An STS Approach to Medical Instruments: The Trans-orbital Lobotomy as a Socially Constructed Technology

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Abstract

This article considers the technological development of the trans-orbital lobotomy and how this related to the social and cultural medical infrastructure of the United States in the 1940s and 1950s. The trans-orbital lobotomy, developed by Walter Freeman in 1946, initially equipped an ice-pick to sever the white matter connecting the prefrontal cortex and the thalamus. At the time, this was viewed as a more tailored approach to Egas Moniz's pioneering pre-frontal lobotomy procedure. By viewing the ice-pick as a socially constructed implement, it is suggested that the tool worked within a semiotic and functional logic similar to that of other surgical instruments. This paper also seeks to rebut Collin & Stam's 2015 paper, in which the transorbital lobotomy is dismissed as an "unaccepted anomaly."

Introduction

In writing critical analyses of technological artifacts, the approach of science and technology studies (STS) offers insight into the coproduction of the material and the societal. Material history aims to take seriously the ways in which objects reflect and influence how we experience the world, and by doing so it expands the sources available to historical analyses.[1] To view the practical applications of an STS

[1] Jordanova, "Introduction."

perspective, this article will reflect upon the material history of the trans-orbital lobotomy and its relation to the field of psycho-surgery.

Initially, the pre-frontal lobotomy, or leucotomy, involved a leucotome being used to sever the white matter connecting the prefrontal cortex and the thalamus. This procedure was believed to alleviate mental illness and was frequently conducted for psychiatric patients with diagnoses of schizophrenia, agitated depression, and dementia praecox.[2] While the procedure often succeeded in controlling patients' disruptive behaviors, many patients emerged from the surgery with severe personality disruption and disturbed emotional expression. Regardless of these issues, the pre-frontal lobotomy experienced several decades of acclaim and scientific uptake, including inventor Egas Moniz being awarded the 1949 Nobel Prize in Medicine.[3] Following critiques of the pre-frontal lobotomy as overly invasive, Walter Freeman's trans-orbital lobotomy emerged in 1946 as a 'safer' and 'tailored' approach to psycho-surgical intervention.[4] While the pre-frontal lobotomy had involved a 'shot in the dark' of entering the patient's frontal cortex through an extensive surgical process, the transorbital lobotomy involved the insertion of an orbitoclast through the orbital socket and a quick gesture to sever a smaller section of white matter connections.

Historical literature on the material qualities of the lobotomy has been limited, with a 2015 paper by Collins & Stam offering the only dedicated analysis. Collins & Stam's study of the materialities of lobotomy posits that the procedure serves as an anomaly in the lineage of psycho-surgical procedures. While they do not draw upon a

[2] Braslow, "Effectiveness and Social Context."
[3] Ibid.
[4] Pressman, "Politics of Precision."

specifically delineated definition of anomaly, an image emerges of deviance, of a lack of belonging within the wider field of psychosurgery and medical knowledge. In their words, “Freeman’s innovation was unwelcome, repulsive, and, ultimately, an unaccepted anomaly.”[5] They base this argument on the technological implementation of the ice-pick and Freeman’s deviation from the accepted space of the operating room. Through mapping the social shaping of Freeman’s orbitoclast, its form emerges as a reflection of the needs and problems of psychosurgery rather than an anomalous technical misstep. Employing the social construction of technology (SCOT), this article will argue that the trans-orbital lobotomy reflects broader networks of materiality, power, and cultural meaning. Following from this, consideration will be placed on how a SCOT approach reframes the role of materiality and challenges historical narratives of invention.

SCOT Theory and its Applications to the History of Surgery

SCOT provides a multi-directional model, which allows for consideration of how social groups determine the problems and solutions of design, as well as a view of ‘invention’ as a drawn-out process of the stabilization of varied technological features.[6] This approach takes into account the ‘interpretative flexibility’ of technology, wherein relevant social groups may perceive whether a technology ‘works’ through varying metrics. From here, the acceptance of a technology’s success emerges out of human characteristics rather than an internal superiority of design or inevitable expression of technical logic.[7]

[5] Collins & Stam, “Lobotomy as Anomaly,” 128.
[6] Pinch & Bijker, “Social Construction of Facts and Artifacts.”
[7] Ibid.

