Studies in History and Philosophy of Science xxx (xxxx) xxx

Contents lists available at ScienceDirect

Studies in History and Philosophy of Science

journal homepage: www.elsevier.com/locate/shpsa

Introduction

'History will be kind to me': An introduction to new directions in the historiography of genetics

'History will be kind to me, for I intend to write it,' Winston Churchill is famously said to have quipped. That he never seems to have actually made this comment is beside the point, since the message is important: past events never speak for themselves. Facts do not settle like rocks in a dry river, but are moved, displaced, and replaced by waters that continue to gush. The currents and their temperates are sensetative to mores, signs of their times. And the keepers of the waters, more often than not, are historians.

But not all rivers are equally managed. The histotiography of the life sciences, for example, has been comparatively neglected by historians. A recent book attempts to fill this lacuna (Dietrich, Borrello, & Harman, 2021). It is important that historians of biology are aware of what fellow practitioners had to say before them, and it is a fantasy to believe, as some who do not value intellectual forerunners, that something can come of nothing. At the same time, it is crucial to allow the rivers to continue to roar: new interpretations, and even the uncovering of new facts, are what keep history alive.

This special issue is devoted to new directions in the historiography of genetics, a field that has seen particularly lively drift, swirl, and surge in recent decades. Radical re-assessments of the history of genetics have been offered for most of the major turning points in the field, and many of its salient features, going back to its inception. Gregor Mendel's *Versuche über Pflanzen-Hybriden*, for example, is no longer simply regarded as a study of the problem of heredity but has been placed more deliberately in the Moravian agricultural context from which it spawned (e.g. Gliboff, 1999; Müller-Wille & Orel, 2007; Olby, 1979; Shan, 2021). The so-called 'rediscovery' story has been greatly reshaped to the point of suggesting a renaming (e.g., Meijer, 1985; Rheinberger, 1995; Simunek et al., 2011). And the Mendelian-biometrician controversy has also been repeatedly re-examined and re-framed (e.g., Ankeny, 2000; Sloan 2000; Pence, 2011; Radick, 2005; Shan, 2020).

Still other themes have been revisited. The gene-centric narrative of the history of genetics has been seriously challenged (e.g., Keller, 2000; Oyama, 2000; Waters, 2006; Falk 2009), buttressed by histories of outliers to the evolutionary synthesis (Shloegel, 1999; Dietrich 2003; Harman, 2004; Richmond, 2007), accompanied by increasing interest in the historiographical role of the genome as a counterweight to the reductionist pursuit of the gene (Lamm, 2014, 2015). The role of the molecularization of biology has been highlighted (Morange, 2020). The history of developmental biology also has been retold (Kirschner & Gebhart, 2005; Laubichler, 2007; Crowe et al., 2015), as has the relationship between genetics, eugenics, and medicine (Comfort, 2012). The significance and role of women in the history of genetics continues to be reassessed (e.g. Dietrich & Tambasco, 2007; Richmond, 2007, 2017; Markel, 2021). And the roles of non-Western geneticists and the networks they created are increasingly in focus (e.g. Dietrich, 2016). Adding to the plethora of scholarship on emerging topics in the field, this special issue specifically explores novel approaches in the historiography of genetics, with the hopes of providing innovative reflections and perspectives.

In 'Mendel the fraud? A social history of truth in genetics,' Greg Radick re-examines a great myth about Mendel's work. Widely acknowledged as the father of genetics, Mendel has been accused of faking his data. From the time of R.A. Fisher, the statistics that Mendel reported in his experiments on *Pisum* just seemed too good to many commentators to be entirely true. Radick suggests that the history of interest in Mendel's data itself has an intriguing structure. He shows that although the data problem was first noted by W.F.R. Weldon in 1901 and rediscovered by Fisher in 1911, there was no public outcry over Mendel's data nor concerns about its truthfulness in the following decades. Radick argues that the so-called data problem became widely discussed and raised high levels of concern beginning in the 1960s for reasons having as much to do with Cold War geopolitics as with traditional concerns about the objectivity of science. He contends that appreciating the Cold War origins of the problem can be a helpful step in shifting both the scientific and historiographic discussions in more productive directions.

