Evolution of the media: map of a discipline under construction. A review

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Abstract

The vertiginous explosion of new forms and experiences of communication that have emerged in the last 30 years cannot be compared with other moments in the history of humanity. The rapid transformation of the media ecosystem and the technological sphere in general is putting old scientific theories and models to the test. The very idea of "ecosystem" or other widely used concepts such as "emergence" (of new media), "adaptation", or even "extinction" (of old media) all point, albeit metaphorically, in the same direction: the development of an evolutionary theory of media change. This review article aims to map the different approaches and contributions that come together in an evolutionary theory of the media, understood as a transdisciplinary work-in-progress. The article opens with a reflection on the processes of theoretical construction, continues with a map of Media Ecology –a "field of inquiry" inspired by the works of Marshall McLuhan and Neil Postman– and concludes this first approach with the authors who worked on the evolutionary dimension of media change. It could be said that the evolutionary theory of the media already exists, but it is scattered in countless texts and studies waiting to be connected. The article concludes with a first identikit of Media Evolution, understood as a theoretical field under construction but developed well enough to understand the past and contemporary transformations of the media ecosystem.

Keywords

Media; Communication; Technology; Evolution; Ecology; Intermediality; Communication theories; Media evolution; McLuhan; Medium Theory; Media archeology; Review article.

1. Introduction

The media ecosystem, and the technological sphere in general, are currently in a period of rapid transformation. All the actors involved, from communication professionals to users, researchers and media managers tend to share the same vision: change is fast, and it is very difficult to focus on it. Although this sensation of acceleration is not recent (we need only to read the texts published in the first half of the 19th century and their descriptions of the railways or the telegraph to realize this), it is evident that the explosion of new media forms and communication experiences that have emerged in the last 30 years do not support comparison with other moments in the history of humanity.

This review article is dedicated to the construction of a new evolutionary theory of media change. A series of questions inspire this theoretical path: How should we understand these changes in the media sphere? How can we make sense of them without getting caught up in conjectural readings or being dazzled by the latest new media? Is it possible to develop a theory of media change that goes beyond technological determinism and does not get caught up in the debate between apocalyptic and integrated positions? Is it possible to think about these transformations from an eco-evolutionary perspective?

To answer these and other questions Media Evolution, understood as a discipline that is still under construction, applies concepts, models, and metaphors of biological change as tools for exploring the transformations of the media field. The first section of the article presents a reflection on theoretical construction processes, at first in a general way, but little by little turning the focus

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towards the media and communication field; after discussing a series of theories and metaphors, this section considers theoretical production as an activity that also includes a creative dimension. We need new theories, concepts, and analytical categories to understand such an elusive and changing reality.

The second section presents a map of Media Ecology. More than a "discipline", media ecologists prefer to define it as a "field of inquiry" (**Strate**, 2017). It is a research field based on the pioneering work of researchers such as **McLuhan** (2003a; 2011) and **Postman** (1970; 1985; 1998), among other scholars. Why do we need to describe Media Ecology? Because, as will be seen in the following pages, media ecology and media evolution can be considered the two sides of the same theoretical coin.

The third section is proposed as a bridge between Media Ecology and Media Evolution; and therefore this section describes the media ecologist researchers who oriented their studies and reflections towards media change. Finally, the fourth section enters fully into Media Evolution, an under-construction "theoretical conversation" (**Scolari**, 2008; 2009) that aims to connect concepts, ideas, texts, and authors who, it could be said, are or have been 'media evolutionists' without knowing it. The main objective of this article is to map this territory and begin to relate these contributions to each other, developing at the same time an eco-evolutionary theoretical view of the transformations of the media sphere..

2. Making theories

Scientific research never starts from scratch. There is always a doubt, a question, a prejudice, or a problem of an intellectual or practical nature (or a combination of both) that guides the researchers' observations and helps them to identify that there is something "there" that is worth investigating. A study may also start from a single concept or from a hypothesis. Identifying scientific areas that do not have a consistent theorization is also a trigger that can spark a research process. As Richard Swedberg wrote in *The Art of Social Theory* (2014), science is about

> "observing a phenomenon, coming up with an idea or a theory why something happens, and then testing the theory against facts" (**Swedberg**, 2014, p. 8).

Following Karl Popper and Charles S. Peirce, he also argued that

> "an idea or a hypothesis is of little value until it has been carefully tested against data according to the rules of science" (**Swedberg**, 2014, p. 8).

The creation and testing of hypotheses is the main business of scientific research.

2.1. Theories and metaphors

Science creates and deals with theories. According to **Shoemaker** *et al*. (2004)

> "Science is all about theory. The goal of science is to produce and test theories (…) The major difference between science and other ways of knowing is that science constantly questions itself. Science tries explicitly to state its theories, to pose then in formal ways using precise statements so that it is clear what they are saying, to test them, and to confirm, modify, or discard them. Science is the ongoing business of coming up with new ideas and finding ways to challenge them" (**Shoemaker** *et al.*, 2004, p. 6).

Swedberg proposed a creative and practical approach to theory building inspired by the works of Charles S. Peirce. Far from being a speculative or time-wasting activity for lovers of abstract thinking, Swedberg insisted that theorizing is a highly "practical activity" (2014, p. 19). The search for metaphors is a common activity in the formulation of new theories. According to Gozzi, when metaphors are used as bridges into the unknown, they

> "gain power from showing us structural similarities, and suggesting paths to follow to discover new insights into the unknown domain" (**Gozzi**, 1999, p. 57).

The long history of mass communication theories (**Rodrigo-Alsina**, 1995; **McQuail**; **Deuze**, 2020) is full of metaphors, from Shannon and Weaver's transmission "channel" to Noelle-Neumann's "spiral" of silence. It could be said that behind any theoretical model of communication there is a metaphor. Collateral disciplines like semiotics are no exception: from Jakobson's initial incorporation of the informational model (his functions of language were inspired by Shannon and Weaver's mathematical model of communication) to Verón's "network" of social semiosis, or Eco's vision of the text as a "battlefield" where two "strategies" confront each other (**Verón**, 1987; **Eco**, 1981), the discipline that analyses sense production and interpretation processes has imported or developed powerful metaphors.

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Like Media Ecology, it is obvious that an evolutionary theory of the media is nourished by biological concepts through a metaphorical operation (**Scolari**, 2012; 2015). Although there are substantial differences between biological and cultural evolutions, both are historical processes that

> "cannot be foreseen, however clear they may seem to be in retrospect. Evolution theory opens the view for accidental momentums of media evolution. It prevents us from looking for a rational ex post explanation of media evolution (…) Both evolutions have produced a great diversity of species and media. Endogenous and exogenous factors have had their impact on diversification. Here and there new functions emerge from older ones. Evolution theory stresses the importance of emergent phenomena. And in both cases, evolution changes its environment: species change their habitats and media change society. Media are 'agents of change' (**Eisenstein**, 1979) (**Stöber**, 2004, pp. 502-503).

As Kaplan put it,

> "the formation of a theory is not just the discovery of a hidden fact; the theory is a way of looking at the facts, of organizing and representing them" (**Kaplan**, 1964, p. 309).

In this case, through the exploration of a metaphor of biological origin, Media Evolution proposes a new way of looking at and representing media change.

To conclude this section, we can ask: why is it so important to analyze the role of metaphors in the construction of scientific discourses? According to Postman,

> "our best poets and scientists are those who have created the most vivid and enduring metaphors" (in **Gozzi**, 1999, p. xvi).

If media and communication researchers want to improve their theoretical models, it is fundamental to know how to create and deal with metaphors.

> *Is it possible to develop a theory of media change that goes beyond technological determinism and does not get caught up in the debate between apocalyptic and integrated positions?*

2.2. A fragmented field

If anything characterizes the media and communication theoretical space, it is its growing fragmentation (**Craig**, 1999; 2015; **Zelizer**, 2015). The phenomenon is not new; in reality, communication theories have never been a unified whole, quite the contrary: since the first reflections at the beginning of the 20th century, theoretical production on media and communication has been marked by diversity and, in some cases, by inter-theoretical competition (for example, the 'cold war' between critical theories from Europe and 'administrative' theories from the United States).