Alongside this, the concept of design flexibility highlights the entanglement of the social in the perception of available design options and the resulting multiplicity of forms a technology can take. In its view of materiality, SCOT offers a means of reckoning with the permeability of technology's shape and function.

As Jones[8] suggests, the adoption of SCOT can assist in analyzing how surgical instruments function in the generation of knowledge, meaning, and practice. She argues that SCOT offers a view into the negotiations involved in producing tools, and the potential for a methodical consideration of the material within historical research. Within the field of STS, the connection between the material, technical, and societal has been envisioned in different capacities, with a significant turn towards Latourian actor-network theory.[9] For the study of surgical instruments, Jones argues that the network approach undermines the centrality of the material and flattens the impact of human agency. In this capacity, although SCOT may offer an older approach, it serves as a compatible mode of linking STS, history, and the material. The following sections will outline a brief history of lobotomy's instruments, followed by an application of SCOT theory.

A Brief History of the Instruments of Lobotomy

In viewing the evolving approach to lobotomy and the tools involved, the orbitoclast emerges as a contextually bound technology. This lineage began with the procedure of the leucotomy, developed by Portuguese neurologist Egas Moniz and his collaborator Almeida Lima in 1935.[10] To carry out the procedure, Moniz developed the leucotome,

[8] Jones, "Surgical Instruments."
[9] Ibid.
[10] Balcells, "History of Leucotomy."

which Collins & Stams suggest followed the conventions of contemporary surgical instruments.[11] The instrument involved a long shaft with a hooked shape at the end. When inserted, a swiveling motion would allow for a 'coring' of brain tissue and the severing of white matter connections. The prefrontal leucotomy also featured a series of surgical instruments, including a scalpel, surgical drill, syringes, surgical mallet, osteotome (similar to a chisel), mastoid retractor, and a rubber dam.[12]

Once brought into the American context by Walter Freeman and James Watts in 1937, the leucotomy was renamed the lobotomy and performed widely on patients with severe forms of mental illness.[13] As the pre-frontal lobotomy expanded into medical practice, concern began to arise over the large-scale destruction of brain tissue and risk of severe personality damage.[14] To address the deficits of the pre-frontal approach, psycho-surgeons attempted to find an alternative, with clinician Walter Freeman emerging as the most 'successful.' Freeman cites Italian neurosurgeon Amarro Fiamberti with informing his trans-orbital approach.[15] Fiamberti had pioneered this route in 1937, conducting over one hundred operations through the trans-orbital route using injections of alcohol to eliminate brain tissue.[16] At this point, the trans-orbital approach

[11] Collins & Stam, "Lobotomy as Anomaly."
[12] Freeman & Watts, *Prefrontal Lobotomy*.
[13] Pressman, "Politics of Precision."
[14] Ibid.
[15] Ibid.
[16] Balcells, "History of Leucotomy."

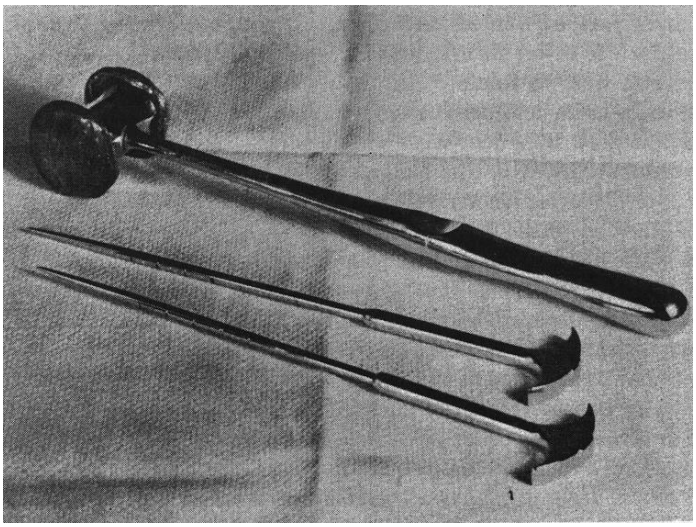
remained a niche method, leaving Freeman with the task of developing a customized approach and instrument suited to popularizing the procedure in the American context.[17]

