

Doctor Atomic: Science Communication in Modern Opera

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Introduction

The opera, as an undoubtedly large-scale artistic and cultural event, portrays social behavior patterns and often criticizes a number of sociopolitical issues. Furthermore, as a popular spectacle nowadays through digital technology (online streaming and live in HD) the lyric art and great opera productions can reach the most remote corner of the planet. In this context, there is a growing movement which argues that the interaction of science and the performing arts can achieve an essential public engagement with science and technology (Schwartz 2014, p. 275).

In our paper we consider issues about the public image of scientist in the opera of contemporary American composer John Adams called *Doctor Atomic* (2005).² The opera focuses on the great stress and anxiety experienced by those at Los Alamos while the test of the first atomic bomb (the “Trinity” test) was being prepared.³ *Doctor Atomic* recalls the final hours leading up to the first atomic bomb explosion at the Alamogordo test site in New Mexico in July 1945. The focal characters are the physicist and Manhattan Project director, Dr. J. Robert Oppenheimer;⁴ his wife Kitty; Edward Teller; and General Leslie Groves, the US Army commander of the project. The controversial libretto of *Doctor Atomic*⁵ was created by Peter Sellars, drawing on original source material, including personal memoirs, recorded interviews, scientific literature, technical manuals of nuclear physics, declassified government documents, extracts from the *Bhagavad Gita* and the poetry of Charles Baudelaire, John Donne and Muriel Rukeyser.⁶

More specifically, we shall attempt to examine the following issues in the opera *Doctor Atomic* and in connection to recent developments in Science, Technology, Society (STS) studies and Science

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² Specifically, “the idea for an opera on J. Robert Oppenheimer came from Pamela Rosenberg, the then general director of the San Francisco opera. She envisioned an opera about an ‘American Faust’, and thought Adams was the composer suited for the job” (Nellestijn 2011, p. 5); see also Ross 2005.

³ See more at Ross 2005, Adams 2008, p. 273 and Nellestijn 2011, p. 6.

⁴ For the life, scientific work and activity of J. Robert Oppenheimer see Bird & Martin 2006; Thorpe 2006; Pais 2006; Monk 2012; Bernstein 1982; Banco 2012; Schweber 2000.

⁵ Critical reception of the opera overall was positive according to some critics (Ross 2005 & 2008; Tommasini 2007; Clements 2009), but the libretto mostly was lamented by the many other critics (Rosenbaum 2008; Kickasola 2008; Taylor n.d.). In these criticisms about the libretto Adams replied that “opera aficionados were not prepared for a libretto that moved back and forth from the banal rhythms of spoken language, much of it about physics and engineering, and the dense, evocative, and elusive world of great poetry” (Adams 2009, p. 57). Despite these reviews, the opera *Doctor Atomic* has unique value as it addresses a technoscientific fact, the first and largest project of “Big Science”.

⁶ According to Fink (n.d., p. 8) “...almost every line could be checked against a source”.

Communication (SciCom). First, we are interested in the shaping of the public image of a famous scientist in a modern opera which is available online. Second, we pay special attention to the directing of opera and how this contributes in the shaping of a public imaginary about the nuclear bomb and its creators. Finally, we are focusing on the official website of the opera and in which way the informative content that provides for the first atomic bomb constructs a public image for this. We believe that *Doctor Atomic* provides us with interesting insights on contemporary questions regarding public communication of science and technology.