In one of the most recent maps of the field, **Waisbord** (2019) found that

> "fragmentation is the result of the confluence of several factors. The multidisciplinary genealogy of the field has been a major cause. Communication was multidisciplinary before multi- and inter-disciplinarity became important trends in academia" (**Waisbord**, 2019, p. 17).

The positions regarding this process of fragmentation are contradictory: while some lament that

> "fragmentation means the dilution of the well-defined and agreed-upon core elements that define any discipline",

others celebrate it because

> "it loosens the straitjackets of disciplinary theories and methodologies and nudges scholars into exciting lines of research" (**Waisbord**, 2019, p. 22).

Beyond these two opposite opinions, it is difficult to imagine a defragmentation of the field soon (quite the opposite). The only way to deal with the fragmentation and hyperspecialization that reigns in the field of communication seems to be to accept this situation and learn to live with it:

> "We should recognize and embrace the proliferation of approaches to the study of digital communication amid the constant reinvention of fields of study related to "communication studies". This attitude demands challenging the modernist project of science identified with a single conceptual system and a finely defined and dominant paradigm, and defending ontological openness, not only in the name of intellectual originality but also as a distinctive quality of the continuous blurring of academic boundaries" (**Waisbord**, 2019, p. 90).

Given the situation of fragmentation and theoretical hyperspecialization that reigns in media and communication studies, the question is more than pertinent: does it make sense to bet on a new theory? We believe that the bet is worth it if the proposal is to build a theory that, without losing specificity, tends to connect existing

> *Like Media Ecology, an evolutionary theory of the media is nourished by biological concepts through a metaphorical operation*

theoretical constructions. In other words, rather than creating a new theoretical niche, the proposal would be to create confluence and trading zones with scientific lines that already have a greater or lesser degree of theoretical development.

Waisbord backs the concept of post-discipline, understood as an "intellectual trading zone" (p. 127) where researchers meet, develop a common language, and build theories around common problems and questions.

> It would be worth building a theory that, without losing specificity, tends to connect existing theoretical constructions: create confluence and trading zones with scientific lines that already have a greater or lesser degree of theoretical development

These conversational zones are not exactly new: some theoretical frameworks such as functionalism, structuralism and materialism are examples of spaces that connect research in the social sciences, the humanities, and even the arts. In this context, Media Evolution appears for all intents and purposes as an emerging intellectual trading zone, a conversational space that proposes the construction of a new discipline oriented towards the understanding of media change.

3. Brief introduction to Media Ecology

In May 7, 1966, Marshall McLuhan delivered a public lecture entitled "The Medium is the Massage" in which he reviewed the basic conceptions of his vision of media:

> "A medium creates an environment. An environment is a process, it is not a wrapper. It's an action, and it goes to work on our nervous systems and on our sensory lives, completely altering them (…) Electronic technology, both radio and TV, for example, have this power of involving us in all our senses" (**McLuhan**, 2003b, pp. 91-94).

Writing about Media Ecology implies writing about Marshall McLuhan and, sooner or later, facing his often-controversial ideas. Some scholars believe that Media Ecology is just an extension of Marshall McLuhan's original ideas about media and mass culture. However, although the Canadian media thinker played a fundamental role in the constitution of the field, Media Ecology "is more than McLuhanism" (**Strate**, 2008, p. 130), and its roots can be traced to the studies of researchers like **Mumford** (2010 [1934]), **Ellul** (1964), **Havelock** (1963; 1981; 1986), **Ong** (1977; 2012), **Goody** (1987), **Febvre**; **Martin** (1998), **Innis** (2007; 2008), **Hall** (1959; 1966), **Langer** (1942; 1953), and **Lee** (1951). In "Kafka and His Precursors" Jorge Luis Borges wrote that

> "every writer creates his own precursors. His work modifies our conception of the past, as it will modify the future" (**Borges**, 1974, p. 712).

In this sense it could be said that many researchers were McLuhanian before McLuhan, in the same way that many writers were Kafkian before Kafka. In other words, Media Ecology has deep roots in the late 19th and early 20th century social sciences and humanistic studies.

3.1. The ecological point of view

How can we explain this theoretical perspective in just a few words? As early as 1970 Neil Postman affirmed that Media Ecology was

> "the study of media as environments" and clarified that "the word 'ecology' implies the study of environments: their structure, content, and impact on people" (**Postman**, 1970).

In a talk given in Denver in March 1998 he expanded this idea saying that "technological change is not additive; it is ecological". He explained this concept with an example:

> "A new medium does not add something; it changes everything. In the year 1500, after the printing press was invented, you did not have old Europe plus the printing press. You had a different Europe" (**Postman**, 1998).

McLuhan also insisted that media are environments or a medium in which individuals live, like fish do in water. This environment is the place where humans create and develop technologies (from writing to television, from wheels to airplanes, from papyrus to books) that later model their perceptual and cognitive systems. Other scholars, like Nystrom, author of the first doctoral thesis on Media Ecology, affirmed that Media Ecology should be broadly defined as the study of "complex communication systems as environments" (**Nystrom**, 1973, p. 1).

Any introduction to Media Ecology should include a reference to James **Carey** (1967; 1983; 1992), a borderland scholar who created bridges between the Media Ecology tradition (specifically the works of Mumford, McLuhan, and Innis) and

cultural studies thinkers like Clifford Geertz. In general, Carey praised Innis in his works while providing a less enthusiastic view of McLuhan: he preferred the careful accumulation of detail and the identification of many interconnections in Innis's scholarship to McLuhan's polemical generalizations. However, for Carey both McLuhan and Postman, alone among the scholars of human society, made

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"the history of the mass media central to the history of civilization at large. Both see the media not merely as appurtenances to society but as crucial determinants to the social fabric" (**Carey**, 1967, pp. 270-271).

Beyond his theoretical critical contributions, Carey's classic research into the telegraph in the American cultural experience is a great example of an ecological approach to media analysis (**Carey**, 1983; 1992; **Flayhan**, 2001; **Strate**, 2007).

Although it is not the objective of this article to discuss the internal disputes between media ecologists, it must be recognized that the field, like any other scientific territory, has been crisscrossed by different visions and ways of doing. Sometimes, the internal disagreements took a moral line: for example, while McLuhan defended the moral neutrality of media analysis, **Postman** (2000) was very critical of that position:

"I think there is considerable merit in McLuhan's point of view about avoiding questions of good and bad when thinking about media. But that view has never been mine. To be quite honest about it, I don't see any point in studying media unless one does so within a moral or ethical context" (**Postman**, 2000).

Media ecologists have had contradictory attitudes toward media change: while scholars such as **Postman** (1985) lamented the decline of the printed word, other researchers such as **Meyrowitz** (1985) and **Levinson** (1997) were more enthusiastic about the arrival of electronic media (**Gencarelli**, 2000; **Ramos**, 2000). As it can

> ' The internal tensions demonstrate the vitality of the Media Ecology conversations and the effervescence of the scientific field '

be seen, Media Ecology has been traversed by very rich theoretical discussions. However, media ecologists also agree on many points, from the criticism of the transmission view of communication to the development of a common environmental vision of media, culture, and technology. After all, these internal tensions demonstrate the vitality of the Media Ecology conversations and the effervescence of the scientific field.

3.2. The ecological metaphor

Why the ecological metaphor? The publication of Fundamentals of Ecology (**Odum**; **Odum**, 1953) introduced a new vision of ecological principles characterized by a holistic approach to biological systems. The book proposed a whole-to-part progression: the ecosystem level was the first rather than the last chapter of the book. **Odum** (1964) defined this phase of the ecological reflection as the "new ecology". As the environment-awareness movement began to emerge in the late 1960s (the first Earth Day was organized on 22nd April 1970) these ideas spread throughout American society and many scientific fields, including sociology, economy, and linguistics. Postman and McLuhan's "media ecology" was born in parallel with the consolidation of Odum's "new ecology".

What is the "new ecology"? For E. P. Odum, science should not only seek to understand phenomena by detailed study of smaller and smaller components: it should also be synthetic and holistic, in the sense of

"seeking to understand large components as functional wholes" (**Odum**, 1964, p. 1289).

