

Lecture 10: "Mr Darwin's Hypotheses"

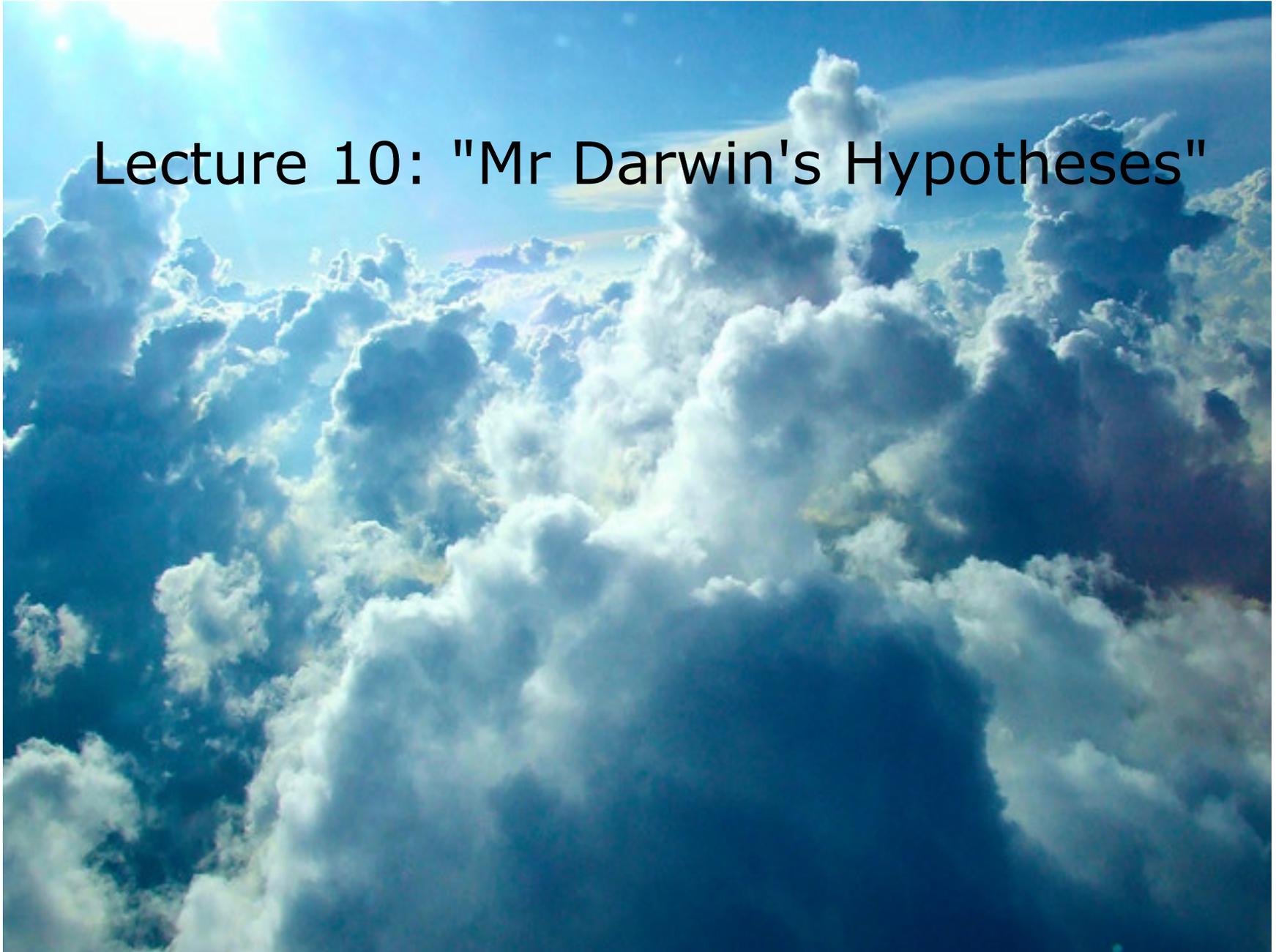


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Outline

1. Wallace's path to a theory
2. Wallace's and Darwin's paths converge
3. The race to the *Origin of Species*
4. How to explain the convergence:
 - How common interests, ideas and influences led two very different men to almost exactly the same theory....

