«Diamo l'assalto al cielo!» («Let's assault the sky»): science communication between scientists and citizens and Lombardo Radice's television in Italy in the years of the protests

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Abstract

The years of the protests marked a period of social turmoil in Italy. The critical impulses that developed within worker and student groups had political effects even on science.
This paper aims to offer a historiographical description of some stages of the relationship between scientists and protesting movements, going back over the developments in science communication in Italy between the late sixties and the seventies, focusing on the case of Lucio Lombardo Radice and his work as a TV populariser.
The reinterpretation of the recent past could be useful to better understand the contemporary developments in science communication from a historical perspective.

Keywords

History of public communication of science; Popularization of science and technology; Representations of science and technology

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Introduction

The year [1976] saw the publication of the book *L'ape e l'architetto. Paradigmi scientifici e materialismo storico*,[1] written by four authoritative scientists: Marcello Cini, Michelangelo de Maria and Giovanni Jona-Lasinio, all well-known physicists, along with biologist Giovanni Ciccotti. Inspired by the ferment of 1968, the book questioned the neutrality of science. The newspaper *Quotidiano dei lavoratori,* which used to voice the demands and criticisms of the Italian extra-parliamentary movement *Avanguardia operaia*,[2] published a polemical review of the book by physicist Antonio Sparzani on 7 May 1976:

[1] *The bee and the architect. Scientific paradigms and historical materialism.*

[2] *Avanguardia operaia* [Worker's Vanguard] was a far-left extra-parliamentary organisation founded in Italy in 1968 as a form of political aggregation with a workerist-Leninist inspiration. It was among the most active political formations during the so-called "Years of Lead" marked by incidents of political terrorism in Italy.

> «L'ultimo punto che mi sembra importante toccare (ma nel volume di spunti ve ne sono moltissimi altri) è quello della divulgazione della scienza o, come meglio dicono i nostri autori, il «problema della costruzione di una cultura scientifica di massa». [...] L'appunto che si può muovere a Cini e agli altri compagni è allora forse di non aver contribuito con questo loro volume a "fare chiarezza tra le masse" rispetto ai problemi di cui si parla, e cioè di non essersi sforzati di dare [...] un quadro sufficientemente chiaro anche ai "non addetti" del dibattito e delle questioni in gioco»[3] [Sparzani, 1976, p. 3]

The controversial issues were the "dissemination" of science, as they would say at the time, and the social commitment of scientists. *L'ape e l'architetto* represented the apex of a long and animated shared reflection. This movement of ideas, reflections, influences that supported a "bottom-up" approach put the scientific question at the heart of social dialectics. Consequently, Italian scientists felt compelled to take on new challenges and become actively involved in science communication as well as the political battles that would go on to change the country.

This paper will go back over the little-known story of science communication and the public engagement of scientists in Italy in the years of the protests in order to present an in-depth historical analysis. Further attention will be paid to the case of TV populariser Lucio Lombardo Radice, a paradigmatic example of historical-scientific communication practice that is effective in meeting mass science educational needs.

According to the broad definition given by Bauer and Jensen, over the past few years *public engagement* has incorporated the meaning of "communication action," one capable of establishing a dialogue between science and the various audiences. Such communication action comprises a vast array of activities: public readings, newspaper, radio or TV interviews, writing of popular books, participation in public debates or "scientific cafés," collaborations with non-governmental organisations, activism and much more [Bauer and Jensen, 2011]. The specific nature of the Italian phenomenon has a distinctive trait: the political and cultural activism of many scientists that went beyond the mere communication action, leading to tangible consequences in the social-political fields: practices, laws and social changes originated within this context. At the same time, the mass education action was fundamental to generate shared scientific knowledge, with the television being one of its promoters.

According to the assumptions of Irwin and others, a mere "criticist" approach in communication is not enough to politically influence a democracy: one should go beyond the achievements of public engagement [Irwin, Jensen and Jones, 2012]. Revisiting these perspectives may be useful to evaluate the current state of the work in the field of *science communication*. Based on such postulations, one could agree with Irwin's conclusion that more stories from different contexts are needed to actually shift from a stagnant deficit model to the active participation and full democratisation of science [Irwin, 2014]. In order to do this, we need to illustrate

[3] *The last point that I believe it is important to touch on (but the book contains a lot to be thinking about) is the popularisation of science or — the authors said it better — the 'issue of the construction of mass scientific culture.' [...] The criticism that can be directed to Cini and the other comrades possibly implies the fact that with this book they did not contribute to "shed any light among the masses" on the issues they talk about. In other words, they did not make an effort to establish [...] a picture of the debate and the issues at stake that's sufficiently clear to a public of 'non-experts.'*

the Italian scenario during the "Years of Lead" and the main demands emerging from the protests staged by workers and students alike.

Methodological approach

The following analysis will primarily have historiographical relevance. We will deal with a specific case as an illustration of a wider phenomenon, i.e. widespread mass education useful for democratic access to knowledge. The analysis will be carried out using the historical method. By using sources from that time such as magazines, newspapers, TV programmes and state or personal archives — as well as taking into account the primary and secondary bibliography — we will make an attempt to reconstruct the salient features. This entails telling a story to describe a model [Richter et al., 2019]. To provide some context, we will briefly describe the experiences in the medical and psychiatric field and the related level of media attention. Here the political conquests were effective, so much so that the demands from the "bottom" and their public reverberation hit the heart of the State up to the promulgation of ad hoc legislation that changed the face of the country.

Then we will more specifically examine the "case" of science popularisation on TV by Lucio Lombardo Radice. Based on journalistic sources and archive material (letters and personal notes), the paper will reconstruct his path untangling the knots of his experience. The most important progress of that season was the resort to science communication at various levels and through various means as a fundamental stepping stone to reach the masses, which will be the protagonists of a participatory path in the scientific fields, among others. Lombardo Radice believed that TV screens were able to guarantee the transfer of knowledge useful for mass science education and to have people become interested in science. This is a trick that was used even abroad — as we will see through a short comparison with U.S.A. and U.S.S.R. — although with propaganda purposes. But what was the most original character of Lombardo Radice's production? His "case" stands out for making references to the history of science even when dealing with topical issues. So, we will describe a very special type of science communication on TV.

