



Reading Lists and Course Details

John Rylands University Library of Manchester

HS 3102/3602 - A History of Heredity: from Mendel to Genetic Engineering (2001-02)

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NB - If you are taking the 10-credit version of this course, register in your home department for HS 3102. If you are taking the 20 credit version, register for HS 3602.

COURSE AIMS:

Since its origins at the beginning of the century, genetics has been at the centre of controversy, by virtue of its impact upon biology as well as for its apparent political implications. And soon after the DNA revolution of the 1940s and 1950s had reconstituted our understanding of heredity, the new molecular biology spawned a technology whose power to 'engineer life' now excites admiration and fear in equal measure. This course is designed to provide a historical perspective in terms of which the current controversies may be more fully understood.

OBJECTIVES:

On successful completion of the course, you should:

- a. have a basic understanding of the nature of the 'Mendelian Revolution', of the political and economic impact of interwar genetics, of the rise of molecular biology, and of the social, economic and political implications of the new biotechnologies;
- b. be familiar with some of the secondary sources on a particular topic and be able to identify their differences of interpretation;
- c. be able to summarise and assess your reading in (b) in a clearly written and well-constructed essay.

READINGS:

In order to be able to follow some of the lecture material, you will need to have done the required reading (all of which is examinable) in advance. Since there is no suitable textbook, all of the readings are available - as books or photocopies - in the Short Loan Collection in the main University Library. All reading material in the SLC can be found online via the 'Special Catalogue' option of the University Library's main menu. You can search this by author, title, or lecturer's name.

ASSESSMENT:

10 credit option (HS 310): one 1500-word essay (50%) and the exam (50%).

20 credit option (HS 360): one 1500-word essay (25%), exam (25%), 3000-word project (50%).

Assessment Criteria (used in marking essays, projects and examinations):

1. empirical coverage of the relevant literature: have you drawn upon a wide range of reading, going beyond lectures and required readings?
2. understanding: have you grasped the main concepts and arguments in the readings and lectures?
3. structure of your argument: is it clear? persuasive? show insight? original?
4. critical capacity: have you noticed the differences of interpretation between authors? spotted the limitations of their sources or the weaknesses of their arguments?
5. prose: its quality (spelling, punctuation, grammar) and its clarity.
6. organisation of the material: is it clear? does it make sense as a sequence?
7. format: does the essay or dissertation abide by the appropriate Guidelines for such work?

SEMINARS:

The course consists of one lecture and one seminar per week (seminars begin in week 3). Seminars are based on an article or chapter which must be read in advance. Copies of these readings are available in the Short Loan Collection. Since discussion in seminars will focus upon a series of questions directed at the reading, you should have a look at the relevant questions before tackling each week's reading. Although your performance in seminar is not assessed, these small-group discussions are your main opportunity to make sure you have understood both the readings and the lectures. Thus you should prepare for them accordingly and take an active part in the discussions.

ESSAYS (1500 words):

A reading list (with suggested essay topics) makes up the latter half of this course outline. It should be obvious which section of the list is relevant to each of the topics I have suggested. Once you've located that section, you'll need to scan a variety of sources before deciding which ones will be most useful. With an article, take 5-10 minutes to skim the key sections (introduction and conclusion); with a book look at the table of contents, the index, and perhaps the introductory paragraphs of selected chapters. For a 1500 wd essay I expect you to read about half a dozen articles or chapters, above and beyond required lecture and seminar reading.

About halfway through this course outline you will find 'Guidelines for the Preparation of Essays' which are designed to help you to acquire basic writing skills. Adhering to these Guidelines is essential, and essays which fail to do so will lose up to 10 marks. You must also keep all notes on the readings used for your essay since I may ask to see them. If you would like feedback on an outline of your essay (prior to drafting it in full), I am happy to provide it (so long as I get it before week 12).

Submission dates for essays: Essays are to be handed in to me at the final lecture (Friday 10 May) so that I can mark and return them to you before the exam. No essays

submitted via email will be accepted. Essays arriving after 10 May will be penalised 10 marks. The last possible day for submission is the day of the exam for this course. No coursework submitted thereafter will be marked.