The rise of the new ecology was a response to the need for greater attention to holism in science and technology. Working in the same direction, after years of thinking about communication processes from a lineal perspective based on the Shannon and Weaver model –in which the information was an 'arrow' flying from the sender to the receiver– the Media Ecology scholars proposed a new conception of the relationships between media, individuals and society based on an environmental metaphor.

The convergence of Media and Communication Studies and ecological thinking situates Media Ecology at the same level as many other compound meta-disciplines, such as biochemistry, psychobiology, linguistic anthropology, and psycholinguistics. This convergence is not causal or an isolated phenomenon as researchers from the social sciences and humanities had an open mind towards ecological and biological models over the post-war years, when fields like cultural ecology (**Steward**, 1955), biosemiotics (**Rothschild**, 1962), biolinguistics (**Lenneberg**, 1967), ecological anthropology (**Rappaport**, 1968) and political ecology (**Wolf**, 1972) were born.

In this context, the development of a media ecological approach was not an unusual or extraordinary scientific event. The configuration of Media Ecology in the 1960s and 1970s was part of a broader process of the general application of the ecological metaphor to the social sciences and humanities in the post-war period. Although the introduction of the ecological metaphor into media studies is not recent, the analogy was not completely exploited in the past. A deeper exploration of the metaphor would widen the research horizons, increase the number of concepts and categories available for theoretical conversations, and introduce new questions and challenges to Media and Communication Studies. In this sense, the evolutionary approach should be considered as an extension of the ecological view of the media.

3.3. Media as environments / Media as species

It could be useful to return to Postman's conception:

"the word 'ecology' implies the study of environments: their structure, content, and impact on people" (**Postman**, 1970).

As McLuhan explained in *Understanding Media*, a book originally published in 1964, the effects of technology

> "do not occur at the level of opinions or concepts but alter sense ratios or patterns of perception steadily and without any resistance' (**McLuhan**, 2003a, p. 31).

As an example, McLuhan mentioned television, a medium that

> "changed our sense-lives and our mental processes" (p. 439)

in the same way that digital maps and GPS technology are changing our perception of physical space. Postman amplified this idea when he described how the human "worldview" is a creation of every medium of communication. According to Postman each medium provides a

> "new orientation for thought, for expression, for sensibility […] (they) classify the world for us, sequence it, enlarge it, reduce it, colour it, argue a case for what the world is like" (**Postman**, 1985, p. 10).

This interpretation of the ecological metaphor could be defined as the environmental dimension of Media Ecology. In this interpretation media create an 'environment' that surrounds the individual and models their perception and cognition.

Another possibility is to understand the ecological metaphor as a territory where different media interact. Although scholars like **Strate** (2017) are against this interpretation

> –"it is at best a secondary concern, a far cry from the life, the universe, and everything type of questions that are often associated with media ecology scholarship" (**Strate**, 2017, pp. 7-8)–,

texts speak for themselves. Classic scholars of the Media Ecology tradition like **Innis** (2003; 2007) developed a holistic approach that integrated the evolution of the different media and socio-economic processes (for example the parallel development of railroads and telegraphy in the 19th century). For Innis the relation between media was a basic component of his conception of the communication system: the intellectual influence of the book was

> "The rise of the new ecology was a response to the need for greater attention to holism in science and technology"

> "destroyed by new developments in magazines and newspapers" (2007, p. 79), and this monopoly of communication based on the eye "hastened the development of a competitive type of communication based on the ear' like in the radio" (2007, pp. 81-82).

In *Amusing Ourselves to Death* (1985) Postman described the synergies and conflicts between different media in the United States (i.e., the telegraph and the press in the US in the 19th century) and the central role of television in the media ecosystem:

> "through it (TV) we learn what telephone system to use, what movies to see, what books, records, and magazines to buy, what programs to listen to" (**Postman**, 1985, p. 78).

This interpretation can also be identified in *Laws of Media* (**McLuhan**; **McLuhan**, 1988) by the father and son team Marshall and Eric McLuhan, and in many passages of his books, articles, and conferences, especially *Understanding Media*. According to McLuhan "media interact among themselves". Radio changed the form of the news story as much as it altered the film image in the talkies. TV caused "drastic changes in radio programming, and in the form of the thing or documentary novel" (2003a, p. 78). Nystrom reaffirmed this perspective when she wrote that

> "no medium of communication operates in isolation. Every medium affects every other medium" (**Nystrom**, 1973, p. 130).

McLuhan summarized this second conception of the ecological metaphor in one of his famous aphorisms:

> "No medium has its meaning or existence alone, but only in constant interplay with other media" (**McLuhan**, 2003a, p. 43).

This interpretation of the ecological metaphor could be defined as the *intermedia dimension* of Media Ecology. In this interpretation media are like 'species' that live in the same ecosystem and establish relationships between each other.

In a few words: the ecological metaphor applied to media accepts at least two complementary interpretations:

- The *environmental* conception considers the media to be an environment that surrounds the subjects and models their cognitive and perceptual system.
- The *intermedia* version of the metaphor looks at the interactions between media, as if they were species of an ecosystem.

Can both interpretations of the metaphor be integrated into a single framework? In this case media ecology should be considered as an environment that includes different media and technologies (television, radio, the

> "Media are like 'species' that live in the same ecosystem and establish relationships between each other"

Internet, RFIDs, mobile devices, TCP/IP protocol, etc.), subjects (content producers, users, readers, media researchers, etc.), social/political forces (Hollywood majors, *Wikileaks*, legal regimes, etc.), contents (books, webpages, movies, radio programs, advertising, memes, etc.) and, last but not least, a complex set of relationships, processes and practices. This holistic and integrated conception of media ecology is quite close to the Actor-network theory (ANT), an approach that combines material and semiotic elements in a single network of relationships (**Latour**, 2005; **Law**; **Hassard**, 1999) and other similar approaches, such as **De-Landa**'s assemblage theory (2006; 2016).

> In the 1980s, a much more specific and to some extent more rigorous theoretical construction was born within Media Ecology: the so-called Medium Theory

3.4. Laws of Media

One of the best-known analytical models produced by media ecologists is Marshall and Eric McLuhan's four Laws of Media (**McLuhan**; **McLuhan**, 1988). In this work Marshall McLuhan condensed and simplified his vision of media into four basic principles or laws that, at the same time, could be used as an analytical tool. Father and son found

> "that everything man makes and does, every procedure, every style, every artefact, every poem, song, painting, gimmick, gadget, theory, technology –every product of human effort– manifested the same four dimensions" (**McLuhan**; **McLuhan**, 1988, p. ix).

In this context they proposed a series of questions to facilitate identifying the four principles in different technological and cultural settings:

- Extension: What does the media enhance or intensify or make possible or accelerate? For example, the communication system via SMS messages amplified and intensified the communication processes and the exchange (especially at the interpersonal level) of information.
- Obsolescence: What is pushed aside or obsolesced by the new media? SMS messaging services, for example, made other systems of instantaneous interpersonal communication obsolete, from the telegram to telephone calls or recording messages on answering machines.
- Retrieval: What recurrence of earlier actions and services is brought into play simultaneously by the new media? SMS recovered the telegraphic writing developed in the 19th century based on reducing the number of words.
- Reversal: What is the reversal potential of the new media when pushed to the limits of its potential? SMS communication systems anticipated the current informative obsession and the permanent interruption due to the arrival of messages that, basically, end up weakening the communication processes and the exchange of information that this medium promoted in its beginnings.

Although McLuhan's discourse was sometimes complex to grasp for traditional readers (and scholars), the Laws of Media are the opposite: they are a simplified and useful tool designed to explore and reflect on the transformations of the media ecosystem. Like any other simplification, the Laws of Media have limits, and their application is the most relevant of these: instead of testing the Laws and seeing how far they hold, as Karl Popper would have done, researchers sometimes simply look for 'positive' examples to confirm their validity. In any case, the responsibility does not lie with Marshall or Eric McLuhan but with those who apply these principles with a non-critical spirit.

