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In 1865, at two consecutive meetings of the Natural Science Society in the Moravian city of Brünn (Brno), an Augustinian friar by the name of Gregor Mendel outlined the results of fertilization experiments he conducted on peas. Carefully planned and meticulously analyzed, Mendel's investigations suggested that the pattern of inheritance of individual pea traits, such as height, color or shape, was governed by a simple mechanism, wherein each trait was determined by an independent hereditary factor. Not before the dawn of the twentieth century, thirty-five years later, did Mendel's results garner their due appreciation. Recognized today as the cornerstone of modern genetics, Mendel's laws of heredity transformed forever our understanding of the process of heredity in plants, animals and humans.

The importance of Mendel's theory for the growth of modern genetics is uncontested. But how did the rediscovery of Mendel's theorem, and the research practices that it enshrined, impact the broader domain of racial and eugenic thought throughout the first half of the previous century? In the case of Germany, what changes did Mendel's laws promote in the scientific perceptions of anthropologists, psychiatrists and genealogists, and how did these changes affect the social programs initiated, supported and finally implemented by those same scientists, before and after the Nazis came to power? How did Mendelian ideas influence the way Germans of all ranks understood the nature of the hereditary threat that racial-alien and the hereditarily damaged posed to their well-being and to their future, and how did Mendelian reasoning inform the measures chosen in order to face those dangers?

The importance of these questions goes beyond the specific case of Nazi Germany's eugenic policies. Eugenics and its related sciences serve as a prototype for how scientific and social thought can become intertwined, with potentially horrendous results. Studying eugenics provides an opportunity to explore the dynamics between scientific theories, cultural perceptions, political agendas and social policies in the modern world. The links between science, culture and society have fascinated

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scholars and the public during the course of the past several decades. While the popular image of science is all too often that of an autonomous kingdom of the mind – progressing from one achievement to the next through the materialization of genius ideas and cognitive breakthroughs of great, white-bearded men – for scholars studying science, and probably for most practicing scientists themselves, it is obvious that science and scientific thought, while having their own unique dynamics of development, are also embedded in certain cultural environments, shaped by social institutions and constrained by material considerations. In the flourishing field of Science Studies, there are many open questions – and plenty of intriguing answers – regarding the intricate dynamics of the interaction between scientific practices and perceptions and their social or ideological pretext, or impact.

These issues are of special interest in the case of Nazi bio-political thought. Infamously, the Nazis prided themselves on grounding their world-view in biological principles. Consequently, historical accounts on the intellectual origins of National Socialism often invoke the name of Charles Darwin or of his German disciple, Ernst Haeckel, whose evolutionary theories, so it is argued, supplied racial theorists and politicians with an overall framework for constructing narratives on racial struggles between peoples and nations, struggles in which those who survived were necessarily superior in physical, intellectual or moral qualities. For racial theorists, the argument continues, the survival of the fittest was elevated from a characterization of evolutionary dynamics to the sphere of normative judgment. The science of eugenics – a term that was coined by Darwin’s half cousin, the British polymath Francis Galton – set out to redirect human evolutionary processes and to combat physical, mental and social degeneration by regulating human reproduction. The rise of eugenic thought in Germany and its eventual manifestation in Nazism are therefore characterized as the epitome of “Social Darwinism,” or of the application of Darwin’s ideas to society in an attempt to eliminate parasitic elements and alien races.¹

¹ Analysis of the relations between Darwinian thinking and racism informs many works on German racial and eugenic thought, from Hanna Arendt, *Elements of Totalitarianism* (New York, NY: Harcourt Brace Jovanovich, 1951), 178–179, Daniel Gasman, *The Scientific Origins of National Socialism* (London: Macdonald & Co., 1971), and Peter Weingart, Jürgen Kroll and Kurt Bayertz, *Rasse, Blut und Gene: Geschichte der Eugenik und Rassenhygiene in Deutschland* (Frankfurt a. M.: Suhrkamp, 1988), to Jerry Bergman, *Hitler and the Nazi Darwinian Worldview: How the Nazi Eugenic Crusade for a Superior Race Caused the Greatest Holocaust in World History* (Kitchener, ON: Joshua Press, 2012). The relationship between Darwin’s thought and Nazism is outlined most explicitly in Richard Weikart, *From Darwin to Hitler: Evolutionary Ethics, Eugenics, and Racism in*