Practice Essays:

For those of you who haven't written an essay since school and would like a bit of practice before submitting your assessed essay, you are welcome to submit a short unassessed piece of work. Read the article by Kenneth Ludmerer, 'American geneticists and the eugenics movement, 1905-1935', *Jour of Hist of Biology*, vol 2 (1969), 337-362. Write a brief analysis of it (no more than 2 sides) in which you:

summarise his argument, identify any weaknesses in the argument, suggest how the argument might be strengthened,

Adhere closely to the 'Essay Guidelines' included in this course outline. Submit the practice-essay (by the end of the Easter Vacation), and I will return it to you with feedback.

THE EXAM

will be a 2 hr. paper in which you are asked to answer two essay-type questions out of about 6. Read the questions carefully; answers which fail to address the question will be heavily penalised. Avoid using the same material in your answers to both questions. Illegible handwriting will cost you marks. If you would like some practice at writing exam answers, choose a question or two from an old exam paper and answer it within the specified time. I will then 'mark' it and give you some feedback (provided I receive it at least a week before the exam).. Past exam papers are on file on the ground floor of the Main Library and are also available on the web at: www.intranet.man.ac.uk/past-papers

PROJECTS (20-credit students only):

Your project must be a substantial piece of work since it contributes one-half of the credits for your course. It may take the form of an essay (3000-5000 words), an original research project, or some other form which you agree with me in advance. The topic can be on any issue connected with the course, provided it does not overlap with your essay and has been agreed with me. Here are a few sample topics (though you are encouraged to come up with your own):

1. Mendel's work is conventionally regarded as having been 'misunderstood' in the 19th century and 'rediscovered' in 1900. Recent historical work, however, has radically revised this view. How? What does this newer literature tell us about the nature of scientific discovery?
2. Little is so far known about the ways in which genetics emerged as a discipline in Britain. Drawing upon primary sources (on which I will advise you), note the kinds of research questions which British geneticists addressed, as well as the institutions in which they found support before the Second World War.
3. Genetics has sometimes got into trouble because of its perceived political implications but nowhere with such drastic consequences as in the Soviet Union from the 1930s. How did genetics come to be officially banned there after 1945, and why was the ban finally lifted in the 1960s? In his [*Lords of the Fly: Drosophila Genetics and the Experimental Life*](#) Robert Kohler argues that the Morgan school's choice of the fruit fly as an

experimental system largely dictated which research problems were thenceforth to be central and which to be peripheral. Consider how genetics was done in other labs or countries: Was *Drosophila* the only logical organism for Morgan's group to work on? Did working on *Drosophila* necessarily impose constraints over which research questions could be asked?

5. The literature on the reception of Mendelism, 1900-1925, has focussed on several high-profile critics (eg, William Bateson, Richard Goldschmidt). Survey the ways in which Mendelian books were reviewed in British and American journals, and consider to what extent the high-profile critics were actually typical of the rank-and-file biological community.

I will meet with all 20-credit students in the first few weeks of the course in order to help you choose a topic and appropriate sources. We will meet again in week 8 to see how you're getting on so that you can dedicate part of the Easter Vacation to your project. Projects are due at the final meeting of the course on Friday 10 May. No projects submitted via email will be accepted. Work arriving after the 10th will be penalised 10 marks. The last possible day for submission is the day of the exam for this course. No projects submitted thereafter will be marked.

LECTURES AND SEMINARS:

lecture 1 (1 Feb): Introduction

no seminar in week 1.

lecture 2 (8 Feb): Conceptions of Inheritance in the 19th century

Mendel's approach was quite unusual for his time. For throughout most of the 19th century, inheritance was not perceived as a specific problem requiring analysis. It was instead a taken-for-granted aspect of the problem of form. During the first half of the century the search for laws of form -- morphology -- was pursued in various ways (eg, embryonic development, comparative anatomy). The emergence of evolutionary theories around mid-century introduced a new approach: the causes of a given species' form were sought in its history. While the fact of evolution was soon widely accepted, the mechanism by which it occurred was not. Evolutionists thus devised a variety of rather speculative theories of inheritance which were compatible with their favoured evolutionary mechanism. Common to many of these theories, however, was the view that inheritance was a conservative process like growth while 'variation' arose through perturbing this process. Neither entailed a specialised heritable substance.

reading: Robert Olby, [*Origins of Mendelism*](#), pp.170-174 and 187-193.

seminar 2: Mendel and his Approach to Heredity

reading: V. Orel, [*Mendel*](#) (Oxford Univ. Press, 1984), pp. 28-41 and 42-59.