3.5. Medium Theory

A more specific theoretical construction emerged from Media Ecology in the 1980s: the so-called Medium Theory. According to **Meyrowitz** (1995) the Medium Theory focuses on the "particular characteristics of each individual medium or of each particular type of media". The medium theorists should ask:

> "What are the relatively fixed features of each means of communicating and how do these features make the medium physically, psychologically, and socially different from other media and from face-to-face interaction?" (1995, p. 50).

Meyrowitz's proposal (an author unfortunately never translated into Spanish and, consequently, not very present in Ibero-American bibliographies) is clearly based on the 'media as environment' metaphor. According to this author, each media creates an environment that has

> "characteristics and effects that transcend variations in content and manipulations of production variables" (1993, p. 61).

This leads to what Meyrowitz calls "medium analysis", an approach that focuses on

> "those environmental features of the medium that are largely out of the control of users once the medium is in use" (p. 62).

According to Meyrowitz, researchers can study media by establishing both the micro, single-situation level, and the macro, societal level. On the micro level, medium analyses

> "explore the implications of choosing one medium over another in a given situation"; on the macro level, "medium analysis deals with the larger social implications of the widespread use of a medium" (**Meyrowitz**, 1995, p. 62).

Meyrowitz's Medium Theory and Media Ecology have many points in common. For example, when it comes to analyzing the temporal dimension of media transformations, both approaches offer a similar long-term view that follows the well--known sequence:

oral culture > written culture > print culture > electronic culture

In this context, it could be said that Media Evolution already existed, in a nutshell, within Media Ecology and Meyrowitz's Medium Theory. Without too much effort, the researcher interested in media evolution can find in these two fields a set of concepts, analytical categories, hypotheses, and clues for beginning their own theoretical and analytical journey.

3.6. The ghost of technological determinism

Both Media Ecology and Medium Theory have sometimes been dismissed under the label of technological determinism. From this perspective, technologies –including media– influence people and societies in a predetermined, uniform and almost direct way. However, a careful reading of all these authors is enough to keep readers at a safe distance from technological determinism. Beyond some phrases out of context or some controversial McLuhanian aphorism dropped to make readers or audiences think, all contributions tend to vindicate the complexity of the relationships between media, technology and society. **Strate** (2008) considered that McLuhan's emphasis on media influence has led some of his critics to label his approach as "technological determinism", even if the Canadian

> never actually used the term, 'determinism', nor did he argue against human agency. In his bestselling book, *The Medium is the Massage*, he wrote,

>> "there is absolutely no inevitability as long as there is a willingness to contemplate what is happening" (**McLuhan**; **Fiore**, 1967, p. 25).

Culkin (1967) summed up McLuhan's position with the quote,

> "we shape our tools and thereafter they shape us" (1967, p. 52),

> "actually never used the term 'determinism' or argued against human agency. In his bestselling book *The Medium Is the Massage* he wrote:

> "there is absolutely no inevitability as long as there is the will to contemplate what is happening" (**McLuhan**; **Fiore**, 1967, p. 25).

Considered as environments, media

> "do not determine our actions, but they define the range of possible actions we can take and facilitate certain actions while discouraging others" (**Strate**, 2008, p. 135).

Other media ecologists proposed a 'relationist' thesis when dealing with major developments in culture and consciousness; for example, Walter Ong considered that

> "major developments, in culture and consciousness, are related, often in unexpected intimacy, to the evolution of the word from primary orality to its present state. But the relationships are varied and complex, with cause and effect often difficult to distinguish" (**Ong**, 1977, p. 9).

In the specific case of the Medium Theory, Meyrowitz (2019) also rejected deterministic interpretations:

> –"medium theory describes how the characteristics of a widely used medium foster, enable, and encourage certain communication patterns while discouraging others" (**Meyrowitz**, 2019, p. 5)–

However, at the same time, he was aware of the limitations of this theoretical approach. The wide spectrum of media experiences that the Medium Theory claims to cover (that is, the exploration of how changes in the media influence people and social organizations through the creation of environments) makes its postulates difficult to confirm using traditional social science methods. This perspective is also open to criticism for the relative lack of attention to exceptions and variations within the same culture or between different cultures. In other words, the Medium Theory should work better with details and "textures". Even in an apparently homogeneous era like the current one, some "boundaries are blurred while others are reinforced; many institutions become more porous, yet others become more defended; and previously marginalized populations are mainstreamed unevenly and incompletely" (**Meyrowitz**, 2010, p. 61).

The coexistence of many different forms of communication within a culture may hide the differences among media and social classes. According to Meyrowitz, most theory –not only the Medium Theory– has focused too narrowly on changes among the middle and upper classes in Western societies. In general, very little is known about the media ecosystems located outside the so-called Global North. Although great effort is being made to decolonize communication theories (see for example **Miike** and **Yi**, 2022), these criticisms are important when it comes to outlining a scientific strategy for Media Evolution, an approach that should go beyond the study of media in the West or its consequences for only certain social sectors.

This section cannot come to an end without presenting the Ibero-American production on Media Ecology. As in much of the Anglo-Saxon world, the academic and scientific circulation of Media Ecology in Spain and Latin America was deeply marked by the discussions, criticisms, and vindications of Marshall McLuhan's works. Although this is not the appropriate

space to reconstruct that journey (McLuhan was always at the crossroads of anti-imperialist and anti-capitalist theories), it could be said that in the last decade the waters have calmed down enough to reread the work of the Canadian author with another less-emphatic gaze. Moreover, the translations of the works of other Media Ecology researchers are now beginning to circulate. Regarding the Ibero-American authors, in addition to the permanent work of disseminating McLuhanian thought

> If anything characterizes the media ecosystem since the emergence of the WWW, it is the consolidation of global information networks, intermedia convergence processes, and the explosion of new media and communication platforms

carried out by **Islas** (2004; 2008; 2014; 2015; 2016), a group of collective initiatives should be mentioned, from the two monographic works published by *Infoamérica* (2012) and the *Revista Latinoamericana de Ciencias de la Comunicación* (2011) on the occasion of the 100th anniversary of the birth of Marshall McLuhan (1911-1980), to the special issues of *Razón y Palabra* (coordinated by Denis Renó) and *Palabra Clave* (coordinated by the renowned Colombian researcher Sergio Roncallo-Dow), both from 2015. Finally, two books should be included in this list: *El dispositivo-McLuhan. Recuperaciones y derivaciones* (**Valdettaro**, 2011), a compilation by the *Center for Mediatization Studies* (*CIM*) of the *National University of Rosario* (Argentina), and *Ecología de los Medios* (**Scolari**, 2015), a collective volume that includes texts from the first (McLuhan, Postman), second (Strate, Logan, Levinson, Gencarelli) and third (Renó, Roncallo, Ibrus, etc.) generations of media ecologists. Researchers from Canada, the US, Europe, and Latin America coexist in all these publications; their reflections, obviously, go far beyond the "McLuhanian vulgate" and delve into the foundations and theoretical consequences of the ecological perspective. If some authors choose to apply the ecological metaphor to analyze informative ecosystems (for example, **Canavilhas**, 2015; **López-García** *et al.*, 2021), the theoretical contributions are usually no less challenging (for example, **Carlón**, 2015; and **Arroyave**-**Cabrera**; **Miller**, 2017).

As already indicated in the Introduction, the next section deals with the emergence of an evolutionary theoretical approach to media change. Since it is impossible to include all the researchers who, to a greater or lesser extent, have analyzed media change from an evolutionary perspective, the section will only focus on the scholars who have made these transformations the focus of their work. In this context, the article continues with a brief description of the contributions that three generations of media ecologists have made and which can be recovered from the perspective of Media Evolution.

4. From the ecological to the evolutionary point of view

If anything characterizes the media ecosystem since the emergence of the World Wide Web, it is the consolidation of global information networks, intermedia convergence processes, and the explosion of new media and communication platforms. Moreover, new forms of storytelling, such as transmedia narratives, have emerged (**Jenkins**, 2006; **Scolari**, 2013b) as well as new logics based on the many-to-many model which is challenging the traditional broadcasting model based on the one-to-many model.