How does Mendel – or rather, his theory, as understood in the early twentieth century – fit into this story? Current historiography provides three possible answers to this question. The first identifies Mendelism with the notion of “hard heredity,” or the idea that genes are immutable units of heredity, indifferent to environmental influences. Mendel was in reality not the progenitor of this idea – August Weismann is probably the more natural candidate for that role – but it is nevertheless true that many early twentieth-century individuals associated Mendel with it, or saw Mendelian theory as providing the strongest counterargument to the opposite, environmentalist, “Lamarckian” view. The main problem with equating Mendel with hard heredity is not its historical inaccuracy, but its narrowness, as it fails to capture the complexity and richness of Mendelian thinking and therefore also misses its wide-ranging impact on various domains of social and scientific thinking.² Mendelian theory, as this book shows, had much more to offer than the mere notion of hard heredity.

Another answer provided by existing historiography acknowledges other elements of Mendelian theory but reduces them to mere technicalities, with few implications of any real significance. Michael Burleigh and Wolfgang Wippermann’s authoritative *The Racial State* is a case in point. After describing Darwin as the “involuntary progenitor of racist ideology,” Burleigh and Wippermann move on to discuss Hitler’s *Mein Kampf*

Germany (New York, NY: Palgrave Macmillan, 2004), a book that was received with reservations by many in the academic community. See for instance the criticism offered in Robert J. Richards, *Was Hitler a Darwinian? Disputed Questions in the History of Evolutionary Theory* (Chicago, IL: University of Chicago Press, 2013), 192–242. Weikart’s response may be found at www.evolutionnews.org/2014/01/was_hitler_a_da080761.html. As these latter examples demonstrate, in American public discourse the purported links between Darwin’s theory and Nazism have been mobilized by creationists to discredit evolutionary thought as supposedly having proto-Nazi ingredients. The scholarly debate on this theme thus became overburdened with political implications, which didn’t always work in its favor. For more balanced assessments on the meaning of Social Darwinism in Germany, cf. Richard J. Evans, “In Search of German Social Darwinism. The History and Historiography of a Concept,” in Manfred Berg and Geoffrey Cocks (eds.), *Medicine and Modernity: Public Health and Medical Care in 19th- and 20th-Century Germany* (Washington, DC: German Historical Institute, 1997), 55–79, and Diane B. Paul, “Darwin, Social Darwinism and Eugenics,” in Jonathan Hodge and Gregory Radick (eds.), *The Cambridge Companion to Darwin*, 2nd ed. (Cambridge: Cambridge University Press 2009), 219–245.

² In the words of Staffan Müller-Wille and Hans-Jörg Rheinberger: “Most historical studies of eugenics do not scrutinize the concepts of heredity that underwrote these movements. ... If any effort is made to characterize notions of heredity, the well-worn dichotomy of ‘hard’ versus ‘soft’ is usually employed.” Staffan Müller-Wille and Hans-Jörg Rheinberger, *A Cultural History of Heredity* (Chicago, IL: University of Chicago Press, 2012), 99. For a discussion, see Maurizio Meloni, *Political Biology* (Basingstoke: Palgrave Macmillan, 2016).

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and state that “Hitler eschewed technical scientific terms like Weismann’s ‘germ plasm’ or Mendelian ‘hereditary properties’ in favor of calls for the ‘maintenance of the purity of the blood.’” They fail to recognize that Hitler’s perception of such blood purification had Mendelian concepts already absorbed into it, concepts that were used by Hitler and other Nazi leaders on several different occasions.³ Another example for the marginalization of Mendelism can be found in Saul Friedländer’s masterful account, *Nazi Germany and the Jews*. Friedländer does cite Hitler’s statement that in “the seventh, eighth, or ninth generation the Jewish part would be ‘out-Mendel’” but is quick to clarify: “ausgemendelt – a pun on the name of the Czech monk, Gregor Mendel, who discovered the laws of heredity.”⁴ The present study argues that references to Mendel, by Hitler as well as by others, were much more than “a pun,” and that they often testified to the internalization of a particular way of thinking that was enshrined by Mendelian theory and that needs to be acknowledged, explored and analyzed, not dismissed.