Taking stock: the situation in 1855

- Darwin has been at work on his species theory for 17 years
- Wallace has been searching for a species theory for 10 years
- Wallace publishes “the Sarawak law”, which strongly implies the evolution of species
- Lyell is impressed with Wallace’s paper and shows it to Darwin, who writes to congratulate Wallace, telling him that they seem to be thinking along similar lines....
- And, urged on by Lyell, Darwin starts work – at last! – on a “big book” to be called *Natural Selection*

And three years later, in 1858

- Darwin is roughly 2/3 of the way through *Natural Selection*
- And Wallace is on the island of Ternate in the Moluccas, still working away on the species problem
- ...when he is struck down by a bout of “intermittent fever” (malaria), which “prostrated me for several hours during the day during the cold and succeeding hot fits”
- And then this happened....

“..something led me to think of Malthus..”

“I was then [February, 1858] living at Ternate in the Moluccas, and was suffering from a rather severe attack of intermittent fever, which prostrated me for several hours every day during the cold and succeeding hot fits...

...During one of these fits, while again considering the problem of the origin of species, something led me to think of Malthus' Essay on Population (which I had read about ten years before), and the “positive checks” – war, disease, famine, accidents, etc. – which he adduced as keeping all savage populations nearly stationary...

...It then occurred to me that these checks must also act upon animals, and keep down their numbers; and as they increase so much faster than man does, while their numbers are always very nearly or quite stationary, it was clear that these checks in their case must be far more powerful, since a number equal to the whole increase must be cut off by them every year.”

Wallace's Malthusian "Eureka!" moment

"While vaguely thinking how this would affect any species, there suddenly flashed upon me the idea of the survival of the fittest – that the individuals removed by these checks must be, on the whole, inferior to those that survived. Then, considering the variations continuing occurring in every fresh generation of animals or plants, and the changes of climate, of food, of enemies always in progress, the whole method of specific modification became clear to me, and in the two hours of my fit I had thought out the main points of the theory. That same evening I sketched out a draft of a paper; in the two succeeding evenings I wrote it out, and sent it by the next post.." **where exactly?**

Where did he send it??

Oops!!

"While vaguely thinking how this would affect any species, there suddenly flashed upon me the idea of the survival of the fittest – that the individuals removed by these checks must be, on the whole, inferior to those that survived. Then, considering the variations continuing occurring in every fresh generation of animals or plants, and the changes of climate, of food, of enemies always in progress, the whole method of specific modification became clear to me, and in the two hours of my fit I had thought out the main points of the theory. That same evening I sketched out a draft of a paper; in the two succeeding evenings I wrote it out, and sent it by the next post to Mr. Darwin."

He sent it to Darwin!!

“Your words have come true with a vengeance...”

“My dear Lyell

Some year or so ago, you recommended me to read a paper by Wallace in the Annals, which had interested you & as I was writing to him, I knew this would please him much, so I told him. He has to day sent me the enclosed & asked me to forward it to you. It seems to me well worth reading. Your words have come true with a vengeance that I sh^d. be forestalled. You said this when I explained to you here very briefly my views of “Natural Selection” depending on the Struggle for existence.— I never saw a more striking coincidence. if Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as Heads of my Chapters.”

Darwin, letter to Lyell, 18 June 1858

And now, events move swiftly...

- Darwin receives Wallace's paper in June 1858, and writes seeking Lyell's advice on what to do
- Lyell and Joseph Hooker take over. They
 - ask Darwin for copies of dated manuscripts (including letters) that establish his priority in the discovery of the principle of natural selection
 - arrange for the reading of a joint paper comprising these manuscripts plus Wallace's paper,
 - at a meeting of the Linnæan Society of London in July 1858
 - write to Wallace to tell him what they've done
- Darwin abandons his incomplete manuscript of *Natural Selection*, and sits straight down to write *On the Origin of Species*

Darwin/Wallace paper, 1858

ON THE TENDENCY OF SPECIES TO FORM VARIETIES. 45

On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection. By CHARLES DARWIN, Esq., F.R.S., F.L.S., & F.G.S., and ALFRED WALLACE, Esq. Communicated by Sir CHARLES LYELL, F.R.S., F.L.S., and J.D. HOOKER, Esq.; M.D., V.P.R.S., F.L.S., &c.

[Read July 1st, 1858.]

London, June 30th, 1858.

MY DEAR SIR, ---The accompanying paper, which we have the honour of communicating to the Linnean Society, and which all relate to thr same subject, viz_ the Laws which affect the Production of Vareities, Races, and Species, contain the result of the investigations of two indefatigable naturalists, Mr. Chales Darwin and Mr. Alfred Waalace.

These gentalmen having, independently and unknown to one

But how will Wallace react?