Without wanting to use risky anachronisms, this is a chance for a fruitful historical reinterpretation of the recent past as something useful to the current understanding of *science communication* [Kolstø, 2008], today more based on a critical and dialogical model [Irwin, 2006; Bucchi, 2008; Einsiedel, 2008; Irwin, Jensen and Jones, 2012]. The current trend that establishes a line of communication from the expert to the "layman" and back, resulting in conscious active participation, does not differ much from the perspectives of the years analysed. Such dynamics were possible through the television debate that was created — in the TV programmes that will be described — between the expert and his non-expert audience. Generally speaking, going back to such dynamics would result in the adoption of science policies that are more conscious, still distant from unequivocal significance [Brown, 2015].

«We want it all and we want it now». Scientific knowledge facing the protests

The period of Italian history spanning from the sixties to the seventies of the last century — often reduced to the incomplete decade between 1968 and 1977 — represented a period of social and cultural turmoil. Those were years marked by great changes, hard fights and significant achievements, but also defeats. Two places were particularly involved: the factory and the school (including university). The experiences of those two centres led to deep reflection, which gave rise to the activity of the movements, engaging various intellectuals and scientists. In the wake of the economic boom that characterised the country starting from the fifties, the cultural and social dynamics became the focus of younger generations, determined to break away from the backwardness of the previous years. [Crainz, 2000, pp. 127–128]. *Vogliamo tutto*[4] was the symbolic title of the most successful novel by writer Nanni Balestrini published in 1971.

Science did not remain out of the complicated history of the young Italian democracy. On 3 March 1964, geologist and engineer Felice Ippolito was arrested for alleged administrative irregularities within CNEN (the National Committee for Nuclear Energy). A little more than a month later, it was the time of chemist Domenico Marotta, director of the National Institute of Health, accused of similar wrongdoings. Such "scandals" were among the factors that generated a negative perception among the population: the idea that the independence of scientists collided with the interests and needs of the citizens [Guerraggio and Nastasi, 2010, pp. 241–282; Baracca, 2017, pp. 167–170]. It was probably starting from those facts that scepticism towards science mounted, which later led to the questioning of its "non-neutrality," even in other countries [Rossi, 1975, pp. 3–21; Rossi, 1977, pp. 269–315; Geymonat, 1978, pp. 166–181; Agar, 2008; Kaiser, 2011; Heymann, 2017].

"Dissemination" became a necessity to define again the potential and the risks in the scientific field. The recollections of the war were still vivid and in that context science — guilty of having "caused" the degeneration of nuclear energy — lost its innocence. The image of scientists was to be reconsidered, their social and political role was to be understood, and the structure keeping economic interest and scientific production together was to be broken up.

People developed a drive to go beyond the static dualism that kept a distance between the humanistic and the scientific worlds. The "dream" of a unified culture fed the speculations of various intellectuals: the year 1964 saw the publication of the first Italian translation of the much-discussed classic *The Two Cultures* by Charles P. Snow. A collaborator of then British Minister of Technology Harold Wilson, with his book Snow highlighted the need for more "proximity" between the two worlds and the advantages of improved mutual communication without hiding his tendency to defend humanities. The Italian translation was accompanied by a preface written by mathematician and science philosopher Ludovico Geymonat, a supporter of this perspective, with an ideology much more rooted than Snow's. A former partisan and member of the Italian Communist Party — before leaving it owing to disagreements — who later joined extra-parliamentary movements, Geymonat represented the type of intellectual that was mostly engaged in science popularisation. In his words, this perspective should have been promoted to reach the outline of an evocative "cultural way:"

[4] *We want it all.*

> La ricerca scientifica [...] assume un vero significato culturale in quanto ci porta ad una più profonda comprensione dell'uomo. [...] Sarà la stessa ricerca umanistica a richiedere di venire integrata con la ricerca scientifica. L'esigenza di superare la frattura oggi esistente tra le due culture.[5] [Snow, 1970, pp. XIII–XIV]

For an economic, political and cultural reappraisal in the scientific field, history had to be investigated, so that the Marxist matrix of materialism — the main theoretical reference of those years — could also redefine its object. In the following years, Geymonat devoted himself to "high-quality dissemination" work by publishing the monumental *Storia del pensiero filosofico e scientifico*:[6] it was a work initially comprised of six volumes (subsequently reaching eleven) which saw the author collaborating with many scientists over the seventies. The volumes fell within a very defined ideological framework: the choice of limiting the study of ancient times and the Middle Ages only to the first volume is evident. The aim was to focus more on the periods closer to industrialisation and the development of capitalism.

The author even formed a school in Milan, which not by chance represented the centre of these novelties. The city hosted the Università Statale, where Geymonat lectured in philosophy of science and the "revolutionary" movement originated from. His work was relevant: his reflection become the linchpin for a reappraisal of Lenin's realism in the wake of the legacy of dialectical materialism. Starting from this approach, he had adapted the main categories of *DIAMAT* to scientific discourse. His pupils became the authors of important contributions — read by students — which were decisive for that season: *L'interpretazione materialistica della meccanica quantistica. Fisica e filosofia in U.R.S.S.* [1972], *Attualità del materialismo dialettico* [1974], *Scienza e realismo* [1977], *Paradossi e rivoluzioni. Intervista su scienza e politica* and *Materialismo e dialettica nella filosofia sovietica* [both 1979; 1979].[7]

At the same time, another interpretative line inspired by the principles of historical materialism developed. Also the book *L'ape e l'architetto*, mentioned above, started from this perspective. The writings by mathematician Lucio Lombardo Radice are indicative of that, in particular his [1976]'s book *Educazione e rivoluzione*,[8] which discussed the experience of the protests from the previous years, binding the discourse to the scholastic-educational aspect and the dissemination of scientific knowledge in the working class. Volumes such as *Scienza e potere*[9] [1975] and *La neutralità impossibile*[10] [1977] fed the debate which was very heated in the seventies. A look at the publications reveals how literary production was the mirror of an urgent demand.