questions: How did Mendel's approach differ from common understandings of heredity in the mid-19th century? In what respects does Orel think Mendel's approach was modelled on physics? What did Mendel take from botany and other life sciences of his time? What problem was Mendel trying to solve through his pea experiments?

lecture 3 (15 Feb): Growing Interest in Heredity and the Rediscovery of Mendel's Work

By the 1890s a number of younger life scientists had taken up studies of the nature of heredity, regarding it as the key to the question of evolutionary mechanism. Several researchers were beginning to note the proportions of various kinds of offspring from crosses between selected parents. Others were trying to develop statistical tools which would allow them to predict the distribution of types among offspring, even for continuously varying traits. Moreover the discussion had begun to focus upon the properties of a distinctive hereditary substance. It is not entirely surprising, therefore, that in 1900 three botanists - Erich Tschermak, Hugo deVries and Carl Correns - stumbled upon Mendel's 1866 paper in the course of their work. Mendel seemed to have solved their problem neatly through experiment and quantitative analysis.

reading: Robert Olby, [*Origins of Mendelism*](#), chp. 6.

seminar 3: Getting Genetics Established: the Politics of Discipline-Building

reading: Jonathan Harwood, [*Styles of Scientific Thought: the German Genetics Community, 1900-1933*](#), chp. 4.

preface: although this paper opens with discussion of the different approaches to genetics in the US and Germany, our seminar will be concerned with the institutions in which genetics was practiced and the problems of introducing it to the universities (ie, sections 3 & 4 of the paper).

questions: 1. When historians speak of a field being 'institutionalised', they mean that it has a visible organisational presence or foothold within the scientific community. Other than university departments dedicated to the field, what organisational forms do you think this might take? 2. Why is the timing of a new field's appearance on the scene so crucial for its institutional success? 3. Public perceptions of a new field are equally important; why? 4. If you were trying to secure an institutional foothold for a brand-new field, would you concentrate your efforts on getting a private research institute set up or a university department established? Why? 5. The distribution of power within a university makes a big difference in how easy it is to get a new discipline established. What are the key centres of such power?

lecture 4 (22 Feb): Developing Mendelism into a Credible Theory

Soon after the rediscovery of Mendelism, a few biologists noticed that the behaviour of Mendel's factors seemed consistent with observations on structures in the cell nucleus which had been made in the 1870s and 1880s. The first convincing claim that Mendelian factors were located in the chromosomes, however, was made by T. H. Morgan and his students, working on the fruit-fly between 1911 and 1915. By the mid-1920s the theory was widely accepted in most countries, and in 1933 Morgan was the first geneticist to receive a Nobel prize.

reading: Garland Allen, [*Life Science in the 20th Century*](#), pp. 56-68.

seminar 4: Engineering the Fruit Fly as an Experimental Organism

reading: Robert E. Kohler, 'Moral economy, material culture and community in *Drosophila* genetics', pp. 243-257 in Mario Biagiolo (ed.), [*The Science Studies Reader*](#) (Routledge 1999).

questions: 1. How did Morgan come to adopt *Drosophila* as an experimental organism? Kohler says the answer is 'neither strictly biological nor strictly cultural'. What does he mean by this? 2. You can do lots of different things with mutants, but Morgan and co. chose to map them. Why? 3. *Drosophila* was engineered to make it good for mapping. What disadvantages might that entail? 4. What were the 'rules' of the fly group's moral economy (pp. 249-252)? Why did they foster success? Where did they come from? 5. Kohler says that the rules of exchange brought benefits to the fly group, but he notes that this changed in the 1930s (p. 255). Why? 6. Kohler says that Morgan did not try to set a research agenda; all that counted was 'doing good work'. And yet the vast majority of the group's work was in a particular area: mapping (or transmission genetics more generally) rather than in development or evolution. Why is there no contradiction here?

lecture 5 (1 Mar): Genetics and Politics: the Origins of Eugenics

During the latter half of the 19th century concern was sometimes expressed that medical and various humanitarian measures meant that natural selection was no longer at work in industrialised societies. Would such societies degenerate as a result? Galton and others argued that the state must intervene to regulate human reproduction along scientific lines if social progress was to continue.

reading: Diane Paul, [*Controlling Human Heredity*](#), chp. 2.

seminar 5: The Growth of Eugenics Movements in Britain and the United States

reading: Daniel Kevles, [*In the Name of Eugenics*](#), chps. 4 and 6 and pp.169-175.

