

# A perfect storm: A challenge of complexity

James Dyke

Institute for Complex Systems Simulation

University of Southampton

[www.icss.soton.ac.uk](http://www.icss.soton.ac.uk)

UNIVERSITY OF  
Southampton

Institute for Complex Systems Simulation

ICSS [ ]

Doctoral Training Centre: 77 PhD students

Infection: taught year

Dispersal: co-departmental supervision

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Complex Systems Simulation Seminar Series

CS<sup>4</sup>

# ICSS Staff

**Markus Brede:** statistical mechanics on networks - regulation of commons

**James Dyke:** Abiotic-biotic interactions - stability & collapse

**Jason Noble:** ABM - social & ecological systems

**Richard Watson:** AI & evolution - levels of selection & modularity

**Seth Bullock** - Director of DTC - *everything*

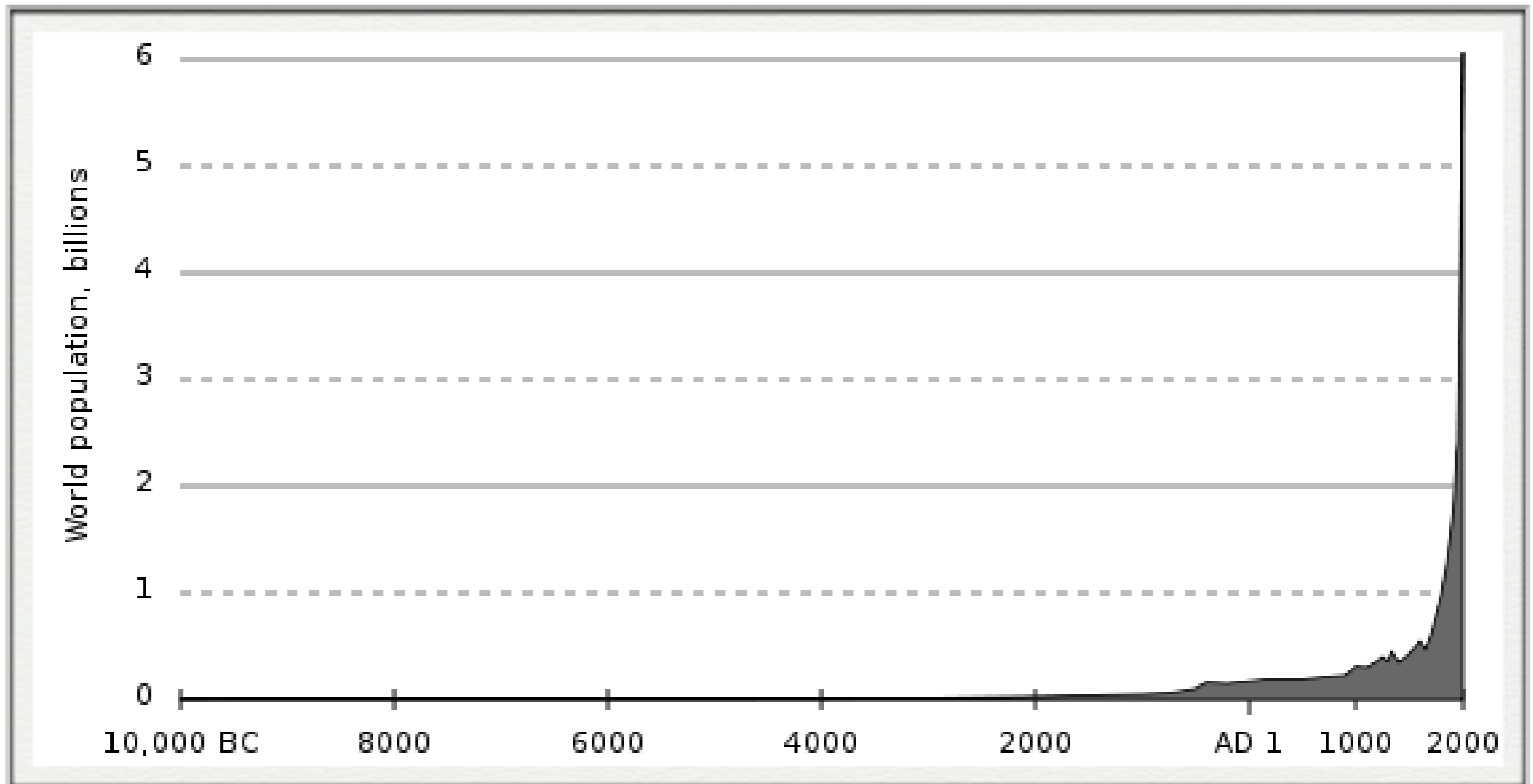


Table Data: United States Census Bureau



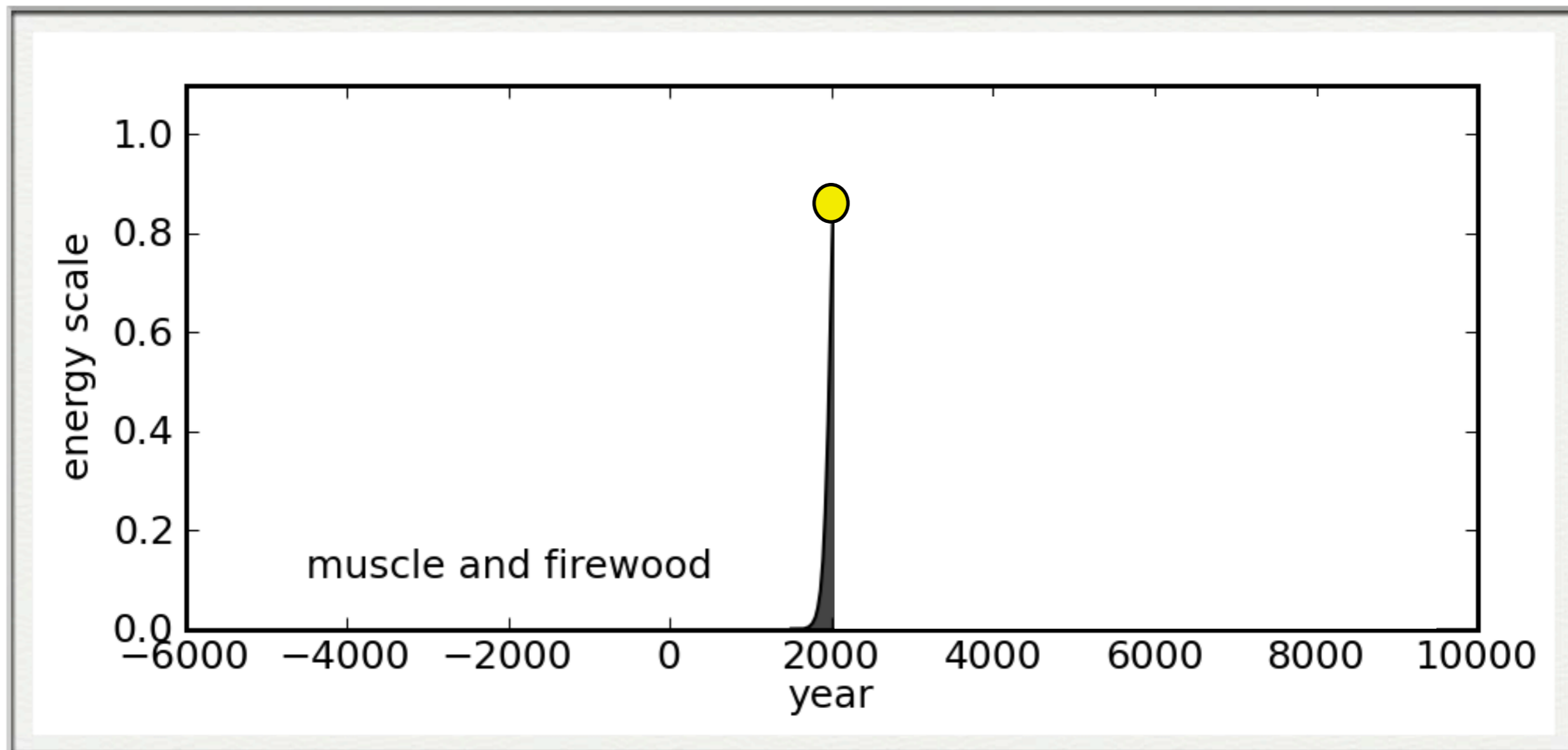
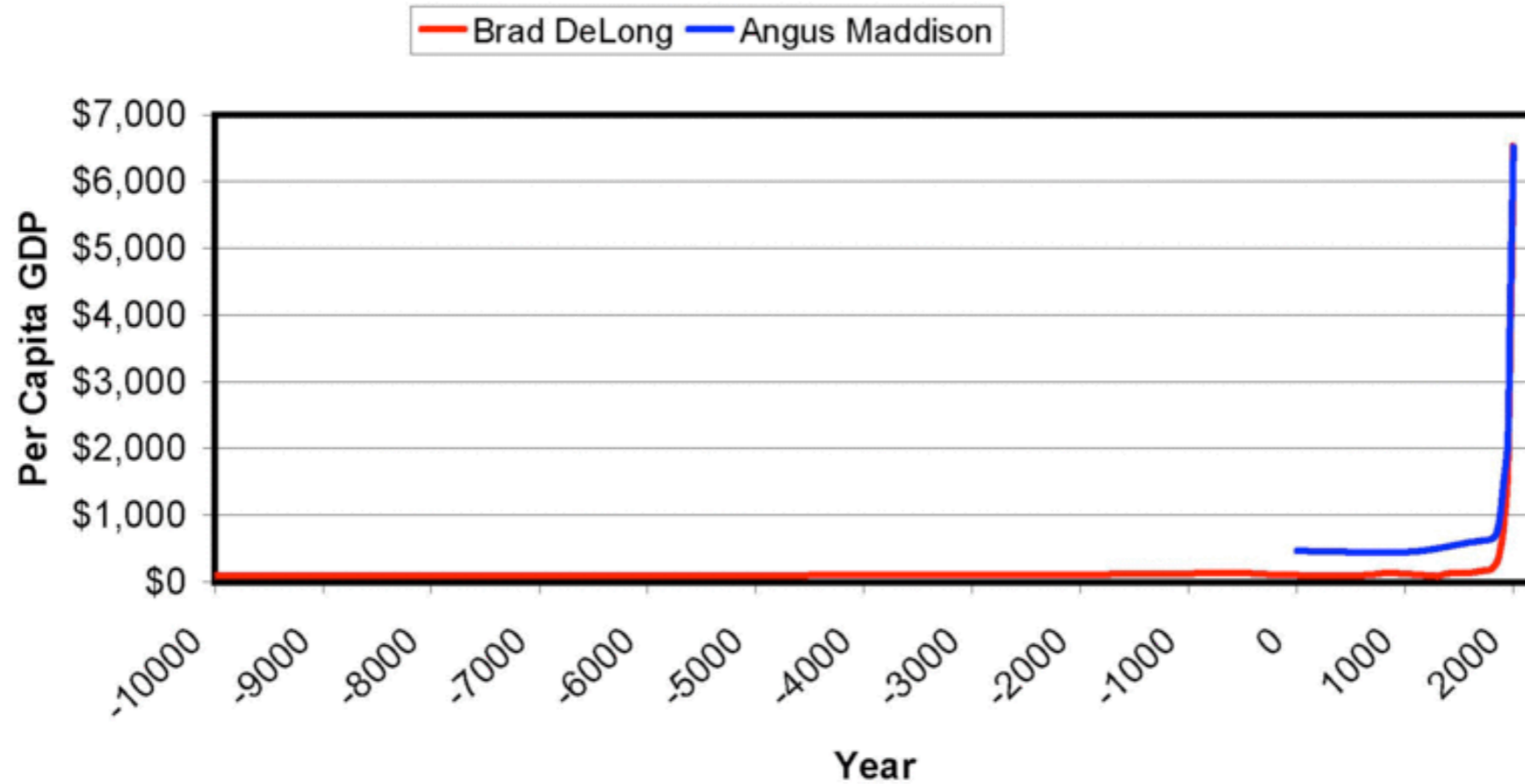


