

# **THEORIES UNDER STRESS: THE EVOLUTION OF EARLY GENETICS**

**University College London, 17/5/2017**

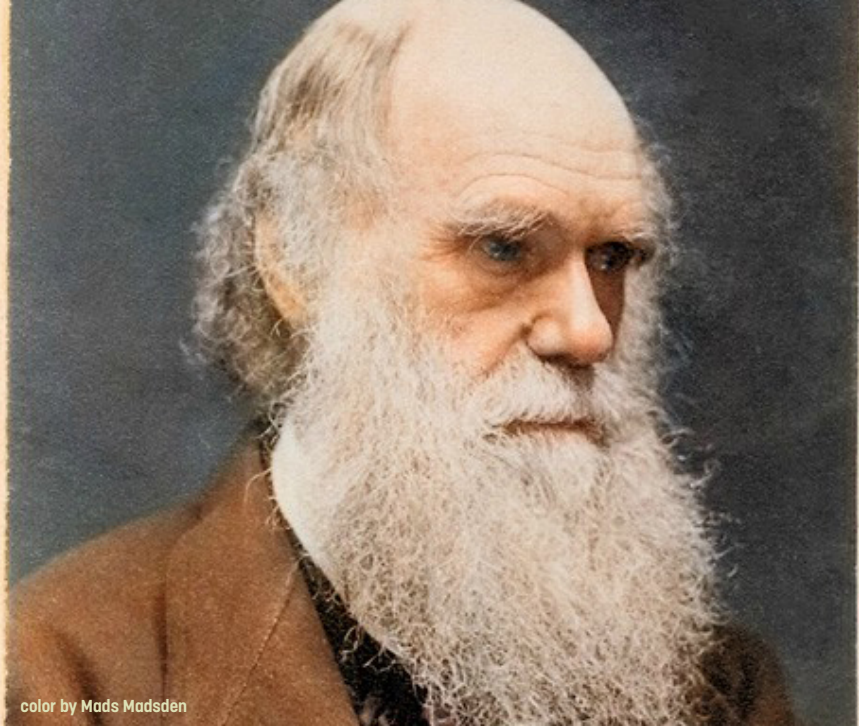
**Charles H. Pence**

**Institute for Ethical Leadership  
Department of Philosophy  
and Religious Studies**



**How can we understand the  
structure of scientific  
communities during  
theoretical crises?**

# THE BIOMETRY / MENDELISM DEBATE



color by Mads Madsen



Fleeming Jenkin, in 1884, from memoir by R.L. Stevenson



William Bateson, in 1905

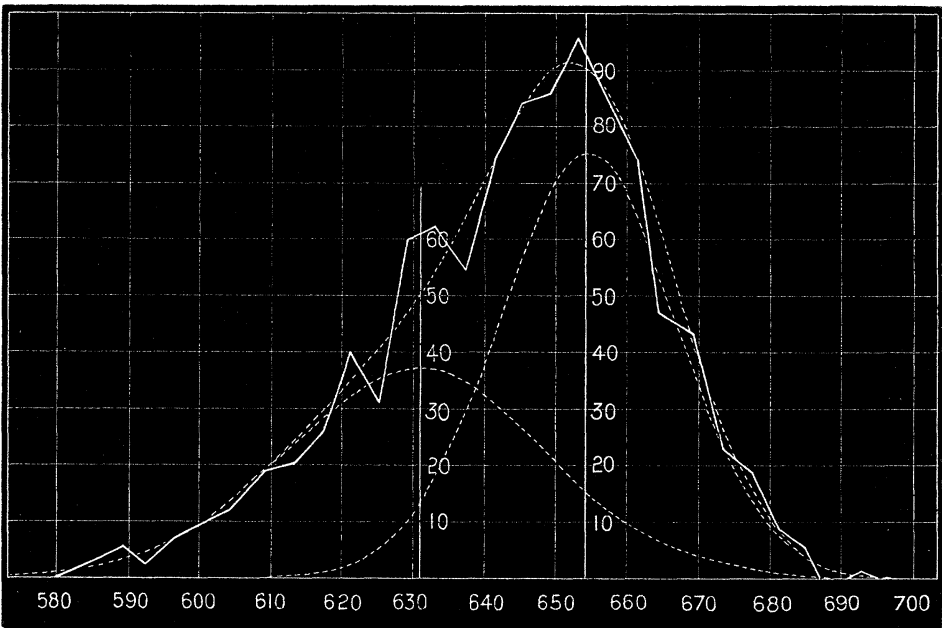


W.F.R. Weldon

Karl Pearson and Francis Galton







From Weldon (1893)



