

THE SPECTACLE OF SCIENTIFIC MASCULINITY – MILITARY, SCIENCE AND
MASCULINITY IN GREAT BRITAIN AND GERMANY 1820 – 1880

BY

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THESIS

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Inhaltsverzeichnis

Introduction	3
Great Britain	13
The Military and Science – Alliances and Careers	13
<i>The ‘Decline-of-Science’ Debate</i>	17
<i>The Legacy of the Image of the Eighteenth-Century Scholar and Francis Bacon’s ‘New Science’</i>	21
<i>The Foundation of the GDNÄ and the BAAS</i>	24
Rhetoric Part I	26
<i>Appeal to Aristocratic-Military Culture from 1830 till 1850 at the Meetings of the BAAS</i>	26
<i>From the Domestic Model to the Militaristic Model of Masculinity</i>	32
Rhetoric Part II	38
<i>Appeal to Military Culture from 1860 till 1880 at the Meetings of the BAAS</i>	38
Germany	44
<i>The Glance to the German States – The State and Science</i>	44
<i>Militarism – The State and the Military</i>	46
<i>The State and the University</i>	51
The Military and Science – Alliances and Careers	54
Rhetoric Part III	57
<i>Appeal to Military Culture in the Speeches at the Meetings of the GDNÄ</i>	57
<i>“— in fiery battle, there erupt zealous powers, their quarrel yield big things, ...” - Virtues of the ‘Modern’ Man</i>	58
<i>“...their union yield even greater things.” - Scientific Community as Army</i>	61
Conclusion	66
Bibliography	70
<i>Images</i>	70
<i>Sources</i>	72

Introduction

Masculinities are lived out in the flesh but fashioned in the imagination.

- Graham Dawson, *Soldier Heroes*, 1994

...it may be that the obedience, drill, and discipline, which are the soul of the soldier's life, possess some potent and formative influence upon the character, and develop that power of disciplined concentration which is so essential to the formation of true genius.

- Samuel Smiles, *Duty*, 1880

In the nineteenth century, when more and more men pursued scientific work and strived for their profession to gain authority in the social and cultural life of England and German-speaking states, they may have turned into “scientists”¹, but they still remained men. I concur with historian Pieter Spierenburg's remark, that “men can be studied explicitly as men, the male gender, rather than implicitly as the merchants or politicians with whom historians happen to have dealt for so long”². Spierenburg's proposition represents a good guiding principle for this thesis, in which I look into the history of scientists and their aspiration to gain a certain position in their society from the perspective of their gender-conception. Taking into account gender historians' conclusion about the emergence of the divided spheres “private-female”, “public-male” and the gendered character traits “male-rational” and “female-emotional” in the nineteenth century, one can argue that these phenomena played a formative role in the gender-conception of scientific practitioners.³

One way to trace this, is to look into the genealogy of self-discipline: One of the most important epistemic virtues in the nineteenth century was disinterestedness, or

¹ It has been stated that Whewell has coined this term in his review of Mrs. Sommerville's book, see Whewell, 'On the Connexion of the Physical Sciences'.

² Spierenburg, *Men and Violence: Gender, Honor, and Rituals in Modern Europe and America*, 2.

³ For an account about the emergence of gendered character traits see Karin Hausen, *Karin Hausen, Die Polarisierung der »Geschlechtscharaktere« – Eine Spiegelung der Dissoziation von Erwerbs- und Familienleben*; for the interrelation between objectivity, rationality and masculinity see Bard, 'Have Only Men Evolved?' and Keller, 'Gender and Science'.

objectivity.⁴ A pivotal factor to render one's science objective, was to exert control over one's prejudices, affects and interests in a process of constant self-discipline. This "fabled Victorian attribute", while at first a "virtue open to all", increasingly became male-accentuated in the 1830s. From then it was "the special price and distinguished attribute of middle-class men".⁵ This 'middle-class-idea' was promoted by multiple Victorian writers. For example, Samuel Smiles (1812-1904) argued, that for the constitution of one's "character", "heart-power", which Smiles declared as being more prevalent in women than in men, was more important than "head-power"; however, "character" was something fully realized only by men because of their consistent regimen of self-discipline.⁶ William Whewell (1794-1866) used a very similar language to compare the male and female setup of the head- and heart-constitution in his review of Mrs. Somerville's book. He concluded that,

In men..., practical instincts and theoretical views are perpetually disturbing and perplexing each other... The heart and the head are in perpetual negotiation, trying in vain to bring about a treaty of alliance, offensive and defensive. The end of this is, as in many similar cases, inextricable confusion - an endless seesaw of demand and evasion.⁷

The similarity between the rhetoric of the literary man Smiles and the polymath Whewell shows how science's practitioners were invested in contemporary discussions about cultural dispositions and ideas about gender and values. Men of science were grounded in and influenced by the culture of their times. British and German men of science imagined a social role for themselves while navigating the expectations that adhered to middle-class masculinity and its transformations. My investigation into these navigational processes sets off in the 1820s. In that decade, new associations were founded, aiming at fostering the cultivation of 'modern science' and promoting the social elevation of the man of science.

With this research I do not intend to come up with antagonistic pairs of different types of masculinities, neither is it my aim to show the battle between models of masculinities and femininities. Instead, I draw a picture about the shifting ideas about

⁴ See Daston and Galison, *Objectivity*.

⁵ Adams, *Dandies and Desert Saints*, 4,7.

⁶ Smiles, *Character*, 140.

⁷ Whewell, 'On the Connexion of the Physical Sciences', 65.

masculinity and how nineteenth-century men of science reacted to these, while appealing to different models of masculinity. An example of this type of work is Margery Masterson paper on “Dueling, Conflicting Masculinities, and the Victorian Gentleman” in which she illustrates how pacifist and martial masculine identities coexisted in a shifting and uneasy balance.⁸ This is the position I am also taking. With my research I shed light on a militaristic model of masculinity while acknowledging that this represented only one of many circulating models of masculine identities. When I talk about “masculinities”, I refer to “hegemonic masculinities” in Connell’s sense:

models of admired masculine conduct, which may be exalted by churches, narrated by mass media, or celebrated by the state. Such models refer to, but also in various ways distort, the everyday realities of social practice (...) hegemonic masculinities can be constructed that do not correspond closely to the lives of any actual men. Yet these models do, in various ways, express widespread ideals, fantasies, and desires.⁹

As such, these martial or pacifistic hegemonic masculinities I work out should be understood as contingent ideas rendered by their bearers’ cultural embodiedness. They are not “a fixed, transhistorical model.”¹⁰ Thus, looking into these models of masculinities, I break down the norms and ideas that were adhered, appealed to and discharged through the agency of the group of nineteenth-century scientists. Connell characterizes said agency by explaining:

Men can dodge among multiple meanings according to their interactional needs. Men can adopt hegemonic masculinity when it is desirable; but the same men can distance themselves strategically from hegemonic masculinity at other moments. Consequently, ‘masculinity’ represents not a certain type of man but, rather, a way that men position themselves through discursive practices.¹¹

The positioning-process is influenced by personal and environmental factors. Golinski writes, “the identities of the natural philosopher or scientist...have been formed from a variety of cultural resources, including those used to shape masculine identity in

⁸ Masterson, ‘Dueling, Conflicting Masculinities, and the Victorian Gentleman’.

⁹ Connell and Messerschmidt, ‘Hegemonic Masculinity’, 838.

¹⁰ Ibid.

¹¹ Connell and Messerschmidt, 842.

society at large”¹². Under these environmental factors, I understand social and cultural resources that belong to a whole strata of society, for example the middle and upper class of a nation.

My work begins here, in showing the cultural embodiedness of German and British nineteenth-century men of science and the strategies that were implicit in their reference to hegemonic masculinities prevalent in the upper and middle class. Men of science fashioned themselves as noble Gentlemen, schoolmen, priests and bishops and as generals and knights. Thus, for the ‘man of science’ and the ‘Naturwissenschaftler’, the formation of an identity succeeded at the backdrop of negotiations of nineteenth-century ideas about manhood and situating their position amongst the already established designs of nineteenth-century masculine identities. When Huxley’s disciple, Michael Foster (1836-1907), wrote his tutor, he addressed him alternately with “Noble Sir,” “My dear General,” “Honored Episcopus,” and, most frequently, “Reverend Sir”.¹³ This array of male professions - lord, general, bishop, reverend - had in common that they were considered to represent professions in which a man could influence, even change, their environment. In other words, holding these professions, the men possessed authority.

There is something else in these deliberate choices of metaphors used by Foster. Men of science used metaphors like these to adhere an identity of their own, a place amongst these other vocational projects. Like a lord, they referred to the aristocratic concept of “character” and “honor”, like a general, they showed no fear in calling out their enemies, and subjected themselves to rigorous training, like a bishop, they had a mission. Pivotal for the delineation of their social position was not only to distinct themselves from the female sex but that these distinctions of gender “were just as important in constructing the identities of men of science among themselves.”¹⁴

Although I intend to shed light on the dynamic of appealing to different models of masculinity, I focus especially on the ‘militaristic’ notion of man/scientist: the appeal to

¹² Golinski, *Making Natural Knowledge: Constructivism and the History of Science, with a New Preface*, xiii.

¹³ ‘Michael Foster and Thomas Henry Huxley, Correspondence, Letters 1 through 19, 1865–1895’; ‘Michael Foster and Thomas Henry Huxley, Correspondence, Letters 20 through 52, 1865–1895’; ‘Michael Foster and Thomas Henry Huxley, Correspondence, Letters 53 through 75, 1865–1895’.

¹⁴ Ellis, *Masculinity and Science in Britain, 1831-1918*, 24.

military virtues and culture. Nineteenth-century men of science used a vocabulary that listeners associated with heroism and the culture of military. They often depicted their heroes in military language, 'fighting for the fatherland' and in possession of a 'steeled mind' mirroring the steeled body of a soldier in the imagery of their culture.¹⁵

Additionally, they likened the group of scientific practitioners to an army, this way advocating the sciences as being equally important for the state as the Army and Navy was. In their rhetoric, they painted an image of the scientific community carrying flags and standards and "the banner of truth"¹⁶. Besides invoking symbols and idioms pertaining to military culture, scientists appealed to military ethos as well. They emphasized virtues that were usually associated with an ideal of militaristic masculinity. To get an idea about contemporary beliefs about military virtues, one can turn to Smiles third self-help book *Duty*. In his book that illustrated how to lead a life by aspiring to men of excellent character, Smiles identified the following virtues as characteristics "which make a man" and "also those which make the true soldier": obedience, submission, discipline, courage and endurance.¹⁷ Appeal to these virtues can be observed in nineteenth-century scientists' reference to "duty", "discipline", "vigour", "moral strength" and "courage". The appropriation of these virtues that were intrinsically linked with military ethos, show that a connection was sought between the character of scientific workers and the ideal of militaristic masculinity.

The fact that this type of language was usually used in speeches, obituaries and biographies that addressed a public audience reveals that the emitters of these messages wanted to fashion the public image of nineteenth-century men of science in a certain way. These public means of communication are useful sources in that "they reflect culturally sanctioned standards for praise and blame, thereby articulating socially shared expectations, implicit or explicit codes of conduct, and biographical templates for scholars to conform to."¹⁸ Virtues, that members of the scientific community invoked during speeches revealed the expectations that they had for their

¹⁵ N.N., "Carl Friedrich Gauss und Wilhelm Weber," *Zeitschrift des Vereins Deutscher Ingenieure*, 824-825, quoted in Horst Michling, *Vom Gauß-Weber-Denkmal und seiner Einweihung. Mitteilung der Gauss-Gesellschaft* (1969) 6:16-21.

¹⁶ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, v. 29-30 (1852-1853): 3.

¹⁷ Smiles, *Duty*, 190.

¹⁸ Paul, 'Weber, Wöhler, and Waitz', 92.

colleagues. At the same time, military language also appeared in correspondences between colleagues and friends; revealing that aspects of militaristic masculinity played a role as well in the self-fashioning of men of science.¹⁹

I argue that the appeal to military culture and ethos was strategically used in order to link the profession of the scholar and scientist with an ideal of masculinity that was considered – and still is -, to entail a very resilient form of hegemonic masculinity. Joshua S. Goldstein works out that there exists a curious constant in gender roles across societies when it comes to war, he calls it the “puzzle of consistency of gender roles in war”: “That connection is more stable, across cultures and through time, than are either gender roles outside of war or the forms and frequency of war itself.”²⁰ In order to explain this peculiar consistency, he argues that “cultures developed gender roles that equate ‘manhood’ with toughness under fire.” On account of the fact that war has pervaded in most of human history, these gender roles and dynamics continue to be reproduced.²¹

In every society that fights wars, a uniform pattern exists that links men with warfighting.²² Although men’s roles in the military changed accordingly to contingent influences, the general link between men and warfighting is peculiar resilient and enduring. Naturally, this link also existed in the nineteenth century. Historians Dudink, Hagemann and Tosh come to the conclusion that war, along with politics resembles a ‘natural’ homeland of masculinity.²³ Relating thereto, military virtues “such as aggression, strength, courage and endurance have repeatedly been defined as the natural and inherent qualities of manhood, whose apogee is attainable only in battle.”²⁴

The need to render the profession of scientist as ‘masculine’ originated from the problem that ideas about the eighteenth-century scholar suddenly became under scrutiny in the age of industrialized, modern nations. The romantic notion of masculinity

¹⁹ One example of a scientist molding his scientific persona according to his service in the army is Roderick Murchison. See Secord, ‘King of Siluria’, 441–42.

²⁰ Goldstein, *War and Gender: How Gender Shapes the War System and Vice Versa*, 9.

²¹ Ibid.

²² Goldstein, *War and Gender: How Gender Shapes the War System and Vice Versa*, 10.

²³ Dudink, Hagemann, and Tosh, *Masculinities in Politics and War*.

²⁴ Dawson, *Soldier Heroes: British Adventure, Empire and the Imagining of Masculinities*, 1.

included aspects that were not adequate anymore for life in the modern economy. Early modern aspects of scholarly life - the reclusiveness, the use of imagination, the emphasis on showmanship - became suspect and conferred the men who embodied them with effeminacy and 'foppishness'. Furthermore, in both nations - Great Britain and Germany -, members of the educated classes propagated their concern about the amalgamation of masculine traits with character traits that were linked with femininity. To begin, they feared losing what was uniquely manly about them, to conclude, they wished to delineate themselves clearly from women. The delineation from the 'other sex' had the effect that they formed one unit in their 'manliness.' In *Duty*, Smiles portrayed an array of famous men, who possessed attributes that rendered them excellent idols. Regardless if they were British or German, he asserted that men like the Duke of Wellington, von Moltke and Stein embodied a model of masculinity, that exceeded national pride. What made these men exemplary and equals was something beyond national borders; it was the "honest and upright performance of individual duty"; the epitome of "manly character".²⁵

In order to rid the image of the scholar from its suspected effeminacy and to render the middle-class man normatively masculine, nineteenth-century men of science appealed to military culture and ethos, exploiting the strong association between military and masculinity.

I structured the thesis, arranging it according to a series of subdivision criteria. The first criterion is geography; thus, I divided my research in two parts, Great Britain and Germany respectively. To connect these two parts, I briefly explore how British scientific practitioners compared the status of their scientific developments with German science. German science and the associations they formed, represented a point of reference for the British. In particular, the British Association for the Advancement of Science (BAAS) was inspired by the formation of the Society of German Naturalists and Physicians (*Gesellschaft Deutscher Naturforscher und Ärzte*; GDNÄ).