Figure: <http://physics.ucsd.edu/do-the-math>

# World Per Capita GDP 10000 BCE - 2003 CE (1990 International Dollars)



**Source:** J. Bradford DeLong, "Estimating World GDP, One Million B.C. - Present" [http://www.j-bradford-delong.net/TCEH/1998\\_Draft/World\\_GDP/Estimating\\_World\\_GDP.html](http://www.j-bradford-delong.net/TCEH/1998_Draft/World_GDP/Estimating_World_GDP.html). Accessed Mar 5, 2008; Angus Maddison. "Contours of the World Economy, 1-2030 AD: Essays in Macro-Economic History." New York: Oxford University Press, 2007. 382.

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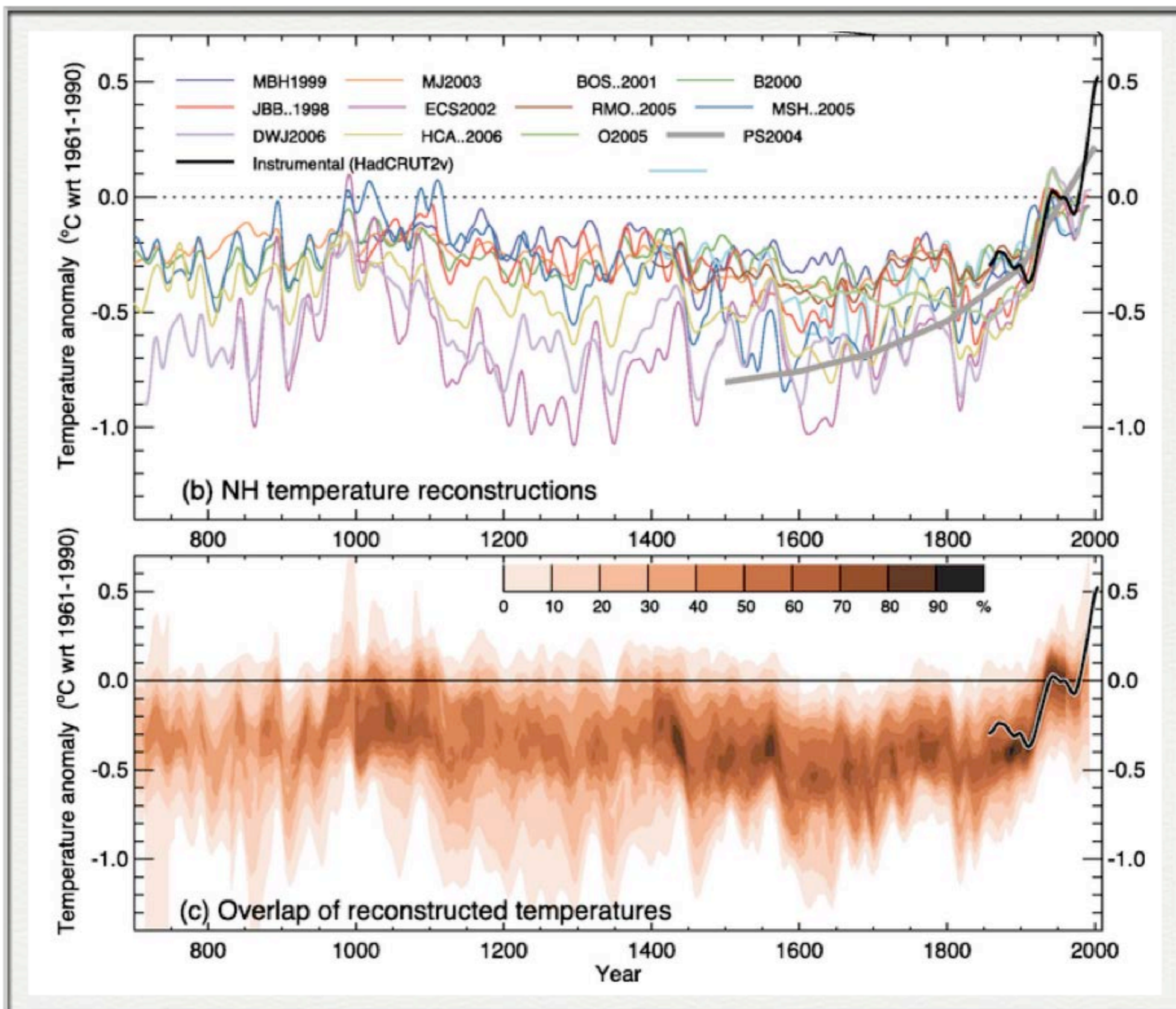


