

ABSTRACT

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Race as a biological category has a long and troubling history as a central ordering concept in the life and human sciences. The mid-twentieth century has been marked as the point where biological concepts of race began to disappear from science. However, biological definitions of race continue to penetrate scientific understandings and uses of racial concepts. Using the theoretical frameworks of critical race theory and science and technology studies and an in-depth case study of the discipline of immunology, this dissertation explores the appearance of a mid-century decline of concepts of biological race in science. I argue that biological concepts of race did not disappear in the middle of the twentieth century but were reconfigured into genetic language.

In this dissertation I offer a periodization of biological concepts of race.

Focusing on continuities and the effects of contingent events, I compare how

biological concepts of race articulate with racisms in each period. The discipline of immunology serves as a case study that demonstrates how biological concepts of race did not decline in the postwar era, but were translated into the language of genetics and populations. I argue that the appearance of a decline was due to events both internal and external to the science of immunology. By framing the mid-twentieth century disappearance of race in science as the triumph of an antiracist racial project of science, it allows us to more clearly see the more recent resurgence of race in science as a recycling of older themes and tactics from the racist science projects of the past.

INVESTIGATING THE POSTWAR DECLINE OF RACE IN SCIENCE:

RACE, SCIENCE, AND IMMUNOLOGY

By

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Dedication

For Hakim.

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Chapter 1: The Decline and Resurgence of Race in Science

Biological race has been many things over time. In the eighteenth century, biological race was a typology of human beings based on skin color and behavior (Linnaeus 1735). Sixty years later, biological race could be determined by skull size, hair type and other anthropometric characteristics along with geographic origin (Blumenbach 1795). In 1853, Linnaeus's four races and Blumenbach's five became de Gobineau's three pure races: black, yellow, and white (1853).¹ In 1919, biological race was associated with blood types and scientists believed that a person's race determined their blood type (Hirschfeld 1919). Intelligence, as determined through psychological testing, infiltrated understandings of biological race in the early decades of the twentieth century (Smedley 2007). Our current scientific understanding of biological race is grounded in genetics and heredity (Roberts 2011). The idea that humans can be categorized into different groups based on one or another biological characteristic endures.

Biological concepts of race continue to penetrate scientific understandings and uses of racial concepts. However, a definition of race as a social construction currently prevails as the sanctioned meaning of race. The social construction of race is routinely taught in both social and biological science classrooms all over the United States (Morning 2011). It is also part of the official United States standards for the collection of data on race, including in medical research.² Internationally, the United Nations

¹ Carolus Linnaeus introduced the first classification scheme for human beings and named four types of humans: *Europaeus*, *Americanus*, *Asiaticus*, and *Africanus* (1735). Blumenbach expanded on Linnaeus and named five different types of humans: *Caucasian*, *Mongolian*, *Ethiopian*, *American* and *Malay* (1795). De Gobineau's classification of races invoked notions of pure and intermediate types of which *Aryan* was the purest of the white races (1853).

² The National Institutes of Health (NIH), The Food and Drug Administration (FDA), Census Bureau, and Centers for Disease Control (CDC) all refer to the 1997 Office of Management and Budget's (OMB) Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity which states: "The racial and ethnic

Educational, Scientific and Cultural Organization (UNESCO) announced a social concept of race in 1950.³ At the time of UNESCO's publication of the "Statement on Race," the world had recently learned costly lessons about the consequences of biological concepts of race from events like the Holocaust, Apartheid in South Africa, and Jim Crow in the United States. The statement declared that race is more of a social myth than a biological reality and is largely considered indicative of a significant turning point in the history of race and science (UNESCO 1950, 1951; Stepan 1982; Barkan 1992; Stocking 1982).

The mid-twentieth century has been marked as the point where biological concepts of race began to disappear from science, particularly after those concepts were used to rationalize the Holocaust in Nazi Germany (Fredrickson 2002; Winant 2001). Mid-century reform of the use of biological concepts of race in science took place within a larger interpretive climate where the conflation of race and nation was being condemned for its role in Nazi Germany but also harnessed by colonized populations seeking independence and statehood (Balibar and Wallerstein 1991; Puri 2004). Despite the weight of such historical events and investment in a social definition of race, a resurgence of biological concepts of race has become apparent.

Biomedical and genetic research is one of the main sites of this resurgence in biological concepts of race. Race has been increasingly on the rise in scientific discourse and practice and many have argued that science has redefined race as a biological category that is written in our genes (Roberts 2011; Duster 2003, 2015; Fullwiley 2007; Reardon 2008; Kahn 2008, 2005; Fujimura et al. 2008; Koenig et al. 2008; Haraway

categories set forth in the standards should not be interpreted as being primarily biological or genetic in reference. Race and ethnicity may be thought of in terms of social and cultural characteristics as well as ancestry."

³ The UNESCO statement reads: "For all practical purposes 'race' is not so much a biological phenomenon as a social myth" (1950).

1996). Scholars point to numerous cases of this resurgence. One of the more famous is the 2004 approval of BiDil, the first race-based drug to treat only African-Americans (Kahn 2005, 2006a, 2006b, 2008; Reardon 2008; Roberts 2011). In the 1990s, the Human Genome Diversity Project proposed a project to sample and archive the world's human genetic diversity, spurring accusations of neocolonialism and racism (Human Genome Organization 1993; Reardon 2005). In 2014, Nicholas Wade wrote a book declaring that race is a biological reality and decrying the “intellectual barriers” that prevent the scientific study of biological race (Wade 2014).

Medical practice is another site of the resurgence of biological concepts of race. A 2002 New York Times Magazine article written by a self-proclaimed “racially profiling doctor” reads,

“In practicing medicine, I am not colorblind. I always take note of my patient's race. So do many of my colleagues. We do it because certain diseases and treatment responses cluster by ethnicity. Recognizing these patterns can help us diagnose disease more efficiently and prescribe medications more effectively. When it comes to practicing medicine, stereotyping often works (Satel 2002).”

In this dissertation, I explore this mid-century moment where biological concepts of race seem to disappear from scientific discourse. Using immunology as a case study, I argue that concepts of race never quite disappeared and that medical science continued to use biological concepts of race through this era. I explain how race seemed to disappear from science due to broader changes in the ways that the lives of racialized people mattered and a renewed focus on the unmarked category of white. By reaffirming the virtues of science and the scientific method, the narrative of the decline of race in science

is crucial to our contemporary practices of knowledge and governance. In this introduction, I explain the narrative of the disappearance of biological race and review scholarship that has challenged it.

Racism and Biological Concepts of Race

Race as a biological category has a long and troubling history as a central ordering concept in the life and human sciences. While biological concepts of race are variable and tend to change over time, they can be generally defined as inherent inferiority or superiority of different groups based on racial group membership.

Deep-seated beliefs in the biological reality of race are most potent when attached to state initiatives. The use of biological concepts of race by states has justified colonial conquest, settlement, and slavery. State racism supported eugenic practices of sterilization, immigration restriction, and in the extreme case, extermination (Bauman 2000; Ordover 2003; Kelves 1995). More often than not, these types of state-based racisms are predicated on scientific medical beliefs. State supported medical experimentation was sanctioned for racialized populations based on scientific justifications that black bodies react differently to disease than white bodies; the infamous Tuskegee experiments being one of the most well-known examples (Washington 2006; Reverby 2009). Racialized immigration restrictions are often articulated through health and disease requirements that are in turn based on racist practices and beliefs (Kelves 1995).

The discipline of immunology has been one site of the elaboration of biological concepts of race in science. As the biomedical science that focuses on how bodies react to

disease it is well-suited to making claims about essential differences between groups or populations. Chapter 5 focuses on the discipline of immunology as a case-study in the use of biological concepts of race over time.

Building the Narrative of Decline

In this dissertation I investigate the mid-twentieth century narrative that concepts of biological race declined in science. The basic tenets of this narrative are 1) that biological concepts of race in science declined in the postwar era; 2) scientific racism was based on bad science; and 3) science has since provided indisputable evidence there are more differences between individuals than between races.

Decline in the Postwar Era

In the postwar era a narrative about the decline of race in science was beginning to be built by scientists and historians of race and racism and the history of science. With the memory of the Holocaust still fresh in the mind of the public and the minds of scientists, the first event in this narrative was the 1950 publication of the United Nations Economic, Scientific and Cultural Organization's Statement on Race. In December of 1949 a group of international scholars came together in Paris with the task of defining the race concept itself. The construction of the statement involved more than 100 individual scientists and was authored by Ashley Montague, a professor of Physical Anthropology at Rutgers University, known for his antiracism. The 1950 publication that came out of this meeting was a social constructivist manifesto declaring the end of the concept of biological race, stating that race was more of a "social myth" than a "biological phenomenon" (UNESCO 1950).

After a vocal outcry from biologists, UNESCO was forced to reconvene another group of experts to revise the 1950 Statement on Race. This group of experts was mainly biologists and geneticists who insisted that the first statement had gone too far on two accounts. They argued that race could still be a biological phenomenon and that the assertion that “humans tend towards kindness and cooperation by nature” was not proven (Reardon 2005). The second Statement on Race was published in 1951. The second statement is less well known, however both of these statements have since come to signify the beginning of what I shall call in this dissertation the narrative of the decline of biological race in science.⁴

After the Statements on Race, a few significant publications came to be widely cited as documenting the decline of race in science. These scholarly works played a large role in the creation of the narrative of decline, especially in academia. Three books in particular are potent examples of the decline narrative: 1) Nancy Stepan’s 1982 *The Idea of Race in Science*; 2) George Stocking’s 1968 *Race, Culture and Evolution: Essays in the History of Anthropology*; and 3) Elazar Barkan’s 1992 *The Retreat of Scientific Racism: Changing Concepts of Race in Britain and the United States between the World Wars*. Together these works along with the thousands of citations attributed to them have built a narrative in academia and beyond, where the end of race in science or the end of scientific racism is placed in the mid-twentieth century.

Stepan’s 1982 book, *The Idea of Race in Science: Great Britain, 1800-1960* argues that “long before the scientists were stirred to action by political events in Europe, doubt and uncertainty in race science had set in” (1982:140). Barkan’s 1992 book, *The*

⁴ I will refer to this as the “decline narrative” or the “narrative of decline” for economy of words.

Retreat of Scientific Racism: Changing concepts of race in Britain and the United States between the World Wars, makes a similar claim adding the idea that Nazism did not in itself lead to the decline of scientific racism (1992: 2). While this literature is helpful in illuminating the terms of the debate about the concept of race in science, it is limited in scope due to its focus on the disciplines of biology and anthropology. The disciplines of biology and anthropology were at the center of the debate about the meaning of the concept of race (Stepan 1982:142; Barkan 1992). Biologists and anthropologists were considered experts on the question of race in science, thus it makes sense to focus on these disciplines as the locus of change concerning race science. However, what this particular disciplinary focus loses sight of is how the centrality of the debate in these disciplines obscures from view how these changes in ideas affected theories and practice in medicine and medical practices. While it is important to understand how scientists who worked directly with race as a theoretical concept dealt with wider political changes and responded to public pressure to renounce racism in science, it is just as important to understand how these changes affected disciplines whose applications bear directly on the practices of healthcare and prevention of disease, such as immunology.

Stepan and Barkan write a more internalist history that assumes that the influence of politics on science works through the mechanism of the political ideologies and beliefs of scientists themselves (Harding 1998:2). Thus, their focus is often the racist or anti-racist beliefs of individual biologists and anthropologists that were directly involved in the debate on race. The significance of this internalist history is two-fold. On the one hand, it highlights the fact that science does not in itself determine the political stance of scientists. Barkan writes, “Scientists’ positions on race could not be predicted from their

research or the progressiveness of their science” (1992: 343). On the other hand however, it obscures other channels through which the political has an effect on the scientific. For example, there is no analysis of how national level scientific institutions responded to the abuses of concepts of race in science that became starkly evident in the genocidal practices of Nazism.

This internalist history also leads Stepan to the false conclusion that the new population genetics, which she sees as a replacement for racial science, would be neutral in terms of race (1982:160). It leads Barkan to the conclusion that even without the impetus of political events in the interwar period that science would have done away with concepts of race on its own (1992:345).⁵ For Stepan, politics does indeed influence science, however, as she argues in a characteristically internalist fashion, science depends for its character on empirical tests of data (1982:141). Thus, mechanisms internal to science are, in the end, responsible for the ‘retreat of scientific racism.’ An external perspective, on the other hand, would interrogate the empirical tests as well as the data for the politics of science, opening the black boxes of scientific knowledge and revealing its political content.

Pseudo-Science and Racist Scientists

State actions grounded in medical and scientific beliefs about inherent biological differences based on racial group membership have proved deadly for centuries. In our current climate, the beliefs that led to the brutality and abuses described above are largely thought of as outdated. The scientific racism and medical practices of the sort that

⁵ To be fair, neither of them deny the importance of political developments, but both authors’ arguments pivot on the conclusion that race in science was already being questioned before these developments took place, thus minimizing their role and privileging the internalist.

happened in Tuskegee and Guatemala are now dismissed as pseudo-scientific; examples of bad science or of bad scientists or racist doctors (Reverby 2009).

Dismissing past scientific practices as pseudo-science is to commit a basic mistake of historical fallacy. The sciences of craniometry, eugenics, and intelligence testing, were considered cutting edge at the time when they were being practiced. It is only in hindsight, with our present moral standards that early and mid-twentieth century scientific practices can be considered racist or pseudo-science. As Roberts writes, “Scientists today can then claim that it was pseudoscience that fell victim to racial prejudice, not *real* science, which studies racial difference objectively. But what we call racial pseudoscience today was considered the vanguard of scientific progress at the time it was practiced” (Roberts 2011:27). While charges of racism are appropriate descriptions of these types of scientific practices, it does not mean that they were any less scientific. In Chapter 4, I argue that the tendency for the decline narrative to dismiss past scientific paradigms by using charges of racism played a role in shaping post war scientific nationalism in the United States.

In this dissertation, whether or not individual scientists engaged in immunology or other medical sciences were racist is not at issue. Rather, I take the perspective that biologists, immunologists, and other medical scientists engage in racial projects that have the potential to be both racist and/or antiracist projects. I am not interested in an accusation of individual scientists as racist or antiracist but rather how broader structural arrangements create opportunities for the emergence or maintenance of racial projects in science and medicine.

Indisputable Evidence

While the narrative of decline has the postwar era as its starting point, the 2002 completion of the mapping of the human genome is another focal point of the decline narrative. All of our genes together are what is known as the human genome, it is the blueprint for the development and function of a human being. The Human Genome Project was an international research project to map and understand all of the genes of human beings.⁶ Genes are the stuff that humans are made of and the Human Genome Project was an international research collaboration to make sense of our genes by mapping or sequencing them. For many of our genes, scientists now know where to find them on a chromosome and for some, they know what they are intended to do. The science of what humans are and what we are made of is always closely followed by the idea of what makes us different. The answer that is always already at hand is that of race and racial differences. This was not lost on the scientists or politicians involved in the project. When the mapping was completed, a joint press conference featuring Tony Blair and Bill Clinton announced the achievement. Clinton is famously quoted as saying, “After all, I believe one of the great truths to emerge from this triumphant expedition inside the human genome is that in genetic terms, all human beings, regardless of race, are more than 99.9 percent the same” (Clinton 2000).

When geneticists completed the mapping of the human genome and declared that there were more genetic differences between individuals than there were between races and that the differences between races was less than 1% of the entire genetic make-up of

⁶ <http://www.genome.gov/12011238>

humans, they were building on the foundation of the decline narrative that had been laid 40 years earlier.

Biological Race Makes a Comeback

The resurgence of biological concepts of race is associated with the rise of genetics that began in the 1950s (Fujimura et al. 2008). At the same time that concepts of race were being condemned by UNESCO's representative scientists, the genetics revolution, that would soon transform how we think about medicine and disease, was just beginning. In Troy Duster's (1990) book, *Backdoor to Eugenics*, he argues that the new science of genetics has brought a halo of legitimacy to research that demonstrates how genetic disorders are differently distributed through racial and ethnic groups. Duana Fullwiley argues that the human genome has become a referent for racial distinction in the United States and has served to "*molecularize race itself*" (2007:4; original emphasis). Dorothy Roberts (2011) argues that old typologies of race are being redefined as a genetic biological category. Duster (2015) described this as the re-inscription of race at the molecular level.

Jonathan Kahn argues that race is being used as a strategic category by pharmaceutical companies to obtain patent protection and drug approval as in the case of Bidil. He explains that racial categories are used as a workaround because "at this point the technology and resources do not exist to efficiently scan every individual's genetic profile" (2006a: 1350). Kahn also indicts the state, and more specifically the Office of Management and Budget, which provides racial categories that underlie broader federal initiatives that shape the use of race in research and pharmaceutical production. He argues that "federal initiatives reward the reification of race as a category" and provides a

“structural incentive” for pharmaceutical companies to develop and patent race-specific drugs in the name of genetics (Kahn 2008). Other scholars have seconded this notion that financial incentives based in structures created by state action support the resurgence of race in genetic science (Koenig et al. 2008; Stevens 2008; Roberts 2011). Immunology is one of the sites of this resurgence of biological concepts of race. How racialized bodies react to particular diseases and how their immune systems make use of medicine has become a site of this resurgence.

Challenging the Dominant Narrative

As literature on the resurgence of race in genetic science has grown, a few scholars have looked to history to reevaluate the postwar era and the dominant narrative of the decline of race. Jenny Reardon directly interrogates the purported disappearance of race from science in the postwar era. She finds that race did not disappear, nor was it disavowed by scientists as it is often proposed. She argues that scientific understandings of race moved from what she terms the ‘typological approach’ to the ‘population approach’ (2005:36). The typological approach to race was the particular concept of race that separated the human species into discrete types. The population approach denied that humans had distinct types and argued that understanding human variation as differences in population groups defined by genetics was a more useful conceptual framework. Reardon argues that the distinction between these two approaches however, is itself a product of history and the population approach never solved the problems of earlier approaches to race. She writes, “Here, though, it is clear that population does not replace race; rather, races become populations (2005:28).

In 2008 Gissis conducted a study of how race is used in Western science. The article begins with “the widely perceived sense that the use of the category of race in sciences dealing with humans has markedly decreased... after it had almost completely disappeared soon after the end of World War II” (2008:437). He argues that race “only *seemingly* disappeared from scientific discourse after World War II and has had a *fluctuating yet continuous* use during the time span from 1946-2003” (2008: 438; original emphasis). Another example is Ann Morning’s 2008 article, which uses high school biology textbooks to demonstrate that the teaching of race declined in the 1950s but has been on the rebound since the 1990s (2008: S108). From a feminist technoscience perspective, Haraway argues that the mid-twentieth century retreat from race does not represent a disappearance of race from science but a reconfiguration of the “discursive entanglements of family, gender, nation, and race” (Haraway 1996).

Research Questions

1. How can we explain the appearance of a mid-century decline of race in science?
2. How did concepts of biological race change over time in the discipline of immunology?

Dissertation Organization

In Chapter 2, I present the theory and methods that ground and support this project. I rely on feminist technoscience, postcolonial studies, the history of science, technology and medicine, critical race theory, and critical science and technology studies to provide the analytic framework for this dissertation. My methods draw on historical comparative analysis and narrative analysis to deconstruct the story of the dis- and re- appearance of race in science and medicine.

In Chapter 3, I connect concepts of race to structures of racism focusing on the domains of medicine and science and specific to the three time periods I set out this chapter. I lay out in more detail how biological concepts of race have operated in specific times and spaces and how they have changed over time and in space. Chapter 4 explains the seeming disappearance of race and offers alternative explanations of the appearance of a decline of race in science. I argue that race seemed to disappear from science due to broader changes in the ways that the lives of racialized people mattered and to whom. I show how the unmarked category of white obscured the continuing use of biological concepts of race in science and medicine. In this chapter, I also describe the work that the narrative of the decline has accomplished through its reaffirmation of the virtues of science for the scientific nation state.

Chapter 5 is a case study that uses the discipline of immunology to explain how race continued to be used as a concept in medical science throughout the post-war time period that is part of the decline narrative. For the discipline of immunology, the idea of racial or natural immunity was central to rise and fall of theories of immunity that have far reaching impacts on how we understand our own bodies even today (See Chapter 5).

In the concluding Chapter 6, I explain the resurgence of race in science in light of the seeming disappearance and the continued use of race in science.

Chapter 2. STS and CRT in Conversation: Theory and Methods

This dissertation draws on the theoretical frameworks of critical Science and Technology Studies (STS), and Critical Race Theory (CRT). In this chapter I begin with a short overview of STS and CRT and then explain how a synthesis of these two frameworks gives me special purchase on the puzzle of the narrative of disappearance of race in science. In the second part of this chapter I explain my methodology for this project.

Critical Science and Technology Studies

Critical STS is a branch that focuses explicitly on questions of power by analyzing science and technology from a perspective of social justice and democracy (Hess 1997:133). Research in the critical STS tradition takes an external perspective on science and opens the ‘black boxes’ of scientific knowledge to reveal the political content of a science once thought to be objective and unbiased. From this perspective, the production of scientific knowledge is less a matter of experiments and evidence, but rather a social and political process where power is always at work. In this section I introduce the framework of STS and provide examples of similar work and perspectives. Specifically, I focus on how STS scholarship looks to history to understand and interpret structures of knowledge production and the power dynamics that shape them. Next, I turn to the significance of narrative in science and focus on the importance of the stories we tell ourselves about science.

Science and technology studies acknowledge the role that broad historical contexts play in shaping how knowledge is produced (Hess 1997). This project works

within this tradition of scholarship that looks to historical context as an explanatory category for describing changes in the production of knowledge. Earlier, I discussed how the global political context of colonialism shaped scientific knowledge production. STS scholars have also shown how the development of the social sciences in the United States was linked to processes of empire formation (Nugent 2010). Nugent argues that in the aftermath of WWI, both Europe and the United States had a need for detailed knowledge about social groups and cultural patterns found along “contested frontiers of empire.” This need for knowledge led to increased funding for the social sciences and the emergence of Area Studies as the dominant geography of knowledge (Nugent 2010). This study seeks a similar understanding of how the structure of the production of knowledge is shaped by global political and economic processes.

The critical, external, perspective complements what Frickel and Moore (2006) call the *New Political Sociology of Science* (NPSS). This framework explicitly draws attention to structural bases of power and inequality in knowledge politics. This focus on structural bases of power takes the perspective that an actor’s position within a specific institution or network provides access to available resources. Rather than assume that a specific paradigm rises and falls based on its explanatory power, this project views scientific change as a political process that is just as dependent on issues of prestige, funding, space, time, alliance and power as it is on the experimental method. In terms of concepts of race in postwar immunology, the position of particular scientists in their institutional contexts will shape their ability to influence ideas in the discipline. Furthermore, “NPSS demonstrates the ways in which institutions and networks shape the power to produce knowledge and the dynamics of resistance and accommodation that

follow” (Frickel and Moore 2006: 5). The analysis of the institutions and networks that shape the power to produce knowledge emphasizes the role of rules and rule-making in the production of scientific knowledge (Frickel and Moore 2006: 11). Thus national science policies and regulations will be part of the explanation for the appearance of a decline in race in the postwar period.

STS provides an analytical framework for understanding the ways that science and scientific knowledge are embedded within specific historical contexts. Scholars of STS look to the ways that social relationships and power have an effect on the ways that knowledge is produced and that social and historical relationships of power have an effect on the knowledge that is produced. STS does not evaluate the truth claims of scientific knowledge, but rather asks questions about how and why specific types of knowledge are produced and accepted in a given context. In that vein, this dissertation does not portend to evaluate the truth or non-truth of claims about race in science, but rather seeks to uncover the ways in which broader social historical relationships shape how knowledge is produced and the vicissitudes of power that lead to the broad acceptance and relevance of certain scientific ideas over others (Frickel and Moore 2006).

In addition to a political perspective on the production of scientific knowledge, a co-production perspective adds interpretive power to this framework by bringing together concerns about science and social order (Jasanoff 2004). Co-production is the idea that both the natural and social orders come into being together; they are co-produced. Drawing attention to the “appropriate social supports” of knowledge, the co-production perspective focuses on “How knowledge making is incorporated into practices of state-

making or governance more broadly and in reverse how practices of governance influence the making and use of knowledge” (Jasanoff 2004:3). A couple of examples will help clarify the perspective of co-production.

