TABLE OF CONTENTS

SECTION 1: ZUSAMMENFASSUNG

GENDER IN NEUROSCIENCE: An empirical and interdisciplinary critique of methods and theories linked to the gender/science debate

E. Ngubia Kuria[1, 2]
[1]Graduate School of Gender Studies, Humboldt University Berlin
[2]Institute for the History of Medicine, Charité Universitätsmedizin Berlin

ABSTRACT

Um die ungleiche Verteilung von Männern und Frauen in naturwissenschaftlichen, ingenieurswissenschaftlichen, technologischen und mathematischen Fächern zu diskutieren, werden zunehmend Erkenntnisse aus neurowissenschaftlicher Forschung herangezogen. Insbesondere auf dem Gebiet der *educational neuroscience* wurden empirische Ergebnisse über kognitive Geschlechterdifferenzen implementiert, deren ethische Relevanz kontrovers diskutiert wird. Die zentrale Fragestellung meiner Dissertation liegt darin auszuloten, auf welche Weise die Neurowissenschaften diese Differenz erklärt. Ausgehend von einer Perspektive der Wissenschaftsforschung zeige ich, wie Geschlechterdifferenzierungen im Labor hervorgebracht werden und welche Rolle dabei auch Versuchsanordnungen und die eingesetzten Werkzeuge spielen. Indem ich Arbeiten aus den Gender Studies vergleichend heranziehe, analysiere ich diese Situationen als geprägt von spezifischen Machtbeziehungen, die Geschlechterdifferenzierungen hervorbringen. Besonders beleuchtet wird dabei, wie das subjektive Verständnis über Geschlechterdifferenzierung von Wissenschaftler_Innen die Verfahren im Labor und die Interpretation der Bedeutung der Ergebnisse beeinflusst.

Meine Forschung habe ich in drei arbeitschritte organisiert. Erstens habe ich im Labor Prozesse [ethnographisch] untersucht, welche die „Greifbarkeit“ beziehungsweise Konkretisierung von Geschlechterdifferenzen hervorbringen, mit anderen Worten: die Sichtbarmachung und Objektivierung von Geschlechterdifferenz in neurowissenschaftlichen Laboren. Zweitens bin ich mit einer diskursanalytischen Methode den Ursprüngen der *gender math debate* in den Neurowissenschaften gefolgt und habe ihre soziale Kontextualisierung analysiert. Hier diskutiere ich die empirische Forschung als den Aspekt einer “moralischen Ökonomie” die weitverbreitete Diskurse der Geschlechterdifferenzierung widerspiegelt. Drittens gehe ich dem Transfer von Ideen und Werten über Geschlechterdifferenzen in neurowissenschaftlichen Fachartikeln nach. Die Rolle des sozialen Kontexts, in dem diese Versuche stattfinden, wird betont, um eine kritische Position zum Verständnis von Wissenschaftler_Innen zu Geschlechterdifferenzierung und den darunterliegenden Hypothesen zu entwickeln. Meine Arbeit zeigt, dass Geschlechterdifferenz nichts Gegebenes ist, sondern dass das Auffinden von geschlechterspezifischer kognitiver Performance nur durch ein kontextualisiertes Verständnis von Geschlechterdifferenz möglich wurde. Darüber hinaus zeigt meine Studie die politische Notwendigkeit einer ausbalancierten Perspektive für Gesetzgebung, Pädagogik und Psychologie, wenn wissenschaftlich gewonnene Daten Eingang in relevante Entscheidungen über das Bildungssystem und Lehrstrategien finden. Aus historischer und globaler Perspektive können solche Interventionen eine bessere Einbeziehung von Frauen in die Naturwissenschaft und Mathematik bewirken.

ZUSAMMENFASSUNG

INTRODUCTION

The gender-math gap debate is an academic discourse drawing largely from neuroscience research. Research in this field has been geared towards identifying the origins behind the observation that more men than women are represented in top level scientific research in Science Technology Engineering and Mathematics (STEM) subjects. For the past four decades, neuroscientists have typically provided researchers and policy makers with 'hard data' that supposedly give biological and cultural justifications for why men do better than women in these subjects. An experiment that has been used by researchers to analyze mental acuity with regard to mathematical aptitude in males and females is the Mental Rotation Task (MRT) introduced in 1971 by Shepard and Metzler. The MRT measures visuo-spatial abilities. Despite the fact that this experiment was originally designed to test the relationship of mental processes to reaction time and task difficulty, contemporary discourse holds it as the authority in linking abstract thinking to intellectual capacity. Neuroscientists have claimed that visuo-spatial skills are utilized in academic subjects like mathematics (Burnett, Lane, & Dratt, 1979), chemistry (Barke, 1993), computer sciences (Norman, 1994), engineering (Sorby, Leopold, & Go´rska, 1999) and other careers where abstract thinking is required; academic programmes in which the largest sex segregation can be observed (Meinholdt & Murray, 1999; Vetter & Babco, 1986; White, 1985).