questions: 1. From what sections of society did the eugenics movement draw its members? Why this pattern of recruitment? 2. What general kinds of policies did eugenics movements endorse? 3. In political terms was eugenics on the right or left? 4. How does Kevles account for the movement's shift to the left from the 1930s (pp. 169-175)?

lecture 6 (8 Mar): 'Racial Hygiene' and Nazism in Germany

Eugenics principles found their most vicious application in Nazi Germany in the form of compulsory sterilisation, 'euthanasia' and genocide. The central historical question here has been whether German eugenics was peculiarly nasty from the start so that the Holocaust was more or less an extension of it. Or was German eugenics before 1933 little different from that elsewhere, the Holocaust arising because of unusual political circumstances in Germany which allowed the Nazi Party free rein to pursue its evil vision?

reading: Sheila F. Weiss, 'The Race Hygiene Movement in Germany', [*Osiris*](#) vol. 3 (1987), pp.193-236.

seminar 6: The Relations between Geneticists and the Eugenics Movement

reading: Kenneth Ludmerer, 'American geneticists and the eugenics movement, 1905-1935', [*Journal of the History of Biology*](#), vol 2 (1969), pp. 337-362.

questions: 1. What reasons does Ludmerer give for geneticists' enthusiasm for eugenics during the period 1905-1915? What other possible reasons can you think of? 2. Although Ludmerer sees geneticists withdrawing support between 1915 and 1924, he notes that they did not 'publically condemn eugenics' (p. 352). Why might this have been so? 3. He also notes that during this period some geneticists even remained enthusiastic. What does this suggest? 4. What reasons prompted geneticists to speak out between 1924 and 1933, according to Ludmerer? How else might one account for geneticists' behaviour at that time?

lecture 7 (15 Mar): What was 'Molecular Biology' and Where Did it Come From?

Molecular biology arose out of several strands of research which had been largely separate during the 1930s but which began to communicate with one another from the 1940s: the analysis of radiation-induced mutation, work on the structure of proteins and other macromolecules, and studies of the biochemistry of gene-function in microorganisms.

reading: Garland Allen, [*Life Science in the 20th Century*](#), chp. 7.

seminar 7: How do you Build an Interdisciplinary Field like Molecular Biology?

reading: Pnina Abir-Am, 'The assessment of interdisciplinary research in the 1930s: the Rockefeller Foundation and physico-chemical morphology', [*Minerva*](#), vol. 26 (1988), pp.153-176.

preface: Nearly all of early molecular biology was funded by the Rockefeller Foundation. But it was not straight-forward for private foundations to target funding at worthy projects, especially in universities. In reading this paper, put yourself in Joseph Needham's shoes and imagine trying to secure support for your pet project, finding backers and getting round obstacles.

questions: 1. Why was the Rockefeller Foundation interested in Needham's project? 2. In what respects did his project not fit easily in the University as it was then organised? 3. Why did the RF insist that Needham's project had the University's backing? 4. What was significant about the RF's willingness to support Waddington's research? 5. How would you characterise the stance of the University administration in this episode? 6. What does the response of the 'assessors' (= referees) tell us? 7. Why would the RF have consulted referees (like Mellanby or Dale) who did not work in relevant research areas?

lecture 8 (22 Mar): The Distinctive Style of early Molecular Biologists

Observers have often commented on the distinctive way in which molecular biologists (esp. the phage group) approached biological problems. The latter preferred to tease out the essence of a problem and solve it with extremely simple methods. The route to the elegant solutions they valued was via hard thinking rather than hard graft, a preference which made for constant friction with biochemists. One reason for this style of work may have been the remarkable number of physicists who migrated to the emerging field during the 1930s and 1940s.

reading: Donald Fleming, 'Emigre physicists and the biological revolution' in Fleming and Bernard Bailyn (eds.), [*The Intellectual Migration: Europe and America, 1930-1960*](#) (Harvard UP 1969), pp.152-189 (you need read just pp.152-180).

seminar 8: Molecular Biology's Impact upon other Biological Sciences

reading: E.O. Wilson, [*Naturalist*](#), chp. 12 (on the 'molecular wars'). You needn't bother with the last 4 pages.

questions: 1. Why were Watson and co. so critical of ecology (and other areas of traditional biology)? 2. Were the 'molecular wars' just a clash of egos, or was more at stake? 3. Were Watson and co. right that all real biology was molecular? How might organismic and population biologists justify their right to exist within biology? 4. How were the tensions between molecular biologists and evolutionary biologists – at Harvard as elsewhere – resolved? What consequences might this outcome have for teaching and research in biology?