Jenny Reardon provides a clear example of co-production in a 2008 article titled “Race without Salvation: Beyond the Science/Society Divide in Genomic Studies of Human Diversity.” In this article Reardon investigates the Human Genome Diversity Project or the HGDP. The HGDP was a project designed to create a database of the genetic information of indigenous populations that were disappearing due to globalization and the incorporation of previously isolated groups (Cavalli-Sforza, Wilson, King, Cook-Deegan and Cantor 1991). The initiative to sample the genetic material of these groups encountered resistance from indigenous rights groups such as the Third World Network (Lock 1994).

The HGDP ran into problems as it attempted to decide how to get informed consent from these groups. At issue was the decision about the groupness of these populations and who could give informed consent. An Ethical Protocol, which called for the identification of groups by experts, was agreed upon as a tool to address the concerns of indigenous rights groups. However, the Protocol assumed that there was an essential existence of a group to be sampled and failed to recognize that whichever expert was to decide the contours of the group was also constructing the group itself. As Reardon states, “Rather than merely including participants, these novel procedures create new participants as they seek to include them –at once altering the constitution of the objects that can be the focus of scientific inquiry and the subjects who can make claims against governmental institutions and their research programs” (2008: 306). This example

demonstrates how both scientific practices and social practices were needed to construct the population. On the one hand is the scientific expert who will decide which groups qualify as groups and on the other, the social practices of ethics and the credible system of governance that supports ethical practices.

A second example of co-production draws on James Scott's 1998 book *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Scott argues that the pre-modern state did not know much about its subjects and as a result state-led interventions were often crude and ineffective (1998:2). Modern states, however, engage in systematic knowledge seeking practices, (e.g. standardization and categorization) that work to make subjects legible to states and therefore manipulable. Scott argues that European statecraft was devoted to the rationalizing and standardizing of complex societies into legible and administratively convenient formats (1998: 2). As an example, Scott describes map-making and is worth quoting at length.

These state simplifications, the basic givens of modern statecraft, were, I began to realize, rather like abridged maps. They did not successfully represent the actual activity of the society they depicted, nor were they intended to; they represented only that slice of it that interested the official observer. They were, moreover, not just maps. Rather, they were maps that, when allied with state power, would enable much of the reality they depicted to be remade. Thus a state cadastral map created to designate taxable property-holders does not merely describe a system of land tenure; it creates such a system through its ability to give its categories the force of law (1998: 3).

Systematic knowledge seeking (i.e., science) *and* social practices of governance together co-produce objects of knowledge in this example. Furthermore, Scott demonstrates how the production of knowledge in turn, loops back to re-shape practices of governance such as taxation.

The idiom of co-production informs this study in two fashions. First, by drawing attention to the ways in which the natural and social orders are brought into being together, the co-production framework resists opposing science and ideology. In lieu of asking whether or not concepts of race are scientific *or* social, truth *or* non-truth, this perspective brings into focus the work that is required to maintain a distinction between true scientific knowledge and mere ideology. The co-production framework also challenges the primacy of science as a precedent to social or racial order by insisting that the two are co-produced. In other words, science does not by itself create the categories of racial membership that the state then takes up and uses to distribute the rights and responsibilities of citizenship. Rather, state officials and scientists co-produce categories of racial membership that lead to differential outcomes.

Second, the co-production framework offers new ways of looking at power and the role of knowledge in shaping and transforming relations of authority (Jasanoff 2004). Co-production has been used as a framework to highlight “the intimate relationship between science and statecraft” (Caroll 2009). This framework complicates the relationship between state and science by acknowledging that government officials and policy makers cannot simply turn to science to provide answers to social problems (e.g., racism, health disparities) and these social actors cannot govern without some form of systematic knowledge seeking (e.g., science). As mentioned earlier, states use science to make disorderly populations legible (Scott 1998). Making populations legible in terms of race and disease serves the state in its function to provide for the health and welfare of the nation. However, this picture is complicated by the differential returns on the contract

of citizenship for racialized populations who are relegated to a second-class citizenship (Collins 2001).

Critical Race Theory

The framework of Critical Race Theory provides an analytic framework for understanding how race and racism operate. Critical race theory refers to a diverse set of literature that is concerned with the production and maintenance of race and racism. Four themes from this broad genre of literature inform this study. The first theme, the post WWII rupture in racial formation, stems from work on the historical sociology of race and underscores my periodization of concepts of race in science (see Chapter 3). Second, is the rejection of simplistic understandings of race in favor of a nuanced and dynamic concept of race. The third theme is the importance of science and medicine as crucial sites of the elaboration of race and racism. Finally, critical race theory also provides a framework for understanding how race is intimately related to the modern state.

Omi and Winant's theory of racial formation and its constituent racial projects are often interpreted as *racist* projects. However, by their own definition, racial projects can be both racist and *antiracist*.⁷ The language of project that these authors inject into theories of race and racism over time, helps to ground meanings of race with structures of racism and inequality. While sociological work on racist projects is abundant, historicizing antiracist projects and connecting antiracist projects to social structures is not done as often. This dissertation views the seeming erasure of race from science as an

⁷ "Racial formation theory allows us to differentiate between race and racism. The two concepts should not be used interchangeably." [...] "This emphasis on projects allows us to refocus our understanding of racism as well, for racism can now be seen as characterizing some but not all, racial projects" (Omi and Winant 1994: 71).

antiracist project of scientific knowledge production rather than as an inevitable progression of science and the revelation of truth. Viewing the narrative of disappearance as a project draws attention to the ways in which it has become attached to and subservient to other projects that do not share the same antiracist goals. It invites analyses to consider the project itself as flawed, political, and fraught with tension as opposed to objective scientific truth supported by empirical evidence.

CRT literature on the historical sociology of race identifies World War II as a moment of rupture. Critical race scholars have marked this period as the beginning of the end of blatant and overtly racist government policies (Bell 1980; Omi and Winant 1994; Fredrickson 2002; Winant 2001). In *The World is a Ghetto* Winant argues that epochal developments created a rupture with the white supremacist past. He lists the developments as “decolonization, the enactment of new civil rights laws, the undoing of longstanding racial dictatorships, and the adoption of cultural policies of a universalistic character” (2001: 134). Similarly, George Fredrickson argues that “Nazi Germany, apartheid South Africa and the Jim Crow South had taught the world a lesson about the rampant and unchecked racism that eventually changed the standards for internationally acceptable conduct.” (2002: 105). These developments moved the global racial order into a new period of instability and tension in the middle decades of the twentieth century.

A central idea of critical race theory is racial formation. Racial formation refers to the social and historical process by which racial categories are created, transformed, and destroyed (Omi and Winant 1994). Racial formations are made up of disparate and sometimes contradictory racial projects that connect what race means to the way in which social structures are organized (1994: 56). Omi and Winant describe the postwar period

as a paradigm shift where “racial identity, the racial state and the very nature of racial politics as a whole were radically transformed during the 1960s –transformed so profoundly that the racial meanings established during this period continue to shape politics...” (1994: 97). The concept of racial projects informs how I will approach the use of concepts of race in science in the postwar period. This means viewing the science of immunology and its use of concepts of race as a racial project that not only produces meaning but is historically situated in social structures that reorganize and redistribute resources along racial lines.

The 1950 and 1951 UNESCO statements that condemned racism and racial prejudice in science have become part of the story of this broader global shift in racial formation from one set of projects to the next. The purported purging of race from science buttressed claims about the equality of races and the emergence of a new era of racial and social justice in the West. It was during this new era of equality and justice in the West that science became the new frontier on which the greatness of these newly anti-racist nations would be built.

A second theme from critical race theory is the rejection of simplistic binary understandings of race. Omi and Winant urge us to understand race as “as an unstable and ‘decentered’ complex of social meanings constantly being transformed by political struggle” (1994:55). Conceptions of race have shifted over time from what David Theo Goldberg calls ‘naturalist’ to ‘historicist’ conceptions (2002). The naturalist conception of race insists that racialized others are inherently or biologically inferior and the historicist version conceptualizes racialized others as pre-modern and historically or culturally immature. Historically, racial rule has moved from a naturalist to a historicist

conception of race. Goldberg insists that one form of racial rule is not more or less benign than the other and “the naturalist and historicist traditions of racist commitment always contained the seeds, the incipient presumption, of the other” (Goldberg 2002: 84).

The binary construction of race offered by Goldberg maps well onto the assertion from scholars of race and science that race as a biological concept declined after the postwar era in favor of the view that race is a social myth. However, as Goldberg suggests these two conceptions of race (biological/naturalist and historicist/culturalist) have always existed simultaneously, in constant conflict with one another. Within science, race is also described as being “continually remade or reconstructed” (Morning 2008: S108). Donna Haraway has used the metaphor of a vampire to describe how concepts of race can spontaneously change forms when necessary (1996). As Ernst and Harris argue, “Racial discourses work well not despite their logical inconsistencies, ambiguities and mixing up of premises but because of them” (1999: 7). Thus, race as *either* biological or cultural will not be the heuristic with which I will approach concepts of race in science. Rather, I will approach concepts of race in science as a dynamic, mutable and inherently unstable.

Critical race theory has long recognized science and medicine as primary sites of racial formation. Wailoo and Pemberton have shown how racialized constructions of genetic diseases leads to very different outcomes in terms of the acceptable amount of risk in available treatments for diseases strongly linked to race (i.e., cystic fibrosis, sickle cell anemia, Tay-Sach’s) (Wailoo and Pemberton 2006). Epstein argues that medicine’s reliance on racial categories encourages belief in race as a real biological category and “interferes with [the] attempts to understand and eliminate health disparities” (Epstein

2007: 228). Medical constructions of race work to reinforce ideas about the reality of race in other arenas and to redistribute chances for life and death along racial lines.

The third theme from this literature is the perspective that the state is an important site of the elaboration of race and racism. Critical race theory insists that race be framed as part of the social structure rather than a reflection of class or ethnicity, and thus must be understood in context of the institutional relationships that shape racial conflicts and interests. Goldberg argues that racial classification is part of the collective understanding of the social order and instrumental rationality of the modern state. As Goldberg writes, “race is integral to the emergence, development, and transformations (conceptually, philosophically, materially) of the modern nation-state. Race marks and orders the modern nation-state, and so state projects, more or less from its point of conceptual and institutional emergence. The apparatuses and technologies employed by modern states have served variously to fashion, modify, and reify the terms of racial expression, as well as racist exclusions and subjugation” (2002: 4). Collins argues that “racial categories frame different ways of belonging to the nation-state itself” (2001:8). Omi and Winant argue that “The state from its very inception has been concerned with the politics of race” (1994:81). However, the authors also argue that “race must be understood as occupying varying degrees of centrality in different state institutions and at different historical moments” (1994: 83).

Commonalities

Bringing together CRT and STS reveals many commonalities between the two schools. These include the coincidence of a major rupture around the WWII era, insistence on non-linear change, a foregrounding of the state as an important site of articulation, political contestation, how both race and science are shaped by historical context, and the importance of narratives.

For STS scholars, the WWII era is marked by a significant change in the way that science is organized. Mukerji (1989) argues that the contemporary relationship between science and state was established at the end of WWII. She argues that scientists became a resource for the state as science became central to new ways of waging national battles. After WWII the contributions of science to the state were much more visible. Vannevar Bush's seminal 1952 report, the *Endless Frontier*, suggested how government might profit from science in the post-war era and equated national advancement with scientific progress. This is the era when the state became the main funder of scientific research. Sheila Jasanoff argues that there were fundamental shifts in the way that the state deploys science beginning in the postwar era. She argues that this shift changed the relationship between knowledge creation and democracy and that contemporary societies have become "knowledge societies" (Jasanoff 2005).

On the other hand, CRT scholars mark the post WWII era as a shift in racial formation. Omi and Winant describe the post-war period as an era of widespread anti-racism when racialized groups began to protest their place in the social structure. Not coincidentally to this project, this era is also marked as the end of scientific racism and is the beginning of the end of biological concepts of race. Scholars tend to see these sets of

changes as disparate and unconnected. However, in this dissertation I recognize these changes as linked and interrogate the ways in which changes in science, state, race, and racism are intertwined.

Another commonality between STS and CRT is their insistence on non-linear change. Both schools agree that change is not a simple, nor cumulative process. Kuhn argues that change in science requires “scientific revolutions” and does not necessarily build upon past knowledge as much as replace previously held paradigms (1996). CRT scholars insist that racial projects descend from earlier racial formations and previous conflicts. Race, and the meaning of race is multiply determined, mutable, and overlapping.

STS and CRT scholars both foreground the state as a critically important site of articulation. Co-construction insists that the state is deeply implicated in our knowledge making practices. CRT scholars often look to the state as a paramount site of the distribution of resources, and the right and responsibilities of citizenship along racial lines.

Both science and race are politically contested. STS insists that the endeavor of science is rife with controversy and that agreement among scientists is not as common as is often believed. Similarly, race is a politically contested arena. The meaning, definition, and usefulness of race is hotly contested in the political arena. Omi and Winant argue that contests and controversies about race are most often framed on the terrain of politics (1993). Finally, both CRT and STS have an analytical framework that insists that their subject matter is shaped by historical context. STS holds that the ways that we make

knowledge and how it becomes legitimate are shaped by the organization of power and the distribution of resources that characterize a particular historical moment (Frickel and Moore 2006). The meaning of race and how it articulates with social structures are, in turn, deeply shaped by the historical context in which they arise and are deployed.

Narrative and storytelling are important concepts in both STS and CRT. Heroic narratives of science in the 18th century were tales of exploration and discovery that became part of the larger grand narrative of scientific progress (Terrall 1998). These narratives promoted the value of science to the state and fed into a larger narrative of progress in civilization with science as an integral mechanism of that progress (ibid). Historians of science are skeptical of the linear progress narrative of science and how it erases the power structures that shape scientific revolutions. Kuhn writes that scientists are more likely to rewrite their history as a linear progression because “the results of scientific research show no obvious dependence upon the historical context of inquiry” (1996: 138). The critique of scientific narratives of cumulative progress informs the approach to the narrative of how race declined in science in the postwar era. Kuhn’s comment suggests that bringing back in the “historical context of inquiry” is part of the critique.

In CRT scholars are concerned with master narratives and counter-storytelling. Master narratives are part of the dominant discourse and are constructed in ways that naturalize race and racism (Delgado 1989; Solorzana and Yosso 2001). Counter-narratives or counter-storytelling is a tool for challenging master narratives and the racisms that they naturalize (Crenshaw 2011). Bringing together STS critiques of the linear progress narrative in science with the tool of counter-narrative in CRT highlights

how the decline of race in science narrative supports the master narrative of scientific progress and suggests that a counter-narrative could challenge how the narrative supports concepts of race and the racisms that accompany them.

Despite these many commonalities, together, the frameworks of STS and CRT complement each other in ways that have not been fully exploited by most scholars in either camp. In what follows, I argue that bringing together CRT and STS creates a powerful analytic framework. In the first section, I explain how taking seriously the scientific aspects of biological concepts of race shifts analytical attention towards moments of scientific “agreement” and charges of “pseudo-science” as problematic. Next, relying heavily on Omi and Winant’s concept of racial formation, I explain how approaching biological concepts of race as racial projects refocuses our attention on the articulation of race in scientific discourse with the redistribution of resources along racial lines, how biological concepts of race descend from previous racial projects, and how biological concepts of race are not always racist, but can also be antiracist projects.

Exploring the Gaps: CRT and STS in conversation

Approaching biological concepts of race as racial projects refocuses attention on the articulation of race in scientific discourse with the redistribution of resources along racial lines. Scholars are beginning to explore the fruitful conversations to be had between STS and CRT (Collins 2015; Hatch 2014). Works that take seriously this line of questioning have focused their studies on how the new concept of biological race grounded in genetics continues to disadvantage the lives of people of color (Duster 2015, 2003; Hatch 2016; Bliss 2012; Roberts 201; Fullwiley 2007; Fujimura et al. 2008). Omi and Winant, however, argue that racial projects can also be *antiracist*. The post WWII

era, in CRT literature, is characterized by international antiracist movements of independence, civil rights and antiapartheid (Omi and Winant 1994; Winant 2001; Frederickson 2002). The coincidence of this period with the “end of scientific racism” in both CRT and STS literatures too easily leads to conclusions that biological concepts of race disappeared from science. Rather than take for granted the success of postwar antiracism in defeating notions of essential biological race, this project interrogates the constraints and continuities that characterize moments of antiracism and that thread through this period of tumultuous change.

Another contribution of CRT to STS literature is how biological concepts of race descend from previous racial projects. Omi and Winant argue that racial projects “exist in a definite historical context, having descended from previous conflicts” (1993: 58). This project seeks to explore not how the consequences of biological concepts of race affect racialized populations, but rather the mechanisms through which older concepts continue to infuse newer biological concepts of race. Taking seriously the intersection of CRT and STS leads to one of the main research questions in this dissertation: How did science continue to use concepts of race in the postwar era?

An important concept from the CRT literature that is often overlooked in STS is the unmarked category of whiteness. While many scholars have focused on how concepts of biological race tend to disadvantage people of color, less attention has focused explicitly on how the unmarked category of whiteness played a role in the continuities between historical scientific racism and contemporary concepts of biological race. In Chapter 4, I argue that one of the ways that race seemed to disappear from biological science is due to the tendency to overlook whiteness as a racial category.

Frickel and Moore (2006) insist that the political sociology of science take seriously the idea that sustained large-scale relationships make some outcomes far more likely than others. In CRT, racial formation is the concept that captures the sustained large-scale relationships that Frickel and Moore reference. Approaching these large scale relationships as racial formations foregrounds unequal power relations of empire and white supremacy and asks us to consider how science effects and is effected by these power relations.

The narrative of the disappearance of race in science charges that the science of earlier periods was “pseudo-science,” carried out by racist scientists and later disproven. However, STS warns us to be suspicious of historical charges of pseudo-science. Kuhn writes, “Out-of-date theories are not in principle unscientific theories because they have been discarded” (1996: 2-3). It is easier to view early concepts of biological race as racial projects and less as science rather than approaching all biological concepts of race as racial projects. Viewing early concepts of biological race as pseudo-science supports the ideas that science is a linear and cumulative process. Understanding that racist biological concepts of race are no less scientific now than when they were embraced makes it more difficult to understand science as a linear and cumulative endeavor (Kuhn 1996).

To reject past racial science as pseudo makes it harder to critique contemporary science. It assumes that in the past, scientists were simply racist and therefore were doing something less than scientific. This leads to acceptance of contemporary science that is not outwardly racist. It also leads to a neglect of how biological concepts continue to be used in science and medicine by many CRT scholars which has only begin to be corrected.

In CRT race is fundamental to the state, while in STS the state is fundamental to science. Taking both of these seriously this project sees state, science as race as intimately connected and views race as a fundamental scientific concept that we should not expect to simply disappear during a fleeting antiracist moment in history.

Methods

The theoretical framework laid out above points toward a methodology that allow an analysis of the decline narrative as a particular racial project situated in time and space. Historical interpretivist methods are best suited to answer the research questions in this dissertation. In what follows, I describe interpretivist methods and why they are appropriate for this study. I then detail the process of data collection and analysis I followed.

The methods employed in this project include a case study of the field of American immunology and an interpretive analysis of a complex pattern of relationships in specific time periods. Interpretivist methods are appropriate because to facilitate a rereading of the decline narrative as a particular racial project. Interpretive methods “proceed by “reading” texts... or other repositories of meaning and then attempting to reconstruct the codes...that the texts or text analogues instantiate and upon which their authors can be presumed to have drawn in carrying out their actions” (Sewell 2005:332). Interpretive methods are appropriate for this study because the analytic framework of STS emphasizes that we open the black boxes of science to reveal the social and political content within. In this study I interpret scientific texts, including journal articles, textbooks, secondary histories, and speeches, in an attempt to reveal the ways in which they articulate with broader structures of racial inequality.

However, scientific discourse does not exist in a vacuum and the framework of NPSS insists that science also operates in a field of power and that power influences the content of science and scientific discourse. Another part of the methodology includes the analysis of the field of power in which science operates and includes texts produced by

supporting institutions and bodies that govern and influence scientific discourse. Data in this category includes public health reports, transcripts from Congressional hearings and debates about science and research policy.

Comparative historical narrative methods are particularly well-suited for the theoretical frameworks I laid out earlier in this chapter. Narrative puts sequence at the center of analysis and captures both the constraining and creative role of the past. This fits well with CRT's view of race as beset with both continuities and new racial formations and projects. Narrative is also a good fit since one of the main themes of this project is to link events that might otherwise be seen as separate. The more recent resurgence of race is often seen as a surprise and one of the main arguments of this dissertation is that we should not be surprised by the linkages between biological concepts of race in the past and the present. This method also allows contingent events to shape the direction of social change which respects the historical context that is essential to the framework of STS. However, a limitation of this methodology does limit the generality of causal mechanisms to the specific contexts described.

Drawing on historical comparative methodologies, data collection and analysis used an inductive and iterative process (Sewell 2005;). After choosing a theoretically informed starting point (which I describe below), sensitizing concepts informed my analysis while emergent themes and concepts from the data directed my path of inquiry. Below, I explain why immunology is an appropriate case study, how I chose the starting point of my research, and I also provide detail on the sensitizing concepts used.

Immunology is a particularly appropriate case study for this investigation into how medical science continued to use concepts of race in the postwar era. Immunology and the immune system are part of the common sense of how we talk about our bodies. Emily Martin has shown how the language of the immune system –susceptibility, immunity, and resistance –has become one of the main ways in which we talk about bodies, sickness and disease in the postwar era (1995). The historical association between disease and racial difference also makes the discipline of immunology an appropriate case for this research. Nineteenth and twentieth century understandings of disease susceptibility and causation were dependent on racial and gendered categories as part of immunology’s earliest conceptual framework (Silverstein 1989; Anderson et al. 1994; Arnold 1993). Vulnerability and resistance to disease was seen as characteristic of races and was used as a form of social control as well as a powerful tool of racism wielded by the state (Worboys 1999). For the discipline of immunology, the idea of racial or natural immunity was central to rise and fall of theories of immunity that have far reaching impacts on how we understand our own bodies even today (See Chapter 5).

I began with secondary histories of immunology, including, Silverstein (1989) *A History of Immunology*, Moulin (1991) *Le dernier langage de la médecine: L’histoire de l’immunologie de Pasteur au Sida* (The Final Language of Medicine: The History of Immunology from Pasteur to AIDS), and Mazumdar (1989) *Immunology 1930-1980: Essays on the History of Immunology*. Using these histories, I identified theories that were dominant in the discipline of immunology from the early 19th century through the 1950s. A theory of immunology, of how bodies resist and succumb to disease is fertile

territory for ideas about differences between bodies and groups of bodies that are, more often than not, formulated as racial groups.

Sensitizing concepts are a tool of grounded theory and helped guide my analysis. From histories of immunology, I learned that certain concepts and terms in immunology were closely associated with ideas about human racial differences. Terms such as natural immunity, natural selection, biological difference, naturally occurring antibodies, heredity, blood groups, and biological specificity emerged as concepts that were racialized in the discipline of immunology. These terms and my overall definition of biological race as scientific explanation of inherited differences within racial groups served as sensitizing concepts in this portion of the study. Sensitizing concepts came from both the data and the literature.

The analytical framework provided by an STS view of science emphasizes the ways that scientific discourse articulates with other social structures. In the case of immunological discourse, I interpreted dominant theories of immunology for how they articulated with broader discourses and justifications of racial difference. For example, one of the early theories of immunology argued that people were born with a particular set of antibodies that determined which germs or viruses could make them sick and which they were able to fight off. The concept they used to describe these antibodies is natural immunity. The concept of a natural or inherited immunity articulates well with beliefs that racial groups have different immunities because it provides a scientific basis for inherent group differences in humans. Another salient example is the use of natural immunity to explain blood groups and the subsequent effort to prove that one's blood group determined the "immunological distance" of racial groups from one another (see

Chapters 4 and 5). I supplemented these histories with a review of immunology textbooks for mentions of race that might have been overlooked or intentionally left out by those writing the history of the discipline.

