Satellite television technology in Socialist Republic of Romania: Between grassroots and grass routes approaches

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Abstract: This research analyses the role of the state sponsored publication *Tehnium* in connection to the grassroots movement of accessing western satellite television, during the communist regime in Romania. The article starts from the broader perspective of viewing the magazine as an intermediary between the capabilities of the socialist state and the popular aspirations for accessing Direct Broadcast Satellite television transmission technology in the 1980s decade. It will then delve into the grassroots level of examining specific strategies for receiving satellite broadcasts, as they surface in *Tehnium.* The article provides a qualitative content analysis of the magazine dealing with grassroots approaches to satellite television during socialism, which are grouped in thematic categories, established by the use of inductive category formation. The article proposes a reading of the magazine as a defining platform for the movement and provides important tools for tracing its history, material constitutive parts and main actors. *Tehnium*'s role is positioned as intermediary between the state and grassroots approach to technology, analyzed through the lens of technostruggles.

Keywords: DIY, radio amateurs, space age, technostruggles.

1. Introduction

Satellite transmissions of television signal were developed during the Space Race period of the Space Age. Artificial satellites made global television possible (Schwoch, 2009), but the capabilities of developing a satellite infrastructure were not equally distributed (Parks, 2005). Besides the two main protagonists of the cold war, few western European countries[2] together with Canada, Japan and Australia, had the means to engage in this endeavour. Some nations could afford the high cost of implementing satellite systems using infrastructures offered by post industrialized economies (Barker, 2005), while others were excluded from the "promise of the satellite" (Sei, 2022).

Different inclusion mechanisms applied for the viewers, since accessing satellite television could be shortcut by DIY ways. When Western European countries expanded satellite television networks in the 1980s, communist regimes in Eastern Europe faced the insurmountable task of dealing with Western signals penetrating their borders without

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restrictions. This blurred the "territorial divisions of the cold war" (Bönker et al., 2016, p. 6) and supplemented the prevalence of cross-border terrestrial television signals. Citizens throughout the Eastern Block accessed the new television differently. Hungarian People's Republic strictly forbid direct satellite television reception until 1985, then legalized it in 1987, but gaining access involved a major financial investment, resulting in it being more feasible for parts of the urban middle classes (Szekfü, 1989). Similarly, Polish People's Republic allowed the import of satellite equipment from the mid-1980s, but its prohibitive cost and necessary bureaucracy kept the numbers restrained. In comparison, both oral and archival sources (Gross, 1998; Bardan 2021; Péter, 2018) reveal that citizens of socialist Romania had to roll over their sleeves and build such devices themselves. *Tehnium*, a state sponsored publication, offered solutions in this regard by printing the know-how. Launched in 1970 by the Union of Communist Youth, the monthly magazine saw its first issue in December 1970 and ceased its publication in December 2006, summing up 37 years of existence, 20 of which during the communist regime. The publication catered to amateur constructors, with the objective to attract youngsters to the domains of applied science and technology and perfect the abilities of those already professionally engaged in these fields, regardless of gender. However, its patriarchal understanding and separation, was reproduced in the magazine. Its agenda was intertwined with the industrialization processes of the 1970s, functioning as a galvanizing platform to stimulate the needed workforce (Mărculescu, 1999, p. 7; Albescu, 1980b, p. 2). A documentation on the profile of readers, published by Mahler (1988) in September 1988, reveals that the majoritarian age did belong to youth: 80% of *Tehnium* readers were up to 30 years old). Out of them, 30% were pupils, and 37.3% were young workers with secondary education, making them the main audience. Additionally, 98.5% were male, and 80% were from urban environments. This demographic profile, referred to as *technophiles* (Mahler, 1998), confirms that the target audience, at least in regards to the age gap, less in regard of gender, was reached. *Tehnium* was a huge success. First issues were sold out and the number of copies was increased from 40 000 to 150 000 by 1973 (Mihăescu, 2013, p. 35). The feedback of the readers shaped the design of the magazine (Dorian, 1970), and a horizontal relationship was built up from the start (Dorian, 1971a). As such, subject matters provided by readers determined more than half the contents (Dorian, 1971b). The juxtaposition of a technology promising global connectivity, in what was coined as the global village (McLuhan, 1964), against the backdrop of stringent border controls and censorship, raises questions about the socialist state's stance on the proliferation of satellite broadcasts. This requires an exploration of how the socialist regime navigated the tension between embracing technological progress and maintaining control over information flow. The article will start from the broader perspective of viewing the magazine as an intermediary between the capabilities of the socialist state and the popular aspirations for accessing cutting-edge television transmission technology. It will then delve into the grassroots level of examining specific strategies for receiving satellite broadcasts, scrutinizing in depth the intricate connections between these tactics and *Tehnium*.

2. Literature review

Studies of cross-border television dissemination, including satellite, during the Cold War, are relatively new (Badenoch et al., 2013; Bönker et al., 2016). In spite of enabling new connections, the development of satellite television has retained Eastern Europe geopolitically separate, and instead brought America and Western Europe closer together (Badenoch et al, 2013, p. 366). While Badenoch et al. (2013, p. 19) provide significant insights into social formations that consolidated through the utilization of particular broadcasting technologies, their analysis is centred on radio and sound and overlooks those centred around viewing transitional satellite broadcasts. Schwoch (2016, p. 272) mentions that the viewers from Eastern Europe needed to train and practice their technological skills, in order to enhance the reception of distant television signals, as well as adapt their television sets for different technical standards. However, he does not delve further into how these disseminations of the media apparatus looked in practice.

Jajko et al. (2021) contributed significantly to the understanding of grassroots initiatives in accessing Western satellite television in Cold War in Eastern Europe. Throughout the volume, the DIY approach points out to several domains, from satellite (Jajko, 2021), to computers (Grada, 2021). Jajko (2021) details on a grassroots endeavour to create a localized adaptation of a cable television system, pointing out to specific groups of "satellite TV enthusiasts" (Jajko, 2021, p. 205), working together with the community of an estate to install a single satellite dish and reception system, accessible to all apartments, labelled "cable televisions for the poor" (Jajko, 2021, p. 228). A similar way of accessing satellite television was described by Szekfü (1989) for the Hungarian context.

While satellite television was expanding in Western Europe during the 1980s, for socialist Romania the decade marked the decline of national television, with transmission hours reduced, poor programming and problems with the availability of its signal. This accentuated alternative TV consumption practices (Bardan, 2021; Dwayer & Uricariu, 2015; Mustata, 2011; Péter, 2018), including "para-television" (Bardan, 2021; Matei, 2013). Satellite television is rarely discussed in such studies, and even less present are the reception strategies at grassroots level, including their material base. Research on satellite-TV reception during the Cold War in Romania is also mentioned in the history of television (Gross, 1999). Studies concerning the media equipment for accessing foreign terrestrial television highlight grassroots efforts. Mustata (2011, p. 41) reveals that enthusiastic civilians were marketing handmade amplifiers. In her analytical framework of paratelevision, which encompasses a collection of alternative media consumption practices, including satellite television, Bardan (2021) mentions the material base of such practices, but does not develop them further. Referring to the grassroot level of manufacturing equipment for cross-border terrestrial television, Bardan emphasizes the role of *Tehnium* in what she describes as "informal networks and apartment industries" (Bardan, 2021, p. 36).

