microfossil records through this period and the addition of one/both of these proxies would really help firm up interpretation. The whole project could be undertaken by one industrious student or by two students providing complementary data but whose theses would be independent. Background on the study area and the existing Lake Surprise record can be found in Builth, H., Kershaw, A.P., White, C., Roach, A., Hartney, L., McKenzie, M., Lewis, T., and Jacobsen, G. (2008) Environmental and cultural change on the Mt Eccles lava flow landscapes of south-west Victoria, Australia. *The Holocene* 18, 421-432.

http://www.aqua.org.au/AQUA/frames_INTIMATE.html

<http://www.geo.uu.nl/fg/INTIMATE/>

2. A high resolution record of the Holocene from Caledonia Fen

Caledonia Fen, located in the highlands of central-eastern Victoria, provides a remarkable detailed pollen record for the last glacial interglacial cycle (Kershaw, A.P., McKenzie, G.M, Porch, N., Roberts, R.G., Brown, J., Heijnis, H., Orr, L.M., Jacobsen, G., Newall, P.R. (2007) A high resolution record of vegetation and climate through the last glacial cycle from Caledonia Fen, south-eastern highlands of Australia. *Journal of Quaternary Science* 22: 481-500). However, by comparison with other sites, resolution of the Holocene is relatively low and could be improved by production of a new high resolution record. In addition, this record would serve two other purposes.

- a. Provide a very precise ‘interglacial’ record for comparison with an equally precise ‘interstadial’ record from the site dated to around 70,000 years BP (Kershaw et al. submitted) to allow a better understanding of the structure of warm periods.
- b. Provide a pollen record that can be directly compared with planned research into burning and grass isotope patterns from the same core material. A research group from the US (University of Harvard, University of Illinois) are using Caledonia Fen as one site to test the hypothesis that fire rather than changing CO₂ levels in the late Quaternary determines the abundance of C₄ grasses. They will undertake macrocharcoal counts as a measure of fire and undertake $\delta^{13}\text{C}$ analysis of individual grass pollen grains to measure the relative abundance of C₄ and C₃ grasses.

It is intended to collect the new core in Late October this year when the US team will be at Monash.

This is an opportunity to be involved in climate change research at two cutting edges

3. Contributions to IGBP-PAGES project “Long-Term climate REconstruction and Dynamics of Australia” (LOTRED-OZ) and Land and Water Australia project "The recent Western Victorian drought and its impact: without precedent?"

High-resolution, multi-proxy climate reconstructions over the last 500 to 1000 years with a representative spatial coverage over the globe are arguably among the most important tools for the assessment of the responses of the Earth climate to natural and anthropogenic forcing. Whereas hemispheric or regional multi-proxy reconstructions for the past 500 – 1000 years are available for Europe and North America, the Southern Hemisphere including Australia has remained largely *terra incognita*. The Land and Water Australia supported project, recently taken over by Rural Industries Research and Development Corporation, provides one focus for research in Australia. It is anticipated that projects would involve collection and pollen analysis of sediment cores from volcanic lakes on the Western Plains of Victoria to determine changing climate in relation to land use during late Aboriginal land management and European land management periods, though documentary or diatom research could also be undertaken in place of, or in addition to, pollen.

Vacation scholarship support

Support for at least 4 weeks will be available for background study in these project areas. This may involve description and digital imaging of taxa, useful to your own research, for entry into the Australasian Pollen and Spore Atlas, supported by an Australian Research Council grant.

<http://apsa.anu.edu.au/>

Honours studies in Climatology / Meteorology

<http://www.arts.monash.edu.au/ges/research/climate/postgrad/index.html>

The Honours program is designed to broaden skills and knowledge already gained during undergraduate studies but moreover to give an opportunity to conduct independent research. Many projects will comprise an exciting field component and often travel. The program is generally undertaken over two semesters and includes a seminar series, course work and research thesis. A distinction average is required for entry. The Honours degree will aid in competing for job opportunities or lead to further postgraduate studies such as a PhD or Masters Degree. Job opportunities include the Bureau of Meteorology, Australian Greenhouse Office, Environmental Protection Authority, Bureau of Rural Sciences, Dept. Sustainability and the Environment, to name a few.

Honours and Postgraduate studies in Climatology / Meteorology can be undertaken within the School of Geography and Environmental Science. Honours can be taken as Geography / Climatology Honours (GES4000) and/or Atmospheric Science Honours (ATM4000). For more information see the Schools Honours page (<http://www.arts.monash.edu.au/ges/undergraduate/honours.html>).

Honours projects can be developed in conjunction with the climatology staff (<http://www.arts.monash.edu.au/ges/research/climate/people.htm>). A list of possible current topics is provided over the page. Opportunities are available in many of our research areas: If you are interested in further studies in Climatology and wish to be kept informed of the groups activities you can email us.

Possible Topics for Honours commencing in 2010 - Climatology

Some of the topics listed below are part of ongoing and funded projects. Projects in the group are driven by a strong awareness of the need to understand the impacts of climate and environmental change. Topics of your own choosing are possible in consultation with Nigel Tapper (NT), Jason Beringer (JB) or Amanda Lynch (AL). Collaboration is possible with members of the Atmospheric Sciences group including for example Neville Nicholls (NN) and Christian Jakob (CJ) or across other schools for multidisciplinary topics.

Urban climatology

1. The Melbourne urban heat island – satellite mapping (JB) or vertical characteristics (NT).
2. Numerical modelling of the urban canopy (JB)
3. Determination of the unique urban surface properties (albedo, emissivity, roughness, etc using satellite techniques) of Melbourne and their effect on urban climate (JB).
4. Changes in Melbourne's vegetation characteristics resulting from the 12-year drought (NT)
5. Links between urban climate and health (NT)
6. Urban influences on radiation balance across Melbourne (NT)

Eco-climatology

7. Mountain Ash project – Investigation of water and carbon balances of old growth forests. (JB In conjunction with Charles Darwin University)
8. Savanna fire project – Carbon budgets using Carbon accounting tools, land surface models and/or observed fluxes using tower fluxes (JB and NT).
9. Multiple benefits of revegetation in the Goulburn Broken catchment– Analysis of the impact of revegetation in the catchment on carbon, water and biodiversity (JB)
10. Termite mound architecture as a control on thermal loadings NT)

Climate change and variability

11. Using modelled data to examine the impact of mud flats on tropical island thunderstorm development (NT and JB)
12. Evaluation of global climate model 21st Century and present day simulations of rainfall over Australia (AL, CJ)
13. The role of polar cyclones in determining heat and moisture budgets over Antarctica (AL).
14. Spatio-temporal changes in dust storm activity across Australia and the relationship to Climate Change (NT)
15. There are many areas of potential interest in this section (NT, AL, JB).

Surface-atmosphere interactions and mesoscale circulations

16. Satellite derived cloud signatures as evidence of circulations associated with dry salt lakes (NT)
17. Surface flux measurements of dry salt lakes and surrounds and their association with mesoscale circulations (NT)
18. A range of possible topics in this area (NT, JB and AL).

Other applied climatology

19. Weather and road accidents (NT and Accident Research Centre)
20. Use and communication of climate information by policy makers (AL).