Such books were very successful in terms of readership. It was the origin of the construction of an audience for science comprising mobilised and interested

[5] *Scientific research [...] takes on a true cultural meaning as it leads us to a deeper understanding of mankind. [...] It will be humanistic research itself that will demand to be integrated with scientific research. The need to patch up the rift now existing between the two cultures*.

[6] *History of philosophical and scientific thought*.

[7] *The materialistic interpretation of quantum mechanics. Physics and philosophy in U.S.S.R.* (1972), *Current state of dialectical materialism* (1974), *Science and realism* (1977), *Paradoxes and revolutions. An interview on science and politics* and *Materialism and dialectic in Soviet philosophy* (1979).

[8] *Education and revolution*.

[9] *Science and power*.

[10] *Impossible neutrality*.

citizens. Following Edna F. Einsiedel, through dialogue and exchange, such citizens became an important voice within democratic dynamics [Einsiedel, 2014]. Hence the reverberation of criticism "from below:" it was a call for scientific awareness-raising with popular support and an educational purpose.

Health is not a luxury

Soon the debate turned into practice. In 1972 physician Giulio Alfredo Maccacaro founded the movement *Medicina democratica*.[11] In the same year the Feltrinelli publishing house appointed him as the editor of a new series bearing the emblematic title *Medicina e potere*.[12] Two years later he became the editor-in-chief of the magazine *Sapere*, with the clear objective of strengthening the scientific awareness of the citizens through an instrument aimed at spreading knowledge outside the circles of the experts. Taken over by the publisher Dedalo in 1967 who appointed a new editor-in-chief, Adriano Buzzati Traverso [Coga, 2005, pp. 585–586], the periodical aspired to be the first science popularisation magazine in Italy. Editor Maccacaro paved the way to a new militant season which focused on denouncing the relationship between science and power and demanding collectivisation of knowledge. His educational relevance and openness pursued a broad political plan aiming at the public integration of scientific knowledge. Maccacaro's goal was to engage in a major battle in support of workplace health with frequent journalistic investigations and by demanding the enforcement of health protection legislation. Little by little, his *Medicina democratica* finally managed to adopt a formal structure at its official convention in Bologna in 1976. In the same year, the political activism of the group was useful to support member of the parliament Massimo Gorla in submitting a proposal for a healthcare reform. Gorla was a member of *Democrazia proletaria*[13] — a party which gathered the most prominent groups of extra-parliamentary groups such as *Avanguardia operaia* and *Partito di Unità Proletaria per il Comunismo*[14] — and worked to bring forward the demands of the workers: all of that converged in the law that created the Servizio Sanitario Nazionale (SSN)[15] of December 1978 (Law no. 883/78), upon the initiative of the Minister for Health Aldo Aniasi [Giorgi and Pavan, 2019]. Established on 1 July 1980, the SSN defined the value of fair access to health, "without distinction of individual or social condition and according to standards that ensure the equality of citizens in relation to the service."[16]

In the late sixties, politically involved physicians such as Giovanni Berlinguer had already dealt with similar issues. Starting from 1967 Berlinguer, a member of the Central Committee of PCI,[17] launched a survey among over three hundred thousand workers at three hundred Italian companies: the account of the results was published in the investigation *La salute nelle fabbriche*.[18] The experience was encouraged by the consideration of the fragile condition of health in the vast majority of Italian factories. Based on the voices of the workers, apparently the situation was as follows:

[11] *Democratic medicine*.
[12] *Medicine and power*.
[13] *Proletarian democracy*.
[14] *Party of proletarian unity for Communism*.
[15] *National Health Service (NHS)*.
[16] Law no. 833, 23 December 1978. *Gazzetta ufficiale della Repubblica Italiana*.
[17] *Italian Communist Party*.
[18] *Health in factories*.

> La parte del questionario riguardante gli enti e le istituzioni che dovrebbero proteggere la salute (medico di fabbrica, Comuni, ENPI, Ispettorato del lavoro, cliniche universitarie etc.) si presenta come una desolante fila di «no, niente, nessuno, mai visto». Queste istituzioni sono quasi completamente assenti nella vita sanitaria della popolazione italiana, e nella vita dei lavoratori in particolare. I rapporti con questi ultimi sono praticamente inesistenti. [...] Sul medico di fabbrica il giudizio dei lavoratori è unanime: al servizio del padrone. [...] «dice che sei idoneo senza visitarti»; «al servizio del padrone, costringe i lavoratori a ripresentarsi prima dei giorni fissati»; «per mezzo suo, gli infortuni non vengono denunciati e vengono dati 3 giorni di lavoro».[19] [Berlinguer, 1975, p. 101]

Berlinguer revealed a dramatic picture, between the harsh reality and the doctrinal requirements of his political affiliation. At the same time, it was clear that he felt the desire to take action where there was a need directly deriving from the distress expressed by workers.

Even RAI (the Italian broadcasting service) became aware of the need of better information on the health issue. In 1976 the broadcaster aired the show *Buonasera, dottore*[20] featuring physician and historian of medicine Luciano Sterpellone, in order to provide some sort of TV "medical advice" for everyday life [de Ceglia, 2011, p. 335]. Even the newspapers highlighted the need for extra-institutional action. Referring to *Medicina democratica*, in view of the Bologna convention, the *Corriere della Sera* of 12 May 1976 used this tone: «Medicina democratica diventa particolarmente importante in un momento in cui si assiste alla pericolosissima privatizzazione della gestione della salute, in cui lo Stato mostra tutta la sua incapacità di intervenire a livello di prevenzione nelle epidemie e nelle calamità»,[21] hence the onus of self-proclaiming as a speaker of a movement of physicians that aimed not only to «fregiarsi di un'etichetta ma di impegnarsi in continuazione»[22] [Borghese, 1976, p. 3].