Both Media Ecology and Medium Theory proposed essential concepts, analysis categories, hypotheses, and reflections when it comes to making sense of these transformations from a holistic and comprehensive perspective. Re-reading **McLuhan** (2003a; 2011; 2011) without the academic prejudices that isolated him in the 1960s, rediscovering **Postman**'s (1970; 1985; 1992; 1998; 2000) analysis of education and communication in the midst of a crisis in schooling, revisiting **Mumford**'s (1934 [2010]) description of the technological transformations of the last thousand years, recovering **Innis**'s (2007; 2008) analysis of the long-term coevolution of writing systems and empires, or going back to the astute reflections of **Ong** (1977; 2012) or **Havelock** (1963; 1981; 1986) on the transition from orality to literacy, can offer the researcher new key interpretations for understanding the shape that the media ecosystem is adopting in the 21st century. The contributions of the second generation of media ecologists, like **Levinson** (1979; 1997; 1999; 2012), who defended the first PhD Thesis on Media Evolution in 1979 under the supervision of Neil Postman, and **Logan** (1986; 2004; 2007a; 2007b; 2010; 2013; 2014), who began an incredibly rich conversation between Media Ecology, complexity theories and biological models, function as an obligatory interface in the theoretical passage that goes from Media Ecology to Media Evolution.

4.1. Media and civilization

In the long list of scholars that could be considered as precursors of Media Evolution, Lewis Mumford and Harold Innis occupy a privileged position. Mumford was first and foremost a scholarly historian who analyzed the long-term evolution of society and technology from an interdisciplinary perspective. Classic works like *Technics and Civilization* (**Mumford**, 1934 [2010]) creatively integrated categories from history, sociology, philosophy of technology, urbanism, and literary criticism into a single approach. Mumford has had a constant and profound influence on media ecologists; for example, his division of human civilization into three epochs (*eotechnic, paleotechnic*, and *neotechnic*) would become the base for similar sequences in the Media Ecology tradition, for example Postman's *tool-using, technocracy*, and *technopoly* epochs (**Strate; Lum**, 2006).

Mumford broke with a traditional mistrust of technology in social sciences, revealing the interplay between society

and technical achievements. While Marx assumed that the technical forces evolved automatically and determined the character of all other institutions, Mumford demonstrated that the relationship was reciprocal and many-sided; for example, the ancient dream of instant communication made Samuel Morse invent the electric telegraph (**Mumford**, 2010 [1934], p. xv). In presenting

> In the long list of academics who could be considered precursors of an evolutionary approach to media, Lewis Mumford and Harold Innis occupy a privileged position

technical development within the setting of a more general "social ecology", Mumford avoided considering it the dominant and determinant factor of social change:

> "The world of technics is not isolated and self-contained: it reacts to forces and impulses that come from apparently remote parts of the environment" (2010, p. 6).

This idea is fundamental from the perspective of a theory of media evolution: the ecological approach, understood in terms of complexity and multi-determination, is the best antidote to deterministic readings, whether of a technological or social origin.

Reading Mumford's early works, such as *Technics and Civilization*, is like reviewing the research agenda of Media Ecology and medium theory thirty years before their origins. Among other conceptions, Mumford anticipated the idea of "media as extension". According to this author, some of the most characteristic media, from the telephone to the phonograph and the motion picture,

> "have grown out of our interest in the human voice and the human eye and our knowledge of their physiology and anatomy" (2010, p. 6).

Anticipating Michel Foucault's work, Mumford also drew attention to the disciplinary dimension of modern capitalism:

> "from the 15th century on, invention and regimentation work reciprocally" (**Mumford**, 2010 [1934], p. 41).

Even though Mumford made a holistic analysis of technological transformations in the last thousand years, the references to media mutations repeatedly appear on the pages of *Technics and Civilization*. Particularly relevant are his analyses of the optical telegraph as an instrument of war, the almost coevolutionary relationships between glasses and books, and the industrial dimension of Gutenberg's printing press:

> "Printing was from the beginning a completely mechanical achievement. Not merely that: it was the type for all future instruments of reproduction: for the printed sheet, even before the military uniform, was the first completely standardized product, manufactured in series, and the movable types themselves were the first example of completely standardized and interchangeable parts. Truly a revolutionary invention in every department" (**Mumford**, 2010 [1934], p. 135).

Any researcher interested in an evolutionary view of media transformations must review the work of Lewis Mumford, a completely contemporary scientific production that even raised issues related to climate change generated by capitalist industry. The same could be said of the works of Harold Innis, perhaps the most renowned Canadian academic of the first half of the 20th century for his work on political economy, especially his studies on the Canadian Pacific Railroad, the fur trade in Canada and the cod fisheries in the North Atlantic.

4.2. Empire and communication

Harold Innis was born just a year before Lewis Mumford, but he died at a young age, precisely when the great project of his life was beginning to take shape: a long-term history of humanity focused on media transformations. In *Empire and communications* (2007 [1950]) and *The bias of communication* (2008 [1951]), two volumes unfortunately never translated into Spanish, the Canadian placed the media at the center of a holistic vision of economy, culture and politics.

Innis's interest in staples took him to pulp and paper production, and from there to newspaper and book printing. From looking at a natural resource base industry, he

> "turned his attention to a cultural industry in which information, and ultimately knowledge, was a commodity that circulated, had value, and empowered those who controlled it" (**Heyer**, 2006, p. 147).

In the early 1940s Innis worked on a massive 2,400-page manuscript entitled *A History of Communications*, a never published *Opus magnum* with the exception of the first three chapters used to produce Empire and Communications. Innis's work was oriented in the same direction as Mumford's transdisciplinary research: what the Canadian was attempting to do in the social sciences was to develop a kind of grand synthesis, something like a media-centered 'unified field theory' of cultural and political transformations. In other words, Innis

> "was attempting to develop and merge a theory of politics or imperialism (drawing largely on the work of classic scholars) with a theory of consciousness (drawing on scholars researching the concept of time and space) and a theory of technology (based on an understanding of the biases of media and communication)" (**Watson**, 2007, p. 17).

Innis's scientific program, one of the most ambitious projects in media and communication studies in the 20th century, was made explicit in the "Introduction" of *Empire and Communication*:

"I do not intend to concentrate on microscopic studies of small periods or regions in the history of the British Empire (…) I shall attempt rather to focus attention on other empires in the history of the West, with reference to empires of the East, in order to isolate factors which seem important for purposes of comparison" (**Innis**, 2007, p. 23).

As

"the effective government of large areas depends to a very important extent on the efficiency of communication" (**Innis**, 2007, p. 26).

According to Innis, media occupy a vital place in social and political organization. In this context, the history of the West could be divided into the period of writing and the period of printing. In the beginning, the first of these was dominated by clay and papyrus, which was later replaced by parchment, until paper arrived from the East in the 13th century. The printing period kept paper as a basic support for textual production but introduced the first forms of industrial reproduction.

Innis's interest in the material supports of writing is complemented by the importance he gave to the temporal and spatial dimensions of the analysis. While space-binding media (like papyrus or parchment) were light, portable, and permitted extension in space, time-binding media (like stone) were heavy, durable, and not easy to destroy. By a space-binding culture he meant a culture with a predominant interest in space, from land surveillance to voyages, imperial expansion, and control; and

> ' As every form of communication has a predisposition towards time or space, this bias can consolidate and end up generating a monopoly of knowledge when certain groups take control of a form of communication and put it under their political or religious control '

on the other hand, time-binding cultures have a predominant interest in history, religion, myths and rituals. According to Carey, one of the more subtle readers of Innis's work, the genius of social policy

"was to serve the demands of both time and space; to use one to prevent the excesses of the other: to use historicism to check the dreams of reason and to use reason to control the passions of memory" (**Carey**, 1992, p. 123).

As cultures became more time-binding

"they became less space-binding and vice versa. The problem again was found in dominant media of communication" (p. 123).

The intersection between the political organization, the materiality of media, and the temporal and spatial dimensions is the core of Innis's theory of media change:

"The concepts of time and space reflect the significance of media to civilization. Media that emphasize time are those that are durable in character, such as parchment, clay, and stone. The heavy materials are suited to the development of architecture and sculpture. Media that emphasize space are apt to be less durable and light in character, such as papyrus and paper. The latter are suited to wide areas in administration and trade (…) Materials that emphasize time favour decentralization and hierarchical types of institutions, while those that emphasize space favour centralization and systems of government less hierarchical in character" (**Innis**, 2007, p. 27).

