THEORIES UNDER STRESS: THE EVOLUTION OF EARLY GENETICS

The Science of Evolution and the Evolution of the Sciences, 13/10/2016

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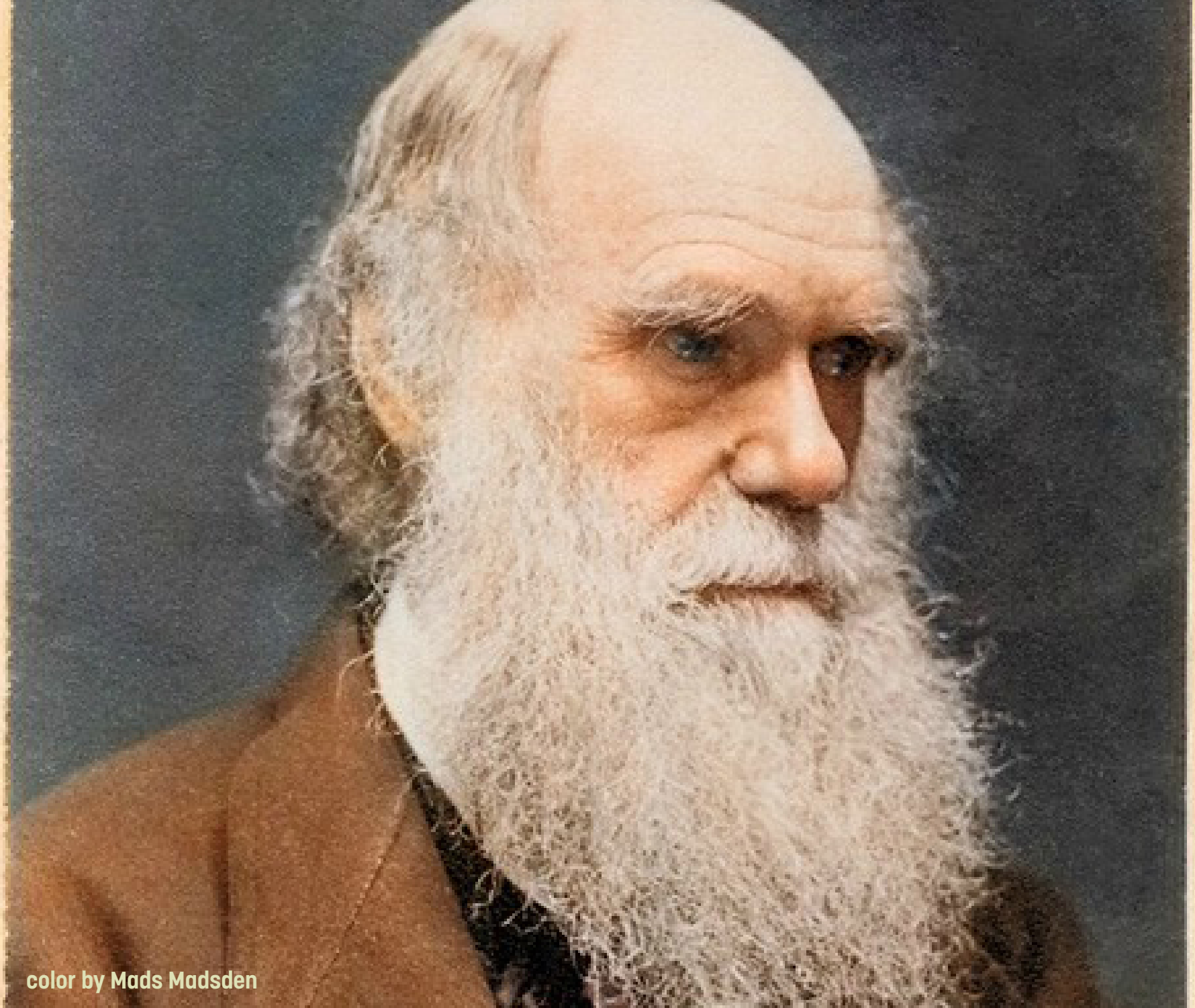
How can we understand the structure of scientific communities during theoretical crises?