The aim of my research has been to examine through empirical research the process through which gender/sex differences in cognitive abilities are established. In contrast to medical and biological disciplines that understand physical characteristics, i.e. the difference in genitalia, as the absolute determinant for a person's gender/sex, I adopt the gender studies perspective that identifies the political nature of gender/sex demarcations, pointing out that intellectual attributions should not rest on physical characteristics. I argue that cognitive differences are based on the legislation of power and pre-defined norms that allow certain bodies to be interpreted in a manner that reflects their societally assigned roles. The terminology 'gender/sex' that I use here embodies the understanding that even *biological sex*, is malleable, changeable, and 'do-able' just as gender is (Butler 1990). The question of how 'difference' is conceptualized forms a central theme in this research. Following the

multidimensional focus of this research, the project was broken down into three working packages.

The first part of the project took me into the laboratory where I examined processes that enable the tangibility of gender/sex, i.e. the making gender/sex 'visible' and objectifiable in neuroscience labs for evaluation. To accomplish this, I observed the workings of neuroscientists as they evaluated the role of gender/sex in psychological performance in a kinematic task. The second working package traced the contextualization and origins of the gender-math debate. Here I examined the process through which these contexts shape laboratory work. I discuss the articulation of prevailing historical social and political contexts through empirical work. Empirical research is discussed here as an aspect of the moral economy that embodies and mirrors popular discourse against a background of power relations. In the third working package I study the transfer of social ideas and values about gender/sex difference into actual empirical outcomes. The process through which ideology explaining how and as what women/men are to be characterized becomes embodied in the outcome of laboratory results, resulting in the naturalization of social attributes is discussed explicitly. I argue that the neuroscientists' understanding of the concept of gender/sex is limited to what is conciliatory to social and political power positioning, i.e. without room to examine how power relations shape the expression of gender/sex.

WORKING PACKAGES

I. EXPERIMENTING WITH GENDER: How science constructs difference

International Journal of Gender, Science and Technology, Vol 4(1): 48-61 Kuria, E.N. 2012

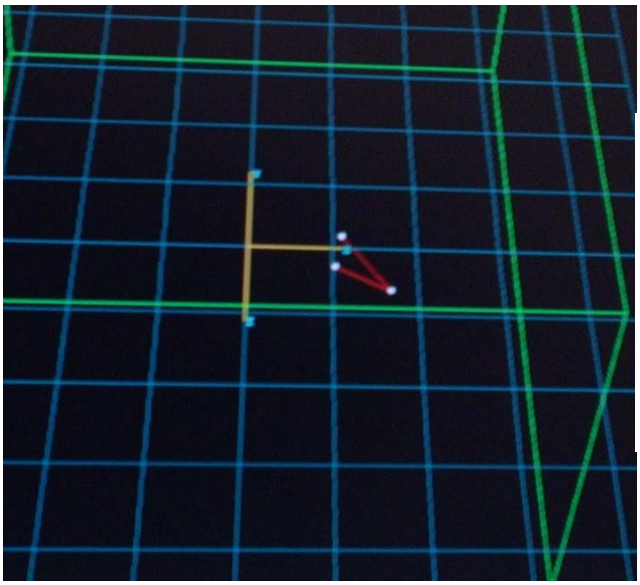
This first package analyzed the role of experimentation in materializing gender/sex in the laboratories. Here I examined the role of experiments in establishing the existence of gender/sex differences in psychological performance. I demonstrated that establishing cognitive differences is not (at all) a straight forward process that results from simple observation as might be assumed. Creating and visualizing difference as a tangible, consistent and measurable variable is a technical collaborative process that involves a set of props in the form of organized activities, tools, closed terminologies and technologies. It is a process that carefully assigns

meaning to abstractions onto laboratory tools and components. I argue that the understanding of gender/sex difference as a simple outcome of empirical research has resulted from “blackboxing”. Blackboxing (Latour, 1999) refers to the veiling-up or closure of the processes that hypothesis go through before they become accepted and integrated into the ‘thought collective’ (Fleck, 1981) of the scientific community. This segment of my research explored the constructed*ness* of gender/sex differences in psychological performance. Perspectives from three disciplines namely neuroscience research, science studies research and gender studies research were implemented. Here, a kinematic experiment that evaluated the influence of gender/sex attributions in psychological performance was analyzed.