The achievement of the creation of SSN represented a prodigious step forward in view of these urgencies. A 2017 ISTAT report provided us with a stark fact: even if we limit ourselves to observing the "life expectancy at birth in Italy. Years 1976–2016" [Istat — Istituto nazionale di statistica, 2017], it appears that in 1976, before the enforcement of Law no. 833/78, life expectancy was 73.7 years; in only 40 years it increased by almost 11 years, reaching 84.5 in 2016. Infant mortality under 5 years of life, in the seventies quite widespread amongst the poorest — those who are "excluded" from healthcare coverage — went from 19 per thousand in 1978 to 3 per thousand in 2016 [Rosano, 2018, p. 19].

[19] *The part of the questionnaire concerning the authorities and institution that should protect health (factory doctors, Municipalities, ENPI [National Body for the Prevention of Accidents], Labour Inspectorate, university clinics, etc.) appears to be a distressing line of "no, nothing, no-one, never seen anyone." Such institutions are almost completely absent from the health life of the Italian population and the life of workers in particular. The relations with the latter are virtually non-existent. [...] Regarding factory doctors, the judgement of the workers is unanimous: they are at the service of the masters. [...] "he says you're fit without even seeing you"; "at the service of the master, he forces workers to go back to work before the day fixed"; "through him, accidents are not reported and they assign you three working days."*

[20] *Good evening, doctor.*

[21] Medicina democratica *becomes particularly important in a moment in which we are witnessing the very dangerous privatisation of health management, in which the State is showing all of its inability to take action at the level of prevention of epidemics and calamities.*

[22] *Carry a label but to constantly undertake to commit to the cause.*

Basaglia's revolution and the new radical psychiatry

The same years also saw the issue of mental health bursting onto the scene. Probably, the vivid memory of the horrors of Nazism encouraged radical metaphors impregnated with ideology such as "asylum = lager." In fact, the problem of mental institutions, also known as "madhouses," evoked a battle that could not leave anyone indifferent.

The issue was taken in charge by a team of psychiatrists led by the charismatic figure of Franco Basaglia. In 1961, Basaglia arrived in Gorizia, Italy, where he was appointed director of the local psychiatric institution. It marked the beginning of a real revolution. Influenced by phenomenology and a new wave of existentialism, the denunciations of an anthropological and sociological nature by Frantz Fanon and Michel Foucault, and pushed by the early stirrings of an "anti-psychiatric" and "critical psychiatry" movement that started to rise in the United Kingdom thanks to David Cooper and Ronald Laing, Basaglia committed himself to a tough battle starting from the borderland that Gorizia represented. He moved there in the winter of 1961. Soon he was joined by colleagues and collaborators determined to bring about a tangible change in the indecent practices of that time: in addition to his wife Franca Ongaro, who played a key role in the writing of the fundamental *L'istituzione negata*[23] [1968], he was joined by Giovanni Jervis and Antonio Slavich. Subsequently, both of them brought those ideas forward in other institutions across Italy.

A relevant fact is that the Gorizia experience could be seen as an inspiration for the ways in which the Italian 1968 movement evolved. The debate on the ways, purposes and social relevance of science was relaunched in assemblies that were innovative for that time. Quoting John Foot, we may say that «Gorizia's assemblies were models for the open-style meetings that would dominate 1968 — from the universities to factories to housing estates to schools. It was a simple message: everyone had a right to speak, and for as long as they liked» [Foot, 2017, p. 143].

The encounter between Basaglia and the movement was an interesting one: it was the explosion in the media coverage of Gorizia that allowed for social and political changes. It was with the participation of a wide audience and the shared realisation of the condition in which "mad people" found themselves in that a clear stance against the application of traditional psychiatry was guaranteed. An essential feature of 1968 (in Italy and outside) was its "publicity" nature: it was a distinct case of what Jürgen Habermas defined as the "critical publicity" of private citizens engaged in organisations, political parties, associations, capable of reconstructing mass democracy [Habermas, 1977, p. 292]. Thanks to Basaglia and his team, the critical impulse was propagating to public debate.

Basaglia's main contribution was to provide the "case" and make an attempt at alternative experimentations. In Gorizia, in 1962, he founded the first "therapeutic community" based on the British model: it became an open, democratic asylum in which any hierarchy would fade away and the patients would become central, no longer relegated to the asocial role of "mad persons." All of this attracted media attention. On 3 January 1969, the general public had to face a shock: the show "Tv 7" aired the documentary *I giardini di Abele*,[24] by journalist Sergio Zavoli. He had recorded it in 1968 when he personally visited Gorizia. The viewers were taken aback by those black and white pictures that showed that "society of excluded

[23] *The institution denied*.
[24] *Abel's gardens*.

people" — as Zavoli himself defined it in his commentary — secluded inside the solid walls of the asylum to suffer the consequences of an institution exclusively able to objectify a human "reducing him or her to a number, a thing" [Zavoli, 1968].

In 1973, a year after the foundation of *Medicina Democratica*, the Basaglias gave life to *Psichiatria Democratica*,[25] with the purpose of promoting the psychiatric reform across the national territory. After a long political battle, accompanied by a collection of signatures promoted by Marco Pannella's Radical Party, it became a pressing issue also to Christian Democracy's member of Parliament Bruno Orsini: after a never-ending five-year-long debate, various attempts and evaluations, 13 May 1978 saw the promulgation of Law no. 180/1978 on the subject of "psychiatric compulsory treatments and medical examinations."

