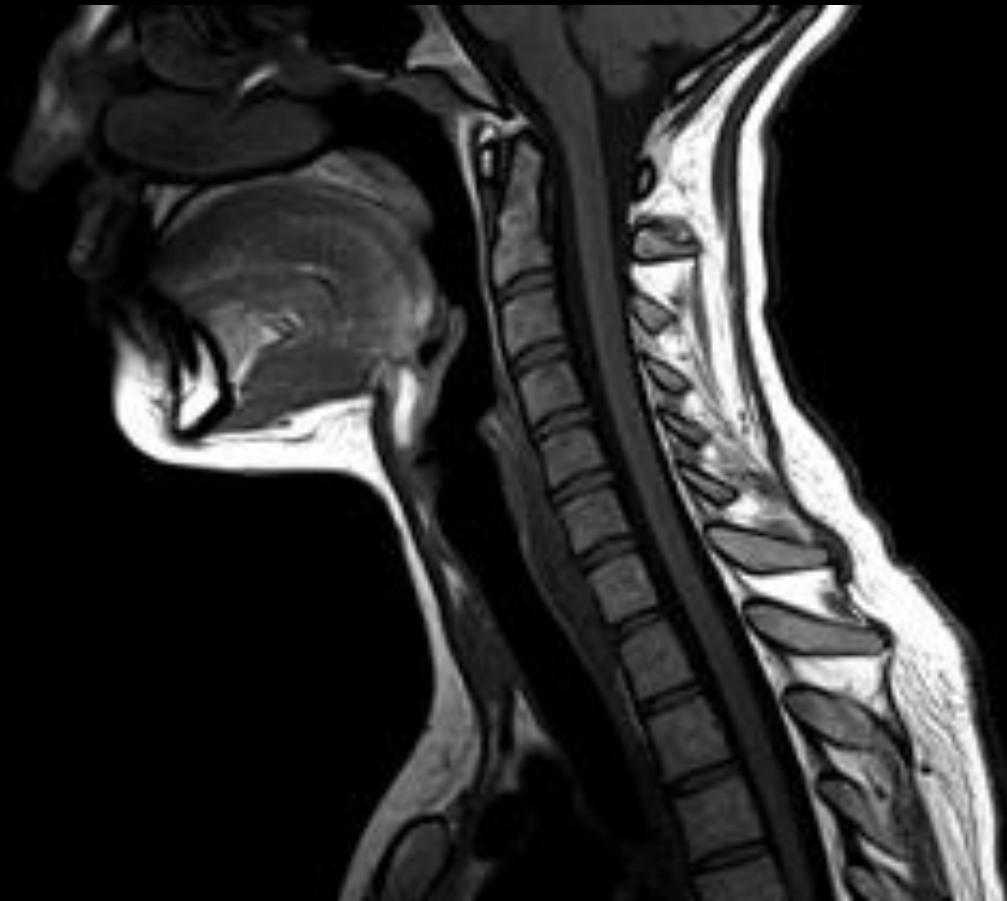




Source: Clermont Radiology, Clermont, FL

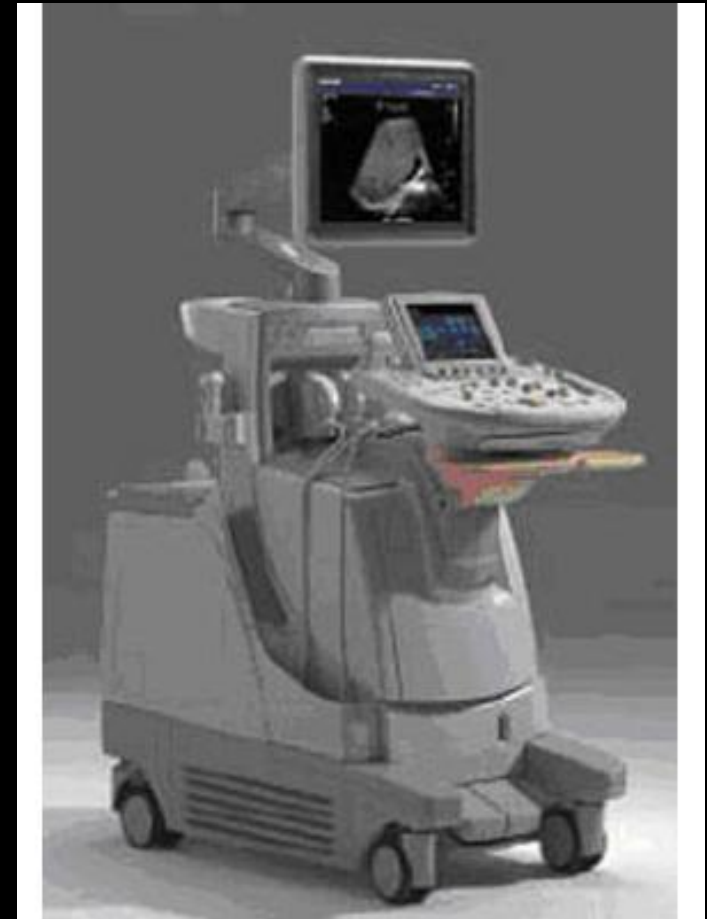
A Sacred Technology? Connecting Cultural Stories about MRI to Medical Practice