In the kinematic experiment examined in this package, females and males were enrolled for the task through announcements that were posted all over the university campus. Participants enrolled themselves and received a small monetary fee for taking part. Once they were in the laboratory, their name and age were requested, but they were not usually asked about their gender/sex. In general, the experimenter made the judgement of the participant’s gender/sex based on visual cues like clothing and physical appearance, i.e. body structure. Here, gender/sex difference in intellectual performance is neither straight-forward nor obvious. Data has to be collected along physical demarcations that the experimenter sets from the onset of the experiment. This specific intervention by the scientist becomes part of normal lab practice that is often not open for scrutiny or debate, shedding some light on aspects of the blackbox.

The intangibility of gender/sex and the need for physical transformations is also another aspect of the blackbox discussed. The *readability* of data within an experimental system (Latour, 1999; 24-79) like the kinematic task examined in this section requires the implementation of tools (i.e. table, computer, cameras, and infrared markers) and technology (ELIGRASP system) that map observations onto new reference frames. Gender/sex differences in this sense are not readily available for examination, and have to be mined through organized procedures with assigned meanings. To illustrate this point, I discuss the *doing* of gender/sex in this experiment. First infrared markers attached to the participant’s thumb, index and wrist. Kinematic motion of the hand was captured and traced by cameras at the four

corners of the table using the ELIGRASP software system. The cameras transformed the marker's motion into cardinal points on a virtual 3D grid on a computer grid shown in the figure below.



The orange bar (T-shape) represented the x,y,z coordinates. The white dots connected with a red line represented the three markers on the wrist, thumb and index as points on a computer grid. The dots closer together represented the grasping action (index and thumb), whereas the point upon which the two red lines merge represented the wrist movement which mapped the reaching action.

Neither the computer nor the cameras could tell the gender/sex of the participants carrying out the task, so the experimenter had to catalogue the observations i.e. same-sex, opposite-sex and neutral interactions, thus giving gendered meanings to the data harnessed. Finally, I illustrate that difference does not emerge as the outcome of the experiment, but as a substance of the discourse created around the specific experimental paradigm. Articulating gender/sex difference from laboratory work requires specific scientific contexts that carry common understandings and shared knowledge. For example, outcomes reported in this experiment became relevant only in the context of previous research in the field that explained how kinematic results are to be interpreted. These already stated outcomes dictated where difference was to be sought. They also provided the relevant meanings for the outcomes legible from the above-named experimental system. I discuss the experimental system as the structure that makes the activities around validating a concept become invisible including the scientist's active engagement in introducing implicit selectiveness into the experimental system, hence blackboxing.

II. Rethinking Gender Politics in Laboratories and Neuroscience research: The case of spatial abilities in Math performance. *Medicine Studies, 3(2): 117-123* Kuria, E.N, Hess, V. 2011.

The second section of the three working packages analyzed the culturally rooted context within which research in neuroscience regarding gender/sex disparities in STEM subjects finds itself. Neuroscience research does acknowledge the role of upbringing, training and context in shaping individual intellectual performance. These discussions however do not extend to how social contexts also shape laboratory work and results. In fact, not much research has been carried out to point the exact influences of macro-power structures on the field (of neuroscience) itself. My research takes on this challenge and argues that the broader androcentric Western societal context, for example the fact that women had been locked out of scientific activity for centuries, organizes and shapes scientific discourse. In this section, the evolution of the Mental Rotation Task MRT is examined as a tool that highlights the evaluation of sex/gender difference in intellectual performance specific to the gender-math gap within the wider social context. Highlighted are the contradictions that surround the interpretation of the origins of difference as well as various factors that directly affect outcomes. A feminist perspective is utilized to discuss power structures and analyze what neuroscientists refer to as 'social influences' in evaluating the interpretation and meaning of results demonstrating difference in intellectual performance.

Dominant preconceptions placing women's intellectual capacity below that of men existed even before empirical research on the subject. Paul Broca[1], a prominent physician, anatomist and anthropologist whose publications irrevocably shaped the focus of cognitive neuroscience by proving that cognitive function could be localized to distinct brain regions had the following to say about gender/sex difference: *"On average, the brain mass is larger in men than in women, in clever men than in ordinary ones, and in superior races than in inferior ones . . . There is an obvious relationship between intelligence and brain volume"* (Broca, 1861). Broca went on to carry out several experiments weighing the masses of male and female brains in order to empirically demonstrate his hypothesis.