Adam Krashniak and Ehud Lamm revisit the work of another pioneer in the study of heredity, Francis Galton. In 'Francis Galton's regression towards mediocrity and the stability of types,' they argue against the received view that, after 1885, Galton came to explain the fact that offspring deviated less from the mean value of the population than their parents did as a population-level statistical phenomenon and not as the result of the processes of inheritance. Krashniak and Lamm show that Galton did not explain regression towards mediocrity statistically, and did not give up on his ideas regarding an inheritance process that caused offspring to revert to the mean; these ideas were tied to his notion of the stability of the organism. They further argue that Galton's concept of regression towards mediocrity is significantly different from the modern statistical concept of regression to the mean. Galton is therefore best viewed as a transitional figure in the understanding of the statistical phenomenon of regression to the mean. Accordingly, the authors argue for closer attention by historians of genetics to Galton's other intellectual pursuits and their specific contexts, in particular, anthropology and anthropometry.

Charles Pence re-examines the so-called Mendelian-biometrician controversy at the beginning of the twentieth century by carefully revisiting the work of the biometricians, especially Weldon. In 'Of Stirps and Chromosomes: Generality Through Detail,' he argues against the assumption that one of the biometricians' great flaws was their inability

https://doi.org/10.1016/j.shpsa.2022.09.009

Available online xxxx
0039-3681/

to look past their population-focused, statistical, and gradualist understanding of evolutionary change. To the contrary, developments in cellular biology around 1900 were very much central to their claims. Pence shows that the work of the biometricians was, from its earliest days, fundamentally concerned with connections between statistical patterns of inheritance and the underlying cellular features that gave rise to them. He elaborates on how they conceived that such a connection could be established by providing an outline of their underlying philosophy of science.

Yafeng Shan challenges the traditional historiography of the Mendelian-biometrician controversy in a more radical way. In 'Beyond Mendelism and Biometry,' he argues that the Mendelian-biometrician distinction is no longer a useful conceptual tool for the historiography of genetics and should be abandoned. Shan argues that the distinction fails to reflect the diversity of the contenders' views on heredity in the debate, as well as their nuanced dynamics, holding that it impedes a better understanding of genetics in the first decade of the twentieth century. He concludes that we can only develop a fuller understanding of the development of genetics and the biological sciences in the 1900s if we go beyond the Mendelian-biometrician dichotomous framework.

In 'Kristine Bonnevie's theories on the genetics of fingerprints, and their application in Germany,' Amir Teicher provides a historical reconstruction of the efforts to geneticize fingerprints as a Mendelian phenomenon, focusing on the theories put forward by the Norwegian biologist Bonnevie. Teicher argues against the typical historiographical narrative, which portrays Bonnevie's methods as lacking in genuine scientific validity and reliability, and views their adoption as yet another case of zealous Nazi scientists rushing to implement oversimplistic genetic models to support their eugenic and racial goals. He claims that German and Austrian scientists were eager to use any available biological knowledge to assess questions of paternity, among other issues, but that this eagerness does not imply that they were simple-minded or methodologically lax. Teicher indicates that the developments in Bonnevie's work may be seen as a reflection of tensions that far surpass her own agency and are inherent to the challenges she took upon herself. Key tensions arose due to the complexity of the object of study and the reductionist framework of Mendelian genetics, the uncertainty inherent to data on human families as compared to the desire to extract fixed patterns from them, and, more generally, because of the disjunction between the sterility of scientific theories and the coarseness and ambivalence of real-life phenomena. Teicher maintains that the history of genetics should be viewed more generally as a history of navigating these tensions.