Péter (2018) mentions the community-oriented, nonprofit manufacturing of antennas for the collective reception of foreign broadcasts of football matches. Examining the networks of individuals around the equipment, he separates the radio amateurs and engineers who own "technical knowledge" (Péter, 2018, p. 119), claiming they were

exempt from the manufacturing labour. Instead, he asserts the task was delegated to "technicians" and "skilled labourers" (Péter, 2018, p. 119). He connects the phenomenon he names forbidden football to *Tehnium*, revealing that the grassroots initiative was aided by published blueprints of antennas (Péter, 2018, p. 53).

Various studies on bottom-up approaches to new media, during the Cold War, have used the concept of grassroots as a frame of analysis. Some authors avoided the term (Badenoch et al, 2013; Mustata, 2011; Péter, 2018), while others clearly specified it (Bardan, 2021; Jajko, 2021; Grada, 2021).

The review exposed above acknowledges a grassroots movement for the reception of satellite television took place in Romania during socialism, however focusing less on people's practices in this regard. Points were made that *Tehnium* magazine was used as a tool in other connected grassroots struggles, but an in-depth analysis of the connection between the two is lacking.

3. Problem statement

The present article proposes to bridge the gap highlighted above and emphasizes the need to explore the DIY methods employed at the grassroots level, by analyzing the role of *Tehnium* as a platform through which the grassroots movement for reception of satellite television in socialist Romania emerged and developed. The magazine offers important insights into the materialization of such practices, allowing to broaden the discussion on several issues, especially considering its connection to both to the state apparatus and to bluntly promoted bottom-up initiatives. The article aims to recuperate grassroots traces imprints in *Tehnium* by showing:

Q1: Who were the main actors actively involved in the emergence and development of grassroots practices in accessing satellite television?

Q2: What did the materialization of the grassroots practices promoted in *Tehnium* consist of?

4. Theoretical framework

In order to place the grassroots movement within the historical context of satellite television, I will outline its three phases briefly, which are important for the further analysis. Since this article primarily delves into the people's hands-on disseminations and use of a technology presumably out of their reach, it is essential to introduce the concept of "technostruggles", as coined by Parks (2012). This term enriches our comprehension of the grassroots movement and situates citizens' actions within a wider discourse about people's approach to technological infrastructures from a critical perspective.

4.1. The three phases of satellite television

Schwoch (2009) proposes three phases in tracing the development of satellite television, namely: experimental (1958-1962), commercial (1962–1980s) and Direct Broadcast Satellite (DBS) television systems (from 1980s onwards). The experimental phase is characterized by satellites in non-geosynchronous orbits, used for sporadic transmissions. Technology advanced during this phase, to the form of geosynchronous satellites. The commercial phase saw the formation of intergovernmental agencies, starting in 1962 in the US with COMSAT[3], having the role of promoting and helping to expand the industry. With the support of COMSAT, INTELSAT[4] was founded in 1964, offering international broadcast services to members and interested parties. INTELSAT owned the first system of geosynchronous satellites by which a constant world coverage was achieved. U.S.S.R. initiated its separate agency, INTERSPUTNIK. During the commercial phase, the biggest issue faced was that of the limited space in geostationary orbit. As a result, the International Telecommunication Union (ITU)[5] became a specialized UN regulating body, and was delegated with allocating new spectrum, frequencies and bandwidth. A pivotal moment occurred during the 1977 ITU World Administrative Radio Conference, where the 11.5-12.7 GHz Band was reserved for DBS transmissions, envisioned to take place in the future.

Bottom-up initiatives of capturing satellite signal were made at the transition moment between the commercial and the DBS phase. Private companies, encouraged by grassroots initiatives, entered the field and accelerated its development. Winston (1998, p. 300) states that in 1985 in the US, a million Americans invested up to $5000 for reception installations that caught signal destined for inter-network transfers and not private viewers. Winston (1998, p. 300) mentions that satellite dishes could easily be manufactured by the people. Fălie (1990) compared the US context to that of Europe, stating that there were no DBS satellites in Europe yet, but the allocated frequency bands were used by existing satellites, catering also in the professional ones.

Socialist Romania took part in the commercial development phase of satellite television by building the satellite ground station Cheia (Radiocom Societatea Națională de Radiocomunicații, n.d.) and in the DBS phase by manufacturing cheap satellite equipment for western states (Bardan, 2021). However, no access to the new Direct Broadcast Satellite television was envisioned for the citizens. Nonetheless, the advancements in DBS were cleverly mapped out in *Tehnium* and could be followed by the readership of amateur constructors. *Tehnium*'s content mirrors the progression through the three stages of satellite television, envisioned by Schwoch (2009): the experimental and commercial phases are surfacing in the special section dedicated to Space Age, that the magazine carried until mid-1970s, and the DBS phase is present in the rest of the articles discussed.

[3] Communications Satellite Corporation.
[4] International Telecommunications Satellite Organization.
[5] Backdated to the 1865 International Telegraph Union.

4.2. Technostruggles in accessing satellite television

Parks (2005) connects the commercial phase of satellite television to the expansion of global capitalism, in the aftermath of the decolonial movements, placing the instrumentalisation of satellite in the hands of the Western world. Parks (2012) examines the impact of satellite technology on the global transfers and disseminations of cultures, by taking into consideration the material aspects of the infrastructure, in an object-oriented approach. Her focus is on the satellite dish as a mediator between the high-end technology for orbiting satellites and the terrestrial users, during the DBS phase. She emphasizes a bottom-up approach when proposing to study satellite technology from the perspective of popular knowledge and technostruggles, terms she takes from Fiske (1996, p. 240, as cited in Parks 2012, p. 64). Parks explores the hands-on approach to technological infrastructures, which are demystified in the process, and understood in their material formation at the point of interaction with the users (Parks, 2012, p. 64). For Parks, a technostruggles approach enhances the understanding of infrastructures as a space that ought to be used by the people also as a terrain for struggle. Critically thinking of the term, it could be adapted even further, to address engaging with an infrastructure one is excluded from, as in the case of satellite television and the socialist state. In this way, I propose to use the term technostruggles to reveal the endeavours of the people towards inclusion as users in the realm of the satellite television.

While Parks associates technostruggles with the satellite dish, her approach of examining technology infrastructure from a bottom-up perspective proves valuable in understanding the relationships between people and the satellite, encapsulated in the constructions put forward by *Tehnium*. Parks (2012) does mention the manufacturing of the satellite dish, but does not recognize any difference between an artisanal dish or its industrial purchase and thus does not include DIY methods for accessing infrastructure, as part of her argument. It becomes necessary to expand the understanding of the term, to encompass people as makers (or replicators) of technology. Citizens who build the technological devices had to show consistent knowledge on electromagnetic waves, have a solid base in physics and mathematics, all on top of social skills necessary to avoid punitive measures for their activities from the state. In this way, technostruggles is tuned to address technology not from a user's point of view, but from a user- turned- manufacturers' one.