The next step was to see how the use of these terms changed over time and how ideas of disease susceptibility and racial difference were used during the postwar era. I began by focusing on *The Journal of Immunology*. I searched within this journal for use of the terms and concepts that I suspected articulated with race based on my reading of the histories of immunology. When searching I began with the term “natural immunity” and read the earliest articles that included the term. I also searched the term “natural immunity” in the PubMed database.⁸ I created an annotated bibliography of these articles and how they were using the concept of natural immunity with specific attention to how authors were writing about different racial groups, if at all. I also did a search on Google Scholar using the terms “race” “natural antibodies” and “immunity.” A list of the articles that were used for analysis can be found in Appendix A.

To understand immunology as a political entity as well as a scientific endeavor the Association of American Immunologists (AAI) became part of the case study as well. In particular, the Presidential Addresses of the newly chosen presidents of the society as well as archival materials including letters and memos from the society’s papers. These documents provided a lens into perceptions of important questions and concerns of the discipline overall. The choice of a particular individual as President of the Association

⁸ The PubMed database is a search engine that access the Medline database which houses bibliographic information from academic journals that cover medicine, nursing, pharmacy, dentistry, veterinary medicine, and health care. The database is maintained by the United States National Library of Medicine (NLM) at the National Institutes of Health.

also provides insight into the discipline and its politics. Presidential Addresses of the AAI can also be found in Appendix A.

Public health reports, bulletins, committee transcripts and official statements by national and international governing agencies make up another major source of data for this project. The Annual Reports of the Surgeon General of the Public Health Service of the United States from the first half of the 20th century provide a broad overview of the concerns of the United States government in terms of health both within and outside of the nation. Other types of public health documents were identified through acknowledgments or mentions in primary and secondary sources. For example, Ella Grove's 1926 article in the *Journal of Immunology* states in a footnote, "The present study was carried out upon the suggestion, and with the financial support of the National Research Council, through its Committee on Human Migrations" (1926: 251). Hearings from this Committee became part of my data because of this footnote as well as other studies that were mentioned at the committee hearing.

Patterns of citations in the reference lists of journal articles often led to a focus on a particular body of work. An important example here is the focus in Chapter 5 on ABO blood groups in immunology. Repeated citations of Hirshfeld, Ottenberg, Landsteiner, and Boyd led me to bodies of research that were not prefigured by the works on the history of immunology that I began with. As another example, when researching natural immunity it quickly became clear that the term "natural antibodies" was closely connected with the concept of natural immunity and the phrase became an important search term. This branching process continued until I reached saturation. Saturation in this project means that I kept running into consistent patterns in the data.

Like all research, I ran into a few challenges when conducting this study. Understanding the scientific literature was one of the main challenges of this study. When reading the journal articles that make up a large portion of the data, I had to pause to look up terms that required their own research to understand them. This process took considerable time and effort and added to the complexity of this research. Some have argued that this is part of how scientists have been able to use concepts of race, by wrapping them in genetic language that is incomprehensible to outsiders (Duster 2003). For scholars of critical STS, this outsider status has both advantages and disadvantages. The time and effort required to understand the scientific jargon is one disadvantage. An advantage of outsider status is a perspective that allows the identification and unpacking of scientific black boxes.

Another challenge was the availability of certain archival materials. The texts of many of the Presidential Addresses of the American Association of Immunologists (AAI) are available through the *Journal of Immunology* where they are published. However, I was not able to locate the Addresses from 1933-1949. After searching the AAI archives at the Center for Biological Sciences Archives in the Albin O. Kuhn Library on the University of Maryland Baltimore County campus, I emailed the AAI historian. The historian acknowledged that these were probably lost if they were not available at the Baltimore archive. There are often holes in historical data such as the one uncovered here.

In the next chapter, I introduce a periodization of biological concepts of race in science and trace the relationship between those concepts of race and the racisms that accompany them.

Chapter 3. Periodizing Race: Institutions of Science and State

The history of race, science and medicine is usefully characterized into three periods. The first period is what I call colonial science. Colonial science is characterized by the ties of scientific knowledge making to the interests and needs of imperialism. The second period is a time of change and transition where the relationship of state and science is altered in fundamental ways. As I will elaborate in this chapter, this period of transition has effects that change the way race is understood in the scientific realm, especially in the field of medicine. The third period marks a reconsolidation of the state relationship to science and a resurgence of race in both scientific research and the use of race in science. Racism and white supremacy are integral to this story of the three periods of race. In this chapter I aim to describe in detail the ways in which race, state, and science are intertwined in the three different periods and how changing notions of race in science and changing structures of racism are mutually articulated.

The three periods of race and science will also be familiar to scholars of the historical sociology of race, postcolonial studies, and the history of science. The periods coincide with larger shifts in the history of race, colonialism, and science. The first period (1880s-1920s) was a global consolidation of white supremacy through racial projects of science and colonialism. The second period is one of change and transition (1920s-1960s) marks the beginning of minority movements all over the world, including civil rights and national independence movements. This period is also notable for major shifts in the history of the relationship between science and state including the scientific advances of WWII, the fallout from the atomic bomb, and the atrocities of Nazi experimentalism and

extermination that led to a deep public distrust of science, especially science in service of governments. The movements of period two continue into the third period (1950s and on) and begin to consolidate towards the end of the 1970s. By the third decade of period three, the world system of empire dominated by European and American power has fragmented into our contemporary world system of independent nations. In the following section I will argue that all science in the first period should be considered colonial science. Next I will describe more specifically the contours of state sponsored scientific racism in the colonial context.

Colonial Science

The eighteenth and early nineteenth centuries were a period of rapid growth of science as well as of colonial conquest. This period is characterized by explicit scientific racism that was elaborated as colonialism advanced. As Winant argues, “Racial themes received ever-increasing intellectual and scientific attention as colonialism advanced” (Winant 2001). My use of the term colonial science is meant to draw attention to how the global political order of colonialism shaped science, how science enables state racism, and how scientific concepts of race legitimate the authority of the nation-state. Referring to science in this early period as colonial also brings in concerns with race, and centers the state as a particularly important site of the elaboration of race and racism.

The term ‘colonial science’ is often traced back to the work of George Basalla who periodized the diffusion of Western science into three stages that corresponded to how non-European nations received Western science (1967). Colonial science was the term that he gave to the second stage when colonial scientists join European scientists in

their scientific endeavors in the colonies. For Basalla, colonial science was a dependent science because its space of practice was in the colonies and the scientific tradition from which these scientists draw on was European and thus external. Colonial scientists lacked the scientific institutions of Europe and did not have access to the “invisible college” that was the essential characteristic of science. However my use of the term colonial science is distinct from this usage.

Science is political and Basalla’s model fails to account for the political character of science (Raina 1999; MacLeod 1987). Central to the political sociology of science is the idea that “sustained large-scale relationships ...make some kinds of claims, outcomes and processes far more likely than others” (Frickel and Moore 2006: 9). Colonialism is one of the most important large-scale relationships that configured the entire world-system from the sixteenth century to at least the 1950s. In these terms, colonial science does not refer to an inferior nor dependent science practiced in colonies, but to all science practiced during colonial times. The term colonial science in my usage draws attention to the broader global political context in which science was practiced, challenges the idea that growth of Western science was independent of imperial discovery and conquest, and recognizes the impact of colonialism on scientific knowledge produced in this context.

Labeling this period colonial science challenges the idea that the growth of Western science was independent of imperial discovery and conquest.⁹ The temporal conjunction of the growth of Western science and the rise of colonialism is anything but coincidence. World-systems theorists have been arguing for decades that the ‘rise of Europe,’ including scientific and technological growth, was not caused by mechanisms internal to the region (Gunder Frank 1969; Wallerstein 1974). The growth and

⁹ Sandra Harding makes a similar argument (1998 see especially pages 6; 23-24; 29-33; and Chapter 3).

development of the West and Western science was directly related to its history of conquest and settlement of previously foreign lands. As James McClellan writes, “The empire of French science expanded along with the rest of the French colonial empire in the eighteenth century, and in the end, institutional ties linking Saint Domingue and the metropolitan France indicate that colonial science in Saint Domingue, while on the periphery, was anything but peripheral” (McClellan 1992:290). The travel and exploration that provided the data for the scientific revolution in Europe was the same travel and exploration that led to colonization (Brockway 1979; MacLeod 1987).

Colonial science in my usage also considers science taking place in Europe colonial. The assumption that science comes from Western Europe and diffuses outwards obscures that fact that science outside of Europe had multiple and profound effects on science within Europe. While scholars have been interested in how the practice of science was different in different colonial contexts, another strand of this literature focuses on how the practice of science in the colonies affected science in the center. Many authors have shown that scientific knowledge did not only flow outwards from metropole to colony, but rather that there was always a two-way traffic (Stoler 1995; MacLeod 1987; McClellan 1992; Harding 1998). For example, MacLeod argues that “exploration in Africa and the tropics revealed features that bore directly on central debates and important reputations in geology and zoology” (1987:234). Basalla himself shows how “The historical record is filled with examples of European naturalists collecting and classifying the plant and animal life they find in remote jungles, deserts, mountains, and plains and then publishing the results for the illumination of the European scientific community” (612). Thus we can consider the science that was taking place in Europe

colonial because of the transformative power that the context of colonialism had on the knowledge being produced.

The motivation for much of the science in this time period was imperial and science was a means to provide legibility to new discoveries and more significantly for this project, to populations. Legibility is a central problem in statecraft (Scott 1998:2). The legibility of a society provides the capacity for the large-scale social engineering that is characteristic of modern states. As James Scott has argued, “Some level of abstraction is necessary for virtually all forms of analysis, and it is not at all surprising that the abstractions of state officials should have reflected the paramount interests of their employer” (Scott 1998:13). Scott demonstrates how scientific forestry, controlled by the utilitarian logic of the state and its officials, made valuable plants legible as ‘crops,’ whereas other plants were ‘weeds’ and insects were ‘pests.’ In the period of colonial science, the questions that were asked and the frameworks through which scientists categorized and standardized foreign materials and people had an imperial backdrop.

Discovery was not a neutral and value-free enterprise, but rather an attempt to understand how such materials and people could be manipulated for the glory and profit of empire (Kochhar 1992; Brockway 1979; McClellan 1992). As Harding puts it, “The colonists’ science projects were, first and last, for maintaining Europeans and their colonial enterprises in those and other parts of the world. They were designed especially for increasing the profit Europe could extract from other lands and maintaining the forms of social control used to do so” (Harding 1998: 44). Typologies of race that were elaborated in the period of colonial science and used to justify slavery and subjugation, are a prime example of making populations legible in the interests of the imperial state.

Thus we can also consider this science, which was science in the service of empire, colonial science.

The term colonial science in my usage also implicates race. Discourses of race made nationalist and colonialist politics possible (Puri 2004). States in the modern world system are nation-states. That is, states derive their legitimacy from the idea that the people over who states rule form a nation (Puri 2004). Nations are imagined communities connected not by geography but by an inherent homogeneity (Anderson 1983). This homogeneity is often conceptualized as racial homogeneity. Race or the “fictive ethnicity” around which nationalism is organized was a scientific construction (Balibar 1991). The dominant and authoritative language of science supported the legitimacy of the nation-state by equating race with nature and the natural order of authority where states rule over nations. In this period of colonial science, race was a scientific fact that supplemented nationalism and justified colonial domination. That this discourse of race was supported by science was crucial to the legitimation of colonial power (Ernst and Harris 1999). Scientific racism naturalized the inferiority of colonized populations and rationalized colonial rule by invoking the natural superiority of whites. Thus colonial science was part of a particular racial formation where scientific racism supported the modern state system of colonial domination (Omi and Winant 1994).

As a particular application of science, medicine played an especially important role in colonialism. As Ernst and Harris argue, “Claims to racial superiority and Western scientific and medical hegemony are seen to have emerged alongside each other in the wake of the Enlightenment, culminating eventually not only in scientifically based racism in the nineteenth and racial medicine in the twentieth century, but also in the perceived

enhancement and legitimization of colonial expansion by reference to medical and scientific progress” (Ernst and Harris 1999: 3-4). David Arnold argues that the ideas and practices of medicine should be understood as part of the “exploratory and regulatory mechanisms of colonial rule” (1993:15).

The racialized discourse of medicine allowed colonizers to intervene into the lives of colonized people and to exert control over their bodies. Warwick Anderson’s 2006 study of race, colonialism and medicine in the Philippines shows how the framing of disease potential allowed colonists to construct a framework for “constituting racial capacities and colonial bodies” (2006: 2). For example, in a chapter provocatively titled “Excremental Colonialism” Anderson writes, “In the Philippines, American physicians used the body’s orifices and its products to mark racial and social boundaries as well as to indicate how easy it would be to assail such enclosures” (2006: 106). Anderson demonstrates how fears about the spread of disease through the fecal matter of Filipinos, which was seen as especially dirty and infectious, allowed colonial health officers to penetrate into the intimate sphere of waste practices. This reform of waste practices was also a colonial practice that supported the civilizing mission of colonialism. Lenore Manderson, this time in colonial Malaya, has also shown how medical science enabled the state to impose itself on populations, again legitimating particular types of intervention for specific bodies deemed unclean or infectious (Manderson 1996).

Period One (1880-1920): Colonial Science and Scientific Racism

In this section I aim to describe how the broader political structures of colonialism and the social hierarchies of racism are integral to understanding how we think about this

period of science. This period of scientific racism (as well as the era of eugenics) is often understood as an aberration in the history of science. Belief in the non-political character of science is essential for this reading of history. The interdependence of science and state were eminently clear in the first period, however, this history is not often told as a backdrop to the crisis of racial science in the mid-twentieth century. Bringing in the longer history of the assemblage of state, science, and race helps to illuminate the ways in which the second period of scientific racism was less an aberration than a continuation of state-science relations. In what follows I will describe the contours of colonial science, race and medicine in the first period. I will demonstrate 1) how imperial interests shaped the interpretation of scientific medicine, and 2) how science and medicine supported the social hierarchy of racism and colonialism.

Tropical Medicine: Imperial Interests and Institutions of Science and Medicine

The elaboration of the discipline of tropical medicine played an important role in colonial medical science. Acclimatization science was the precursor to tropical medicine. The science of acclimatization has been called the paradigmatic colonial science by Michael Osborne. This particular discourse of science was primarily concerned with the transplantation of organisms into places where they had not originated. The practice and theory of acclimatization went hand in hand with European colonialism. Osborne notes that the efforts of acclimatization science “found their rationale in mercantile economic theory, and in attempts to recover sources of cane sugar, exotic spices, and fruit” (Osborne 2001: 142). Humans were included in the discourse of acclimatization and the question of whether Europeans could survive in the colonies or tropics was one of the

primary medical questions studied by acclimatization societies and later by the discipline of tropical medicine (ibid).

One of the major interests of colonizing nations was, of course, to extract resources from their colonial holdings. The Liverpool School of Tropical Medicine is one example of a scientific medical institution created as an outgrowth of trade with England's colonies. As Power explains, "Residence on the West Coast of Africa was recognized as injurious to health but the morbidity attached to working on the ships required further analysis. There was clearly a need to provide skilled medical care in a city such as Liverpool in the early years of the century. The foundation of the School rationalized this provision" (Power 1999:31). The need to protect the Europeans engaged in trade with the colonies supported the creation of the hospital. As Europeans encountered new diseases and brought them back to the metropole, the discipline of tropical medicine and associated institutions emerged to both protect Europeans and to preserve the lives of the natives needed as cheap labor.

The links between scientific racism, medicine and colonial rule have been well studied by historians and postcolonial scholars. Warwick Anderson has explained how the development of bacteriology was used to provide data on past human behavior and also to monitor conformity to the discipline of modern hygiene in the Philippines (Anderson 2006: 59). For example, a bacteriological diagnosis of an infectious disease meant that an individual had at some point in their past adhered to 'uncivilized' or 'unclean' sanitary habits. David Arnold explains how the need to protect Europeans in the tropics informed the practice of native segregation for malaria control in India (Arnold 1999: 127). Leo Spitzer describes how increased research in tropical medicine

lead to similar segregationist policies in Sierra Leone (1968). This author also describes how increased competition for Empire led to increased funds for medical research. “With British prestige in the competition for Empire at stake within Europe, and the “white man’s burden” and the glories of imperialism capturing popular imagination, a great number of people became conscious of the dangers to Britons posed by tropical diseases. Money for medical research, always scarce in the past, was now appropriated by the Colonial Office and donated by private individuals” (Spitzer 1968: 52).

Institutional policies of science and medicine, however, largely depended on the particulars of imperial interests in certain localities. Worboys argues that the London School of Tropical Medicine followed a model that focused on protecting the white governing classes (Worboys 1988). Thus the association of malaria with native children led to a policy of segregation that was designed to protect European colonizers rather than to treat or prevent sickness in the inherently inferior West African population. The Liverpool School on the other hand had interests in increasing trade which led to policies that promoted public health measures to improve conditions that would benefit both the native and imperial populations. The capital to build new laboratories in Liverpool and eventually in Sierra Leone was largely supplied by ship owners and other industry stakeholders interested in increasing trade (Power 1999: 16 ; Wilkinson and Power 1998).

Waltraud Ernst’s study of colonial mental institutions in India is a paradigmatic example of the way in which racial concepts and psychiatry were combined to require the segregation of ‘lunatic asylums’ (Ernst 1999). Ernst argues that the particular social and racial atmospheres of different cities in India had a constitutive effect on the organization of the asylum system. For example, the inferior position of Bombay as compared to

Calcutta and Madras led to less divisive racial and social arrangements because Indian merchants had to be enticed to live and trade there. Here again we see how race and medicine were mutually implicated in subservience to the needs of empire. In this case, however, the need to attract native labor led to less racial segregation in the asylums of Bombay as opposed to the more rigid segregation of Bengal. Ernst also highlights how policies toward intermarriage of Indians and British were encouraged until Eurasians (people of mixed parentage) became a political and social threat to British rule. As the author argues “Financial and political rationales and contingencies became translated into an alleged necessity of racial division” (Ernst 1999: 93).

It is clear in this period of colonial science that science and medicine worked together to serve the interests of the larger political and social contexts in which it was produced. Race in this context was a scientific concept used to justify the domination and control of those seen as lesser races. In the next section I will focus on the ways that race and disease were interpreted in this period.

Racism in Medical Science: Interpretations of Race and Disease

Racism in medical science allowed for varying interpretations of the link between race and disease. External differences between people were interpreted as markers of internal differences that made particular bodies prone to certain types of diseases. Saakwa-Mante describes how scientists considered the dark skin and wooly hair of African slaves signs of their “constitutional immaturity” and natural weakness. Trypanosomiasis or sleeping sickness was only properly applied to people with non-European racial backgrounds. (Saakwa-Mante 1999). When the desire for imperial

expansion was at its highest, scientific discoveries of tropical disease often proved the greater susceptibility of colonial natives as in the above example. If on the other hand, a scientific discovery seemed to initially suggest that a disease affected all races equally, then claims of lack of hygiene, laziness and stupidity were able to reassert white racial dominance and justify the colonial system (Power 1999: 14). A third interpretation of race and disease held that the lower susceptibility of natives to particular diseases meant that they were dangerous carriers of germs that threatened the health of Europeans.

The discourse of race, medicine and health as an imperial force was variable and malleable enough to be form-fitted for each particular political and social context in which it was deployed. Alison Bashford describes how in Australia the discourse of tropical medicine considered the origin of disease to begin with a particular Chinese immigrant or Pacific Islander. Aboriginal people were seen as being “innocently diseased rather than being culpable, even devious, in spreading disease, as was the common representation of Chinese” (Bashford 2000).

Paul Weindling argued that the discovery of bacteriology was seen as part of the civilizing mission. “Although the history of bacteriology has traditionally been conceived of in value-neutral terms as the discovery of new pathogens and improvements in laboratory techniques, the place of bacteriology in German imperialist ideology merits consideration. The support for imperialism by Koch and colleagues meant that bacteriology became susceptible to more racist formulations” (Weindling 1999: 218). Bacteriology is often read as an equalizer; germs have no color line is the familiar formulation of this idea. However, the notion of an inherited disposition to disease as a

racial attribute gave biological objectivity to the notion of different human species groups.

Medina-Domenech argues that the Spanish justified colonization in Equatorial Guinea with scientific explanations of native Guineans' low susceptibility to diseases such as malaria. As she argues, "Conversely, Guineans were also seen to be more susceptible to disease due to a degenerative racial character. Either way, the racialization of disease obscured the negative effect of colonial exploitation such as social disruption, ecological disaster and poverty, and the demographic crisis in the first decades of the 20th century" (2009: 83).

While race and disease were interpreted in many different ways depending on the needs of those doing the interpretation, the ways in which racialized populations were controlled were more common across local spaces. In the next section I describe the techniques of power used to control racialized populations that occupied different places in different colonial regimes, but with the shared the aspect of needing to be controlled by the regime.

Public Health and Hygiene as Discipline and Surveillance

Public health and hygiene were the tools through which scientific racism and colonial governance worked to establish control and maintain surveillance over populations. The notion that colonized and racially othered populations were diseased, were particularly susceptible to diseases, or ironically immune to diseases gave colonial medical officers reasons to intervene into the daily lives of colonized populations. Warwick Anderson provides the vivid example of how public health measures justified

the intrusion of colonial officers into the waste practices of Filipino natives (Anderson 2006). Quarantine of entire racial groups based on beliefs about their increased susceptibility to particular diseases was not uncommon and was often the first intervention and was connected to ideas about economic insecurities and immigrant groups, ideas that are still familiar today.

Surveillance of potentially diseased bodies is one particularly salient aspect of colonial medical science. Surveillance is also crucial as a technique/tool of public health. The segregation in colonized nations helped to make surveillance a possible and practical way of controlling populations. As mentioned above, segregation of colonized populations was seen as a way to control the spread of infectious disease. Once segregated, colonial officials could more easily watch and monitor the behavior of colonized natives. However, segregation was not the only way that surveillance was achieved.

The Central African country of Guinea colonized by the Spanish until 1968 provides an illuminating example. In Guinea the Spanish instituted a health card that required blood testing and typing into the then-new ABO system. Blood testing in the Spanish colony was mandatory and did not provide much useful scientific data but was rather a powerful tool in the control and surveillance of the population. This point was not lost on the colonial officials themselves: “With the implementation and extension of the health card, the fundamental issues of intervention in and control of the indigenous population in the territory have been solved by three-quarters” (*Folleton de Espana Colonial*, 1928: 11-12 quoted in Medina-Domenech 2009:84).

Discipline is also a salient aspect. The hygienic movement in the colonies was dependent on the disciplining of colonial subjects into good medical citizenship. Hygienic principles involved controlling the food and water that people consumed, their waste practices, and sanitary habits (Anderson 2006; Arnold 1993; Manderson 1996). Often promises of assimilation were extended as reward for hygienic discipline. However the extension of promises of assimilation was a standard of citizenship that was never completely attainable for the always already potentially diseased bodies of the colonized. Thus full citizenship was never attainable.

This period of colonial science is characterized by blatant scientific racism that was part of the lexicon of everyday life. As the second period begins, scientific racism begins to be called into question as the social and political context of Empire begins to lose its grip on the globe.

Period Two (1920s-1960s): Eugenics and Statistics

Moving into Period Two, the science of race begins to reach beyond phenotypical differences and gets under the skin and into the brain. National priorities begin to shift from control of racialized populations in colonial outposts to restriction of immigration and the desire for a population that is fit for citizenship and reproduction. Eugenics becomes the dominant paradigm of scientific racism and statistics, and along with blood and intelligence testing are the preferred tools. Similar to Period One, scientific findings are still adapted to the prevailing social views of white superiority and remain useful in supporting state policy and nationalism. As Jacobson (1998:10-11) eloquently articulates, “Political debates over slavery, naturalization law, and immigration drew on

the sciences of anthropology and eugenics, but these bodies of knowledge had arisen in answer to questions about peoplehood generated by the politics of exploration, expansion, colonialism, slavery and republicanism in the first place.”