EASTER VACATION

lecture 9 (19 Apr): Genetic Engineering: a New Technology and a New Industry

Techniques developed by academic molecular biologists in the early 1970s attracted enormous commercial interest. As a result, some academics set up their own biotechnology firms while others served as consultants or part-time research directors.

reading: Sheldon Krimsky, [*Biotechnics and Society: the Rise of Industrial Genetics*](#), chp. 2.

seminar 9: The Impact of Industrial Sponsorship upon Academic Molecular Biology

reading: Martin Kenney, [*Biotechnology: the University-Industry Complex*](#) (SLC), chp. 6.

questions: 1. Does it matter if the industrial sponsor has some say over the choice of research topics? ('Equity' means shares in a company.) 2. If an academic with a financial stake in a biotech company can improve healthcare by producing cheaper pharmaceuticals, what's wrong with him/her doing such research in a lab which has been equipped with our taxes? 3. If scientists were already competitive and secretive before molecular biology became commercially important (p.110), and if research can be

published once it has been patented, what difference will commercialisation make to the flow of scientific information? 4. 'Peer review' (p.114) is the standard process by which applications for research grants are refereed by relevant experts. Why do critics of commercialisation believe that peer review will decline? 5. If you were a research student in molecular biology, would you be attracted to work for a professor who had close links with a biotech company? 6. Do you accept that academics' close industrial ties create a 'conflict of interest'? How is such a conflict best resolved?

lecture 10 (26 Apr): The Debate over Plant-Genetic Modification.

reading: Lawrence Busch et al, [*Plants, Power and Profit*](#) (Blackwell 1991), chp. 1 (You can skip pp. 16-22.)

seminar 10: Patenting Living Organisms

reading: Sheldon Krimsky, [*Biotechnics and Society: the Rise of Industrial Genetics*](#), chp. 3.

questions: 1. What does patenting consist of? 2. Why does the law provide for patenting? 3. Patents are usually defended on the grounds that they encourage innovation. But some critics have argued that allowing an inventor to patent an invention can in fact block its use. How? 4. Critics of genetic modification sometimes argue that biotech turns the animal into a machine, effectively denying its rights. What do you say to this? 5. Is patenting a plant-variety essential for a breeder or corporation to make a profit?

lecture 11 (3 May): Engineering the Human Genome.

In this lecture we will look at the origins of the Human Genome Project, as well as at the arguments of those who regard it as good or bad science. We also look at the likely applications of this knowledge, as sketched by its advocates as well as its critics.

reading: Daniel Kevles, 'Out of eugenics: the historical politics of human genetics', pp. 3-36 in Daniel Kevles and Leroy Hood (eds.), [*The Code of Codes: Scientific and Social Issues in the Human Genome Project*](#) (Harvard UP 1992).

seminar 11: Uses and Abuses of Genetic Testing

reading: Dorothy Nelkin, 'The social power of genetic information', pp. 177-190 in Daniel Kevles and Leroy Hood (eds.), [*The Code of Codes: Scientific and Social Issues in the Human Genome Project*](#) (Harvard UP 1992).

questions: 1. Is it legitimate for insurance companies to require genetic testing before granting insurance (or setting a premium)? 2. At the moment heavy smokers and drinkers pay more for life or health insurance. Should a person with a predisposition to heart disease also pay more? 3. Is it fair for a factory-owner to deny a job to an applicant with a genetic sensitivity to a substance used in the manufacturing process? 4. Why might diagnostic testing cause needless anxiety to an individual (or prompt an unfair decision

by an insurance company)? 5. What does Nelkin mean when she says that testing pits the rights of individuals against those of groups or organisations?

lecture 12 (10 May): Conclusion

Suggestion Box: If you would like to offer comments on this course but were unable to complete the course questionnaire (distributed in week 11), you may hand them in to the CHSTM Office (Maths Tower room 3.32a) or via our website:

www.man.ac.uk/chstm/teaching/courses.htm

Possible Topics for Essays (1500 wds):