Kelly Joyce, Ph.D.
National Science Foundation
College of William and Mary
<http://wmpeople.wm.edu/kajoyc>

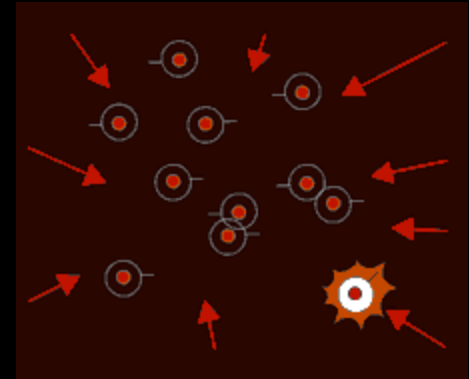
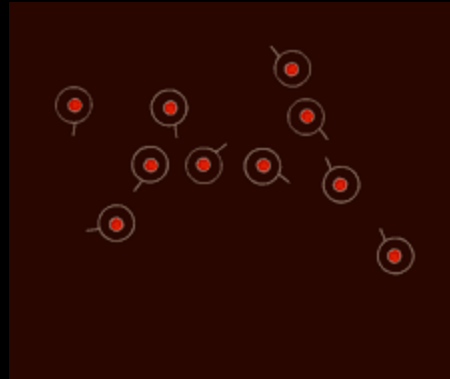
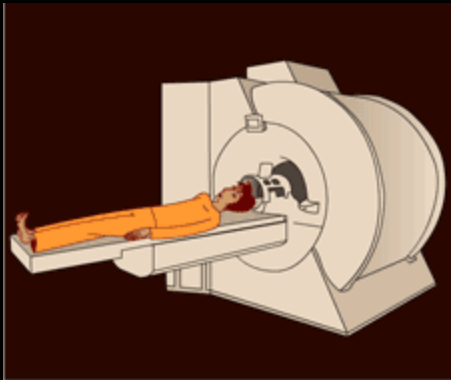
IMAGING TECHNOLOGIES

- **X-Ray**
- **Ultrasound**
- **Single Photon Emission Computed Tomography [SPECT]**
- **Computerized Axial Tomography [CT or CAT]**
- **Magnetic Resonance Imaging [MRI]**
- **Positron Emission Tomography [PET]**



Phillips IU22 Ultrasound Machine
Source: Total Medical Supplies

From Numbers to Pictures: MRI



Public Broadcasting Corporation, "Scanning the Brain."

Source: <http://www.pbs.org/wnet/brain/scanning/mri3.html>

Studying Medical Imaging Technologies (Early Work)

Histories of Imaging Technologies

Bernike Pasveer (1989)

Edward Yoxen (1987)

Stuart Blume (1992)

Social Science: Ultrasound and Pregnancy

Ann Oakley (1986)

Josephine Green (1990s)

Rosalind Petchesky (1987)

Margarete Sandelowski (1994; 1996)

Studying Medical Imaging (Cont.)