In the first period, the simultaneous growth and expansion of imperial control along with medicine and science was decidedly utilitarian and both supported and created ideas for a scientific basis for race. The second period is when the imperial apparatus begins to foresee its demise. The biological concept of race that supported eugenics and the edifice of colonialism, science and nation could no longer sustain such heavy lifting. This major shift in racial formation, in national consciousness and in global political ecology was both cause and consequence of the destabilization of the biological concept of race and state-centered scientific racism. The fall of colonialism ended imperial incentives to continue research in tropical medicine. State discourse turned to the deterioration of domestic populations and became concerned with their betterment. Former colonies became Third World nations where growing concerns about the ‘population explosion’ coincided with a disinvestment in research on infectious diseases and increased investment in chronic disease research.

As we move toward the close of the second period and older notions of biological race are destabilized, ideas that define race as culture are becoming more prominent. This dissertation is focused on definitions of race that are grounded in biology and an in-depth discussion of race-as-culture is out of scope here.¹⁰ While race-as-culture plays a crucially important role in this time period, racial projects are often simultaneous and contradictory. Notions of biological race existed right alongside the rise to prominence of

¹⁰ By race-as-culture, I refer to arguments that biological concepts of race were replaced with arguments of race as ethnicity or race as cultural difference between groups. These definitions of race were sometimes seen as an alternative to rigid biological definitions of race, however were insidious in their own ways.

race-as-culture and, as I argue throughout this dissertation, never ceased to animate scientific arguments and state institutions and policies.

In this section I describe the confluence of heredity with genetics and statistics that culminates in the discipline of eugenics. As the dominant paradigm of scientific racism, eugenics brought forward many of the same techniques of power that prevailed in Period One. However, new tools of intelligence testing, statistics, and blood testing allowed science to reach into the body and move past skin color as the main heuristic of race. The next section introduces eugenics. Afterward, I describe how psychology and intelligence testing were used to support state policies of immigration restriction and sterilization.

Eugenics: Heredity meets Genetics and Statistics

Eugenics is an important chapter in the history of race, science, state and nation both globally and in the United States in particular. Scientific racism reached its zenith with the eugenics movement that began in the late 19th century and lasted until the mid-20th. Supporters of eugenics argued that the genetic composition of the population could be improved by encouraging those with desirable hereditary characteristics to reproduce and discouraging or preventing those with undesirable characteristics from reproducing (Kelves 2001). The categorization of individuals into a desirable or undesirable group translated social biases into scientifically actionable realities. Traits associated with inferior races were deemed hereditary and became the basis on which groups were actively prevented from having children by forced or coercive sterilization. In this section I introduce eugenics as a discourse that brings together state, race and science in powerful

ways. I argue that statistics, genetics, and heritability become central to notions of biological race and support racist practices and policies.

Cousin to the infamous Charles Darwin, Francis Galton, used the term eugenics to describe his idea of how one could use statistics and heredity together to improve humanity (Kelves 2001). By the late 19th century eugenic ideas were beginning to take hold in the realms of psychology, biology, statistics and government. While not all scientists and politicians believed in the idea, it began to make moral sense that one should encourage procreation among those deemed ‘fit’ and/or discourage procreation among those deemed ‘unfit.’ This was important not only on the individual level, but came to be seen as an appropriate national policy. Fitness was also applied to an individual’s ability to be a productive citizen. Especially in light of the economic rivalry between France, Germany and the United States, it seemed to make sense that a fit population within a country would be helpful for national level struggle (Kelves 2001).

When Mendelian inheritance was rediscovered in the early 20th century it was quickly adopted by Charles B. Davenport who was to become the most famous American eugenicist.¹¹ Moving quickly from the observed traits that Mendel used for his argument, Davenport felt that unobservable characteristics were also heritable. Davenport’s racism was normal for early 20th century United States, however his belief in the science of heritability and his position of power in the fields of science and politics were such that his attitudes towards black and immigrant populations were crucial for shaping the American eugenics movement.

¹¹ Mendelian inheritance is the dominant and recessive trait type inheritance that explains eye color and sickle cell and sometimes hair color. Whereas the only way to have a phenotype of a recessive trait is to get them both from your parents, you can show the dominant trait and have the gene for the recessive which means your children might get that phenotype depending on the other parent’s genotype.

Davenport received a grant from the Carnegie Institution of Washington for \$10 million in 1904. Daniel Kelves (2001) writes about Davenport's work at Cold Spring Harbor and describes how the science that supported the blatantly racist immigration and sterilization policies was below the standards of the day.¹² This evaluation of the work, however, is after the fact and while the authority and prestige mentioned by Kelves is part of the reason why Davenport's work was allowed to stand as science, it was also because it resounded with the general sentiment of the time period. The equation of national and racial character is one of the foundations upon which the institution of the state was built. The legitimacy of the entire nation was bound up in the unity of its national and thus its racial oneness (Balibar and Wallerstein 2001; Puri 2004). Davenport's science was a way to legitimize the fears of individuals but also worked to support the underlying narrative of the nation.

Eugenics was also a statistical science. Many of the pioneers in statistical science were eugenicists that were creating statistical tools to prove their theories about differences between the races. As Zuberi (2001:30) points out, "The early success of Francis Galton, Karl Pearson, and Ronald A. Fisher in establishing statistics as a science must be credited as the foundation of modern social statistics and the first effort to legitimate statistical racism." Statistics was a powerful tool that eugenicists created to add to the perceived objectivity of their findings on race. Statistics also helped to consolidate state power by augmenting tax revenues and enabling the centralization of bureaucracy (Zuberi 2001: 35). This history reminds us how racial concepts were central to the creation of statistical methods and how these methods were crucial for state power.

¹² Cold Spring Harbor housed Davenport's Eugenics Record Office from 1910 to 1930. Findings from the ERO provided much of the scientific basis for the eugenics movement in the United States.

Eugenics brought together discourses of race, nation, and science. It tied national social policy to racism through the legitimacy of science and offered up new tools for the control of populations. In contrast to the first period where science was in service of empire, in this period there is a turn towards scientific nationalism where superior or advanced scientific capabilities were equated with international competitiveness and national pride.¹³ In this era nations *should* be scientific and much of science at the time supported the prevailing social views of white superiority. Eugenic focus on fitness and heredity coupled with scientific nationalism led to state-supported scientific racism through practices such as intelligence testing, sterilization, and immigration restriction. In the next sections I illustrate how these practices introduced new trends in race, science and medicine as well as continued many of the older traditions from the first period.

Psychology and Intelligence Testing

Intelligence testing was also a fundamental component of the eugenics movement in this period. With intelligence testing, race begins to get under the skin and can be analyzed by tools not available to the general public. The seeming objectivity of intelligence tests was based on the aura of science that surrounded their use and creation. These new tests were a way to get into the brains of people of color and prove the inferiority that was inferred with earlier phrenological studies. As a tool or scientific technology, intelligence testing purports to reflect the underlying truth of human and racial differences in mental capacity. However, like most medical technology it produces

¹³ Scientific nationalism manifested in different ways in different contexts but is largely a phenomenon of the early 20th century. See Forman 1973; Wang 2002; Mizuno 2009; Jasanoff 2011.

rather than reflects reality, erases human decision making, and confers authority on the knowledge it produces.

Similar to interpretations of race and disease in Period One, white superiority was always already the forgone conclusion to any outcome of testing. For example, one type of intelligence test analyzed the reaction times of Indians, blacks and whites to numerous stimuli. When whites were found to have slower reaction times, the conclusion was that whites were more reflective and deliberate. When whites reacted more quickly they were deemed more intelligent (Smedley 2007). Regardless of the outcomes of testing the conclusion was that certain types of white people (i.e., Nordic) were superior to others based on their biological inheritance.

Intelligence was assumed to be inherited, much like susceptibility to disease in Period One. Henry Goddard, an American psychologist, brought intelligence tests from Europe to the United States in 1908. The Binet-Simon tests were designed to detect mentally deficient children by assigning them a “mental age” (Kelves 2001: 77). Using these tests Goddard developed a typology of “feble-mindedness” that classified individuals based on their mental age. Charles Davenport was also interested in these intelligence tests and provided staff to help Goddard carry out the tests (Kelves 2001: 78). Goddard began testing immigrant populations that arrived at Ellis Island in New York in 1912. He found that 79% of Italians, 87% of Russians, 83% of Jews and 80% of Hungarians were feble-minded (Smedley 2007: 289). They argued that the feble-minded were not fit for citizenship since their mental age was closer to that of children than men.

Intelligence testing was used extensively on soldiers during the First World War. The newly established National Research Council, whose charter was to mobilize

scientists for national defense, supported the design of an Army testing program to classify soldiers. One million and seven hundred thousand recruits had been tested by the end of WWI. Using this data, Carl Brigham published *A Study of American Intelligence* in 1923. He found that Southern and Eastern European “races” were intellectually inferior to Nordic races, contributing to beliefs about the declining intelligence of the nation due to newer immigrant populations. Not surprisingly, Brigham also found that the average intelligence of Black Americans was lower than that of the average white Americans, despite results that black Americans from New York, Pennsylvania, Ohio, and Illinois scored higher than whites from southern states (Kelves 2001; Smedly 2007).

The supposed objectivity of the tests was further evidence that intelligence was genetically determined and supported the notion that any attempts to educate or increase opportunities for people with low intelligence were futile. Intelligence testing brought the seemingly neutral language of science to eugenic discourses of national deterioration. Statistics provided quantitative authority to fears of the “menace of feeble-mindedness” that was associated with reported declines in national intelligence (Kelves 2001). Critiques of the testing argued that rather than measuring innate intelligence, they measured cultural familiarity and formal education. Debates about the ability of intelligence testing to measure innate or inherited intelligence continue to the present.¹⁴ Fueled by intelligence testing, eugenic concerns about the national stock led to state interventions such as immigration restriction and compulsory sterilization.

¹⁴ See *A Troublesome Inheritance* (2014) by Nicholas Wade 2014 and *The Bell Curve* (1994) by Herrnstein and Murray.

Population Control: Sterilization and Immigration Restriction

The evidence provided by intelligence testing, that immigrant populations from Southern and Eastern Europe were threatening the national stock with their low intelligence and high fecundity, led to the harsh immigration restrictions in the early 20th century.

Practices of sterilization were linked with discourses of public health and eugenics. Compulsory sterilization in institutionalized populations in mental institutions and prisons was financed by state governments with the goal of improving the human stock and lowering the costs of welfare (Kelves 2001; Weindling 1999a). The economic crisis of 1929 and the high cost of welfare institutions contributed to a shift towards negative eugenics including both sterilization and immigration restriction (Weindling 1999a). Compulsory sterilization was described as a public health measure that could improve the nation by breeding out undesirable defects. It was also seen as a cost saving measure by permitting release from custodial institutions, lowering the number of dependents for those in poverty, and decreasing the number of people who were seen as inevitably going on welfare.

Motivated by eugenic family studies of hereditary defects, Indiana passed the United States' first sterilization law in 1907. In 1927 the U.S. Supreme court ruled in *Buck v. Bell* that sterilization on behalf of the collective health of the citizenry was constitutional. Twenty-seven states had compulsory sterilization laws on the books by 1932 and continued to be legal in some states until the 1970s (Bruinius 2006). Black and Latina women were often victims of compulsory sterilization in the United States. State

resources were invested in these population control measures that forced sterilization on women without informed consent and also supported family planning and birth control.

Arguments about sterilization went hand in hand with ideas about which types of people should be allowed to emigrate from other parts of the world. The same eugenic ideas about fitness for citizenship and the racial stock of the nation supported both sterilization and immigration restriction. Early laws in the United States that restricted immigration were targeted at Asians in the late 19th and early 20th century. In the mid-20th century, the targets of exclusionary immigration policy were primarily Southern and Eastern European populations. Hearings held by the House Committee on Immigration and Naturalization in 1923 featured arguments about the demands of biology and the need to keep American blood pure (Kelves 2001:97). Carl Brigham's book on intelligence testing was also important to the arguments that eventually led to the passing of the Immigration Act of 1924.

One theme that carries over from the first period and is prominent in the second period is the control of populations through medical institutions with state backing and scientific legitimacy. Both sterilization and immigration restriction rest on a notion of biological race that insists that it is inherited, static, and unchangeable. This also mirrors notions of biological race that dominated in the first period. The second period introduced more sophisticated techniques that purported to measure characteristics inherited along with race such as intelligence testing. It also introduced a public health discourse of economic costs and benefits associated with the health of racialized populations. In the third period, genetics, health disparities and global health become the arena of biological race.

Period Three (1950s and on): Genomics, Disparities, and Global Health

In Period Three biological concepts of race move deeper inside the body and consensus builds around a genetic and evolutionary framework for biological concepts of race. The first section argues that despite the new language of genetics, evolution and population, many of the same ideas that led to eugenics remain as part of more recent understandings of biological race. The racisms that accompany this shift are not well studied by current scholarship although there are a few notable exceptions (Roberts 2011; Hatch 2016). I argue that health disparities are one of the racisms supported by the evolutionary-genetic concepts of biological race that become dominant in this period. I also point to how genetic concepts of biological race support research practices that lead to unequal chances for life and death at the global level.

Geneticization of Race: Old Ideas in New Clothes

After the mapping of the human genome, genetic explanations of race quickly became the dominant concept of biological race (Duster 2003, 2015; Roberts 2011; Fullwiley 2007). Often these genetic explanations are also interpreted within an evolutionary framework that insists that current genetic differences between races (or sexes) stem from conditions that existed many thousands of years ago. These two frameworks –evolutionary and genetic –have come together to shape both popular and scientific concepts of biological race in Period 3.

The languages and practices of genetics are repeatedly indicted as fraught with the vestiges of scientific racism. Troy Duster's *Backdoor to Eugenics* warns that the new genetics brings legitimacy to the idea that race is an immutable biological category. The connection between medicine and genetics, established in the early 20th century is

particularly important for the success of this new paradigm of biological race. As Duster (2003:20) argues, “The new genetic intersection with race concerns a far more neutral, scientific, even health-beneficial issue--screening for genetic disorders.” Jenny Reardon (2005) argues that the newer population approach to genetics continues to reify biological notions of race despite being sold as an anti-racist approach to understanding human genetic difference. Ann Morning (2008) argues that genotypic accounts of race have replaced phenotypic accounts (based on visible differences). This embracing of genetics makes the concept of race accessible only to scientists with tools to analyze DNA and makes sense of the new demographic landscape by relaxing the assumption that racial differences are immediately visible. Dorothy Roberts (2011:x) argues that, “Science is modernizing old racial typologies by redefining race as a biological category written in our genes.” Finally in 2015, Duster described this development as the re-inscription of race at the molecular level.

One way the state supports this iteration of biological race is through mandated reporting for clinical trials. Since 1993, the National Institutes of Health in the United States has required that all federally funded clinical trials include a representative proportion of racial minorities, women, and other minority groups. Steven Epstein has described how this push towards inclusion of minorities in clinical trials has the unintended consequence of reifying difference between these populations as biological (Epstein 2007). The collection of DNA from people that commit crimes or are suspected of crimes to increase law enforcement databases underscores the importance of genetics for the justice system in the United States. Racially based drag nets use these databases to search for suspects that are presumed to be of a particular race (Duster 2015).

Common concepts of race as genetic and evolutionary incorporate biological explanations of particular traits of certain groups. Morning's study of college students demonstrates that many still believe that black Americans are better at sports because they are born with physical prowess (Morning 2011). An article by London School of Economics Professor, Satoshi Kanazawa, that used data from the longitudinal AddHealth survey to argue that whiter races are more attractive than darker races received wide criticism in 2011 (Solomon 2011). Health disparities more than any other type of racial difference lead to biological accounts of race. A prominent example was the explanation given by Dr. Oz and Oprah Winfrey about why black Americans suffer from hypertension at an increased frequency than white Americans.

Dr. Mehmet Oz turned to Winfrey to ask: "Do you know why African Americans have high blood pressure?" Winfrey replied studiously: "African Americans who survived [the slave trade's Middle Passage] were those who could hold more salt in their body." To which Dr. Oz rejoiced: "That's perfect!"¹⁵

Oz and Winfrey's statements are a formulation of the "slavery hypothesis" introduced Grim and Robinson in 1996. Though the theory lacks much empirical evidence, the simple genetic determinism that it espouses has allowed for its widespread acceptance in both popular and scientific arenas (Dressler et al. 2005).

Racial Statistics: Health Disparities and Clinical Trials

The stability of health disparities between races was one of the arguments that supported the NIH decision to require the inclusion of minorities in federally funded clinical trials. Black Americans have higher rates of mortality from coronary heart

¹⁵ Quote from Obasogie, Osagie K. 2007. "Oprah's unhealthy mistake." *Los Angeles Times*. May 17, 2007.

disease, cancer, tuberculosis and suffer from higher rates of diabetes, and hypertension (Dressler et al. 2005). Racial data on health disparities for epidemiological purposes is another point of contention at the intersection of race, state, science and medicine. Opponents of this type of data collection argue that that data itself is discriminatory and there is no need to collect health data on different races since race does not matter (Simon 2008). Proponents of the data collection acknowledge the danger of reifying biological explanations of race, however they argue racial data is necessary to track the effects of structural racism (ibid.). These arguments, both for and against the collection of race-based data on health disparities, mirror similar disagreements on the collection of any type of data on minority races by the state (e.g. crime, school achievement, wealth and income). Since 1978 France has not collected any state level data on race based on this colorblind paradigm and has encountered problems being able to identify and describe inequalities based on racial differences (Simon 2008; Oppenheimer 2008). Data on health disparities is particularly salient in the tendency to reify biological accounts of race.

The collection of racial statistics is a double edged sword, especially in the realm of health and medicine. Johnathan Kahn argues that racial categories provided by the Office of Management and Budget shape the use of race in research and pharmaceutical production. He argues that “federal initiatives reward the reification of race as a category” and provide a “structural incentive” for pharmaceutical companies to develop and patent race-specific drugs in the name of genetics (Kahn 2008). Other scholars have seconded this notion that financial incentives based in structures created by state action support the resurgence of race in genetic science (Koenig et al. 2008; Stevens 2008; Roberts 2011).

Genetic explanations of biological race lead to biomedical rather than social solutions for health disparities. Rather than addressing structural conditions that contribute to higher rates of disease in people of color, genetic race forecloses those possibilities and forces a reliance on medical treatments. Concepts of biological race naturalize racial health disparities.

Clinical Trials and Global Health Inequality

Global health disparities have supported the development of new pharmaceutical products, despite whether they will be meaningfully available to those whose disease rates supported that need. The lack of access to Western medicine in poorer nations along with the 1993 NIH mandate has led to the widespread development of contract research organizations (CROs). These (often European and American) CROs conduct clinical trials overseas in low and middle income countries where the populations are seen as 1) able to fulfill the racial quota required by NIH, 2) easier to access due to lower human rights restrictions, and 3) better test subjects as they are relatively less medicated than their European and American counterparts (Petryna 2005, 2009). One author investigates how Barbadians are seen as genetically and socially “most like” black Americans from the United States and are thus routinely used to replace the hard-to-research population for clinical trials (Whitmarsh 2009). This global landscape creates a tiered system of global biological citizenship where research and experimentation on one set of bodies is designed to serve the health needs of another population.

Chapter 4. Disappearing Acts: Rereading the ‘End of Race in Science’ Narrative

It is widely accepted that the mid-twentieth century marks the end of scientific racism and witnessed a decline of the use of concepts of race in biological and anthropological science.¹⁶ The United Nations Educational, Scientific and Cultural Organization published its first “Statement on Race” in 1950 and the second in 1951. Bringing together more than one hundred scientists across different disciplines the UNESCO statements declare that race is a social and economic phenomenon and not a biological one. These statements and a few paradigmatic scholarly publications have established a dominant narrative of the mid-century “End of Scientific Racism” and “Decline of Concepts of Race in Science” (see especially Stepan 1992 and Barkan 1998). The substance of this dominant narrative attributes the antiracism of this mid-century decline to mechanisms internal to science and the scientific process or alternatively to the efforts of antiracist scientists such as Franz Boas and Julian Huxley (*ibid.*).

The attribution of decline to internal scientific mechanisms and to antiracist scientists is problematic for a few reasons. First, this reasoning erases the broader context in which science is embedded and contributes to the idea that science is not affected by the society or context in which it is performed. Scholars of STS have shown that this science-society divide is a false binary. Second, the contours of this narrative absolve science of its role in past racial projects by branding that knowledge as ‘bad science’ and erase the role of science in later and contemporary racial projects because of the belief that scientific racism ended in the 1950s. Finally, the narrative of decline is problematic because it works to privilege science and the scientific process as a sacred form of

¹⁶ See Stepan 1982, Barkan 1992, Provine 1973, Provine 1986, and Rose 1975.

knowledge-making that is immune from the political and social influences of the world in which it is produced.

In this chapter I offer an alternative interpretation of the decline of race in science narrative that serves as the external story of the history of immunology offered in Chapter 5. By situating the narrative in its broader political, economic and social climate, I reveal the work that this narrative has accomplished in the arenas of life sciences, science policy, and nation-building. Situating the narrative of decline as part of a larger story of racial formation and global political transformation highlights how the fall of colonialism, the rise of third world nationalisms, and the excesses of state sanctioned eugenics, offer a compelling explanation of the seeming appearance of a decline of race in science as well as demonstrate the work done by this narrative. It also draws attention to how science continued to play a role in racial projects.

In the first section I argue that decolonization and the end of empire were important events for the decline narrative. The second section analyzes the global anti-racist moment of the postwar era and describes how the dominant narrative of the end of scientific racism was instrumental in shaping postwar politics. In the third section I focus on the national level and argue that in the United States, the dramatic increase in research on chronic diseases reflects a new racial project and a focus on the health of the internal labor pool and the creation of a white middle class. This story forms the backdrop to the internal history of immunology in the next chapter.

Decolonization and the Decline of Tropical Medicine

Decolonization is a critically important factor that is often missing from the narrative of the disappearance of race in science. The boundary between science on one

side and all things social and political on the other helps to create a false understanding of the fate of racial science. I have argued earlier that the assemblage of colonial science, race and medicine were a particular way through which power operated during the first period. Decolonization necessitated a reconfiguration of that assemblage. In this section I will present evidence that the reconfiguration of empire led to an abandonment of institutions and disease problems that were central to the scientific racism of colonial medicine.

The racial project of colonial medical science connected scientific ideas of race and disease to the need for control and surveillance of colonized populations and the justification of white supremacy. National independence movements and the end of colonialism called for a renegotiation of race in medical science and newly adapted racial projects. Decreased support for schools and laboratories in the newly independent nations reflected a change in the ways that medical science could be used for racial control.

In the period shortly before the end of WWII when imperial nations began to recognize that the end of this iteration of empire was near, a rapid disinvestment in the institutions of colonization began. In the era of empire, as discussed earlier, medical science was often used as a tool of colonization and there was a particular hierarchy whose lives mattered and in what ways. First and foremost was the health of those U.S. and European soldiers, merchants, and settlers who were fighting, trading, or living in a colony. The health of colonized populations was important insofar as that population was used as a labor force. Finally, the health of a native population mattered if it was seen as a threat to colonizers living in the colony. When imperial nations began to leave their colonies, these original reasons and justifications for investing in diseases like malaria,

sleeping sickness, yellow fever, and cholera became less relevant. The research infrastructure that supported colonial medicine was fundamentally transformed when the motivations shifted away from their original basis. The need for the same types of racial control outlined in Chapter 2 also shifted.

The discipline of tropical medicine was central to colonial scientific racism and a crucial part of its research infrastructure. Many of the diseases that concerned early immunologists were infectious diseases that were also the domain of tropical medicine. The historical trajectory of the discipline shows how changes in the significance of the health of colonized populations contributed to the appearance of a decline of race in science. The laboratories of tropical medicine in both the colony and metropole were in financial trouble by the end of the First World War. By the time WWII began it had gone from trouble to crisis.