Following Joan Scott's suggestion that gender is a legitimate and necessary category of historical analysis, Marsha Richmond revisits the role of women in the history of genetics. In 'The imperative for inclusion: A gender analysis of genetics,' she focuses on women's places in three important experimental research institutions of classical genetics in the UK, US, and Germany, and in the leading university-based research program of T.H. Morgan at Columbia. Richmond argues that gender analysis provides a promising approach to the comparative and systematic study of the development of genetics, and in turn offers the prospect of providing a richer historiography of genetics. As she concludes, the imperative for inclusion–of both women and gender analysis–will not only result in a more equitable and informative picture of the discipline's development, but also yield a historiography that more faithfully reflects the activities associated with doing science.

The papers in this special issue, together with other recent scholarship in this field, attest to the exciting new challenges in the historiography of genetics. Far from being a tired, well-established story of progressive discovery, this innovative work problematizes and adds rich texture to fundamental aspects of the history of genetics. These include the social practices of science (Richmond, this issue); the periodization of the history of genetics (Shan, this issue); the relations between theory and evidence (Pence, this issue; Krashniak and Lamm, this issue); and reception studies and the biases of history that accompanied the success of the molecular genetic paradigm (e.g., Veigl, Harman, & Lamm, 2020), as well as situating the writing of the history of genetics within broader cultural history (Radick, this issue).

Most of the papers in this special issue emerged from the 32nd Annual International Workshop on the History and Philosophy of Science: 'New Directions in the Historiography of Genetics,' which took place in November 2019 at the Cohn Institute of History and Philosophy of Science and Ideas, Tel Aviv University, Israel. The workshop was generously funded by the Van Leer Jerusalem Institute. We would like to thank the authors who have contributed to this special issue, as well as our colleagues at the Inter-University History and Philosophy of Life Sciences program, the Cohn Institute, and the Van Leer Institute. The work of writing the history of genetics continues. And while it would seem that Churchill did not promise to ensure his posterity by writing his own history (though he tried to do so in practice), he did say these sage words: "Success is not final, failure is not fatal, it is the courage to continue that counts."

References

Ankeny, R. A. (2000). Marvelling at the marvel: The supposed conversion of A. D. Darbishire to mendelism. *Journal of the History of Biology, 33*(2), 315–347.
Comfort, N. (2012). *The science of human perfection: How genes became the heart of American medicine*. New Haven, CT: Yale University Press.
Crowe, N., Dietrich, M. R., Alomepe, B. S., Antrim, A. F., ByrneSim, B. L., & Yi, H. (2015). The diversification of developmental biology. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences, 53*, 1–15.
Dietrich, M. R. (2003). Richard Goldchmidt: Hopeful monsters and other "Heresies". *Nature Reviews Genetics, 4*, 68–74.
Dietrich, M. R. (2016). Experimenting with sex: Four approaches to the genetics of sex reversal before 1950. *History & Philosophy of the Life Sciences, 38*, 23–41.
Dietrich, M. R., Borrello, M., & Harman, O. (2021). In *Handbook of the Historiography of Biology*. Cham: Springer.
Dietrich, M. R., & Tambasco, B. H. (2007). Beyond the boss and the boys: Women and the division of labor in Drosophila genetics in the United States, 1934-1970. *Journal of the History of Biology, 40*(3), 509–528.
Gliboff, S. (1999). Gregor Mendel and the laws of evolution. *History of Science, 37*, 217–235.
Harman, O. (2004). *The Man Who Invented the Chromosome: A Life of C.D. Darlington*. Cambridge, MA: Harvard University Press.
Keller, E. F. (2000). *The Century of the Gene*. Cambridge, MA: Harvard University Press.
Kirschner, M., & Gebhart, J. (2005). *The Plausibility of Life: Resolving Darwin's Dilemma*. New Haven, CT: Yale University Press.
Lamm, E. (2014). The genome as a developmental organ. *Journal of Physiology, 592*(11), 2237–2244.
Lamm, E. (2015). Systems thinking versus population thinking: Genotype integration and chromosomal organisation. *Journal of the History of Biology, 48*(4), 641–677.
Laubichler, M. (2007). Evolutionary developmental biology. In D. Hull, & M. Ruse (Eds.), *The Cambridge Companion to the Philosophy of Biology* (pp. 342–360). Cambridge: Cambridge University Press.
Markel, H. (2021). *The Secret of Life: Rosalind Franklin, James Watson, Francis Crick, and the Discovery of DNA's Double Helix*. New York: W.W. Norton.
Meijer, O. G. (1985). Hugo de Vries No mendelian? *Annals of Science, 42*(3), 189–232.
Morange, M. (2020). *The Black Box of Biology: A History of the Molecular Revolution*. Cambridge, MA: Harvard University Press.
Müller-Wille, S., & Orel, V. (2007). From linnaean species to mendelian factors: Elements of hybridism, 1751-1870. *Annals of Science, 64*(2), 171–215.
Olby, R. C. (1979). Mendel No mendelian? *History of Science, 17*(1), 53–72.
Oyama, S. (2000). *Evolution's Eye*. Durham, NC: Duke University Press.
Pence, C. H. (2011). The statistical philosophies of W. F. R. Weldon and Karl Pearson. *Studies in History and Philosophy of Biological and Biomedical Sciences, 42*(4), 475–485.
Radick, G. (2005). Other histories, other biologies. *Royal Institute of Philosophy Supplement, 80*(56), 3–47.
Rheinberger, H.-J. (1995). When did correns read gregor Mendel's paper? *Isis, 86*(4), 612–616.
Richmond, M. L. (2007). Opportunities for women in early genetics. *Nature Reviews Genetics, 8*(11), 897–902.
Richmond, M. L. (2017). Women as public scientists in the atomic age: Rachel Carson, Charlotte Auerbach, and genetics. *Historical Studies in the Natural Sciences, 47*(3), 349–388.