To refine a new approach to lobotomy, Freeman conducted experiments on cadavers. He described the uptake of the ice-pick (figure 1) as a response to there being:

> "No surgical instrument available that was tough enough to perforate the orbital roof in some cadavers, though in others a spinal puncture was sufficient. I selected an icepick as being the only instrument that possessed the necessary qualities of sharpness and toughness to do the job."[18]

Figure 1: Ice-pick used in Freeman's trans-orbital lobotomies c.1950. Accessed via: https://eehe.org.uk/?p=25037. Image source: Wellcome Images (WI no. L0026980).

In the continued use of the ice-pick, the technological form was adapted to meet the technical and social needs of its use as a medical instrument. This re-design process produced the orbitoclast, also referred to as the transorbital leucotome (figure 2). This instrument was designed to form a stronger, blunter, and better calibrated iteration of the ice-pick.[19] Freeman argued for the success of the orbitoclast based on its ability to sever less brain tissue, avoid scarring, and re-orient the lobotomy as a 'minor' operation.[20] Based on the relative simplicity of this approach, Freeman advocated for the extension of the procedure



[17] Ibid.
[18] Pressman, "Politics of Precision," 337
[19] Pressman, "Politics of Precision."
[20] Ibid.

beyond the sanitary and normative walls of an operating room, as well as its performance on less-severe forms of mental illness.[21] The fall of lobotomy and psycho-surgical intervention has been widely attributed to the rise of anti-psychotic drugs Reserpine
and Chlorazopine in the mid-1950s.[22] Pharmaceutical options provided a less invasive approach to sedating or stabilizing patients, with the added benefit of being easily scalable to meet the needs of hospital overcrowding.[23]

The Social Construction of the Trans-orbital Lobotomy

Viewed through the perspective of the social construction of technology, the orbitoclast appears as situated within pre-existing technological forms and expectations of a successful instrument. Pressman describes the further refinement of lobotomy as stemming from the impulse of "following through on their faith in science,"[24] which imparted the need for the refinement of lobotomy rather than an abandonment of the pre-existing scientific 'progress.'[25] From this standpoint, the adaptation of the lobotomy to the trans-orbital route represents a continuity with the existing scientific theory and professional role of psycho-surgery. As Pressman notes, the uptake of the ice-pick resulted from a trial-and-error process wherein standard surgical tools failed to provide the necessary features.[26] This process can also be viewed as 'learning by doing,'[27] wherein the experience of using tools influences design

[21] Collins & Stam, "Lobotomy as Anomaly."
[22] Braslow, "Effectiveness and Social Context."; Faria, "Brief History of Psychosurgery."
[23] Braslow, "Effectiveness and Social Context."
[24] Pressman, "Politics of Precision," 354.
[25] Ibid.
[26] Ibid.
[27] Jones, "Surgical Instruments."

and operation, therefore serving as a slower form of development and an expression of tacit knowledge.