Figure: IPCC AR4



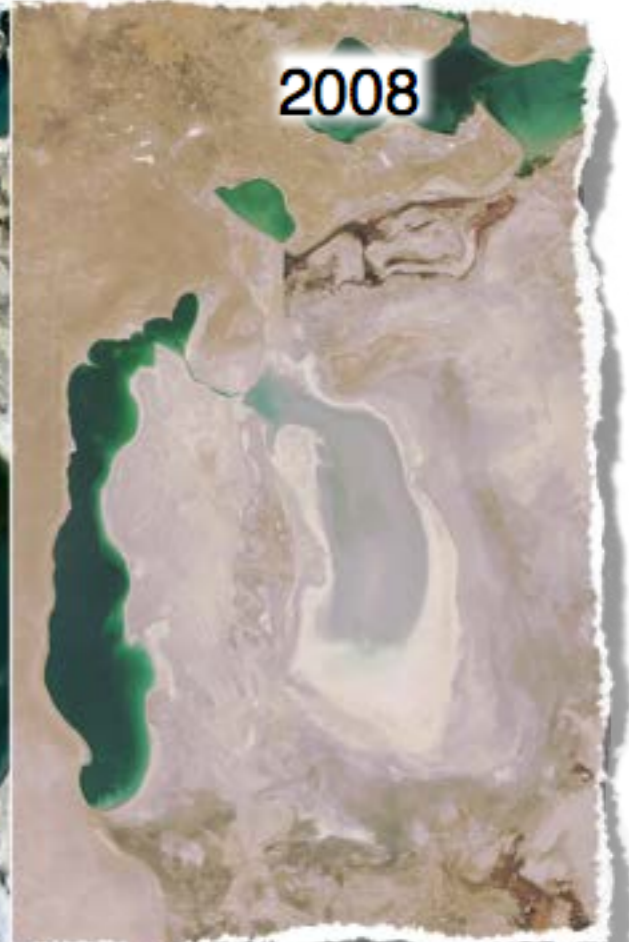


Photo: Wikipedia



Image: Wikipedia



Photo: Greenpeace





Photo: Wikipedia



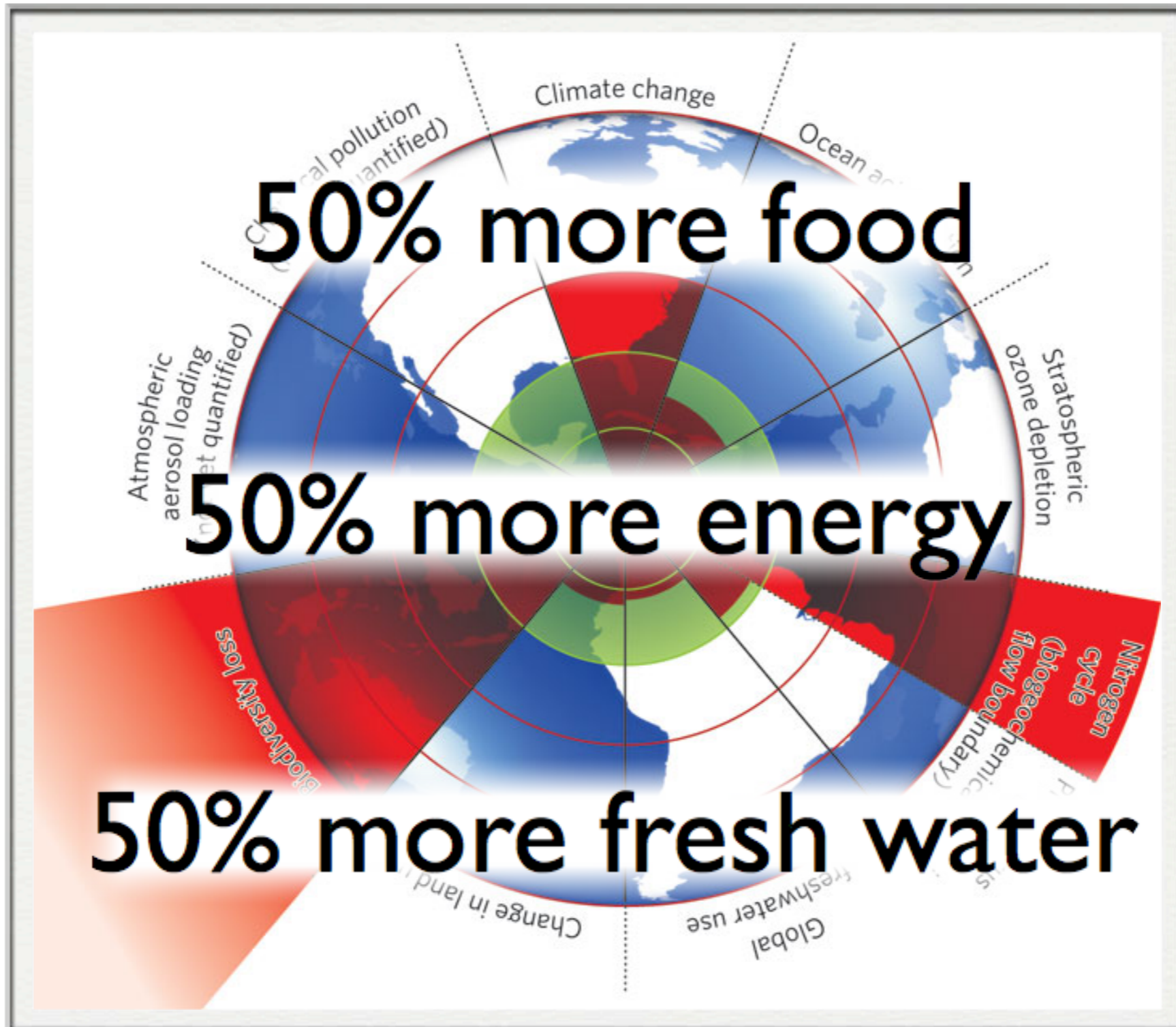


Figure: J. Rockström et al (2009) *Nature* 461, 472-475







Image: [www.globaia.org](http://www.globaia.org)