[1] His ideas were not original, and in fact built upon those of preceding researchers including Franz Joseph Gall, who pioneered the association of brain function with various anatomical regions of the brain.

The relationship between brain mass and function has long been disproved, but Broca's notions indicate the conceptualizations of gender/sex that confronted cognitive neuroscience at its inception. Theoretical considerations such as these were the basis upon which man and woman, gender/sex were understood and investigated at the turn of the 20th century. Following this background, this section of the thesis explicitly argues that scientific research on gender/sex reflects social and political ideologies in its theory and practice as Ebeling and Schmitz (2006) elegantly demonstrate. It is also demonstrated that cognitive differences are not stable, and they are not fixed to any gender/sex, but rather, they are contextual, flexible and changeable. Dar-Nimrod and Heine (2006) for example show that belief and attitudes regarding gender/sex differences in math ability shape intellectual performance in test settings: Women who are presented with evidence for no gender differences in math performance during the MRT outperform women who are convinced that there are either negative stereotypes or genetic reasons related to women's performance in math subjects (Coleman and Hong 2008). Feng et al. (2007) demonstrate that spatial skills can be improved through training, thus challenging any assumptions that might suggest that difference is located in the biological structure of the brain.

I conclude this segment by demonstrating the role of power in shaping cognitive performance. The research outcomes of Gneezy et al. (2003) demonstrate a relationship between power and the enactment of gender. In their work, women's competitive attitudes within a patriarchal system versus a matriarchal system (e.g. the Khasi in India) were examined. Results demonstrated that women were not competitive towards men within patriarchal systems, but they competed actively against other women. Within matriarchal societies, the opposite pattern was observed where women were more competitive in general than men (Gneezy et al. 2009). This interdependence of competitive attitudes with (political) power structures within communities of people introduces interesting considerations that directly link our claim for the intersection of gender, science and power. Guiso and colleagues (2008) have also confirmed a positive correlation between gender equality and the gender-gap in mathematics i.e. its disappearance in more power balanced communities like Norway and Sweden. They forward social–political–cultural factors and power relations as sufficient conditions for shaping cognitive performance. The reader will also note that women are often measured against the background of the

male (norm) who is often reported to demonstrate no significant changes in attitude or aptitude with changing social contexts. This is another aspect of gender/sex research in psychological performance that is contested in this research.

III. Los desafíos de la investigación de género en neurociencia. *Perspectivas* Bioéticas, Nº30: 62-84. Kuria, E. 2011.

The third working package examined the transfer of gender/sex social attributes from the powerstructured context discussed in section II into laboratory results. This section discusses various challenges under the sub-topics: terminology and inclusion (i.e. which bodies/brains are seen to be male or female, which others are excluded?), naturalization, extrapolation (borrowing research from animal studies), ideology, stereotyping as well as ambiguity in the definition of 'difference', i.e. is difference in the anatomy of the brain, or in the technique utilized for problem solving, or in the neural network engaged in the task? Following these demarcations, I studied the process that enables the naturalization and absorption of gender/sex socialized notions of difference into cognitive facilities in the context of neuroscience research within a framework that is informed by feminist empiricism. I draw attention to the fact that current research explaining disparities in access to power and resources are established by obscuring the influence of socially instituted gender/sex distinctions. The following example demonstrates how this evaluation is achieved: Wang et al. (2007: 228) present an experiment that examined gender-specific neural circuitry of psychological stress. Perfusion-based fMRI was utilized in the measurement of cerebral blood flow responses to stress in 32 healthy people (16 males and 16 females). Psychological stress was elicited by means of mental arithmetic tasks under varying levels of psychological pressure to perform. Researchers report that men activated the left orbitofrontal cortex which is implicated to the 'fight or flight' response, while women activated the ventral striatum, putamen, insula and cingulate cortex which form part of the limbic system. The researchers' interpretation and discussion of these results clearly reflect the background upon which difference is examined.