Finally, some writers on racism and its relation to genetics portray Mendelian theory as antiracist and benevolent. Mendelism may have been abused and oversimplified by its early proponents, such as the American eugenicist Charles B. Davenport, but ultimately it led to the dissolution of racial dogmas and to the emergence of more progressive, liberally minded biology.⁵ This perception of Mendelism, as the final section of this book shows, is in itself an outgrowth of post-World War II

³ Examples of Nazi leaders’ usage of Mendelian concepts will be provided in Chapter 5. Burleigh and Wippermann further claim, “In contrast to racial-hygenicists, Hitler expected no immediate results from these [racial-hygenic] measures,” because he prophesied that the process of regenerating the nation and weeding out the physically degenerate and mentally ill would require six hundred years. Such views seem (and are presented as) senseless. An acknowledgment of their underlying Mendelian propositions makes them intelligible and, in contrast to Burleigh and Wippermann’s assertion, fully compatible with the views of other racial-hygenicists. See Michael Burleigh and Wolfgang Wippermann, *The Racial State: Germany, 1933–1945* (Cambridge: Cambridge University Press, 1991), 28, 40. For a recent critical assessment of their work, see Devin O. Pendas, Mark Roseman and Richard F. Wetzell (eds.), *Beyond the Racial State: Rethinking Nazi Germany* (Cambridge: Cambridge University Press, 2017).

⁴ Saul Friedländer, *Nazi Germany and the Jews*, vol. 2, *The Years of Extermination* (New York, NY: HarperCollins, 2007), 278.

⁵ For examples, consider the description provided in the Human Genome Project website: www.genome.gov/25019887/online-education-kit-timeline-from-darwin-and-mendel-to-the-human-genome-project/, as well as the Wikipedia entry: https://en.wikipedia.org/wiki/History_of_genetics. See also Jonathan Harwood and Michael Banton, *The Race Concept* (Newton Abbot: David & Charles, 1975), 47–49, where Mendel’s laws (specifically, the recognition that during sexual reproduction, genes for different traits are “shuffled like a pack of playing cards,” p. 49) are presented as striking a definite blow to essentialist racial thinking, and Lucius Outlaw, “Toward a Critical Theory of ‘Race,’” in Bernard Boxill (ed.), *Race and Racism* (Oxford: Oxford University Press, 2001), 58–82.

developments. While it is true that Mendelian thinking posed certain challenges to racial thinking, it also provided solutions to other pressing disciplinary problems and was eagerly embraced by racial thinkers, including top-ranking Nazis. Hence, while presenting Mendelism as essentially antiracist may be reassuring, it would be a gross anachronism.

Contrary to all of these descriptions, the present book argues that Mendel's theory of heredity had a far-reaching impact on how Germans and Nazis thought about society, purity, national renewal and medical dangers. The extension of Mendelian thinking to the human domain – an extension that Mendel himself could neither foresee nor imagine – is what I term Social Mendelism. If the principles of Darwinian thought gradually converged around the struggle over limited resources, nature's selection powers and the ultimately benevolent outcome of free competition, Mendelian thought offered its own independent toolbox for thinking about the sociobiological dynamics leading from the past through the present to the future. Significantly, the notions and axioms Mendelian theory provided were distinct from those associated with Darwin's work, and most of them did not necessitate an underlying evolutionary narrative. Naturally, however, in certain areas – most notably racial-hygiene – Mendelian principles and Darwinian reasoning were meshed together. Disentangling the threads of Mendelian thinking and identifying their multifarious manifestations is necessary for reconstructing the Nazi mind-set, and helps us appreciate the unique relations between the biological and the cultural sides of Nazi policies regarding both Jews and the mentally ill.

Toward the end of this introduction I will provide a succinct description of the essential components of Social Mendelian thinking. Before doing so, however, I will highlight a significant transformation in the role of Mendelian theory for scholars interested in human heredity, which took place during the mid-1910s, and present an overview of the content of the book. I will then turn to the question of the scientific/pseudo-scientific nature of Mendelian theory, eugenics and Nazi science in general. At the close of this introduction, I include a short glossary of terms to help orient readers who feel less comfortable with the biological lexicon. This brief introduction should provide the uninitiated with all the necessary preliminary knowledge for reading this book.