But not only materiality: Innis pays particular attention to writing systems. For example, the monopoly that religious power held over writing in Egypt and Babylonia was destroyed by the development of a new simplified type of writing:

"The power of religion based on monopolies of complex systems of writing implied an emphasis on continuity and time, but the alphabet facilitated the growth of political organizations which implied an emphasis on space" (**Innis**, 2007, p. 77).

Because any form of communication has a predisposition towards time or space, this bias can consolidate and end up generating a monopoly of knowledge when certain groups take control of the form of communication and put it under their political or religious control. If knowledge is considered as a commodity, as something that can be owned and distributed, then it can be monopolized by a group that controls the 'supply'. Aware of the risks he was running –the ghost of technological determinism always haunts these scientific conversations– Innis was quick to clarify that

"it would be presumptuous to suggest that the written or printed word has determined the course of civilizations" (p. 27)

given that

"monopolies of knowledge had developed and declined partly in relation to (emphasis added) the medium of communication on which they were built" (**Innis**, 2007, p. 192).

Although sometimes overshadowed by Marshall McLuhan's worldwide fame, Harold Innis's contributions were generally very well received among media and communication researchers. As already noted, in his works James Carey praised

Innis while offering a less enthusiastic view of McLuhan's contributions. For Carey, Innis's commitment to the historical and particular led him

> "to pursue communications in a genuinely interdisciplinary way. He was simultaneously geographer, historian, economist, and political scientist and he located communications study at the point where these fields intersected (…) In short, Innis provided in communication studies, at a moment when virtually no one else in the United States was doing so, a model of scholarly investigation that was historical, empirical, interpretive, and critical" (**Carey**, 1992, pp. 114-115).

In recent years, a new generation of scholars have approached the texts of Harold Innis and generated interpretations beyond traditional readings. From the perspective of Media Evolution, one of the most suggestive contributions comes from the interpretation of Innis' works from the perspective of complexity theories. According to complex adaptive systems theory, systems are composed of many agents that interact with each other, giving rise to phenomena such as self-organization and emergent change (**Kauffman**, 1995). By adopting a new communication technology, such as clay tablets, papyrus, or the printed book, the management of information changes throughout society. When this happens, cultures can become dysfunctional because

> "they fail in the fundamental task of information management. For Innis, information was a tool to stimulate creativity. When cultures lost control of the information circulating within them, they invariably became rigid or unstable in their thinking, and often turned to violence prior to their collapse" (**Bonnet**, 2013, p. 7).

In both *Empire and communications* (2007) and *The bias of communication* (2008) Innis proposed a history of Western empires, from Babylon to the Great American Empire, understood as a

> "history of constructs of change", that is, conceptual architectures "stabilized and des-stabilized by the emergence of new communication technologies" (**Bonnet**, 2013, p. 13).

It is important to remember that Innis never identified linear or direct relationships between the material support of writing and political or cultural changes. For example, a light support like papyrus can be found in two different environments: if in Israel it was used by religious groups and supported a cultural disposition towards time, in the Roman Empire the same technology underpinned a cultural disposition towards space. The relationship that Innis traced between communication technologies and political and religious institutions "was far more complex than is traditionally assumed in the literature" (**Bonnet**, p. 13). This interpretation of Harold Innis's works from the perspective of complex systems theory brings the Canadian scholar even closer to the theoretical conceptions of Media Evolution.

> ' If in Israel papyrus was used by religious groups and supported a cultural disposition towards time, in the Roman Empire the same technology underpinned a cultural disposition towards space '

4.3. Between oral and written culture

Media Ecology has extensively researched two key moments in the long evolution of media and communication systems:
- the transition from orality to writing, a slow process that lasted several millennia and culminated in classical Greece, and
- the mechanization of textual reproduction in the fifteenth century, a much faster development that, in less than two centuries, left a deep mark on Western societies.

The passage from orality to writing offered a first example of how the transition from one communication system to another affected different spheres of individual and social life. Moreover, this process also revealed the complex network of actors that intervened in this transition, from political and religious institutions to professional castes (scribes), writing systems (pictographic, alphabetic, etc.) and different writing supports (stone, tablets, clay, papyrus, parchment). **Havelock** (1963; 1981; 1986) and **Ong** (1977; 2012) are the key figures in the study of the transition from orality to literacy.

The scientific production of Eric Havelock works as a hinge between the contributions made by Innis and McLuhan. Havelock, a British scholar of classical culture who frequently visited the *University of Toronto* between 1927 and 1947, was the leading researcher on the transition from orality to literacy in Greek society. His book on the transformations of Greek culture since the consolidation of literacy (*Preface to Plato*, 1963) profoundly influenced the ecological view of the media. As for Walter Ong, his *Interfaces of the word* (1977) and *Orality and literacy: The technologizing of the word* (2012 [1982]) are reference works on the transition from orality to writing. For half a century Ong analyzed this transition in its different dimensions: literary, theoretical, social, cultural, historical, and even biblical (**Soukup**, 2005). Like other human creations and in fact more than any other, according to Ong the technology of writing was essential for realizing the potential of our species. In this context, technologies

> "are not mere exterior aids but also interior transformations of consciousness, and never more than when they affect the word. Such transformations can be uplifting. Writing heightens consciousness" (**Ong**, 2012, p. 81).

In one of his most celebrated and cited contributions, Ong detected a return to orality in contemporary electronic media.

> "With telephone, radio, television and various kinds of sound tape, electronic technology has brought us into the age of secondary orality. This new orality has striking resemblances to the old in its participatory mystique, its fostering of a communal sense, its concentration on the present moment, and even its use of formulas. But it is essentially a more deliberate and self-conscious orality, based permanently on the use of writing and print, which are essential for the manufacture and operation of the equipment and for its use as well" (**Ong**, 2012, pp. 133-134).

Ong's concept of secondary orality is close to McLuhan's "global village", especially when he argues that this new orality generates a meaning "immeasurably larger than those of primary oral culture" (p. 134). However, there are other differences between the old and the new orality: although radio and television brought the voice of important political speakers to a huge audience, this practice is far from the old orality. Political debates in the media do not include the public. The audience is absent, invisible, and inaudible. As Ong said,

> "the old-style oratory coming from primary orality is gone forever" (**Ong**, 2012, p. 134).

In a context marked by the appearance of instant messaging applications and ephemeral texts that have a lot to do with oral communication, the works of Walter Ong are an unavoidable reference for the new generation of media and communication researchers (**Soffer**, 2016; 2020).

4.4. The anthropotropic model

Many researchers have been inspired by McLuhan's four laws of media. In his doctoral thesis, supervised by Neil Postman, Paul Levinson developed an "anthropotropic" theory of media evolution (1979) which he later expanded on in books such as *The soft edge* (1997) and *Digital McLuhan* (1999). Levinson believes that the media

> "constantly undergo evolution under pressure of human usage and invention" (1999, p. 108).

Moreover, the media are increasingly selected for their support of "pre-technological" human communication patterns in form and function (p. 41). According to Levinson, media evolve

> "in a Darwinian manner, with human beings acting not only as their inventors (obviously) but their selectors (i.e., the selecting environment, in Darwinian terms)" (**Levinson**, 1999, p. 52).

Subjects make their selections based on two criteria:

- The subjects want the media to expand their communications beyond the biological limits of seeing and hearing (the media as an extension was McLuhan's first law of the media).
- The subjects want the media to recover elements of that biological communication that the first artificial extensions may have lost (recovery was the basic principle behind McLuhan's third law of the media).

