

THEORIES UNDER STRESS: THE EVOLUTION OF EARLY GENETICS

Leeds HPS Centre Seminar, 24/5/2017

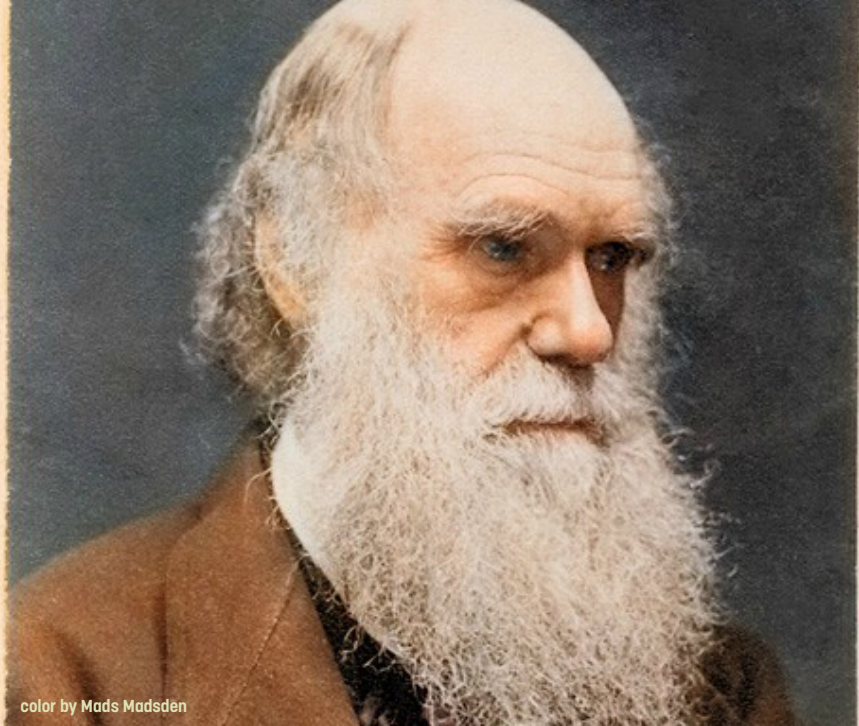
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**How can we understand the
structure of scientific
communities during
theoretical crises?**

THE BIOMETRY / MENDELISM DEBATE



color by Mads Madsen



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



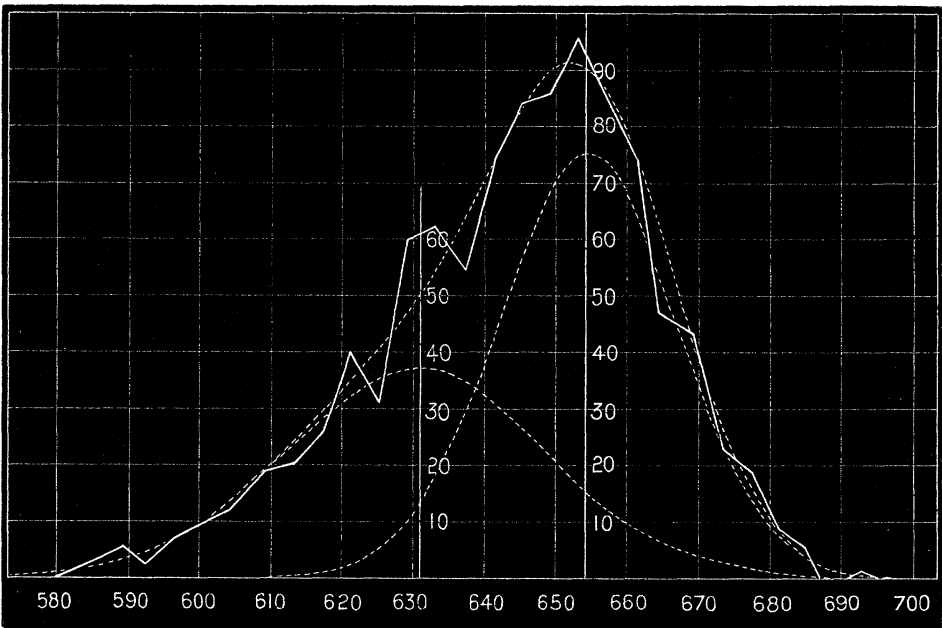
William Bateson, in 1905



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)