5. Methodology

The methodology is based on the Qualitative Content Analysis method proposed by Mayring (2014), of the information extracted from the text of the exhaustive collection of *Tehnium*. This is a mixed method approach to analyze text qualitatively by assigning categories and quantitatively by analyzing the density of these categories (Mayring, 2014, p.10). The collection was accessed digitally, as uploaded on Copcea's (2011) blog and supplemented by consulting it in the library. A set of codes was chosen to filter out the articles of the magazine, whose topic dealt with the dissemination of satellite television in the context of Socialist Romania. These codes consisted of the terms: satellite, receiver,

space, SHF, parabolic and cosmic, which were used as keywords to extract the articles from the magazine, which were noted down in an X-cell table. The content of each selected article was later assessed, leading to the structuring of the results in four thematical categories, by the use of inductive category formation method (Mayring, 2014, p. 104). Identifying the main actors for the grassroots movement, connected to *Tehnium*, was made possible by articles belonging to the categories (1) ham radio operators using satellite connections and (2) passionate DIY readers. The material practice of the grassroots was traced in the categories (3) popularization articles of satellite television, and (4) construction articles. A second coder was asked to check the coded elements, which were then re-assessed in an inter-coder discussion, leading to refinements in the coding scheme. Both coders agreed on the distribution of the categories, but the second coder saw minimal overlaps of articles belonging to ham radio operator's category to those of popularization articles of satellite television. Secondly, the second coder signalized the ruling out of articles with focus on the post 1989 period. The inter-coder agreement was reached after both points remarked by the second coder were addressed.

The initial phase of the analysis traces the key actors and detects a differentiation between the categories of ham radio operators using satellite connections, and the passionate readers interested in satellite. The intricate knowledge required to construct satellite television devices fell within the realm of radio amateurism, a subject extensively covered by *Tehnium.* Thus, the first category was entrusted with building equipment, which was presented in their dedicated section of the magazine, rendering them the *professionals*, while the second one, the regular passionate readers present in the magazine's forum and editorial notes, are revealed as *amateurs*. Regardless of this internal differentiation, *Tehnium* functioned as a training ground, where readers belonging to both categories grappled with increasingly complex devices. Regular readers were not merely passive consumers of the information and construction schemes published, they also anticipated these, making them active participants in the development of the grassroots movement. Their inquiries and requests reveal a complex picture, where the information channels available to the readers intersect with those of the magazine. The mapping of the spaces occupied in the pages of the magazine by the two main actors, discloses the landscape of technostruggles, in regards to satellite television technology in socialist Romania.

The second part of the analysis focuses on *Tehnium's* articles which lead from the introduction to satellite television technology, to making one's own hand-built equipment for accessing it. The subject matter of Direct Broadcast Satellite, as a latest technological development, was referenced in different ways, depending on the aim of articles where the topic surfaced. On one hand, articles focused the topic of television, referred to satellite TV as a future development, to which Romania will eventually take part, while on the other hand, articles discussing microwaves transmissions (the technology at the base of DBS), referred to satellite television as an actuality. The choice of components for the satellite installation which entered the repertoire of *Tehnium* at different points in time, showed that all necessary parts were proposed for construction, but only some proved suitable for artisanal approaches in the long run. The offset of construction plans, as well as their exit from *Tehnium,* pointed out that the grassroots continued in the immediate aftermath of the fall of the communist regime, as a consequence of inflation and poverty.

6. Analysis and results

6.1. Ham radio operators using satellite connections

From the start, *Tehnium* established a strong connection with the amateur radio community, carrying dedicated sections for constructions (Radioconstructor) and, since December 1973, for ham radio operators at large (CQ-YO). This connection was reinforced when *Sports and Technique* ceased publication the same month, leading *Tehnium* to adopt the topic into its focus (Vasilescu, 2009), even organizing national competitions for radio amateurs from the 1980s onwards (Mihăescu, 2013, p. 36). Even more, *Tehnium* sponsored activities of the Ham Radio Romanian Federation, including international competition participation by its members (Mihăescu, 2013, p.36). Engaging in amateur radio activity entailed becoming a member of both a national and an international network[6]. During socialism, each county had its own Amateur Radio Club (41 counties after the 1981 reform), with a number of workshops estimated at 1600 in 1984 (Mihăescu, 1984b, p. 3), that operated as part of educational institutions or working places. In 1977 there were approximately 6000 radio amateurs (Enciu, 1977), but by 1984, 20 000 practitioners were reported — this figure, however, doesn't represent registered ham operators with the Ministry, but rather individuals involved in technical-applicative workshops (Mihăescu, 1984b, p. 3).

Amateur radio operators were the first group encouraged to use communication technology offered by artificial satellites, as a distinct part of the sport activities[7]. A number of 10 articles, dedicated to this topic, were published between December 1977 and March 1990. All of them were printed in the 'CQ-YO' section, and most of them were featured on the cover, attesting to the appeal of the practice. The years 1984-1985 witnessed the most significant concentration of articles on the subject, summing up a number of six articles, authored by Virgil Ionescu, director of Cheia Satellite Communications Center. This occurred just before the focus shifted to articles on satellite television from 1986 onwards. The articles were organized in categories covering the principles of communication and devices construction schemes. As the satellites for ham radio were in non-geostationary orbit, one had to calculate exactly when and how long the

[6] In Socialist Romania, technical norms and authorizations for amateur radio operators were administered by the Ministry of Trasport and Telecommunications, while the sport competitions of the field were administered by the Romanian Federation of Radio Amateurism. The International Amateur Radio Union serves as a unifying body for national organizations, facilitating coordination among ham radio operators, which establish connections with one another on a global scale. These connections are structured through organized competitions and activities, tailored to specific interests within the sports.

[7] In the midst of the Cold War, the international radio amateur community successfully launched satellites into orbit dedicated exclusively to ham radio communication, known as OSCAR satellites (Orbiting Satellite Carrying Amateur Radio). The planning for building such satellites took into consideration the compatibility with the existing equipment of ham radio operators, and by this eased up their access to the new technology. (Ionescu V., 1984b, 8). Artificial satellites catering specifically to the global ham radio community allowed for connections as far as 18,000 km apart, which meant that one could connect to any point of the globe (Ionescu V., 1984a, 6).

satellite would be reachable, and how to trace it. The endeavours promoted through these articles can be viewed as a preparatory workshop for the upcoming domain of DIY satellite television devices. This approach can thus be correlated with how the first article describing the construction of a satellite receiver referred to the readership: radio amateurs (Fălie, 1989b, p. 13).