"My dear Sir

I beg leave to acknowledge the receipt of your letter of July last, sent me by Mr. Darwin, & informing me of the steps you had taken with reference to a paper I had communicated to that gentleman. Allow me in the first place sincerely to thank yourself & Sir Charles Lyell for your kind offices on this occasion, & to assure you of the gratification afforded me both by the course you have pursued, & the favourable opinions of my essay which you have so kindly expressed. I cannot but consider myself a favoured party in this matter...."

Wallace, letter to Joseph Hooker, 6 October 1858

Wallace continues...

"...It would have caused me much pain & regret had Mr. Darwin's excess of generosity led him to make public my paper unaccompanied by his own much earlier & I doubt not much more complete views on the same subject, & I must again thank you for the course you have adopted, which while strictly just to both parties, is so favourable to myself."

Wallace, letter to Joseph Hooker, 6 October 1858

Darwin's reaction: Phew!

"My dear Sir

I was extremely much pleased at receiving three days ago your letter to me & that to Dr. Hooker. Permit me to say how heartily I admire the spirit in which they are written. Though I had absolutely nothing whatever to do in leading Lyell & Hooker to what they thought a fair course of action, yet I naturally could not but feel anxious to hear what your impression would be. I owe indirectly much to you & them; for I almost think that Lyell would have proved right & I sh^d. never have completed my larger work, for I have found my abstract hard enough with my poor health, but now thank God I am in my last chapter, but one...."

Darwin, letter to Wallace, January 25th 1859

"But with regard to the material world, we can at least go so far as this—we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general laws."

W. WHEWELL: *Bridgewater Treatise*.

"To conclude, therefore, let no man out of a weak conceit of sobriety, or an ill-applied moderation, think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works; divinity or philosophy; but rather let men endeavour an endless progress or proficience in both."

BACON: *Advancement of Learning*.

Down, Bromley, Kent,
October 1st, 1859.

ON
THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

OR THE
PRESERVATION OF FAVOURED RACES IN THE STRUGGLE
FOR LIFE.

By CHARLES DARWIN, M.A.,

FELLOW OF THE ROYAL, GEOLOGICAL, LINNEAN, ETC., SOCIETIES;
AUTHOR OF 'JOURNAL OF RESEARCHES DURING H. M. S. BEAGLE'S VOYAGE
ROUND THE WORLD.'

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1859.

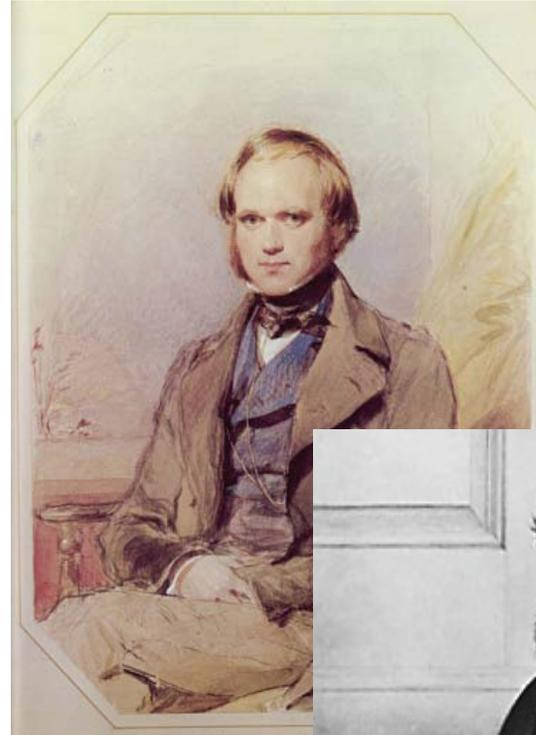
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Aftermath

- On his return to England in 1862, Wallace immediately played an active role in developing & defending the theory of evolution by natural selection
- He continued to contribute actively to the development of evolutionary biology
- As we shall see, he came to differ with Darwin on several important points
- But he always gave Darwin the lion's share of the credit for their theory
- And he even promoted use of the term "Darwinism" (!)

“Simultaneous discoverers”

- Darwin and Wallace are recognized as co-founders of one of the great theories in modern science
- Their near-simultaneous discovery can tell us a lot about the nature of creative steps in science, as well as about the kinds of factors that shaped the modern theory of evolution at its inception



"Creative steps" in science

Question:

What are some candidate key ingredients to the making of creative steps in science?

Candidate ingredients

- New actors
 - *Fresh viewers*
- New observations
 - *Fresh things to be seen*
- New orientations
 - *Fresh perspectives from which to see*
- New connections for old ideas
 - *Fresh contexts in which to interpret what is being seen*

New actors

Darwin

- A young man when he made his discovery
- Relatively well-trained
- Familiar with transformist ideas (from Lamarck, & his grandfather)
- Once he'd hit upon his discovery, Darwin proceeded very cautiously; he had a growing professional reputation, a secure position in London society, and a young family to think about....