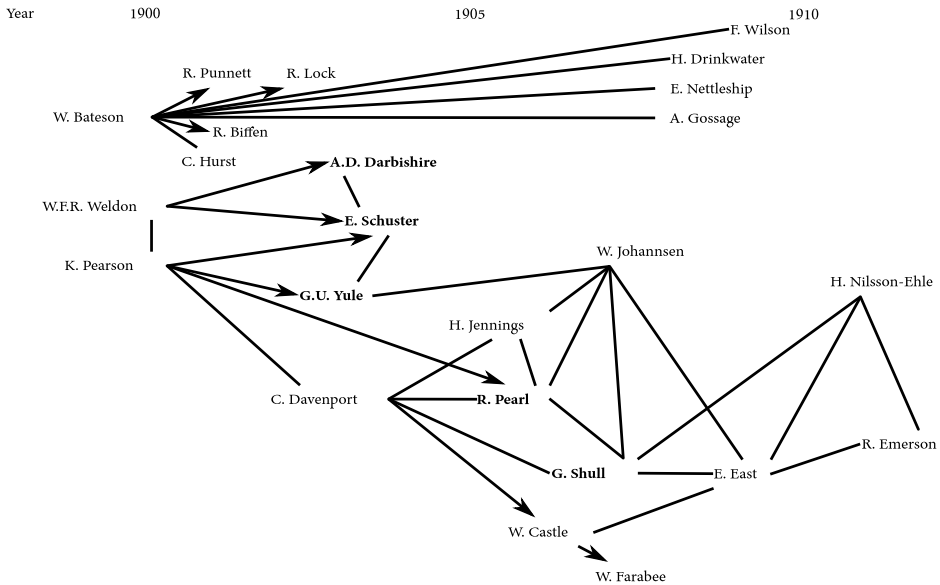
- **1867: Jenkin's review of the *Origin***
- **1892: Bateson's *Materials***
- **1893: Weldon's first biometrical work**
- **1901: Rediscovery of Mendel**
- **1906: Death of Weldon**
- **~1930: Beginning of Synthesis**

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**

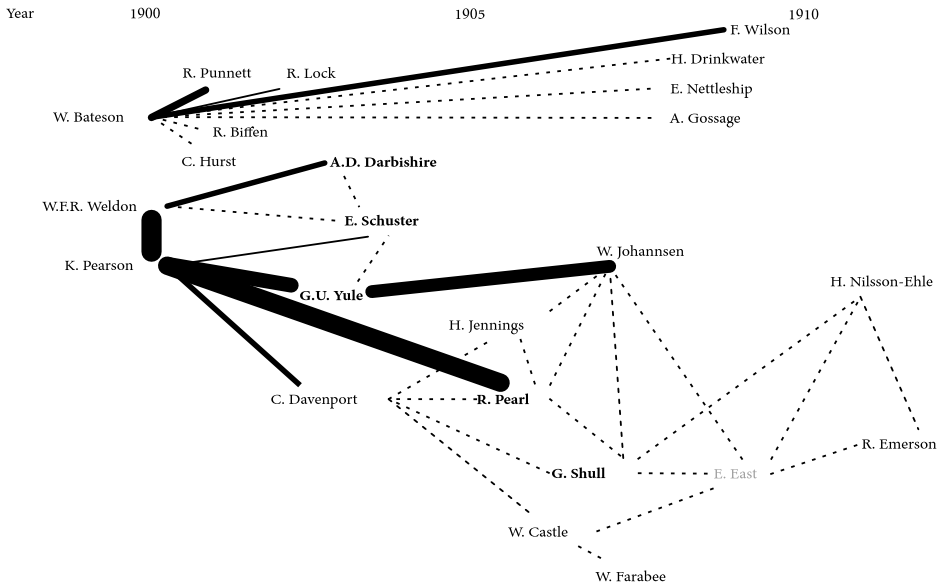
**But! It's not straightforward,
and the networks of discourse
give us interesting questions
to ask about the community.**

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?

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