As the technology used enabled global connections, a strategy to deter its political misuse was to emphasize the moral virtues of radio amateurism as a sport, and how these are, in turn, reflected in the high moral-stands of its practitioners (Enciu, 1977, p. 6). However, this construct was also misused as a way to avoid censorship, since the articles dedicated to construction schemes for satellite television published during socialism were supposedly catering to radio amateurs' pure interest in sports (Fălie, 1989k, p. 14).

6.2. Passionate DIY readers

Tehnium featured a dedicated section for engaging with reader's questions, alternatively called 'Editorial Post Mail', 'Dialogue with the Readers' or 'Service'. This functioned as a forum where inquiries regarding satellite television, amongst other topics, were responded to. The criteria for topics discussed were determined by the potential of reader's questions to ignite collective debates around issues with development potential (Dorian, 1971a). Within this section, one can trace the gradual development of the hands-on activities, as well as the level of knowledge, in the field of satellite broadcasting, during the 1980s decade. I have identified three stages of development, with the first one between 1982 and 1984, during which satellite transmissions are known about, but the DIY approach is not yet possible. A second stage between 1984 and 1986, when the handmade possibility is framed as palpable for the future, stage which ends with the publication of the construction scheme for a satellite dish. Between 1987 and 1990, the third stage ensued, marked by *Tehnium's* publication of the majority of construction plans. During this period, the dialogue with readers centred primarily on the dissemination of their engagement with the schemes. All translations from Romanian language quoted below are mine.

The first mention of satellite television is made in June 1982, when *Tehnium* answers Radu from Bucharest that "the mode in which satellite transmissions are made does not allow the access of the greater public to it" Mihăescu (1982a, p. 24). Two months later, in August 1982, *Tehnium* answers Tompe Raul from Constanta that "Direct-to-home satellite TV programs are not received in our country for the simple reason that there are no such transmissions (even for the whole of Europe)" Mihăescu (1982b, p. 24). These two statements situate satellite television in Europe still in its second phase, with DBS yet to be implemented.

In November 1984, two answers published to citizens from Oradea, signal a change of the situation. Perecsenyi Zoltan is told that "communications via telecommunications satellites are at very high frequencies (10-12 GHz), so the equipment cannot yet be built by amateurs" (Mihăescu, 1984a, p. 24), and Baes Ciprian is answered that "at the moment we do not have a construction plan for a satellite dish" (Mihăescu, 1984a, p. 24). These statements point to the transition towards DBS, while the phrasing is

emphasizing a momentary situation, opening up the possibility for amateurs to build the equipment in the future.

Another change occurs two years later, in 1986, when questions on the transmissions of satellite television signal are answered in three distinct issues. The January issue answers Hondoca Dan from Iaşi that "television satellites transmit on frequencies in the 10-12 GHz range; the construction of converters by amateurs for reception of these satellites is particularly difficult" (Mihăescu, 1986a, p. 24). Although deemed demanding, the possibility of building devices by amateurs is hence confirmed. The next two issues dealt with the topic of frequency bands in which satellite transmissions were broadcasted. February issue answers Ionescu Adrian from Bucharest that "satellite TV transmissions to the general public are in the 10-12 GHz band. The TV information is then translated into one of the V-band channels using a converter" (Mihăescu, 1986b, p. 24). June issue answers Bota Daniel from Argeş County that "the broadcasting frequency of TV satellites is a few gigahertz or even more than 10GHz." (Mihăescu, 1986c, p. 24), both statements confirming that television channels were already broadcasted on the DBS reserved bands.

Although *Tehnium* publishes a construction scheme for a satellite dish in September 1986, no further construction articles relating to satellite television appear throughout 1987. This is particularly noteworthy as the year marked a significant moment for amateur builders in the region, with the publication of an article in the Hungarian magazine Rádiótechnika detailing the construction of a satellite receiver, resonating within the radio amateur community in socialist Romania. The answers published in 1987 that concern satellite receivers and converters could be corelated with this context of lack of material in *Tehnium*. January issue answers Onisii Antonio from Fălticeni and Iliuţă Dan from Galaţi that "the construction of an 11 GHz receiver assembly is still beyond the practical possibilities of an amateur builder" (Mihăescu, 1987a, p. 24). March issue answers Sava Vasile from Iaşi that "we do not have the construction data of an 11 GHz receiver" (Mihăescu, 1987b, p. 24). Mai issue answers Bogdan Miftel from Bucharest again that "building an 11 GHz converter is beyond the technical capabilities of an amateur builder" (Mihăescu, 1987c, p. 24), and August issue answers Claponea Octavian from Constanţa that the "reception of satellite programs requires the use of a very complex installation" (Mihăescu, 1987d, p. 24). Last two answers contain some confusing remarks. September issue answers Pavel Cristea from Bacău that the "TV receptions (by chance) come from the Netherlands and Sweden" (Mihăescu, 1987e, p. 24), probably referring to long distance UIF intermittent reception, dependent on reflections in the ionosphere. The answer to Rădulici Victor from Buzău, published in October issue, stating: "The satellite TV reception setup was a joke (especially for 1.04)" (Mihăescu, 1987f, p. 24), is even more riddling. The reader's forum from 1987 reads as revisionist of earlier statements regarding the possibility of DIY devices for satellite television.

Up until 1989, *Tehnium* features four more answers, most of them connected to the SHF receiver published in June 1988. May issue of 1988 answers Oprea Stelian with a simple reminder that the "satellite dish construction plan was published" (Mihăescu, 1988a, p. 24). August 1988 issue answers Drăgan Constantin from Craiova that "the SHF band refers to broadcasts in 11 GHz" (Mihăescu, 1988b, p. 24), followed by September

1989 issue, in which Burnar Ion from Bucharest gets informed that "there are no restrictions concerning the reception of the SHF band" (Mihăescu, 1989a, p. 24), which was an important information about the legality of reception. November 1989 issue answers Stanciu Dan from Deva that the magazine "will publish other receivers for SHF band broadcasts" (Mihăescu, 1989b, p. 24). These answers show that readers were engaging practically with the construction schemes as soon as they were printed, and by 1989 they were experimenting with or already using DIY devices to view satellite television.

6.3. Popularization articles of satellite television

In the first half of the 1970s decade, *Tehnium* included a dedicated section on the Space Age. From May 1971 to December 1975, *Tehnium* featured a monthly[8] news section on space explorations, edited by Florin Zăgănescu. The author was a member of the elite science organizations and a collaborator of *Tehnium* until March 1976. Information on telecommunication satellites and television was first published in this section in a news bullets form. The section ceased to exist at the same time as the Socialist Republic of Romania was inaugurating its own ground station for satellite communications in October 1976, connected to the INTELSAT system (Radiocom Societatea Națională de Radiocomunicații, n.d.). This opaquing of socialist Romania's own inscription in the Satellite Age is surprising, considering that the director of Cheia Satellite Communications Center (Vasilescu, 2014) was also a collaborator of the magazine. As readers demanded the further publication of this section (Redacția 1975, p. 23), one conclusion is that its cessation and the omission of Cheia was a top-down decision.