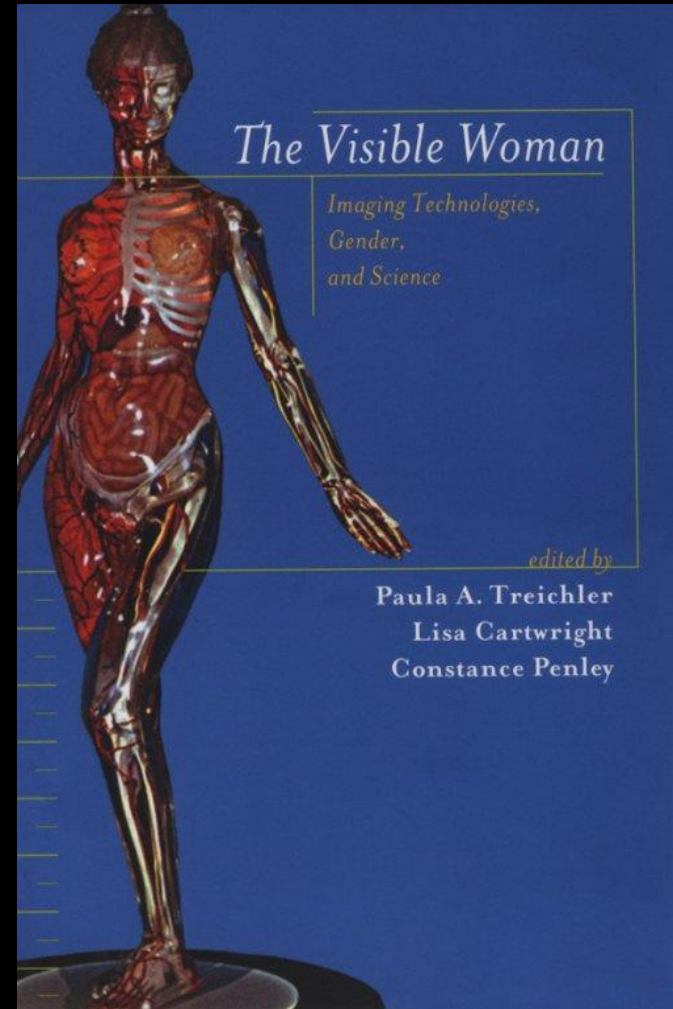
English/Film Studies

(early 1990s):

Lisa Cartwright, UC San Diego

Valerie Hartouni, UC San Diego

Carol Stable, U of Oregon



Medical Imaging Scholarship (recent)

Neuroethics (2000-current)

Judy Illes, Program in Neuroethics
Stanford University, U.S.

Eric Racine, Neuroethics Research

Unit, Institut de recherches cliniques de Montréal
(IRCM), Canada

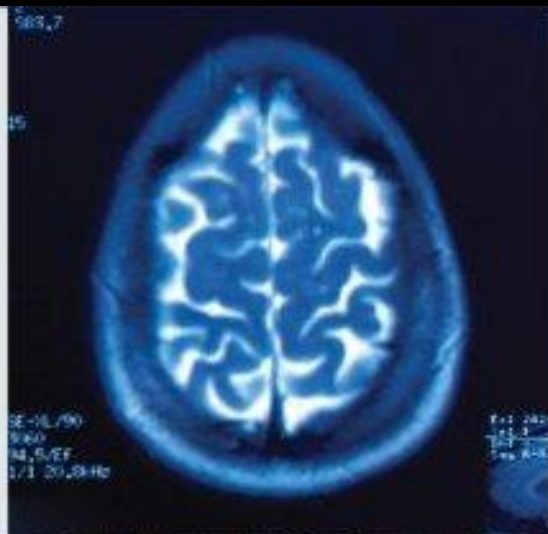


Ultrasound, Identity, Pregnancy (2000-current)

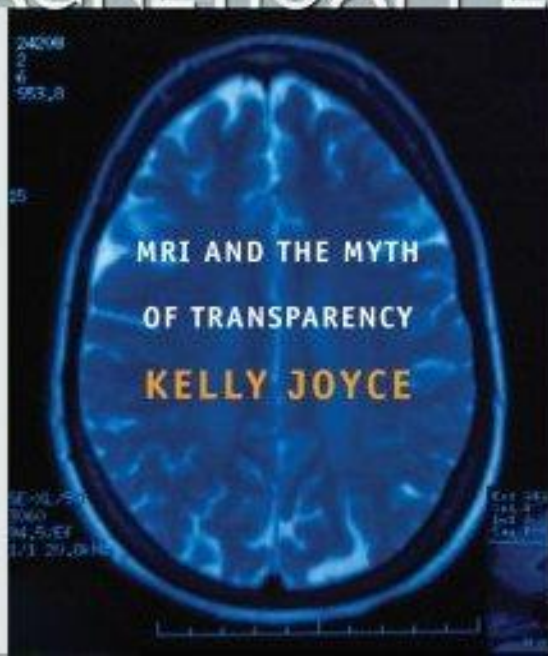
- Eugenia Georges, Rice University, U.S.
- Lisa Mitchell, University of Victoria, Canada
- Julie Palmer, University of Warwick, U.K.
- Janelle Taylor, University of Washington, U.S.