Mendelism and the Study of Human Heredity

As odd as it may sound, until the mid-1950s, humans did not yet have DNA. In the nineteenth century, what humans did have were hereditary transmissions, hereditary substances, hereditary influences

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and hereditary burdens. Were these running through the blood stream or residing within the germ cells? Indifferent or sensitive to environmental signals? Tending to blend into each other or gradually accumulating? Containing messages from remote ancestors or sensitive to the sex of their carriers? Inheritance was an undeniable phenomenon with occurrences in everyday life; but the nature of inherited properties was an enigma, and the patterns of generational transmission were fertile ground for competing hypotheses.

The new century brought with it the rediscovery of Mendel's work, which offered a solution to some of these mysteries by defining a simple mechanism governing the transmission of hereditary factors, later to be called genes. Throughout the first decade of the twentieth century, Mendelian mathematical and experimental methods were being defined, as the theory gained increasing popularity in various scientific communities. Mendelism was adopted enthusiastically in the United States, where during the 1910s, and as a result of its obvious success, its experimental ramifications became ever more sophisticated. Acknowledging the role of chromosomes in the hereditary process, the American "Lord of the Flies," Thomas Hunt Morgan, performed detailed studies on fruit flies that transcended the original framework of Mendelian thought, applying new experimental methods and mobilizing new interpretative techniques. Concepts such as chromosomal crossover and chromosomal maps became established; later, in the 1920s, novel technologies were also piloted, such as inducing mutations via radiation. At the same time, alternative ways of studying different facets of the hereditary process took shape worldwide. A decade and a half after the rediscovery of Mendel's work, for both supporters and opponents of Mendelism, studying heredity came to require increasing engagement with cellular mechanisms and developmental processes, way beyond the initial mathematical and experimental framework that Mendel had laid out.⁶

This was true in Germany, too. From the mid-1910s, most German geneticists dealing with heredity in animals and plants were either anti-Mendelian or simply non-Mendelian. Jonathan Harwood's 1993 book on the German genetics community and later works by Bernd Gausemeier demonstrated that many experimental geneticists and plant breeders distanced themselves from the American-led (Mendelian) focus

⁶ For a general overview, see Ernst Mayr, *The Growth of Biological Thought* (Cambridge, MA: Belknap Press of Harvard University Press, 1982); Peter J. Bowler, *The Mendelian Revolution: The Emergence of Hereditarian Concepts in Modern Science and Society* (London: Athlone Press, 1989); Hans-Jörg Rheinberger and Staffan Müller-Wille, *The Gene: From Genetics to Post-Genomics* (Chicago, IL: University of Chicago Press, 2017).

on transmission genetics and preferred instead to study developmental and embryological issues, as well as cytoplasmic inheritance.⁷ Anthropologists, in turn, far from confining themselves to pedigree analyses that would emulate Mendelian experimentation, gradually moved to direct their energies toward alternative research techniques, such as twin-studies.⁸ In the field of psychiatry, Pauline Mazumdar differentiated between a Mendelian and a non-Mendelian style of inquiry and showed that German psychiatrists chose the latter path, a fact corroborated by other works on German psychiatry.⁹ When taken together, historical scholarship gives the impression that in the professional communities of geneticists, anthropologists and psychiatrists, Mendelism was overshadowed by competing or complementary strategies of research and interpretation.

This analysis is valid when one looks primarily at the methods of inquiry and at experimental procedures (what is commonly referred to as “the context of discovery”), but less so when one examines the overall conceptual framework and the regime of legitimization (“the context of justification”). It overlooks the fact that from 1913 to 1933, Mendelism changed its role: during this period its ability to inspire experimental work or offer direct solutions to professional challenges indeed waned, while at the same time its status as a legitimizer of results – obtained in whatever way – became more established. As a result, Mendelism remained prominent in the study of human traits, even if and when the methods for analyzing heritability transgressed the Mendelian framework. This new role for Mendelian theory would later transform it into an important political and propaganda weapon with lasting results. In a sense, it is the transformation of Mendelism from a research framework

⁷ Jonathan Harwood, *Styles of Scientific Thought: The German Genetics Community, 1900–1933* (Chicago, IL/London: University of Chicago Press, 1993); Bernd Gausemeier, *Natürliche Ordnungen und politische Allianzen: Biologische und biochemische Forschung an Kaiser-Wilhelm-Instituten, 1933–1945* (Göttingen: Wallstein, 2005); Gausemeier, “Genetics as a Modernization Program: Biological Research at the Kaiser Wilhelm Institutes and the Political Economy of the Nazi State,” *Historical Studies in the Natural Sciences* 40, no. 4 (2010): 429–456.