The first lengthy article to discuss television programs transmitted through the satellite was published in March 1980. *Direct satellite TV program* (1980) was referring to signals transmitted by Ekran satellites, a system developed by the U.S.S.R. for national coverage, using the UHF band which could be captured using a Yagi Antenna. The article includes a graphic depicting the signal, journeying from the orbital satellite to a home residence, where it is received instead by a satellite dish.

Between November 1983 and September 1985, a 19-part article titled *Reception Quality of Black and White and Color Television Broadcasts* was showcased. In its tenth installment, Solcan (1984) delved into the advancements of direct satellite television, emphasizing that it would not supplant terrestrial networks, but complement them. The sixteenth article revisited the subject of DBS, discussing its integration with collective antennas (Solcan, 1985). Both parts implied that satellite technology will be used for Romanian television. In March 1985, Ionescu S. (1985, p. 6) highlighted in the 'CQ-YO' section the significance of microwave bands for satellite television, referred to as an actuality. Furthermore, Harbic (1986, p. 11) delved in the May 1986 issue, 'Hi-Fi' section, into the potential transmission of high-fidelity audio via satellite.

Popularization articles highlighted the stark contrast between the futuristic concept of satellite television and the limited broadcasting windows on national television during the late 1980s, while maintaining a vague promise opened, that the socialist state

[8] The section was absent in issues 8/1971, 4/1972 and 5/1973.

will incorporate this technology in the future. This did not happen during socialism, and, as a consequence, the focus of *Tehnium* moved on DIY devices for satellite television signal captured from elsewhere.

6.4. Construction articles

Tehnium's collection of DIY devices for satellite installations are analyzed according to two individual part they tackled: the satellite dish and the satellite receiver (Table 1). Among all the separate parts[9] required for a complete satellite installation, these two were the most probable ones to be successfully assembled by amateurs.

Table 1. Construction articles published in *Tehnium*

Year	Issue	Section	Title	Author
1986	September	CQ-YO	Construction of satellite dishes	Simion
1988	June	Laboratory	0,95-1,75 GHz Receiver	Fălie
1988	October	Informatics	Azimuth and elevation calculation	Fălie
1989	February	TV-DX	Reception in SHF Band: satellite dish	Fălie
1989	March	TV-DX	Reception in SHF Band: satellite dish and frequency converter	Fălie
1989	April	TV-DX	Reception in SHF Band: frequency converter	Fălie
1989	May	TV-DX	Reception in SHF Band: frequency converter	Fălie
1989	June	TV-DX	Reception in SHF Band: frequency converter	Fălie
1989	July	TV-DX	Reception in SHF Band: frequency converter	Fălie
1989	August	TV-DX	Reception in SHF Band: frequency converter	Fălie
1989	September	TV-DX	Reception in SHF Band: satellite receiver	Fălie
1989	October	TV-DX	Reception in SHF Band: satellite receiver	Fălie
1989	November	TV-DX	Reception in SHF Band: satellite receiver	Fălie
1989	December	TV-DX	Reception in SHF Band: satellite receiver	Fălie

The Satellite Dish

The construction and use of satellite dishes is detailed in four articles, published in the second half of 1980s, starting with Simion's (1986) *Construction of satellite dishes* published in September 1986 in 'CQ-YO' section, followed by Fălie's (1988b) *Azimuth and elevation calculation,* printed in the 'Informatics' section and *Reception in SHF Band,* part I and II (Fălie 1989a and 1989b), printed in February and March 1989 in the 'TV-DX' section.

[9] A further component addressed in *Tehnium* during socialism was a frequency converter. Although Fălie (1989b, 1989c, 1989d, 1989e, 1989f, 1989g) published the scheme for a frequency converter, Karundy (1994, p. 4) notes that this part of the installation could not be built by amateurs at a reasonable standard. Construction articles addressing updates to satellite devices were published up to 1998 in the magazine;

Simion (1986) highlights the importance of antennas for receiving long-distance TV broadcasts, particularly emphasizing the versatility of parabolic antennas for both ham radio and television, specifically noting their advantage in the SHF band (reserved for TV reception via satellites). The article avoided to evoke a concrete purpose of the antenna, but hinted nonetheless at the most obvious deployment, making a case for satellite television, without proactively promoting it. The text provides calculation formulas and Simion (1986) suggests a wooden template for construction, which Jajko (2021, p. 192) also presented as used in Poland. In regards to the materials for antennas, aluminum was recommended for those between 90 and 120-centimeter diameter, and stainless-steel for antennas between 2 and 6-meters diameter (Simion, 1986, p. 11).

The variation speaks about the state of the art of reception around 1986. Then, in 1989 Fălie (1989b) notes that individual installations exist with antennas having a diameter between 1,5 and 3 meters, for television transmitted through the professional frequency band. In comparison, for the DBS transmission in the SHF band (which was still described as a thing of the future), an antenna with a diameter of 50 to 90 cm was sufficient (Fălie,1989b). Dragoş Fălie, a physicist and researcher affiliated with the Politehnica University of Bucharest, was a frequent collaborator of *Tehnium*. Tudorancea (1989) highlights his role as a ham radio operator and his enthusiasm for receiving television signals over long distances, providing another link between the ham radio community and the grassroots movement. Fălie (1989a, 1989b) emphasizes the importance of signal power data for determining the dimension of the dish, regardless of the fact that concrete information on operating satellites was never printed in *Tehnium* during socialism. It was only after the regime change that *Tehnium* freely listed the satellite-TV channels whose signals could be received in Romania. Taking for granted that the dish was either manufactured, or procured from informal economy, Fălie (1989a) refers to the diminishing power of reception, due to irregularities on its surface, as well as the reduction caused by holes intended to reinforce its resistance to wind. In order to take measures counterbalancing these issues, such as increasing the size of the dish if manufacturing was expected to be flawed, Fălie (1989a) offers precise calculations, including a table detailing the wind forces projected on the dish, considering the various sizes used at that time throughout the territory. The 'Informatics' section, inaugurated in October 1988 and dedicated to the field of computers, offered an additional aid in calculating the precise positioning of the satellite dish for readers endowed with a personal computer. Fălie (1988b) recommends a program automatizing the necessary calculations, publishing commands in BASIC programming language, that readers could copy. The information inscribed in the materiality of the dish can be used retrospectively for a media archeological research on remaining manufactured satellite dishes. This would enable their identification within a specific time frame, their exact placement within the coordinates of the country and their correlation with the satellite signal watched.

Since it has to maintain a stable connection with signals beamed from outer space and at the same time remain resilient against ground disturbances, the satellite dish becomes more than a mediator between an advanced technology and household users (Parks, 2012), serving also as a mediator between outer space and Earth's atmosphere, adeptly navigating both forces.

The Satellite Receiver

Tehnium's collection of receivers blueprints during socialism includes: Receiver 1, published in 1988 and Receiver 2, published in 1989. Each receiver was presented in a different section: receiver 1 in 'Laboratory', receiver 2 in 'TV-DX' section.