Public image of science and scientist in "Doctor Atomic"

The opera starts (Act I, Scene 1) focusing on discussions that evolve around several issues between scientists Robert Oppenheimer, Edward Teller and Robert Wilson in the laboratory of the Manhattan Project: the dispute⁷ between Teller's obsession of a thermonuclear ("hydrogen") weapon, the "Super" (fission and fusion bomb), and "The Gadget" (fission bomb), the atomic bomb that the Oppenheimer had undertaken to construct; whether the discussions on the implications and risks inherent in the use of the atomic bomb must be carried out inside to the scientific laboratory; if the scientists are competent to making political decisions or should they leave these to the politicians. Issues which have been raised and studied by the STS. Furthermore, it is a scene that depicts the daily activities of scientists at work and which could have emerged from the classic books of STS studies as the *Laboratory Life* (Latour & Woolgar 1986) and *Science in Action* (Latour 1987). In this context, the (Act I) Scene 1 of the opera shapes a public image of Oppenheimer as a brilliant scientist (professor of physics) and a civil servant⁸ – a bomb laboratory's director, a science administrator upon whose shoulders the ultimate success of the Manhattan Project rested (Bird & Martin 2006, p. 241).⁹

On the other hand, focusing on the relationship of Oppenheimer with his wife Kitty (Act I, Scene 2), and the growing estrangement and loneliness that they felt due to the pressing job of Oppenheimer, shapes a different public image of Oppenheimer, not merely as a great scientist but "as an everyday human being" (Jabobi and Schiele 1989, p.750). Additionally, the literary reference to Baudelaire's poem ("Un hémisphère dans une chevelure", 1869) whereby the Oppenheimer addressed to Kitty, the mythological ("The rings of Plato"),¹⁰ hermetic ("Homer's golden chain")¹¹ and communist ("Lenin with his cry of Dare We Win")¹² references in the duo of

⁷ This dispute brought the two scientists in a severe conflict in the 1950s, the era of McCarthyism and prosecution of Oppenheimer as a communist danger.

⁸ As noted by Bird & Martin (2006, p. 217): "Los Alamos had transformed Oppenheimer. At Berkeley, he was the man of 'pure science' who had been entirely focused on exploring the 'deep secrets of nature'. But at Los Alamos, he was directing an industrial enterprise although he had not been before remotely interested in anything like an industrial enterprise".

⁹ But also as "mad scientist – mad because he stubbornly pursues what everyone else ignores; mad because what will emerge from his work is somewhat disquieting, unpredictable. He is reconstructing the world and therefore delving into the realm of the forbidden, or at least the dangerous" (Jabobi & Schiele 1989, p.749).

¹⁰ The Ring of Gyges is a mythical magical artifact mentioned by the philosopher Plato in Book 2 of his *Republic*. It granted its owner the power to become invisible at will. Through the story of the ring, *Republic* considers whether an intelligent person would be moral if he did not have to fear being caught and punished for doing injustices.

¹¹ Homer, the epic Greek poet, spoke (in the 8th book of the *Iliad*) about a mythical Golden Chain that binds heaven and earth, a chain every mortal man can climb if he desires to ascend to the realm of the gods.

¹² A reference to the book: Lenin, Vladimirilyich 1905, *Dve taktiki Sotsial-Demokraty v demokraticeskoy revolyutsii* [Two Tactics of Social-Democracy in the Democratic Revolution], translated by Abraham Fineburg and Julius Katzer, Geneva. Available from: <http://www.marxists.org/archive/lenin/works/1905/tactics/ch13.htm> [10 January 2016].

Kitty – Oppenheimer (declarative of the responsibility which lies with the scientist), the phrases from the Bhagavad Gita (5th century BC / “I am the heat of the sun”) and simile of Oppenheimer with the Hindu god Vishnu, as well as at John Donne’s poem (“Holy Sonnet XIV”, c. 1609),¹³ that inspired him to name the test site “Trinity”, highlights and shapes a public image of Oppenheimer, not as an ordinary scientist but a deep connoisseur of global literature, a man with especial sensitivities, a true “Homo Universalis”.¹⁴

Moreover, the opera *Doctor Atomic* (Act I, Scene 3; Act II, Scene 2 and Scene 3)¹⁵ reproduces a public image of “Big Science” depicting the military–scientific complex¹⁶ on which the construction of the atomic bomb was based. Speaking more with STS’s terms, the opera depicts a Latour’s actor – network¹⁷, with human (restless and anxious scientists and technicians – impatient militaries – pressing politicians/statesmen) and non-human (the unpredictable – fickle weather, the secret Potsdam Conference) actors, which interact and contribute to the construction of the atomic bomb. In this context, the opera shapes a public image of technoscience as a network of heterogeneous elements which are taking place within a set of diverse practices.