It became known by everyone as the "Basaglia Law," because it was certainly inspired by the vicissitudes of the psychiatrist and his followers. But it was actually the "Orsini Law" after the name of the physician — also a psychiatrist — and member of Parliament who promoted it in the Parliament and wrote its text marking a certain distance — to tell the truth — from the most extreme tendencies of radical psychiatry. Asylums were closed and psychiatric compulsory treatments were regulated: Italy was the first and only country to do away with this institution. However, the law was enforced only for a few months: in December 1978 it was incorporated into the reform outlined by the above-mentioned Law no. 833 on the SSN.

Although the law was passed not with the profound spirit of Basaglia-inspired ideals, his battles "from the bottom" supported by the movements that flanked him played a decisive role in achieving such a goal. Nothing would have been possible if the issue had not reached the population receiving a great amount of publicity in the media. As the law is still known to the general public as the "Basaglia Law," it can be certainly said that his contribution was hefty. By then, science had to pass under the yoke of public opinion, which was hungry for knowledge and in need of it, in the hands of masses that were under the impression that they could change the world with knowledge and conscious choices. Italy was engaged in the critique of science through the broader critical target that was the entire society. Democratic access undoubtedly benefited from it.

Scientific dissemination on TV: the *mainstream* and a TV schedule to invent

The desire for science extended across all media. Among all the players, RAI — the national public broadcasting service — took on most of the responsibility for communicating science. In fact, some scientists appeared on TV quite often to play the role of presenters or popularisers. The previous scientific programmes — though sporadic — had already paved the way to an audience interested in "mastering" scientific issues even from the viewpoint of TV spectacularisation.

The TV schedule was mainly filled by forays into topical issues. In addition to the above-mentioned case of *Buonasera, dottore*, a medical communication TV show, and the "scandal" created by Zavoli's journalistic investigation, TV programming was enriched by the space race and the compelling issue of nuclear energy. In

[25] *Democratic psychiatry*.

particular, the latter was featured on TV already in the early sixties: 1961 saw the debut of *L'Italia nucleare*,[26] a programme that saw the active participation of then Director of CNEN Felice Ippolito in order to emphasise the potential of such a perspective; in 1964, *Atomo pratico*[27] brought to the audience a description of the vicissitudes of the everyday life of nuclear technology, so that viewers could be convinced it was all well and good and ultimately support it. But those years also saw the reverberation of the fear of that "nuclear" word, which generated journalistic investigations such as *Storia della bomba atomica*[28] (1963) featuring physicist and populariser Ginestra Giovene-Amaldi, to ensure that the audience did not fall for the deception of unidirectional propaganda. In 1969 — in the heat of the protests — the same director, Leandro Castellani produced the journalistic investigation *Dopo Hiroshima*[29] which served the purpose of awakening the general public [de Ceglia, 2011, pp. 339–340].

The issue of nuclear energy was central not only in Italy. For related propaganda needs, such issues were widely dealt with in the U.S. as well as U.S.S.R. In the former, it was Hollywood that took action. To mention a prominent example, Stanley Kubrick filmed an outstanding depiction of the fears of the time in his *Dr. Strangelove* (1964). Right in the after-war period, and in the subsequent twenty years, the U.S. saw the release of as many as 31 films on the subject of the "atomic age" [Fruth et al., 1996], spanning various genres and emotionally highlighting the prospect of an imminent "disaster" [Telotte, 2004, pp. 119, 144–145]. Among the various TV shows devoted to the theme — of which many were sponsored by the Committee of the *American Association for Advancement of Science* with the main purpose of educating young people in particular [Rudolph, 2002, pp. 51, 80] — one featured the "father" of the atomic bomb, Robert Oppenheimer, by then turned an American citizen who had the task of narrating the miraculous destiny of an atomic future in the framework of a propaganda type of television immersed in the Cold War logic [Banco, 2017]. At the same time, the issue of nuclear energy proved useful to celebrate the triumph of "Soviet science" and, internally, to deconstruct the Stalinist experience in U.S.S.R. In the film industry, both these needs found expression in the films *Nine Days in One Year* (1962) by Mikhail Romm and *Into the storm* by Sergei Mikaelian (1965) [Dumančić, 2012]. In addition, the theme was repeatedly featured on state television channels during the episodes of *Ochevidnoye-neveroyatnoye* (*Evident, but Incredible*), the most popular Russian scientific dissemination broadcast presented by physicist Sergey Kapitsa starting from 1973. The Soviet self-celebration relied heavily on the party-controlled broadcast channels.

However, while the Italian people were looking for "alternative" realities and the world was suspended during the Cold War, space possessed the greatest charm. In 1968 — almost as a premiere of the achievements of the following year — the main Italian TV channel broadcast *Il futuro nello spazio*,[30] a series of documentaries featuring the young Piero Angela. The great success arrived with *25 ore sulla Luna*,[31] the historic RAI live programme hosted by Andrea Barbato constantly supported

[26] *Nuclear Italy*.
[27] *Practical Atom*.
[28] *History of the atomic bomb*.
[29] *After Hiroshima*.
[30] *The future into space*.
[31] *25 hours on the moon*.

by Tito Stagno for the technical commentary and Ruggiero Orlando reporting from Houston. Despite its title, the live broadcast lasted as many as 28 hours: it was the first great interactive event of Italian television, a communication triumph that put citizens face-to-face with experts. From the largest squares of the countries, the correspondents would report on the "feelings of the Italians;" the hotlines were inundated with calls and the phone operators struggled to filter the calls from the viewers who asked questions to the experts in the RAI studios; many scientific figures crowded the TV studios to offer the audience their expert opinion. To fully grasp the scope of the public engagement, it will suffice to say that no police reports at all were filed across the country that night between 20 and 21 July 1969.