Wallace

- A young man when he made his discovery
- Largely self-taught
- Familiar with transformist ideas (largely from the *Vestiges*)
- Once he'd hit upon his discovery, he proceeded apace; he had few influential scientific friends, a reputation to make and no family responsibilities to think about...

New Observations

Darwin

- Naturalist & collector
- Major voyage of discovery
- Collected many new species across large (dis)continuous area
- Saw meaningful patterns in the geological & geographical distribution of species

Wallace

- Naturalist & collector
- Major voyages of discovery
- Collected many new species across large (dis)continuous area
- Saw meaningful patterns in the geological & geographical distribution of species

New orientations

Darwin

- had been trained in natural theology, and took some time to break with Paley's natural theology
- was greatly influenced by the new geology (especially Lyell), and was willing to think in naturalistic terms almost as soon as he was in the field "on his own"

Wallace

- was largely self-trained; he had a penchant for radical ideas and little investment in natural theology
- was greatly influenced by new thinking in natural history, including both Lyell's geology and the *Vestiges of the Natural History of Creation*

New connections for old ideas

Darwin

- Saw domesticated plants & animals as an important source of insights into the mechanism of descent with modification
- saw in Malthus a key to understanding the role of the struggle for existence in the the natural world

Wallace

- Saw domesticated plants & animals as illustrating, not how evolution might work but what happens when the laws of evolution are suspended
- saw in Malthus a key to understanding the role of the struggle for existence in the the natural world

Converging Paths

Darwin

- Victorian naturalist
- Inveterate collector
- Voyage of exploration
- Interested in geological & geographical distribution
- Read Malthus and immediately saw its relevance

Wallace

- Victorian naturalist
- Inveterate collector
- Voyages of exploration
- Interested in geological & geographical distribution
- Read Malthus, and eventually saw its relevance

What does this tell us about “simultaneous discoveries” in science?

- Simultaneous discoveries are (relatively) common in science, because *independent discoveries, while independent of one another, are never independent of a common scientific/cultural context*
- Scientific contemporaries often share similar
 - Experiences, theoretical sources, challenges, observations
- In short, simultaneous discoveries happen because *scientists don't work in a social vacuum*; they work in *overlapping and extensively shared networks of intellectual, personal and social practice*

Darwin & Wallace

Convergence and Divergence?

Darwin

- Gentleman naturalist
- 'Conservative revolutionary'
- Social networker
- Reputation as "great man"

Wallace

- Artisan naturalist
- Consistently radical leanings
- A loner
- Mixed reputation

Wallace's education

- Left school at 13
- Extensively self-taught
- Attended 'halls of science' and mechanics' institutes, institutions of informal education that were also places where radical ideas (in science, in politics, in religion) flourished in early-Victorian society

Wallace's radical causes

Early career (up to 1860):

- phrenology
- mesmerism
- transformism (early fan of *Vestiges*)

Later career (after 1860):

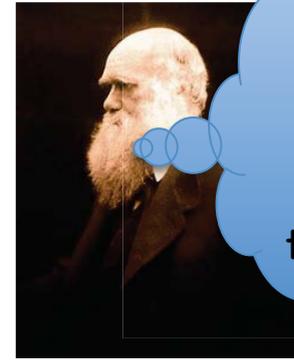
- Spiritualism (mediums, 'table-turning', etc.)
- socialism (including land nationalization)
- women's suffrage

I'm a bit of a radical



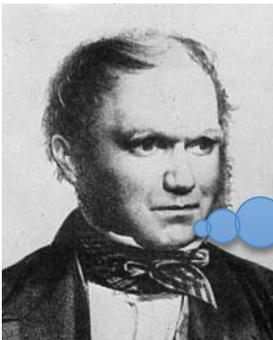
Similar, but different?

I never really wanted to rock the boat



1858
joint
paper

I'm from a distinguished family of Whigs (liberals)



I was never very happy being in the boat in the first place



So...what have we learnt?

- Darwin and Wallace were genuinely 'joint' founders of the theory of evolution by natural selection
- They came to (essentially) the same idea through remarkably parallel biographical experiences
- Nevertheless, each was 'his own man'; and after 1859, they would disagree on many specific issues

A lesson for today?

- Nonetheless, the way in which they handled their joint ownership of modern evolutionary theory was exemplary.
- They never, ever
 - Disputed each other's priority to the theory
 - Grumbled about the credit the other received for the discovery
 - Became embittered rivals

How amazing is that?!!

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