The next criterion is content-related. In order to begin with my investigation about the model of military masculinity and the influence it had in the science community, I give an overview about the interrelations between military and science. This section will mostly be an account of institutional history and biographical facts. In this way, I

²⁵ Samuel Smiles, *Duty*, v.

highlight the points of contact between the Army and Navy with the 'building blocks' of science and their protagonists, of whom a certain amount had been employed in the Army or Navy. They were taught values, rules and the social order that prevailed in military organizations. Moreover, not only did they register that the State funded science that led into military advancements, but they also noticed the increased attention that was given to the military organization as such.²⁶

Each part (Great Britain and Germany) is subdivided in little chapters that explore the history of shifts in ideas about masculinity, mainly the ideas that were relevant for the self-conception of middle-class men. These, again, are connected to changes in the economy and related to the processes of rationalization, bureaucratization and professionalization. I cover - when relevant - social and cultural history that explain or illustrate the shifts in ideas about masculinity.

For Great Britain, I determined two 'themes' in ideas about masculinity. The first half of nineteenth century was coined by tension between the two antagonistic notions of the "domesticity" and "sociability" of the man of science. In an age where the Industrializations and the growth of population fostered the idea of a manhood that defines itself around notions of practical skill and the ability to have a measurable impact on the world, the image of the reclusive 'Gentleman of Science' that works on his theories in the safe haven of his domestic house became outdated. Historian Eli Adams argues that the ideology of 'separate spheres', which designated the domestic sphere as the women's place rendered Victorian intellectual vocations as feminine activities. In this context, the appeal to the notion of militaristic masculinity was "charged with the energies and anxieties of masculine self-legitimation; it represents one especially vehement effort to claim for those engaged in [intellectual labor] the status of normative manhood."²⁷

From the 1860s, historian Tosh demarcated a shift from ideas about masculinity rooted in domesticity to a more imperialist, active and public notion of masculinity. After illustrating this change, I trace how this transformation influenced the language, that British men of science used.

²⁶ About reforms in the military in the nineteenth century see Reed, 'Military'; Spiers, 'War'.

²⁷ In this paper, I understand 'normative manhood' and 'hegemonic masculinity' as synonyms. Adams, *Dandies and Desert Saints*, 1.

In the part about Germany, I explore the emergence of militarism as an important factor for changing the ideas about middle-class masculinity and influencing the relationship between state and scientific research facilities. While doing so, my basic assumption is that the relevant effects of this change were increasingly perceivable over the course of the nineteenth century in the whole of Germany. Afterwards, I dive into the analysis of the scientists' language and the reference to military virtues and the army.

To summarize, the image of the 'effeminate' middle-class man played a role in debates about the state of the educated classes in both countries. Nonetheless, whereas the concept of domesticity played an important role in Great Britain, the emergence of militarism and with it the emergence of the male profession of 'reserve officer' shaped the self-conception of scientists and physicians in Germany.

Lastly, I differentiate between the sections that cover themes from social and cultural history and my analysis of the rhetoric of British and German men of science. The speeches held during the meetings of the BAAS and GDNÄ respectively represent the sources that I analyze with regard to the appeal to military culture and ethos. I tagged the section where I investigate these primary sources with 'rhetoric' above their title.

Therefore, I have two parts (Great Britain, Germany) that each are subdivided in two sections; the first explaining social and cultural changes that affected notions about masculinity, and the second, presenting the effect of these changes in the language of German and British scientists, who fashioned their professional identity at the backdrop of existing, ideas about hegemonic masculinities.

In the outcome of this study, I show that the scholarly persona of the nineteenth-century man of science resembled more a panoply than a unified image. When we understand the various hegemonic masculinities adhered and promoted by scientific practitioners, we can start to see behind the illusion of seemingly self-evident male scientific authority that we assumed existed all along. Or as Ellis puts it: by looking into the self-fashioning of men of science is to analyze that "one linear narrative of the powerful, to deconstruct, question and expose it."²⁸ Nineteenth-century scientists invoked different ideas of what the 'men of science' ought to be, but they all emphasized that the result of their vocation (scientific knowledge) is entirely removed

²⁸ Ellis, *Masculinity and Science in Britain, 1831-1918*, 25.

from the fact that they were embodied human beings. At the same time though, the virtues and conducts they referred to were aligned with contingent ideas about masculinity. Evelyn Fox Keller sums up this curious juxtaposition, writing that cultural images rendered scientists as “super-masculine and simultaneously ‘less sexual’ than other men.”²⁹

The picture that emerges from this research, is one that exemplifies how nineteenth-century men of science defined the “rules of the game” in a way that is masculine-centered and aggressive and discouraged certain newcomers from playing the game at the same level.

²⁹ Keller, ‘Gender and Science’, xvi.

Great Britain

The Military and Science – Alliances and Careers

The end of the Napoleonic Wars signified an increase in the public recognition of the military man. The model of the military man was closely linked with physical courage demonstrated in the public, and political arena of war and it represented a polar opposite of the quizzical and isolated scholar; an image, that, as I elaborate in the second and third chapter, was perceived as problematic by the science 'community' because it inhibited for the man of science to find recognition in the sphere of the cultural elite.

One aspect of the interrelations between scientific investigations and the Services was the scientific research, that has been completed by the Services themselves and their members. The Services' scientific research mostly concerned ballistics, explosives and the physiology of the soldier. For instance, the War Office carried out thorough investigations about the physiological and anatomical conditions of enlisted men during the second half of the nineteenth century.³⁰ During that phase of the nineteenth century, the Government "began really to take an informed interest in scientific research for Services purposes."³¹ Additionally, members of the Services, e.g., navy officials were interested in developing scientific apparatus. They knew that these could provide an advance in war, as the following account will illustrate: David Brewster's (1781-1868) workshop, in which he conducted his early attempts in science, was visited often by French prisoners who resided in Jedburgh during the French war. About one of them Brewster recalled: "M. Charles Jehenne - captured at Trafalgar, who from the mast-head observed Nelson's fleet bearing down on the French, - 'They saw us,' he said, 'before we saw them,' - successfully constructed a telescope."³² This interest was also reflected in the big demand for guides about scientific observations.³³

³⁰ Wansbrough-Jones, 'The Scientist's Place in the Services', 858.

³¹ Wansbrough-Jones, 859.

³² Margaret Maria Gordon, *The Home Life of Sir David Brewster*, 16.

³³ See Withers, 'Science, Scientific Instruments and Questions of Method in Nineteenth-Century British Geography'.

High-rank military men weren't only interested in science, they also sometimes employed men that would later procure employment in the sciences: Men like Thomas Huxley (1825-1895), Joseph Dalton Hooker (1817-1911) and George Busk (1807-1886) worked as navy surgeons before they pursued a scientific career.

The history of alliances between military organizations, the State and scientific practitioners precede the nineteenth century though. The founding of a multitude of cooperations that fused scientific research with its utility for war created a network between military men and men of science.

One of the most prominent cooperation of this kind was the Board of Longitude, founded in 1714, which directly married the demands of naval ships with scientific endowment. In that time till the early 1800s, the connections between Royal Society and the Admiralty were strong; numerous military men sat in the in the Society's Council as Admiralty representatives. Conversely, members of the Royal Society gave advice on expeditions. In 1828, the Admiralty representatives John Barrow (1764-1848) and John Croker (1780-1857) founded an internal consultive committee called Resident Committee of Scientific Advice. Michael Faraday (1791-1867) was one of the main members together with polymath Thomas Young (1773-1829) and astronomer Edward Sabine (1788-1883). Historian Naylor argues that Barrow and Croker's goal with founding this committee was to "keep the Navy's interactions with men of science out of public view and to control whom it dealt with more effectively." The Resident Committee didn't prevail for long though; the critics accused it of nepotism and patronage. Moreover, one year after its founding, Young died, and Sabine was posted to Ireland in 1830. Only Faraday remained first consultant for the Admiralty; a role he performed till the 1850s.³⁴ During the Crimean War (1853-1856), Faraday was a scientific adviser to the War Department, where he advised against the Earl of Dundonald's plan that envisioned filling ships with burning sulfur to drive the Russian garrison out of Cronstadt.³⁵

Positions like the one of Faraday represented options to gain an income for doing scientific work. Other offices that offered job-positions for scientifically trained men were the Nautical Almanac Office, the Chronometer Office, the Astronomical

³⁴ Naylor, 'Log Books and the Law of Storms: Maritime Meteorology and the British Admiralty in the Nineteenth Century', 773.

³⁵ Forgan, 'Faraday — From Servant to Savant', 65.

Observatories at Greenwich and the Cape, and the Hydrographic Office. All of which were part of the Admiralty Scientific Branch that was founded in 1831 and fused the Navy with scientific endeavor. Finally, military institutions like the Military Academy Sandhurst or Military College employed men in teaching positions to educate the future generations of officers in natural sciences. The discussions about the best means and methods to teach natural sciences were a prominent topic in the meetings of the BAAS from the 1850s.

Besides these infrastructural interrelations, the Navy played also a big role in scientific enterprises because they provided the resources for scientific projects to get realized: the use of naval vessels and the equipment that was provided with them as well as a disciplined and trained personnel. Historian Naylor argues that not only the provision of financial and infrastructural means was necessary for the conduct of science project, but also the order and discipline prevailing in the Navy's ship crew; "the daily regime onboard ship lent itself well to ensuring regular and reliable scientific observations."³⁶ The availability of officers and a crew that were drilled into repetitive and strictly regulated routine led John Herschel (1792-1871) or George Airy (1801-1892) to compare the social setting on ship with the setting in laboratories: the ship functioned as "itinerant observatories" and naval seaman represented "obedient drudges".³⁷ In order to ensure that the observation made by navy officials represented reliable data, Herschel published together with John Murray (1808-1892) "A Manual of Scientific Enquiry". The volume was commissioned by the Admiralty to provide naval officers on foreign service with general instructions in various branches of science.³⁸ Furthermore, ships of the Admiralty (and merchant navy) were employed in scientific missions, such as meteorological observations. Once again, the Crimean War fueled interest in scientific investigations: when British and French fleet were destroyed due to storm disasters in the War, the British government granted the Meteorological Department the permission to issue storm warnings. This department was a

³⁶ Naylor, 'Log Books and the Law of Storms: Maritime Meteorology and the British Admiralty in the Nineteenth Century', 774.

³⁷ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 15th Meeting (1845): xxxv.

³⁸ MacDonald and Withers, *Geography, Technology and Instruments of Exploration*, 88.

cooperation between the Admiralty and the Board of Trade, headed by Admiral Fitzroy.³⁹

Overall, the interrelations between the natural sciences and the military were manifold. Scientific practitioners were temporarily employed in the Army or Navy, they worked as advisers and held discussions about scientific subjects in the presence of esteemed military men during meetings of science' associations. They interpreted the integration of scientific knowledge in warfare as an increase in recognition and validation of the sciences and its producer. In discussions, men of science fashioned science as important for the state as the military; the "brain power"⁴⁰ that lied behind scientific advancement would undoubtedly foster military advancement as well. Scientific workers like Huxley would claim military power as one of the benefits of science.⁴¹

³⁹ Anderson, *Predicting the Weather: Victorians and the Science of Meteorology*, 108; Achbari, 'Rulers of the Wind: How Academics Came to Dominate the Science of the Weather, 1830-1870', 80.

⁴⁰ For an account in which science is praised because it fostered the warfare see Lockyer, *The Influence of Brain Power on History*.

⁴¹ Barton, *The X Club*, 443.

The 'Decline-of-Science' Debate

In the wake of the Industrial Revolution and utilitarianism, historians have remarked that the 1830s were a particularly unstable time during which traditional social hierarchies were shaken and the interrelation between gender and class were re-arranged. The transition from an absolutist to liberal-constitutional state together with the emergence of socio-economic mobility, set off “anxious efforts to claim new forms of status and to construct new hierarchies of authority”⁴². As a result of the problematic legacy of the image of the scholar that was associated with pedantry and effeminacy, the transformations that erupted traditional social stratifications and the continuous lack of governmental support, the ‘Decline-of-Science’-debate revealed the fears of scientific practitioners at the beginning of the nineteenth century. In the subtext of their complaints, rang the echo of the preceding generation of natural philosophers’ fears; not being able to claim an acknowledged social identity that they define for themselves, but instead being regarded as pursuing trivial activities: “Nothing wounds more effectually than a Jest; and when Men once become ridiculous, their Labours will be slighted, and they will find few Imitators”⁴³.

In other words, the debates, revolving around the lack of “genius and spirit” in their fellow men of science, were symptomatic for the British scientists’ insecurities about their social standing amongst other well-established masculine identities. Early-nineteenth-century scientists were still very dependent from their employment as clerical, schoolman or professional physician and it was as performer of these social roles – and not as scientists - that they were conferred with authority and could gain autonomy. However, what they wanted, was to “self-define” the conditions of their livelihood.⁴⁴ In other words, to become ‘full men’.

From the 1820s a series of debates in the scientific associations and societies promoted a rather pessimistic outlook on the current state of the natural sciences. What gave the impulse for these debates, was the comparison of the relationship between the State and science in Britain, France and Germany. Closely linked with the state’s

⁴² Adams, *Dandies and Desert Saints*, 5.

⁴³ William Wotton, “Reflections upon Ancient and Modern Learning” quoted in Syfret, ‘Some Early Critics of the Royal Society’, 44.

⁴⁴ Turner, ‘The Victorian Conflict between Science and Religion’, 360.

patronage of science, was the social standing of scientists in their respective country. For example, Charles Babbage (1791-1871), wrote that Davy's motivation to write a treatise about the British "Decline of Science" was his visit to Germany and France, where he observed the different attitudes towards science and conditions for working in science. Another example was Brewster's review of the "Decline of Science", in which he declared that the other European countries showed better means for their philosophers by awarding their work with patronage, a more established reward system, honour titles and the creation of science institutions like universities, societies and museums. Moreover, in Prussia "the known attachment of the king to every species of talent, and the desire to draw around him even the genius of foreign countries, holds out the hope that these institutions will soon rival the more ancient establishments of France."⁴⁵ Hence, the scientific practitioners were in a better position because the State was better aligned with the intellectual elite.⁴⁶

Not only Brewster, but also other men of science had begun to criticize the lack of social acknowledgement for the exact sciences in papers like the *Edinburgh* or the *Westminster*. Once again, the comparison with the state of scientific institutions overseas was the pivotal point for complaining about the inadequateness of the English ones. Critics, like John Playfair and Lord Brougham compared the English Universities and Royal Society to the social respect that universities and scientific academies gained in Germany and France.⁴⁷

Behind this critique lied the fear of being outpaced by the philosophic minds of other countries. Thus, the debates about the lack of support and cultural acknowledgement for scientific workers were simultaneously about the consequence of this insufficient facilitation: the absence of great minds. As Davy noted in a correspondence to Harcourt in 1824: "Unfortunately, Britain now possesses no naturalist who has a reputation that may be called European, and I am afraid we shall long want the genius and arranging spirit of a Cuvier."⁴⁸

⁴⁵ Brewster, 'Reflexions on the Decline of Science in England', 318.

⁴⁶ For further opinions about the disadvantaged position of science in England see MacLeod, 'Of Medals and Men', n. 2.

⁴⁷ MacLeod, 81.

⁴⁸ Sir James South, 'Royal Society' (Letter to the Editor), *The Times*, (Friday, 11 January 1829), p. 4.