The Liverpool School of Tropical Medicine is an example of the abandonment of colonial scientific institutions. As the British Empire declined the role of the School was no longer obvious and the United Nations began to take responsibility for the disease problems of the former colonies (Power 1992; Wilkinson and Power 1998). The inability to attract European or American scientists to work in the newly independent nations reflects a lack of investment in tropical medicine from these nations. In East Africa, Lumsden describes how after independence the flight of expatriate scientists from the old colonial scientific institutions was seen as one of the main issues plaguing science in the post-colonial setting (1975). Before independence, research in tropical medicine was usually conducted in European schools or by expatriates working in research institutes in the colonies. “After independence expatriates were gradually replaced by African

scientists” (Keiser and Utzinger 2005: 361). Similarly, the United States began an explicit Filipinization of laboratories and health services in the Philippines after 1914 (Anderson 2006).

Disinvestment in the colonial science infrastructure meant that the disease problems (that were often understood in terms of racial immunity and susceptibility) became less popular scientific issues to work on. The appearance of decline is partly explained by this institutional change that was part of the process of decolonization rather than due to scientific process. In the Philippines for example, the Filipino elite that took over positions of colonial medical officers did not demonstrate the same racial understanding of tropical disease transmission (Anderson 2006).

This contributes to the appearance of a decline of race in science because the loss of this research infrastructure meant that the work of colonial science either ended or was repatriated back to Europe or America where the norms of working with the concept of race were different (Keiser and Utzinger 2005; ?). Without the need to control local populations and preserve the health of expatriates, colonial medical science faltered. For example, work on malaria and the idea that whites were more susceptible to the disease began to fade in favor of lines of research that focused on wide scale prevention in the name of development (Wilkinson and Power 1998). Research on trypanomiasis, a major issue during colonial rule, also began to decrease after World War II (Lumsden 1975). Focus on the weak constitution of racial others and their increased or decreased susceptibility to these diseases was no longer as important an issue. The decrease of research dollars helped support the narrative of a decline of race in science by decreasing

the amount of scientific work done in the colonial space and with the goal of controlling native populations and protecting colonizers.

At the 50th anniversary dinner of the American Society of Tropical Medicine and Hygiene (ASTMH), the President's address gave a brief history of the organization and commented on its future. The founding of the society in 1903 by Thomas Fenton began with a letter he wrote to prominent physicians in Philadelphia. Fenton supported his idea for a tropical medicine society by stating that many of the areas in the United States are subtropical as well as the "new possessions" of the country which are "almost wholly tropical" (quoted in Geiman 1954: 400). Another highlight of the history of the society came in the 1910 Presidential address where sanitary work on the Panama Canal was touted:

"We therefore believe sanitary work in the isthmus will demonstrate to the world that the white man can live and work in any part of the tropics and maintain good health and that the settling of the tropics by the Caucasian will date from the completion of the Panama Canal" (quoted in Geiman 1954: 404).

It is clear that the founding of the ASTMH was a project of colonial science and medicine. However, when speaking about the future of the society Geiman says:

"Now we are confronted with the paradox that man himself is living longer because of the development of sulfonamides, insecticides, antimalarial drugs, antibiotics, improved methods of sanitation, improved economic conditions, thus creating a population stress in many parts of the world that threatens to become the primary problem and displace disease as man's worst enemy" (1954: 410).

Geiman's concern with population stress was a common concern about less developed countries in the mid-twentieth century. The expected population explosion due

to decreased mortality from infectious disease was a preoccupation of those who concerned themselves with the wellbeing of “Third World” nations.

Also in 1954 at the same celebration dinner, Stacey May, an economist was invited to speak. She defines tropical diseases as the ailments that are prevalent in underdeveloped areas and also mentions that these are diseases that have been largely eradicated in advanced Western nations as well as Japan and New Zealand (May 1954). Towards the end of her speech May’s remarks turn towards why tropical medicine is important. She explains that the United States has economic interest in underdeveloped countries for expanding export markets and importing raw materials from them. She continues:

“An American economist must be interested in the progressive economic improvement of the Free World underdeveloped areas because the continuing dynamism of the United States is importantly dependent upon their economic growth. He must be interested in tropical medicine, because better control than has yet been achieved of the incidence of mass diseases in the underdeveloped areas is prerequisite to their economic growth” (May 1954:420).

May’s justification for continued interest in tropical medicine stands in stark contrast to the reasons of the original founders. This contrast illustrates the change in how the lives of people in underdeveloped nations mattered. In the first period tropical medicine was concerned with the health of white colonizers who were being sent to foreign areas for military or commercial reasons. In the second period, this impetus changes and tropical medicine is only important insofar as it supports the expansion of markets and the supply of raw materials for import. These economic concerns for the health of previously colonized populations is complicated by the concern of over

population. Immunology and its application in vaccines was central to concerns about reduction of disease and then after its success, concern about over populations.

Tropical medicine moved from being the paradigmatic discipline of colonial science to the main discipline of international and global health (Keiser and Utzinger: 2005; Wilkinson and Power 1998). The work these scientists were doing was soon to become the work of ‘development’ which would require a different racial lens and altered ways of thinking about and working with scientific concepts of race. Many of the organizations, journals, and institutions that were once associated with colonial medicine were transformed into the global health network that we have today. The discourse of international development made this transition possible. However, the discourse of development, as others have argued, retained many of the characteristics of the civilizing mission of colonization (Escobar 1995; Puri 2004). The science of development is another racial project that connected ideas of race to the social in structure in particular ways.

Health was a major element in the discourse of development. How Power describes the changes of the post war period is particularly telling. She writes, “This was crucial in a period of financial uncertainty when the LTSM needed to lose its colonial colors and join the vanguard of global health” (1992: 6). The financial uncertainty of the school’s future necessitated that it move from being a colonial institution to one of global health. The shift from colonial medical institution to bastion of global health and the concomitant condemnation of scientific racism went hand in hand with one of the basic elements of institutions: survival of the institution itself. The narrative of the end of race in science erases how the very survival of institutions such as the LTSM were bound

together with the end of colonialism and the need to reinvent themselves as continually necessary in financial and political arenas. The need for immunology to remain relevant and thus aligning itself more closely with biology stems from this need to reinvent itself in financial and political arenas in the postwar era.

In the next section, I argue that the narrative of decline was part of the postwar political posturing by advanced industrial nations designed to encourage capitalism in direct opposition to communism in the cold war era.

Postwar Competition and the Scientific Nation

The narrative of the end of scientific racism and the UNESCO documents that announced its demise came at a particular moment in global history. The end of WWII and the beginning of the Cold War marked a period of intense competition over the (mostly) newly independent nations' political structures. The United States and other European nations had both political and economic goals that made the future of newly independent nations important to their own interests and futures. The new nations were potential markets for capitalist economies and potential allies for communism (Gaddis 1997). Both the Soviet Union and the United States sought influence and national security in the aftermath of WWII. Despite their short-term cooperation, their economic and ideological differences led to a lasting competition for influence at a global level. In this section I argue that the decline narrative (particularly the UNESCO statement) was part of the postwar political posturing on the side of the allies in the competition over influence in the Free World. I also argue that the decline narrative disassociated science

from its racist past and in doing so enabled science to regain its status as a legitimate and authoritative knowledge making practice.

Anticommunist, pro-democracy arguments were attached to antiracist arguments by various actors and institutions. Gunnar Myrdal's famous work *An American Dilemma* (1944) connected antiracism to the United States' international role as a leader of the democratic and free world. Domestic racial issues in the United States were drawing international attention and hurting the image of the United States as it was competing with the Soviet Union for global influence (Dudziak 1988). Professed ideals of democracy and free trade were tarnished by internal racial politics, particularly the brutal oppression of segregation and Jim Crow. Racism and discrimination in the United States threatened its image as the leader of the free world whose democratic ideals were superior to communism.

Derrick Bell has argued that the crucial *Brown v. Board of Education* Supreme Court case was less a condemnation of racism and segregation than a political strategy necessary to showcase fairness and equality in the United States for the benefit of international spectators (Bell 1980). Bell writes, "The foreign policy advantages of a pro-civil rights result in *Brown* were specifically argued to the Court in the federal government's amicus curiae briefs" (Bell 1976: 12). Appearing anti-racist was an important foreign policy goal and the 1950 and 1951 UNESCO statements can also be seen in this light. The Third World nations at stake in the Cold War competition were nations of color and overtly state-sanctioned racism would not help in winning the competition.

The Holocaust in Nazi Germany was specifically mentioned as a reason to define the concept of race by UNESCO (1950) . The United Nations charged UNESCO to write a statement to educate the world about the concept of race and how it was connected to antiracism. The nations who signed on to the statements were not only publicly committing themselves to antiracism on a global level but were also distancing themselves from the Nazis and the scientific racism that supported state genocide.

While the usefulness of a condemnation of race in science was clearly advantageous in terms of foreign policy, the UNESCO statements did not have as strong basis of scientific support as the dominant narrative suggests (Reardon 2005). However just as the influence of international politics is not part of the popular narrative of the history of civil rights, it is also not a part of the narrative of scientific progress and the end of race in biology. The end of scientific racism narrative served postwar political posturing by advanced industrial nations designed to encourage capitalism and democracy in the cold war era. It was also important for the postwar image of the United States as a leading scientific nation whose internal democracy depends on the legitimacy of science.

Part of the Cold War was also a battle over whose version of governance – communism or democratic—capitalism would win out as more scientific. Claims to the scientific superiority of communism as a form of government were foundational to the Soviet Union’s communistic ideas and rhetoric. They believed that communism was the form of government supported by scientific principles and that it would solve the problems of society and civilization (Gaddis 1997). On the other hand, the United States argued that capitalist economies were scientific. This more basic disagreement about the

scientific principle of communism versus capitalism is one of the reasons why techno-scientific superiority (e.g. space race, weapons race) was one of the major components of the Cold War.

Science in the first period was a tool to provide evidence and bring legitimacy to beliefs about white superiority. In the second period, science shifts from being a tool and becomes a signifier of the superiority of advanced nations. More advanced science meant a more advanced nation. But the image of science in the hands of the state was the state-supported scientific racism of genocide in Nazi Germany, sterilization and lynching in the United States and other countries, and colonial domination in Asia, Africa and Latin America. Science needed to shed its colonial and racist past. The narrative of decline does this work of absolving science from the crimes of its past. Doubling down on its image as an apolitical and legitimate arbiter of truth, it attributes this progress to its own internal mechanisms. On the other side of the end of biological race, science is the signifier of a culturally advanced or developed nation. Discourses of development that characterized how advanced industrial nations interacted with less developed countries in this era have been indicted for continuing colonialism by other means (Puri 2004).

Debate about the usefulness of race as a concept in science can be found at any point in the history of science and argument and debate between scientists with different points of view are the norm rather than rare. The framework of coproduction reminds us that we must further question the mechanisms that make it appear that science is unified and that when scientists appear to come to agreement is where and when we must look for the other social practices that work together to coproduce science as truth.

In the next section I look to the state for those social practices that come together with the practice of science to offer an alternative explanation for the alleged disappearance of race in science. Further, I will argue that the concept of race did not completely disappear but was deliberately moved out of sight through the same mechanisms that brought it to the forefront in the first place. Those mechanisms are more often of a political and economic character than they are of linear scientific progress. Chapter 5 takes the discipline of immunology as a case study to more fully understand how the concept of race did not actually disappear from science.

National Level Changes: Basic Research into Chronic Diseases in the United States

In this section I will explain how institutions of medical research in the United States played a role in the appearance of a decline of race in science. Focusing on the institutional level of change situates the disappearance of race narrative. The narrative of the end of race in science is often attributed to a scientific consensus motivated by the diligent work of various anti-racist scientists. However as I will argue in this chapter, race seemed to disappear because of a broader set of changes in medical research in the country more generally. The oft-cited shift to research on chronic diseases and the ways in which researchers began to incorporate statistics into medicine greatly decreased research on infectious disease that was the backbone of racially explicit and racist medicine.

In what follows I explain how race seemed to disappear from medical science because of a change in focus from infectious to chronic disease.¹⁷ Much of the science of infectious disease was racially explicit, especially during the eugenics movement of the 1930s. Part of the reason race seemed to disappear was because researchers simply stopped doing this work. State sponsored medical research in the United States has its roots in the Public Health Service (PHS). As the PHS transformed into the National Institutes of Health the increased prestige and rewards associated with research on chronic disease quickly shifted researchers' attention away from racially charged work on infectious disease.

Medical research policy in the United States was sporadic and limited until the 1930s. Traditionally, medical research was left to private sector institutions such as the Rockefeller and Carnegie Foundations (Strickland 1972).¹⁸ 1878 was the first year that federal officials approved and encouraged state medical research efforts following devastating cholera and yellow fever epidemics. Early state medical research in the United States took place in the Hygienic Laboratory of the Public Health Service (PHS). The Public Health Service was the name given in 1912 to the hospitals and career service men and women that were largely responsible for the control of infectious disease in the United States. The Service began as a set of marine hospitals that cared for seamen along the coasts of the country and expanded to the control of infectious disease more generally, for example, the inspection of immigrants at sites such as Ellis Island.

¹⁷ Infectious diseases are those caused by agents or pathogens from outside the body such as bacteria, parasites, and viruses (e.g. tuberculosis, malaria, hookworm, HIV/AIDS, polio, etc.). Chronic diseases are long-lasting, are not communicable from person to person, and are generally of slow progression (e.g. heart disease, cancer, diabetes, etc.).

¹⁸ Much has been written on the role that these philanthropic institutions played in the elaboration of racial discourses of science and medicine, particularly in the field of genetics and microbiology. See Kay 1993, Ordovery 2003, and Abir-Am 2002.

While the PHS was in charge of medical inspection of immigrants entering the United States, only a very small percentage were actually refused entry based on medical reasons. The rhetoric surrounding immigration and its association with racialized immigrants and disease and contagion supported the Immigration Acts of 1921 and 1924. The medical inspection of immigrants was required beginning in 1891. The history of immigration restriction can be read as a history of racial restrictions masquerading as public health policy. The “history of immigrant medical inspection as the story of public health used for racial demarcation and exclusion” (Fairchild 2004). The eugenics movement encouraged anxieties about the fitness of the race and supported restrictive immigration policies that equated biological inferiority with lack of cleanliness and perceptions of dirty and diseased immigrants. These unfit and diseased immigrants were not only a threat to the present population’s immediate health, but were also a threat to the fitness of future populations. The connection between public health and eugenics infiltrated the medical inspection of immigrants and also drove national immigration policy.

Fairchild writes of the medical inspection line at Ellis Island as a public spectacle of power where immigrants were asked to undress and be inspected without privacy (Fairchild 2004). She writes, “Disease was instrumental in rationalizing these exclusions, and the medical examination served as a flexible tool to achieve higher exclusion rates in regions of the country receiving greater shares of “undesirable” immigrants” (2004:532). The Hygienic Laboratory of the PHS was one of the major tools of the Immigrant Inspection Service. Often immigrants were separated by class and those who could not afford first or second-class passage were subjected to a more thorough and intense

medical inspection. The specimens sent to the lab for testing gave an aura of scientific reality to the diagnoses that constructed immigrants as dirty and disease ridden. However the practice of only inspecting those who were poor ensured that rates of disease would be higher. The knowledge making practices (laboratory testing) and social practices (selective screening by class) together, co-constructed immigrants as diseased and unfit.

By the 1930s this institution was also heavily involved in medical research. The Hygienic Laboratory, started by a student of Pasteur and Koch in 1887, was the cornerstone of the PHS's medical research and was instrumental in the fight against infectious diseases in the late 19th and early 20th centuries.

In the early 20th century the PHS was largely concerned with protecting the country from infiltration of infectious diseases from other countries. The main method of preventing the spread of diseases was quarantine and the Immigration Inspection Service was responsible for this work (Furman 1973). As the scientific arm of the PHS, tasked with the diagnosis of infectious disease, the Hygienic Laboratory originally housed only one division: bacteriology and pathology.

As part of the racial project to ground race in scientific and biological notions, this laboratory played a major role in the co-construction of race and disease in this era. The division of bacteriology and pathology was responsible for diagnosis of disease and used the basic tools of immunological chemistry to help identify specific diseases. When identified, PHS officers would quarantine incoming ships and individuals in order to prevent the spread of infectious disease in the country. The science that they performed was not basic medical research as we understand it today, but was an applied science

designed to prevent the spread of disease. This was not expanded until 1902 when Congress gave medical research a definite budget and established an Advisory Board to the Hygienic Laboratory (Strickland 1972).

In the late 19th and early 20th centuries, the United States had greatly reduced the impact of infectious diseases associated with tropical medicine within its borders. Much of this work was accomplished by the New Deal and the Social Security Act which included money for a drainage program for malaria control in the South and strengthened State and local health organizations. While this reduction was unequal among racialized populations, the decreased mortality was enough to push the nation into a new era of medical research and policy. The creation of the National Institutes of Health in the 1930s is one of the signs of the change in focus from infectious to chronic disease. It also marks a major investment in chronic disease research and the entrance of the federal government as a major patron of medical research in the United States.

U.S. Surgeon General George Parran was instrumental in the shift towards basic medical research on chronic disease. His main argument was that infectious disease had been conquered. Parran writes in 1939, “No longer was the chief potential enemy the epidemic which could come to this country on a ship –although that danger should never be minimized. Deaths now were chiefly caused by the chronic disease –syphilis, tuberculosis, heart diseases, cancer and strokes” (Parran 1939). With the outbreak of World War II the efforts of PHS turned towards the military effort. The PHS furnished medical care to the entire personnel of the Coast Guard, supervised epidemic control and sanitation in North Africa and India, and were in charge of the health of Japanese detainees (Furman 1973).

As the war was ending, the PHS Act of 1944 allowed the Surgeon General to make grants in aid to universities, laboratories and other public and private institutions and individuals (Furman 1973). The applied research focused on preventing the spread of disease moved to the periphery and basic medical research (mostly within the discipline of biology) became the focus of the major research institutions. As more money was pumped into NIH for basic medical research, epidemiological research was separated from basic research. This separation decreased the amount of scientists who were working on the older infectious disease that were associated with the scientific racism of the prewar period. As we will see in Chapter 5, immunology also needed to change after years of serological work that more closely mirrored epidemiology became less valued.

The separation of epidemiological and basic medical research also meant the creation of a separate institution for epidemiological surveillance. The Centers for Disease Control established in 1946 as the Communicable Disease Center could be described as “old-fashioned” for its focus infectious disease surveillance (Etheridge 1992). As the PHS and NIH turned towards chronic diseases, the Centers for Disease Control gradually took over responsibility for infectious disease control. In its push towards basic medical research, leaders at NIH were glad to have the CDC take care of epidemic control and surveillance of the population (Etheridge 1992:17). The prestigious Venereal disease branch of the PHS moved to Atlanta, followed by the Tuberculosis branch. Gradually most epidemiological investigations moved to Atlanta from Bethesda (ibid.). In the 1950s much of the most interesting work at CDC included projects in polio, psittacosis, encephalitis and Q fever. In the early 20th century the venereal disease branch was the most prestigious unit at PHS. The move towards research left the control of

infectious disease to the CDC and it was clear that the major hub of basic medical research was in Bethesda. The move of the venereal and tuberculosis disease branches from Bethesda to Atlanta is an example of how research on diseases whose scientific understandings are historically intertwined with race and racism was moved to the periphery of basic medical research in this era.

The annual reports from the Surgeon General of the Public Health Laboratory tell a similar story about the move from research on infectious disease to chronic diseases. In report from 1901 the first diseases listed include tuberculosis, smallpox. There is also an emphasis on the health of people outside of the United States, including places such as Cuba, Quebec, Liverpool, and Naples for example. Under the section titled Hygienic Laboratory there is research being conducted on yellow fever, “insects as factors in disease,” bubonic plague, and “disinfection experiments.” These research and work concerns of the PHS change drastically by the middle decades of the century. By 1931 the headlining disease in the Division of Scientific Research was cancer, followed by leprosy and malaria. In 1941 the Division of Scientific Research had become the National Institute of Health. Cancer, the paradigmatic chronic disease, had its own institute in the 1941 report as compared to infectious diseases which were consolidated into one division. The sub-discipline of cancer immunology demonstrates how the discipline of immunology reflected the shifts in medical research more broadly.

Alongside the decrease in the focus on infectious diseases at the national level was the creation of global institutes of health who took on the problems of health and infectious disease in developing nations at a global level. For example the World Health Organization.

In the next section I explain how race seemed to disappear from medical science due to the tendency to overlook whiteness as a racial construction. Much of the scholarship on scientific racism and medicine focuses on how technologies of science and medicine construct people of color as biologically inferior. In what follows I argue that the technologies of disease surveillance that emerged in the mid-twentieth century were part of the racial project that consolidated previously ethnically identified populations into whiteness.

Chronic Disease Research and the Racial Project of Whiteness

Research on chronic disease experienced rapid expansion in the post WWII era. In literature on public health, scholars describe this moment as the transition from the old to the new public health (Porter 1999). The move towards increased research on chronic disease was also a shift away from racially charged research on infectious diseases. This is one reason for the seeming disappearance of race in the mid-twentieth century—a decline in the study of infectious disease. Whiteness is often overlooked as a racial category in medicine and science in this period and chronic diseases were white diseases. Blacks were thought of as insusceptible to coronary heart disease and cancer (Pollock 2012; Wailoo 2011). Describing this change as moving past the era of infectious disease and into an era of chronic disease erases the implicit racialization of chronic disease. Cancer and heart disease are modern ailments of modern Americans. They were defined against the infectious diseases that are associated with lack of hygiene, tropical climates, and people of color. As a particularly important example, heart disease was associated with the stress and strain of modern life. As Anne Pollock argues, “Heart disease was imagined to be characteristic of white Americans not only because their burden of

infection was decreasing, but also because they lived a modern life of stress and strain” (2012: 33).

Keith Wailoo describes a similarly racialized understanding of cancer that was also explicitly gendered. “While early twentieth-century authorities imagined white women as biologically prone to cancer, focusing on them as individuals with intimate fears, they saw African Americans as a stereotyped, homogenous social group lacking such an interior life. Theories about these social groupings pervaded cancer discourse, fueling speculation about biological and ecological differences that made blacks almost ‘immune’ from the disease” (2011: 5). Concerns about cancer, heart disease and chronic disease more generally reflected a turn away from the infectious disease problems of the primitive part of the world. The lives of racialized others ceased to matter due to their proximity to whites in previously colonized nations. Whereas once, the proximity of natives to white colonizers meant that fighting infectious disease through science and medicine served the twin purposes of keeping whites healthy and providing a scientifically based form of social control (e.g. compulsory hygiene, medical identification cards, etc.). This turn to chronic, modern diseases associated with the everyday life of advanced industrial nations should be read as part of a racial discourse that devalues the lives of people of color while elevating the life and health of middle-class whites.

With the importation of statistics into medicine, the biomedical model at this point began to focus on the average patient. Race seemed to disappear because the focus of public health in the United States shifted from protecting the country from invading pathogens to increasing the number of years in the labor force of the average male. The

acceptance of the clinical trial as the gold standard of safety and efficacy in medical practice ushered in an era of standardization. Clinical trials are based on statistics and standardization that sought to place clinical practice on scientific grounding. Clinical trials were formally adopted by medical authorities in the United States in the postwar period. Aligned with the shift to chronic diseases, the long-term and large scale observation of individuals was often focused on coming up with a standard medical model of treatment. Often, this standard model was white and male. As Epstein explains,

As clinical research became more scientifically grounded and more central to the image of modern medicine, and as more and more funding poured into clinical trials from both the government and pharmaceutical companies, it is reasonable to imagine that researchers wanted to use the new techniques to address problems affecting mainstream or socially privileged groups, such as a perceived epidemic of heart disease in men. Similarly, it is reasonable to suppose that drug manufacturers wanted to study those groups in society with the greatest ability to afford their remedies” (Epstein 2007: 48).

Third, with the importation of statistics into medicine, standardized notions of the medical patient and the research subject gradually have taken hold within medicine, especially in the twentieth century –potentially promoting a bias in favor of seeing white male adult as the standard type of human” (Epstein 2007:51).