Shan, Y. (2020). Doing integrated history and philosophy of science: A case study of the origin of genetics. In *Boston Studies in the Philosophy and History of Science* (1st ed.). Cham: Springer. https://doi.org/10.1007/978-3-030-50617-9.

Shan, Y. (2021). Mendel on developmental information. In C. Meyns (Ed.), *Information and the History of Philosophy* (pp. 262–280). London: Routledge.

Shloegel, J. J. (1999). From anomoly to unification: Tracy Sonneborn and species problem in protozoa, 1954-1957. *Journal of the History of Biology, 32*(1), 93–132.

Simunek, M., Hoßfeld, U., & Breidbach, O. (2011). 'Rediscovery revised' - the cooperation of erich and armin von Tschermak-seysenegg in the context of the 'rediscovery' of Mendel's law in 1899-1901. *Plant Biology, 13*(6), 835–841.

Veigl, Sophie, Harman, Oren, & Lamm, Ehud (2020). Friedrich Miescher's discovery in the historiography of genetics: From contamination to confusion, from nuclein to DNA. *Journal of the History of Biology, 53*, 451–484.

Waters, C. K. (2006). A pluralist interpretation of gene-centered biology. In S. H. Kellert, H. E. Longino, & C. Kenneth Waters (Eds.), *Scientific Pluralism* (pp. 190–214). Minneapolis and London: University of Minnesota Press.

Yafeng Shan*

Department of Philosophy and Centre for Reasoning, University of Kent, UK
Department of Philosophy, University of Kent, Canterbury, CT2 7NZ, UK

Ehud Lamm

The Cohn Institute for the History and Philosophy of Science and Ideas, Israel
The Cohn Institute for the History and Philosophy of Science and Ideas, Humanities Faculty, Tel Aviv University, Ramat Aviv, Tel Aviv 6997801, Israel
E-mail address: ehud.lamm@gmail.com.

Oren Harman

Graduate Program in Science, Technology and Society, Bar Ilan University, Bar-Ilan University, Ramat Gan, Israel, Wissenschaftskolleg zu Berlin, Wallotstrasse 19, Berlin 14193, Germany
E-mail address: oren.harman@gmail.com.

* Corresponding author.
E-mail address: y.shan@kent.ac.uk (Y. Shan).