Mackenzie & Wajcman characterize the development of new technologies as "not from flashes of disembodied inspiration but from existing technology, by a process of gradual change to, and new combinations of, that existing technology."[28] In viewing the trajectory of the orbitoclast as outlined above, it emerges from a lineage of the leucotome and the attempts to match technical features to the task of the trans-orbital route. The stages of this process suggest the relevance of design flexibility, wherein different features are selected to match the emergent problems a technology aims to solve. The form of Freeman's procedure can arguably be located as a synthesis of Fiamberti's and Moniz's approaches. Replacing Fiamberti's use of alcohol or formalin into the frontal lobe, Freeman's approach marks the standard established by Moniz of the use of a tailored tool in producing a swiveling motion and thus severing brain tissue. Arguably, the trans-orbital lobotomy borrows much from the pre-frontal lobotomy, with the primary difference being the use of only two tools for the trans-orbital route.

Alongside the function of the tools, the visual impact of the material provides relevant insight into the development of the orbitoclast. As Jones outlines, concern may be placed on the viscerality of what a surgical tool looks and feels like.[29] Centrally, the composition of the ice-pick as a metal object with a handle and a sharpened point locates it within the visual vernacular of surgical instruments. In its ongoing design process, we see the replacement of a wooden handle with a uniformly metal structure. This likely reflects expectations of the visual features of a surgical instrument, as well as

[28] Mackenzie & Wacjman, "Introductory Essay," 9.
[29] Jones, "Surgical Instruments."

an aesthetic and practical association between sterility and metal.[30] Ghislaine Lawrence writes on the symbolic function of metal implements, noting the contrast between all-metal surgical instruments and the persistence of wood, brass, and ivory in the tools of physicians.[31] Based on Freeman's role as a clinician rather than a trained neurosurgeon, the inclusion of wood reflects the profession-based range of materials available in developing medical tools. As Lawrence suggests, the visual quality of metal emerges as a symbol invoking surgery's role as a modern and prestigious pursuit.[32] The lack of wood in the orbitoclast's design may represent a cohesion to surgical norms, wherein what was anomalous at one point becomes filtered out in the process of forming an acceptable technology.

When viewing the trans-orbital lobotomy, a variety of social groups emerge in the shaping of the technological artifact. Of immediate concern here is the relationship and power-distribution between physicians, patients, and institutions. The overcrowding of psychiatric institutions, particularly state hospitals, has been suggested to be the core challenge psycho-surgery endeavored to address in the post-WWII era.[33] The dis-empowerment of the patient marks an undeniable aspect of the acceptability of both the pre-frontal and trans-orbital lobotomies. These procedures did not require the consent of the patient, who was institutionally rendered as an acceptable target for drastic medical intervention.[34] The families of patients also presented an essential social group, with the 'success' of a lobotomy being largely evaluated by the patient's ability to re-

[30] Schlich, "Surgery, Science, and Modernity."
[31] Schlich, "Surgery, Science, and Modernity," 246. Schlich's application of Lawrence's work has been used based on lack of access to source material.
[32] Ibid.
[33] Braslow, "Effectiveness and Social Context."; Faria, "Brief History of Psychosurgery."
[34] Ibid.

integrate into their previous living situations.[35] The trans-orbital lobotomy pushed the boundaries of surgical procedure by removing psycho-surgery from a sterile operating space, with the procedure instead being performed in psychiatric wards and state hospitals. While this move can be viewed as anomalous to the rules of medical knowledge, the ability for this subversion of norms reflects the ability of the trans-orbital lobotomy to 'work' in meeting the expectations of its relevant social groups. Pressman contextualizes Freeman's approach as reflecting the 'physician-king' status of American private-practice physicians.[36] The lack of accountability or standardization within the medical field at the time allowed for physicians to practice according to their own impulses and beliefs.[37] The acceptability of drastic intervention reflects the disempowerment of psychiatric patients, with women and other marginalized groups facing added levels of stigmatization and the resulting imposition of medical control.[38] In viewing the social groups surrounding the orbitoclast's usage, the design and application of technology appears as tailored to its societal setting. Particularly, the trans-orbital lobotomy's ability to efficiently sedate and 're-make' the psychiatric patient emerged as a key qualification for its uptake.

The design of the implement reflects the value placed upon efficiency, thus suggesting that the orbitoclast provided a technical 'solution' to mass-overcrowding and a desire to render patients docile.

