Geschlechterverhältnisse in der Elektrizitätslehre

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In der Veranstaltung berichtete ich zunächst kurz über das Zentrum für Geschlechterforschung an der Universität Uppsala, wo ich seit 2007 zeitweise als Gastwissenschaftlerin tätig bin. Am Zentrum verden Lehrveranstaltungen zu Gender Studies angeboten, der Schwerpunkt der Arbeit liegt aber auf der Forschungstätigkeit der rund 40 MitarbeiterInnen. Von 2007 bis 2011 wird ein durch den Vetenskapsradet (vergleichbar der DFG) gefördertes Projekt zu Gender und Naturwissenschaften durchgeführt. Ich forsche im Bereich Gender und Physik.
Informationen zum Zentrum: www.gender.uu.se
Informationen zum Projekt Gender und Naturwissenschaften: www.genna.gender.uu.se
Dort gibt es auch weitere Informationen zu den Aktivitäten der Forschergruppe zu Gender und Physik, so wie dem aus der Gruppe erwachsenen Netzwerk i-GAP (Interferences of Gender and Physics), das inzwischen rund 20 ForscherInnen aus den westlichen Ländern umfasst, die zu Physik, Chemie und verwandten Disziplinen aus einer Genderperspektive forschen.

Das Buchprojekt Transforming Substance
Im Rahmen der Schriftenreihe „Crossroads of Knowlede“ plane ich die Herausgabe eines Sammelbandes zum Thema Gender in Material Sciences (also Physik, Chemie und Ingenieurwissenschaften). Die Herausgabe der englischsprachigen Texte ist für 2011 geplant.

Übersicht über die geplanten Beiträge:

Autorin	Titel	Thema
Erlemann	Hunting for female galaxies and giving birth to satellites: The gendering of epistemic cultures in public discourse on physics	Physics and Gender in Public Discourse
Pettersson	Boundaries of gender and science among experimental plasma physics. Towards a development of masculinity studies and physicists.	Gender and Plasma Physics
Rentetzi	From Experienced Experimenters to Scanning Girls. Women Designers and Users of the Sintilation Counter Before and After WW II	Gender and Measuring Instruments
Frietsch	The scientific unconscieous: from alchemy to chemistry	Gender and Alchemy
Götschel	Visual Imagery and Invisible Gender in Static Electricity	Gender and Electricity
Kovacs	Gender in Models, Metaphors, and Paradigms of Chemical	Gender and Physical Chemistry

	Thermodynamics	
Offenberger	Home Heating and the Co-Construction of Gender and Technology	Gender and sustainable heating technologies
Wolffram	Gender perspectives in automotive engineering	Gender and automotive engineering and mobility

Mein eigener Beitrag im Buch lautet „Visual Imagery and Invisible Gender in Static Electricity", was auf Deutsch ungefähr so viel bedeutet wie "Bildliche Darstellungen und unsichtbares Geschlecht in der statischen Elektrizität". Es folgt nun die etwa dreiseitige Einleitung des Textes (in englisches Sprache), in der ich meine Forschungsfragen, Methoden (Vorgehensweisen) und die Quellenlage skizziere.

In the history of early electricity gender seems not to play an important role. Women in ancient, medieval, and early modern times had – despite a few exceptions – no access to scholarly education. And they are not present among the natural philosophers, physicians, theologians, and gentlemen who studied static electricity. Nor was gender a visible part of the research environments or the concepts and images developed to describe and understand the phenomena of electricity. Nevertheless, because gender is a structural concept deeply rooted in Western culture and society, I suggest in my paper to use a gender perspective at the historiography of physics, as well as at some of the original writings of researchers and practitioners of early electricity. I analyse these resources in two ways: First, as a set of narrations told about the 'male heroes' in the history of electricity while disregarding others, and second, as a set of narrations on the concepts and images used to describe the phenomena of static electricity.

Scholars discussed electric phenomena since ancient times, but systematic studies on electricity began not until the late sixteenth century. In mid 18th century, the development of appropriate instruments amplified the sensible effects and caused not only an intensification of scholarly studies but also an enormous public interest in electrical experiments and the sensation of electrification. The quantitative treatment and mathematical description of electricity at the end of the 18th century led to the dynamic concepts of electric current, the unification of electricity and magnetism in electrodynamics, the professionalization of electrical engineering, and the wide technical use of electrification.