In Brewster's memoir, the apprehension about the insufficient recognition of the scientist, was recounted in the form of comparisons between the different social standings of masculine role models and idols. In his review, he claimed that Britain should "place the genius of knowledge on the same level with the genius of legislation and of war, to raise it to the offices which it can fill, and reward it with the honors which it has achieved".⁴⁹

Brewster argued to consider martial valor equivalent to scientific talent, placing the sage and the hero on the same footing. In his "Reflexions on the Decline of Science in England", he looked into the past and, while reminiscing about the sages of previous ages, wrote the tale of past philosopher-heroes, namely Galileo, Tycho Brahe, Kepler, Descartes, Newton, Huygens, Hevelius, Leibniz, Euler, Lagrange, Laplace and Volta of Como:

The appellations of the sage and the hero have at all times been inseparably joined; and in countries but little removed from barbarism, and in ages comparatively dark and ignorant, kings have conferred the same honors on those who saved their country by their prowess or enlightened it by their wisdom.⁵⁰

He likewise praised Napoleon for having done the same more recently, writing that in France, "the sage and the hero deliberate in the same cabinet ... they bear the same titles; they are decorated with the same orders. And the arm and the mind of the nation are thus indissolubly united for its glory or its defence."⁵¹

In Britain, on the contrary, excellent men did not gain the deserved honor, social recognition and (financial) reward as their colleagues overseas: in an account of Wollaston's accomplishments, Brewster lamented:

He who buckled on the weak arm of man a power of gigantic energy; who taught his species to triumph over the inertia of matter, and to withstand the fury of elements...— the immortal Watt, was neither acknowledged by his sovereign, nor honored by his ministers, nor embalmed among the heroes and sages of his country.⁵²

⁴⁹ Margaret Maria Gordon, *The Home Life of Sir David Brewster*, 84.

⁵⁰ Brewster, 'Reflexions on the Decline of Science in England', 309.

⁵¹ *Ibid.*, 317.

⁵² *Ibid.*, 315.

This description lingered on heroes' eulogies, words like "triumph over", "withstand the fury" and "immortal" liken Watts to a knightly or war-hero. Babbage's language was permeated with allegorical words fusing stories of scientific workers with stories of manly excellence.

Historian Ellis concludes that the complaints about diminishing "character, energy and moral manliness among men of science"⁵³ prevalent in the discussions, reflected one of the profound shifts that happened in the 1830s and 1840s regarding male identity. She writes that the "emphasis shifted from traditional aristocratic and military roles to the cultivation of particular moral qualities, in particular, sincerity, humility and self-discipline"⁵⁴. This change mirrored the "broader cultural shift from a strictly hierarchical society, based on rank and position, to an increasingly democratic culture where status was ideally achieved rather than ascribed."⁵⁵ Indeed, "ideally" men would find recognition for their actions, but first they need to radiate enough authority, so they are considered important enough to be paid attention to. Moreover, the attention they sought for, was the attention of powerful men like a sovereign or (embodied by the sovereign) the nation: Babbage wrote,

Sir W. Herschel, indeed, was made a Hanoverian knight, and Sir Humphry Davy a baronet, but the comforts which these distinguished men enjoyed, and the stations which they occupied in society, *were neither derived from the sovereign nor from the nation*. No monument has been reared to their memory, and no honours have descended to their families.⁵⁶

In order to gain attention, men of science were still dependent on invoking virtues and customs that traditionally pertained to men in high positions, namely the aristocracy. Meaning, men of science appealed to codes of conduct from aristocratic and military culture in order to elevate the social standing of scientists and render them as 'full men' in the sense of obtaining the ability of self-defining the conditions of their livelihood. Thus, the aforementioned change to a more "democratic culture" was still very much coined by the desire of scientists to liken themselves to established hegemonic, masculine identities, which emitted the greatest social power.

⁵³ Ellis, *Masculinity and Science in Britain, 1831-1918*, 8.

⁵⁴ Ellis, 10.

⁵⁵ Ibid.

⁵⁶ Brewster, 'Reflexions on the Decline of Science in England', 315.

The Legacy of the Image of the Eighteenth-Century Scholar and Francis Bacon's 'New Science'

To understand nineteenth-century debates about the state of science, it is helpful to recognize the conflicts that eighteenth-century natural philosopher saw themselves confronted with when they thought about the character of the philosopher and his activity.

Concerns about insufficient recognition for performing scientific labor rooted in an image of the scholar that was problematic because of its association with unmanly characteristics. In this chapter I briefly explore the shifts in ideas about manhood linked with the eighteenth-century natural philosophers' public persona. This way, I work out the context, that explains why nineteenth-century men of science were earnestly occupied with changing the image of the scholar and changing the program of doing science accordingly.

At the foundation of these disputes was the notion that the reclusive scholar was considered a passive figure. The figure of the philosopher was linked with retreat in solitude and the act of philosophizing with physical stillness; both rendered the figure as effeminate. This is reflected for example in Michel de Montaigne's (1533-1592) statement that "the pursuit of learning makes men's hearts soft and effeminate more than it makes them strong and warlike"⁵⁷. Interestingly, already Montaigne seemed to consider that the opposite of soft and effeminate was to be warlike; to show attributes of a warrior/soldier. The impression of effeminate scholars stemmed from the Middle Ages, where most scholars were clerics and the image of learned men who study books in the reclusivity of their cells was a dominant cultural one. The image contrasted strongly the image of the noble man who took part in the public life of politics and fought battles in wars. Thus, the scholar was viewed as

lacking in the knightly virtue of valor; his blind reliance upon ancient authority over prudence was an expression of timidity; he who was a slave to Aristotle was not a free

⁵⁷ Montaigne, 'Of Pedantry', 106.

man. Withdrawn study worked against the acquisition of that sense of emulation and responsibility that made men do brave deeds.⁵⁸

Francis Bacon's (1561-1626) remark that induction did not "soften men's mind" or make them "more unapt for the honor and exercise of arms" sounds like a direct reply to Montaigne's claim.⁵⁹ Indeed, Bacon worked on reforming the program of the study of nature and, accordingly, reconceptualizing the scholar, ridding him from the associations of pedantry. With the aforementioned statement, Bacon promoted his 'new science', contrasting it to the traditional scholastic knowledge of the natural world. Bacon's project envisioned the natural philosopher freed from reciting doctrines of classical authors, and instead providing more certain means of demonstrating knowledge (empiricism). In his project, "a rigorous disciplining of the self with a celebration of the powers of connected and communal human activity" were combined.⁶⁰ The present needed to be seized in order to bring forth a future, in which heroic men of wisdom gathered together, finding the means to overcome the helplessness and poverty of the human race.⁶¹

Bacon's concept of the 'new science' depicted in his *New Atlantis*, had a significant influence throughout Europe. One of the earliest recipients was Immanuel Kant, who declared in his *Critique of pure reason* that Bacon had initialized the project of modern science by constituting empirical sciences as the "military road of the sciences" (Heeresweg der Wissenschaften). The connection between the scientific activity and their communal performance was well received by scientists in the beginning of the nineteenth century. Because the negatively afflicted image of the effeminate scholar was reluctant and prevailed even with Bacon's envisioned science program⁶², nineteenth-century men of science saw themselves confronted with the same problems as the early-modern *Savans*; the ideas about what made an aristocratic Gentleman and what constituted a scholar stood in opposition.

In order to facilitate the transformation of science into Baconian 'new science', men of science in Germany and Great Britain founded two associations respectively,

⁵⁸ Shapin, "A Scholar and a Gentleman", 290.

⁵⁹ Bacon, 'The Advancement of Learning', 268.

⁶⁰ Iliffe, 'The Masculine Birth of Time', 442.

⁶¹ Iliffe, 443.

⁶² Shapin, "A Scholar and a Gentleman", 304.

the *Gesellschaft Deutscher Naturforscher und Ärzte* (GDNÄ) and the British Association for the Advancement of Science (BAAS). The legacy of Bacon's modern project casted a shadow, easily detectable in the speeches of attendees of both associations. During one of the first meetings of the BAAS, William Vernon Harcourt (1789-1871) explicitly mentioned Bacon; "the actual and immediate effect produced by Bacon on the general spirit of philosophy, has been underrated: His writings were quickly circulated through Europe, and their value was appreciated abroad even sooner than at home."⁶³

The foundation of the BAAS was thought to foster the implementation of Baconian ideas. Disappointed by the Royal Society's insufficient promotion of natural knowledge, Harcourt disclosed that the BAAS will revive the idea of fostering scientific labor and "guide the labour of others"⁶⁴. Mirroring the ideal of the assembly of scientists under the roof of Salomon's house, the BAAS would ensure to break the tradition of the insulated scholar and facilitate science's progress by encouraging mutual consultations under like-minded men: for, "the greatest minds require to be urged by outward impulses, and there is no impulse more powerful than that which is exercised by publicly-esteemed bodies of men."⁶⁵ Brewster echoed this vision in the press, writing that the British Association would flourish through a healthy "scientific rivalry"⁶⁶.

⁶³ British Association for the Advancement of Science, 'Report of the 1st and 2nd Meetings of the British Association for the Advancement of Science', 2nd ed. (1835): 24.

⁶⁴ *Ibid.*, 26, 28.

⁶⁵ *Ibid.*, 31.

⁶⁶ Brewster, 'Decline of Science in England', 325.

The Foundation of the GDNÄ and the BAAS

The 'Decline of Science' debate, which was heavily tainted by the comparisons made between the different cultural standings of *Savans* in European countries, facilitated a dialogue about the future organization and qualities of science' practitioners. As a result of the debates, British men of science founded an association, which emulated the German GDNÄ: The BAAS aimed inter alia "to raise scientific and literary men to their just place in society and vindicate their claims to the same honours as every other class of national benefactors."⁶⁷ In order to attract the attention of the nation and State, an assembly of men of highest rank and scientific practitioner should held meetings and this way merge professional scientific pursuit with national endowment.

For the members of the BAAS, the desired alliance between State and intellectuals was already achieved by its German model, the GDNÄ or Society of German Naturalists and Physicians. The alliance was represented by the Society's royal patronage and the spectacle that followed the meetings. At one of these events, nearly twelve hundred men of rank and talent gathered in a festive concert-room. This *soiree* was interpreted as emblematic for the more prestigious standing of the German man of science; after all, as president of the BAAS, Brewster concurred, "the princes of the blood mingled with the cultivators of science, and the heir-apparent to the Prussian throne was seen in earnest conversation with the philosophers of his own or of other kingdoms that were most celebrated for their talents and their genius."⁶⁸ Brewster was not alone with his praise for the royal recognition for science in Germany. The *Edinburgh* article mentioned the same celebration, interpreting the festivity as a "homage thus paid to science by a powerful sovereign, [that] was at once a compensation for her labour, and an acknowledgement of her power."⁶⁹

The spectacles that adorned the Society's meetings were emblematic for the strong alliance between the State and its philosophers. Furthermore, they fulfilled the desire of British men of being *seen* by the Government as men of importance. To remove "the ignorance and supineness of the Government"⁷⁰, the BAAS-meetings

⁶⁷ [Brewster, 'The British Scientific Association', 371.

⁶⁸ Brewster, 'Reflexions on the Decline of Science in England', 318.

⁶⁹ [Brewster], 'The British Scientific Association', 369.

⁷⁰ *Ibid.*, 371.

gathered men from the clergy and gentry with men that pursued scientific research. “The example of noblemen on display at BAAS meetings and social gatherings”, writes historian Ellis, embellished “the masculine reputation of men of science themselves.”⁷¹ The conglomeration of the powerful with the not-so-powerful was thought to augment the cultural weightiness of scientific pursuit.

The urge to create an identity that is masculine connoted and rendered through a form of spectacle is never more evident than here. Brewster explained that the power of the BAAS lied in the “pageant ... of a numerous and imposing assemblage”. Referring to the pageant, Brewster continued to write: “It is the brawny arm with which the intellectual giant is to procure his food, and to smite his enemies, and to extend his domain.”⁷² In other words, the meetings of the BAAS represented a platform for the spectacle through which scientific masculinity got established. What is more, the public alliance of aristocratic, military men and scientific practitioners would solve the perceived antagonistic characteristics of doing science and taking active part in the world.

⁷¹ Ellis, *Masculinity and Science in Britain, 1831-1918*, 73.

⁷² [Brewster], ‘The British Scientific Association’, 388.

Rhetoric Part I

Appeal to Aristocratic-Military Culture from 1830 till 1850 at the Meetings of the BAAS

The meetings of the BAAS were accompanied by rituals that stemmed from aristocratic lifestyle. Something easily recognized by the members of the aristocracy, of which a considerable number held positions in high ranks of the military. An account that described the spectacle, that followed the nomination of geologist William Buckland to the BAAS presidency in 1832, gave an impression of the imitations of aristocratic-militaristic traditions that embellished the meetings: “A regiment of cavalry, two hundred strong, was assembled on Magdalen Bridge”, Buckland, hammer in hand, “put himself at the head of this class á cheval, which forthwith sallied forth to explore the geological wonders of the neighbourhood.”⁷³ The message was clear: the BAAS represented the “aristocracy of science”, uniting “all who had the courage to enlist under its banner” and together they should “marshal in favour of science”⁷⁴.

References to aristocratic and military culture are not only found in rituals, where men of science performed aristocratic, military *habitus*. In case that they served in the Army, men of science actively emphasized this and incorporated it in their formation of a professional identity as scientist. One of the most prominent scientific practitioners, who emphasized his experience in the army was geologist Sir Roderick Impey Murchison (1792-1871): After having been trained in a Military College and serving eight years in the army, he turned his back to a military career and started his dedication to geology. Nevertheless, he continued to appeal to the symbols and rhetoric of military and used them for his self-fashioning. When talking about his scientific activities, he described the research field as a “field of battle”, the assistance he needed he described as to “enlist raw recruits”. A tour with Adam Sedgwick (1785-1873) in prospect, he referred to himself as an “aide-de-camp”, putting himself at service to the more experienced Sedgwick. After his scientific reputations grew and

⁷³ ‘Buckland Becomes President of the BAAS’, 442.

⁷⁴ [Brewster], ‘The British Scientific Association’, 371.

he started to lead his own tours, he regarded his own subordinates as such.⁷⁵ Not only did he stress the parallels between his former occupation as an officer and his investigations into geology, but he also frequently wore the Russian military orders he received from the Czar.⁷⁶

Murchison's attempts of cultivating his military character didn't remain unnoticed: "There was always something of a soldier about him.... His bearing was that of a man who had known drill and seen service in his youth", writes one obituarist.⁷⁷ Appreciation was also bestowed upon him from Edward Forbes (1815-1854), who affirmed that Murchison led his "noble army of investigators" with "the energy of fifty hammers."⁷⁸ Forbes' image of a scientific enterprise that is performed in a militaristic fashion, shows that military qualities were regarded beneficial for a scientific practitioner to possess. In a review of Murchison's *Siluria*, the author resumed that "Sir Roderick is as essentially a general in science as Napoleon or Wellington was of troops", and that "he could afford to give away every title of originality of detail, and yet stand a pre-eminently great man."⁷⁹ What delineated him from other scientific workers was his abilities to exert organizational and administrative skills. He advised the government, overtook tasks in organizing the personnel in annual addresses to the Geological and Geographical societies and reviewed the results of dozens of investigators in his successive editions of *Siluria*. For his contemporaries, Murchison didn't only stand out because of his original work, it was his dutiful execution of tasks of organizing other people and their work that found recognition and rendered him a "great man".

As shown in these examples, the likening of men of science to officers (who were most often of aristocratic origin) and the appropriation of aristocratic-militaristic practices, had the aim to create an *aura* of militaristic prestige. Still, the analogies went even further than simply referring to military and aristocratic culture. They imply

⁷⁵ R. I. Murchison to John Phillips [1833], in Geikie, *Life*, I, 219; R. I. Murchison to Adam Sedgwick [pmk. 12 May 1827], Cambridge University Library Add. MS 7652. III. D. 88, quoted in Secord, 'King of Siluria', 421.

⁷⁶ Secord, 419.

⁷⁷ Unsigned newspaper obituary in the Archibald Geikie Papers, Edinburgh University Library, MS Gen. 523/5, quoted in Secord, 418.

⁷⁸ Forbes, *Literary Papers*, 25–26, 35.

⁷⁹ Mackie, 'Review of *Siluria: The History of the Oldest Fossiliferous Rocks and Their Foundations; with a Brief Sketch of the Distribution of Gold over the Earth*', 88–90.

qualities, such as great organizational skills and the dutiful completion of compiling many different strains of information to facilitate surveys that made it possible for his contemporaries to deduct the current state of research. In the imagination of the science' community, these qualities endowed Murchison's importance.

