2018 YCCSA SUMMER SCHOLARSHIP PROJECT SUBMISSION

This form is for prospective project supervisors to submit their projects to be included in the YCCSA Summer Scholarships Programme for 2018.

It is the purpose of the YCCSA Summer School that any projects submitted are novel and interdisciplinary in nature.

Date	11/01/2018
Supervisors' Names and Departments / Affiliation and Contact Email	John Forrester, Research Fellow, Stockholm Environment Institute, Environment Department, john.forrester@york.ac.uk Anje Neutel, Visiting Associate Biology (visiting research scientist from the British Antarctic Survey), anjute@bas.ac.uk Richard Law, Professor Emeritus, Departments of Mathematics and Biology, richard.law@york.ac.uk
Project Title	Key feedback loops in social and ecological networks
Project Description	We propose using network feedback-and-stability ideas developed for food webs (see Neutel & Thorne, 2014) to further help understand tipping points in social systems (*cf.* Bentley, Ormerod & Batty, 2011). In parallel with the rise in popular usage of the term "tipping point" (popularised by Gladwell, 2002), tipping points have been used in systems thinking to link levels. This has implication for the concept of social resilience. In the interplay between community forces (between different social groups); self-regulating forces (within groups); and external drivers or constraints (the wider context); feedback mechanisms play a central role. In natural trophic communities (food webs), the quantification of interaction strengths (based on observed material flows) has revealed how 3-link and 2-link feedback loops play a key role in system stability. In any n-component foodweb, the strength of lower level feedback (in particular the positive (destabilising) 3-link versus negative (stabilising) 2-link feedback) turns out to be an indicator of the amount of selfregulation that is needed to keep the whole (n-level) network stable. Identifying such key feedback loops in social systems is nascent science, but could provide a tool to link dynamically across levels of social organisation and help study the 'carrying capacity' of social systems as a system-dynamic property emerging from interactions, not as a simple input parameter. Following the evidence from the food web research above, and concentrating on 'lower level feedbacks' within social systems (and *where* these lower level feedbacks occur in social systems), we will jointly explore if feedback loops in social systems can be considered in a similar way to those in (other) natural ecosystems.
Required Skills	Background in mathematics or (natural or cultural) systems science
Supervision and Collaboration Arrangements	Day to day mathematics and ecology supervision will provided by Anje Neutel and social systems supervision by John Forrester, with Richard Law acting as in a senior advisory role
Project Dates	*The summer school runs for 9 weeks, starting on Monday, 09 July 2018 and finishing on Friday, 07 September 2018.*

Other Information	*Anything that doesn't easily fit above.*
References	Bentley, R.A., Ormerod, P., & Batty, M. (2011). Evolving Social Influence in Large Populations. *Behav. Ecol. Sociobiol*. **65**: 537-546 Gladwell, M. (2002) *The Tipping Point*. Abacus New Ed edition. Neutel A. M. & Thorne, M.A.S. (2014). Interaction strengths in balanced carbon cycles and the absence of a relation between ecosystem complexity and stability. *Ecology Letters* **17**, 651-661

When complete, please email the form to sarah.christmas@york.ac.uk