Charles Darwin and Sir John F.W. Herschel

CLMPS 2015, Helsinki, Finland, 2015/8/7

Charles H. Pence

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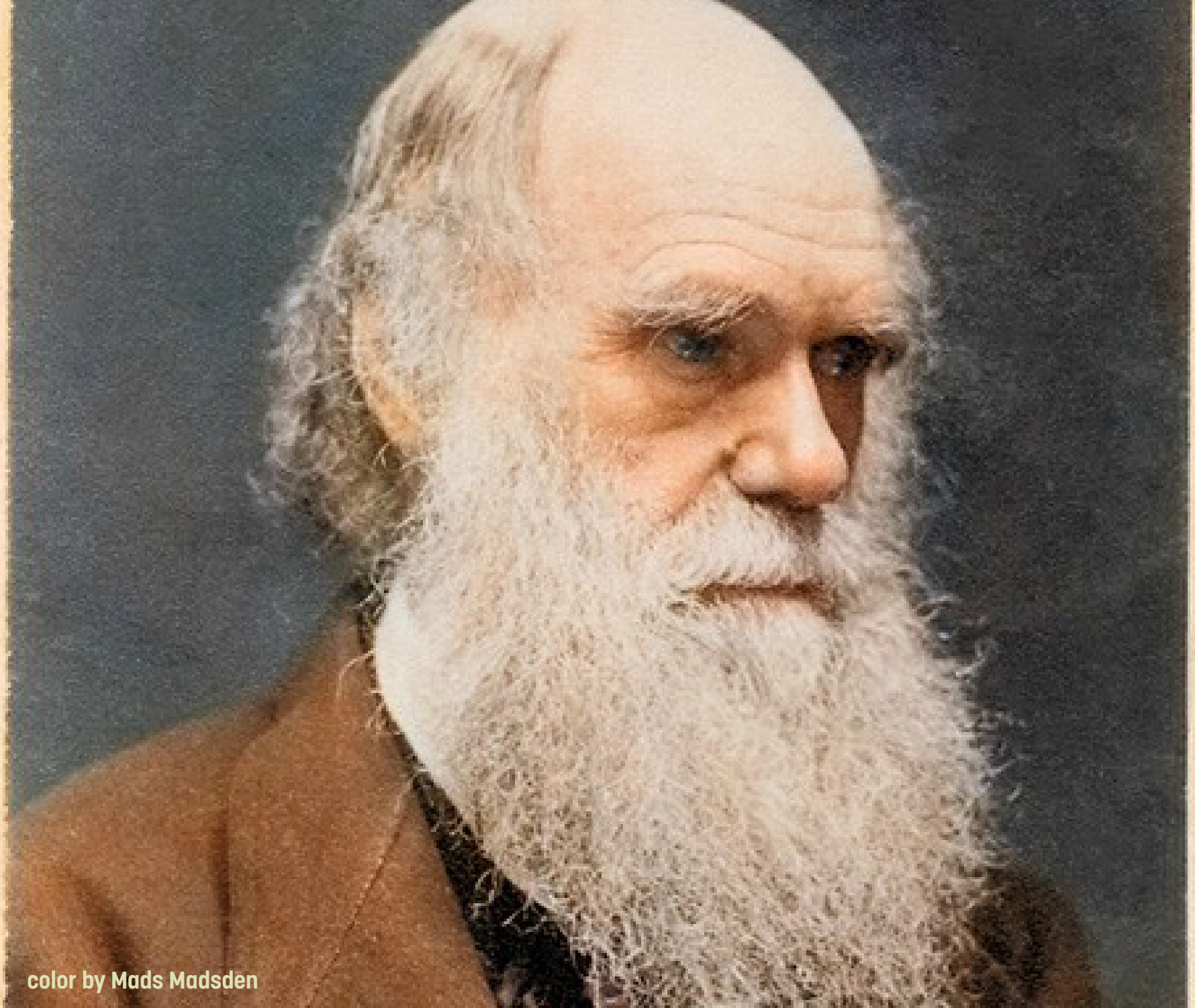
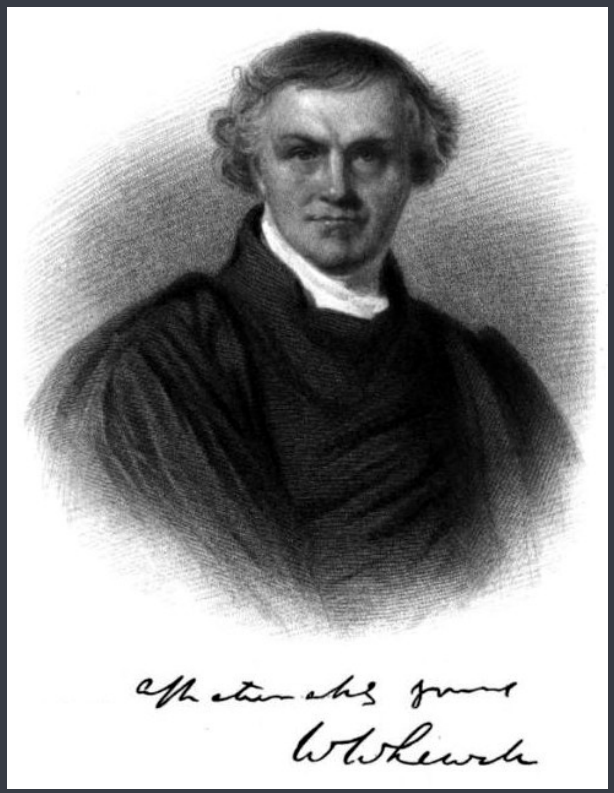
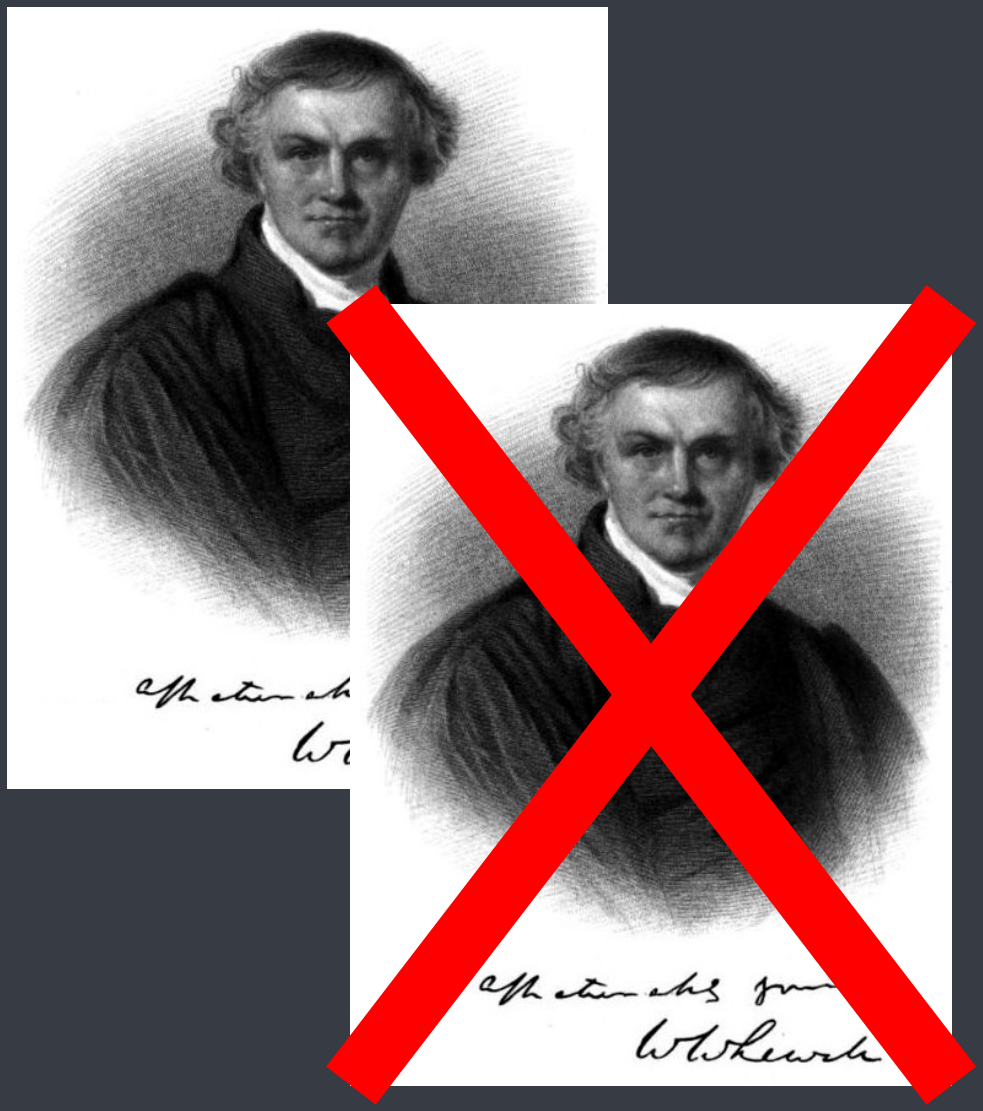
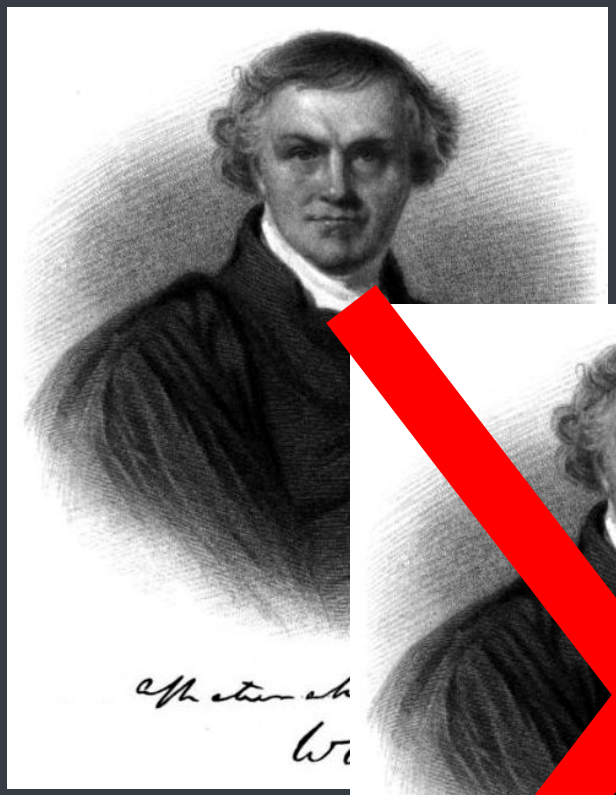