As historian Ellis remarks, ideals of masculinity shifted and increasingly included practical skill and the ability to have a measurable impact on the world.⁸⁰ As key factor for this change, Connell names "the creation of an impersonal bureaucracy" that replaced the former system of assigning roles through kinship and patronage. The Ancien-régime masculinity that was coined by "family honor, worked through kinship and patronage obligations, and connected the exercise of authority with a capacity for violence" was removed by a masculinity "organized around themes of rationality, calculation, and orderliness."⁸¹ In this age of increased bureaucratic and administrative work, to have the discipline to perform this type of tedious work was considered valuable.

Moreover, leading qualities came in handy because science, rather than an activity pursued in reclusive scholarly solitude, resembled increasingly a business, requesting administrative work and organizational skills from its practitioners. The attendance to the meetings of societies such as the BAAS tripled over the course of the nineteenth century. At the backdrop of this demographic growth of the group of scientists, statement like that of J. W. Bowden, who emphasized that "in these days of combination, of co-operation, go joint stock company proceedings, the business of natural science, like all other businesses, must, as a matter of course, be carried on by bodies rather than by individuals"⁸², represented a weighty plea. To gain control and clarity in "the confusion of a mixed and multitudinous assembly" was to create organizational structures in which the assembly would arrange themselves. Thus, the societies offered the opportunity for scientists to assemble in an orderly fashion and, by exchanging their views, regulating ideas.

Almost as important as the discipline of exerting orderliness was the manly vigour, of which the aristocratic model of manhood was regarded its manifestation. The attractiveness of this aristocratic model lied in its emphasis on masculine zeal and "military

⁸⁰ Ellis, *Masculinity and Science in Britain, 1831-1918*, 40.

⁸¹ Connell, 'The State, Gender, and Sexual Politics', 521.

⁸² Bowden, 'The British Association for the Advancement of Science', 14.

vigour”, which Ellis concludes, “perhaps best encapsulates all these various elements into one phrase and which offers itself as the closest synonym for 'masculinity' used at the time.”⁸³ During speeches at the BAAS meetings, scientific practitioner and military men were praised likewise if they possessed vigour and/or zeal, conjoining them under their shared traits of ‘masculinity’. At the fourteenth meeting of the BAAS, the *laudator* brought to attention the preparations that forego such meetings, praising the “activity and zeal” of the men who coordinated this said meeting in 1844; in this case Colonel Sabine and Lieutenant Riddell.⁸⁴

To highlight scientific practitioners’ possession of masculine “vigour” and “zeal”, was a recurring theme in descriptions of fellow men of science and science organizations. In one instance, Whewell started his portrayal of Dr. Dalton by pointing out the latter’s possession of a vigorous intellect. In another one of his addresses, Whewell recounted that the lively discussion that unfolded at the Geological Society impressed him because of their “manly vigour”. The meetings of the Geological Society were coined by debates about the arguments presented by peers. This represented a novelty; former societies did not encourage discussions about the treatises after they were recited. The model of discussing arguments during the meetings was adopted by the BAAS. The fruitfulness of heated exchange was regarded as a strong characteristic of the BAAS meetings: “the collision of various intellects, ... displays of personal strength and skill, knightly combats” were highlighted by former attendees of the BAAS meetings.⁸⁵

In the year 1842, ten years after the first meeting of the BAAS, one report concluded that “the world of science” had undergone a revolution. The result of this revolution was the “increased ...vigour and zeal” of sciences’ *Savans*. A year later, this beneficial effect was conjured once again: the exchange of ideas was regarded a “salutary influence”, which consisted of “healthy vigour of action.”⁸⁶

⁸³ Ellis, *Masculinity and Science in Britain, 1831-1918*, 74.

⁸⁴ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science, 1844, 14th Meeting (1845)*:xlv.

⁸⁵ Jukes, J. Beete, “Annual Address Delivered before the Geological Society of Dublin, February 8, 1854.” *Journal of the Geological Society of Dublin*, 6: 61-108, here 108, quoted in Secord, *Controversy in Victorian Geology*, 17.

⁸⁶ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science, 1844, 14th Meeting (1845)*:xlv; British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science, 1834, 3rd Meeting (1833)*:x; British Association for the

The repeated emphasis with which these manly virtues appeared in the rhetoric of aforementioned men of science, show how the late eighteenth-century' accusation of the scholar "lacking in the knightly virtue of valor" greatly preoccupied the minds of British men of science. Consequently, the desired enhancement of their social authority that lied at the heart of the appropriation of aristocratic-militaristic virtues and customs, was attached to the attempt to render scientists' role as masculine.

The qualities of an aristocratic military man, such as fulfilling one's duty with vigour, zeal and endurance, were called upon in the rhetoric of attendees of BAAS-meetings. The function of the appropriation of said virtues was to enhance scientists' cultural recognition and fuse their professional role with the normative masculinity that inhabited aristocratic-militaristic men. Pivotal for the masculine reputation of the aristocrat, was his involvement in the public domains of politics and war.⁸⁷ Thus, the likening of men of science to officers and the emphasis on their military vigour, zeal and energy, represented efforts to remove the image of the natural philosopher's passivity and out-worldliness and gain the same type of recognition for men who engage in scientific activity, that other, more traditionally established masculine models, already received. In his address at the meeting in 1848, the Marquis of Northampton drew an analogy between men of science and the man that "protects their happiness, their freedom, their sovereign, their laws, their independence". The Marquis clarified that the British men of science had "duties to perform", just "like our soldiers and our sailors, like the ministers of the laws of the land and the expounders of the laws or morality and religion."⁸⁸

Now, the success with which former military man Murchison fashioned himself as impersonating military virtues shows that these virtues were not only received positively by his peers, but that they implied a possible recommendation for how to deal with the increasing changing demands of Baconian's 'new science'. These demands only increased with the nineteenth century forging ahead.

Advancement of Science, *Report of the British Association for the Advancement of Science*, 1842, 12th Meeting (1842):107; British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 1843, 13th Meeting (1843):xxxii.

⁸⁷ See Dudink, Hagemann, and Tosh, *Masculinities in Politics and War*.

⁸⁸ British Association for the Advancement of Science., *Report of the British Association for the Advancement of Science*., 18th Meeting (1848): xxxvii–iii.

From the Domestic Model to the Militaristic Model of Masculinity

From the 1860s onwards, ideas about masculinity changed, according to historian Tosh, from a 'domestic' model to a more active, imperialistic one. As a result, men of science, while striving for social recognition, faced the challenge of negotiating ideas about masculinity that changed.

The shifts that Tosh works out, have as their starting point the weight and cult of domesticity; something peculiar for the nineteenth century. "*Domesticity* represents ... a state of mind as well as a physical orientation, its defining attributes are privacy and comfort, separation from the workplace, and the merging of domestic space and family members into a single commanding concept."⁸⁹ The notion of domestic life, at first an integral part and product of bourgeois culture, became increasingly a "goal of the conventional good life" across from class boundaries. The cult of domesticity was integral for nineteenth-century masculinity. To entertain a household and wield authority within home was imperative for being recognized and respected as a full man in society.⁹⁰ This was even more the case in Great Britain, "the domestic nation *par excellence*"⁹¹. Tosh considers it the first country in which "the full apparatus of domesticity appeared"⁹².

The importance of domesticity can be seen in depictions of public male figures like Newton, Darwin, and General Henry Havelock, which were described in scenarios of domesticity. The English 'home' appeared center stage in a considerable number of Victorian literature. Biographies of men of science were often fashioned in the setting of their domestic life, e.g. "The Home Life of David Brewster" (1869). For Tosh, the adherence and fulfillment of a domestic life was a compelling requirement for nineteenth century men. That is, until the 1870s.

At the end of the nineteenth century, the problematic tension between the patriarchal ideal of a domestic life and the central requirement of gaining manhood, autonomy, were out in the open, revealing the initial contradictory nature of masculinity and domesticity. Tosh describes the problem as follows: "The heavy moralizing of

⁸⁹ Tosh, *A Man's Place*, 4.

⁹⁰ *Ibid.*, 3.

⁹¹ *Ibid.*, 5.

⁹² *Ibid.*

home ties conflicted with two longstanding aspects of masculinity. The first was homosociality.” Clubs, taverns, associations and committees in which women were increasingly excluded from, represented “the forum in which masculine stand-in was appraised and recognized.” Secondly, the crucial part of masculine self-reliance, independence and self-defense, stood in opposition to domestic attributes of comfortable retreat and representing reliability in your duties as a father and husband.⁹³

Tosh demarcates the peak of domesticity lasting from the 1830s to the 1860s. “From the 1870s the view was increasingly heard that domesticity was unglamorous, unfulfilling and - ultimately - unmasculine.”⁹⁴ This shift was evoked by different factors. One of them was the increasing wrecking of orthodox beliefs which represented one of the constitutive pillars of the domestic order. Another factor was the continuous gendering of the private sphere as feminine, from which it was important to delineate as a man. Furthermore, the view that homosocial activities were the proper sphere of masculinity intensified and “club life and outdoor sports flourished as never before”⁹⁵. Lastly, imperialism and the martial confrontations with uprising warriors overseas in the British colonies, led to a revival of the association of masculinity with adventure and knightly virility.

To give an example of the possible influence of the shift from domestic masculinity to an imperialist and active model of masculinity in British culture, one can look at John Everett Millais paintings. The esteemed Victorian painter created two paintings with different versions of knights. British fascination about the masculine model of ‘the Knight’ was nothing new, nevertheless, the increased emphasis on the connection between ‘the Knight’ and adventure was a novel factor. Historian Rosemary Mitchell traces the different emphasis, domestic knight and hero knight, in said paintings.⁹⁶

⁹³ Tosh, *A Man’s Place*, 6.

⁹⁴ *Ibid.*, 7.

⁹⁵ *Ibid.*

⁹⁶ Mitchell, ‘Sir Isumbras at the Ford: A Portrait of the Young Artist Becoming an Old Knight’.



Figure 1: left: Millais', *A Dream of the Past: Sir Isumbras at the Ford*, 1857 and on the right his *The Knight Errant*, 1870.

In Millais' painting called "Sir Isumbras at the Ford" (1857), an elderly knight is depicted on a large horse, carrying two children and a pile of firewood across a ford at twilight. According to Mitchell, *Sir Isumbras*, which Millais painted briefly after his marriage, was a self-portrait of the artist. Millais, who expressed his sentiment about his marriage in a letter to his friend Charlie Collins, "I am truly a favoured man ... I am convinced that as a married man I will show the public what I am capable of doing", drafted his version of the medieval knight according to middle-class ideas about domesticity and chivalric values.⁹⁷ Thirteen years later, Millais' "The Knight Errant" (1870) shows a very different type of knight: a young man in silver-shining armor rescues a (naked) woman, the sword in his hand exposes trails of his enemy's blood. Mitchell proposes that this knight might have reflected ideas about masculinity, that from the 1860s entailed a "more imperialist, active and public model."⁹⁸

When men created a male identity against the backdrop of the 'domestic' patriarch, they assimilated "the polarization of traits between father and mother as faithfully as possible, by suppressing the need to give or receive affection, and the

⁹⁷ Gordon H. Fleming, *John Everett Millais* (London: Constable and Co., 1998), 150, quoted in

Mitchell, 'Sir Isumbras at the Ford: A Portrait of the Young Artist Becoming an Old Knight', 310; *ibid.* 306.

⁹⁸ Mitchell, 319.

impulse to express feelings.” The result was exemplary for “the most extreme form of manliness as self-control”, which found its stereotypical equivalent in the male posture of the ‘stiff upper lip’. Others reacted by defying ‘domesticity’ altogether. They sought to find affection and acknowledgement in other men, who they often idealized. This is why “bachelorhood and club or college life might be not merely a refuge from domesticity, but an alternative emotional resource.”⁹⁹

Viewing the history of the nineteenth century through this lens, the introduction of sport in the educational system of boys represented a means to foster a certain type of masculinity, correlating with the values of the ‘stiff upper lip’ posture: sports should teach the boys values like “courage, self-control, stoical endurance, and the subordination of the ego to the team.”¹⁰⁰ In sum, Tosh demarcates a shift from a middle-class masculinity that was strongly influenced by Evangelists promoting a manhood rooted in domesticity to the “late Victorian manliness” that was composed by “a public, even military, code, to be exercised among men.”¹⁰¹

The renaissance of the knightly hero, together with the aforementioned shifts led to late-Victorian’ ideals of manliness that were very different than at the beginning of the nineteenth century. Fostered by the introduction of sports and military drill in schools, the ideas encompassed “embodied qualities ... such as physical strength, courage and an independent spirit”. This independence though, was not exempted from the subordination to other men; it was combined with “a dedication to duty and a willingness to follow orders, be they from the captain of the cricket eleven or the commander of the regiment.”¹⁰²

⁹⁹ Tosh, *A Man’s Place*, 184–86.

¹⁰⁰ Tosh, 188–89.

¹⁰¹ Tosh, 189.

¹⁰² Anderson, ‘Red Coats and Black Shields’, 22.



Figure 2: *The Graphic*, 'The 4th (King's Own) at Different Periods', 22 February 1879. The eighteenth-century officer is depicted as finicky, showing off his military *décor*. In contrast the nineteenth-century officer seems sober and firm and readily prepared for battle.

The promotion of the concept of manly independence in combination with dutiful subordination, fit the political program of warfare and colonial campaigns and the increase in social interest in militarism. As historian Spiers clarifies, "the drama of battle captured the popular imagination." In the opening segment of Victorian periodical, *The Times*, the author observed, that the British public had become 'engrossed' in the spectacle of war.¹⁰³ The Crimean War, military actions in the Zulu-War and the Indian Mutiny, all of these heavy mediated military spectacles promoted a certain type of militaristic and imperial masculinity, which represented a crucial component of British racial identity, legitimizing British domination of other races.¹⁰⁴ Anderson writes,

¹⁰³ Spiers, 'War', 87.

¹⁰⁴ Anderson, 'Red Coats and Black Shields', 22.

Colonial conflict offered a means of mitigating such cultural emasculation. Imperial warfare - outright fighting between the British and native races - particularly contributed to a 'masculinisation' of British identity in the late nineteenth century. Sir Garnet Wolseley, a popular hero of the Zulu War and several other imperial campaigns, defined war as 'a manly, elevating aspiration [which] exercises a healthy influence on all classes of society . . . War, though it may mean a hard struggle for national existence, is the greatest purifier to the race or nation that has reached the verge of over-refinement, or of excessive civilization'.¹⁰⁵

The shifts from a 'domestic' to an imperial model of masculinity were perceptible in the community of scientists. For one, from 1860, the issue of education played a more prominent role in the discussions of the BAAS and it was in this context that new emphasis was put on virtues and conduct that accommodated the aforementioned ideal of militaristic masculinity: drill, endurance, discipline of body and mind, honesty or frankness and courage.

¹⁰⁵ Anderson, 8–9.

Rhetoric Part II

Appeal to Military Culture from 1860 till 1880 at the Meetings of the BAAS

Discussions about education circled around the importance of scientific education in the mechanical institutes and secondary schools and the best methods to teach them. For one, the introduction of military drill in schools from 1860s found affirmative responses in the BAAS. In a report from 1860, E. Chadwick reported in the section “Statistical Science” about the beneficial effects of the introduction of military drill in popular schools. He explained how during examinations, the inspectors detected that the girls had better attention spans and were in advance in book attainments. This led to reforms that likened the education of boys to those of the girls. Thus, the intellectual classes were cut in half and industrial training were added to their education. This had the intended effect of putting boys “in their previous relative position, which was in advance of the girls.” Chadwick declared that the contributing factor was the reformed educational program, that consisted of “active bodily exercises, the naval and the military drill, and the reduction of the duration of the school teaching to within what appear to me to be the psychological limits of the capacity of voluntary attention.”¹⁰⁶ Chadwick’s report shows, that drill and physical exercise was considered beneficial for improving the boys’ perceptive faculties. Moreover, it facilitated their supposed superiority as members of the male sex.