The first construction scheme for a satellite receiver was published in June 1988. As mentioned, the previous year, Hungarian monthly magazine *Rádiótechnika* published an article spread across three issues, titled *Satellite receiver device* (Viletel 1987a, 1987b and 1987c). This was providing blueprints and step-by-step instructions on how to build one's own satellite receiver for future DBS transmissions. *Tehnium* had a subscription for the magazine (Poşta redacţiei, 1995) and considering Romania shares not only a border with Hungary but also has the largest Hungarian ethnic minority population, it's reasonable to expect that *Rádiótechnika*'s circulation would extend to the community of amateurs in the region. It is on the backdrop of this publication, that *Tehnium* proceeds to publish a similar construction scheme, using however the less self-evident title of *0,95-1,75 GHz Reciever* (Fălie, 1988a). Fălie (1988a) is clear in stating that the device is for satellite television, although he makes no reference to actual television channels.

The most prolific period of articles concerning the making of devices for viewing satellite television is February-December 1989. Eleven articles by Fălie, published under 'TV-DX' section, using the title *Reception in SHF Band*, were grouped into three sections. First was catering to the characteristics and positioning of the satellite dish, previously discussed. The second section described the construction of a frequency converter (March to August 1989), while the third part contained the construction plan for the second receiver (September to December 1989). Although the actual construction of a satellite dish was not included, the emphasis given to the calculations and planning makes it a complementary addition to the 1986 article describing its manufacturing. Through this series, *Tehnium* was offering a full guidebook for building a complete satellite television receiving set, during the communist regime. The first two articles don't even mention the word 'television', nor the phrase 'satellite television'. Determined by the informed readership, references to the C and Ku transmissions implied that specifying them as television bands was unnecessary.

The second receiver published in *Tehnium* (Fălie 1989h, 1989i, 1989j, 1989k) was an updated version of the previous one published by Fălie. The article features a 1:1 scale assembling template, which was reprinted in the double issue May-June 1990, pointing out to a continuity of DIY means for satellite television. Fălie (1989a, p. 12; 1989b, p. 13) was addressing his readership as fellow radio amateur operators. The language used in these articles belongs to the radio amateur realm, revealing that if one could understand the language describing radio amateurism devices, then one could definitely follow the instructions in building a satellite receiver. Fălie's (1989k, p. 14) articles end with a note from the editorial team, concerning the legal usage of the devices, which is hesitant regarding the reception of satellite television, pointing instead to the regulations of the radio amateur field. By printing such a statement, *Tehnium* was released of any responsibility for faulty usage of the devices, while also emphasizing the embodied ambivalence, that although it clearly contained DIY satellite television equipment, did not mention the viewing of satellite TV. At the time of the article's

publication, the European legislation regarding the free reception of signal was not yet in place, being implemented only on 22nd of May 1990 by the former European Economic Community Court of Justice EEC (Comşa & Comşa 1991, p. 4). The importance of the second receiver is pointed out by Cuşnarencu (1999), who emphasizes that the last decade of socialism was marked by numerous senseless restrictions, and marks retrospectively the magazine's publishing of the satellite receiver blueprint, a rebellious act.

Tehnium published the blueprints for a 3rd receiver during 1994 and 1995, in a newly inaugurated section titled 'Individual TV-SAT reception'. This device was even baptized "INDOOR TV-SAT receiver Tehnium" (Karundy & Cheregi, 1995, p. 8). While the post 1989 period is not the topic of this article, it is important to note that the DIY movement for satellite television continued well into the first decade of transition, determined in most part by economic reasons. Mărculescu (1999, p. 7) provides a clear assessment of the country's first decade of transition, mentioning that a significant segment of *Tehnium*'s target audience lacked the financial resources to afford the magazine, let alone obtain the materials and tools necessary for technical pursuits.

The tracing of popularization and construction articles showed that the two categories followed chronologically. Popularization articles stop at the momentum when Direct Broadcast Satellite television systems in Europe become an actuality, hence continuing to present the latest developments of this technology would have only revealed socialist Romania's exclusion from this realm. *Tehnium* then changes focus, and DBS becomes the unnamed topic for construction devices, which were built and used within the regulation available for ham radio operators. This antagonism between, let us call it 'ego of the state' not wanting to be revealed as lacking access means and the latest technology threatening its borders from above, is key in understanding why and when the grass routes for satellite television could become beaten tracks in *Tehnium*. The identified routes speak about the perfect understanding of the status of technology by readers, corelated to their geopolitical position, which determined their access to it. In this way, the spatial separation from the focus of the satellite signal, while reflecting a measurable distance on the East-West axis of the Cold War, could simply be erased by the size of the satellite dish and enhancements to the handmade receivers.

7. Conclusion

Tehnium functioned as a platform for the dissemination of the latest technologies and represented a daring endeavor within the confines of the totalitarian regime, notably during the latter years of communism, when interactions with the Western world were severely limited. Understanding the rationale behind its publication required an examination of key factors. The primary one lay in the recognition that a crucial arena of confrontation during the Cold War centered on technological advancements. Secondly, satellite broadcasting technology was intrinsically linked to the Space Age, in which the Socialist Republic of Romania aspired to play an active role as well (Cloşcă-Grigore, 1987; Roth, 1966). This ambition facilitated the publishing of up-to-date information regarding the progress of satellite television, filtered through this sieve of political interests. Thirdly, it's crucial not to overlook the desire of the population to have access to

the latest technologies, particularly in light of the socialist state's inability, both financially and ideologically, to provide such access. During communism, *Tehnium* adeptly built the path for this yearning and attracted to its readership the main actors of the grassroots movement. By including satellite devices in its repertoire, *Tehnium* enabled the population to access transmissions addressed to their western neighbors simultaneously, circumventing the temporal lag associated with technology (Poenaru, 2019). The multi-layered exclusion from the Western satellite industry was hence partially overcome by technostruggles approaches of advised eastern Europeans, supported by a local state-owned publication. The economic reasoning behind a DIY approach has been shown to transcend the regime change.

The analysis went through the intersections of macroscale technological developments and political interests, whose traces were identified in the terrain of *Tehnium*. The article shows how the grassroots and grass routes approaches reflected in the pages of the magazine, and thus complements the studies of alternative TV consumption during socialism in Romania. It also emphasizes how the particular material structures and strategies enlarge the understanding of technostruggles, in regards to the dissemination of a technology with global impact.

8. Further research

In order to provide an exhaustive view of grassroots and grass routes approaches to satellite television in Socialist Romania, the data extracted from *Tehnium* should be combined with other sources such as oral interviews with the main actors as well as other archival data.

Furthermore, as a was a way to avoid censorship, satellite TV devices were showcased independently of television content during socialism, casting their role as serving purely technological quests of being up to date, without consideration for any potential social implications or subversive practices they might incite. Nonetheless, as a further inquiry it would be necessary to reveal what politics the built devices actually contained, thinking here of the frame of analysis of technological politics proposed by Langdon Winner (1999). This would help understand their specific and complex role in the former eastern European state's moment of transition.