1. Historians have advanced a variety of explanations for the 'biometrician-Mendelian controversy'. Which of these explanations are compatible with one another, and which are mutually exclusive? Which explanations are most convincing and why? 2. Although we now recognise the Mendelian chromosome theory as essentially correct, it met with criticism between the wars, from some who felt it was insufficient and from others who regarded it as impossible in principle. Who was critical and why (eg, for technical reasons? for philosophical ones?). 3. The industrial funding of academic molecular biology is controversial. Has it changed traditional university research practices? Who benefits from these changes, and who does not? 4. Historians are agreed that eugenics movements changed between the wars, and some argue that they declined during this period. But they disagree as to **why** such change occurred. Discuss the strengths and weaknesses of the accounts provided by Ludmerer, Kevles, Roll-Hansen, Allen and Barker. 5. What effects did eugenics' association with Nazism have upon eugenics movements after 1945? 6. The respective roles of nucleus and cytoplasm in the development of traits was a matter of some controversy before 1945. Why were geneticists unable to agree on this? 7. The new biotechnology is providing tools for engineering the human genome in ways that interwar eugenicists could only dream of. Is the new human genetics just a more powerful version of the old eugenics? 8. Geneticists in the 1950s often argued that the new Mendelian theory after 1900 had led to great improvements in the methods of plant-breeding. To what extent was this claim justified? 9. The eugenics movements in Scandinavia were relatively powerful. What can study of the Scandinavian case tell us about the causes of the eugenics movement's rise and fall? 10. The Rockefeller Foundation is known to have funded much of the early research in what later became 'molecular biology', but historians differ over the importance to be assigned to the Foundation. Consider the arguments on both sides of this debate, and draw your own conclusion.

Other topics may be feasible, but you must agree them with me before proceeding.

Sources for Essays and Projects:

1. general histories of genetics:

A. H. Sturtevant, [A History of Genetics](#), 1965.

L. C. Dunn, [A Short History of Genetics](#), 1965.

E. A. Carlson, [The Gene: a Critical History](#), 1966.

Hans Stubbe, [A History of Genetics](#) (1965; Engl.ed. 1972).

Francois Jacob, [The Logic of Living Systems](#), 1974.

Peter Bowler, [The Mendelian Revolution](#), 1989.

A number of general histories of genetics were published around 1965, marking the 100th anniversary of the publication of Mendel's classic paper. Written by working geneticists rather than historians, they tend to iron out the wrinkles, focussing on success stories rather than blind alleys or persistent controversies and on genetics' theories and concepts rather than its institutional or social context. They are useful, however, as reference works (especially Dunn) if you are looking for a brief discussion of a particular theory or geneticist. Stubbe and Carlson are narrower in scope; the former covers ideas of inheritance only up to 1900 while the latter is a history of the concept of 'gene' which is light on developmental or evolutionary genetics. Jacob's book is a very readable general history of the ways in which organisms have been conceptualised since the 17th century, with particular reference to ideas of inheritance. Bowler provides a useful summary of the recent literature in the field, and his is the only book which considers how genetic concepts and theory might have been shaped by social context.

2. Conceptions of Inheritance in the mid 19th century:

Robert Olby, [Origins of Mendelism](#), pp.170-174 and pp.187-193.

Robert Olby, 'The emergence of genetics', in Olby et al (eds.), [Companion to the History of Modern Science](#) (SLC), pp. 521-536 (esp. pp. 521-523).

Robert Olby, 'Charles Darwin's manuscript of "Pangenesiis"', [British Journal for the History of Science](#), vol. 1 (1963), pp. 251-263.

Peter Bowler, [The Mendelian Revolution](#), pp. 46-64.

M. Ghiselin, 'The rationale of pangenesiis', [Genetics](#), vol. 79 (1975), pp. 47-57.

William Coleman, [Biology in the Nineteenth Century](#), chp. 3.

F. B. Churchill, 'From heredity theory to Vererbung: the transmission problem, 1850-1915', [Isis](#), vol 78 (1987), pp. 337-364.

I. Sandler and L. Sandler, 'A conceptual ambiguity that contributed to the neglect of Mendel's paper', *History and Philosophy of Life Sciences*, vol. 7 (1985), 3-70 (look at pp 60-70). [Not held at JRULM]

Margaret Campbell, 'The concepts of dormancy, latency and dominance in 19th century biology', [Journal of the History of Biology](#), vol. 16 (1983), pp. 409-431 [Darwin and Mendel conceived 'dominance' in different ways].