color by Mads Madsden

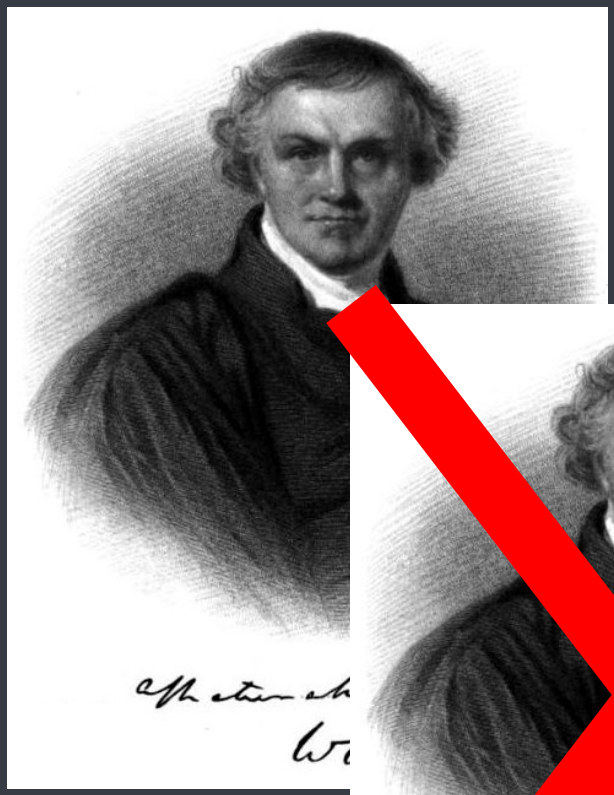
DARWIN'S INFLUENCES







SIR JOHN FREDERICK WILLIAM HERSCHEL, BART F.R.S.