# 1:72 SUPERMARINE SPITFIRE MK1a

A01071A MODEL KIT • MAQUETTE A MONTER • MODELLBAUSATZ • MODELLO A SCALA • BOUWMODEL • MAQUETA PARA MONTAR • PLASTBYGGESATS • RAKENNÜSSARIA • MODELO PARA CONSTRUIR • MODELBYGGESÄT • ΣΥΝΑΡΜΟΛΟΓΟΥΜΕΝΟ ΜΟΝΤΕΛΟ

**Multidisciplinary Activities**  
**Outreach and Impact**  
**Simulation & Analysis**  
**(Dynamical) Systems Approach**



# Global Challenges

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## Course Notes

**Lecture 1** – 28/1/2013 – Introduction – Dr James Dyke. Available as a PDF file download here: [UOSM2010-L1](#).

**Seminar 1** – 31/1/2013 – Group facilitation – Dr James Dyke. Available as a PDF file download here: [UOSM2010-S1](#) Information about 6 Hats thinking is available [here](#) and [here](#).

**Lecture 2** – 4/2/2013 – Systems Primer – Dr James Dyke. Available as a PDF file download here: [UOSM2010-L2](#). An annotated video of the lecture can be found on the University of Southampton Panopto site [here](#).

**Seminar 2** – 7/2/2013 – Systems Primer – Dr James Dyke. Available as a PDF file download here: [UOSM2010-S2](#).

**Lecture 3** – 11/2/2013 – Peak Phosphorus – Dr James Dyke. Available as a PDF file download here: [UOSM2010-L3](#). An annotated video of the lecture can be found on the University of Southampton Panopto site [here](#).

**Lecture 4** – 14/2/2013 – Climate Change – Prof John Shepherd. Available as a PDF file download here: [UOSM2010-L4](#). A video of the lecture can be found on the University of Southampton Panopto site [here](#) and on the [Global Challenges YouTube](#) channel.

**Lecture 5** – 18/2/2013 – Biodiversity – Dr Felix Eigenbrod. Available as a PDF file download here: [UOSM2010-L5](#). A video of the lecture can be found on the University of Southampton Panopto site [here](#) and on the [Global Challenges YouTube](#) channel.

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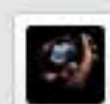
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Dr Felix Eigenbrod of the University of Southampton gives a Global Challenges guest lecture on biodiversity and ecosystem services. Follow the Global Challenges module at:

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## About Global Challenges

Edit

The Global Challenges module (UOSM2010) at the University of Southampton is a new multidisciplinary module that allows students to explore a range of global, systemic challenges that face current and future generations.

[GC module website](#)

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## James Dyke: Global Challenges

**Various Events**



**Description:** In 2011 the global population reached 7 billion. The United Nations estimate this 7 billion will grow to a little over 9 billion by 2075. John Beddington, the UK government's chief scientific advisor, has warned of a 'perfect storm' - an increase in competition for food, water and energy that a growing population will demand. As food prices rise, more people will go hungry and migration will increase.