The outcomes were discussed in line with the evolutionary theory that acknowledges a 'fight or flight' as the acceptable reaction for a stressful situation. Difference in physiological stress response is linked to women's performance, and researchers

explain this difference by citing women's care-giving and nurturing roles. Giving birth is the important attribute cited to explains this 'female' psychological reaction, and the examiners support this claim by stating that these attributes and behaviours are '*especially mediated by oxytocin'*. Problematic in this discussion is the linking of the limbic system to emotion, to care-giving needs, to female reproduction and biology. This results in the naturalization of social-cultural gender/sex roles that are implicated as implicit mediators of the functioning of the brain in important gender/sex demarcated ways, demonstrating the manner in which social and political positioning about what it means to be female or male are made relevant for psychological performance. This philosophy is echoed in economic studies that suggest that men make better economic choices (because they are rational[2]) compared to women under similar conditions who are reported to engage with their emotion (Van Vugt, De Cremer & Janssen, 2007). These elucidations demonstrate the modern reconstruction of difference that integrates social roles and females' and males' cultural experience into biological brain matter. Several prominent neuroscientists including Cordelia Fine (2010) in '*Delusions of Gender'* and Anne Fausto-Sterling (2000) in '*Sexing the Body: Gender Politics and the Construction of Sexuality'* have criticized this logic that builds on the idea that the ability to carry offspring affects how female species relate with the world around them in significant ways.

CONCLUSION

The outcomes of this research are as follows. I succeed in exhibiting the physical process of constructing and making gender/sex difference materialize in the laboratory by examining actual empirical work. This neuroscience-based ethnographic research is amongst the first of its kind on the subject of gender/sex difference. I demonstrate that gender/sex difference in cognitive ability are distinctions that are embodied within a specific body of knowledge, and a specific scientific 'thought collective' that construct it. Difference is enabled by pre-conceptions of what and who man/woman is, and the outcome of empirical research in neuroscience is a reflection of these pre-conceptions. This thesis has set about to expose the relationship of socially constructed conceptualizations of gender/sex difference to scientific observations made in laboratory work, and arguments presented within the Western global context. This project contributes to the growing

[2] The prefrontal cortex which males activate during stress is closely associated with intellectual capacity, decision making and reasoning abilities

body of knowledge in the newly emerging sub disciplines of critical neuroscience, neuroethics and philosophy of neuroscience research that are now discrediting the neutrality of neuroscientific research by demanding a multidisciplinary approach and mutual exchanges of subject areas that have especially long been studied by other existing disciplines.

IMPLICATIONS

Student achievement in STEM subjects has come under the lens of academics, mainly due to the historical disparities in these subjects. The implications of gender/sex research are far-reaching and demand a balanced perspective on the part of policymakers whose role is to translate empirically presented results into executable action plans. Although the proportion of women in STEM subjects has increased, women scientists in Europe remain a minority (SHE figures 2009) with most women dropping out of science before they can fill the top jobs. According to Sadker and Sadker (1995), policy and legislation have influenced women's occupational choices. In the 1960s for example, their vocational choices were restricted to secretarial, nursing and teaching careers, or motherhood. In a study evaluating gender/sex differences at critical transitions in STEM Careers, the National Research Council (2010) affirmed that explicitly encouraging the hiring, promotion and tenure of women into STEM and medicine careers, including the allocation of institutional resources will substantially address the inequities identified. I further argue that additional caution by neuroscientists who are wary of the consequences of stereotyping and prejudices in their own research can further mitigate the gap, especially because there is a new move by educational psychologists to implement neuroscientifically-based outcomes to guide educational decisions regarding teaching, learning approaches, strategies, and interventions. Policy-makers seeking to narrow the gender-gap in science should consider (even demand) the intellectual exchange between relevant stake-holders and cross-border interactions among disciplines already engaged in the subject, e.g. gender studies and feminist material. This could open up spaces for new ways of thinking about difference, and perhaps provide alternative ways of addressing the issues concerned.

Bibliography

Barke, H.D. (1993). Chemical education and spatial ability. *Journal of Chemical Engineering,* 70: 968–971.

Broca, P. (1861). Sur le volume et la forme du cerveau suivant les individus et suivant les races. Bulletin et Mémoires de la Société d'Anthropologie de Paris, 2: 139–207.

Burnett, S.A., Lane, D.M., Dratt, L.M. (1979). Spatial visualization and sex differences in quantitative ability. *Intelligence, 3*: 345–354.

Butler, J. (1990). *Gender Trouble: Feminism and the Subversion of Identity*, New York, Routledge.

Coleman, J.M., Hong, Y. (2008). Beyond nature and nurture: The influence of lay gender theories on self-stereotyping. *Self and Identity*, 7: 34–53.

Dar-Nimrod, I.,Heine, S.J. (2006). Exposure to scientific theories affects women's math performance. *Science*, 314-435.

Ebeling, S., Schmitz, S. (2006). *Geschlechterforschung und naturwissenschaften: Einführung in ein komplexes Wechselspiel.* VS Verlag, Wiesbaden, Germany.