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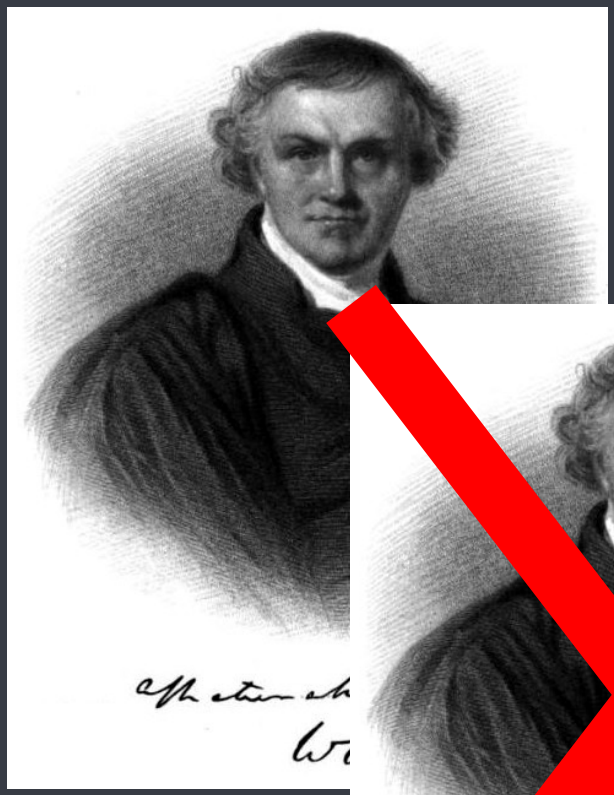