To clarify this double conception, Levinson worked on an evolutionary approach that he called "anthroposophical":

> "Indeed, as I discuss in my 'anthropotropic' theory of media evolution –tropic = towards, anthropo = human– the overall evolution of media can be seen as an attempt, first, to fulfil the yearnings of imagination by inventing media that extend communication beyond the biological boundaries of hearing and seeing (thus, hieroglyphics and the alphabet and the telegraph each in its way extends words thousands of years and/or thousands of miles), and, second, to recapture elements of the natural world lost in the initial extension (thus, photography recaptures the literal image lost in writing, and telephone, the phonograph, and radio recapture the voice). From this vantage point, the entire evolution of media can be seen as remedial. And the Internet, with its improvement of newspapers, books, radio, television, et al. can be seen as the remedial medium of remedial media (**Levinson**, 1999, p. 179).

Although the second criteria is inspired by McLuhan's notion of recovery (third law of the media), it goes further by specifying which elements of communication are more likely to be recovered:

- the telephone replaced the telegraph under human evolutionary pressure to recover the lost element of voice;
- color photos replaced black and white photos because subjects longed to see the colors of the natural world in their technological reproductions;
- talkies replaced silent movies, etc. (**Levinson**, 1999, p. 52).

For these and other contributions, Paul Levinson should be considered the first researcher to systematically explore the possibilities of the evolutionary metaphor within Media Ecology.

4.5. Biological, technological, and cultural evolution

Robert K. Logan considered that technological evolution "follows a pattern similar to that of living organisms" (**Logan**, 2014, p. 93). Beyond the works of McLuhan, Logan's techno-evolutionary conception of the biological matrix is inspired by researchers of technological evolution such as **Basalla** (1988) and experts in complexity and self-organization such as **Kauffman** (1995):

"Cognitive tools and physical technology are two resources at the disposal of human innovators, and the needs or demands of society are often the motivating force. Necessity is the mother of invention, yet invention does not occur in a vacuum. All of the previous innovations in a culture provide the resources, both cognitive and physical, for the next level of innovation" (**Logan**, 2004, p. 125).

Like other researchers mentioned in this article, Robert K. Logan confirms the central role of preceding innovations in any kind of transformation within the socioeconomic system. Each new invention, technological innovation, or discovery gives rise to new social conditions and technical and cognitive capacities. These items then

"interact with the existing economic, political, social, cultural, technical, and cognitive realities of the culture to set the stage for the next round of innovation" (**Logan**, 2004, p. 215).

Technological change, from this perspective, is a continuous iterative process.

According to Logan, biology and culture

"can no longer be studied separately because human evolution is a combination of biological and cultural evolution" (**Logan**, 2007b, p. 21).

On the other hand, Logan proposes to go beyond the metaphorical use of the word ecology in the expression "media ecology":

[It] "has been used more in its metaphoric sense than in the strict biological sense. This observation, which also pertains to my own media ecology work, is not meant to critique or disparage the efforts of media ecologists but rather to suggest that perhaps interesting insights might emerge if we take the term ecology at its face value and consider communications and media from a biological perspective" (**Logan**, 2007b, p. 21).

In this new context, the hypothesis to be explored is that

"media are emergent phenomena and may be regarded in a certain sense like organisms that propagate their organization and interact with each other like living biotic agents in an ecological system" (**Logan**, 2007b, p. 30).

Most of Logan's research has focused on the evolution of language, understood from a broad conception that goes far beyond traditional linguistics. Logan considers that

"speech, writing, mathematics, science, computing, and the Internet as six distinct modes of language, which form an evolutionary chain of development" (**Logan**, 2014, p. 63).

Each of these modes of language have different forms of communication and information and provide a unique framework for viewing the world.

In other texts, **Logan** (2004) addressed the evolution of the media based on the idea that "one technology or medium leads to another", as formulated by Marshall McLuhan in *Understanding media* (2003). The analysis of the evolutionary chain of languages suggested to Logan a model for developing communication and information processing systems based on the premise that all innovations have a cognitive, social, and technological component. That is, the six languages can be considered basically conceptual technological tools, but each of them requires one or more physical objects:

"The development of speech required the evolution of a biological artefact – namely, the physical human speech apparatus including the lowering of the larynx and the emergence of the fine motor skill of the tongue. The other forms of language, writing, mathematics, science, computing, and the Internet all required some kind of man-made tools whether they be clay tablets and a wooden stylus, paper, pen, and ink, the printing press, or the computer. The development of the six modes of language resulted from the interplay of human cognitive tools, physical techno- logy, and socioeconomic factors all at work in the culture" (**Logan**, 2010, p. 85).

This interactive model, in which technology, cognition, and changes in the social environment converge, dismantles the accusations of "technological determinism" that have often been attributed to Media Ecology. Without a doubt, technology

"plays a role in determining social outcomes, but not in an exclusive manner nor in a linear cause-and-effect manner either" (**Logan**, 2010, p. 86).

Simultaneously, Logan integrated the same two laws of media applied by Levinson in his anthropotropic approach (extension and recovery) into a single formulation: *a new medium is the extension of some older medium.*

"The fact that technologies and media evolve from one form to another and that media are "extensions of man" gives rise to the notion of cascading technologies or media. As an example, the printed book is an extension of the written word, which is an extension of the spoken word, which is an extension of a mental process or the mind. Thus we have a cascade of media from thought to the spoken word to the written word to the printed word. We can even extend the cascading process further to the library whose content is books and journals and hence is an extension of the printed word" (**Logan**, 2010, p. 89).

Robert K. Logan, one of Marshall McLuhan's most versatile and creative disciples, jumps in a McLuhanian way from media ecology to biology, and from technological innovation to linguistics, complexity, and cultural evolution. According to Logan, media ecologists

"have not studied biology, evolution and emergence in depth nor have biologists paid much attention to media ecology". From his perspective, "the marriage of these two interdisciplinary fields will yield many interesting results to both fields of study" (**Logan**, 2007b, p. 23).

If we consider theories as a conversation, Logan occupies a central node in the network of exchanges between Media Ecology and Media Evolution.

4.6. Evolution and Medium Theory

Joshua Meyrowitz's Medium Theory also proposed concepts and analytical categories that are very useful for building an evolutionary theory of media. From an analytical perspective, the Medium Theory can be divided into two levels of intervention: the micro level and the macro level (**Meyrowitz**, 2010). The micro level explores the consequences of choosing one medium over another in a specific situation, for example the differences between establishing a relationship through traditional love letters or through an application like Tinder. The macro level, meanwhile, aims to answer broader questions about the ways in which changes in the media have influenced

"modes of thinking, patterns of social organizations, status differences, value systems, collective memory, and even the physical layout of the built environments" (**Meyrowitz**, 2010, p. 53).

In this context, the Medium Theory proposed a model of cultural and media evolution based on a succession of four phases totally in tune with the ideas of Media Ecology (see Table 1).

Table 1. Four phases of communication and culture (**Meyrowitz**, 2010, pp. 56-59)

Phases	Description
Traditional oral cultures	Sound and speech dominate as the forms of interaction. The culture's history, philosophy, and mores must be stored in memory and conveyed orally, supported by embodied action, song, dance, and ritual.
The transitional scribal phase	Beyond promoting more abstract thinking, in this phase the introduction of writing systems segregated those who could read and write from those who could not, and the different stages of mastery of writing and reading fostered different levels of authority. The different types of writing systems (pictographic, alphabetic, etc.) also generated new distinctions.
Modern print culture	In the West the mechanic reproduction of texts and the growing availability of printed materials reorganized political, religious, cultural and scientific institutions, and accelerated their transformation. Print encouraged new modes of thinking based on visual and linear metaphors.
Postmodern global electronic culture	The first electronic media (telegraph, telephone) came into use as print culture was reaching its full power. However, in the long run, electronic media such as radio, television, the computer, the internet, and mobile devices undermine many features of print culture. For example, electronic media retrieve some key aspects of oral societies, including the dominance of experiences and the near- simultaneity of action, perception, and reaction. On radio and TV, the word returns as an event, rather than as an object.

This model is a condensation of the contributions of an extensive series of authors already mentioned in the previous sections. In general, these four phases could be considered as the 'standard model' of media and cultural evolution from the perspective of Media Ecology and Medium Theory, two direct interlocutors of an evolutionary theory of media.