Fausto-Sterling, A. (2000). *Sexing the body: Gender politics and the construction of sexuality*. NewYork, BasicBooks.

Feng, J., Spence, I., Pratt, J. (2007). Playing an action video game reduces gender differences in spatial cognition. *Psychological Science*,18(10): 850–855.

Fine, C. (2010) *Delusions of Gender: The Real Science Behind Sex Differences*, London: Icon Books.

Fleck, L. (1981). *Genesis and Development of a Scientific Fact*, University of Chicago Press.

Gneezy, U., Leonard, K.L., List, J.A. (2009). Gender differences in competition: Evidence from a matrilineal and a patriarchal society. *Econometrica, Econometric Society*, 77(5): 1637–1664.

Gneezy, U., M. Niederle, and A. Rustichini. (2003). Performance in competitive environments: Gender differences. *Quarterly Journal of Economics,* 1049–1074.

Guiso, L., Monte, F., Sapienza, P., Zingales, L. (2008). Culture, gender, and math. *Science*, 320: 1164–1165.

Kuria, E.N. (2011). Los desafíos de la investigación de género en neurociencia, *Perspectivas Bioéticas*, Nº30: 62-84.

Kuria, E.N. (2012). Experimenting with Gender: How Science Constructs Difference. *International Journal of Gender, Science and Technology*, 4(1): 48-61.

Kuria, E.N., Hess, V. (2011). Rethinking Gender Politics in Laboratories and Neuroscience Research: The Case of Spatial Abilities in Math Performance. *Medicine Studies*, 3(2): 117–123.

Latour, B. (1999). *Pandora's Hope: Essays on the Reality of Science Studies* 1. Ed, Harvard University Press.

Meinholdt, C., Murray, S.L. (1999). Why aren't there more women engineers? *Journal of Women and Minorities in Science and Engineering, 5*: 239–264.

National Research Council (2010). Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty Washington DC, The National Academies Press.

Norman, K.L. (1994). Spatial visualization – a gateway to computer-based technology. *Journal of Special Educational Technology,* 12: 195–203.

Sadker, M., Sadker, D. (1995). *Failing At Fairness: How Our Schools Cheat Girls,* 1st Touchstone Edition.

SHE Figures (2009). Statistics and Indicators on Gender Equity in Science, produced by the European Commission Directorate-General for Research http://bit.ly/4QWnk5

Shepard, R., Metzler, J. (1971). Mental rotation of three dimensional objects. *Science* 171(972): 701-3.

Sorby, S.A., Leopold, C., Górska, R. (1999). Cross-cultural comparisons of gender differences in the spatial skills of engineering students. *Journal of Women and Minorities in Science and Engineering,* 5: 279–291.

Van Vugt, M., De Cremer, D,. Janssen, D.P. (2007). Gender Differences in Cooperation and Competition: The Male-Warrior Hypothesis. *Psychological Science,*18(1): 19-23.

Vetter, B., Babco, E. (1986). Professional women and minorities. Washington, DC: *Commision on Professionals in Science and Technology*.

Wang, J., Korczykowski, M., Rao, H., Fan, Y., Pluta, J., Gur, RC., McEwen, BS., Detre, J.A. (2007) "Gender Difference in Neural Response to Psychological Stress," *Social Cognitive and Affective Neuroscience*, 2(3): 227–39.

White, J. (1985). Sex related differences in subject choice and intervention strategies used to reduce girls' educational disadvantage: Acomparative review. In M. Lehrke, L. Hoffmann, &P. L.Gardner (Eds.), *Interests in science and technology education. 12th IPNSymposium*: 295-306.

SECTION 2: PUBLIKATIONEN

Anteilserklärung

[Emily Benice Ngubia Kuria] hatte folgenden Anteil an den vorgelegten Publikationen:

Publikation 1: [Autorin: Emily Ngubia Kuria], [Titel: Experimenting with Gender], [Zeitschrift: International Journal of Gender, Science and Technology], [Erscheinungsjahr: 2012]
_100_ Prozent
Beitrag im Einzelnen (bitte kurz ausführen):
Schreiben 100%
Konzept 100%
Forschung 100%

Publikation 2: [Autoren: Emily Ngubia Kuria, Volker Hess], [Titel: Rethinking Gender Politics in Laboratories and Neuroscience Research: The Case of Spatial Abilities in Math Performance.], [Zeitschrift: Medicine Studies], [Erscheinungsjahr: 2011]
_73_ Prozent
Beitrag im Einzelnen (bitte kurz ausführen):

