

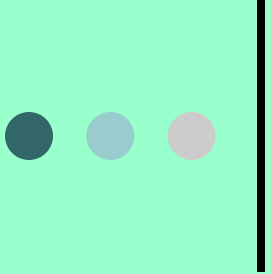


Looking at High Energy Physics from a Gender Studies Perspective

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Centre for Gender Research
Uppsala University, Sweden

Working Group ARGENTEC (Work, Gender, Technology)
Hamburg University of Technology, Germany



Looking at High Energy Physics from a Gender Studies Perspective

- I. Entanglement of Gender and Physics
- II. Gender Studies and High Energy Physics –
Research Results and Examples
- III. Summary and Prospects



I. Entanglement of Gender and Physics

Gender is

- a grammatical category: genus
- a social category: sex – gender
- a theoretical category: gender as construction and performativity of masculinity and femininity

Judith Butler: Gender Trouble. Feminism and the Subversion of Identity. New York: Routledge, 1990



I. Entanglement of Gender and Physics

Gender Studies is

a field of interdisciplinary research which analyses the social constructions and cultural representations of masculinity and femininity



I. Entanglement of Gender and Physics

Science Studies is

an interdisciplinary research area that situates scientific expertise in a broad social, historical, and philosophical context.

It is concerned with the history of scientific disciplines, the interrelationships between science and society, and the purposes that underlie scientific claims.

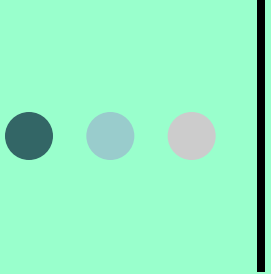
(cf. http://en.wikipedia.org/wiki/Science_studies)

Example of Science Studies in HEP

Andrew Pickering:
Constructing Quarks.
A Sociological History
of Particle Physics.
Chicago: University of
Chicago Press 1984



<http://www.press.uchicago.edu>



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II. Gender Studies and High Energy Physics

II.1. Human Actors in Particle Physics

II.2. Workplace Cultures in Particle Physics

II.3. Knowledge Production in Particle Physics

Londa Schiebinger (ed.): Gendered
Innovations in Science and Engineering.
Stanford: Stanford University Press, 2008



II.1. Human Actors in Physics

- **International statistics** show that women appear to be in the minority in physics in many Western industrial countries, but their low percentage is not to be taken as a biological fact.
- **Biographical studies** on historical and contemporary physicists explore the situation of women (and men) working in the field. Some concentrate on biographies of individual outstanding women physicists, other studies question the working-life and conditions that women physicists encounter in academia, industry, or education.



II.1. Human Actors in Particle Physics

We know some „heroes“ who's names are given to prizes, medals, or institutes; to particles, measurement units, and laws of nature. But are we familiar with „heroines of particle physics“ as well?

Some statistics:

- Particle physics community:
13.000 people, thereof 2.400 women
- Percentage of women at CERN today: 21%

Hardly any biographies of, or research on, individual outstanding women particle physicists exist so far.

II.1. Human Actors in Particle Physics

(Pickering 1984: 245-247)

Professor of Particle Theory
Mary Katharine Gaillard
(1939 -)



Positions: 1964-1981 Researcher at CERN, 1982-2009 Professor at the University of California, Berkeley, to this day Researcher at Lawrence Berkeley National Laboratory

Achievements: Prediction of the charmed quark mass, three-jet events, the bottom quark mass, amongst others.

Publication: Report on Women in Scientific Careers at CERN. In: CERN-Report CERN/DG-11 from March 8th, 1980

II.1. Human Actors in Particle Physics



Professor
Renata Kallosh
Stanford University
String Theory

Professor Sau Lan Wu
University of Wisconsin-
Madison
Gluon Production, QCD



Nina Byers, Gary Williams (eds.): Out of the shadows.
Contributions of twentieth-century women to physics.
Cambridge: Cambridge University Press, 2006

II.1. Human Actors in Particle Physics

So far no gender research on these and other well known theorists and experimentalists...