⁸ Karl Heinz Roth, “Schöner neuer Mensch. Der Paradigmenwechsel der klassischen Genetik und seine Auswirkungen auf die Bevölkerungsbiologie des ‘Dritten Reichs,’” in Heidrun Kaupen-Haas (ed.), *Der Griff nach der Bevölkerung* (Nördlingen: F. Greno, 1986), 11–63; Hans-Walter Schmuhl, *The Kaiser Wilhelm Institute for Anthropology, Human Heredity, and Eugenics, 1927–1945: Crossing Boundaries*, Boston Studies in the Philosophy of Science, vol. 259 (Dordrecht: Springer, 2008).

⁹ Pauline Mazumdar, “Two Models for Human Genetics: Blood Grouping and Psychiatry in Germany between the World Wars,” *Bulletin of the History of Medicine* 70 (1996): 609–657; Volker Roelcke, “Programm und Praxis der psychiatrischen Genetik an der deutschen Forschungsanstalt für Psychiatrie unter Ernst Rüdin: Zum Verhältnis von Wissenschaft, Politik und Rasse-Begriff vor und nach 1933,” *Medizinhistorisches Journal* 37 (2002): 21–55.

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to an interpretative scheme that set the stage for its next metamorphosis – into an overall framework for pursuing human improvement, a social theory.

To an extent, this shift was intrinsic to the attempt – or pretension – to apply Mendelian thinking to the human sphere, and not just to the plant and animal domains. Among biologists, botanists and zoologists, studying heredity and searching for Mendelian patterns required carefully designed breeding experiments. These experiments constituted the first part of any research project; the analysis of the results comprised the second part. On the face of it, practical obstacles should have hindered the possibility of similarly identifying Mendelian patterns among humans, since humans cannot be hybridized like plants and animals, let alone self-pollinated. Nevertheless, attempts to apply the Mendelian framework to the human domain – first, to human pathologies, then to normal human traits – began as early as 1902 and intensified in the decade that followed.¹⁰ To bypass the non-feasibility of experimentation, scholars interested in human heredity studied the mating conducted inadvertently by humans throughout history: namely, they looked at human pedigrees. Family histories, explained one psychiatrist in 1925, functioned as “the protocol of an experiment that man unconsciously performed throughout generations.”¹¹

In theory, if properly selected and adequately analyzed, pedigrees could substitute directed hybridizations, but only on the condition that their formal characteristics made them comparable with Mendelian experimental conditions. Mendel crossed pure, clearly distinct and constant strains. Was it not also possible to find human populations that were clearly distinct – namely, different races – and examine the traits among those who were racially crossed? Mendel counted the ratios of traits among the progeny of his cross-pollinated plants. Couldn't one similarly count the prevalence of certain traits in human families? True, human families did not have progenies in numbers approaching those of the plant and animal kingdoms. But couldn't this problem be overcome with the aid of statistical techniques and large-scale sampling?

The search for methodological substitutes to the controlled laboratory experiment yielded various solutions, and each of these found favor in a different scientific community. Studying the mixture of distinct

¹⁰ The first study to identify Mendelian transmission in humans was Archibald E. Garrod, “The Incidence of Alkaptonuria: A Study in Chemical Individuality,” *Lancet* 160, no. 4137 (1902): 1616–1620.

¹¹ Friedrich Meggendorfer, “Erblichkeitsforschung und Psychiatrie,” *Zeitschrift der Zentralstelle für niedersächsische Familiengeschichte* 7, no. 10 (1925): 225–229 (quote from p. 229).

human populations with an eye on Mendelian reasoning seemed like a promising direction to follow in anthropological research. Encouragingly, the dynamics of racial mixture appeared to corroborate the validity of Mendel's laws for human crossings. This opened new paths of research into the Mendelian characterization of separate traits and into the implications of Mendelian theory for anthropological research in general. Tracking the manifestation of traits in individual families, irrespective of racial affiliation, could have appealed to genealogists, who were eager to improve the scientific status of their field by incorporating biological notions into their familial studies. Finally, substituting experiments with mass familial statistics became the domain of psychiatrists. On the basis of information gathered from clinics and asylums, they computed the prevalence of diseases among patients and their relatives and inferred from them the patterns of inheritance of mental disorders.