Static electricity is a phenomenon that occurs when two materials, which have dissimilar ability to attract electrons, are brought into close contact. These two materials, as we explain it today, form chemical bonds through the exchange of electrons. Glass and dry air, for example, hold their electrons, while most metals, on the contrary, easily loose their valence electrons. Rubbing materials, such as amber and fur, can increase the contact area between materials and therefore strengthen the electrostatic effect. When the materials are separated, their surfaces have more or less electrons then before the contact, because some electrons have moved from one material to the other, and thus are electrically charged. If materials increase their number of electrons they are negatively charged (as the electrons have a negative charge) and if they have fewer electrons, they are positively charged. Electrically charged material attracts neutral and oppositely charged materials (e.g. Purcell 1965).

The historiography of electricity started in 1767 with the monograph "The History and Present State of Electricity" by Joseph Priestley, a British theologian, teacher at a dissenting (not belonging to the Church of England) Academy at Warrington, and practitioner of electrical experiments at this institution of higher education. In the "age of electronics" after World War II grew the scholarly interest in the history of electricity. Bernard Cohen, first US-American to hold a doctorate in history of science and professor at Harvard University, was an internationally recognized expert on Isaac Newton and a scholar with interest in the history of computing. His monograph entitled "Newton and Franklin: an inquiry into speculative Newtonian experimental science and Franklin's work in electricity as an example thereof", published in 1956, was for many years the standard work on 18th century electricity. An Australian historian of physics, Roderick Weir Home, in 1967 finished his dissertation on electricity and experimental physics in 18th century Europe and in following the approach of history of ideas (or intellectual approach) wrote the history of the effluvial theory of electricity (published as Home 1981). In 1979 US-American historian of physics John Heilbron in his post-Kuhnian (or sociological) approach analysed the rise of experimental physics by following the history of electricity. He focused on scientific communities and laboratory practices and specified three groups of experimental practitioners: professors at universities teaching a traditional curriculum, researchers at modern science oriented academies, and public lecturers, performing electricity for pleasure. Further research on the history of electricity in English, French, German, and other languages followed, but Heilbron's work has remained a classic (Steinle 2004: 515), although the research area is of minor interest in present-day research into the history of physics.

These renowned scholarly works did not address gender questions. Women appeared, if at all, not in full shape and without being honoured for their contributions to the development of science. For example, many illustrations of experiments and their outcomes in the original publications showed some helping hands that operated machines or hold instruments. Historians of science interpreted the hands as belonging to trained male helpers and servants, although they could have been the hands of female research assistants and family members such as Abbe Nollet's female research assistant shown with the upper part of her body in illustration 14 of his "Essai sur l'électricité des corps" (Paris 1746, cited from Fara 2002: 53) or as Lucia Galeazzi Galvani (1743-1790), wife and research assistant of physician Luici Galvani in his frog experiments on nervous fluids (Fara 2002: 146). Other scholarly work cites women researchers in footnotes only, if at all, or in a subordinate clause as the wife of an important scientific husband, as first European university professor and researcher on electricity Laura Bassi (1711-1778) in Heilbron (1979: 354).

Among the first scholars to write on women in electricity were US-American professor of Italian History Paula Findlen (1993) and German historian of physics Beate Ceranski (1994), who both did research on Laura Bassi. Further research on educated women in northern Italy followed (Findlen 1999, 2005). But it was not until recently when British historian of science and expert on early modern physics Patricia Fara (2002, 2004) started to focus on how magnetism and electricity had been structured by social and political factors, such as gender. The visual images that were utilised in early electricity, however, have not been analysed from a gender perspective. Therefore I will reread the interpretations and demonstrations of both 17th and 18th century practicing

researchers and 20th century historians of physics. For example, the fight over the mastery of the seven seas, the physiological and medical debate over the conception of the human body as a mechanical body, the contemporary discussions in natural philosophy on money economy, the implementation of gender gaps in the age of enlightenment and in the process of the formation of a civic society in my opinion have been part of the corresponding context for the development of visual imagery and invisible gender of electricity.

When I speak of imagery and visualisation in electricity, I do not restrict my interest on visible images and illustrations (Lynch + Woolgar 1990). Rather, I am interested in concepts and visions, including analogies, metaphors, and symbolic systems that are used by savants to describe electrical phenomena, represent barely perceptible electricity, and define physical realities. Analogies, the cognitive process to transfer information from a particular subject to another particular subject, play an important role in both the historical development of scientific models and in contemporary science education (e.g. Aubusson et al. 2006, Hallyn 2000). Metaphors are a special kind of analogies. In following Lakoff and Johnson (1980), I will use the term metaphor not as a rhetoric figure of language alone, but in the meaning of metaphorical concept or conceptual metaphor that is an expression that a subject can be conceptualised in terms of another subject. Furthermore, I understand symbolic systems by following Harding (1986: 52-56) as a set of cultural arrangements, relations, meanings, and thoughts. Most interesting to me are the analogies and metaphors of static electricity relating to the four elements, and their symbolical gender systems, as elaborated by philosopher Zdenka Kalnicka (2001) and literary scholar Inge Stephan (2000).