Resonating with Chadwick’s affirmative opinion about the usefulness of military drill for training one’s intellectual abilities, Philip Gilbert Hamerton promoted in his *The Intellectual Life* (1873) “harness” as an essential quality for doing intellectual work. “Harness”, Hamerton explained, was “discipline settled beforehand like military drill.” He continued,

Harness trains us to the systematic performance of our work, and increases our practical strength by regulated exercise, but it does not supply everything that is necessary to the

¹⁰⁶ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 30th Meeting (1860):187.

perfect development of the mind. The truth is, that we need both the discipline of harness and the abundant nourishment of the free pasture.¹⁰⁷

To explain how this systematic work-performance should exactly take place, Hamerton wrote in another passage: “The object of intellectual discipline is the establishment of a strong central authority in the mind by which all its powers are regulated and directed as the military forces of a nation are directed by the strategist who arranges the operations of a war.”¹⁰⁸ Hence, intellectual work required active application of the mind. Conveniently, a way to train the mental activity, was the study of nature: By the 1860s, scientific thinking was promoted because of its qualities that improved its possessor’s mental abilities. In an address from the meeting in 1865, W. A. Miller elaborated, that the study of nature couldn’t be fathom in a state of passive reception, but that “Science ... is to be employed to develop the powers of the mind, and to discipline them for action.”¹⁰⁹ When, from the 1860s, John Tyndall (1820-1893), Thomas Henry Huxley (1825-1895) and other members of the X-Club, wished to make scientific thinking the basis of education and social policy, they advocated “study of Natural Science” as “a means of disciplining the mind”.¹¹⁰ In another address, similar beneficial qualities of the study of natural sciences was stressed: “Natural sciences are particularly valuable in mental training. They teach the student to look at the objects around him not with an idle gaze, but with an intelligent discrimination. They ensure correctness of diagnosis and encourage orderly and systematic habits.”¹¹¹ As such they neatly complemented the introduction of military drill in educational institutions, doing for the mental capacities what the military drill did for the physical ones. Together, mental training through sciences and physical exercise should render the boys into men that embodied the late-Victorian ideal of militaristic masculinity.

The nineteenth century began with a tension that persisted between two notions of the values and the identity of the philosopher. On the one hand, as Yeo explains,

¹⁰⁷ Hamerton, ‘Intellectual Life’, 459.

¹⁰⁸ *Ibid.*, 85.

¹⁰⁹ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 35th Meeting (1865):24.

¹¹⁰ Barton, *The X Club*, 315; for an account on how Tyndall and Huxley argued for the disciplining qualities of learning the scientific method, see p. 320.

¹¹¹ British Association for the Advancement of Science., *Report of the British Association for the Advancement of Science.*, 1864, 33rd Meeting (1863):94.

“the tradition with then most ancient pedigree depended on a set of associations between the man of knowledge - the savant or natural philosopher - and solitude.”¹¹² On the other hand, “the influential view of the scientific enterprise propounded by Bacon” which contained the notion of an assembly of philosophers who are concentrated in one place. In this scientific community, the individual truth-seeker will thrive through collaboration in a strictly homosocial environment.

The natural philosopher who works in seclusion and solitary neither mirrored adequately the Baconian ideal of the scientific communal work nor the growth of the scientific community nor the change of scientific work, that now included even more administrative and organizational work. Moreover, the effects of the shifts from a masculinity rooted in Evangelical domesticity to a more public, militaristic type of masculinity that was considered to thrive best in homosocial environments, intensified the suspect nature of the ‘solitary scholar’ even further.

The consequences of these transformations were noticeable in the critique of scientific practitioners, who still could be fathomed as representatives of this previous type of *savans*, from 1860 onwards. Former values of the polite society were increasingly deserted for virtues like honesty and frankness. This transformation can be seen in how much the contrasting, public images of Faraday and Tyndall clashed:

The meek and retiring manner of Michael Faraday was symbolic of the apologetic attitude which physical science adopted when it was first being popularised. It is now no longer the modest shrinking maiden, its face knows not the blush of shame, its mien is arrogant and aggressive.¹¹³

Historian DeYoung argues that “it is probable that Tyndall ... served as one of the main targets for the statement’s imagery of arrogance and aggression.”¹¹⁴ This new form of self-presentation that Tyndall and Huxley promoted still seemed disreputable for their contemporaries in the 1860s. Yet, this opinion underwent a change and by the end of the century, virtues like frankness and courage were considered adequate.

Tyndall fashioned himself as an adventurous hero, fighting for science’ progress. He appealed to virtues that fit the more imperialist, active model of masculinity. When Tyndall supervised three young men, it was their ‘moral energy’ that he referred to

¹¹² Yeo, *Defining Science*, 135.

¹¹³ DeYoung, ‘Tyndall’s Work as a Scientist’, 19.

¹¹⁴ *Ibid.*

when he formalized his judgement. In his view, all three men could work long hours and forgo sociability, signifying their possession of said energy. Nevertheless, when one of them fell by the wayside, Tyndall concluded: “he ... does not possess sufficient moral energy to look his faults in the face and trample on them.”¹¹⁵ Tyndall’s ‘moral energy’ encompassed endurance, stoicism and honesty towards oneself. A similar catalogue of virtues could be found in Stafford Northcote’s address, printed in the BAAS report of 1869. Progress in knowledge, according to Northcote, was only solidified by “wisdom and honesty...; aye, and courage too”. He elaborated,

for it is no slight trial to man, who with much labour and much ingenuity has collected a mass of materials, and has constructed a theory out of them, to find that, through some mistake ... the whole work must be taken to pieces, the materials sifted and rearranged, and the favourite theory abandoned.¹¹⁶

Thus, for the man of science, it was required that he was ready to abandon everything he felt some sort of attachment to, rid himself of the image he had of himself and be willing to annihilate it; or as Tyndall put it, “look his faults in the face and trample on them.”

The way that Tyndall’s frank and rational tone prevailed in the sciences by the end of the century correlated with the shift of ideas about masculinity. The model of masculinity linked with aggression and a more active, public display was represented by the new ascending generation of scientists to whom Tyndall and Huxley belonged. Former role models in science, Davy and Faraday, were associated with a different style of doing science and speaking about it, which from the 1860s became suspect. Davy’s emphasis on a poetic and impressive presentation of science and the fact that he allowed women to attend his lectures, elicited critique from many of his fellow scientists. The lecturing approach that exhibits the lecturer’s feelings could be viewed as the lecturer not having his passions under control, hence unmanly. This style of rhetoric, which revolved around sublimity, passions, “spontaneous feelings”, imagination and creativity, didn’t disappear completely but it lost their superior position in the rhetoric of a new ascending generation of men of science, who instead emphasized a more rational and frank tone.

¹¹⁵ Tyndall, “Journal”, 13 May 1847, quoted in Barton, *The X Club*, 73.

¹¹⁶ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 38th Meeting (1868):173.

Davy wasn't the only one whose appeal to imagination was considered suspect. Davy's prodigy, Faraday held a series of lectures, that were equally popular because they augmented one's "spiritual vision" and stimulated the listeners' imagination "to something beyond the mere exposition of physical facts"¹¹⁷. Faraday's ornate language evoked Tyndall to call him a prophet, lamenting that the language was not representative of the scientific idiom that Tyndall expected from his peers.¹¹⁸

But it wasn't only Faraday's lecturing style that caused younger scientists to frown. Faraday also represented the domestic ideal of a middle-class man, working and living in the same physical space. He lived in the Royal Institution and kept his room and remained Superintendent of the House until his death in 1867. His wife, Sarah lived there with him, the petty cash account books were written in Jane Barnard's, Sarah's niece, hand. With them lived Faraday's relative Benjamin Vincent, holding the position of Librarian and Assistant Secretary and his wife, who was another of Sarah's nieces. As historian DeYoung comments, "for Faraday, the public and private domain were not only adjacent; they overlapped."¹¹⁹ Moreover, though his working environment belonged to a public domain, his working method was solitary: "I do not think I could work in company, or think aloud, or explain my thoughts at the time."¹²⁰ In times, where scientists strived for manifesting the scientific method as the basis of all pedagogical and social policy, when the BAAS worked on the implementation of the Baconian program of 'modern science' and the group of scientists grew considerable, former scientist-models such as the talented showman Davy and the domestic genius Faraday ceased to match the ideas about an ideal scientist.

Rather, science in the new times required "a recruitment of a lot smaller minds into a program that sought to table results on a daily basis. The overall goal for this "army of scientific men"¹²¹ was not only the advancement of scientific knowledge, but the defeat of their enemy through showing unity in the right moment: In a report about the foundation of Zoological Stations in different parts of the Globe, the announcement

¹¹⁷ Crosse (1891), 42, quoted in Forgan, 'Faraday — From Servant to Savant', 65.

¹¹⁸ Forgan, 65.

¹¹⁹ DeYoung, 'Tyndall's Philosophy of Science and Nature', 61.

¹²⁰ Faraday to Hansteen, 16 December 1857, Correspondence, 2, 673, quoted in Forgan, 'Faraday — From Servant to Savant', 60.

¹²¹ British Association for the Advancement of Science, *Report of the British Association for the Advancement of Science*, 53rd Meeting (1883):7.

of Count Moltke's principle "marching separately and fighting conjunctively" preceded Dr. Dohrn's argument that "zoological battles may be best won, ... leaving to Systematists their own route, as well as to anatomists, physiologists, and embryologists, on condition only that they will, when meeting the enemy (Error and Ignorance), fight together."¹²²

The themes apparent here, namely the likening of the science community to an army and the aspiration to "fight together" were identical with two very prominent themes in the rhetoric of German scientists and physicians. To investigate the language of the latter is the purpose of the next part of this thesis.

¹²² British Association for the Advancement of Science., *Report of the British Association for the Advancement of Science.*, 1873, 42nd Meeting (1872):410.

Germany

The Glance to the German States – The State and Science

What British men of science saw when they glanced to the German states was an image of an uprising status of scientific knowledge. During the world exhibition in 1867, British scientific practitioners grew pale facing the German advancements. The shock about their inferiority in technological know-how, led chemist Edward Frankland (1825-1899) to criticize British decadence in science. In 1871 he wrote:

Thus, not only are we far behind in the aggregate of activity in discovery, but our individual productiveness is also markedly below that of Germany and France. From a purely national point of view, our case is even worse than it appears to be from a comparison of these figures, since a considerable proportion of the papers contributed by the United Kingdom were the works of chemists born and educated in Germany.¹²³

For historian Willink, the factors that caused this difference was the comparable small numbers of English tertiary education institutions. Because of the decisively smaller number of universities there was also a “permanent shortage of new jobs in ... English higher education.”¹²⁴ Furthermore, German states started from the mid 1860s to greatly invest in expensive apparatus for the universities and laboratories. The metamorphosis that science underwent from the mid-century, led to the introduction of scientific work employed in laboratories. The work in laboratories shifted the emphasis from doing work in home or museums to performing it in these new social spaces. This effected also the communication, that was more exhaustive than the former held in college halls and it also offered more opportunities for showcasing experiments to peers.¹²⁵

¹²³ Edward Frankland in *Nature*, 6 April 1871, 445, quoted in Willink, ‘On the Structure of a Scientific Golden Age Social Change, University Investments and Germany’s Discontinuous Rise to 19th Century Scientific Hegemony’, 42.

¹²⁴ *Ibid.*

¹²⁵ *Ibid.*, 41.

country: year:	Britain		Germany		Russia		United States	
	stud.	univ.	stud.	univ.	stud.	univ.	stud.	univ./col.
1860/ 1	3,385	5	12,188	20	5,000	9	22,464	
1870/ 1	5,560		13,206		6,538		31,900	560
1880/ 1	10,560		21,209		8,045		49,300	
1890/ 1	16,013		28,621		13,169		72,250	
1900/ 1	17,839		33,739		16,357		100,000	
1910/ 1	26,414		53,364		37,901		144,800	
1920/ 1	34,591		86,367		109,200		251,750	
1930/ 1	37,255	16	97,692	23	43,600	21	489,500	1,400
growth:	11 times		8 times		9-22 times		22 times	

Figure 3: Jarausch, *Absolute University Enrollment*, 1982. Note, how many more universities (tertiary education) existed in Germany in comparison to Great Britain.

Another reason for the ascent of German science was the economy that was made up by a multitude of federal states, which fostered competition. More importantly, the states' officials regarded the university as a means to facilitate the modernization of Germany. Underlying this was the notion, that science was a useful tool for propelling the industrialization of Germany. Of all the sciences, especially the experimental sciences obtained institutional support. The procedure of the experimental sciences included technological and routine work. This form of science "had come to signify the kind of 'cultural education' desired by a society trying to deal with the problems of a changing and growing economy."¹²⁶

That being said, to confer that the universities gained institutional support because the states' governments saw the outcomes of the research as "necessary for tackling the problems of an industrializing economy"¹²⁷ doesn't entail that universities directly contributed to the industrialization. Instead, they facilitated processes as rationalization, bureaucratization and professionalism, which catapulted the German states into modern States.¹²⁸ As historian McClelland summarizes, "the fundamentally modernizing forces of public schooling, technical expertise, and university *Wissenschaft* were accepted because the rationally oriented principles of day-to-day

¹²⁶ Tuchman, *Science, Medicine, and the State in Germany*, 7.

¹²⁷ *Ibid.*, 5.

¹²⁸ *Ibid.*, 13.

administration favored the augmentation of the power and prosperity of the monarch's state."¹²⁹

In order to further understand this close alliance between the state and science, I explain the emergence of militarism in Germany and focus on the nature of said connection.

Militarism – The State and the Military

Before starting with my investigation about Germany, I find it necessary to explain the emergence of militarism in German society.¹³⁰ The reason I am doing this is because the emergence of militarism in the German states led to a peculiar social configuration of German society that also influenced the relationship between state and universities, and between middle-class man and state. Furthermore, it influenced the circulation of certain models of male identity i.e., the officer and its civil counterpart, the reserve officer, that nineteenth-century physicians and philosophers referred to when they shaped their gender identity. The processes that I cover here, namely the emergence of militarism, the improved social position of the military and its members, the alignment between state and university and concurrently Germany's rise to scientific hegemony, all underwent fluctuations. Nevertheless, the overall tendency was to increase and intensify. After the union of the German states in 1872, the leading position of Prussia, where militarism was fully formalized, affected the social climate of the nation considerably.

At the end of this chapter, I conclude that the first connection between military and science consisted in the fact that military and university represented venues to disseminate virtues, which was linked with a certain model of masculinity, that was

¹²⁹ MacClelland, *State, Society and University in Germany, 1700-1914*, 153–54.

¹³⁰ One of the most prevailing opinions in Nineteenth-Century German historiography, is the emergence of militarism in Prussia that also influenced other German states but was nonetheless fully formalized in Prussia. For the emergence of militarism see Richter, *Staatskunst Und Kriegshandwerk. Das Problem Des "Militarismus" in Deutschland. 2. Bd.: Die Hauptmächte Europas Und Das Wilhelminische Reich (1890-1914)*; Meinecke, *Die Deutsche Katastrophe. Betrachtungen Und Erinnerungen*; Kehr, 'Preuß Ischen Reserveoffiziers'.

thought desirable because it helped propel Germany into a new age of a modernized, industrialized and capitalist economy.

After this digression, I show more direct connections between the military and science at the institutional and biographical level. Afterwards, I take a closer look into how the themes that I work out in this chapter figure in the rhetoric of nineteenth-century men of science.