Lisa Randall
Professor of
theoretical physics
Harvard University

<http://fallingawake.files.wordpress.com>



<http://cdsweb.cern.ch>

Fabiola Gianotti
ATLAS
Spokesperson

SLAC Theorist
Helen Quinn

<http://www2.slac.stanford.edu>



<http://atlas.ch/photos/portraits.html>

Fermilab
Deputy Director
Young-Kee Kim

II.1. Human Actors in Particle Physics - Recent research

Professor **Gisela Mateos**
Universidad Nacional Autónoma
de México, Mexico City

Research project:

History of neutrino physics

Aim: to include the women in neutrino physics





Gisela Mateos

The absence of women in neutrino physics
Proceedings of the 2nd ICESHS, 2006

While I was working on the history of the discipline of neutrino physics I was shocked by the absence of women in all the brief histories related to the discipline. The first question arose: Are there any women in the field ? (...) I have been searching on the SPIRES HEP preprint index archive (...) in most of the cases the articles are signed with the family name and the persons name has been reduced to an initial. (...) The first task is to find out the name of the articles authors. (...) I did not found all the names. (...) For finding out which of the authors are women we found that some of them when they get married they use the name of their husband (...) But others remain with their families name. The Russian women have an -a at the end of the family name so you can detect them. All the other women are invisible.

1970: Total=134 Women=1 Men=101 Unknown=32

Women in Neutrino Physics

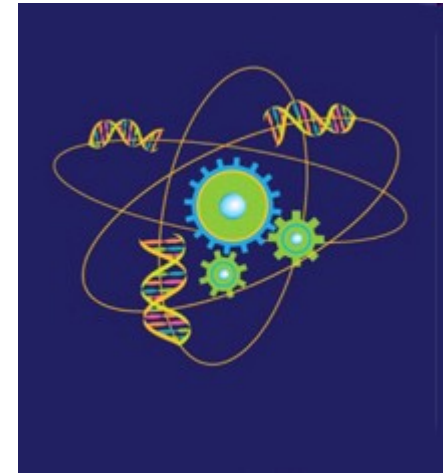
http://web.mit.edu/physics/people/faculty/conrad_janet.html



JANET CONRAD

Professor of Physics at MIT
Fermilab

Symposium
Leaders in Science
and Engineering:
The Women of MIT
March 28/29, 2011



<http://mit150.mit.edu/symposia/women-of-MIT>



II. Gender Studies and High Energy Physics

II.1. Human Actors in Particle Physics

II.2. **Workplace Cultures in Particle Physics**

II.3. Knowledge Production in Particle Physics



II.2. Workplace Cultures in Physics

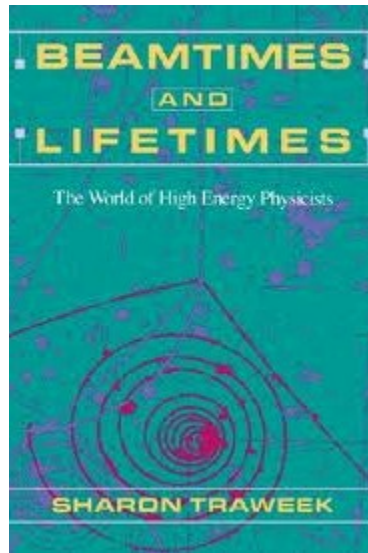
Historical, sociological, and anthropological studies on physics as a workplace culture shift the focus from

- the “problem of women or minorities in physics” to
- the “problem of physics with women and minorities”.

These research gives insight into the external and internal processes that

- create a welcoming or chilly climate for women and minorities at the workplace and that
- encourage or discourage their careers in physics.

II.2. Workplace Cultures in Particle Physics



Professor of
Anthropology
Sharon Traweek

Beamtimes and
Lifetimes.
The World of High
Energy Physicists

Cambridge &
London: Harvard
University Press,
1992 (orig. 1988)





Sharon Traweek

Beamtimes and Lifetimes

Chapter 3: "male tales" told during a life in physics:

In their careers, physicists journey from romantic readings of other's lives [as students], through handling on mimetic tales of heroic action and quest of survival [post-doc], to becoming [as group leaders] skilled practitioners of gossip and rhetoric. [As geniusses] They complete the circle by telling erotic tales about physics, tales transformed into romance for the next generation of neophytes.