From the other side, the Orchestral Interlude (Act II, Scene 1), “Lighting in the Sangre de Cristos Mountains” (“Blood of Christ” in Spanish), reinforces a post-naturalness of opera, contributing to the creation of a set up where something demonic is going to happen, and reproducing a stereotyped public image of the “mountain of the mad scientist”¹⁸ which we find in the ’40 and ’50 science fiction and nuclear (atomic) monster films.¹⁹

Finally (Act II, Scene 1 and Scene 2), reproduced a public image according to which science and the construction of the nuclear weapons by Oppenheimer are framed negative while the female concern about what is happening, and the mother instinct of Kitty framed positive.²⁰ From another semantic point, this reproduces a perception whereby the male nature is intertwined with science–technology and female nature with the harmony of nature. A perception strongly has been disputed by the STS and Gender Studies.

“Doctor Atomic” 2014 | Opéra National du Rhin (ONR) – Strasbourg

¹³ Donne’s Holy Sonnet XIV “Batter My Heart Three Personed God” is his earnest plea to his Creator, the Three In One God, The Holy Trinity, Father Son and Holy Spirit, to deliver him from the clutches of evil Satan and ensure his eternal salvation. This poem reflects an aspect of the Oppenheimer’s character which cultivated by the Ethical Culture School, who was a student, but also the inner ethical concern about whether the atomic bomb turns him instead of a god into a demon.

¹⁴ Oppenheimer had read Plato and Homer in Greek, Caesar, Virgil and Horace in Latin and Hindu classics in Sanskrit. He could talk at length about literature as he had read a large part of English, French, German and Russian literature in the original text and Dante in Italian. When he was young began writing poetry. (Bird & Martin 2006). Also, the libretto with references to literature shows different kind of scientist of the past that the current over-specification and the neoliberal attack on the humanities make increasingly rare.

¹⁵ For a synopsis of each act see: <<http://www.earbox.com/doctor-atomic/>> [10 January 2016].

¹⁶ Concerning the role of the military–scientific complex in the manufacture of the atomic bomb see Kaiser, D 2015, “History: From blackboards to bombs”, *Nature*, vol. 523, no. 7562, pp. 523–525.

¹⁷ About Actor–Network Theory (ANT) see: Latour, B 2005, Latour & Woolgar 1986 and Latour 1987.

¹⁸ As noted by Bird & Martin (2006, p. 256): “Just before arriving, Robert Wilson had finished reading Thomas Mann’s *The Magic Mountain*, and sometimes he now felt as if he had been transported to that magical dominion”.

¹⁹ As noted by Nellestijn (2011, p. 3): “*Doctor Atomic* indeed is meant to refer to a kind of ‘50s science fiction films. To be more precise, I believe *Doctor Atomic* refers to the genre of nuclear monster films, in which a monster angered by a nuclear test threatens civilization. Secondly, I believe it is certainly possible for a spectator familiar with this type of films to perceive the references made in *Doctor Atomic*”.

²⁰ For the reproduction of a stereotype “science vs nature” to the opera *Doctor Atomic* see Golijov et. all 2015.

In this section, we attempt a brief analysis of the exceptional direction of Lucinda Childs for the production of *Doctor Atomic* by the Opéra National du Rhin in 2014 and how this direction reproduces and shapes a public image for the technoscience. Because is too long to discuss here, we focus we pinpoint the most important facts.