3. Mendel's Life and Work in Context:

G. Mendel, 'Experiments on plant hybrids' (1866), reprinted in Curt Stern and Eva Sherwood (eds.), [The Origin of Genetics: a Mendel Source Book](#) (W.H. Freeman 1966).

Robert Olby, [Origins of Mendelism](#) (Chicago UP 1985), chp. 5.

Roger Wood and Vitezslav Orel, *Genetic Prehistory in Selective Breeding* (Oxford UP 2001). [Not held at JRULM]

V. Orel, [Mendel](#) (Oxford UP 1984) [a short biography].

V. Orel, [Gregor Mendel: the First Geneticist](#) (Oxford UP 1996) [a full-scale study of Mendel's life and work].

V. Orel and Roger Wood, 'Early development in artificial selection as a background to Mendel's research', *History and Philosophy of Life Sciences*, vol. 3 (1981), pp.145-170. [Not held at JRULM]

V. Orel and Roger Wood, 'Empirical genetic laws published in Brno before Mendel was born', [Journal of Heredity](#), vol. 89 (1998), pp. 79-82.

H. F. Roberts, [Plant Hybridization before Mendel](#) (Princeton UP 1929).

Conway Zirkle, [The Beginnings of Plant Hybridization](#) (Pennsylvania UP 1935).

www.netspace.org/MendelWeb

3a. The Renewed Interest in Heredity at the End of the 19th Century:

Peter Bowler, [The Mendelian Revolution](#), pp. 64-70 and pp. 83-92.

Robert Olby, [Origins of Mendelism](#), pp. 55-68 (on Galton).

Robert Olby, 'Mendelism: from hybrids and trade to a science', [Comptes rendus de l'Academie des Sciences/Sciences de la vie](#), no. 323 (2000), pp.1043-1051.

William Coleman, 'Cell, Nucleus and Inheritance', [Proceedings of the American Philosophical Society](#), vol. 109 (1965), pp.124-158.

Ruth Schwartz Cowan, 'Francis Galton's contribution to genetics', [Journal of the History of Biology](#), vol. 5 (1972), pp. 389-412.

Ruth Schwartz Cowan, 'Nature and nurture: the interplay of biology and politics in the work of Francis Galton', [Studies in the History of Biology](#), vol. 1 (1977), pp.133-208.

Garland Allen, [Life Science in the 20th Century](#) , pp. 41-47.

Lindley Darden, 'William Bateson and the Promise of Mendelism', [Journal of the History of Biology](#), vol. 10 (1977), pp. 87-106.

Frederick Churchill, 'Hertwig, Weismann and the Meaning of Reduction Division ca. 1890', [Isis](#), vol. 61 (1970), pp. 428-457.

Frederick Churchill, 'August Weismann and a break from tradition', [Journal of the History of Biology](#), vol. 1 (1968), pp. 91-112.

Gloria Robinson, *A Prelude to Genetics: Theories of a Material Substance of Heredity, Darwin to Weismann* (Coronado Press 1979). [Not held at JRULM]

Sharon Kingsland, 'The battling botanist: D.T. MacDougal, mutation theory, and the rise of experimental evolutionary biology in America, 1900-1912', [Isis](#), vol. 82 (1991), pp. 479-509.

Garland Allen, 'H. de Vries & the reception of the "mutation theory"', [Journal of the History of Biology](#), vol. 2 (1969), pp. 55-87.

Bert Theunissen, 'Knowledge is power: Hugo deVries on science, heredity and social progress', [British Journal for the History of Science](#), vol. 27 (1994), pp. 291-311.

Ernst Mayr, 'Weismann and evolution', [Journal of the History of Biology](#), vol. 18 (1985), pp. 295-329.

3b. Who Rediscovered Mendel's Work and Why?

Robert Olby, [Origins of Mendelism](#) (Chicago UP, 2nd ed, 1985), chp. 6.

R. C. Olby, 'Mendel no Mendelian?', [History of Science](#), vol. 17 (1979), pp. 53-72; reprinted in his [Origins of Mendelism](#), pp. 234-258.

O. Meijer, 'Hugo deVries no Mendelian?', [Annals of Science](#), vol. 42 (1985), pp.189-232.

A. Brannigan, 'The Reification of Mendel', [Social Studies of Science](#), vol. 9 (1979), pp. 423-454 (also appears as chp. 6 of his book [The Social Basis of Scientific Discovery](#)).

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