The beginning seemed promising. Revealingly, the two scientists who attempted most rigorously to introduce Mendelian concepts into their respective fields in the early 1910s – Eugen Fischer (in anthropology) and Ernst Rüdin (in psychiatry) – would later become among the most prominent scientists in the Nazi academic world. These issues were in fact related: Fischer and Rüdin's wish to "mendelize" their fields indicated that they were both more than capable of adapting scientific work at the frontline of science while adopting novel techniques and abandoning outdated concepts. They thus reshaped their fields, which won them repute in Germany and abroad, and both came to head prestigious research institutes. When the Nazis seized power, both were in a position to exert academic influence and play an active role in shaping policies within the Nazi administration. Their work has justly received great scholarly attention and is analyzed here as well.

As it soon turned out, however, there was a limit to what Mendelian teaching could offer to each of these three disciplines. In the case of genealogy, the Mendelian framework demanded that genealogists give up too much of their traditional methods and their professional identity. They therefore adopted very little of it. Among psychiatrists, there were vocal opponents to Mendelian inquiries, but the impact of Mendelism was nevertheless deep and lasting. The anthropological discipline fully embraced and adapted itself to Mendelian ideas, though simultaneously recognized the limitations of Mendelian analysis. Developments in these three scholarly communities are explored in Chapters 1 and 2, which also show that at the end of the 1920s Mendelism was still a ruling paradigm both in anthropology and psychiatry, even if it no longer supplied actual tools for scientific inquiry.

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But Mendelism did not only reign high among scientists interested in processes of human heredity; as Chapter 3 demonstrates, it also became integral to the refashioning of concepts with larger social, political and cultural implications. Mendelian theory offered a new way for thinking about the meaning of purity and (racial) hybridity – or, as the Germans preferred to call it, “bastardization” – and it suggested a new concept that quickly became a focal point for scientific, medical and social anxieties: recessive traits. The new toolbox that Mendelism offered impinged directly on the emerging visions for racial and national regeneration. In particular, Mendelian teaching became part of the discussions centered on the pathological nature of Jews, on the one hand, and of the cultural exaltation of the peasantry as the fountain of racial renewal, on the other hand. Intriguingly, it was the same Mendelian mechanisms, only differentially applied, that could account for the negative evaluation of the Jews and the positive character of the peasants.

All of these ideas were transformed from theoretical speculations into social realities after Hitler became chancellor. Chapter 4 examines how Mendelian logic informed the attitude of the Nazis toward the mentally ill and how it shaped the Nazi sterilization policy. It begins by showing that Mendelian reasoning led to the inclusion of certain disease categories in the Nazi Sterilization Law of July 1933, an inclusion that later helped the Nazis to argue that their sterilization campaign was based on Mendelian teaching. It then moves to analyze the way Mendelian theory and the sterilization policy were explained to high school students and exposes the multiple functions that Mendelian reasoning performed in the Nazi classroom. Finally, an examination of the implementation of the sterilization law and the proceedings in different Hereditary Courts reveals that, although the law was implemented without explicit dependence on Mendelian theory, it was still informed by and imbued with Mendelian suppositions.

With respect to antisemitic racial policy, Chapter 5 shows that Mendelian thinking left a clear mark on the legislation of the 1935 Nuremberg Laws, the most important anti-Jewish legislation during the Third Reich. Degrading the status of Jews to second-class citizens, the Nuremberg Laws also redefined who was to be considered a Jew, half-Jew, quarter-Jew or German-blooded. These definitions were not only informed by Mendelian reasoning; they were also propagated as such. This was true in the public domain, and was certainly true in German high schools, where Mendelism and racial theory were intimately intertwined. After revealing the (at times surprising) interconnections between racial and Mendelian teaching, the chapter moves to examine the praxis of racial diagnosis, exposing the Mendelian assumptions that underlay it. It ends