Fig. 1: “Doctor Atomic” 2014 | Opéra National du Rhin (ONR)

After an impressive introductory digital video²¹ (Figure 1), Oppenheimer²² with his colleagues (Act I, Scene 1) appear in a lighted tetragon closed room-box (Figures 2), studying formulas and equations written on a huge blackboard,²³ trying to solve problems that would lead them to a successful test of the first atomic bomb, while exposing their concerns about the ethical implications of their scientific work. This directorial choice reproduce a public image of science as a “black box”.

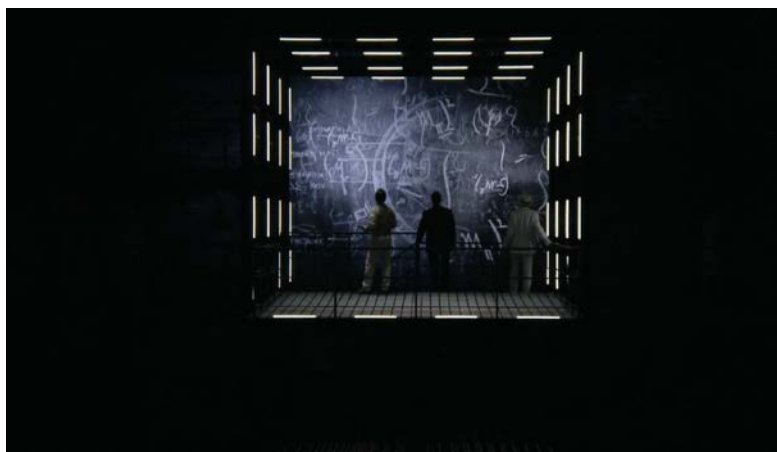


Fig. 2: “Doctor Atomic” 2014 | Opéra National du Rhin (ONR)

²¹ Directed by Stephen Guiol and Arnaud Pottier (BK), the omnipresent video content addresses a contemporary scenographic vision by providing a visual increase over several levels of screens for total immersion. See more: <<http://bk-france.squarespace.com/#/dr-atomic/>> [6 January 2016].

²² The choice a white suit as Oppenheimer’s garment is another of the many symbolisms that reflects the “innocence – naivety” of the scientist (“innocent dove”), and the character of Oppenheimer, an “esthete scientist”, but also, it contrasts with the “dark work” which he was in charge to carry out. In conjunction with the selection of bass-baritone Dietrich Henschel for the role of Oppenheimer, the production of the Opéra National du Rhin creates a public image of him which is not far from reality.

²³ “Oppenheimer’s lectures were invariably accompanied by a slew of formulas written on the blackboard. But like most theoreticians, he had no respect for mere formulas” (Bird & Martin 2006, p. 169).

In Act I Scene 2, the estrangement of the couple, because of the stressful and with great responsibilities Oppenheimer's job, is visualized by the director with the emblematic scene in which Oppenheimer and Kitty sit isolated from each other on the sofa of their house and in the background representing Oppenheimer's image, his mind and thought is dominated by the "Little Boy" (the codename of the atomic bomb that fell on Hiroshima) and the forthcoming trial (Figure 3).



Fig. 3: "Doctor Atomic" 2014 | Opéra National du Rhin (ONR)

In Act I Scene 3, we see a visualization of the preparations and the last checks which the technicians carry out while they are awaiting the final nuclear test and the first appearance of the "Gadget",²⁴ an accurate replica of the atomic bomb which Oppenheimer inspect (Figures 4). This is an image of Promethean' Oppenheimer with his gadget. The directorial choice of the emblematic introduction of the bomb is an image which shows both the insignificance of man in front of the total destruction, in which the use of modern technoscience may lead, as well as an image of the dawn of a new world, the nuclear world. Also, this scene is depicting the "Big Science" complex and also shapes a public image of technoscience as an actor – network.