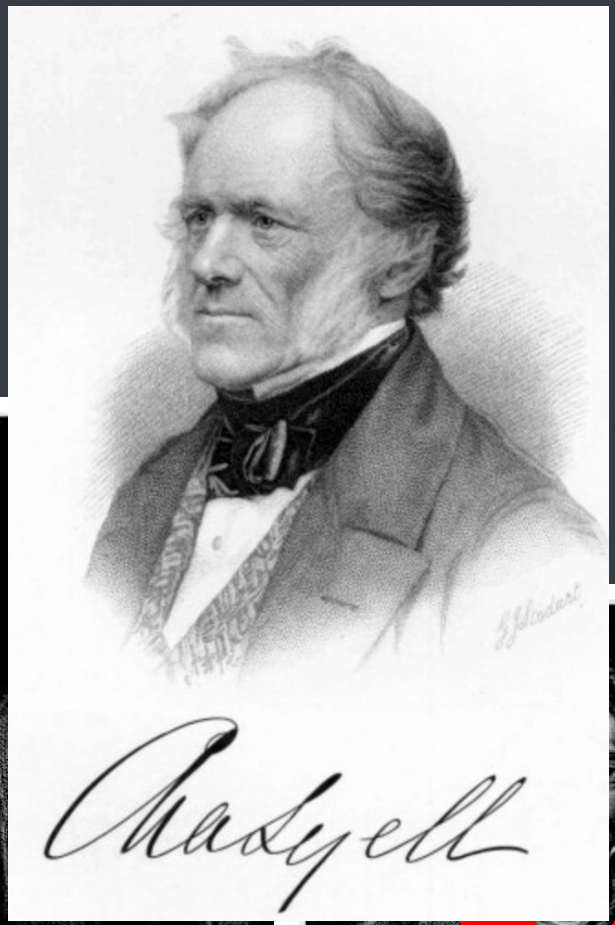

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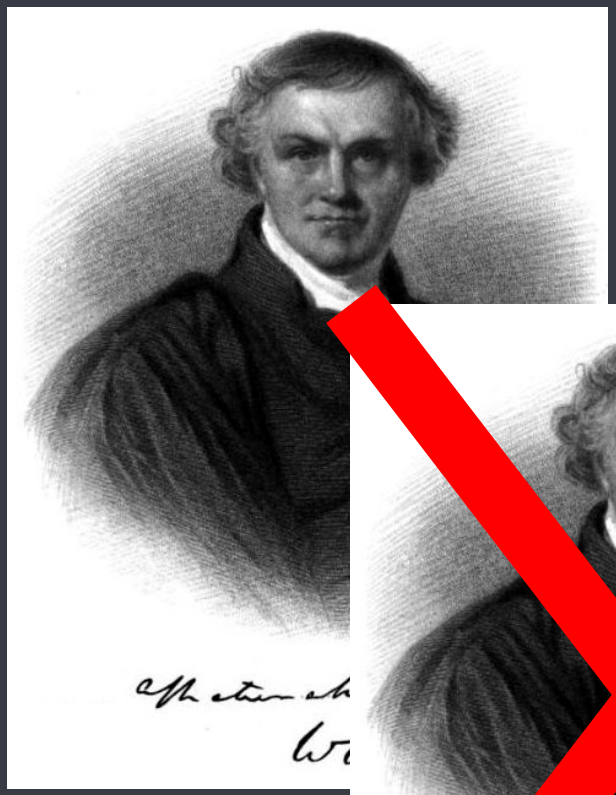