Traweek 1992: 103



Sharon Traweek

Beamtimes and Lifetimes

Example „Group Leader“

The leader and protégé [his heir] will help each other in building and maintaining domains in their respective generations. One group leader at SLAC was known to be angry about a contretemps with another leader (...) The first leader is said to have leaked the information to a protégé at another lab, whose group supposedly began to look for the crucial data. When the discovery was announced, the credit had to be shared by the two groups.

This quite possibly apocryphal [doubtful] story made sense to its tellers because it included a leader and his loyal protégé assisting each other in their separate domains, each competing with others in his own generation.

cf. Traweek 1992: 94-101



Sharon Traweek

Beamtimes and Lifetimes

Example „Genius“

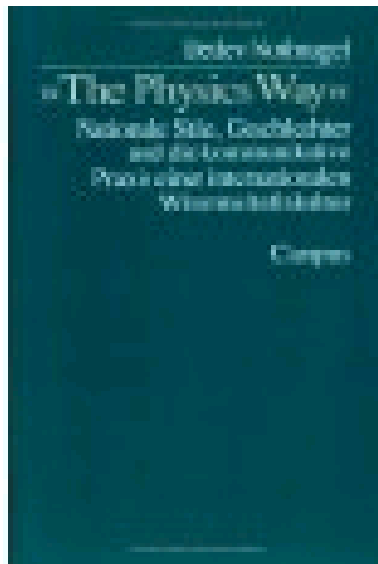
Richard Feynman: „That was the beginning, and the idea seemed so obvious to me and so elegant that I fell deeply in love with it. And, like falling in love with a woman, it is only possible if you do not know much about her, so you can not see her faults.“

Burton Richter: „Writing this brief biography has made me realize what a long love affair I have had with the electron. Like most love affairs, it has its ups and downs, but for me the joys have far outweighed the frustrations.“

Such stories express the desire for knowing about nature. But at the same time they express the physicists opinion about knowing and loving, and their image of women. The picaresque genre [story of rogue / histoire de filou] excludes women as proper subjects from the story and therefore from the history of physics.

cf. Traweek 1992:102-105

II.2. Workplace Cultures in Particle Physics



Professor of
Communication Studies
Detlev Nothnagel
„The Physics Way“.
Nationale Stile,
Geschlechter und die
kommunikative Praxis
einer internationalen
Wissenschaftskultur
[*National style, gender,
and communication of an
international science
community*]
Frankfurt/M.: Campus
2001



<http://147.172.172.240/employee/nothnagel/index.htm>

Detlev Nothnagel

The Physics Way

Searching for knowledge = Topos Hunting

Topos (rhetorical argument that expresses a relationship)

Hunting is sports, fun, and adventure. Moreover, hunting is a cultural activity. Hunting represents aggressive and colonial attitudes.

Hunting is a masculine activity, connected to power and domination. Hunting transfers a wild animal into a prey animal, transforms nature into culture. Moreover, physicists – themselves part of nature – by hunting turn themselves into cultural beings. Therefore hunting creates a new identity distinct from nature.

The topos HUNTING in HEP expresses fun as much as it is dealing with the identity of physicists. cf. Nothnagel 1992:100-101