Fig. 4: "Doctor Atomic" 2014 | Opéra National du Rhin (ONR)

Modern Opera and Science Communication in the Digital Age

Doctor Atomic premiered in 2005 World Year of Physics (celebrating the 100th anniversary of Einstein's year of great discoveries) and the 60th anniversary of the Trinity Test and atomic

²⁴ About the "Gadget" see:<<http://www.atomicarchive.com/Photos/Trinity/image5.shtml>> [5 January 2016].

bombings of Hiroshima and Nagasaki. In this context, “the San Francisco premiere of *Doctor Atomic* was an international cultural event, covered across the United States and Western Europe” (Fink n.d., p. 13). A variety of digital media (special websites, online streaming broadcastings, DVDs/Blue-Ray, YouTube video archives, digital exhibitions, free online educational materials²⁵ etc.) were exploited for the promotion of the opera *Doctor Atomic*, for the better information and enhancing the historical memory about the atomic bomb and the protagonists of, and for educational purposes, showing how, through the modern opera, the science and technology can communicate in public and cause an essential public engagement with them.²⁶

Specifically, two productions of the opera (De Nederlandse Opera / Dutch National Opera, 2007 and The Metropolitan Opera of New York, 2008) are available in DVD / Blue-Ray.²⁷ Also, the production of The Metropolitan Opera of New York (2008) and Opéra national du Rhin (2014) are available through the online platform Medici.tv (the largest online collection of classical music, operas and ballets in the world) – the second, for about one year, as well as was available free in Culturebox / Francetv info (the official web of the French public national television) –contributing to greater dissemination of opera to the public.²⁸ In addition, interviews with the creators of the opera *Doctor Atomic*, scientific symposiums for Oppenheimer, the atomic bomb and the opera, views from the historians of science and testimonies of the protagonists of the Manhattan Project there are online on YouTube and elsewhere.²⁹

The San Francisco Opera / Doctor Atomic official website – which was active until the summer of 2015³⁰ but now it redirects the viewers to John Adams official website (it includes only basic information about the opera) – and the Exploratorium - The museum of science, art and human perception (San Francisco)³¹ / Dr. Atomic: Commentary on an Opera (website)³² are two leading examples of science communication through modern opera and digital technology.

²⁵ There is an exceptional quality free online educational material for the opera *Doctor Atomic*, which has been produced by The Metropolitan Opera of New York (*Met Stages presents: Doctor Atomic Teacher Study Guide*, 2008 / Available from: <<http://www.metopera.org/uploaded/pdf/pressrelease/doctoratomic.pdf>> [8 February 2016]) and Opéra national du Rhin (*Dossier pédagogique*, 2014 / Available from: <<http://issuu.com/operanationaldurhin/docs/dp-def-doctor-atomic/1>> [10 January 2016], as well as the official program of *Doctor Atomic* from the Badisches Staatstheater Karlsruhe (Available from: <http://spielzeit13-14.staatstheater.karlsruhe.de/media/programmheft/BAST_PGH_Atomic_Web.pdf> [8 February 2016].

²⁶ See more at Fink n.d, p. 11 and Schwartz 2014, p.p. 282–283.

²⁷ *Doctor Atomic*2007a, (DVD), Opus Arte.(Directed by Peter Sellars) and *Doctor Atomic*2008, (DVD), The Metropolitan Opera, Fifty Nine Productions (video design) (as Fifty Nine Productions Ltd.), A Metropolitan Opera High Definition Production, Public Broadcasting Service (PBS) (in association with), Fifty Nine Productions. (Directed by Gary Halvorson).

²⁸ See *Doctor Atomic* directed by Peter Sellars: <<http://www.medici.tv#!/doctor-atomic-john-adams-peter-sellars>> [12 May 2015]. Also, see *Doctor Atomic* directed by Lucinda Childs: <<http://www.medici.tv#!/john-adams-doctor-atomic-opera-rhin-patrick-davin>> [10 January 2016] and <<http://culturebox.francetvinfo.fr/festivals/operas-de-france/doctor-atomic-a-lopera-national-du-rhin-154865>> [5 January 2015].