THE BIOMETRY / MENDELISM DEBATE

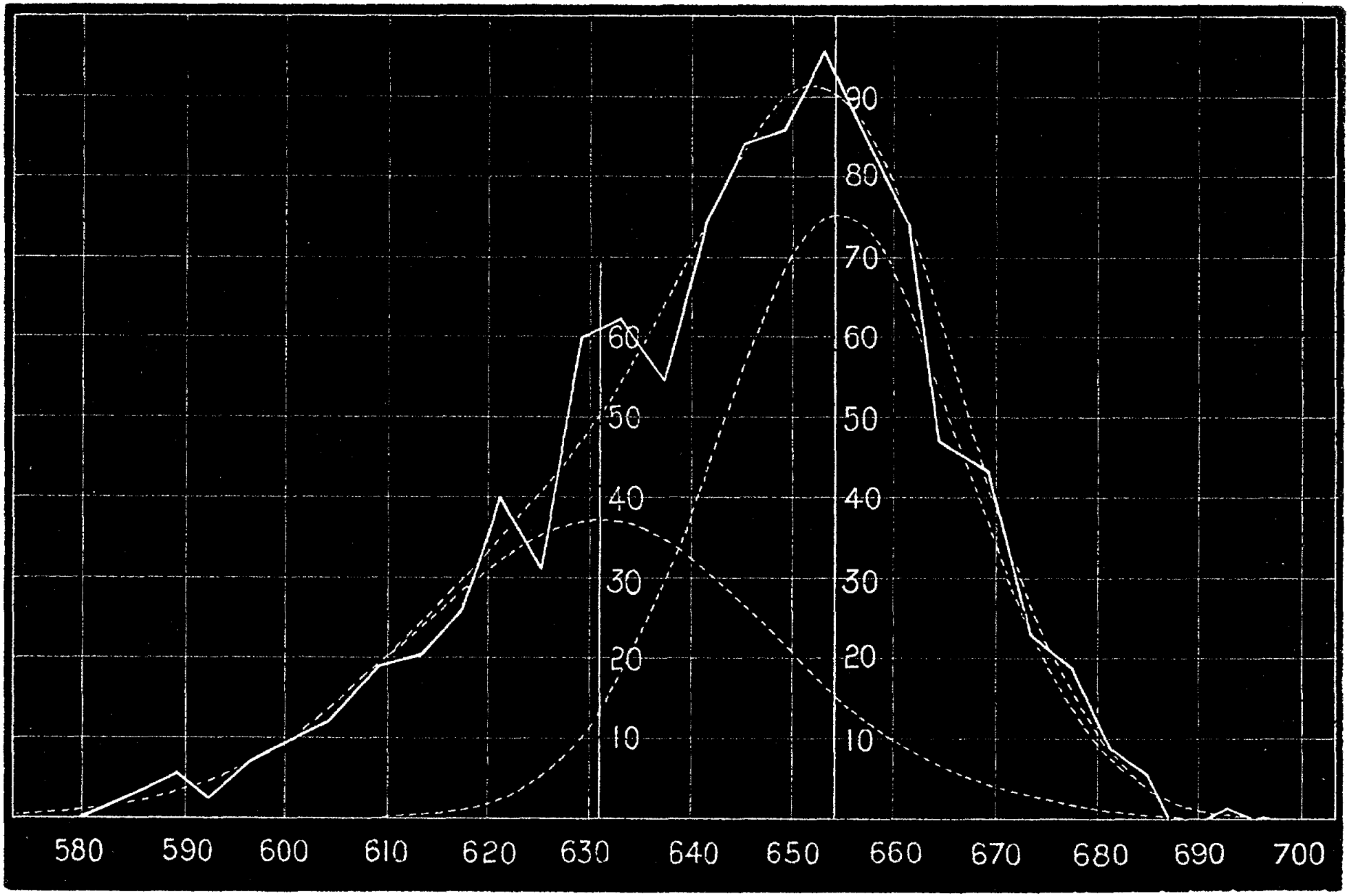

color by Mads Madsden

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)