New studies that focused on chronic disease tended to take white men as the neutral medical model (Pollock 2012; Wailoo 2011; Riska 2004). The famous Framingham Study that began at the National Heart Institute is one example. Beginning in 1948 and continuing for more than half a century, the Framingham Study is a longitudinal, multi-generational study designed to identify risk factors for heart disease. It began with 5,209 adult participants from Framingham, Massachusetts. Much of our common knowledge about the long term effects of diet, nutrition, smoking, exercise and other health behaviors have their roots in this ongoing study. The original sample included only those thought to be at risk for coronary heart disease: middle-aged, middle to upper class, white males. Pollock writes about the Framingham study, “Its unmarked whiteness was not

inevitable or natural. Rather, it was a contingent and emergent aspect shaped by intersections of old racialized diagnoses; old and new notions of whiteness; and new notions of how to manage difference in epidemiological research” (2012: 53).

Epstein’s work focuses on how the underrepresentation frame excluded minorities. In contrast, I draw attention to how the frame of the average white male medical model served to consolidate whiteness in the postwar era. Epstein’s book describes how the whites in the Framingham Study were not typical of whites elsewhere. The Framingham Study had an ethnic mix that included “roots in Poland, Ireland, Italy, Greece, French Canada, and England” (Lynch 1977: 53). However, differences between whites of various ethnicities were consolidated through the statistical categories that became popular through the use of the human subjects that did not differentiate between various ethnicities that were to consolidate as white in the postwar era. Pollock explains, “Yet this homogenous whiteness of the Framingham study was not a given at the outset of the study, but a conceptualization of the population that emerged and became stable over the 1950s and ‘60s” (Pollock 2012: 60).

The rise of the average white male medical model had two related consequences for the disappearance narrative. On the one hand, it supported the claim that race had disappeared from science due to a shift in focus on the unmarked race of white. By using statistical techniques to focus on the average, race was erased by the assumption that individuals approach the norm. On the other hand is the construction of this norm. Like in the example of the Framingham Study, whites of different ethnicities that would have once been thought of as biologically inferior were redefined into the category of average

white male. In this way, medical science contributed to the racial project that consolidated different ethnicities into a generic and unmarked whiteness.

Another important study conducted by the influential Johns Hopkins Institute of Hygiene and School of Public Health in Baltimore consisted of only whites. In 1916 when the school was being created advocates argued that the city's substantial black population provided enormous opportunities for the study of infectious diseases (Fee 1987). In contrast, the Eastern Health District studies in the late 1930s excluded blacks and included only whites in their preliminary studies of the prevalence of chronic disease (Downes and Collins 1940). At the same time as this longitudinal health study was taking place Baltimore was experiencing a steady influx of poorer first generation Americans and black Americans from the south and more rural areas.

A third study that was particularly important in defining risk factors for heart disease was the Western Collaborative Group Study. When it began in 1960, it included 3,524 healthy, white middle- and upper-level male executives from 39 to 59 years old (Riska 2004). Researchers were interested in the high levels of stress among middle class white men with white collar jobs. This study, among others, supported the association of Type A men with increased stress and being more prone to heart disease which they nicknamed the "executive disease" (Riska 2004:32).

In a 1917 meeting on the prevention of poliomyelitis, the conference members discussed whether or not to include race or nationality on a universal reporting form. The importance of race, color and nationality are considered:

Dr. Drake: If we are to incorporate that question as to race, I think it would be very much better to indicate it as it is indicated on the standard blank; that is, red, white, black or Indian. That covers all the races.

Dr. Swarts: Is it desired to discover the color of the skin of the patient, or the place he comes from? It seems to me it is the question of nationality that the collaborators want to get at, to determine the susceptibility of Germans, Irish, or Americans. It is not a question of whether the skin has a light color or more or less color. It is rather a question of nationality.

Dr. Trask: It seems to me from what has been said that there are certain communities in special sections of the country having what is known as a colored population, and that in those sections the words "white" and "colored" would be thoroughly understood, and will bring out the desired information; that under other circumstances the word "nationality" would perhaps come nearer giving you the information you desire, whether Italian, German, or Scotch. I would suggest in addition to the form as it stands that there be inserted, "white or black" or "white or colored," in the line under nationality.

Before the argument period comes to an end there is one final comment:

Dr. Woodward: It seems to me, Mr. Chairman, you are going rather finely into the tissue functions of individuals when you try to ascertain whether the parent of this 5-year-old child was born in America. It hardly seems we are going to get anywhere on a trail of that sort. The important thing is, practically, whether he is foreign in his instincts, foreign in his habits and in his mode of life. [...] It is really the social status of the man we are interested in, rather than where he was born, because we want to determine whether the disease prevails throughout certain social groups (United States Public Health Service 1916: 94-96).

While it is clear that there are different reasons for incorporating information on race in a form for polio surveillance, it is also important to note which races or nationalities are important here. In the above quote, Dr. Swarts is concerned with differences in the susceptibilities of groups that were just becoming part of the Caucasian racial group that was just emerging. As Jacobsen explains, "In general a pattern of racially based, Anglo-Saxonist exclusivity dominated the years from 1840 to the 1920s, whereas a pattern of Caucasian unity gradually took its place in the 1920s and after" (Jacobson 1998). As a

racial category, white is often called the unmarked race (Waters 1990; Frankenberg 1993). By collapsing the categories of ethnicity into a monolithic whiteness, studies such as the Eastern Health District study and the Framingham Study demonstrate how medical science continued to use concepts of race and contributed to the racial project of whiteness. Techniques of enumeration in public health and medical science continue to have dramatic effects on how people react to and understand risk of disease (Sangaramoorthy and Benton 2012).

This chapter serves as a backdrop of the external changes in broader political and social arenas that are reflected in the history of immunology offered in the next chapter.

Chapter 5. Race and Immunology: Natural Immunity, Blood Types, and the Biological Self

The previous chapter explained how the end of scientific racism should be reinterpreted based on the broader social and political change of the WWII and postwar era. This chapter takes the form of a case study of immunology in order to focus a more detailed lens on how the separation of concepts of race from the scientific discourse was not a necessary progression and how disciplines are shaped by forces beyond the laboratory. This chapter is organized into three sections that correspond to the periodization of race in science (See Chapter 3).

Immunology –the study of the immune system– was closely connected to scientific racism and immunity remains potent in our contemporary biological explanations of race. It grew out of the early discoveries of bacteriology and in its classic form is closely connected to the fields of epidemiology and medicine. Early immunologists identified diseases and tried to isolate antibodies to those diseases in laboratory settings. Today, immunologists work both in lab and clinical settings, particularly with patients that suffer from immune disorders.

In the first section, natural immunity, I discuss how the concept of natural immunity framed how immunologists used race in the first period. Natural immunity is best understood in contrast to acquired immunity. Acquired immunity stems from the early observation that once someone experiences a certain disease, often that person is subsequently immune to a second attack. Chicken pox is helpful here as an illustration. When a child gets chicken pox they *acquire* immunity in that they are usually no longer susceptible to a second attack. In this sense the immunity is not something that a person is born with, but immunity that they gain or acquire. Natural immunity, on the other

hand, is a hereditary lack of susceptibility to disease or category of disease (Citron 1914). An example here is how in the 1930s scientists believed that Chinese people were naturally immune to scarlet fever (Ando et. al 1929). The concept of natural immunity articulates with the idea that different groups of people show different susceptibilities to particular diseases and was often invoked as scientific evidence of biological differences between races.

The second section tells the story of how immunology turned to the study of the relationship between blood groups and race. Blood groups, or the ABO system, was discovered in 1901 by immunologist Karl Landsteiner and won him a Nobel Prize. Serology, or the study of blood, became the dominant concern of the discipline of immunology during the second period. In the discipline of immunology, scientists continued to pursue the idea that racial relationships could be measured by blood groups. For example, immunologists argued that people with type B blood were more closely connected to African races.

This episode in immunology is often erased from secondary histories of the discipline. Arthur Silverstein, historian of immunology calls this time period of serological inquiry the “Dark Ages” of immunology (Silverstein 2009). I argue that the erasure of this period of immunology demonstrates how race seemed to disappear from science in the second period. The story of immunology and its concern with blood groups and race does not often make it into the history of the discipline because it goes against the idea of progress in science and also because it showcases how race did not disappear from the concerns of scientists in the postwar era.

The third section of this chapter explains how biological race was reinterpreted into genetic language and corresponds to the third period of race in science. Immunology experienced a dramatic paradigm shift that brought immunology under the umbrella of a new biology where race had become an individual trait rather than a group trait. The merging of immunological and biological theories turned on the reinterpretation of mechanisms of immunology based on MacFarlane Burnet's theory of self and non-self. By introducing a theory of immunology based on the individual rather than a group, Burnet was able to resolve immunological concepts of race with the new biological race as an individual characteristic.

In this section I also argue that the turn of immunology towards more biological explanations was also a political move that helped to guarantee the continuation of immunology as a discipline at a time when its survival was threatened. Enormous investments in public sector scientific research were made during WWII. As the war was ending, the place and funding of science in peacetime was being debated and scientific institutions that saw a tremendous influx of funds during the war had to create a postwar space for themselves. I argue that the discipline of immunology aligned itself with biology through the adoption of Burnet's theory as part of this postwar struggle for institutional survival.

Natural Immunity

For immunologists, the concept of natural immunity served to both entrench and destabilize ideas about how health and disease are negotiated by the body. The career of natural immunity helps demonstrate the different ways that the fundamental idea that people have different susceptibilities to disease held sway over what could be

scientifically possible. The history of immunology can be interpreted in terms of the career of the concept of natural immunity that also maps onto the periodization offered in Chapter 3. Major theories in the discipline of immunology were accepted or rejected based on whether or not they could account for the existence of natural immunity or natural antibodies. In what follows, I do not evaluate the truth claims of the history of immunology but analyze how forces outside of the laboratory might shape the questions asked within. I argue that one of the enduring ways that we understand biological race – as group difference in susceptibility to disease – had the power to arbitrate the direction of one of the major biological disciplines of medicine.

While many historians of immunology acknowledge the role that the concept of natural immunity has played in the history of the discipline what is often unmentioned are assumptions of racial difference that have been part of the grid of intelligibility of natural immunity. In the mid-twentieth century, the idea that different races had differing natural immunities to particular diseases was common knowledge. Immunologists argued that black people were more immune to polio than whites (Fox et. al 1956), that the Chinese possessed an “inherent racial immunity” to scarlet fever (Ando et. al 1929), and that blood types could determine racial relationships (Hirschfeld 1919; Grove 1926). The close relationship of the concept of heritable immunities to biological understandings of race is almost obvious because of how we continue to understand and think about heritability, the body and race. The story of the rise and fall of natural immunity and the corollary of natural antibodies mirrors the contours of the oft-told history of scientific racism. In what follows, I outline the story of natural immunity and the role that this concept has played in the history of immunology. Alongside that narrative I have brought

in the larger structural context of race and racism to draw attention to how the scientific narrative is connected to its broader context.

The Concept of Natural Immunity: Immunology from Ehrlich to Burnet

We take for granted the knowledge that germs cause disease but it was a relatively recent discovery in human history. The late 19th century discovery that some diseases are caused by organisms too small to see without a microscope had to beat out competing theories of disease causation. At the time that germ theory was being discovered the miasma theory of disease was the dominant understanding of disease etiology. Miasmas were understood to be poisonous vapors or mists that when breathed cause illness. The term miasma comes from ancient Greek meaning bad air. Another pre-19th century theory of disease that held sway was the theurgic origin of disease where people believed that a god (or gods) of pestilence gave disease to those who deserved it (Silverstein 1989).¹⁹

Modern medicine still largely accepts germ theory that is often attributed to Louis Pasteur and his work in the mid-19th century. Louis Pasteur, working in Paris at the Institut Pasteur, discovered methods for scientifically proving that diseases were caused by bacteria. While he was not the first to advocate for germ theory he was able to convince the world that germ theory was correct. At this point immunology still was not a discipline. Pasteur worked in the field of bacteriology, a field with which immunology was closely associated for much of its history. Germ theory was a challenge to the idea that disease was punishment for sin. The more that microbes were to blame and that everyone is susceptible to disease meant that morality had a lesser role to play in the

¹⁹We still hear echoes of the idea that gods give diseases to sinners who deserve them (Silverstein 1989: 6).

understanding of disease. However, Anne-Marie Moulin, historian of immunology, draws a connection between the Pastuerienne program and the emergence of tropical medicine that exploited the colonial space as a laboratory for proving the feasibility and efficacy of immunization (Tilley 2011). The colonial space as a laboratory for European science that was then used as justification for colonization is a contradiction that post-colonial scholars of STS are just beginning to explore.

From the earliest writing on disease, people observed that diseases did not treat everyone equally. Differential immunity was used to support claims of racial superiority and inferiority. Differing susceptibility to disease was both evidence of the superiority of the white race to people of color as well as evidence for the biological inferiority of people of color. Moving from theurgic to miasmatic and then to germ theories of disease did not prevent the interpretation of different disease susceptibility as racially mediated and indicative of biological superiority/inferiority. The Pastuerienne era of bacteriology led to the next major development in the history of immunology: the discovery of antibodies and the theories of Paul Ehrlich.

Paul Ehrlich was a German physician whose career in immunology began with the development of a technique for staining tissues. At the time, chemical sciences were the dominant scientific model and the German chemical dye industry was at the forefront of chemical sciences, leading to economic progress. Coming from the top chemical industry in the world and applying chemical models to biology, Ehrlich believed that all biological processes could be understood as chemical interactions. This led to him developing his most famous contribution, the side-chain theory of antibody formation.

The side-chain theory proposed that cells of the body had receptors or side chains that were specifically shaped to bind to particular antigens. For example, if a pneumonia bacteria or antigen entered an organism it would bind to a receptor or side chain in the way that a particular puzzle piece fits into a jigsaw. Ehrlich's theory demonstrates a clear tendency towards chemical reductionism and part of the attraction to his side-chain theory was its simplicity. Later, when Sir MacFarlane Burnet's theory rose to prominence in immunological discourse, this chemical reductionism was jettisoned in favor of biological and evolutionary mechanisms as mediating factors for immunity.

The side-chain theory enjoyed an almost uninterrupted reign in immunology for 50 years. Part of the reason for this dominance was the conflict between France and Germany that eventually led to the first Great War. Elie Metchnikoff, a student of Pasteur in Paris, proposed a theory of immunity that was pitched against Ehrlich's side-chain theory. That the two sides were mutually exclusive and could not be reconciled was more a product of the warring countries than a scientific impossibility. Each side generalized and accentuated the respective mechanisms of immunity and attempts at reconciliation of the two theories were ignored for decades (Moulin 1991:71).

Ehrlich's side-chain theory was also powerful because it articulated well with the prevalent theory of natural selection (Moulin 1991). In these terms, antibodies *naturally* exist in the body and the antigens *select* from the available side-chains and destroy the invading pathogens. Natural selection and the existence of natural antibodies articulated well with biological concepts of race. Different races of people had natural antibodies that protected them against pathogens that they might encounter in their geographic areas where they come from. This theory helped explain why whites might get sick when they

went to different climates and why natives did not have the same immunity against diseases brought by European explorers. Theories of natural selection were often used to argue the superiority of whites and Ehrlich's side-chain theory of immunity was well suited to this argument as well.

Natural Immunity and Race

In the immunological literature the term natural immunity was used interchangeably with racial immunity. "It would be of interest to compare the results of skin tests in a naturally immune race, as the Indian, with those in white individuals having a history of scarlet fever and, as clinical experience has shown, consequently actively immune (Sherwood et al 1926)." "It occurred to us that if there existed a racial immunity to scarlet fever among full blooded Indians, it would be interesting to test out their susceptibility by means of the skin test (Sherwood et al. 1926)." The quote demonstrates that racial and natural immunity were interchangeable concepts. Natural immunity was also assumed to be inherited. "...When it was impossible to sort out cases into convincing statistical groups on account of the unknown factor of natural or inherited immunity which plays an important and as yet little charted part in epidemiology" (Von Sholly and Park 1920). Racial, natural, and inherited immunity were all concepts that allowed immunologists to distinguish biologically between groups of people.

At the 1918 Presidential Address to the AAI, John Kolmer describes natural immunity to pneumonia and meningococcus meningitis, and tetanus as examples of the few "more pressing problems" to be given further study. Kolmer also suggests that this type of natural immunity might not exist. However, Kolmer's mention of natural

immunity during his presidential address points to the importance of the concept in the discipline at the time.

Racial groups were not the only groups used in terms of natural immunity. Age was also a factor in articles discussing natural immunity (Brownlee 1905). Brownlee writes, “It would seem as if there was in inverse relationship between the natural immunity and the capacity for acquiring immunity. As the natural immunity increases with age the possession of high capacity for acquiring immunity becomes less necessary” (Brownlee 1905: 528).

Social and biological differences between groups were confounded within the concept of natural immunity. A 1919 article described differences between army men, “In other words, the natural immunity of recruits is much lower than that of seasoned²⁰ troops, and this is particularly true of rural men, such as composed the Camp Wheeler draft” (Cecil and Vaughn 1919: 479). “In the first place, many of the men whom we were to vaccinate at Camp Wheeler were raw recruits of rural origin, a considerable part of them negroes. The men vaccinated at Camp Upton had come chiefly from New York City, were well seasoned at the time of vaccination, and were mostly of the white race (Cecil and Vaughn 1919: 461)

Immunologists were also concerned with their role in helping the country during wartime. The presidential address of John Kolmer to the American Association of Immunologists in 1918 was titled “The Role of Immunity in the Conduct of the Present War” (Kolmer 1918). The article by Cecil and Vaughn mentioned earlier was concerned with the health of soldiers (1919). The 1920 article by Von Sholly and Park mentioned

²⁰ The article defined seasoned as one month or more of service.

that their work was “partly for general scientific knowledge and partly for the purpose of finding out the practicability of group vaccination for a commercial company from the point of view of loss of services following and due to the inoculations” (Von Sholly and Park 1920: 106).

Articles that attempt to chart group differences in immunity to specific diseases have focused on Black Americans, American Indians, Eskimos/Inuit populations, and Japanese and Chinese people in Manchuria. The particular races that were under the microscope both literally and figuratively were also fundamentally important to the imperialist state that sought to colonize the native lands of these different races of people or to maintain or increase the social and biological distance between them and the dominant white majority. Much of the early research on natural antibodies or natural immunity or even, racial resistance, took place in the context of colonialism. The context of colonialism means that the distribution of power was uneven and the interpretation of health and disease was always already in the interests of maintaining that unequal distribution of power. The discourse of science and medicine in the context of colonialism served to further entrench the power of the colonizers and to extend the techniques of social control further into the bodies and behaviors of the colonized.

One article on Eskimos aimed to test their natural immunity to four diseases, clearly communicated by the title of the article, “Susceptibility of Eskimos to the Common Cold and a Study of their Natural Immunity to Diphtheria, Scarlet Fever and Bacterial Filtrates” (Heinbecker and Irvine-Jones 1928). Results from one group of people was assumed to be the same as another group of the same race, “The subjects were taken indiscriminately and represented practically the whole of the tribe present at

the time of the experiments.” [...] “In view of the results obtained from the Schick test in the next tribe they would also presumably have been negative” (Heinbecker and Irvine-Jones 1928: 398-399).

A 1929 article, “On the Natural Immunity to Scarlet Fever of the Japanese and Chinese Residing in South Manchuria” aimed to study “racial differences of natural immunity” in a place where different races live in the same environment but where one of the races is “native” (Ando et al. 1929: 473). The authors write, “...The difference in this susceptibility of the two races, the Japanese and the indigenous Chinese, residing in South Manchuria may depend on the inherent difference in the development of immunity, but not on the difference of acquired immunity...” (Ando et al 1929: 479). The argument of increased susceptibility to disease of an invading army was often used as another argument for the control of colonized or conquered populations. The biological vulnerability of the Japanese both differentiates them from the Chinese and establishes a need for separation and control of the potentially dangerous and diseased population. In 1929, the Japanese were on the verge of invading this part of China.²¹ As a colonial power, the use of similar arguments about natural immunity, race, and disease in Japan is not surprising.

Natural Antibodies destabilize Ehrlich

Ehrlich’s theory, however, began to run into trouble when other scientists began to question the basis that each person is born with all of the specific side-chains that would protect against every single antigen (Silverstein 1999; Moulin 1991). Scientists experimenting with antibody formation were able to produce antibodies that reacted with

²¹ See Tamanoi, Mariko Asano. 2000. “Knowledge, Power, and Racial Classifications: The “Japanese” in “Manchuria”.” *The Journal of Asian Studies*. Vol. 59: 248-276.

all different types of substances, including manmade antigens. This led to the question of why the human body would evolve to protect against something that did not exist in nature.

Another issue of the economy of nature also ran against the logic of Ehrlich's theory. Scientists were able to show that people from vastly different parts of the world were able to produce antibodies against diseases that were not found in the places to which they are native. For example, one 1903 study found that blood from Inuit populations in Greenland was able to produce antibodies to malaria, despite that the population would presumably never have needed to evolve side-chains that protected against a disease that does not exist in their area. The suggestion that every individual is born with the inherent capacity to protect itself against every possible invading pathogen did not seem possible nor did it articulate very well with prevailing ideas of human racial difference.

These discoveries that increased the antibody repertoire beyond what was acceptable in light of evolutionary theory led to the development of instruction theories of antibody formation (Silverstein 1999; Moulin 1991). Instruction theories are most often credited to Haurowitz and Breinl, and Topley, Mudd and Alexander's work between 1930 and 1932 (Silverstein 1989: 68). Before the discovery of DNA it was assumed that the body could not have accumulated enough information through evolution to account for all the antigens that had been discovered. Rather than assume that the body carried all this information, instruction theories proposed that the antigen brought with it the template for production of antibodies. In other words, when an invading pathogen

enters the body, it then binds with natural precursors and serves as a template that instructs the formation of the specificity of the antibody.

Instruction theories of antibody formation assumed that all of the information needed for the body to produce antibodies came from outside the body. The antigen instructs the body how to produce the correct antibody by serving as a template upon which the nascent antibody could be constructed. In terms of the idea of natural immunity, this theory side-stepped the problem that required evolution to have provided the body with enough information to produce antibodies against every possible antigen.

Natural antibodies were an anomaly for instruction theories of antibody formation. Instruction theories of antibody formation did not account for the existence of natural antibodies. At this point the debate on natural antibodies became polar. On one side, there were those who argued and provided evidence that all antibodies could be accounted for by infection with an antigen whether or not symptoms of the infection could be seen clinically. For example, if a person was immune to chicken pox, an investigator would not assume that they were born with antibodies to chicken pox even if they never had symptoms of the disease. A doctor or scientists who subscribed to instruction theories would insist that the person did have chicken pox at some point in their life but just did not show any symptoms (subclinical infection). On the other, there were those who argued that natural antibodies existed for antigens which could not be explained by subclinical infection. Instruction theories of antibody formation were followed by selective theories.

Niels Kaj Jerne is most often given credit for the theoretical turn in immunology from instructive to selective theories. Jerne's contribution was to suggest that humans had evolved natural antibodies that fit more or less with most antigens. After the antigen had selected for a particular antibody, the entire antibody-antigen complex would be transported to a system of cells that would reproduce the antibody. In the overlapping years between Periods 2 and 3, Koshland and Englberger argue that their data on diphtheria toxins did not support the instruction theory of antibody formation advanced by Breinl, Haurowitz, Mudd, Pauling or Salley that requires an antigen to present for the production of antibodies. They argue that their data could support Jerne's selection theory (1957). In an experiment with three-week old pigs, Segre and Kaeberle find that preformed antibodies transferred to baby pigs from their mother's colostrum provides for recognition of the non-self and supports the hypothesis of Jerne (1962).

The controversy over natural antibodies was never really settled in immunology; it was replaced by a new theory that gained prominence in the mid-twentieth century. The theory of self/non-self immunity of Sir MacFarlane Burnet translated the question of the existence of natural antibodies as a group or racial trait into the ability of an individual immune system to distinguish between native and foreign material.