The theme was featured even more prominently in the productions of the two main countries engaged in the space race. Since 1950, the U.S. ran a propaganda machine aimed at praising any future achievements in space: *Destination Moon* was a documentary film that ended up influencing more generations with its symbolic scenario of the ideological superiority of western science [Kirby, 2011, pp. 207–214, 208]. But the true masterpiece of an era — despite many successful Hollywood releases (such as *Conquest of Space* or *The Island Earth*, both from 1955) — was another work by Kubrick. Yet with certain pessimism, *2001: A Space Odyssey* — released in 1968 — awakened the audience's curiosity and showed the scenarios that one year later everyone would want to avoid at any cost. At the same time, the film explored the relationship between humankind and technology and launched the debate on the role played by humans in the universe [Kirby, 2011, p. 2]. On the other hand, while in the U.S.S.R. the subject was equally popular, the stance adopted went in the opposite direction: the American moon landing was downplayed and the Soviet achievements from the previous decade were emphasised. In that country, the boom of science fiction was used to boast socialist progress. In 1957, Pavel Klushantsev released his film *Road to the Stars* a few months before the Sputnik space launch. The sixties were characterised by a large film production that focused on space travels. In particular, 1966 saw the release of *The main star man*, a *cartoon* by Roman Davydov in which two kids were depicted as travelling through time to the future as well as the past. Though a few years later, the Soviet answer to *2001: A Space Odyssey* arrived with Tarkovsky's highly successful masterpiece *Solaris* (1972), based on Stanisław Lem's novel of the same name published in 1961. A miniseries had already been aired on TV with a 1968 production featuring two episodes [Brancale, 2016].

During the Cold War, the goal of the two powers was to direct the public's attention toward the scientific progress they were making versus the other side. The propagandistic approach was paired with an intensive scientific literacy campaign. It should be noted how in both cases a substantial contribution came from the science fiction genre or TV shows about technological novelties. So far, we gave emphasis to the common features but in the following section we will deal with the case of Lucio Lombardo Radice and his formats designed for the education of citizens. The peculiarity of his case — not observed so far — lies in his idea to use the history of science for an innovative offering able to bring together commentaries, education as well as topical issues.

Science on television: Lucio Lombardo Radice

Television was at the heart of the science communication work carried out by the populariser Lucio Lombardo Radice, whose life was characterised by a truly pedagogical and political interest. He had a mathematical background and was an algebra professor at the La Sapienza University in Rome and a member of the cultural committee of the Italian Communist Party. He was featured in the TV schedule as part of the cultural programme launched in the late sixties and early seventies. Lucio Lombardo Radice was a key figure in the Italian culture, an innovator who combined the anti-fascist battles of his youth with the willingness to modernise the old idealistic tradition with his Marxist inspiration. A tireless publicist and a convinced member of his political party, he took on television work among other things. To him, all efforts were good to reach the great masses with knowledge in any form to achieve large-scale public education. He strongly believed that science meant culture and freedom as well. In 1963 in the newspaper *L'Unità* he wrote: "Vi è poi una grande, non utopistica speranza, e cioè che il libero e responsabile dibattito della società scientifica di oggi prefiguri il 'modo di essere' della libertà nelle società [...] come ricerca comune della verità e della soluzione ottimale"[32] [Lombardo Radice, 1963, p. 6].

The social purpose and the vision for the future were cornerstones of his thought. For this reason, his attention was focused on the young people and the proletariat, "healthy carriers" of a revolutionary stance within the Italian culture. It should be remembered that he was the editor of the *Ulisse* encyclopaedia: in fact, it was devised as children's initial approach to science. It saw the collaboration from many scientists and was published by Editori Riuniti in 1976. Lombardo Radice became personally involved in the promotion of this "product" among the schools by presenting the work in letters addressed to teachers and explaining its advantages in seven points. The unitary vision of culture, the conception of science as a human historical work or the idea that cutting-edge science should be included right up in primary school education were a few of the linchpins which made *Ulisse* an innovative encyclopaedia designed for young people.[33] In addition to the merely educational level, the "Marxist Ulisse", as it was called by the newspaper *Corriere della Sera* [Larco, 1976, p. 11], was «Una enciclopedia — e non a caso il suo motto è «conoscere per trasformare» — in grado di offrire una visione storica e dialettica della cultura e che aiuti grandi masse ad emanciparsi»[34] [Angeloni, 1975, p. 3]. Young people were also the target audience of 1971's book *La matematica da Pitagora a Newton*:[35] an adventure through mathematical thought for fledgling readers [Lombardo Radice, 1971, p. 12]. Come without saying that for the author of *L'educazione della mente*[36] [1972b] and *Educazione e rivoluzione*[37] [1976], a young audience was also the target of its TV shows. Below, we will focus on Lombardo Radice's television experience, leaving aside a complete biographical and intellectual portrait.

[32] *"And then there is a great, non-utopian hope that the free and responsible debate of today's scientific society prefigures the 'way of being' of freedom within societies [...] as a common search for truth and best solutions."*

[33] Letter to Riccardo Olivetti dated 21 April 1980, *Fondo "Lucio Lombardo Radice"*, FGO, Busta 16, 59. Ulisse, enciclopedia.

[34] *"An encyclopedia — and its motto is 'knowledge for change' not by chance — able to offer a historical and dialectical vision of culture and designed to help great masses to become empowered."*

[35] *Mathematics from Pythagoras to Newton.*

[36] *The education of the mind.*

[37] *Education and revolution.*

His television debut came in 1971 with the show *Dall'uno all'infinito*,[38] a series featuring 12 episodes aiming at introducing viewers to mathematics. This initiative was strongly supported by RAI television writer Angelo D'Alessandro. A former assistant director for Federico Fellini in the fifties, D'Alessandro already worked in the field of children's television programmes with the series *I racconti del faro*[39] (1967). In turn, Lombardo Radice worked as a television writer because of his mathematical knowledge. In 1972 it was the time of *Le rivoluzioni della scienza*,[40] a four-episode series focusing on the great scientific breakthroughs of humankind. The project was part of a wider RAI series on the theme of "Research — scientific methodology issues." Director Virgilio Tosi used Lombardo Radice and populariser Delfino Insolera as technical advisors. Although today it may be considered banal, back at the time Lombardo Radice's final debate with high school students was really intriguing to the viewers. Among archive footage, slides and informational posters, the audience was taken through a path from Ptolemy to Copernicus in *La rivoluzione eliocentrica*.[41] The path from Democritus up to Bohr's achievements in quantum physics was the subject of *La rivoluzione atomistica*.[42] A long path from Linnaeus's intuitions to Darwin was dealt with in *La rivoluzione evoluzionistica*,[43] enriched with the advice from biologist and geneticist Giuseppe Montalenti. The achievements leading from Newton to Albert Einstein were the subject of *La seconda rivoluzione fisica*.[44] As a populariser, Lombardo Radice also used historical narration — on the basis of the then recent reassessments of the term "revolutions" provided by Thomas Kuhn — in order to delve deeper in the critique of the concept of "scientific progress:" as Paolo Rossi noted in the same years, science was guided by revolutionary disruptions. However, this realisation dismantled the idea of continuous progress [Rossi, 2009, p. xvi].