STS/Sociology/Anthropology (late 1990s-current)

- Morana Alac, U California-San Diego, U.S.
- Anne Beaulieu, Royal Netherlands Academy of Arts and Sciences, The Netherlands
- Regula Burri, Collegium Helveticum of ETH, Switzerland
- Joe Dumit, U California-Davis, U.S.
- Kelly Joyce, College of William and Mary, U.S.
- Amit Prasad, U Missouri-Columbia, U.S.
- Rachel Prentice, Cornell University, U.S.
- Catherine Waldby, University of Sydney, Australia



MAGNETIC APPEAL



Research Methodologies

- ▶ Content analysis of media sources, 1999-2006
- ▶ Fieldwork at 3 MRI units in New England
- ▶ Fieldwork at 5 MRI-related Conferences
- ▶ Interviews with 48 technologists and physicians affiliated with the research sites
[20 interviews with technologists, 17 interviews with radiologists, and 11 interviews with neurologists]
- ▶ Interviews with inventors of the technology

My Contributions to STS Literature

- Economics of imaging (e.g., grant funding, advertisements, fee-for-service reimbursements)
- MRI use in clinical practice (not research laboratories)
- Rise of Radiology as a profession



Grounded Theory

- Anselm Strauss and Barney Glaser, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (1967)
- Strauss, *Grounded Theory in Practice* (1987)
- Inductive approach
- Develop codes/themes from reading through data
- Systematically code data post theme development

U.S. Popular Culture (1999-2006)

- MRI is equivalent to the physical body
- MRI represents progress
- MRI as agent or actor

MRI is Equivalent to the Physical Body

“Supersharper scanning machines are giving doctors a clear new window into the brains of stroke victims, revealing strokes that are missed three-quarters of the time by older scanners. The device is a kind of souped-up MRI machine that can pinpoint spots of dying tissue deep within the brain during the first hours of a stroke” (Haney, *Chicago Sun-Times*, 2000: 29).

MRI is Equivalent to the Physical Body (cont.)

- Dr. Jay Giedd “has devoted the past 13 years to peering inside the heads of 1,800 kids and teenagers using high-powered magnetic resonance imaging [MRI]. For each volunteer, he creates a unique photo album, taking MRI snapshots every two years and building a record as the brain morphs and grows” (Wallis and Dell, *Time*, 2004: 56).

MRI as Progress



Epcot Innoventions, 1999-2002

Source: Radiological Society of North America

MRI as Agent

- “MRI scans found cancer in her brain”
(Parlette, *San Francisco Chronicle*, 2005: E1).
- “The MRI showed the jury where cerebral spinal fluid had leaked through multiple skull fractures (seen on accompanying CT images) into King's right maxillary sinus” (Kevles, *Naked to the Bone*, 1997: 175).

Exceptions Exist

- House (Fox Television Show)
- Gina Kolata, New York Times



Source: Fox Broadcasting
Company

MRI is Equivalent to the Body

- “MRI is really the same as the anatomy labs. You can look at the anatomy perfectly, see everything.” (a neurologist)
- “Now with MRI you are going to be seeing the heart in real time. You are going to be seeing the lungs in real time. You are going to be marching through the body with MRI.” (a radiologist)

MRI as Progress

- “Physical exams are guesses as to what is going on. The imaging is really key.” (a radiologist)
- “Using MRI, one can easily look and see that there is a disc [problem in the back]. It’s all very cut and dried. It’s not like, ‘Oh well. I can do an examination on you and [tell you that] you have some sort of lower back pain. We don’t know exactly what’s causing it. It’s probably a disc.’” (referring physician)

MRI as Agent

- “It was MRI that diagnosed that problem. MRI has told me that the patient has had strokes, but I don’t know what caused it.” (a radiologist)
- “It [MRI] shows you so much... It’s just so fantastic. It shows you everything you have to see.” (a radiologist)
- “Here is an equipment which allows you to know a lot and peeps into your body and has the ability even to look at functions and things like that.” (a referring physician)

A Sacred Technology?

- “I feel a thrill when I look at MRI exams... Its nothing short of a miracle to be able to look at [the body through MRI],” (a physician)
- “I am still always in awe [when I see an MRI exam]. I stare at them for hours.” (a physician)
- “God, these pictures are beautiful.” (a radiologist)

A Sacred Technology?