²⁹ Available online are the following conferences which organized in connection with the opera *Doctor Atomic*: Science and the Soul: J. Robert Oppenheimer and Doctor Atomic, 2005; Doctor Atomic: J. Robert Oppenheimer: The Man, the Manager, the Physicist, 2008; Doctor Atomic: The Manhattan Project: Photography, 2008; Doctor Atomic: The Manhattan Project: The Scientists, 2008; Doctor Atomic: The Making of Doctor Atomic, 2008; Doctor Atomic: Wartime Decisions and the Atomic Age, 2008. See also: Mirsky2008; Barrow & Graham 2008.

³⁰ A view of the website structure is available on the Internet Archive (a non-profit library of millions of free books, movies, software, music, and more): <https://web.archive.org/web/*/http://www.doctor-atomic.com> [20 January 2016].

³¹ See more at <<http://www.exploratorium.edu/about-us>> [20 January 2016].

The San Francisco Opera / Doctor Atomic official website is an exhaustive web platform about the “Making of [the] Opera” and a pioneering science communication tool (Figures 5). This website consists of four sections: “Opera”, with information about the story, music, characters, libretto, set and costumes); “Production”, with information about the creators, behind the scenes, cast, production team, animating opera); “Timelines”, with information about the opera, production, scientists, bomb, history; and “Resources”, with documentary footage, interviews, online resources, press (media kit), reading list, opera basics, store (Figure 6). The site with a varied material is a digital platform through which, with an entertaining and educational way, achieved a public engagement with science and technology and particularly contribute to shaping a public image for the big science and atomic bomb.



Fig. 5: San Francisco Opera / Doctor Atomic official website

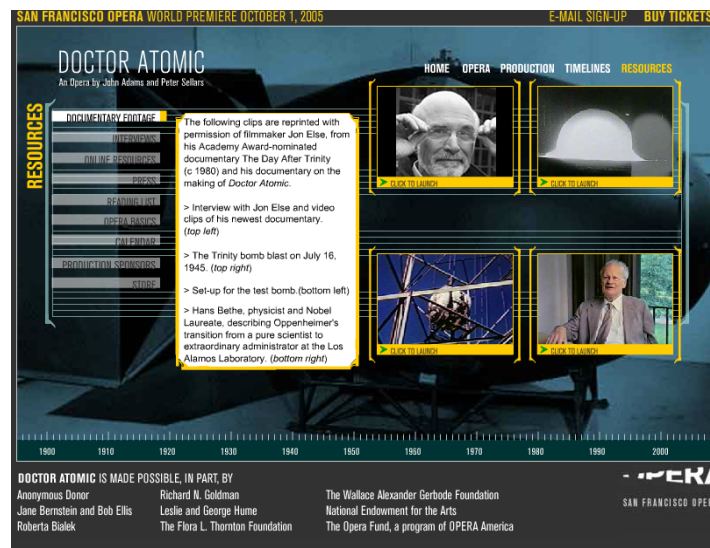


Fig. 6: San Francisco Opera / Doctor Atomic official website - Resources section

The Exploratorium - Dr. Atomic: Commentary on an Opera website provides the scientific, historical and cultural context for composer John Adams’s new opera, Doctor Atomic (Exploratorium 2005). This website consists of three sections: The first (“About”) includes online

³² See more at <<http://www.exploratorium.edu/doctoratomic/>> [20 January 2016].

text and videos about the production of the opera and some excerpts from the libretto which derived from public documents (Figure 7); the second provides an “Annotated synopsis of opera” which the users serve as a starting point to their investigations and conversations, to explore the development of the atomic bomb and its use, as well as the functions of art as lens through which to view our morality, history and humanity (Figure 8); and the third section (“Legacy”) includes archival photographs and provides an interactive application, which shows a diagrammatic representation of “Big Science” and the complex network that had shaped around the Manhattan Project. This application reproduces and shapes a Latourian public image of technoscience as an actor – network (human and/or non-human), “an interrelated web of people and institutions” (Figure 9).