**TED<sup>x</sup>**

**Southampton University**

**x = independently organized TED event**

**Blue skies thinking on *sustainability***

**17<sup>th</sup> March 2013**

**University of Southampton**



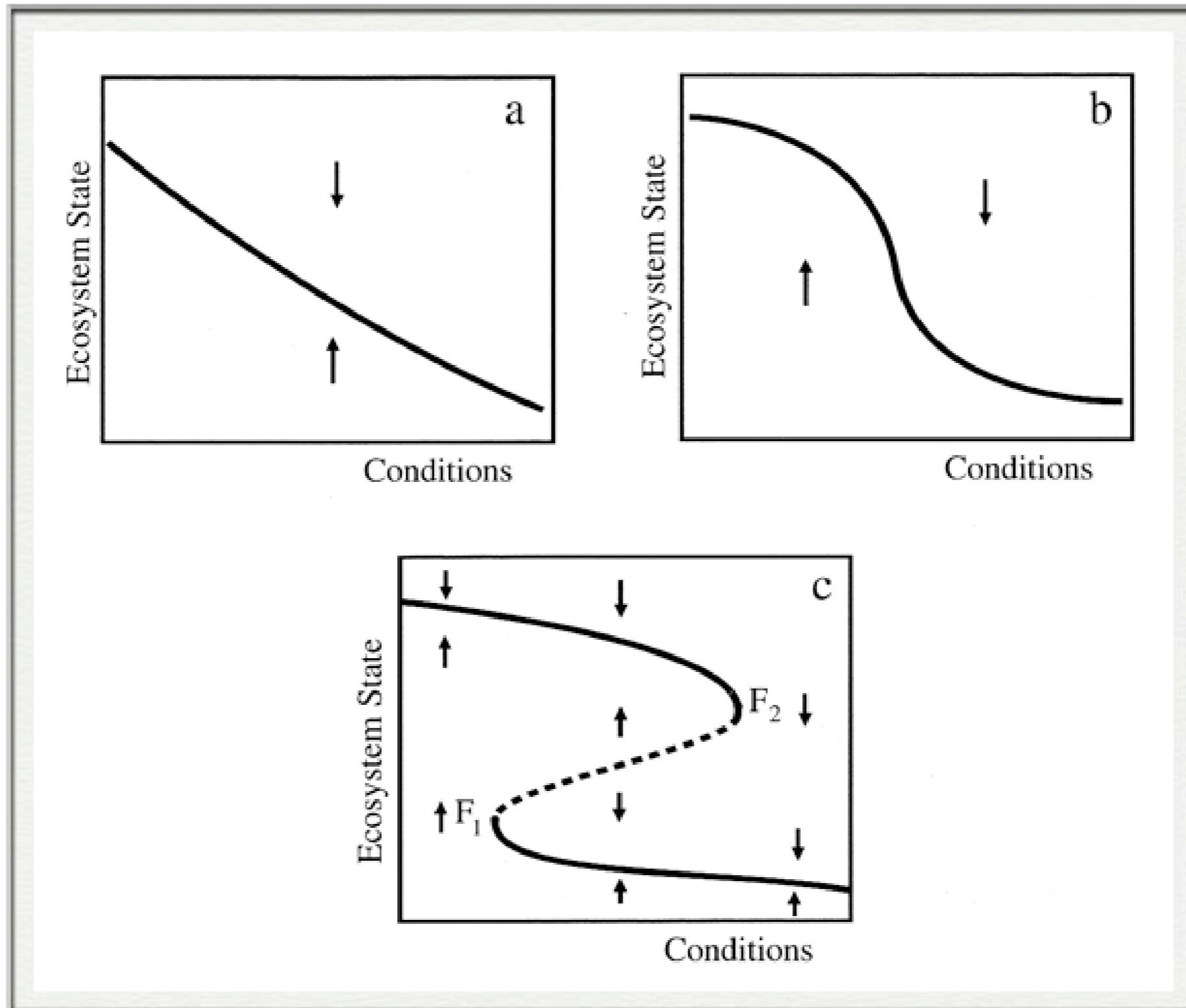


Figure: Scheffer, M. (2009). *Critical Transitions in Nature and Society*. Princeton University Press.

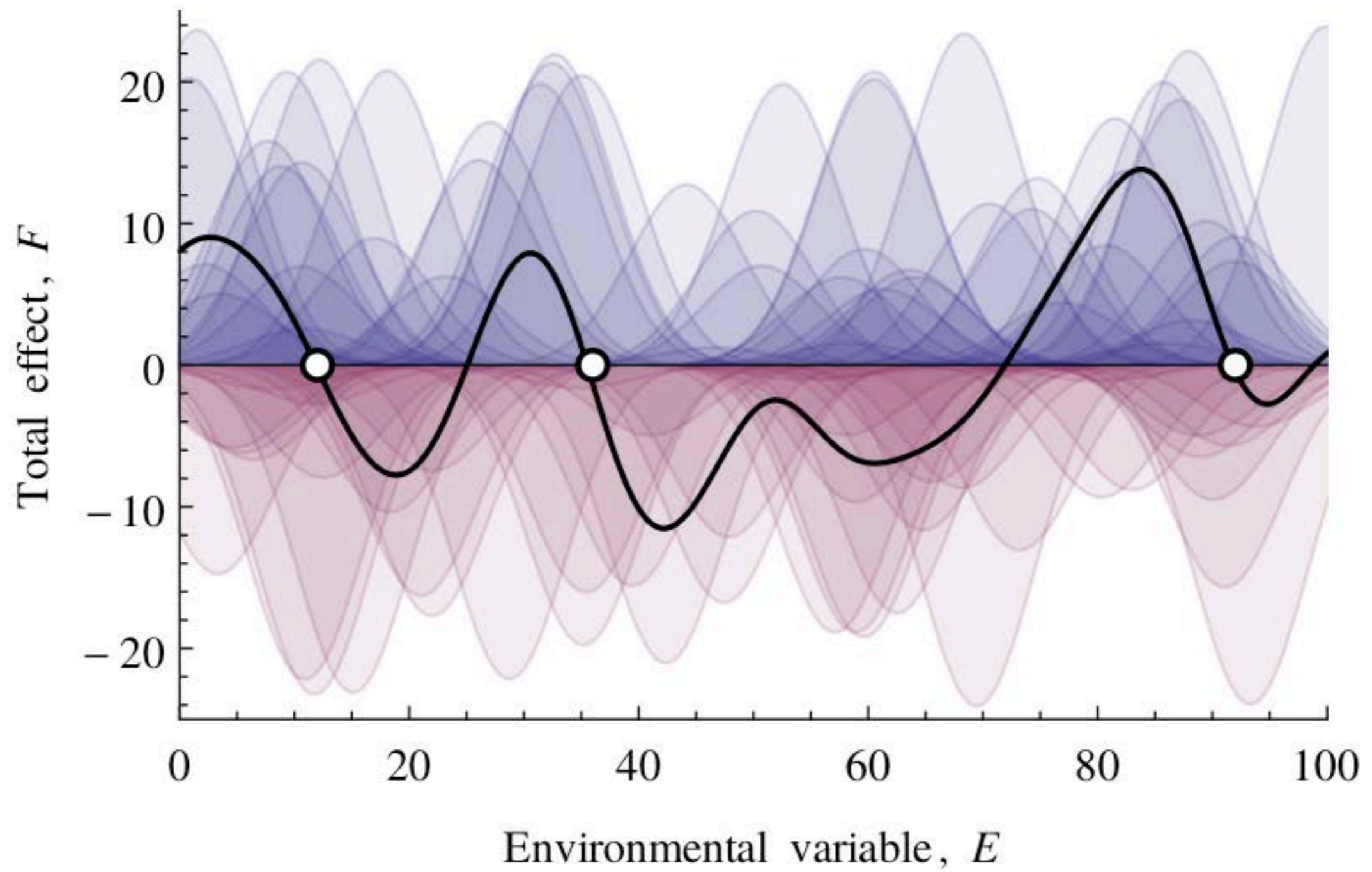


Figure: Dyke JG & Weaver IS *The emergence of homeostasis in complex ecosystems*  
PLoS Computational Biology (in press)