	Emily N. Kuria	Volker Hess
Schreiben	90%	10%
Konzept	50%	50%
Forschung	80%	20%

Publikation 3: [Autorin: Emily Ngubia Kuria], [Titel: Los desafíos de la investigación de género en neurociencia], [Zeitschrift: Perspectivas Bioéticas], [Erscheinungsjahr: 2011]
_100_ Prozent
Beitrag im Einzelnen (bitte kurz ausführen):
Schreiben 100%
Konzept 100%
Forschung 100%

Datum Unterschrift
Berlin den 20. September, 2012

PIBLICATION 1

PIBLICATION 2

PIBLICATION 3 (Spanish)

PIBLICATION 3 (English)

SECTION 3: AUSSAGEN

"Mein Lebenslauf wird aus datenschutzrechtlichen Gründen in der elektronischen Version meiner Arbeit nicht veröffentlicht."

"Mein Lebenslauf wird aus datenschutzrechtlichen Gründen in der elektronischen Version meiner Arbeit nicht veröffentlicht."

"Mein Lebenslauf wird aus datenschutzrechtlichen Gründen in der elektronischen Version meiner Arbeit nicht veröffentlicht."

COMPLETE LIST OF PUBLICATIONS

Peer reviewed articles

Kuria, E.N. 2012. EXPERIMENTING WITH GENDER: How science constructs difference.*International Journal of Gender, Science and Technology*, Vol 4 (1): 48-61.

Kuria, E.N. & Hess,V. 2011. Rethinking Gender Politics in Laboratories and Neuroscience Research: The Case of Spatial Abilities in Math Performance. *Medicine Studies*, 3(2): 117–123.

Kuria, E.N. 2011. Los desafíos de la investigación de género en neurociencia *Perspectivas Bioéticas*, Nº30: 62-84.

Book Chapters

Kuria, E.N. 2012. The Challenge of Gender research in Neuroscience. In. Essays in *Neuroscience and Political Theory; thinking the body politic*, by F. Vander Valk. Routledge, 268-287.

Kuria, E.N. 2010. Africa: Its embodiment within a within a German context. In. "*Rassismus auf Gut Deutsch"* Brandes & Apsel publishing, Frankfurt am Main, 223-237.

Opinion Articles

NextGen VOICES: How will the practice of science change in your lifetime? *Science*, 335 (6064) 36-38 (January 6, 2012) http://bit.ly/wGv5cd

Tackle fallacies to promote gender equality in science, *Science and Development Network*, (June 2011) http://bit.ly/qDJTTx

Unsere Sozialisierung bestimmt, wie und was wir forschen", *Tageszeitung, Berlin,* (*May, 2010)* http://bit.ly/nZymeg

MPil. Thesis

Damaged access and spared mental representation of the body: A single case study.

Selbstständigkeitserklärung

„Ich, Emily Benice Ngubia Kuria, erkläre, dass ich die vorgelegte Dissertation mit dem Thema: **Gender in Neuroscience: an empirical and interdisciplinary critique of methods and theories linked to the gender/science debate** selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt, ohne die (unzulässige) Hilfe Dritter verfasst und auch in Teilen keine Kopien anderer Arbeiten dargestellt habe.“

Datum Unterschrift
Berlin den 20. September, 2012

APPRECIATION

I would like to express my deep appreciation and gratitude to my thesis advisor Prof. Dr. Volker Hess for accepting to supervise this exciting and challenging project. I am especially thankful to Prof. Hess for his constant encouragement, unwavering support and thoughtful guidance during my three years as a graduate student at the Charité Berlin. I thank him for his enthusiasm, dedication and interest for this research, and moreover, his genuine concern for my personal well being. These three years have been my best years career-wise and academically; I am so very proud of what we have been able to achieve working together. And finally, I am especially appreciative of the freedom he gave me to grow, to discover and to explore various other facets of my non-academic life which I have always valued.

I am equally very grateful to my co-advisor PD. Dr. Bettina Bock v. Wülfingen. I thank Bettina for the many lengthy discussions she made time for at the inception of this project. Her encouragement and advice proved invaluable in designing the methodological foundation for this research project. Through her guidance and expertise I was able to bridge the wide empirical data gap between neuroscience/cognitive neuroscience 'natural science' approaches, to the more fluid social science approaches established in gender studies.