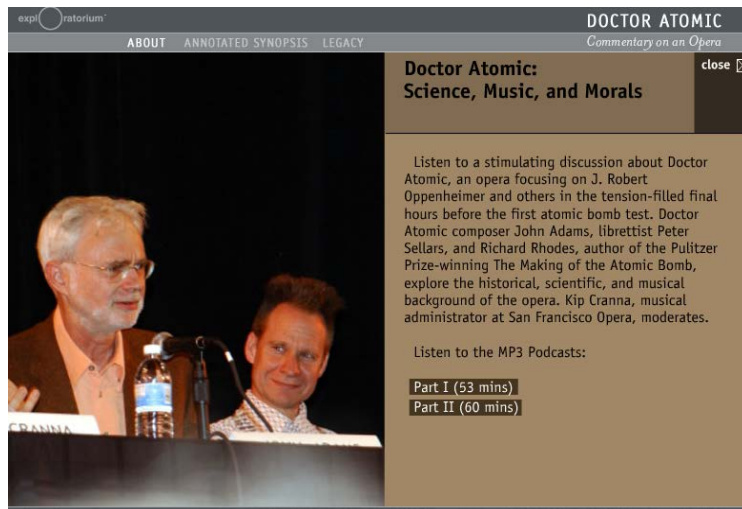


Fig. 7: The Exploratorium - Dr. Atomic: Commentary on an Opera website



Fig. 8: The Exploratorium - Dr. Atomic: Commentary on an Opera website

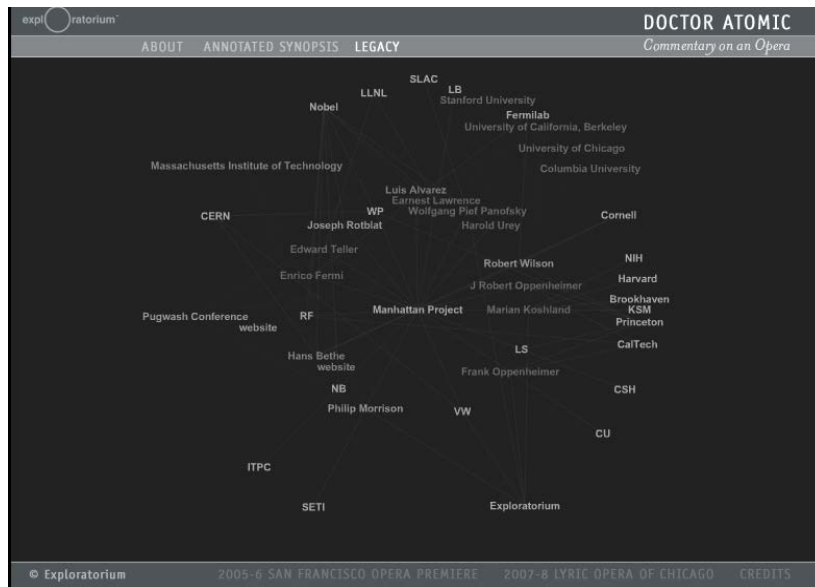


Fig. 9: The Exploratorium - Dr. Atomic: Commentary on an Opera website

Concluding remarks

Doctor Atomic shapes a public image of Oppenheimer according to which he looks more like a modern Prometheus, despite the intention of Adams and Sellers to present him as modern Faust, by analogy with the opera of Charles-François Gounod. In this context, Adams's operatic portrayal of Oppenheimer is far more convincing musically and dramatically. Furthermore, *Doctor Atomic* reproduces a public image of science which aphoristically confirms the phrase of Langdon Winner (1980) that "the artifacts have politics". This public image of science shows that the atomic bomb is not only/simply the culmination of an extraordinary path of scientific discovery, but the outcome of a specific science and technology policy. Concluding, *Doctor Atomic* confirms that the performing arts provide a preferential field for the science communication and in connection with the possibilities afforded by the digital age can achieve an essential public engagement with science and technology

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