The political climate in the first half of the nineteenth century in the German-speaking states was coined by the Liberation Wars. Discussion about the deficiency of the German standing Army led to the introduction of universal conscription in 1814 in Prussia; other German states followed. The introduction of conscription represented one of many reforms enacted in the military, universities and in the administrative apparatus, resulting in societal changes at a large scale.

The changes of the recruitment system had two lasting effects. First, because the conscription led to “all male subjects [to] become personally liable to perform military service”, it was now harder for the wealthy part to avoid military service. Second, now that officer ranks were made available for middle-class men to attain, a potential career in military became an option for many men.¹³¹ The increase in middle-class men entering the rank of officers, the creation of the reserve forces and the monarch’s high recognition of the military led to a rise of the status of the military profession. The assignment in the military was now a suitable and socially acceptable pursuit for an upstanding citizen.¹³²

The conscripted citizens, who have to serve in the military temporarily, formed the *Landwehr* (reserve forces). This conflation of citizen with officers and soldiers should evoke “national consciousness” in the entire male population. As Prussian official and professor of history Friedrich von Raumer (1781-1873) suggested, the “equable, early, and compulsory military service” should make the male populace aware of this duty and shed the “effeteness and indolence stemming from the wrong upbringing”.¹³³ The conflation would help overcome the “previous antagonism between the military and civilian classes” in two ways: firstly, by embourgeoisement of the

¹³¹ Simon and Mohamed Alaa Abdel-Moneim, *A Handbook of Military Conscription and Composition the World Over*, 75.

¹³² Ibid.

¹³³ ‘Raumer, Dated 14.6.1811’, 460.

officer corps and, secondly, by “gradually spreading a military spirit and sense of order throughout the entire nation”.¹³⁴

Although many of the eligible middle-class men dreaded the obligation to undergo military training, the educated class conjured up the association between military and masculinity, promoting it as the right upbringing for men. In the discussions leading up to the introduction of the conscription proponent Johann August Sack (1764-1831) emphasized that “art, science and public virtue” should go “hand in hand with heroic valour, the love of the fatherland, and the duty to defend it”.¹³⁵ In addition, philosophy professor Friedrich Paulsen (1846-1908) called his service in the army, that lasted from 1871 to 1872, the “school of masculinity” (Schule der Männlichkeit). Although other “schools” in which men were raised to incorporate certain attributes existed - formerly the professional world and in family upbringing -, “there is some evidence that military service became increasingly important in the formation of masculine ‘gender character’”. A central contributing factor was the raised social recognition of the military, which peaked in the Wilhelmine Empire. Moreover, the inclusion of men from other social ranks into the military in combination with the exclusion of women enhanced the meaning of gender as a clear social category.¹³⁶

The need for the formation of a refurnished masculinity was introduced by discussions about the effeminate generation of the Romantic: according to Ernst Moritz Arndt (1769-1860), his generation could be characterized with “foolish and feminine pleasures, laziness and cowardice” (läppische und weibische Vergnügungen, Faulheit und Feigheit). In line with his argument, a failed upbringing was responsible for the appearance of such unfortunate character traits.¹³⁷

Additionally, the customs of modernity, which were of finer and more gentle nature, would induce a general “effeminacy, pettiness, weakness, and cowardice” in the male populace (Verweichlichung, Kleinlichkeit, Schwächlichkeit und Feigheit)¹³⁸.

¹³⁴ Ibid.

¹³⁵ ‘Johann August Sack to Raumer’, 26 January 1811.

¹³⁶ Frevert, ‘Citizen-Soldiers: General Conscription in the Nineteenth and Twentieth Centuries’, 231.

¹³⁷ Ibid., 223-24.

¹³⁸ Carl Welcker, “Anhang zum Artikel Heerwesen (Landwehrsysteem),” in *StaatsLexikon oder Encyclopädie der Staatswissenschaften*, ed. Carl von Rotteck and Carl Welcker (Altona: Johann Friedrich Hammerich, 1839), 7:589–607, quoted in Frevert,

The conviction, that modernity fostered the amalgamation of what could be regarded the unique ability and skill of men with those of cultivated citizens who had to follow customs of politeness and embody a sort of cultivated sensitivity, added weight to the appeal to military training as ‘masculizing’ men. Frevert summarizes, “although they had markedly different opinions about the duration and location of the aforementioned training, southern German liberals and democrats were as convinced of its necessity as Prussian conservatives.”¹³⁹

Because now every man was potentially eligible to perform military service and could be held accountable for that, the army became the only institution with a potentially formative influence on most male citizens of the empire.¹⁴⁰ This, in theory, also included the educated classes. A considerable number of students entered university in their first year as reserve officers (Einjährigfreiwilligen). The student-soldier, although spared from the “normal rigors of draft into the army”, stood under military discipline. The institution of the Prussian reserve forces, the *Landwehr*, was responsible of fostering the “martial education of the people and unites every Prussian in their common interest for king and fatherland”. Citizen and soldier should be conflated to such a degree that, as field marshal Gebhard Leberecht von Blücher put it, it would be hard to determine where the estate of citizen ends, and the estate of soldiers begins.¹⁴¹

Regardless of whether a young man could avoid undergoing military training or even the draft into army, the military rose to a prominent position in the imagery of German society and the male identity of reserve officer became a point of reference for middle-class men. In fact, the high social recognition of the military prompted middle-class men to prefer fashioning themselves in terms of their rank as a reserve officer than on basis of their civil vocation. Industrial pioneer of electrical engineering and scientist-entrepreneur Werner von Siemens (1816-1871) gave an example of this, when he recounted his life in his autobiography from 1893. He wrote,

“Citizen-Soldiers: General Conscription in the Nineteenth and Twentieth Centuries” in Simpson (Ed.) Enlightened War W. v., 224.

¹³⁹ Frevert, ‘Citizen-Soldiers: General Conscription in the Nineteenth and Twentieth Centuries’, 223–24.

¹⁴⁰ See Frevert, ‘Das Militär als Schule der Männlichkeiten’.

¹⁴¹ Artillerie-Akademie Berlin, *Die Staatskräfte Der Preuß Ischen Monarchie Unter Friedrich Wilhelm III. Von Dem Freiherrn von Zedlitz*, quote from Blücher from 23.

Although I have always gained a certain amount of satisfaction from the fact that I owe my position in life to my own work, nevertheless, I have always recognized with gratitude that my path was made easier for me by my acceptance into the Prussian army and thereby, into the state of the great Frederick. ...there existed no well-off, educated middle class that could have acted as a counterweight to the military, the state officials and the aristocratic landowners. Under these circumstances, it meant a lot in Prussia to belong, as an officer, to court society and thereby to have access to all social circles.¹⁴²

Siemens hinted in his autobiography at the peculiar social fabric, characterized by the strong alignment of the aristocracy and military to the monarchy. This alignment, and accordingly the high status of the military, was promoted by the Crown. The promotion was imbued with the pathos of devotion to the Crown.

The emphasis on loyalty to the monarchy and national devotion was also apparent in the changed recruitment system for officers. When recruiting officers, preferences should be given to courage, selflessness and devotion to the national state instead of nobility; not the sons of aristocrats but the sons of men who were killed in action, should be preferred for promotion to officer. Non-commissioned officers and even soldiers became eligible to rise to the rank of officer if they showed great valor in times of war. As a result of this new recruitment strategy, the promotion of virtues like “unwavering loyalty to the king and civil obedience, as well as orderliness, cleanliness, punctuality, thrift, and self-discipline” became evident. The first minister of war summarized these virtues as “virtues of the state’ citizen” (Tugenden des Staatsbürgers). The army portrayed themselves as their promoter, this way realizing their goal to conflate military with citizenship.¹⁴³ Aside from the promotion of these virtues, the army was also responsible for disseminating a militaristic notion of discipline into broad strata of the society.¹⁴⁴ Blessing writes that the education in the army did not only fulfill the function of expanding the numbers of potential soldiers but that it worked also as a formative organization that fostered the modernization of German states by training men in virtues, that were thought to prepare them for a

¹⁴² Frevert, ‘Citizen-Soldiers: General Conscription in the Nineteenth and Twentieth Centuries’, 298–99.

¹⁴³ Boyen to Vincke, January 4, 1815, quoted in Frevert, ‘Citizen-Soldiers: General Conscription in the Nineteenth and Twentieth Centuries’, 229.

¹⁴⁴ Blessing, ‘Disziplinierung Und Qualifizierung. Zur Kulturellen Bedeutung Des Militärs Im Bayern Des 19. Jahrhunderts’, 461.

modern, industrialized economy. The army, as an organization, propelled its members into the modern world. Especially the general population experienced service in the army as an exercise in a physical-moral *Habitus*, which 'modern' element consisted of making them efficient subordinates.¹⁴⁵

Thus, a pivotal feature of this German militarism was that it was grounded and fostered by the state, which was concerned with propelling Germany into the age of industrialized national empires. Additionally, the German monarchies and ministers were interested in binding the population to the interests of the monarchy. As a result of the lack of societal 'weight' that the bourgeoisie had, part of the latter (the *Besitzbürgertum*) imitated the aristocracy in their public appearance and adopted in an opportunistic fashion their military conventions.¹⁴⁶

The State and the University

Mirroring the state's influence in the military and the increasing 'militarization' of the German upper and middle class, was the governments' support and influence in universities. Although the first half of the nineteenth century was characterized by *bildungsliberale* ideas¹⁴⁷ and protests against the state's interference and censorship, the universities would increase their alliance with the state over the course of the whole nineteenth century. Tuchman points out, that whenever important positions in the government were held by liberal-minded ministers, the state poured more money into science education (e.g. Baden in 1830s under Ludwig Winter, in the 1850s and 1860s under Franz Freiherr von Stengel and then August Lamey, in Saxony in the 1860s under Johann Paul Freiherr von Falkenstein; and in Prussia in the 1830s under Karl Freiherr von Stein zum Altenstein). This governmental support was not so much politically motivated, as it was the consequence of the liberals' belief that education in natural sciences prepared its pupils for life in a modern economy.¹⁴⁸ Thus, overlooking

¹⁴⁵ Ibid., 474-75.

¹⁴⁶ Mertens, 'Das Einjährig-Freiwilligen Privileg. Der Militärdienst Im Zeitgeist Des Deutschen Kaiserreiches', 318.

¹⁴⁷ Jarausch, *Students, Society and Politics in Imperial Germany*, 12, but also see chapter 4 to 6.

¹⁴⁸ Tuchman, *Science, Medicine, and the State in Germany*, 8.

the relationship between German state officials and professoriate over the course of the nineteenth century, it becomes evident that there existed a relatively beneficial relationship between state and university. The nature of this relationship might explain why, even shortly after the revolution in 1848, in which many students protested against the surveilling influence of the state in universities (“Karlsbader Beschlüsse”), “most professors were undoubtedly loyal and apolitical or, in many cases, served the state with unswerving conservatism”.¹⁴⁹ The conservatism of the professoriate revealed itself also in the acceptance of the introduction of conscription, that forced many of the students to serve temporarily in the military thus drastically changing the socialization process of the student body.

From the 1850s onwards, German universities became places of support and facilitation for experimental sciences. New faculty positions and expensive research institutes were founded with the help of financial funds from the government; examples were Robert Bunsen’s chemistry laboratory in Heidelberg, Carl Ludwig’s physiology laboratory and laboratory of the University Jena in which Ernst Haeckel (1834-1919) worked for a period of time.¹⁵⁰ Parallel to this increasingly intensifying alliance between state and university, the ideology of the neohumanist *Wissenschaft* got replaced by a more utilitarian idea of science, *Bildung* made place for *Ausbildung*, and with it the laboratory prevailed as the place where the science that was regarded most useful for tackling the problems of industrialized Germany (experimental sciences) was performed.

By the 1870s this strong connection between the state and university was fully crystallized. As MacClelland notes, “The clear trend in relationships between state and university in the German Empire ran toward greater control and initiative of the former at the expense of the latter.”¹⁵¹

The universities and (from the 1850s onwards) newly founded institutes, in which scientist performed their labor, occupied a position in German society that was characterized by the institutional support they received and the belief of the government in sciences’ utility for fostering the modernization process in Germany.¹⁵²

¹⁴⁹ MacClelland, *State, Society and University in Germany, 1700-1914*, 228.

¹⁵⁰ Tuchman, *Science, Medicine, and the State in Germany*, 4–5.

¹⁵¹ MacClelland, *State, Society and University in Germany, 1700-1914*, 289.

¹⁵² Tuchman, *Science, Medicine, and the State in Germany*, 9.

It is this, which represent the first big connection between military and science: By the 1880s, university and army, both represented epitomes of national pride, both were fashioned to be closely aligned with the Empire's drive to exert control over the areal of terrain and over nature and both represented venues for disseminating ideas about a model of militarized masculinity that corresponded with the aspiration of German politicians, physicians and other professionals to meet the demands of modernity. As these forums, they exuded great importance for the identity of the German fatherland. Or as chancellor Bismarck put it:

Hold fast to the national spirit...! What is it that sustains the German official? The university and the army, indeed, two imponderables, which nonetheless exert a weighty influence.¹⁵³

¹⁵³ Oppermann, *Alemannia 2*: 1-3, quoted in Jarausch, *Students, Society and Politics in Imperial Germany*, 21.

The Military and Science – Alliances and Careers

Another important aspect of the relationship between science and the military consisted in the military enabling scientific careers. The state's perspective about sciences' utility for an industrialized economy and modernized society directly translated in funds for the development of the tertiary education sector. In contrast to Great Britain, the German states expanded their tertiary education sector, which increased the positions available for employment for science graduates.

Propelled by advancements in modern science, technology, and industrial economy, reformers demanded the introduction of a more "realistic education" that should focus more on modern languages and the natural sciences.¹⁵⁴ To satisfy these demands, a new type of college, the *Technischen Hochschulen* were founded. Next to the technical colleges, military academies such as the *Preußische Militärakademie* were educating young men with a similar emphasis on natural sciences and modern languages. In their curricula, the students would be taught artillery-science, physics, mathematics, the art of fortification, architectural drawing, military geography and introduction into the zoology of horses.¹⁵⁵

Military institutions like the *Militärakademie* did not only represent places of employment. Rather, the military also granted men of more modest origin the opportunity to study in fields that could lead to a scientific career. In other words, similar to Great Britain the military enabled scientific career. One exemplary case was that of Hermann von Helmholtz (1821-1894) who became first director of the *Physikalisch-Technische Reichsanstalt* (PTR). In order to realize his wish to become a physician he accepted a government stipend. This fund enabled talented young men, who's fathers lacked the financial means, to receive higher education. In return for that support, the young men agreed to serve eight years in the army. Helmholtz, after receiving his M.D. degree in 1842, served five years as an army surgeon in Potsdam.

The personal connection to the army and the court helped Helmholtz and Siemens not only in their individual careers but in founding a new institute in the second half of the nineteenth century. This new institute should fuse research in natural

¹⁵⁴ Jaraus, 103.