Special thanks to Prof. Dr. Christina von Braun for identifying my project as a relevant and appropriate contribution to the Graduate School of Gender Studies “Geschlecht als Wissens Kartegorie” where I learned many invaluable things. The *Graduiertenkolleg* was highly instrumental in fine-tuning my project through the colloquiums and research study retreats. I also had the wonderful opportunity to meet many excellent people with whom I was able to share my research challenges and ultimately expand my project. The *Kolleg's* deep understanding of science and high standards for research in gender studies continue be an inspiration to me.

This thesis has been made possible through the financial support provided by the Schlumberger Foundation, Faculty for the Future Program (FFTF). Through this prestigious grant, I was able to work and move between different laboratories, forming the core of the design of this trandsciplinary research. The Kommission für Frauenförderung (KFF) Promotionsabschlussstipendium from the Humboldt University enabled the final compilation of the thesis, for which I am very thankful.

Many special thanks to Prof. Dr. MD. John Nicholls for holding my hand and walking with me through the many challenges I have faced during my graduate studies both in Trieste and in Berlin. John has been a good friend, a great source of wisdom, encouragement and strength for me. Without his gentle guidance, friendship and nurturing, I would not have grown to the as excellent scholar I am today. John has been one of my greatest and most trusted mentors; I can truly only thank heaven that our paths crossed...

I would like to also thank Prof. Dr. Raffaella A. Rumiati (International School for Advanced Studies) for catalysing my interest in this exciting research field, and of course Prof. Castiello Umberto (University of Padova) and Dr. Luisa Sartori for offering up their laboratories for the necessary research on the kinematic task discussed in this thesis. Thanks also go to Prof. Dr. Anelis Kaiser (Universität Freiburg) for giving me that critical extra push to publish and finish my write up.

Thanks to my teacher Prof. Dr. Kerstin Palm for providing me with necessary tools for researching gender through feminist empiricism. She made it meaningful for me to enter gender studies as a natural scientist, and provided all of the relevant tools for my growth. I would also like to thank the NeuroGenderings working group for the opportunity to develop knowledge together, and for creating a network of people interested in this rare disciplinary intersection. Special thanks to the Prof. Dr. Florencia Luna (Universidad de Buenos Aires) for inspiring the writing of my first peer reviewed publication, and for taking time to read the first proofs. Many special thanks to Prof. Dr. Leonard Fleck (Michigan State University) for his invaluable insights, support and advice as I establish my academic career. I thank Jean Edmunds for the unique ways she has richly contributed to my life, and Marcie Lambrix (Case Western Reserve University) for offering her time to read through my research (more than once), and for her friendship. Many thanks to Fondation Brocher for providing the space in which the initial aspects of this thesis were birthed, and for presenting unique opportunities for serendipitous meetings with fascinating researchers who have contributed to the development of the ideas surrounding this thesis.

There are many people who directly or indirectly contributed to the full establishment of this project. I thank Evelyn Hayn for her friendship, clever insights and useful references. For those many moments we discussed science over a hot cup of tea, and I would suddenly get a revelation about how to address a theoretical challenge I was facing. I really enjoyed those moments… I would like to thank Julia Stone for proofreading my research on more than one occasion, and most especially for the time we shared seeking God's guidance and encouraging each other through the challenging dissertation-writing process. I would like to thank Sven Bergman for many useful discussions and help in translating part of this thesis into German, Sabine Selle for printing out my publications in colour, and for always having been available to restore my computer when it was giving me problems. I thank Ulrike Klöppel for lending me her laptop for use in completing the writing of this thesis. Special thanks to Stefanie Voth for her invaluable support in managing the bureaucratic procedures regarding registering as a student at the Charité right to the submission process, and for her patient listening and gentle care. Grabriela Jähnert's useful guidance is notable at the time I was deciding to join the Humboldt University, Gender Studies program. Christa Margies, Wolfhard Margies, Gudrun Bonnen, Wolfgang Bonnen, Andrea Gries and Manfred Gries have been my very special family in Berlin. Their care, their prayers their friendship and their presence in the various aspects of life have been a solid encouragement and support during my four year stay in Berlin, and I thank them.

Finally, I appreciate my mother Jane Wanjiru Kuria, my father Nathan Kuria Waithaka, and my siblings Loise Wangui Kuria, Aida Theru Kuria and Edwin Waithaka Kuria for their love, steady support, foresight, insight, vision and prayers. You all gave me the strength to hold on when the going got tough. I share this great achievement with all of you!

I thank God for his great faithfulness, mercies and love and constant help. Without his grace, I would not have come this far. I am especially encouraged by the wonderful encounters and amazing people he has brought my way, and for his great thoughts about me and plans for my life.