Even the film industry was drowned in the waters of science that flooded the screens: in the heat of the moment, science film festivals were organised for a few years. An example was the *International Science Film Festival* held in Milan, at the Museo Nazionale della Scienza e della Tecnica "Leonardo da Vinci" between 1960 and 1962 [Canadelli and Casonato, 2018, pp. 119–126]. Even Lombardo Radice was no stranger to the charm of cinema. In 1971, in a collaboration with director Ansano Giannarelli, he revisited in a political light the figure of mathematician Évariste Galois, one of the pioneers of abstract algebra. The film was shot in avant-garde experimental style typical of political cinema from the seventies. [Mereghetti, 1994]. The film *Non ho tempo*[45] [1973] was based on his scientific advice and produced by Marina Piperno for REIAC Film.[46] For the occasion, Lombardo Radice embarked on a short acting career, playing the part of professor Richard. He was no stranger to humour either, as demonstrated by an interview published in the magazine *Domenica del Corriere* in which he wondered what the reaction of his colleagues — university "barons" — would be in seeing himself featured in a film [Lombardo Radice, 1972a]. The film — already presented at the Cannes Festival in

[38] *From one to infinity*.
[39] *The lighthouse tales*.
[40] *The revolutions of science*.
[41] *The heliocentric revolution*.
[42] *The atomistic revolution*.
[43] *The evolutionistic revolution*.
[44] *The second physics revolution*.
[45] *I don't have the time*.
[46] The full summary of the film is stored in "Non ho tempo", *Fondo "Lucio Lombardo Radice"*, FGO, Busta 48, 1. Dibattiti Televisivi.

the same year — was the subject of criticisms as well as political censorship, and was ultimately aired on TV only much later in 1977 [Lombardo Radice, 1974; Cipriani, 1974; de Ceglia, 2012, pp. 213–246]. The feature film better fit the climate of those subsequent years. As authoritative journalist Natalia Ginzburg stressed in the pages of *Corriere della Sera*, the story of Galois appeared to be similar to the life of the young people engaged in student protests [Ginzburg, 1977].

The fruitful professional relationship between the two resulted in a TV series comprised of five episodes, *Uomini della scienza*.[47] Each episode was preceded by an introduction by Lombardo Radice who would briefly explain the features of the content offered to the audience. Science with the scientists, but at the same time for men and of men [Seno, 1977]. The series was about the biographies of personalities of the past, hinting at his political substrate: the first episode was *Il sogno di d'Alembert*[48] and it aimed at praising the achievements of Enlightenment's encyclopedism. *La ballata dell'abate Spallanzani*[49] dealt with experimental biology from the 18th century speaking about the extremely controversial figure of man of faith and scientist Spallanzani; next was *Ipotesi sulla condanna a morte di A.L. Lavoisier*,[50] a portrait of a great experimenter and revolutionary who worked in the field of biology and chemistry; also featured was a picture of the brilliant figure of Alessandro Volta in *La luminosa carriera del prof. Volta*.[51] The series came to a conclusion with *Elogio di Gaspard Monge fatto da lui stesso*,[52] starring the father of descriptive geometry.

A reassuring Lombardo Radice introduced the episodes with thoughtful preliminary speeches in which he would outline the historical context and theories of the figures presented to the viewers in the film productions. At the end of the show, ample time was given to actual forays into the history of science, with references to the contemporary debate. This was the peculiarity of the programme that distinguished it from all the rest. It was Lombardo Radice who had the task to "recruit" the experts to be featured, as it appears from a letter that he addressed to one of the experts. He never failed to provide methodological explanations that were effective in making his popularisation mission a reality:

> Mi permetto anche fin d'ora di raccomandare la massima accessibilità del linguaggio. Il nostro è un tentativo di dare a un largo pubblico italiano un poco di quella nutrizione scientifica che ancora non viene, o viene in troppo scarsa misura, dalla scuola, dall'editoria, dai mezzi di comunicazione di massa[53,54]

The attention of this man of science to the audience mirrored his pedagogical intent which turned him into one of the most productive authors of his time, who

[47] *Men of science*.
[48] *The dream of d'Alembert*.
[49] *The ballad of abbot Spallanzani*.
[50] *The case of the condemnation to death of A.L. Lavoisier*.
[51] *The bright career of prof. Volta*.
[52] *Praise of Gaspard Monge by himself*.
[53] Letter to an unknown recipient dated 5 October 1977, *Fondo "Lucio Lombardo Radice"*, FGO, Busta 50, Uomini della scienza.
[54] *I would like to recommend that you use language that is highly understandable. Our attempt is aimed at providing the Italian general public with a little scientific nourishment that still they do not receive, or receive in a limited manner, from school, publishers and media*.