¹⁵⁵ Artillerie-Akademie Berlin, *Die Staatskräfte Der Preuß Ischen Monarchie Unter Friedrich Wilhelm III. Von Dem Freiherrn von Zedlitz.*

sciences with research and developments in technology. Other lobbyists were teacher of mathematics Karl Schellbach and astronomer Wilhelm Foerster. At that time, officials in the Prussian academy for sciences (*Preußische Akademie der Wissenschaften*) had a negative attitude towards technology, thus the proposal of the lobbyists got declined by the *Akademie der Wissenschaften*. After this rejection, Foerster forwarded the request to the *Preußische Landestriangulation* of whom the chair was Helmuth von Moltke. The chief of the military general staff (“Generalstab”) recognized the military use that improved precision technology would provide, which prompted the formation of a commission that would look into the level of German precision technology. The commission confirmed the need for technological improvement. The *Preußische Landtag*, where the report of the commission was forwarded to, were hesitant to make a decision. Once again Moltke and Siemens made efforts to push the foundation of an institute for the natural sciences and technology on the agenda of the Federal Council. A few years later, the foundation of Siemens’ institute for physics and technology became reality. The property for the new PTR amounted to 25.739 square meters; a size that rendered the PTR to one of the largest, if not the largest site for physical research till 1920.¹⁵⁶

In addition, a further connection was the role that military men played in science. One important group consisted of military surgeons, which was also prominent in the gatherings of the Society. From 1827, the executive of the seventh meeting, Alexander von Humboldt (1769-1859) introduced specialist departments. These new founded ‘sections’ should facilitate the high level of discussions, that were a reflection of the progressing specialization of the sciences; the romantic type of ‘Universalgelehrter’ was slowly but steadily replaced by the expert. In 1868, military surgeon Wilhelm Roth (1833-1892) founded the department for medical services for the military, the *Sektion Militärsanitätswesen*. One of their goals was to facilitate discussion of remaining research questions which emerged during the most recent experiences in the battlefield hospital. An important medium for broadcasting the lectures held at the meetings of the *Sektion Militärsanitätswesen* was the, in 1872 founded journal *Deutsche Militärärztliche Zeitschrift*.¹⁵⁷

¹⁵⁶ Bortfeldt, Hauser, and Rechenberg, *Forschen, Messen, Prüfen : 100 Jahre Physikalisch-Technische Reichsanstalt/Bundesanstalt, 1887-1987*, 30–39.

¹⁵⁷ Rauch, ‘Die Sektion Militärsanitätswesen auf den Versammlungen der Gesellschaft Deutscher Naturforscher und Ärzte von 1868 bis 1913’, 4–6.

The influence of the military as an institution and its members like von Moltke cannot be underestimated. It was as a reserve officer that Siemens gained access to men in the highest rank and it was through von Moltke's lobbying that the commissions acted favorably for realizing the foundation of an institute such as the PTR. The great investments that facilitated the foundation of huge research institutes like the PTR were one of the reasons which rendered the German Empire at the end of the nineteenth century "to become a superpower in the empire of science."¹⁵⁸

¹⁵⁸ N.N., "Carl Friedrich Gauss und Wilhelm Weber," *Zeitschrift des Vereins Deutscher Ingenieure* 824-825, quoted in Horst Michling, *Vom Gauß-Weber-Denkmal und seiner Einweihung. Mitteilung der Gauss-Gesellschaft* (1969) 6:16-21.

Rhetoric Part III

Appeal to Military Culture in the Speeches at the Meetings of the GDNÄ

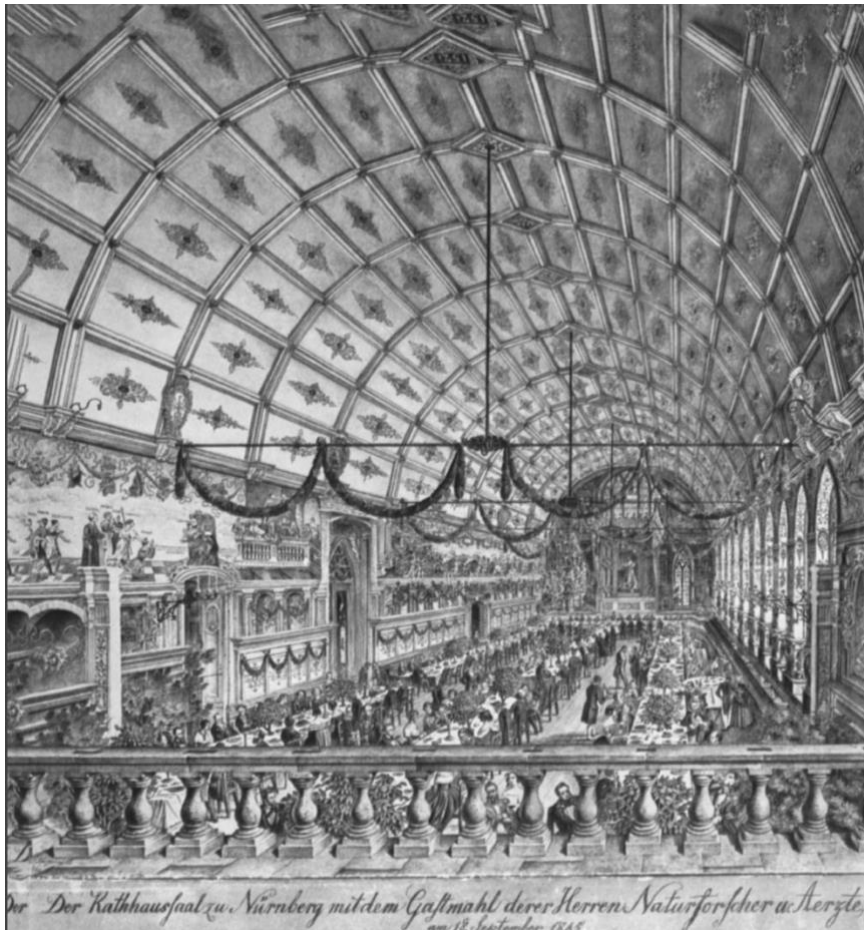


Figure 4: Georg Christoph Wilder, *Ansicht des großen Rathaussaales mit dem Bankett der Naturforscher und Ärzte am 18. September 1845*. Council chamber in which the Society dined after their meeting in 1845.

The gatherings of the Society of German Naturalists and Physicians contained as much festivity as the meetings of the BAAS. (The exuberance of the communal dinners in the evening would even attract critique in the succeeding decades. See figure 4). A difference to the published reports of the BAAS was that the German daily proceedings contained festive salutations that were full of poetic pathos. The celebration in the evenings often took place in beautiful theatre which were decorated accordingly.

For example, during the celebration of the Seventh meeting, the columns opposite of the entrance to the hall of the Royal theatre were embellished with banners. They listed the most prominent, deceased German natural philosophers. Aside from the names, two epigraphs adorned the walls. One of them was a quote from a poem by Friedrich Schiller (1759-1805): “— in fiery battle, there erupt zealous powers, their quarrel yield big things, their union yield even greater things.” In this inscription one can find the themes that will pertain in the rhetoric of the attendees of the Society’s meetings throughout the whole nineteenth century: First, that scientific disputes generate scientific results and progress, and that, outside these quarrels, the adversaries stand in union. Second, the cultivation of the idea that battle facilitates energetic output that would encourage men to excel. The link between these two convictions is that they represented the major themes in which German scientists revealed their alliance to the idea of science propelling the German nation into modernity.

“— in fiery battle, there erupt zealous powers, their quarrel yield big things,...”
- *Virtues of the ‘Modern’ Man*

Already in the first decade of the gatherings of the GDNÄ, the “victory of the natural sciences” was declared. Indeed, the speeches of the meetings leading up to 1830 show rising faith in the success of the sciences, mentioning that “in no other branch of knowledge there is such a fast and unstoppable progress perceivable than in the field of the natural sciences.”¹⁵⁹

This victory gave way to “men’s mastery of nature”, or as physician von Langenbrücken put it: “the natural science has enhanced the spirit of men and bestowed him, through the recognition of the natural laws which stand in harmony with his reason, infinite rulership over the nature.”¹⁶⁰ In his speech about the “new natural

¹⁵⁹ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte.*, v.7-8 (1828-1829):16.

¹⁶⁰ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte.* 1860, v.35 (1860-1861): 41; Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, 1836, v.14-15 (1836-1837):70–71; Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher*

sciences”, Helmholtz realized with insight that the progressing mastery of nature was due to men’s desire for control over the natural forces.¹⁶¹ The goal was to subordinate nature to men’s moral purposes and the route towards it was through science. Correlating with the superior attributes that science endowed its practitioners with, was the notion that “intellectual strength” and “power of observation” were called “the most powerful weapons” that men possess in the struggle for life.¹⁶² Historian Tuchman notes that the liberals believed the education in natural sciences to be the best preparation for life in the modern economy; the lower class would acquire skills and a ‘modern mentality’ that would ease the transition from farm work to employment in small manufactories” and middle-class men would feel inspired to participate in an entrepreneurial fashion in economic and political matters.¹⁶³

Nevertheless, it was not only the case that science conferred her practitioners with abilities and attributes that would render them prepared for life in the Modern Age. Instead, the speakers at the Society’s gatherings emphasized military virtues as well. Virtues, that traditionally were considered to ideally belong to the personality of military men, were of use for the physician and scientist to possess as well. The lack of fear and the ability to stay clearheaded and brave in battle, important military virtues, were highlighted in speeches during the meetings of the GDNÄ. In one of them, physician Ignaz Langer emphasized how “zeal, goodwill, industry, caution, knowledge, skill” were imperative for military doctors to possess, as they have to be ready to face the consequences of the battle with “calm..., with courage and consideration”, so he can assist the patients “with energy”. This shows how attributes, that men would be said to gain during their military training, also proved beneficial when present in men of science. When Helmholtz praised the developments in recent medicine and physiology in his speech in 1869, he praised at first the industriousness of Germans.

Naturforscher Und Aerzt., 1857, v.33 (1857-1858):81; Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, 1857, v.34 (1857-1858):45.

¹⁶¹ Hermann von Helmholtz, “Über die Entwicklungsgeschichte der neueren Naturwissenschaften”, Vers. d. GDNÄ (1869), quoted in Autrum and Ärzte, *Von Der Naturforschung Zur Naturwissenschaft: Vorträge Gehalten Auf Versammlungen Der Gesellschaft Deutscher Naturforscher*, 34.

¹⁶² Werner von Siemens, “Das naturwissenschaftliche Zeitalter”, Vers. d. GDNÄ (1886), quoted in Autrum and Ärzte, *Von Der Naturforschung Zur Naturwissenschaft: Vorträge Gehalten Auf Versammlungen Der Gesellschaft Deutscher Naturforscher*, 143.

¹⁶³ Tuchman, *Science, Medicine, and the State in Germany*, 8.

However, the most significant factor, he concluded, was the fact that “a greater fearlessness prevails in face of the consequences of the whole and full truth” than in other nations. It was the German language and “German industriousness and German fearlessness in [face of] truth” which signified the borders of the German fatherland.¹⁶⁴ Two years later, after the Germans defeated France, Benjamin Theodor Thierfelder resonated with satisfaction that “the victory of German weapons is a victory of the German intellect, that intellect...which we have to thank for, that integrity, loyalty, manfulness, self-denial are considered to be virtues of the Germans.”¹⁶⁵

The mentioning of “manfulness” sounds like a direct reply to the aforementioned debates about the perceived lack of manful attributes and skill that would clearly delineated men from women, uniting them at the same time as the protruding sex. This social aspiration, exerting great power through homosocial competition and manifesting great power in unity, found its biggest rhetoric equivalent in Schiller’s poem, that adorned the wall of the hall, where the seventh meeting of the GDNÄ was held: “— in fiery battle, there erupt zealous powers, their quarrel yield big things, their union yield even greater things.” The allusion to male power was invoked again and again in the speeches of the Society’s participants: In the closing speech of the twenty-ninth meeting, the speaker declared: “Although we have fought, the fight didn’t divide us, it didn’t impede our striving, it fostered it; for battle must exist, our lives are battle and only in battle there is life...”¹⁶⁶ The allusion to men ‘toughening’ through battle, impelling them towards excellence, shows traces of the early-nineteenth-century debate revolving around the suspicion that men – especially middle-class men – might “degenerate” to a “weakened sex” (verweichlichtes Geschlecht). In another address in 1867, the speaker explained: “...the times of political unrest and social battles and revolutions are as well the times, in which the sciences gain biggest momentum..., while conversely the times of peaceful stillness allows intellectual life to degenerate

¹⁶⁴ Hermann von Helmholtz, “Über die Entwicklungsgeschichte der neueren Naturwissenschaften”, Vers. d. GDNÄ (1869), quoted in Autrum and Ärzte, *Von Der Naturforschung Zur Naturwissenschaft: Vorträge Gehalten Auf Versammlungen Der Gesellschaft Deutscher Naturforscher*, 61-2.

¹⁶⁵ Gesellschaft Deutscher Naturforscher und Ärzte, *Tageblatt der 44. Versammlung DGNÄ in Rostock vom 18. bis 24. September (1871)*: 17.

¹⁶⁶ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, v.29-30(1852-1853):75.

and become marshy.”¹⁶⁷ In a speech during the seventeenth meeting of the Society, surgeon Holscher stressed that scholarliness alone will not suffice, the scholar needed to develop “moral strength”. Holscher saw the need for this strength in preventing its possessor of giving themselves away to physical and mental effeminacy. He advised his listeners to develop aforementioned strength, for, it is that which will secure that the scientist will still be able to continue work while ill. When men of science should reach a new height of “moral strength, spiritual freedom and intellectual autonomy”, it would elevate them above mundane matters such as their mortality and physical weakness.¹⁶⁸

“...their union yield even greater things.” - Scientific Community as Army

The close alliance between the ministers and princes of the states and the universities, became not only visible in the festivities accompanying the meetings but also in the rhetoric of the speakers, who fashion the assembly as celebrations of “national importance” (1860). Although being split in sections according to their respective disciplines, they formed a phalanx as scientists. On their agenda lay the implementation of Bacon’s science program and the “legion’s route” to their “victory” was empirical sciences.¹⁶⁹ The “age of the natural sciences’ reign” was seized by the efforts of the scientific practitioners, “an army of observers and employees.”¹⁷⁰

¹⁶⁷ Gesellschaft Deutscher Naturforscher und Ärzte, *Tageblatt der 41. Vers. DNÄ*, vol. 3, (1867):19: orig., “...die Zeiten politischer und socialer Kämpfe und Umgestaltungen auch diejenigen sind, in denen die Wissenschaften den höchsten Aufschwung gewonnen, ...während umgekehrt die Zeiten friedlichen Stillebens ... das geistige Leben verkommen und versumpfen lassen.”

¹⁶⁸ Gesellschaft Deutscher Naturforscher und Ärzte. *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, v.17(1839-1840):855.

¹⁶⁹ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte.*, v.14-15(1836-1837):70; Kant., *Kritik der reinen Vernunft*, 18.

¹⁷⁰ Autrum and Ärzte, *Von Der Naturforschung Zur Naturwissenschaft: Vorträge Gehalten Auf Versammlungen Der Gesellschaft Deutscher Naturforscher*, 144,148.

Another example for the conjunction between the assembly of German naturalists/physicians and an army, embodying national sentiment can be found in Rudolf Virchow's (1821-1902) rhetoric. He called them "ecclesia militans" (1860), "a pugnacious army" which "encourages the German mind to do noble deeds" (1861) and finally, "the method of the whole nation" (1871).¹⁷¹ Preceding Virchow's analogy of the Society with the army, was Carl Remigius Fresenius (1818-1897) opening speech in which he declared that "through the exchange of thoughts of so many excellent men, proven things shall remain, doubtful things get removed, opposing things clarify, new things emerge, so that the banner of truth expands with ever more joy and liberty, which every science has to carry forward as their flags and standards."¹⁷²

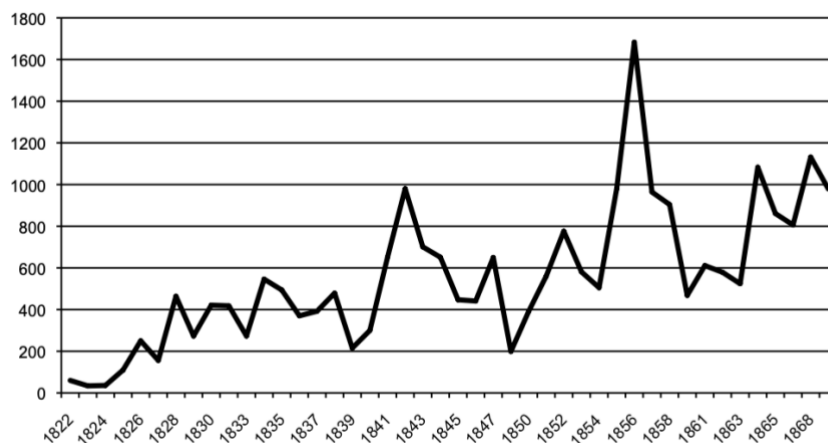


Figure 5: Schanbacher, attendees of the general meetings of the Society, 1822-1869. The numbers of members increased substantially over the nineteenth century, leading to new demands in organizing and facilitating science disputes.