Gregor Mendel



St. Cross Church, Holywell

**The basic idea: (e.g., Provine 1971)**

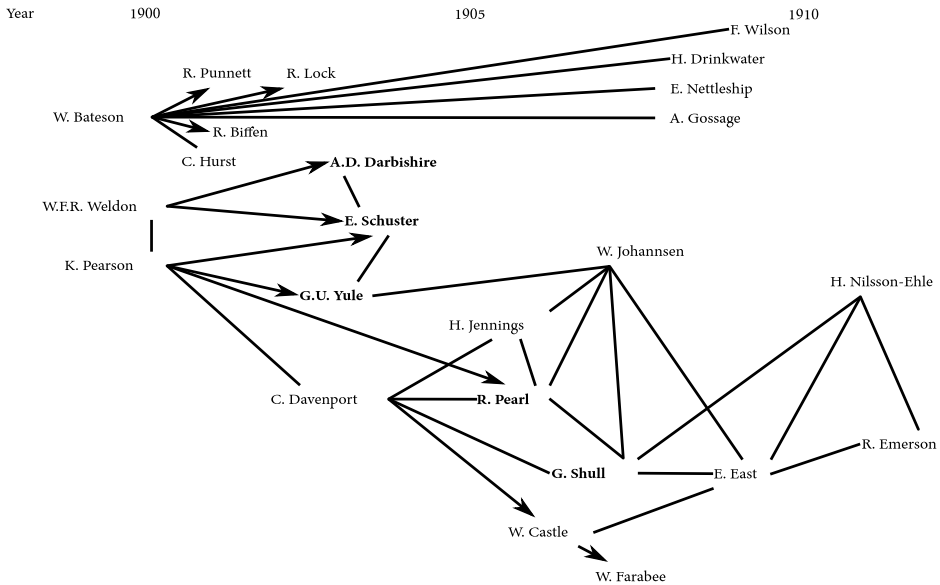
- **1867: Jenkin's review of the *Origin***
- **1892: Bateson's *Materials***
- **1893: Weldon's first biometrical work**
- **1901: Rediscovery of Mendel**
- **1906: Death of Weldon**
- **~1930: Beginning of Synthesis**

# **SOCIOLOGICAL STRUCTURE**

# Explaining Scientific Consensus

Kyung-Man Kim, 1994

*The Case of*



After Fig. 2, Kim 1994

New emphasis: **paradigm articulators** – those who “articulated the still inchoate paradigms by extending and elaborating the theory,” but *without* “evaluat[ing] their mentor’s theory” (Kim 1994, 35)

Five of these – Darbishire, Schuster, Yule, Pearl, and Shull – **converted** from biometry to Mendelism between 1903 and 1910.



**Kim's focus: structures of  
education, training, and theory  
transmission**

**Good! But this is an active  
debate in the literature.**

**Can we detect its signal there?**

# NETWORKS OF DISCOURSE

**From previous work (Pence 2011, 2015) I knew some of this debate played out in *Nature*. Let's find more.**

**A network of around 100 biologists working on heredity published around 2,000 articles in *Nature* between, roughly, 1870 and 1940.**

**Aside: Check out the data! The network I will be describing can be interacted with live at:**

**<https://cpence.github.io/biometry-mendelism/>**



**And all data is at:**

**<https://github.com/cpence/biometry-mendelism>**

**(data: full network, animated network,  
time slices)**

- **-1884:** No robust clustering, standard center-periphery network
- **1885-94:** Slight clustering of those involved in debate
- **1895-99:** Cluster of people involved in debate pulled *out* of broader conversation
- **1900-04:** Bateson and Weldon completely separate from remaining network
- **1905-09:** Last biometrical analysis, Pearson/Pearl working together; Weldon retreats to experimental work, dies
- **1910-:** Back to a cluster-free network

# CONCLUSIONS



**Community structure *is*  
reflected in the structure of  
the network of discourse**

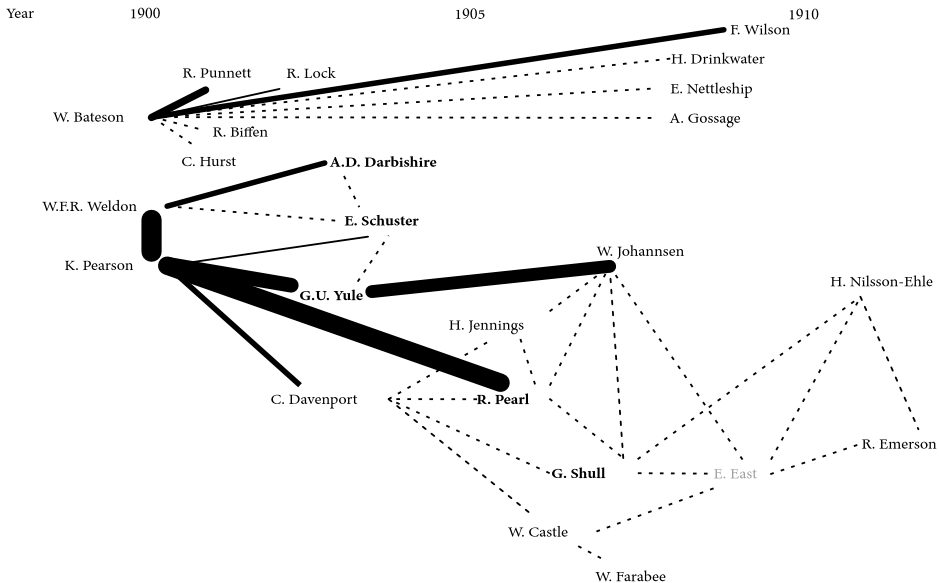
**But! It's not straightforward,  
and the networks of discourse  
give us interesting questions  
to ask about the community.**

**Paradigm “debaters?”**

**Paradigm “warriors?”**

**Participating in debates  
between paradigms *pulls you  
out* of the broader network.**

**Networks of discourse *don't*  
sort paradigm A from paradigm  
B, nor do they give us Kim's  
sociological structure.**



After Fig. 2, Kim 1994, line weight proportional to edge weight in network of discourse, dashed line indicates connection present in Kim but missing in new network. Pearson-Pearl line reduced for clarity.

**You get a variety of links  
*across* paradigms, and those  
connections can be difficult to  
describe in any other robust  
way.**

## Problems and Next Steps:

- This is **just one journal**, broadly based in the UK. Can't see Davenport's school in the US very well.
- Another siloing effect: biometricians **found a new journal, *Biometrika***. Working on data access now.
- **Just one case study!** Need more!

# QUESTIONS?

**charles@charlespence.net**

**<http://charlespence.net>**

**@pencechp**