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- “God, these pictures are beautiful.” (a radiologist)

A Sacred Technology? (cont)

- A brain scan was “exquisitely beautiful, because it was a face and a head, and you could see the profile.” (a radiologist)
- “There are clearly cases right now that without MR, I would be shooting in the dark. MR provides me with the light to decide what path of a different therapy I am going to take.” (a physician)

Healthcare Professionals' Tacit Knowledge

- the production of the exams
- the transformation of the image into a written report
- the use of the scans and the written report by referring physicians



Source: Clermont Radiology, Clermont, Florida

The MRI Suite

Producing MRI Scans

- “It’s easy to tweak the parameters to make something that’s not there. You can also hide lesions. If you knew where a lesion was and you pointed it out to me, I could make it so that the lesion can be in the gap. And you could go through the liver or the brain and you would never see it.” (a technologist)
- MRI scans “are smoke and mirrors.” (a technologist)

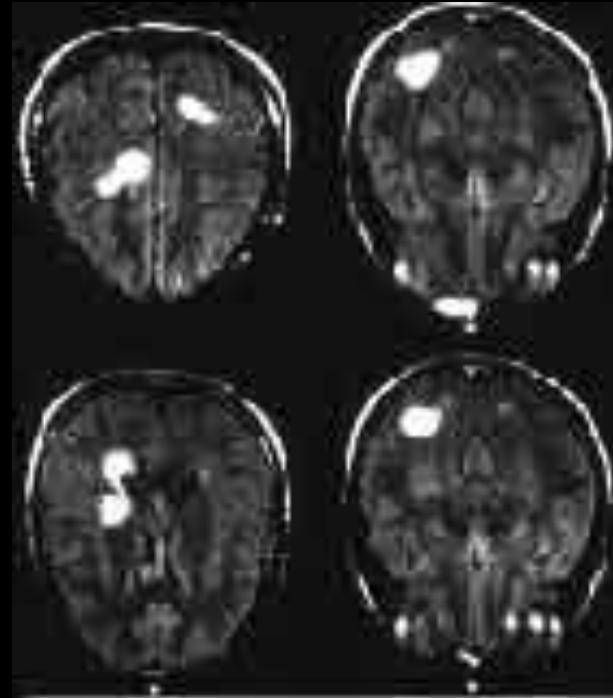


Source: Owen Franklin, Corbis Corporation.

Into the Reading Room

Working to Interpret Scans

- Artifacts (e.g., flow voids, cross talk)
- Old Friends
- Unidentified Bright Objects [UBOs]
- Overinterpretation
- Underdiagnosis



Source: Columbia University Medical Center.

Interpretation Work

- “You hope that you see everything, but that isn’t the case. There have been studies that suggest that radiologists may miss 35% of the findings on any given image.” (a radiologist)

Interpretation Work (cont.)

- There was a patient at ----- that was scheduled to have a resection of a pineal tumor. It turned out that it was an artifact from a flow void. The neurosurgeon who scheduled the operation for that same day said, “I just want to make sure that we are looking at the same thing here.” He put the film up in front of me. And I said, “We are looking at a flow void in the third ventricle.” He said, “Really? That’s not a pineal tumor?” I said, “No. That’s not a pineal tumor.” And he said, “Oh. Good thing I showed it to you.”

The Clinical Encounter

- “The MRI scan is probably negative up to 25% of the time in [Multiple Sclerosis] cases, so I would usually trust my exam much more than the MRI scan.” (a neurologist)
- “Say a patient gets an MRI and it shows a lesion that is of no clinical consequence. Now you are left with doing the backtracking and saying, ‘You’re neurologically normal. This bright object in your brain is of no significance. It has no correlation with the headache that you have. You just have a headache.’” (a neurologist)

Policy Implications in the U.S.

- No policies that mandate MRI parameters (e.g., slice thickness, field of view)
- Fee-for-service reimbursements plus emphasis on productivity encourages shorter exams
- Health insurance policies typically reimburse for one reading
- Formal review of radiologists' work dependent upon the institution
- Few regulations about doctors' training and interpretation of MRI scans

Policy Implications (cont.)

“I researched who read the exam and it was a neuroradiologist. A neuroradiologist shouldn’t be reading a pelvic exam. But he was the radiologist on duty that day and instead of saying that he was incompetent to read it, he read the exam.” (a technologist)