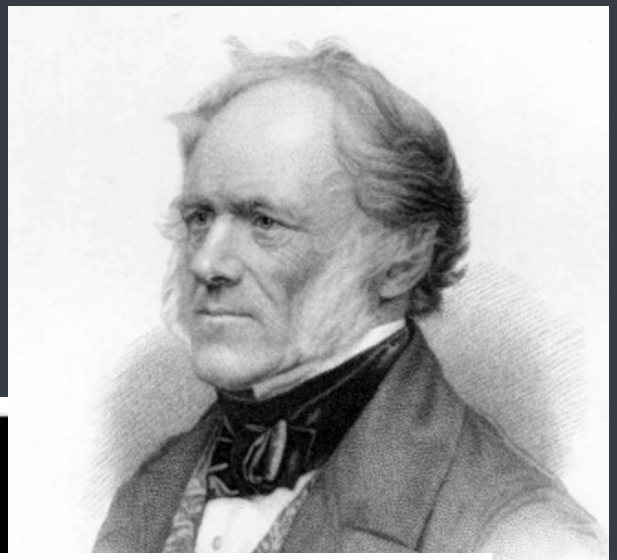

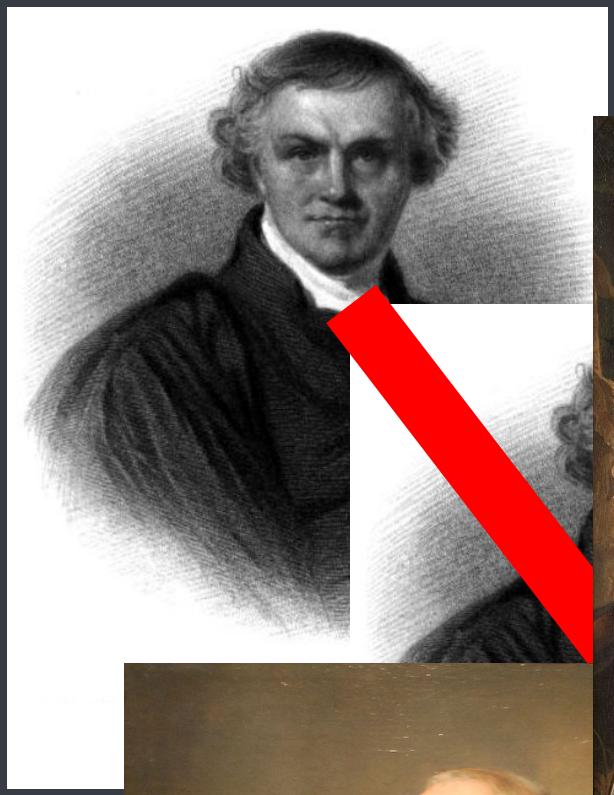


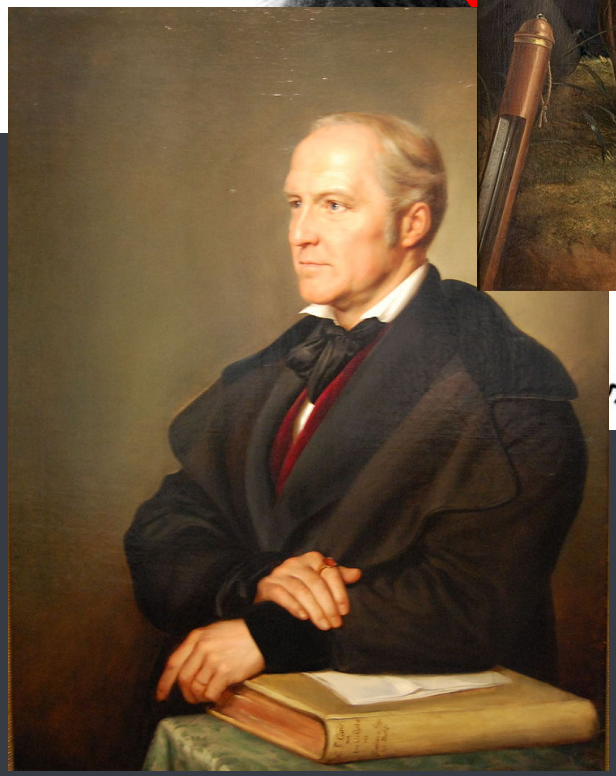

photograph by Julia Margaret Cameron, 1867


JOANNES HERSCHEL
GULIELMI HERSCHEL
NATU OPERE FAMA
FILIUS UNICUS
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VIXIT LXXIX ANNOS
BIIT UNDECIMO DIE MAII
A.D. MDCCCLXXI.
CHARLES ROBERT DARWIN
BORN 12 FEBRUARY 1809
DIED 19 APRIL 1882

HERSCHEL ON METHOD

Natural Philosophy.

A PRELIMINARY DISCOURSE

ON

THE STUDY OF NATURAL PHILOSOPHY.

BY

J. F. W. HERSCHEL, ESQ. M.A.

OF ST. JOHN'S COLLEGE, CAMBRIDGE.

LONDON:

PRINTED FOR

LONGMAN, REES, ORME, BROWN, AND GREEN,

PATERNOSTER-ROW;

AND JOHN TAYLOR,

UPPER GOWER STREET.

1831.

Baconian induction: "an enumeration, if not complete, … at least of considerable extent, of [nature's] materials and combinations" (*PD* s.129)

Arbitrary hypotheses: "[W]e must not, therefore, be scrupulous as to how we reach to a knowledge of such general facts: provided only we verify them carefully when once detected, we must be content to seize them wherever they are to be found" (*PD* s.170)

[Proposed causes] must be *verae causae,* in short, which we can not only show to exist and to act, but the laws of whose action we can derive independently, by direct induction, from experiments purposely instituted; or at least make such suppositions respecting them as shall not be contrary to our experience, and which will remain to be verified.... (*PD* s.209)

A *vera causa* is a cause that:

1. is already known to exist
2. either:

   (a) has produced experimental phenomena other than those which it was originally proposed to explain, *or*

   (b) is at least not contrary with experience, and will be verified later

Success at finding *vera causa* will "mainly depend, 1st, On the number and variety of causes experience has placed at our disposal; 2dly, On our habit of applying them to the explanation of natural phenomena; and, 3dly, On the number of analogous phenomena we can collect, which have either been explained, or which admit of explanation by some one or other of those causes" (*PD* s.141)

The *vera causa* principle:

A low bar.