Despite the hundreds of articles published on natural immunity and natural antibodies, a 1966 article by Stephen Boyden begins with the assertion that "Although a great deal has been written about the antibodies present in normal serum, surprisingly few authors, with the notable exception in recent years of Jerne (1955, 1960), have paid much attention to the possibility that natural antibodies might play an important role in immune responses" (1966:1). In 1993, Avrameas and Ternynck lament, "This fact is obvious

when the literature available is considered, including the most recent publications concerning contemporary immunology: among several hundred pages, humoral natural immunity is rarely accorded more than four or five of them” (Avrameas and Ternynck 1993: 1134). Almost no mention is made of the multiple studies of natural immunity nor the blood group antibodies which so preoccupied early 20th century immunology.

The 1932 article says, “Although the idea that inherent differences among animals exist in resistance to disease antedates the discovery of bacteria, but little attention has been directed to a study of such differences and to their significance for the broader problems of disease” (Lambert 1932: 229). This is also one of the first papers in the *Jl* to use experimental selective breeding to study inherent natural resistance to disease. This particular author cites works by other scientists who were vocal proponents of eugenics. In the 1930s the theme of inheritance and genetics becomes central to the concept of natural immunity. The broader scientific context of debate about eugenics and heredity fits well with this impetus.

The concept of natural immunity articulates well with the discovery by Karl Landsteiner that the blood of individuals tends to react to the blood of other individuals in the same way it acts against an antigen. In other words, when injected with the blood of another person, an individual shows an immune response to that injection. Some people are naturally immune to other people. Blood group agglutinins are one type of natural antibody. When blood groups were discovered in immunology the interpretation was that people have natural immunities towards each other. In the next section, I tell the story of how blood groups were used to provide scientific justifications for racial classification.

In this section I argue that the erasure of the research that sought to prove that blood groups determine racial relationships contributes to the narrative of the disappearance race. In the second section, I demonstrate how state and scientific impulses to scientifically support race were aligned. Finally, I explain how the transition to population genetics was an outgrowth of research on blood groups and race.

Blood Groups and Race

A seminal moment in the history of immunology was Karl Landsteiner's discovery of blood groups in 1901 for which he subsequently was awarded the Nobel Prize. Blood groups were quite naturally amenable to racial thinking because the ABO system allowed for the classification of different people into different types. Blood groups were one of the first ways to categorize different groups of people from the inside out. For decades, researchers both within and outside of immunology insisted that blood groups were an important signifier of race. Using blood group testing, immunologists traveled the world collecting blood samples, typing populations and mapping the racial distance between populations. However, this major episode in immunology is all but missing from secondary histories.

Historian of immunology, Arthur Silverstein describes the fifty years between 1910 and 1960 as the "Dark Ages" of immunology (Silverstien 2009). While Silverstein mentions the progress made by Landsteiner and his discovery of blood groups, his judgement of the period is based on the domination of "chemical approaches" in the discipline. What he leaves tacit is that during this period one of the lines of research in serological immunology was the investigation of blood groups, race, and disease

(Schneider 1995). This time period that Silverstein calls the “Dark Ages” spans the second period where I argue that race seems to disappear from science. While not all immunologists were involved in blood group research that attempted to classify races, Silverstein’s hasty dismissal of this work contributes to how race seemed to disappear in the post-war era, specifically in the discipline of immunology.

The story of blood group research and racial relationships is more often a part of the history of biological anthropology rather than immunology. However, the discovery of blood groups was an immunological achievement and many of those who studied blood groups were prominent immunologists. As I will explain later in this chapter, eventually, immunology moved on from the chemical approaches that nourished lines of inquiry and research about race and blood groups. Race did not disappear from immunology, but since the dominant approach within which immunologists were working was replaced with a new theoretical paradigm, it is missing from the history of the discipline (Kuhn 1996). Labeling this period the “Dark Ages” and not exploring the research within this era erases the racial science that was being pursued during those years.

The ABO Blood Group System and Racial Classification

After Landsteiner’s discovery of the ABO system Ludwig and Hannah Hirszfild suggested that blood groups could be useful in determining racial relationships. A study done by Ludwig and Hannah Hirszfild in 1919 was the first major study that found a pattern of blood group frequency distributions that corresponded with racial groups. The Hirszfilds found that the frequency of blood type B increased (and type A decreased) as one moved away from Western Europe towards central Asia (Schneider 1995). The

techniques required to analyze blood types and those used in bacterial serology to identify disease in hospitals and public health laboratories were almost identical (Mazumdar 1990). This made immunologists particularly well suited to carry out research in the domain of blood group research.

The ABO system was also seen as giving an improved scientific underpinning to racial classification schemes that were better than the older anthropometric and morphological observations. The main advantage of the ABO system was its ability to see under the skin and determine race objectively. Blood typing allowed for identification of race below the skin whereas the older methods of relied on the classification of visible physical characteristics and cultural categorizations. This began a flood of blood grouping expeditions and attempts to characterize the world in terms of blood groups and evolutionary histories (Boyd 1950; Mourant 1954; Race and Sanger 1958).

Presidential addresses to the American Association of Immunologists are an important barometer of the preoccupations of leaders in the discipline. In his 1928 address to the AAI, Karl Landsteiner, who would receive the Nobel Prize for his work in defining blood groups in 1930, commented on the relationship between race and blood groups. He suggested that blood groups could be evidence of different racial origins but that blood groups could not establish the race of a single individual. Landsteiner had a complex view of the relationship between blood groups and race and likened the differences to morphological characteristics. He explained,

If one tries to sum up the still scanty data it would seem that the serological diversity of the blood of various races is in general not brought about by the constant presence or absence of one or several qualities. One has rather to suppose that, in analogy to certain

morphological features, there exists an average composition of the mosaic of characters around which the individual patterns fluctuate” (Landsteiner 1928: 593).

At the end of this speech, Landsteiner warns that it would be “hazardous” to speculate too far along the lines of evolution, blood groups, and race, and calls for more experimental investigation.

Mapping the world using blood groups and racial indices was often practiced by those working in the field of blood group research. Pauline Mazumdar demonstrates how the data on blood groups and race were drawn into maps that delineated the racial and political borders important in German politics in the 1920s (1990). The mapping projects not only mapped blood groups but also attempted to link up older morphological race data with this new biological marker of race (*ibid.*). These works argued that blood groups were objective ways of classifying human groups, however not everyone was in agreement and others were just as vocal about how racial classifications did not map well onto blood group distributions.

The U.S. government was also interested in mapping people using blood group classifications and supported scientific expeditions to determine the blood group classifications of populations within its borders. Schneider comments, “One obvious feature of these studies was that they were not done in the U.S., a fact that indicates the far-flung medical and anthropological empire of U.S. researchers who were stationed in hospitals or participated in expeditions funded by philanthropic and academic institutions. There were relatively fewer anthropological studies of populations within the United States, and these were almost solely of Native Americans” (Schneider 1995: 104). One of these expeditions was funded by a committee that was tasked with researching the

implications of “migration and crossing.” In this context, research on blood grouping was proposed as a “diagnostic characteristic” (Wissler 1929:7). The report also explained the role that these scientific studies should play in researching the problems of migration. The committee members were concerned with the “potentialities for citizenship” (ibid: 13). Immunology and biology more generally are methods through which the state can justify decisions about the fitness of populations and their desirability. The committee writes, “To the field of general biology one naturally turns for data to aid in formulating an opinion as the relative resistances of different racial stocks, not only to diseases as such, but resistance to industrial and culture strains peculiar to modern life” (ibid. 14). The committee specifically mentions Indians and Filipinos as populations of interest for these biological studies of citizenship potential. Filipinos and American Indians are populations that were the subject of colonialism in the United States. Their status as other, racialized populations makes them prime candidates for this type of state scientific scrutiny because they are populations that the state seeks to control. As one of the central tenets of statecraft is to make populations legible, this effort to understand potential citizens at a biological level implicates immunology as a tool in state-making.

The Fallacy of Purity

The United States government funded research to collect data on the blood types of different racial groups both inside and outside of the country. One such study, published in the *Journal of Immunology* in 1926 attempted to use blood groups to determine racial relationships. The idiom of co-construction is evident in the article. To make the claim that blood groups help to determine racial relationships, researchers had

to find natives that were “pure-blooded” (Grove 1926). An individual of mixed race would therefore have mixed blood. The legitimacy of the research depended on investigators being able to find pure-blooded natives whose blood type, once determined, could speak for what *should* be the blood type of the rest of that population or to determine “immunological distance” from other populations.

The pureness of the native populations is always already a negotiation because a pure population is an imagined trait. Behind the concept of race is the fallacy of purity (Haraway 1997; Stoler 1995). In the world of the scientific, somehow, the fallacy has to become reality. The structures of colonialism provided the researcher with the native population and also made the determination as to who, in fact, was a pure-blooded native. The authority and knowledge of the colonial officer is invoked to legitimize the science. The article reads, “The study of the Ainu was made possible only by the friendly interest of Dr. Shosuke Sato, President of the Hokkaido Imperial University at Sapporo, and Dr. George Batchelor, resident in the same city. Through these gentlemen were obtained lists of Ainu ²²people believed to be pure blooded, and, for this reason, the results of the present study may be considered dependable.” (1926: 254). The fallacy of purity is legitimized by the authority of state officials.

Scientists working with blood groups and race often appealed to the fallacy of purity when discussing their results. In his 1928 address, Karl Landsteiner suggested that purer blood would help make characterization of races through serological testing more clear. He said, “These observations seem to offer some prospect of a further serological characterization of races. The results will perhaps improve when purer blooded stocks are

²² The Ainu are a racialized population of people indigenous to Japan (see Siddle 1996).

subjected to the tests” (Landsteiner 1928: 594). In another study, Landsteiner and Chase write, “Obviously it would be of interest to examine a population of pure blooded Negroes, where a higher frequency of reactions with the serum C. H. could be expected” (Landsteiner and Chase 1934). The fallacy of purity allowed scientists to continue their research on blood groups and racial relationships because they could always argue that the populations they were studying were never pure enough. They never doubted that these essential populations actually existed and were convinced that their assumptions would be borne out if they could only find pure blooded populations. This racial essentialism is one of the main tenets of biological race and as an inherently unreachable ideal was able to support scientific claims and appropriate funds for research in pursuit of the unattainable.

Moving on from Blood Groups

Studies that aimed to classify worldwide racial populations by blood groups were seen as objective ways of measuring and classifying human groups. Towards the end of this period the Presidential Addresses of the American Association of Immunologists lament the domination of serological studies in immunology and urge practitioners to move beyond it. In the 1950 Address of President Thomas Francis Jr. he says, “This field of study has no sharply limiting boundaries, nor a specific discipline by which it must be restricted. Thus, while serologic procedures constitute technics widely applied in immunologic measurement, they are not to be mistaken for the whole of immunology” (1950).

The concerns in the Presidential Addresses of this period (late 1940s and early 1950s) show that the leaders of immunology were concerned about the boundaries and

directions of the discipline. More than one President mentions the idea that immunology might be “dead” or “ending.” This type of concern within a scientific community is associated with the Kuhn’s paradigmatic shifts in science (Kuhn 1996). The death knell of a science signals that the anomalies have built up to a point that the old theories must be replaced by new ones if the discipline is going to survive.

Concepts of natural immunity also began to be questioned and scientific articles in immunology begin to change the way they used the concept natural immunity. Authors put the term natural immunity in quotes and began to question the concept by referring to it as “so-called” natural immunity. As the dominant theory in the discipline moved away from Ehrlich’s side-chain theory and instruction theories became more prominent, the concept of natural immunity became less popular. For example, in a 1941 article in the *Journal of Immunology*, Rickard and Horsfall qualify the term natural immunity with the phrase “so-called.” They introduce two competing explanations for the high proportion of adults that have antibodies against influenza in their serum. The first hypothesis they introduce is that the antibodies are the result of previous infection with the virus. The second hypothesis “is that antibody levels against this virus are merely one expression of *so-called natural immunity* and are not necessarily a residual manifestation of previous contact with the agent but rather one characteristic of the maturation process” (Rickard and Horsfall 1941: 270). With Ehrlich’s theory, the basic assumption was that everyone was born with antibodies against all of the diseases that the person could expect to encounter in their lifetime. Instruction theories, the next dominant (though short lived) paradigm, assume that all of the information that the body needs to fight disease comes from outside the body and people are not born with natural immunities at all.

By 1937, Sanford Hooker can claim that there is “no doubt” about the connection between immunity and genetics based on the evidence of blood groups. He also says that Ehrlich’s theory of antibody formation is “clearly untenable” because of the body’s response to “innumerable and unnatural” antigens (Hooker 1937: 60).

In 1953, John Enders suggests that tissue cultures could be used to study the “vast and as yet little comprehended factors that underlie natural resistance” and to help “solve the puzzle of natural immunity” (Enders 1953:63). Despite the copious amount of work done on natural immunity, natural antibodies and blood groups between 1910 and the mid-1940s, Enders can still describe this as an understudied phenomenon. In this address, Enders is urging the discipline to move towards more biological methods and theories. The use of tissue cultures to study immunological phenomenon is a move towards more biological methods of study as opposed to the strictly chemical methods that dominated immunology in the early 20th century. Bringing in biology led to another major paradigm shift in immunology.

The research on blood groups was the predecessor of population genetics, the discipline that has been hailed as overcoming the racist science of the past. “The results provided the data, however, for the development of human population genetics in the late 1930s and 1940s which redefined human populations into gene pools instead of races” (Schneider 1995: 107). In the next section, I explore how the move away from blood group and bacterial serology led to a paradigm change in immunology that translated race into an individual rather than a group characteristic.

Unification of Biology and the Continuous Disappearance of Race. Individualizing the Racialized Body and Population

This section tells the story of the third period of immunology. In the last section I explained how immunologists continued to use race during the second period by using blood groups to attempt to measure racial relationships between groups. In this section, immunology begins to move away from serological studies of blood groups and embraces MacFarlane Burnet's theory of immune system function. Burnet's theory moved the discipline away from its narrow focus on the chemical composition and chemical interactions of immune substances and bodily fluids and towards a more holistic and biological framing of the immune system. In what follows, I explain how Burnet's theories came to dominate the field of immunology and how the discipline's turn towards biological explanations of the immune system enabled the field to reintroduce concepts of race in a new framework that drew upon the new synthesis of genetics and evolution.

Race and Boundaries of the Self

We take for granted our understanding of the immune system as our bodies' natural defense system. This taken for granted understanding of how our bodies work can be traced back to the thought of Sir MacFarlane Burnet's theories of immunology. Burnet's legacy in immunology captures the return of the discipline to a more biological tradition rather than the earlier chemical reductionism. Concomitant with the rise of biology more generally, Burnet's conceptualization of immunity is one that we often take for granted today. In his 1940 book, *The Biological Aspects of Infectious Disease*, Burnet introduces what has become the central organizing concept in immunology, that of the self and non-self.

Burnet introduced the idea that one's own body can distinguish between what is self and what is non-self, or in other words, what is native or foreign, belongs or does not belong. He writes,

“The alternative hypothesis, on the other hand, appears to offer a mode of approach to one of the basic characteristics of living matter, its intolerance of intimate contact with living material or protein not of its own kind. [...] for there can be little doubt that the whole subject matter of immunology is founded on this intolerance of living matter for foreign material” (1941: 60).

Getting sick, then, is the invasion of the self with the stuffs of the non-self and the reaction of the self to the foreign invasion. In this formulation natural immunity is no longer a group or racial attribute but an individual one. Each individual can immunologically distinguish between self and foreign material and will naturally reject what is foreign.

At the historical moment when the fears about integration, miscegenation and general racial hatred are in the forefront of both national and individual consciousness, the ideas of transgression of boundaries, of infection and integrity of self, share an undeniable elective affinity. “Immunity and infection are quintessentially, although never straightforwardly, connected with the interpenetration of organisms” (Crist and Tauber 1999:514). This formulation of immune system functions articulates well with national preoccupations about race during this time period.

After WWII, the continued abuses of blacks in the Jim Crow south and inequalities of segregation laws were increasingly gaining national attention as returning

soldiers protested the unfairness of racism in the United States. Restrictive immigration laws were still in place, barring entry to people from Asia, Africa and giving preference to northern and western Europeans over their eastern and southern counterparts.

Scientific ideas and the adoption of new scientific theories are not immune from the broader political and social environment in which they are created. The opposition between self and non-self were categories that aligned well with the unified self of the racially homogenous imagined community of the United States (Anderson 1991). The self of the United States is imagined as white and people of color as non-self or foreign and thus dangerous and infectious. Burnet's metaphor fits well with the preoccupations of the time period.

The idea of infection and interpenetration of organisms was not particularly new. After the introduction of germ theory in the late 19th century metaphors about the body's defense against microbial organisms had eventually become thoroughly entrenched in public consciousness (Martin 1994). The dominant metaphor of health and sickness drew upon constant battle and warfare and trying to keep germs, and thus disease, out of the body. While germ theory continued to hold sway, Burnet introduced a new metaphor of the immune *system* and its *training*. Burnet writes, "Immunological reactions of every sort are the result of a process of 'training.' All biological activities tend to improve with practice..." (1941: 46). Here Burnet begins to introduce the ideas that we now readily associate with immune system function. For example, it has become popular to allow children to play in the dirt so that their immune systems can be trained to deal with

common bacteria.²³ Another example of the penetration of these ideas about the immune system into lay knowledge is the idea of ‘microbial diversity.’ Articles abound concerning how certain types of bacteria are needed for health (For a review see Cho and Blaser 2012 and Moloney et al 2014). Fears about how humans have evolved to need certain species of bacteria to be healthy and how we are losing them with industrial farming are also related to the ideas that Burnet introduced in this period.²⁴

Burnet is given credit for the analogy of self and non-self as applied to immunological thought. Crist and Tauber (1999) argue that Burnet’s idiom of self/non-self gave unity to the conceptual organization of immune phenomena. Ilana Lowy (1992) argued that the self/non-self metaphor was a boundary concept that reunited scientists and physicians and made sense of developments in allergy, auto-immunity, and transplantation of organs and tissues. As a boundary concept, the self/non-self metaphor brought immunology closer to the discipline of biology. During this time period the presidents of the AAI began to emphasize the need for immunology to embrace studies that used tissue cultures and encouraged studying cells rather than chemicals. In 1942, the American Association of Immunologists (AAI) voted to join the Federation of American Societies for Experimental Biology because they “needed a voice in Washington” (Cannon 1942). This federation gave a unified political voice to a diverse set of disciplines under the umbrella of biology. The move towards biology is particularly

²³ See: Greenfield, Ben. “Dirty Kids: How Germs Can Be Your Child’s Best Friend.” 2014. http://www.huffingtonpost.com/ben-greenfield/germs-kids_b_4951388.html; Zamosky, Lisa. 2010. “Is Dirt Good for Kids? Are parents keeping things too clean for their kids’ good?” <http://www.webmd.com/parenting/d2n-stopping-germs-12/kids-and-dirt-germs?page=1>.

²⁴ Barclay, Rachel. 2014. “Humans Have Lost Many of Our Gut Bacteria Since We Evolved from Apes.” <http://www.healthline.com/health-news/humans-have-lost-many-of-our-gut-bacteria-110414> . Pollan, Michael. 2013. “Some of my Best Friends are Germs.” http://www.nytimes.com/2013/05/19/magazine/say-hello-to-the-100-trillion-bacteria-that-make-up-your-microbiome.html?_r=0

important for immunology at this point. There were larger changes happening in the medical and life sciences that threatened to leave immunology behind if it did not adapt. In the next section, I turn to the shifts in biology that help explain how the adoption of Burnet's theories in immunology changed the way scientists used concepts of race in immunological discourse.

Unification of Biology and Evolutionary Synthesis: Individualizing Race

When we think about biology (and race) today we often think in terms of evolution and/or genetics. For example, research has found that popular notions of race and biology are often evolutionary. For example, students have been shown to express the idea that it was a genetic advantage for Africans to be athletic (which would have helped them survive the Middle Passage) and that this advantage explains why Black Americans are such good athletes (Morning 2011). Such stories about how our genetics have evolved over time through Darwinian mechanisms of fitness abound. However, genetics and evolution were not understood as complementary frameworks until the 1930s and 1940s. The negotiation between the two once dissonant frameworks is referred to by historians as the "evolutionary synthesis" (Mayr and Provine 1980). In general terms, the evolutionary synthesis was the coming together of genetics and experimental sciences on the one hand, and natural history and evolutionary studies on the other. The evolutionary synthesis is important to this story because it explains how negotiation over concepts of race was central to the future of biology in the mid-twentieth century. It is also important because of the disciplinary relationship between biology and immunology. The negotiations over race that ended in the evolutionary synthesis reframed race as an individual trait rather than a group characteristic. When immunology embraced

MacFarlane Burnet's theory of immunity they were also aligning themselves with the larger discipline of biology. As Reardon writes, "Concepts of race order and stabilize regimes of science and power, and as these rise and fall in importance, so do the concepts of race they embody" (Reardon 2005:17). Biological individualism draws a parallel between the negotiations over race in the evolutionary synthesis and the adoption of the self/non-self metaphor in immunology.

After World War II biology was not the paradigmatic life science as we know it today. Before the late 1940s, the diverse set of disciplines that were to unite under the field of biology included mainly botany and zoology, but also fields of applied biology and a few disciplines that were found primarily in medical schools (Appel 2000: 14).²⁵ The unification of biology is a period in the history of biology that marks the beginning of our contemporary understandings of living beings. Central to the unification of biology in scientific terms is what historians of biology call the evolutionary synthesis. However, the unification of biology was not only about the content of science, it was also political. Those that were to be unified under the umbrella of biology were also explicitly trying to carve out a space for themselves in the newly created National Science Foundation that was to control state funding for research. In this section I will argue that the unification of biology in the late 1940s was both a political and scientific shift that was dependent on the continuation of particular concepts of race in science.

The evolutionary synthesis brought together the disparate fields of natural history and evolution on the one hand and experimental genetics on the other hand. Natural

²⁵ These disciplines included botany, zoology, genetics, ecology, bacteriology, plant physiology, ornithology, mammology, herpetology, ichthyology, and entomology. There were also the applied sciences of fisheries, forestry, economic entomology, horticulture, agronomy, agricultural genetics, animal nutrition and plant pathology. The disciplines found in medical schools included anatomy, physiology, and biochemistry (Appel 2000).

history is particular type of science that was dominant in the early period of scientific and imperial expansion. John Pickstone describes natural history as a particular way of knowing, characterized by the describing and classification of things (Pickstone 2001). Museums of natural history that list, display, and categorize plants, animals and humans are the characteristic institution of this type of scientific inquiry. As scientific inquiry, evolution was part of this tradition of inquiry known as natural history. Evolution was taught in departments of natural history and as part of courses on natural history (Smocovitis 1992). But this type of science was considered speculative, and to prove evolution scientists needed a hard science that was mathematical and experimental.

Genetics, on the other hand, was the first law-like, mechanistic, experimental biological science and thus it occupied a place of privilege among the biological sciences. Smocovitis comments, “Unlike the “-ologies,” which were logocentric or descriptive sciences, genetics was an “-ics” word, meant to emulate physics and other exact sciences” (Smocovitis 1992:14). The mathematics of genetics brought an experimental method to studies of evolution and opened up avenues for funding that would have been closed without that experimental methodology.²⁶ At this time in the history of biology the experimental sciences were increasing in popularity in the curricula of academic institutions, while natural history and evolutionary studies were faced with a crisis of extinction (Smocovitis 1992; Pickstone 2000). Biology in general prioritized the experimental way of knowing that characterized the work of geneticists with DNA. This type of science that is experimental is seen as a more objective and secular way of

²⁶ Experimental sciences were much more easily funded as opposed to natural history. See Smocovitis 1992 and Appel 2000.

establishing scientific authority. This is what genetics offered biology, a more systematic and more easily funded way of making knowledge claims.

Evolution offered biology a distinct difference from physics or chemistry that was both conceptually and politically important. The independence of life made biology more than just the outcome of physical or chemical processes. Darwinian evolution and the ‘survival of the fittest’ is an independent process that is peculiar to living beings. This independence of life made the study of biology a wholly different endeavor than the mechanistic principles of physics or chemistry. However, the merging of ideas of evolution and genetics was not inevitable. Scholars have studied how these two separate disciplines overcame their theoretical differences and brought biology into a new era of microbiology.