Darüber hinaus plane ich mich im Artikel mit folgenden Themen näher zu beschäftigen:

- Antique and medieval knowledge. Understanding electric phenomena of the amber stone and the myth of the Heliades

- Renaissance and early modern theories of physicians (medical doctors) on the qualities of electricity (Cordanus, Gilbert), development of the effluvial theory

- Deepening the understanding of electric fluids in experimental philosophy and struggling with inconsistencies (Hauksbee, Dufay, Madame de Chatelet)

- Intensifying the effects with new device (Leyden jar/condenser) and discussing alternative concepts of electricity: air and fire (and currency) (Nollet, Bassi, Galvani, Franklin, Lavoisier)

- Enjoying electrical sensations, fighting for authority, and believing in action at a distance. The quantification of static electricity (Priestley, Cavendish, Robinson, Coulomb)

- Summary and outlook

Bei der für die Einleitung zitierten Literatur handelt es sich um folgende Aufsätze und Bücher:

Aubusson, Peter, Allan G. Harrison and Stephen M. Ritchie (eds.) (2006): Metaphor and Analogy in Science Education. Dordrecht: Springer

Ceranski, Beate (1994): "Und sie fürchtet sich vor niemandem". Die Physikerin Laura Bassi (1711-1778). Frankfurt and New York: Campus

Cohen, Bernard (1956): Newton and Franklin: an inquiry into speculative Newtonian experimental science and Franklin's work in electricity as an example thereof. Philadelphia: American Philosophical Society

Fara, Patricia (2002): An Entertainment for Angels. Electricity in the Enlightenment. New York: Columbia University Press

Fara, Patricia (2004): Pandora's breeches: women, science and power in the Enlightenment. London : Pimlico

Findlen, Paula (1993): Science as a Career in Enlightenment Italy: The Strategies of Laura Bassi. In: Isis 84(1993): 441-469

Findlen, Paula (1999): A Forgotten Newtonian: Women and Science in the Italian Provinces. In: William Clark, Jan Golinski and Simon Schaffer (eds.): The Sciences in the Enlightened Europe. Chicago: University of Chicago Press, 313-349

Findlen, Paula (2005): Women on the Verge of Science. Aristocratic Women and Knowledge in Early Eighteenth-Century Italy. In: Sarah Knott and Barbara Taylor (ed.): Women, Gender and Enlightenment. Basingstoke: Palgrave Macmillan, 265-287

Hallyn, Fernand (ed.) (2000): Metaphor and Analogy in the Science. Boston: Kluwer Academic Publishers

Harding, Sandra (1986): The Science Question in Feminism. Milton Keynes: Open University Press

Heilbron, John (1979): Electricity in the 17th and 18th Centuries: a Study of Early Modern Physics. Berkeley: University of California Press

Home, Roderick Weir (1981): The effluvial theory of electricity. New York: Arno Press

Kalnicka, Zdenka (2001): Water. In: Krystyna Wilkoszewska (ed.): Aesthetics of the Four Elements: Earth, Water, Fire, Air. Ostrava: University, 97-184

Lakoff, George and Mark Johnson (1980): Metaphors we live by. Chicago: University of Chicago Press

Michael Lynch and Steve Woolgar (eds.) (1990): Representation in Scientific Practice. Cambridge: MIT Press

Priestley, Joseph (1767): The History and Present State of Electricity with Original Experiments. London: Printed for J. Dodsley, J. Johnson and T. Cadell

Purcell, Edward (1965): Berkeley Physics Course. Vol. 2: Electricity and Magnetism. New York : McGraw-Hill

Steinle, Friedrich (2004):Wissen, Technik, Macht. Elektrizität im 18. Jahrhundert. In: Richard van Dülmen and Sina Rauschenbach (eds.): Macht des Wissens. Die Entstehung der modernen Wissensgesellschaft. Köln: Böhlau, 515-537

Stephan, Inge (2000): Wasser und Weiblichkeit. Von den Gefahren des Ertrinkens und der Lust am Untergang. In: Bernd Busch und Larissa Förster (ed.): Wasser. Köln: Wienand, 177-193