II. Gender Studies and High Energy Physics

II.1. Human Actors in Particle Physics

II.2. Workplace Cultures in Particle Physics

II.3. **Knowledge Production in Particle Physics**



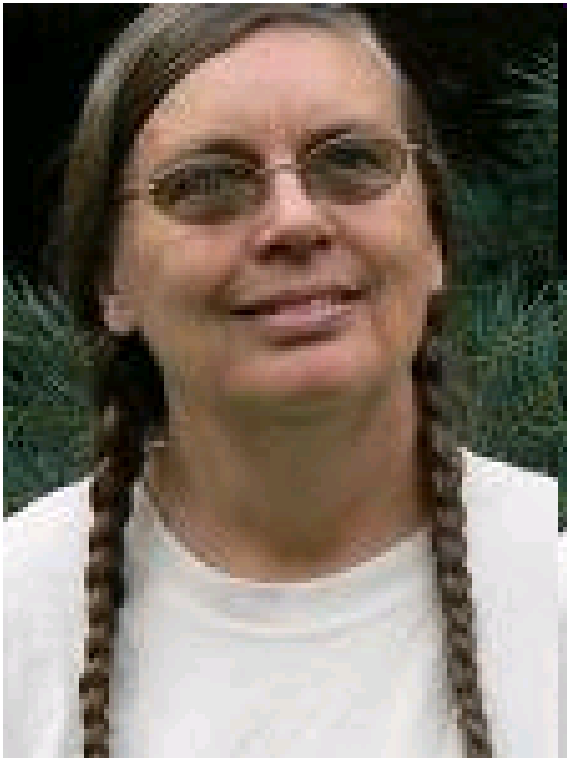
II.3. Knowledge Production in Physics

Studies on the knowledge production of physics shift the image of physics from an area of eternal truth and solid knowledge to an **area of human endeavour and processes of solidification.**

Gender researchers explore how in these processes images of gender are constituted, how gender feeds into the description of the material world, and how epistemological concepts are related to gender.

II.3. Knowledge Production in Particle Physics

http://acad.coloradocollege.edu/dept/pc/people/faculty_staff.html



Physics Professor
at Colorado College

Barbara Whitten

What Physics is Fundamental
Physics: Feminist Implications of
Physicists' Debate over the Super-
conducting Super Collider.
National Women's Studies
Association Journal, 8 (1996), 1-16

*Analysis of 10 years of arguments
from supporters and opponents of
the SSC in Physics Today.*



Barbara Whitten

What Physics is Fundamental Physics

FUNDAMENTALITY

Particle physicist: Who knows what surprises the SSC will reveal? If we did we wouldn't need the machine. We don't quite know what we are doing nor where it will lead. That's what I mean by fundamental.

Condensed matter physicist: The more the elementary particle physicists tell us about the nature of the fundamental laws, the less relevance they seem to have to the very real problems of the rest of science, much less to those of society. Therefore particle physics is not fundamental.

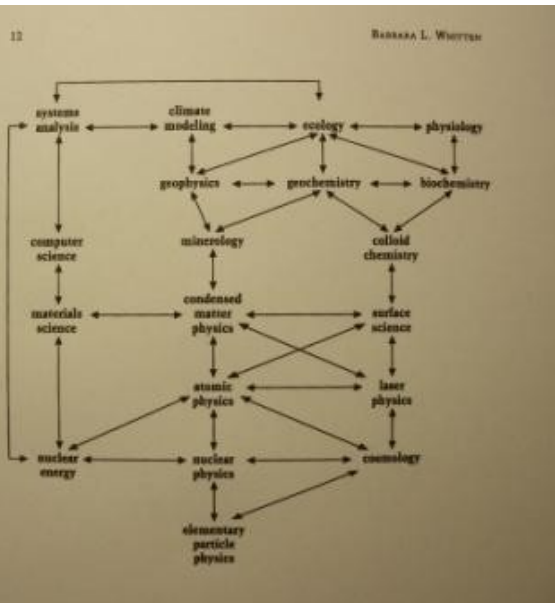
Applied physicist: The most important motivation of a scientist is not a sacred duty to understand the secrets of the universe but the humanitarian desire to solve the problems of human society. That is fundamental.

Barbara Whitten

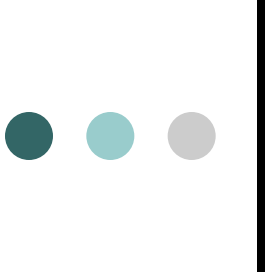
What Physics is Fundamental Physics

HIERARCHY

Particle physicist, condensed matter physicist, and applied physicist use different arguments, but, however, all reproduce uncritically the notion of a hierarchy of fields.



Whitten criticizes this linear hierarchical model. She develops a more complex and interactive model of science. It's fields interconnect and influence one another in complex ways, with information, analogies, techniques, and theories being exchanged on many levels. Whitten calls her model a web model and a more accurate and more feminist [gender equal, democratic] description of science.