On Anomaly and Hindsight

[35] Braslow, "Effectiveness and Social Context."
[36] Ibid.
[37] Pressman, "Politics of Precision."
[38] Ibid.

What is being done by positioning the trans-orbital lobotomy as an anomalous step in the history of psychosurgery? Now cast out of medical practice as a shameful and grisly historical misstep, what remains is a consideration of its role in the history of medicine. Based on the controversial nature of lobotomy, historiography takes an inevitable stance in communicating the role of morality and intent in its renderings. In "Freeman's Transorbital Lobotomy as an Anomaly: A Material Culture Examination of Surgical Instruments and Operative Spaces," Collins & Stam argue for the value of material culture in providing a new means of viewing lobotomy and therefore a view into its anomalous status.[39] The separate set of conclusions drawn here reflect the difficulty of drawing conclusions based on the material, which holds a range of interpretations contingent upon one's personal views and methodological approach.[40] Scholars of material culture suggest that the topic requires a synthesis of disciplines, with insights held in archaeology, STS, anthropology, and other fields.[41] The history of the material is not a singular one, making the ways in which historians evidence their claims and draw upon the material subject to the narrative and epistemological leanings of their approach.[42]

Through Collin & Stam's approach, materiality is equipped to further a narrative of a single individual's deviant medical practice. Collin & Stam's article portrays a moment of discovery wherein: "In 1946, Freeman opened his kitchen drawer in the family home to retrieve a common house-hold item. It was an Uline Ice Company ice

[39] Collins & Stam, "Lobotomy as Anomaly."
[40] Harvey, "Introduction."
[41] Jordanova, "Introduction."
[42] Ibid.

pick… which had a wooden handle and a slim, solid, metal shaft."[43] This narrativization echoes an ongoing tension within the histories of science and technology, wherein moments of discovery, or one could say anomaly, occur as insulated within the creative capacity of the inventor.[44] In the framing of anomaly, the shape of the material is told to reflect the individual's role in isolated creation rather than the socio-economic and political conditions that allowed the technology to 'work' in its time and place. From the perspective of technological development, the trans-orbital lobotomy appears as a deeply embedded procedure that manifests the logic and needs of its broader network. This outlook allows for a more nuanced reckoning with the troubled past of psycho-surgery, rather than a casting-off of technologies now viewed as distasteful. For this case study, consideration of technology's social shaping serves as a route to question the narrative of invention as isolated and anomalous. By contextualizing individual actors, this may provide a more immersive view of what the material communicates about history.

SCOT Methodology and Viewing the Material

Through the perspective of science and technology studies, the orbitoclast emerges as a material object embedded in systems of the theoretical and tangible. As outlined above, the negotiation process involved in a more drawn-out view of invention illustrates the embeddedness to technological choice. The application of the ice-pick appears here as a reflection of the problems and power dynamics of psycho-surgery in the context of American institutions. Through an emphasis on design flexibility, the resulting form of

[43] Collins & Stam, "Lobotomy as Anomaly," 120.
[44] Pinch & Bijker, "Social Construction of Facts and Artifacts."

the orbitoclast emerges as neither inevitable nor anomalous, but rather existing as something in-between.

In its application to producing material histories, SCOT carries stylistic and narrative features that shape historiographic content. A core example of this can be seen in the genre's reliance on case studies, which present a single technology as a starting point for untangling societal influences.[45] Additionally, SCOT portrays a guiding approach to viewing the interaction between technology and society, wherein society is primarily acting upon technology.[46] In the case-study presented, history is told from the starting point of the leucotome and its relation to the 'invention' of the orbitoclast. From here, the societal context of the technology can be mapped onto how the material form took shape. SCOT provides an analytic viewpoint from which technology is rarely in an anomalous, stationary position within its environment. The mapping of societal influence allows for abstract features of design, implementation, and acceptance to contextualize the role of technologies. In this approach to a history of medical instruments, a particular view of embeddedness is put forth, which may benefit the critical gaze we place on the material.