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References

Albescu, I. E. (1980b). Tehnium 10 ani de la apariție [Tehnium 10 years since its publication]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XI (121)*, 2.

Badenoch, A., Fickers, A., & Henrich-Franke, C. (Eds). (2013). *Airy curtains in the European Ether: Broadcasting and the Cold War*. Baden-Baden: Nomos Verlagsgesellschaft mbH & Co. KG.

Barker, J. (2005). Engineers and political dreams Indonesia in the satellite age. *Current Anthropology*, *46*(5), 703–727. https://doi.org/ 10.1086/432652.

Bardan, A. (2021). Parateleviziune în România anilor 1980 [Paratelevision in Romania in the1980s]. In D. Duminică (Ed.) *Audiovizualul, o istorie recentă (1928-2020)*, 25-44. București: Tritonic.

Bönker, K., Obertreis, J. & Grampp, S. (Eds). (2016). *Television beyond and across the Iron Curtain*. Newcastle upon Tyne, UK: Cambridge Scholars Publishing.

Cloşcă-Grigore, C. (1987). *Era Cosmică şi Terra [The Space Age and Earth]*. Bucureşti: Editura lbatros.

Comșa, D., Comșa M. V. (1991). *Sateliții Europei Programe TV și Radio [Europe's Satellites: TV and Radio Programs]*. București: Editura Tehnică.

Copcea, C. (2011, October 11). Colecția revistei Tehnium [The Tehnium Magazine Collection]. http://blog.copcea.ro/?tag=tehnium-colectie-download-pdf

Cuşnarencu, G. (1999). Tehnium la 30 de ani de la apariție [Tehnium 30 years since its publication]. *Tehnium 70 INTERNATIONAL Revistă Pentru Constructorii Amatori Fondată in Anul 1970, Serie Nouă, XXX (326)*, 9.

Dorian, D. (1970). Așteptăm scrisorile dumneavoastră [We look forward to receiving your letters]. *Tehnium Construcții pentru Amatori, Publicație Lunară Editată de Revista "Știință și Tehnică", I (1)*, 24.

Dorian, D. (1971a). Poșta Tehnium Dialog cu Cititorii [Tehnium Post, Dialogue with the Readers]. *Tehnium Construcții pentru Amatori, Publicație Lunară Editată de Revista "Știință și Tehnică", II (4)*, *March 1971*, 24.

Dorian, D. (1971b). Poșta Tehnium Dialog cu Cititorii [Tehnium Post, Dialogue with the Readers]. *Tehnium Construcții pentru Amatori, Publicație Lunară Editată de Revista "Știință și Tehnică", II (9)*, *August 1971*, 24.

Dwayer, T., Uricariu, I. (2015). Slashing and Subtitles. Romanian Media Piracy, Censorship and Translation. In T. Baumgärtel (Ed.) *A reader on international media piracy: Pirate essays*. 207-230. Amsterdam: Amsterdam University Press.

Enciu, G. (1977). Radioamatorismul un sport pentru tineri [Radio amateurism a sport for the youngsters]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții Pentru Amatori, VIII (85),* 6.

Fălie, D. (1988a). Receptor 0,95 -1,75 Ghz [0.95 -1.75 Ghz Receiver]. In *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVIII (211)*, 8-9 + 11.

Fălie, D. (1988b). Calculul Azimutului și Elevației [Azimuth and Elevation Calculation]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVIII (215),* 12.

Fălie, D. (1989a). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (219)*, 11-12.

Fălie, D. (1989b). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (220)*, 12-13.

Fălie, D. (1989c). Recepția în banda SHF [Reception in the SHF band]. *Tehnium RevistăLunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (221)*, 11-12.

Fălie, D. (1989d). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (222)*, 11-14.

Fălie, D. (1989e). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (223)*, 11-12, 23.

Fălie, D. (1989f). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (224)*, 11-12.

Fălie, D. (1989g). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (225)*, 11-12.

Fălie, D. (1989h). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (226)*, 11-12.

Fălie, D. (1989i). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (227)*, 11-12.

Fălie, D. (1989j). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (228)*, 11-12.

Fălie, D. (1989k). Recepția în banda SHF [Reception in the SHF band]. *Tehnium Revistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XX (229)*, 11-14.

Fălie, D. (1990). Sateliții TV și programe ce se pot recepționa în România [TV satellites and programmes that can be received in Romania]. *Tehnium Revistă Lunară Pentru Constructorii Amatori*, XX (232), 12-13.

Fiske, J. (1996). *Media matters: Race and gender in U.S. politics* (Rev. ed.). Minneapolis: Univ. of Minnesota Press.

Grada, M. B. (2021). Microcomputing revolution in the Polish People's Republic in the 1980s. In K. Jajko, M. B. Garda, P. Sitarski & G. Kirkpatrick (Eds). *New media behind the Iron Curtain: Cultural history of video, microcomputers and satellite television in communist Poland.* 111-170. Jagiellonian University Press.

Gross, P. (1999). *Colosul cu picioare de lut, Aspecte ale presei post-comuniste*, Editura Polirom.

Harbic, A. (1986). Analog sau Digital [Analog or Digital]. *Tehnium Publicație Lunară Editatăde C.C. al U.T.C. Construcții pentru Amatori, XVI (186)*, 10-11.

Ionescu, V. (1984a). QSO-uri prin Sateliții de Radioamatori [QSOs via Amateur Radio Satellites]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIV (165)*, 6-7.

Ionescu, V. (1984b). QSO-uri prin Sateliții de Radioamatori [QSOs via Amateur Radio Satellites]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIV (166)*, 8-9.

Ionescu, S. (1985). Emițător-Receptor pe 10 GHz [10 GHz transceiver]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XV (172)*, 6.

Jajko, K., Garda, M. B., Sitarski, P., & Kirkpatrick, G. (Eds). (2021). *New media behind the Iron Curtain: Cultural history of video, microcomputers and satellite television in communist Poland.* Jagiellonian University Press.

Jajko, K. (2021). Television from the sky for everyone. In K. Jajko, M. B. Garda, P. Sitarski & G. Kirkpatrick (Eds). *New media behind the Iron Curtain: Cultural history of video, microcomputers and satellite television in communist Poland*. 171-244. Jagiellonian University Press.

Karundy, T. E. (1994). Construcția unui receptor indoor TV SAT: schema bloc a receptorului [Construction of an indoor TV SAT receiver: receiver block diagram]. *Tehnium Revistă Lunară Pentru Constructorii Amatori Comandă de Stat, XXIV (283-284)*, 4-5.

Karundy, T. E. & Cheregi, S. (1995). Perfecționări ale Receptorului Indoor TV-SAT "Tehnium" [Improvements of the Indoor TV-SAT Receiver "Tehnium"]. *Tehnium Revistă Lunară Pentru Constructorii Amatori Comandă de Stat, XXV (297)*, 8-9.

Mahler, F. (1988). Tehnium în opinia cititorilor săi [Tehnium in its readers' opinion]. *TehniumRevistă Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVIII (214)*, 18.