¹⁷¹ Seen in Querner, Schipperges, and Gesellschaft Deutscher Naturforscher und Ärzte., *Wege der Naturforschung 1822-1972 im Spiegel der Versammlungen deutscher Naturforscher und Ärzte*, 33–34.

¹⁷² Gesellschaft Deutscher Naturforscher und Ärzte., *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte.*, 1852, v.29-30(1852-1853):3.

Fresenius' and Virchow's similes were another representation of the self-image that consisted of a crew of proud men, united in their search for the truth. In the army, banners fulfill the function of providing visual clues for the military structure, that contains sub-groups. Simultaneously, flags have a decorative function; their meaning unfolds fully in the spectacle. To liken the Society, and to further extent, all German philosophers to an army, expressed scientists' belief about the national importance of natural science in propelling Germany into an improved, modernized status.

Complying with Blessing's argument, that the university promoted processes of rationalization, the division of the philosophers into sections, each metaphorically carrying forward "their flags and standards", does not only mirror procedures in the reformed army but was also symptomatic of the nature of the reforms that aimed at 'modernizing' science.

Yet, more is hidden in the usage of this analogy: the nineteenth-century developments of both 'systems' (army and science community) were coined by an increased influx of men stemming from the middle class. Helmholtz recognized the importance of a functional organization of a large group of men, as it was realized in the reformed army, thusly he declared that scientists formed "a sort of organized army." Their work, Helmholtz considered, was "for the good of the entire nation and almost always on its order and at its cost."¹⁷³ The importance of good organization was highlighted by fellow physician Christian Gottfried Nees von Esenbeck as well. In his speech at the twenty-ninth meeting of the GDNÄ, von Esenbeck lamented the lack of good leadership and organization of the "army of physicians" through the state:

Why has the state, which understands very well to organize its people, organized its army of physician in such a bad way and wages war against the epidemic, that kills thousands, in such an incompetent manner? (...) He, who leads his army into the field so badly as the imperial general of the health care system does with his, would suffer one disgraceful defeat after the next.¹⁷⁴

¹⁷³ Helmholtz, "Ueber das Verhältnis der Naturwissenschaften zur Gesamtheit der Wissenschaft: Akademische Festrede gehalten zu Heidelberg beim Antritt des Prorektorats 1862," in Helmholtz's *Vorträge und Reden*, 4th ed., 2 vols. (Braunschweig, 1896), 1, 159-85, quotes on 180-82, quoted in Cahán, *An Institute for an Empire*, 67.

¹⁷⁴ Gesellschaft Deutscher Naturforscher und Ärzte, *Amtlicher Bericht Über Die Versammlung Deutscher Naturforscher Und Aerzte*, v.29-30(1852-1853):63.

To fashion the entirety of men of science as an army, was emblematic for the changes that the scientific community underwent from the first half of the nineteenth century to the second half.

From the 1850s onwards, research included laboratory classes. An important characteristic of the laboratory classes was that they were intended for all students of science and medicine. In this regard, they represented a feature of the 'modern sciences' which did not revolve around an elite group of geniuses, but that incorporated bulks of technicians into the organization of sciences. As Emil du Bois-Reymond (1818-1896) illustrated in his inaugural lecture dedicated to his new institute in 1877:

[It] is not on account of the geniuses (may there be many among you) that this institute is here ; geniuses have always succeeded in making their way even without such institutes. Rather to impart sound physiological intuition and rigorous inductive training as light and armor in the insecure half-darkness of medicine to the person of average intelligence, indeed to the person of lesser ability; that is the reason for the existence of this institute, and if it achieves this purpose, the sacrifices for it will not have been too great.¹⁷⁵

By the end of the nineteenth century, the state-funded metamorphosis of science resulted in a different organization and working procedure. Although advanced research continued to be employed in institutes, the introduction of laboratory classes to train students in routine and technical procedures, distinguished these working spaces from the small office spaces, scientific cabinets, and museums of the early nineteenth century.¹⁷⁶ Historian Lenoir calls this "an institutional revolution in the organization of science in the German states"; a reaction to a science that was "self-consciously" tailored to answer the demands of a nascent, industrializing, capitalist economy.

The repeated appeal to an army that is organized on a national level, shows the extent to which the professoriate of German universities formed a national kingdom before the German states formed an actual empire. The meetings of the GDNÄ were part of the "species of 'national' organization and communication", that German professors achieved by the 1840s. What united them, was their shared faith in

¹⁷⁵ Bois-Reymond, 'Der Physiologische Unterricht Sonst Und Jetzt', 651.

¹⁷⁶ Tuchman, *Science, Medicine, and the State in Germany*, 11.

Wissenschaft to solve problems, emanating from the magnitude, that the industrialized German-speaking area and later German Empire represented.

Both, the image of the 'soldier' and 'scholar' rose in their social standing and gained prestige over the course of the nineteenth century. This rise of both models of male professions in the imagery of German society, became a fact only when it was perceived by others. The necessity of presenting the military in a spectacle in order to establish its importance and prestige was already a well-established part of military culture, which included rituals and symbols like uniforms, flags, standards, paroles, parades, etc. For, the process of adhering an identity succeeds in the process of positioning oneself in the realm of cultural imagery; "the masculine, in short, is as much a spectacle as the feminine."¹⁷⁷ Thus, the way in which German men of science likened themselves to an army and referred to military culture and virtues revealed the necessity of the spectacle for men's self-fashioning.

¹⁷⁷ Adams, *Dandies and Desert Saints*, 11.

Conclusion

The aim of this thesis was threefold. First, I aimed to show how nineteenth-century men of science were influenced by the promotion of certain ideas about masculinity and how they referred to them in order to gain more recognition, and concurrently more financial support from the sovereign. Second, I wanted to close the gap in historiographical research about connections between the emergence of the profession of scientist and the self-fashioning of middle-class men, rendering their profession masculine. Third, I wanted to investigate connections between military and science in the nineteenth century; a topic that is lacking exhaustive historical research as well. As far as the latter is concerned, I narrowed it by presenting a multitude of connections that characterized the relationship between military and science. For one, there were biographical connections; in both nations, army and navy represented a way of enabling men of more modest origin to pursue a profession in medicine, which became the starting point for a career in science. Likewise, the military invested in scientific developments, lobbying for the foundation of a technological institution or providing the equipment for scientific enterprises.

Now, concerning the other two goals: I argued that nineteenth-century scientists invoked virtues and appropriated customs stemming from aristocratic lifestyle and the military. The reason they did this was to liken themselves to men whose identity was considered to correspond with aspects of hegemonic masculinity.

At the beginning of the nineteenth century, the image of the scholar and middle-class man was problematic, particularly in its rendition as unmanly. In contrast, the aristocratic Gentleman and the 'reserve officer' represented aspects belonging to hegemonic masculinity, such as taking active part in the world and coercing change, if necessary, with violence.

Yet, notions about hegemonic masculinity changed over the course of the nineteenth century. Especially in Great Britain, the shift from the ideal of 'domesticity' to a more imperialist, active and militaristic idea about masculinity coined the imaginings that shaped the gendered self of scientists. In case of Germany, I argued that the emergence of militarism influenced ideas about masculinity. Here, I operated on the basis of assuming that the effect of militarism unfolded throughout the nineteenth century. This is why I did not mention a relevant shift in ideas about

masculinity, similar to the one in Great Britain. Surely, this can be criticized. I won't be surprised if future research will detect that there were significant shifts in models of masculinity and that the models differed more than I assumed from one German state to another prior to the German unification.

Overall, the change in what was considered to be manly, was a reaction to the new demands that the organization of an industrialized, capitalist state posed to its citizens. One demand consisted of controlling a large group of people, while guaranteeing useful output. The solution to this demand resulted in different forms of organization and in a different layout of work. Interestingly, in both segments – army and science – the solution included division into sections and transforming 'duties' into task that can be done routinely and without excellent mental ability. The virtues that matched these developments included endurance (of tedious work), obedience (to follow strict working procedures), courage (to dismiss one's preferences for one theory), discipline and strength to continuously perform in compliance with these virtues.

In my research the emphasis lied in the interrelation between models of masculinity that were promoted top-down because they were considered to entail a guideline for how to adopt to, even propel the processes that the industrialization unleashed. In brief, I highlighted the interrelation between masculinity and state. As Graham states, "those forms of manliness that have proved efficacious for nationalist endeavor have been approvingly recognized and furthered with all the power at the disposal of the state...."¹⁷⁸ Processes that led to the expansion of a capitalist, liberal and national economy demanded different behaviors from its citizens. To answer these demands procedures such as rationalization, democratization, bureaucratization and professionalization were promoted. Two venues for the dissemination of these procedures were the army and the university. More specifically, the meetings of the BAAS and the GDNÄ.

Nonetheless, to concur that industrialization changed everything is an old historiographical tale. Rather, I showed how men of science reacted to these shifts and participated actively in the task of fashioning an identity for their newly emerging profession. While performing this task they alluded to models of masculinity and

¹⁷⁸ Dawson, *Soldier Heroes: British Adventure, Empire and the Imagining of Masculinities*, 1-2.

virtues that were ascribed to these and they created platforms through which their self-fashioning entered the public perception.

The emphasis on being *seen* as imagined, in order to become recognized as imagined appeals to Graham's truism that the "masculine is as much a spectacle as the feminine." In my research, I worked out the ways in which men of science directed the spectacle that should serve their desire of attaining recognition as 'full men' in front of other, more powerful men. What escaped this line of vision and, consequently has not been investigated here is the possible role that the female gaze played in contributing to the constitution of certain models of masculinity, including the ones that scientists referred to.

In a podcast from the 21st of April 2020, four gynecologists were talking about their profession. In the middle of the talk one of the gynecologists asked prof. dr. Mandy Mangler, who is inhabiting a chair of gynecology in Berlin, why there is still such a lack of women in that position. Her answer was that she is taking part in a game of which she didn't created the rules. "The rules of the game are definitely male-centered." (Die Spielregeln sind klar männlich definierte in meinem Beruf).

In order to gain the power to self-define these rules, men of science appealed to virtues that were associated with hegemonic masculinity, thus rendering their profession as masculine. As I showed men of science and 'Naturforscher' defined a male culture as they were searching for their place in society. When I talk about culture, I refer to an anthropological definition of culture: falling out from the nineteenth century and at the beginning of the twentieth century, scientists could refer to a canon of male heroes, legends and the *rite de passage*, that consisted of suppressing their affects (the soft, female) in an act of continuous self-discipline. Science became a 'traditionally' male sphere. This had not only to do with the emergence of the gender character traits and the 'feminization' of the domestic, private sphere, but also with the aristocratic and patriarchal alignment of the British and German society in the nineteenth century. The fear to not find recognition because the vocation of a philosopher could be rendered effeminate, shows how deeply woven patriarchal hierarchies were in these societies.

During the twentieth century, scientists continue to refer to values, aspirations, virtues and tales which are intrinsically linked to tales about manly excellence and masculinity. One can argue that even until today there is a peculiar correlation between military virtues and epistemological virtues: According to Hutchings virtues

belonging to the ideal of military masculinity have been identified, such as risk taking, rationality, discipline, endurance and absence of emotion.¹⁷⁹ In a study of how high energy physicist see their own world, anthropologist Traweek writes that the physicists assume “risky work” needs to be undertaken to exceed as a physicist.¹⁸⁰ Furthermore, they regard emotional intelligence unproductive for the performance of their job. Traweek writes, “young scientists often assert their ignorance of human motives, of everything ‘subjective,’ as if that confirms their vocation.”¹⁸¹ Rationality and performing meticulous and persistent work are another set of qualities that are propagated in these circles. Traweek concludes that “the informal stories people tell in the laboratory can give us a special perspective on the dominant models of success and failure in a community: those models are note gender-free in form or content.”¹⁸²

The demands of balancing between the responsibilities of family and career are considered one of the biggest obstacles for women to rise considerably in their careers. Nevertheless, another contributing factor that impedes women to not strive and attain high positions in science and medicine, is the hidden androcentrism: the rules of the game were not made by women. I say ‘hidden’ because often scientists fashion themselves as people rid from their gender identity. However, when I take the same footing as these men and look back into these “picaresque cycles”¹⁸³ of how to succeed in science, I don’t see a human looking back to the stories of his/her/their ascendants, I see a man looking back at other men.

¹⁷⁹ Hutchings, “Making Sense of Masculinity and War”, 394. Hutchings looks at a collection of gender and war literature. She concludes that a big correlation exists in the attempts to characterize military masculinity. The virtues that I listed are the ones they all had in common.

¹⁸⁰ Traweek, *Beamtimes and Lifetimes*, 87.

¹⁸¹ *Ibid.*, 91.

¹⁸² *Ibid.*, 105.

¹⁸³ *Ibid.*, 103.

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Images

Cover:

Caspar David Friedrich, *Der Wanderer über dem Nebelmeer*, around 1818,

Wikimedia Commons accessed January 3rd, 2021

<https://commons.wikimedia.org/wiki/File:Ueber-die-sammlung-19-jahrhundert-caspar-david-friedrich-wanderer-ueber-dem-nebelmeer.jpg>.

Last page:

Caspar David Friedrich, *Der Wanderer über dem Nebelmeer*, detail of the original painting, back of the head of the wanderer, Hamburger Kunsthalle, Wikimedia

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Figure 1:

John Everett Millais, *A Dream of the Past: Sir Isumbras at the Ford*, 1857, Wikimedia

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John Everett Millais, *The Knight Errant*, 1870, Wikimedia Commons accessed

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Figure 2:

The Graphic, 'The 4th (King's Own) at Different Periods', 22 February 1879, in

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6–28, 23, figure 7.

Figure 3:

Konrad H. Jarausch, *Absolute University Enrollment*, 1982, in Jarausch, Konrad H. 'Higher Education and Social Change: Some Comparative Perspectives'. In *The Transformation of Higher Learning 1860-1930: Expansion, Diversification, Social Opening and Professionalization in England, Germany, Russia and the United States*, edited by Konrad H. Jarausch, 13:9–36. *Historisch-Sozialwissenschaftliche Forschungen: Quantitative Sozialwissenschaftliche Analysen von Historischen Und Prozeß-Produzierten Daten*. Stuttgart: Klett-Cotta, 1982, 13, table 1.

Figure 4:

Georg Christoph Wilder, *Ansicht des großen Rathaussaales mit dem Bankett der Naturforscher und Ärzte am 18. September 1845*, in Querner, Hans 1921-, Heinrich 1918-2003. Schipperges, and Gesellschaft Deutscher Naturforscher und Ärzte. *Wege der Naturforschung 1822-1972 im Spiegel der Versammlungen deutscher Naturforscher und Ärzte*. Berlin: Springer-Verlag, 1972, picture opposite of front page.

Figure 5:

Ansgar Schanbacher, *Teilnehmer auf den allgemeinen Sitzungen der VDNÄ, 1822-1869*, 2016, in Schanbacher, Ansgar., Eva-Maria 1950- Neher, and Lorraine 1951- Daston. *Menschen und Ideen: die Gesellschaft Deutscher Naturforscher und Ärzte; 1822 - 2016*. Göttingen: Wallstein Verlag, 2016, 19, figure 2.

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