Conclusion

Based on the application of STS theory to the transorbital lobotomy, the way in which materiality 'matters' to history shifts. Particularly, SCOT demonstrates a concern for technological trajectory and the contingencies involved in design. It is from this perspective that the orbitoclast appears not as an anomaly, but as a deeply reflective

[45] Law, "Materials of STS."
[46] Ibid.

technology that served the purposes of its setting. The historicization of lobotomy presents a challenge in viewing the application of medical knowledge in the context of its time. Through the application of SCOT, this paper has attempted to provide a more situated view of technological development, wherein the design of medical instruments appears as an ongoing negotiation rather than a moment of isolated discovery.

Works Cited

Balcells, M. “The History of Leucotomy.” *Neurosciences and History* 3 (2014): 130–35.

Braslow, Joel. “Therapeutic Effectiveness and Social Context: The Case of Lobotomy in a California State Hospital, 1947-1954.” *Culture and Medicine* 170 (May 1999): 293–96.

Collins, Brianne M., and Henderikus J. Stam. “Freeman’s Transorbital Lobotomy as an Anomaly: A Material Culture Examination of Surgical Instruments and Operative Spaces.” *History of Psychology* 18, no. 2 (2015): 119–31. https://doi.org/10.1037/a0039061.

Faria, Miguela. “Violence, Mental Illness, and the Brain - A Brief History of Psychosurgery: Part 1 - From Trephination to Lobotomy.” *Surgical Neurology International* 4, no. 1 (2013): 49. https://doi.org/10.4103/2152-7806.110146.

Freeman, Walter, and James Watts. *Prefrontal Lobotomy in the Treatment of Mental Disorders (GWU, 1942)*. The National Library of Medicine, 2018. https://www.youtube.com/watch?v=TjPwETslJyc&ab_channel=TheNationalLibraryofMedicine.

Harvey, Karen. “Introduction: Historians, Material Culture and Materiality.” Introduction. In *History and Material Culture: a Student's Guide to Approaching Alternative Sources*, 1–26 (Abingdon, Oxon: Routledge, 2018).

Jones, Claire, “Surgical Instruments: History and Historiography,” In *The Palgrave Handbook of the History of Surgery*, edited by Thomas Schlich, 235–57 (London: Palgrave Macmillan UK, 2018).

Jordanova, Ludmilla, “Introduction,” In *The Look of the Past: Visual and Material Evidence in Historical Practice*, 1–16 (Cambridge: Cambridge University Press, 2016).

Law, John, “The Materials of STS,” In *The Oxford Handbook of Material Culture Studies*, edited by Dan Hicks and Mary C. Beaudry, 171–86 (Oxford: Oxford University Press, 2010).

Mackenzie, Donald A., and Judy Wajcman, “Introductory Essay,” In *The Social Shaping of Technology*, edited by Donald A. MacKenzie and Judy Wajcman, 3–27 (Buckingham: Open University Press, 1999).

Pinch, Trevor J., and Wiebe E. Bijker. “The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other.” *Social Studies of Science* 14, no. 3 (1984): 399–441. https://doi.org/10.1177/030631284014003004.

Pressman, Jack David, “The Politics of Precision: The Quest for a Better Lobotomy,” In *Last Resort: Psychosurgery and the Limits of Medicine*, 318–61 (Cambridge: Cambridge University Press, 1998).

Schlich, Thomas. “Surgery, Science, and Modernity: Operating Rooms and Laboratories as Spaces of Control.” *History of Science* 45, no. 3 (September 1, 2007): 231–56. https://doi.org/doi.org/10.1177/007327530704500301.

Winner, Langdon. “Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology.” *Science, Technology, & Human Values* 18, no. 3 (1993): 362–78. https://doi.org/10.1177/016224399301800306.