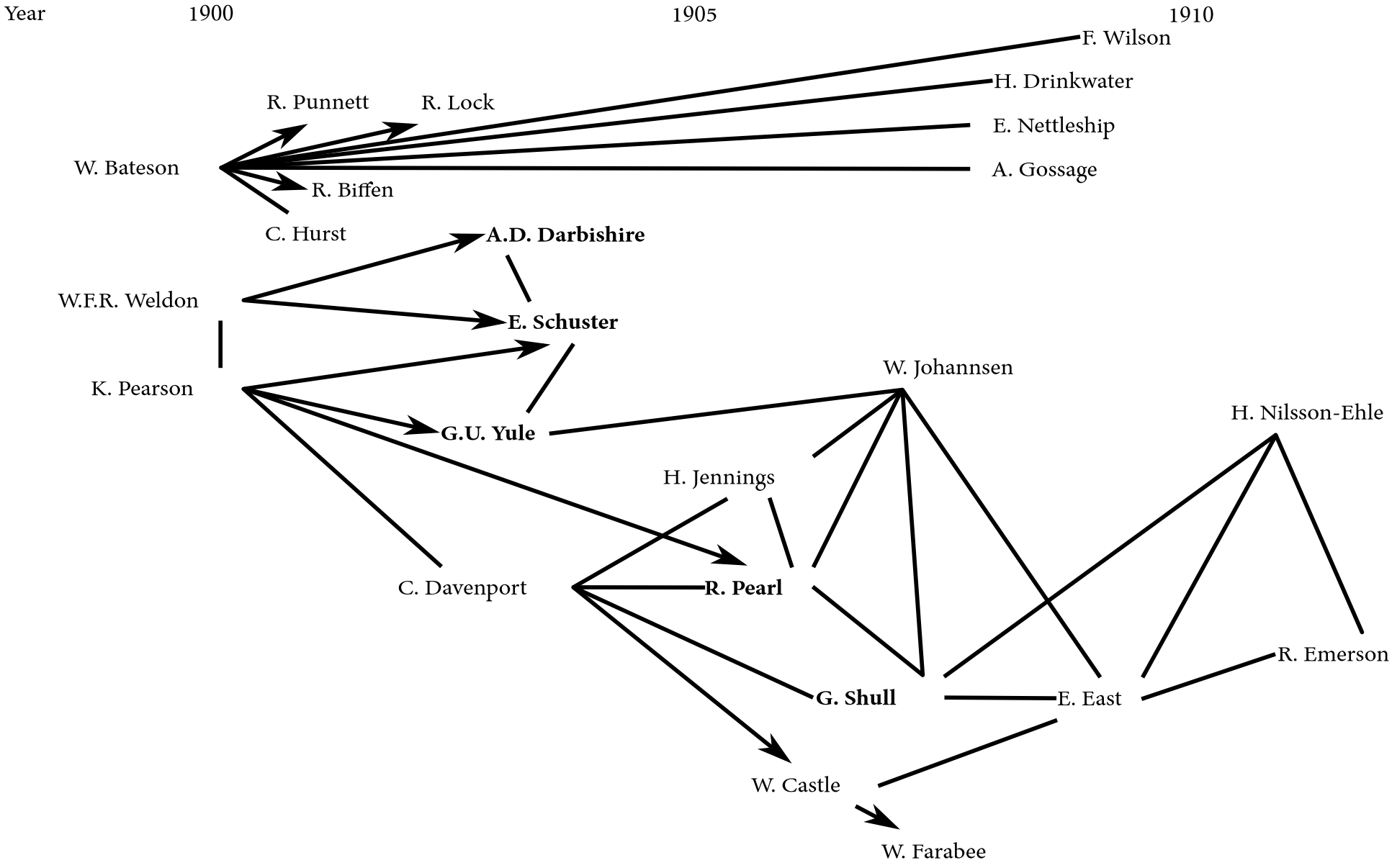
- 1867: Jenkin's review of the *Origin*
- 1892: Bateson's *Materials*
- 1893: Weldon's first biometrical work
- 1901: Rediscovery of Mendel
- 1906: Death of Weldon
- ~1930: Beginning of Synthesis