Matei, A. (2013) *O tribună captivantă. Televiziune, ideologie, societate în România socialistă (1965–1983).* București: Curtea Veche.

Mayring, P. (2014). *Qualitative content analysis: Theoretical foundation, basic procedures and software solution.* Klagenfurt: https://nbn-resolving.org/urn:nbn:de:0168-ssoar-395173

Mărculescu, A. (1999). Tehnium la 30 de ani de la apariție [Tehnium 30 years after its launch]. *Tehnium 70 INTERNAŢIONAL Revistă Pentru Constructorii Amatori Fondată în Anul 1970, Serie Nouă, XXX (326),* 7.

Mihăescu, I. (1982a). Poșta Redacției [Editorial Post Mail]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIII (139),* 24.

Mihăescu, I. (1982b). Poșta Redacției [Editorial Post Mail]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIII (141),* 24.

Mihăescu, I. (1984a). Poșta Redacției [Editorial Post Mail]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori*, XIV (168), 24.

Mihăescu, I. (1984b). Radioamatorismul – sport tehnico-aplicativ cu tradiție în România: 35 de ani de Radioamatorism [Amateur Radio - a technical-applicative sport with tradition in Romania: 35 years of Amateur Radio]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XV (169)*, 2-3.

Mihăescu, I. (1986a). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVI (182),* 24.

Mihăescu, I. (1986b). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVI (183),* 24.

Mihăescu, I. (1986c). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVI (187),* 24.

Mihăescu, I. (1987a). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (194),* 24.

Mihăescu, I. (1987b). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (196),* 24.

Mihăescu, I. (1987c). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (198),* 24.

Mihăescu, I. (1987d). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (201),* 24.

Mihăescu, I. (1987e). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (202),* 24.

Mihăescu, I. (1987f). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVII (203),* 24.

Mihăescu, I. (1988a). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVIII (210),* 24.

Mihăescu, I. (1988b). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XVIII (213),* 24.

Mihăescu, I. (1989a). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (226),* 24.

Mihăescu, I. (1989b). Service. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIX (228),* 24.

Mihăescu, I. (2013). O revistă preponderant electronică [A Predominantly Electronics Magazine]. In A. Ciontu (Ed.). *File din istoria radiotehnicii şi electronicii româneşti: realizări*. 34-43. Lugoj: Nagard.

McLuhan, M. (1964). *Understanding media: The extensions of man*. McGraw-Hill.

Mustata, D. (2011). *The power of television: Including the historicizing of the Live Romanian Revolution*. Utrecht University.

Parks, L. (2005). *Cultures in orbit: Satellites and the televisual*. Duke UniversityPress.

Parks, L. (2012). Technostruggles and the satellite dish, a populist approach to infrastructure. In G. Bolin (Ed.), *Cultural technologies, the shaping of culture in media and society* (pp. 64-84). Routledge.

Péter, L. (2018). *Forbidden football in Ceaușescu's Romania*. Palgrave Macmillan.

Poenaru, F. (2019). Fotbalul ca istorie a mediilor [online talk] [Football as media history]. *asociația 1+1*. http://unuplusunu.org/florin-poenaru-fotbalul-ca-istorie-a-mediilor/

Poșta redacției [Editorial post]. (1995, May-June). *Tehnium Revistă Lunară Pentru Constructorii Amatori Comandă de Stat*, XXV (294), 2.

Direct satellite TV Program [Program TV direct de la satelit]. (1980, March). *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XI (112),* 12-13.

Radiocom Societatea Națională de Radiocomunicații [Radiocom National Radiocommunication Society] (n.d.). *Comunicații prin Satelit. http://www.radiocom.ro/business/servicii/Date/Comunicatii-prin-Satelit/*

Redacția [Editorial staff] (1975, January). Tehnium Magazin. *Tehnium Construcții Pentru Amatori Publicație Lunară Editată de C.C. al U.T.C., VI (50),* 23.

Roth, I. (1966). *Telecomunicații prin sateliții artificiali ai Pământului [Telecommunications via Earth's artificial satellites]*. București: Editura Tehnică

Sei, K. (2022, 02.11) World Wide West: The advent of the internet in awakening democracies. [Video]. transit.sk. https://www.facebook.com/sk.tranzit/videos/1085773595611169/

Szekfü, A. (1989). Intruders welcome? The beginnings of satellite TV in Hungary. *European Journal of Communication*, *4*(2), 161–171. https://doi.org/10.1177/0267323189004002003

Schwoch, J. (2009). *Global TV: New media and the Cold War, 1946-69*. University of Illinois Press.

Schwoch, J. (2016). "Removing Some of the Romantic Aura of Distance and Throwing Merciless Light on the Weaknesses of American Life": Transatlantic Tensions of Telstar, 1961-1963. In K. Bönker, J. Obertreis & S. Grampp (Eds). *Television beyond and across the Iron Curtain* (pp. 271-294). Cambridge Scholars Publishing.

Simion, S. (1986). Construcţia antenelor parabolice [Construction of satellite dishes]. *Tehnium Publicaţie Lunară Editată de C.C. al U.T.C. Construcţii Pentru Amatori, XVI (190),* 6-7, 11.

Solcan, V. (1984). Calitatea recepției emisiunilor de televiziune alb negru și color [Reception quality of black and white and colour television broadcasts]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XIV (166),* 21.

Solcan, V. (1985). Calitatea recepției emisiunilor de televiziune alb negru și color [Reception quality of black and white and colour television broadcasts]. *Tehnium Publicație Lunară Editată de C.C. al U.T.C. Construcții pentru Amatori, XV (172),* 21.

Tudorancea, T. (1989). Amator sau profesionist în tehnica de vîrf? [Amateur or professional in top technique?]. *Revista "Știință și Tehnică", 41(2),* 4.

Vasilescu, N. (2009, August 24). *Ilie Mihaescu YO3CO, primul "Cercetaș de Onoare" dintre radioamatori [Ilie Mihaescu YO3CO, the first "Honorary Scout" among radio amateurs]*. Radioamator.ro. https://www.radioamator.ro/articole/view.php?id=600

Vasilescu, N. (2014, September 06). *In Memoriam - Virgil Ionescu VK5VCI (ex YO9CN).* Radioamator.ro. https://www.radioamator.ro/articole/view.php?id=974

Viletel, I. (1987a). Műholdvevó készülék [Satellite receiver device]. *Rádiótechnika XXXVII, August*, 399-402.

Viletel, I. (1987b). Műholdvevó készülék 2. [Satellite receiver device 2.]. *Rádió technika XXXVII, September*, 456-459.

Viletel, I. (1987c). Műholdvevó készülék 3. [Satellite receiver device 3.]. *Rádiótechnika XXXVII, October*, 513-516.

Winner, L. (1999). Do artifacts have politics? In D. MacKenzie & J. Wajcman (Eds.) *The Social Shaping of Technology* (2. ed., 1. publ.) (pp. 28-40). Open Univ. Press

Winston, B. (1998). *Media technology and society: A history from the telegraph to the Internet*. Routledge.