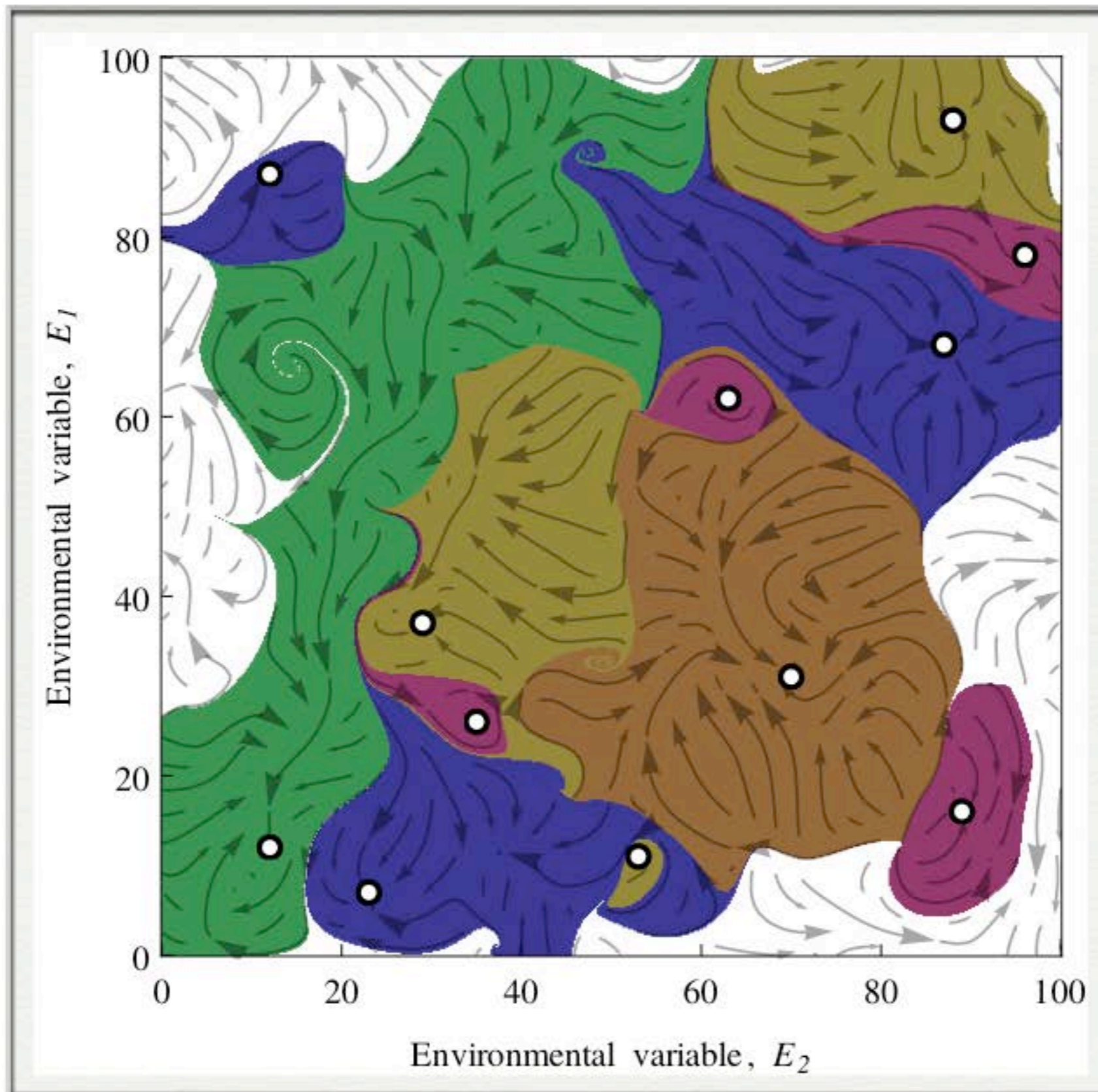


Figure: Dyke JG & Weaver IS *The emergence of homeostasis in complex ecosystems*  
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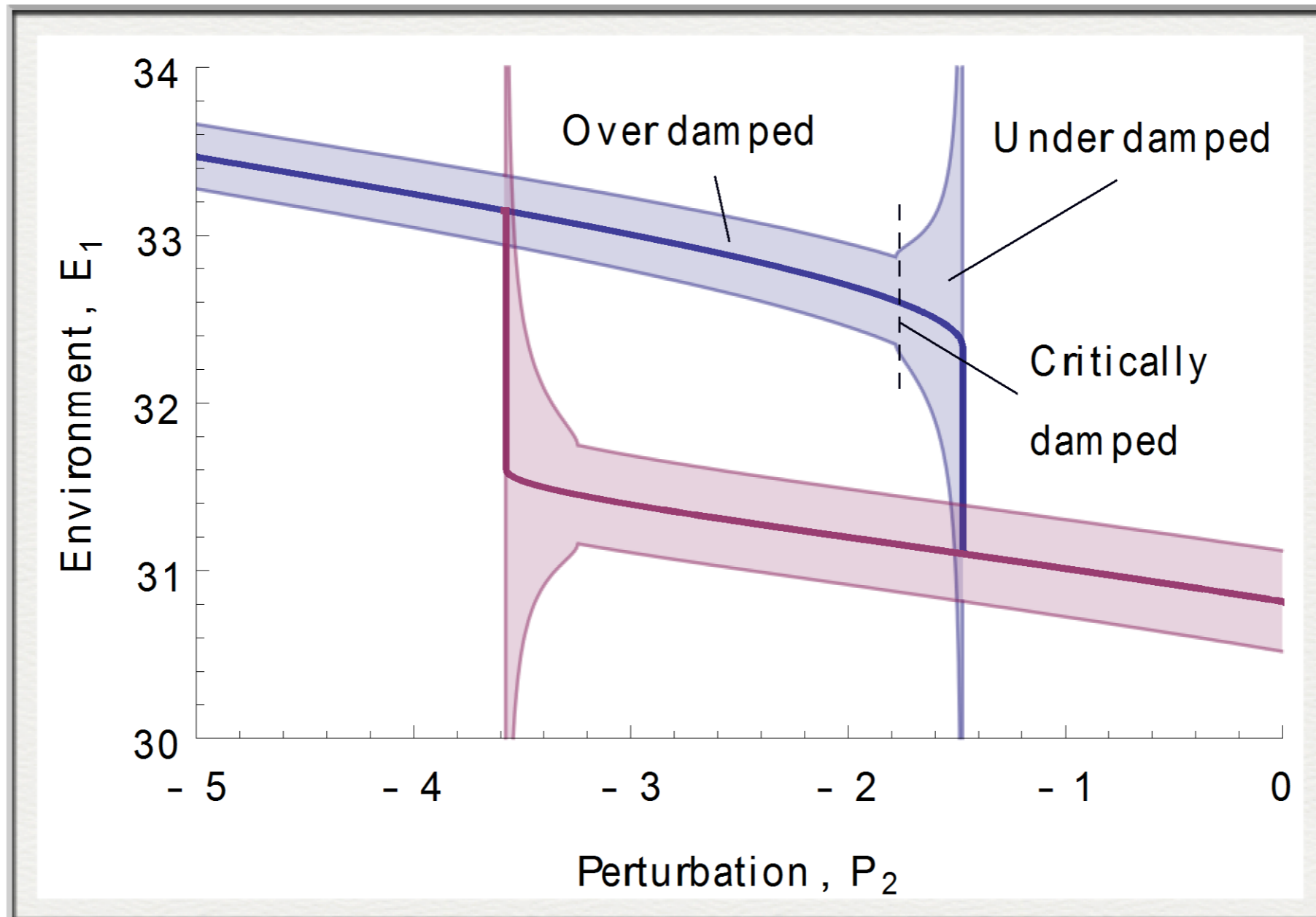