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)

- –1894: No robust clustering, standard center-periphery network
- 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

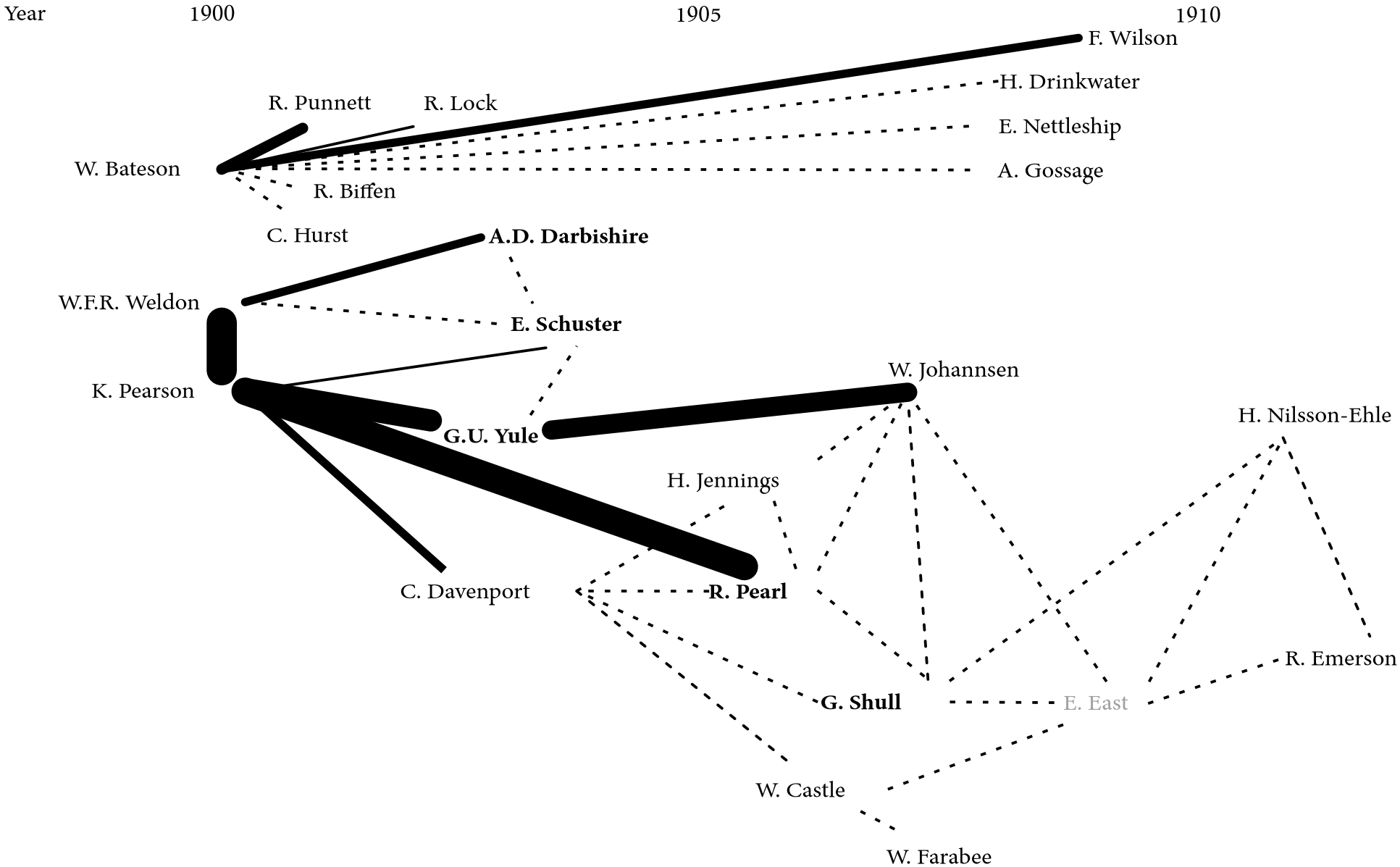
Community structure *is* reflected in the structure of the network of discourse

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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