Experimental geneticists largely believed that genetic inheritance was discrete and discontinuous. For this group, individual differences could not affect evolution at the species or sub-species level. Only an outside influence such as a genetic mutation could bring about a major change in a population. On the other side were the naturalists who believed that there was enough variation in natural populations that nature could select on those differences. The gene became the hereditary mechanism through which both sides could agree that small differences between individuals could explain sub-species or racial change over time (Reardon 2005; Smocovitis 1992; Mayr and Provine 1980). This synthesis leads to the development of the discipline of population genetics, which historians of race and science point to as the new science that took the place of the old racial science of the early 20th century (Reardon 2005; Kelves 1985; Barkan 1992; Roberts 2011). In the discipline of immunology, Lurie et al use the term “genetic

resistance” and “genetic susceptibility” interchangeably with “native resistance” in a 1952 article on resistance to tuberculosis.

By 1981, Bernard Amos could title his Presidential Address to the AAI, “The era of the immunogeneticist.” Amos laments that not many immunologists have continued to study blood groups and suggests that the relevance of blood groups to cancer might stimulate new interest in their study (1981). This sentiment echoes the turn towards chronic disease research argued in Chapter 4. Amos’s Address to the AAI details a few of the failures and successes that eventually led to the coming together of genetics and immunology. One of the challenges he mentions is the lack of cooperation between human and animal immunogeneticists, “Part of the failure in communication was the fear of animal immunogeneticists of getting involved in the polemic raging around the human Rh system” (1981: 1730). The Rh system is a blood group and the argument was similar to that surrounding the ABO blood system. Amos also mentions how World Health Organization workshops helped to standardize the field of immunogenetics.

It is not the goal of the sociologist of science to evaluate the truth claims of science but to examine the conditions or factors under which scientific controversies are settled or unsettled, which factors direct a given body of research, the conditions under which certain types of questions get asked and answered, and the conditions under which a consensus is reached, however tentative. The ideas of the evolutionary synthesis that unified biology were not new (Smocovitis 1992; Mayr and Provine 1980). The evolutionary synthesis was important to the unification of biology, but the unification of biology was not only about the content of the science. The unification of biology was also a political necessity. While the ideas had been previously debated, the consensus came at

a time when a unified voice was politically expedient. The evolutionary synthesis that unified biology meant that the varied disciplines that feared their lack of voice in Washington could make stronger claims on state funding. As Smocovitis explains, “By the 1940s, evolution would be made to “lift” biology above the physical sciences at the same time that it “bound” the fractured biological sciences” (1992: 13).

Postwar funding of science was a hotly contested arena. While the war effort had successfully mobilized civilian scientific personnel and research, the postwar model of funding was far from clear. The eventual creation of the National Science Foundation as the prime funding institution for basic research is often credited to Vannevar Bush and his report, *Science: The Endless Frontier*, published in 1945. This report justified the need for a foundation to orient the nation’s scientific efforts by tying scientific progress to the past accomplishments of the nation and to its future “health, prosperity and security” (Bush 1945: 233). The disciplines of physics and chemistry had the most visibility after World War II and their contributions to the war effort were clearly demonstrable (e.g. nuclear and chemical weapons). However, contributions such as penicillin and DDT were credited to medicine or chemistry rather than biology (Appel 2000). Biology needed a unified voice, distinct from physics and chemistry, to make legitimate and substantial claims on postwar funding.

The evolutionary synthesis and race

The unification of biology was a compromise that gave the mathematical and experimental language of genetics to concepts of race that were not fundamentally different from prewar concepts but were considered anti-racist. This scientific and political compromise refined the biological use of race categories to only using race as an

individual genetic characteristic rather than a primarily group level variable. Race is an individual characteristic. Individuals make up populations. Populations are a function of natural isolation and social forces. Rather than thinking about a group of people as having one or another shared characteristic, the biological individualism that underscores this view of race sees each person has having certain risks associated with their genetic racial category.

Reardon argues that the many geneticists in the 1930s did not believe that differences in populations were related to changes to the level of species or subspecies. “As race was the term that biologists at the time used to describe the groups that structured the evolution of inherited differences within a species (or sub-species level change), this amounted to saying that they did not believe a study of populations related to a study of, in their terms, race” (Reardon 2005: 59). The work of mathematical geneticists that demonstrated that small variations or advantages in populations could explain major evolutionary change was crucial to the evolutionary synthesis that unified and modernized biology.

The argument that the individual variation at the level of genetic frequency can drive evolutionary change and can be mathematically modeled was the theoretical innovation that united biology and merged genetics and evolution. In this way, the genetic uniqueness of the individual underlies the way that these scientists and mathematicians were able to make race seem to disappear from the discourse around evolution and genetics. Jenny Reardon argues that the population approach to genetics replaced the old racial science (Reardon 2005). Reardon argues that the population approach did not solve the problems of the old racial science. The anti-racist project that

supported the adoption of a concept of race as an individual trait rested on the evolutionary synthesis that settled the issue of race as a population characteristic.

Race seemed to disappear from science because of the consensus around the concept of races as biological phenomena rather than a system of biological classification. In this conception race is the result of interbreeding populations. However, the natural cannot be successfully separated from the social. While Reardon argues that there was no clear consensus about the population approach to race, it is clear that this approach was dominant and due to its antiracist discourse was able to bring the study of race into the 21st century under the cloak of population genetics. “The field of human population genetics arose to study and explain the nature and source of inherited differences among individuals within a species” (Reardon 2005:46).

The difference between race as a group trait and race as an individual genetic trait is a subtle but important distinction. Defining race as an individual genetic trait rather than one that is primarily group based serves a similar function in the arena of health and medicine as a similar individualist understanding of race in the judicial-legal realm. Zuberi makes a similar distinction, “One tendency extends from Adolphe Quetelet’s and Emile Durkheim’s efforts to articulate a macrosociology. This perspective views groups as entities with collective traits that can be statistically described. The other tendency extends from the tradition of Galton, and while it recognizes different group statuses, such as race, it describes racial status as individual traits” (Zuberi 2001: 30).

Neoliberal Racism and Biological Individuality

Biological individuality is the boundary concept that brought race through the postwar period by allowing race to be theorized as an individual genetic trait.²⁷

Immunology adopted this concept when it embraced Burnet's self/non-self theory of immune functions. With its inherent rejection of foreign material, the individual became central to how we understand the immune system and its functions. This is how biological concepts of race articulate with racisms in the third period of race in science. Using a case study of immunology, this chapter has shown how biological concepts of race never completely disappeared from science and how the three periods map onto the use of biological concepts of race in immunology.

Neo-liberal individualism allows the treatment of racialized groups as individuals which erases shared group history of economic and political marginalization and subjugation. Biological individualism similarly erases the health effects of continued economic and political subjugation. So biological race as a proxy for biological individuality (because it is as good as we can get) in the same way leads to the equation of people of color with certain medical problems rather than the question of what is it about the experiences of being black in contemporary society that might feedback into matters of health.

Biological individuality is the biomedical equivalent to colorblind ideology, both associated with the rise neoliberalism in the political economy. In the same way that colorblind ideology refuses to acknowledge the effects of structural racism and erases the historical legacy of centuries of oppression, biological individuality frames each person

²⁷ Moulin (1991) introduces this term on page 176.

as an individual and their race as an individual attribute. Similarly, the focus on the individual obscures how structural racism affects the health of an individual and disregards the effects of racism. Scholars have shown that race does indeed have health effects that are not necessarily hereditary.

The immunology literature in this period begins to focus on differences between individuals by bringing in Burnet's self/non-self theory. Avrameas and Ternynck discuss natural autoantibodies and how they are "capable of recognizing several self and non-self antigens" (1993: 1134). They use the idea of how natural autoantibodies have a significant role in the overall stability of the immune system to support how the "distinct natural autoantibody repertoire of each individual" has an effect on how individuals might react differently to the same infection (1137). In an experiment on seven nursing students, Hackett and Beech use Burnet's theory to argue that two of the nurses' "homeostatic mechanisms" are "constitutionally weak" (1960: 537). Kochan, Patton, and Ishak conducted testing on "Caucasians, American Indians and American Negroes" and concluded that the differences they found supported a theory of individual differences rather than racial differences. They write, "Being distributed among the racial groups, the "weak" sera represent an individual rather than a racial characteristic" (1963:717). However, they continue to mention, "Although this conclusion may be true for American Negroes, it is not necessarily true for African Negroes. It is conceivable that the process of natural selection played a role in the development of a relatively resistant population in all races of the United States" (ibid). The natural selection theory of Jerne allows these authors to reject a racial explanation within the United States but to propose significant differences in immune function between populations.

On the micro level, diseases such as diabetes and heart disease are often attributed to individual behaviors. At a macro-level, race (especially blackness in the United States) is associated with higher levels of these chronic diseases. As other have explained, the new biomedical model focuses on risk and one's race automatically assigns a person to a particular category of risk (Clarke et al. 2003). However, explanations of these associations often fail to recognize how segregation, structural racism, and everyday prejudice affect health. Examples of how racism affects health abound. Micro-aggressions that people of color have to live with on a daily basis raise cortisol levels and increase the risks of heart disease. Elevated levels of poverty also increase stress and lead to heart disease. Higher levels of obesity and diabetes are also correlated with lower socioeconomic status and food deserts. De facto segregation increases environmental racism, pushing people of color (including the middle-class) to live in areas that are hazardous to their health.

Chapter 6: Conclusion

Race science and state, as both institutions and ideas, grew up together. STS urges that we think of science not as a monolithic creator of truths but as a messy practice, fraught with internal inconsistencies, the realities of institutions, and deeply affected by the social and political. We should expect disagreements about what race means in science, how it should or should not be measured or deployed and where it can be useful. Contestations of political race and of theories of race in science are normal and we should expect them to affect one another. We should also expect large scale political and social change to manifest in science and should ascribe it a pivotal role in scientific change. Frickel and Moore insist that the political sociology of science take seriously the idea that sustained large-scale relationships make some outcomes far more likely than others. In CRT, racial formation is the concept that captures the sustained large-scale relationships that Frickel and Moore reference.

This dissertation moves us toward the historicization of antiracism which is as contingent and context dependent as practices of racism. Postwar antiracism in science is often attributed to the work of antiracist scientists and the internal mechanisms of scientific inquiry. Science, as the narrative goes, had solved its own race problem through objective interpretation of evidence. Since science had come to the conclusion that the race concept was untenable it followed that race prejudice was due to ignorance and lack of education. Scientists had proven that their old beliefs of scientific racism were no longer scientifically valid, the spread of this *information* would lead to the end of racism.

The research questions that directed this dissertation were 1) How can we explain the appearance of a mid-century decline of race in science? And 2) How did concepts of biological race change over time in the discipline of immunology?

In answering my second research question I conducted a case study of the discipline of immunology. I found that early immunological theories about race and natural immunity led to research on the relationship between races and blood groups. Immunologists continued to produce literature on the relationship between blood groups and race well into the middle decades of the 20th century (see Chapter 5). This finding goes against the narrative that biological race declined during that same time period. I expected to find that immunologists were still quietly engaging with biological concepts of race. However, I did not expect to find such blatant discussion and engagement with concepts of biological race.

The response to my first research question is two-fold. First, I argue that due to the coming end of the colonial era, Western nations refocused their medical and scientific apparatuses inward, and began to focus on the health and fitness of populations within their borders. This shift in focus away from interest in controlling colonized populations through medical institutions and health policies bolstered by scientific knowledge and practice led to a change in the disease problems being studied. Moving from the study of infectious diseases that are often associated with racialized populations and towards chronic diseases that were associated with unraced, white populations led to the appearance of a decline of race in science in the mid-twentieth century. Second, I argue that erasures in the history of the discipline of account for the appearance of a decline of race in science in immunology.

In Chapter 1, I introduce the narrative of the decline of race in science. The basic tenets of the decline narrative are 1) that racism in science declined in the postwar era; 2) scientific racism was based on bad science; and 3) that science has since provided indisputable evidence there are more differences between individuals than between races. In this chapter, I also review literature that demonstrates a resurgence of race in science and introduce the research questions that guide this dissertation.

In Chapter 2, I argue that bringing together STS and CRT requires a rethinking of concepts of race in science. Understanding racial science as a set of racial projects rather than a bygone era of pseudo-science draws attention to the simultaneity of multiple racial projects that may or may not be racist projects (Omi and Winant 1994: 71).

In Chapter 3 I trace the relationship between scientific concepts of race and the racisms that accompany them. I describe in detail the ways in which race, state, and science are intertwined in the three different periods and how changing notions of race in science and changing structures of racism are mutually articulated. I describe the contours of colonial science, race and medicine that characterize the first period. In Period 2, eugenics becomes the dominant paradigm of scientific racism while statistics, blood and intelligence testing become the preferred tools of differentiation. Sterilization and immigration restriction are the racisms supported by these biological concepts of race in this period. In the third period, genetics, racial health disparities, and global health become the arena of biological race.

In Chapter 4 I offer an alternative interpretation of the decline of race in science narrative. By framing the mid-twentieth century disappearance of race in science as the triumph of an antiracist racial project of science, it allows us to more clearly see the more

recent resurgence of race in science as a recycling of older themes and tactics from the racist science projects of the past.

Chapter 5 is a case study of immunology that focuses on how immunologists engaged with concepts of biological race in the mid-twentieth century. The concept of natural immunity framed how immunologists used race in the first period. The second section tells the story of how immunology turned to the study of the relationship between blood groups and race. The third section of Chapter 5 explains how biological race was reinterpreted into genetic language in the discipline of immunology.

Implications and Future Work

Throughout the history of biological concepts of race, the pattern of white supremacy as the ultimate outcome remains the same. In terms of immunology, early concepts of natural immunity and race served to privilege the lives and health of whites in colonial contexts. Later, eugenics and biological race led to outcomes that continued to value the lives and reproductive rights of those deemed fit for citizenship and reproduction. More recently, the turn to genetic explanations of race supports the genetic inferiority of people of color and superiority of whites. The biological mechanisms evolve but racism persists.

The case study of immunology is central to this dissertation. It demonstrates how our understanding of the decline narrative is shaped by forces outside the laboratory and how biological concepts of race did not disappear from science in the postwar era. Through this case study we can see how the politics of funding favored particular approaches to science and in some instances rewarded the use of certain biological concepts of race and sanctioned others.

Science and technology studies cannot be colorblind. While STS does a good job of critiquing how science is political, it does not (as often as it should) engage with issues of race and racism. Racial formation and racial projects as theoretical concepts have much to offer scholars of STS. The implications of this dissertation for scholars of STS should encourage scholars to reconsider how racial formations and racial projects are always already part of the broader context that shapes the politics of science and infuses its content.

On the other hand, as others are beginning to argue (Collins 2015), critical race scholars cannot ignore science as a field in which concepts of race lead to racist practices and policies. The implications for CRT from this dissertation should push scholars toward a deeper engagement with how biological concepts of race inform and articulate with contemporary racisms. These scholars have often bought into the decline narrative and ignored the ways that biological concepts of race have continued to support racism.

Another important point that I argue in this dissertation is that science has not and will not do away with or overcome its problems with biological concepts of race. It is not somehow inherently antiracist. The narrative of decline is powerful because it supports this idea that biological concepts of race were the result of racist scientists practicing a flawed science. The narrative is also significant because of our contemporary practices of democracy and governance.

Science as a means of knowledge production is integral to the operation of modern states and is a fundamental component of Western democracies. Science is often the final arbiter of truth claims and this is especially true for liberal groups. The decline

narrative is necessary for this configuration of scientific knowledge production, governance, and democracy. It was necessary for science to have solved its own racial problems through internal mechanisms for this particular form of knowledge making to have emerged as the objective and unbiased arbiter of truth as it is often treated.

The narrative of decline also prevents us from seeing biological concepts of race as historically linked. The story of a clean break from the racist past of science allows new biological concepts of race to avoid the suspicion that should accompany their use more often.

Duster and others suggest that social scientists need to engage with natural scientists on issues of race, ethnicity, and genetics. In his 2015 article, “A Post-genomic surprise” he argues that we need more empirical studies about how scientific practices reify socially constructed categories of race as biological reality. Rather than continue to critique the discourse of science, future work should focus on understanding the practices that translate social and political concepts of race into biological categories. Future work could explore how the portrayal of the mid-twentieth century in other biomedical disciplines and the ways in which they contribute to or detract from the narrative of decline. This dissertation reminds us that race, state, and science are fundamentally intertwined in ways that are not so easily untangled. We should expect disagreements about what race means in science, how race should or should not be measured and where it can be useful or dangerous. We should not be surprised by a resurgence of race in medicine or science. We should be ever vigilant for where, when, and how they continue to work together to the advantage of some and the disadvantage of most.

Appendix A

Period One 1: 1880-1920

Type	Year	Author	Source	Title
Textbook	1914	Citron, Julius		Immunity: Methods of Diagnosis and Therapy and Their Practical Application. (2nd Edition)
Journal Article	1902	<i>unknown</i>	California West Medical Journal	“Bubonic Plague in California: History of the Outbreak and Resolutions Passed at the Conference of State and Provincial Boards of Health in North America.”
Journal Article	1905	Brownlee, John	Journal of Hygiene	Statistical Studies in Immunity Natural Immunity and the Capacity for Acquiring Immunity in the Acute Infectious Diseases.
Journal Article	1915	Murphy, James B. and John J. Morton	Journal of Experimental Medicine	The Lymphocyte in Natural and Induced Resistance to Transplanted Cancer. II. Studies in Lymphoid Activity
Journal Article	1916	Kolmer, John A.	Journal of Immunology	Complement Fixation in Varicella
Journal Article	1918	Burrows, Montrose T. and Yoshio Suzuki	Journal of Immunology	The Study of Problems of Immunity by the Tissue Culture Method. III. A Method of Determining the Resistance of Individuals to Diphtheria Infection
Presidential Address	1918	Kolmer, John A.	American Association of Immunologists Journal of Immunology	The Role of Immunity in the Conduct of the Present War
Journal Article	1919	Hirschfeld, Ludwig and Hanka Hirschfeld	The Lancet	Serological Differences Between the Blood of Different Races: The Result of Researches on the Macedonian Front
Journal Article	1919	Barber, M.A.	Journal of Experimental Medicine	Antiblastic Phenomena in Active Acquire Immunity and in Natural Immunity to Pneumococcus
Journal Article	1919	Cecil, Russell and	Journal of Experimental	Results of Prophylactic Vaccination Against Pneumonia

		Henry F. Vaughn	Medicine	at Camp Wheeler
Journal Article	1920	Von Sholly, Anna and William Park	Journal of Immunology	Report on the Prophylactic Vaccination of 1536 Persons Against Acute Respiratory Disease
Journal Article	1926	Sherwood, Noble, Clara Nigg, and Leona Baumgartner	Journal of Immunology	Studies on the Dick Test and Natural Immunity to Scarlet Fever Among the American Indians
Journal Article	1928	Heinbecker, Peter and Edith I.M. Irvine-Jones	Journal of Immunology	Susceptibility of Eskimos to the Common Cold and a Study of their Natural Immunity to Diphtheria, Scarlet Fever, and Bacterial Filtrates
Journal Article	1929	Ando, K.H. Nishimura and K. Ozaki	Journal of Immunology	On the Natural Immunity to Scarlet Fever of the Japanese and Chinese Residing in South Manchuria
Journal Article	1930	Robertson, O.H. and M. Agnes Cornwell	Journal of Experimental Medicine	A Study of the Resistance of Normal Human Beings to Recently Isolated Strains of Pathogenic Pneumococci
Journal Article	1930	Mackie, T.J. and M.H. Finkelstein	Journal of Hygiene	Complement-Fixation by the Interaction of Normal Serum and Bacterial Suspensions

Period 2: 1920-1960

Type	Year	Author	Source	Title
Textbook	1937	Bigger, Joseph W.		Handbook of Hygiene: For Students and Practitioners of Medicine
Journal Article	1926	Grove, Ella F.	Journal of Immunology	On the Value of the Blood-Group Feature as a Means of Determining Racial Relationship
Presidential Address	1928	Landsteiner, Karl	Journal of Immunology	Cell Antigens and Individual Specificity
Presidential Address	1937	Hooker, Sanford B.	Journal of Immunology	The Nature of Antibodies
Journal Article	1934	Landsteiner, K, WR Strutton, and M.W. Chase	Journal of Immunology	An Agglutination Reaction Observed with Some Human Bloods, Chiefly Among Negroes
Journal Article	1931	Neill, James M., Emidio L. Gaspari, Robert A. Mosley, and John Y. Sugg	Journal of Immunology	Loss of Immune Substances from the Body. III. Diphtheria Antitoxin in Human Sweat
Journal Article	1931	Neill, James M., Emidio L. Gaspari, Lurline V. Richardson, and John Y. Sugg	Journal of Immunology	Diphtheria Antibodies Transmitted from Mother to Child
Journal Article	1932	Lambert, W.V.	Journal of Immunology	Natural Resistance to Disease in the Chicken. I. The Effect of Selective Breeding on Natural Resistance to Fowl Typhoid
Journal Article	1933	Irwin, M.R.	Journal of Immunology	Inheritance as a Factor in Resistance to an Infectious Disease. II. Differential Host Reactions and the Effects of Selection Within a Population.”
Journal Article	1936	Enders, John F., Chao-Jen Wu and Morris F. Shaffer	Journal of Experimental Medicine	Studies on Natural Immunity to Pneumococcus Type III: IV. Observations on a Non-Type Specific Humoral Factor Involved in Resistance to Pneumococcus Type III

Journal Article	1938	Anderson, Hamilton H. and Alfred C. Reed.	California and Western Medicine	Natural Immunity Versus Drug Toxicity in Malaria
Journal Article	1939	Shumacker, Harris B. Jr., Austin Lamont, and Warfield M. Firor	Journal of Immunology	The Reaction of “Tetanus-Sensitive” and “Tetanus-Resistant” Animals to the Injection of Tetanal Toxin into the Spinal Cord
Journal Article	1939	Cornely, Paul B	American Journal of Public Health	Morbidity and Mortality from Scarlet Fever in the Negro
Journal Article	1941	Rickard, Elsmere R. and Frank L. Horsfall Jr	Journal of Immunology	The Relationship Between Neutralizing Antibodies Against Influenza A Virus in the Sera of Mothers and Infants
Journal Article	1950	Weiner, Alexander	Journal of Immunology	Origin of Naturally Occurring Hemagglutinins and Hemolysins: A Review
Journal Article	1951	Paul, John R., John R. Riordan and Lisbeth M. Kraft	Journal of Immunology	Serological Epidemiology: Antibody Patterns in North Alaskan Eskimos
Presidential Address	1953	Enders, John F	Journal of Immunology	Tissue Cultures in the Study of Immunity: Retrospection and Anticipation

Period Three: 1950s and on

Type	Year	Author	Source	Title
Presidential Address	1981	Amos, D.B.	Journal of Immunology	The era of the immunogeneticist
Journal Article	1966	Boyden, Stephen V.	Advances in Immunology	Natural Antibodies and the Immune Response
Journal Article	1993	Avarameas, Stratis and Therese Ternynck	Molecular Immunology	Review: The Natural Autoantibodies System: Between Hypotheses and Facts
Journal Article	1963	Kochan, Ivan, Charlotte Patton and Kamel Ishak	Journal of Immunology	Tuberculostatic Activity of Normal Human Sera
Journal Article	1952	Lurie, Max B. Peter Zappasodi, Eugenia Cardona-Lynch and Arthur Dannenberg Jr.	Journal of Immunology	The Response to the Intracutaneous Inoculation of BCG as an Index of Native Resistance to Tuberculosis
Presidential Address	1959	Boyd, William C.	American Association of Immunologists	The Specificity of the Nonspecific
Journal Article	1962	Segre, Diego and Merlin Kaeberle	Journal of Immunology	The Immunologic Behavior of Baby Pigs: I. Production of Antibodies in Three-Week-Old Pigs
Journal Article	1960	Hackett, Earle and Margaret Beech	Journal of Immunology	Transient Appearance of "Autoimmune" Antibodies during Prophylactic Immunization
Journal Article	1957	Koshland, Marian Elliott and Frieda Englberger	Journal of Immunology	Mechanism of Antibody Formation: II. Rate of Diphtheria Antitoxin Formation in the Booster Response

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