Whenever, therefore, we think we have been led by induction to the knowledge of the proximate cause of a phenomenon … our next business is to examine deliberately and *seriatim* all the cases we have collected of its occurrence, in order to satisfy ourselves that they are explicable by our cause….

(*PD* s.172)

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(*PD* s.172)

ADEQUACY

[O]ur next step in the verification of an induction must therefore consist in *extending* its application to cases not originally contemplated: in studiously varying the circumstances under which our causes act, with a view to ascertain whether their effect is general; and in pushing the application of our laws to extreme cases. (*PD* s.176)

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CONSILIENCE

0. Hypotheses derived either by enumerative induction or speculation
1. Basic criterion: grounded in *verae causae* (are or are analogous to known causes)
2. Verification: *adequate* to the production of the phenomena
3. Verification: *universality* via *consilience* with extreme or surprising data

DARWIN'S METHOD

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, LINNÆAN, ETC., SOCIETIES;

1. The analogy with artificial selection (ch. 1–3): the *vera causa* principle

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2. The ability of natural selection to produce the observed species and genera (ch. 4–9): adequacy

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2. The ability of natural selection to produce the observed species and genera (ch. 4–9): adequacy
3. Natural selection's responsibility for diverse phenomena (ch. 10–13): consilience

HERSCHEL'S OBJECTIONS

I have heard by round about channel that Herschel says my Book “is the law of higgledy-piggletey”.– What this exactly means I do not know, but it is evidently very contemptuous.– If true this is great blow & discouragement. (Darwin to Lyell, Dec. 10, 1859)

We can no more accept the principle of arbitrary and casual variation and natural selection as a sufficient account, *per se,* of the past and present organic world, than we can receive the Laputan method of composing books (pushed *a l'outrance*) as a sufficient one of Shakspeare [sic] and the Principia. Equally in either case, an intelligence, guided by a purpose, must be continually *in action* to bias the directions of the steps of change – to regulate their amount – to limit their divergence – and to continue them in a definite course. We do not believe that Mr. Darwin means to deny the necessity of such intelligent direction. (Herschel, *Physical Geography,* 1861, footnote)

But [intelligent direction] does not, so far as we can see, enter into the formula of his law, and without it we are unable to conceive how the law can have led to the results. On the other hand, we do not mean to deny that such intelligence may act according to a law (that is to say, on a preconceived and definite plan). Such a law, stated in words, would be no other than the actual observed law of organic succession; or one more general, taking that form when applied to our own planet, and including all the links of the chain which have disappeared. But the one law is a necessary supplement to the other, and ought, in all logical propriety, to form a part of its enunciation. Granting this, and with some demur as to the genesis of man, we are far from disposed to repudiate the view taken of this mysterious subject in Mr. Darwin's work. (cont'd from last)

nature gives successive variations; man adds them up in certain directions useful to him. In this sense he may be said to make for himself useful breeds. (p. 30)

She can act on every internal organ (p. 83)

should plainly bear the stamp of far higher workmanship? (p. 84)

D. recognizes an unknown cause of slight individual differences – but claims for "natural selection" the character of a "sufficient theory" in regard to the results of those differences. (end ch. 5)

Darwin's ch. 5: the adequacy case

Herschel's objection: Darwin's theory cannot be adequate without a sufficient understanding of variation

1. Basic criterion: grounded in *verae causae* (are or are analogous to known causes) (*Origin* ch. 1–3)
2. Verification: *adequate* to the production of the phenomena (*Origin* ch. 4–9)
3. Verification: *universality* via *consilience* with extreme or surprising data (*Origin* ch. 10–13)

KIITOS!

Extra thanks to Stephen Case, Olivet Nazarene Univ.

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Alternative reading	Troubles
Early Ruse, Schweber, Sober: hypothetico-deductive model	Darwin tried this and rejected it (Hodge, 2009)
Recker, Ruse: a Herschellian analogy + a Whewellian consilience	anachronistic; Whewell objects to analogies; bad reading of Herschel
Hodge: existence, adequacy, and responsibility all part of demonstrating a Herschellian *vera causa*	almost right, but misreads Herschel's use of the VCP