strongly believed that he could play a fundamental educational role in the development of the society of his time. He was greatly inspired by Gramsci's philosophy, which convinced him that the role of an intellectual was to be a leader for the revolutionary class that should have changed the country: according to him, a scientist able to give a political purpose to their action should be a "Specialist+Politician" [Lombardo Radice, 1976, p. 24]. The full picture of the programming includes the debates: "Scientific dissemination" followed the first broadcast; "biological research and the programming of life" followed the episode on Spallanzani; the theme "the neutrality of science" was dealt with after *Lavoisier*; "scientific hegemony and academic power" opened the debate after the recount of the career of Volta; in conclusion, "scientific education in high schools" highlighted the role of school education after *L'elogio di Gaspard Monge*.[55] The social-political dimension that Lombardo Radice's "mission" took on was made clear by his own words during the live show after *Ipotesi sulla condanna a morte di A.L. Lavoisier* [1977]:

> «Gli autori del telefilm non hanno esposto una tesi, hanno solo voluto presentare ipotesi. Più che mai, quindi, è necessario un dibattito conclusivo. Questa volta il dibattito deve essere obbligatoriamente sul rapporto scienza — società politica, sulla neutralità o meno della scienza. E questo è uno dei temi centrali in discussione oggi fuori e dentro il mondo degli scienziati»[56] [Lombardo Radice, 1977]

The author's propensity to favour a specific communism-inspired ideology was not unknown to the public: it was a somewhat express intent, which soon reached its climax with the controversial presence of a delegation of workers during the debate aired after the first episode. The theoretical reference to a Marxist-inspired praxeology was well rooted in the Sicilian mathematician: his vision of science was a derivation of the Engels-inspired dialectical-materialistic current of thought. It was not by chance that Lombardo Radice became a translator into Italian of *Dialectics of Nature* by Engels for Editori Riuniti in 1950 [Engels, 1968]. These theoretical assumptions clearly echoed in his work as a science communicator. His "innate" ability to mesmerise the audience with his digressions on science was recognised by Giannarelli himself. In one of his letters in relation to the future broadcast of the first episode, he expressed his complete confidence in the abilities of the mathematician: «quando parli "a braccio" — sia pure su una traccia — tu rendi le cose molto comprensibili, anche quando sono dense di significati (vedi Galois!): e quindi le tue sottolineature emergeranno sicuramente nella tua recitazione, così come saprai sciogliere eventuali termini e concetti più difficili.»[57,58]

Lombardo Radice was able to catalyse the scientific discourse by making use of historical references and, thanks to this trick, he would direct the attention of great

[55] "Uomini della scienza: quadro del programma", *Fondo "Lucio Lombardo Radice"*, FGO, Busta 50, Uomini della scienza.

[56] *"The authors of the film did not present a thesis, but only hypotheses. So, a conclusive debate is now necessary more than ever. This time the debate should mandatorily deal with the science-political society relationship, whether science is really neutral. This is one of the central themes now being discussed inside and outside the world of scientists."*

[57] Letter of Ansano Giannarelli dated 23 January 1977, *Fondo "Lucio Lombardo Radice"*, FGO, Busta 49, 5. Uomini della scienza.

[58] *"When you speak 'off the cuff' — although following a script — you make things very understandable even if they are dense with information (see Galois!): and so the emphasis that you put will surely emerge in your acting, and you'll perfectly know how to simplify the most difficult terms and concepts."*

masses of TV viewers to important debates on topical issues intertwined with the political discourse. His type of science communication can be deemed as a successful example of popularisation through the use of the history of science: though not entirely original, this scenario was very effective in guaranteeing success for his TV shows.

Conclusion

The preceding elements confirm what we tried to postulate: science was being relaunched, even by the institutions, on the basis of strong demand from the audience. Although guided, the audience was hungry for information and convinced of the fact that a sound scientific knowledge could lead to more useful participatory awareness on a social and political level. This, among other things, was the "assault on the sky" the slogans of the time were calling for. We could conclude by saying that there was a connection between the public developments of science and the social-political demands issued by protesters in the years analysed. For the accomplishments reached, the Italian case represents a historical example of reciprocity between the demand of civil society and the contribution from scientists who stepped into the whirlwind of controversy playing an interactive protagonists' role. In line with the above-mentioned definition by Bauer and Jensen, this study made an attempt to highlight certain methods of communication, especially in the field of television, which gave a strong push to the development of science communication in Italy.

The historical case we recounted is an occasion to resurrect old principles that, back at the time, were able to meet the demands of the society through an effective translation into practice of the top-down approach. This is a model that has become outdated in a constantly evolving context. However, in that context it succeeded in achieving its objectives: however, one should never compare two societies that are totally different. The years analysed represent a sort of virtuous time and a politically and intellectually vibrant context. An attempt to apply the top-down model today would lead to totally different results, and this is why one should stop at the mere historical analysis. The State itself adopted an approach based on educational guidelines that were expressly aimed at improving public information and education, today in sharp decline. This was clearly evident in the TV programming. The intellectuals had a greater impact because the audience had more of a listening attitude. Lombardo Radice stood out in this picture as he embraced such educational policy using the history of science on television. On the Italian scene, this model continued to be successful with Piero Angela's later formats.

Besides, it is also true that in the sixties and seventies progress was achieved in various fields: this is the fundamental and distinctive characteristic of that period. However, as recently noted by certain authors, today only a few issues succeed in attracting the attention and promoting the involvement of the public [Schäfer, 2009], resulting in proper "medialisation" (to use Weingart's words) [Weingart, 2001; Weingart, 2002]. In this regard, a historical approach could possibly be attractive for most people: in science, the strength of historical storytelling could make up for the shortcomings of STS studies in general, without the risks associated with relativism [Daston, 2009, pp. 811–813].

In a contemporary world that requires political actions aimed at tackling great problems such as those connected with climate change, respect for the environment, the long-running battles for and over health, going back over those events may encourage sector operators to make an attempt to act at the social and political level. Even using history as a tool. However, this should be done with the awareness that trying to repeat the past in a society characterised by different social and governmental logics would not achieve very much. This leads to a conclusive assumption: it may be useful to gain a deeper understanding of the historical changes on a social and cultural level in order to favour original practices and new policies in science aimed at fostering an empowered citizenry.

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