Figure: Weaver IS & Dyke JG *Tipping points in Complex Coupled Life-Environment Systems*, in progress



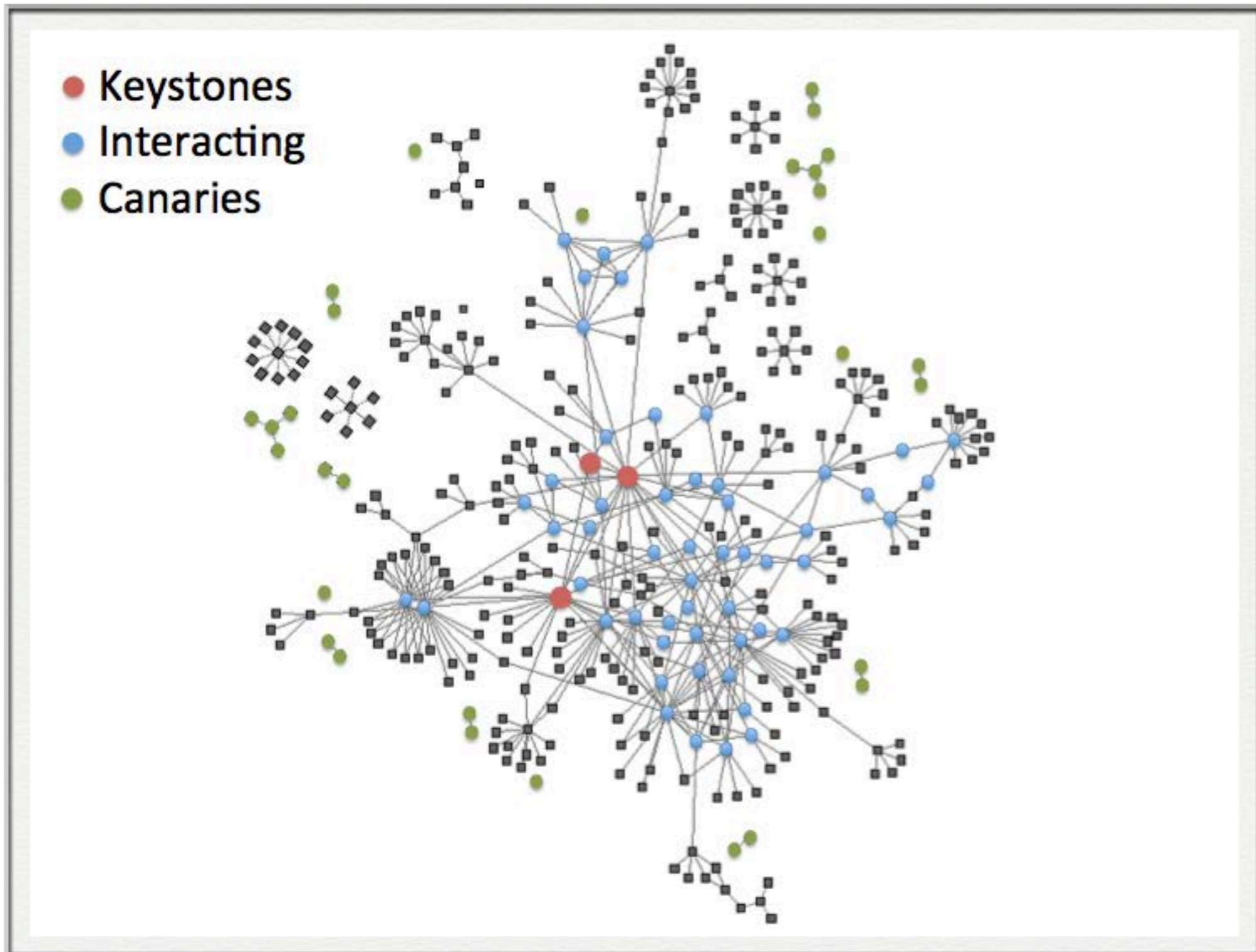


Figure: Alonso Chávez V, Dyke JG, Dearing J, Wang R, Huang J-L, Doncaster P  
*Detecting regime shifts in artificial ecosystems, in progress*

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