III.3. Knowledge Production in Particle Physics

Naming in Particle Physics

It can be factual or joking with words!

- Research Institutes: CERN, DESY (homophonic to DAISY), FERMILAB
- Accelerators: LHC, SPEAR, HERA, TRISTAN
- Detectors: H1, ZEUS, VENUS, ATLAS, CMS (homophonic to SIAMESE)
- Particles: Electron, Muon, Leptons, Hadrons, Bosons, Higgs, Charm, Beauty...



III.3. Knowledge Production in Particle Physics

Sharon Traweek: Bodies of Evidence; Law and Order, Sexy Machines, and the Erotics of Fieldwork among Physicists, in: S. Foster (ed.): Choreographing History. Indiana University Press, 1995

Making names in this way shows that the groups know how to make the right sorts of puns. (...) What is it about the puns they find so satisfying (...) ? Reader, remember that puns bring together meanings which should be kept apart, a kind of verbal incest. (...) These puns directly contradict what all science and engineering students know should be kept apart. (...) What is so important, so dangerous, so illicit that it can only be said in jest [joke] ? Speech and writing, appearance and science, bodies and minds are brought together, all under the name of heroic desire. (...) Why is the name of all this incest so unabashedly [open], sincerely heroic ?”

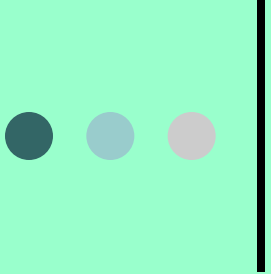
Traweek 1995: 211-226



III.3. Knowledge Production in Particle Physics

Furthermore, female names or allusions to femininity in HEP naming practices appear up to now, almost, solely in a sexual or sexualized context but unfortunately not to highlight the achievements of women in particle physics.

Physicists should leave behind romantic stories of heroes and love of the 19th century. 21st century physics should represent more up to date gender images in their naming practices.



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Gender Studies and Particle Physics – Summary and Prospects

SUMMARY

„applied research“

- Human Actors

„experimental research“

- Workplace Cultures

„theoretical research“

- Knowledge Production



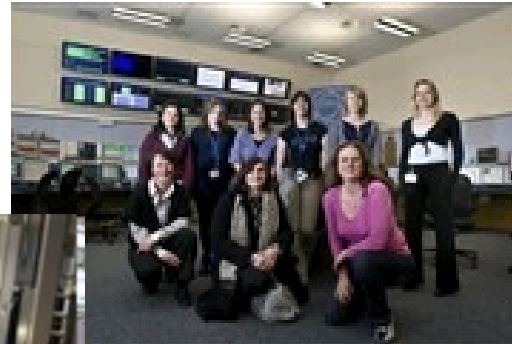
Gender Studies and Particle Physics – Summary and Prospects

PROSPECTS: open research questions

- How does the socio-cultural context influence the development of physics in detail ?
- How is gender in physics connected to other categories such as ethnicity, religion, or class ?
- How can physics be developed in a more diverse and welcoming way ?
- How can more physicists contribute to gender research and gender equality ?
- How can gender researchers be more up to date in particle physics ?

Celebrating Women in Particle Physics

March 8th, 2010



All young women interested in particle physics and high technology are welcome in the field as physicists, engineers and computer scientists

Particle physics is a field where women play an active role at the forefront of experimental research.

● ● ● |

**NorWiP– Annual Meeting 2008 – GenDADA
Crossing Perspectives on Gender and Physics
Conference 17-19 September 2008
Uppsala University**



**Detecting Gender:
Knowledge-Making in
Physics**

**The Anomaly of a Woman in
Physics**

**Dynamics of a Masculine
Field: Learning & Teaching**

**Applying Physics at our
Service**



Thank you for your attention!

further reference

Götschel, H.

The Entanglement of Gender and Physics:
Human Actors, Workplace Cultures, and
Knowledge Production

Science Studies Journal, vol. 24/2011, no. 2
*(special issue on Gender and Physics,
forthcoming)*