4.7. Mediamorphosis

A description of the most relevant evolutionary approaches in Media and Communication Studies cannot ignore Roger Fidler's concept of *mediamorphosis*, a perspective developed in the 1990s to give sense to the accelerated transformation of information systems since the emergence of the World Wide Web. Based on a radical application of the evolutionary metaphor, Fidler defined *mediamorphosis* as

"the transformation of communication media, usually brought about by the complex interplay of perceived needs, competitive and political pressures, and social and technological innovations" (**Fidler**, 1997, p. xv).

More than a theory, *mediamorphosis* is a

"unified way of thinking about the technological evolution of communication media" (**Fidler**, 1997, p. 23).

Rather than study each medium isolated from the rest, Fidler encourages researchers to

"examine all forms as members of an interdependent system, and to note the similarities and relationships that exist among past, present and emerging forms (…) By studying the communication system as a whole, we will see that new media do not arise spontaneously and independently –they emerge gradually from the metamorphosis of old media. And that when newer forms of communication media emerge, the older form usually do not die– they continue to evolve and adapt" (**Fidler**, 1997, p. 23).

Fidler identified six fundamental principles in media transformation. Although they are not understood as "phases" of a process of media change, these principles follow a chronological sequence that begins with the emergence of a new medium (Table 2).

Table 2. The six fundamental principles of mediamorphosis (**Fidler**, 1997, p. 29)

Principles	Description
Coevolution and coexistence	All forms of communication media coexist and coevolve within an expanding, complex adaptative system. As each new form emerges and develops, it influences, over time and to varying degrees, the development of other existing forms.
Metamorphosis	New media do not arise spontaneously and independently –they emerge gradually from the metamorphosis of older media. When newer forms emerge, the older forms tend to adapt and continue to evolve rather than die out.
Propagation	Emerging forms of communication media propagate dominant traits from earlier forms. These traits are passed on and spread through communicatory codes called languages.
Survival	All forms of communication media, as well as media enterprises, are compelled to adapt and evolve to survive in a changing environment. Their only other option is to die out.
Opportunity and need	New media are not widely adopted based on the merits of a technology alone. There must always be an opportunity, as well as motivating social, political, and/or economic reasons for a new technology to be developed.
Delayed adoption	New media technologies always take longer than expected to become commercial successes. They tend to require *at least* one human generation (20-30 years) to progress from proof of concept to widespread adoption.

Although Fidler was primarily interested in the transformation of journalism and new media, his contributions to the development of an evolutionary theory of media change cannot be underestimated. However, although *complexity* and *self-organization* are two key concepts in his theory, Fidler tends to fall into the elaboration of timelines and even Darwinian trees far from the more complex and reticular models of Media Evolution.

4.8. Media evolution: between invention and innovation

To end this section, a brief reference to the work of Rudolf **Stöber** (2004) will be included. This German researcher is far from the tradition of Media Ecology, but he developed a theory of media evolution inspired by the work of the economist Joseph Schumpeter. Stöber proposed an interpretation pattern that

> "follows a grand (macro) theory and a medium-range theory. Evolution theory is the great framework; Joseph Schumpeter's distinction of invention and innovation leads to medium- range aspects" (**Stöber**, 2004, p. 485).

Regarding the theory of evolution, according to Stöber

> "it serves as an allegory: the evolution of biodiversity and of media depends on time. Both are open and complex processes, cannot be foreseen and create emergent phenomena. Endogenous and exogenous factors have had their impact on the developments of both life and media. In both cases, a great diversity has been created. But there is an important difference: bio- evolution does not follow a grand plan or any intention. Media evolution, on the other hand, is a cultural process; it does not follow a grand plan either, but sometimes the direction and speed of the development can be –more or less– planned" (**Stöber**, 2004, pp. 485-486).

Stöber argued that researchers of human evolution often lack archaeological evidence and spend much of their time looking for "missing links" to complete their temporal map. Historians must face the same kind of problem due to the lack of crucial sources for reconstructing the past. Like any building, theoretical macro-constructions need micro-pieces in order to be completed and consolidated. Stöber's mid-range theory is largely based on Schumpeter's contributions to the processes of invention and technological innovation. Crossing the contributions of Charles Darwin with those of Joseph Schumpeter, Stöber ended up outlining a theoretical-analytical model in which media evolution, similarly to biological evolution, is presented as

> "a two-stage process followed by diffusion. Some evolution scientists suggest two kinds of improvements: adaptation and exaptation. Adaptation means the improvement of a feature for the sake of its original purpose. Exaptation means a second-stage improvement aiming at a new function" (**Stöber**, 2004, p. 487).

In this framework, it could be said that Johannes Gutenberg was not the inventor of the printing press since he simply created printing with movable type. In other words, Gutenberg improved writing and copying through a product aimed at the expensive and prestigious book market. In Stöber's terms, the initial phase of development (*adaptation*) was characterized by the improvement of an old medium, but in the next phase (*exaptation*) the printing press technology

> "was exaptated for a new media: first, for non-periodical broadsheets and later for periodical press" (**Stöber**, 2004, p. 488).

Something similar happened when the first animated pictures on celluloid became feature films, and when radiotelegraphy became broadcasting; the same can be said of the passage from Arpanet to the Internet and from there to the World Wide Web.

The work of Stöber, a researcher located in the tradition of German media studies (unfortunately little known in Spanish-speaking countries), constitutes a very large commitment to the application of the evolutionary model to the media. Although the

> "combination of evolution and innovation theory neither provides us with exact dates nor gives us 'scientific laws' for the process of diversification of media" (**Stöber**, 2004, p. 502),

the dialogue between Darwin and Schumpeter allowed Stöber to generate a model of the media transformations that make him another leading interlocutor for Media Evolution.

5. Media Evolution: a map

After this description of the main interlocutors and sources that feed the theoretical conversations proposed by Media Evolution, it is time to outline this new emerging field in more detail. At this point, it should be clear where Media Evolution comes from; now, it is time to look at what this new discipline wants to be and where it wants to go. But before reaching this point, it is convenient to briefly analyze the similarities and differences with two very close disciplines: Media History and Media Archaeology.

5.1. Between history and archeology

Although Media History and Media Archeology are two inexhaustible sources of examples of past media transformations, both have a series of limitations that should be considered before returning to the evolutionary model of media change. Media History is a discipline that often gets caught up in the construction of linear (sequential) technological series, many of them inspired by the model popularized by **Rogers** (1995) in his classic *Diffusion of Innovations*. It is not easy to escape linear series when analyzing the history of any technology, not just communication (see, for example, **Neuman**, 2010) (Figure 1).

Unlike Media History, Media Evolution proposes a reticular (non-sequential) model of media change that gives great relevance to inter-media relations (for example, relations of competition, cooperation, convergence, divergence, etc.). Although Media History has started to adopt an intermedia view over the years (**Balbi**; **Magaudda**, 2018), as **Curran** (2002) stated two decades ago, it never set out to build a broader analytical framework to integrate and interpret media transformations from a long-term perspective.

Figure 1. Historical timeline of American media (**Neuman**, 2010).

Media Archeology, on the other hand, rejects the linear narratives of historians to propose a discreet and focused view that sometimes makes it difficult to appreciate the socio-technological network in all its dimensions. If Media Archeology is presented as a detailed close-up image of the media of the past, Media Evolution aspires to display a wide-angle view of the transformation of the entire media ecosystem over time.

5.2. The two sides of the same coin

If the ecological approach studies the network of relationships between organisms at the same time, the evolutionary approach researches the diversification of those organisms into new species, their extinction (macroevolution) and changes on a smaller scale, for example adaptations (microevolution). In other words, while the ecologist reconstructs networks of organisms, the expert in evolution draws trees of life. In short: ecology thinks in space while evolution thinks in time. The two conceptions, ecology and evolution, are complementary and can be reorganized following the traditional linguistic opposition between diachronic / synchronic levels (**Scolari**, 2013a).

Following this reasoning, Media Evolution, understood as a diachronic discipline, could be considered as the complement of a synchronic discipline: Media Ecology. As we have seen, most media ecologists, from Marshall McLuhan and Neil Postman to Paul Levinson and Robert K. Logan, included in their studies and reflections elements that we now recognize as part of an evolutionary approach to media. In the case of researchers such as Lewis Mumford and Harold Innis, the diachronic dimen-
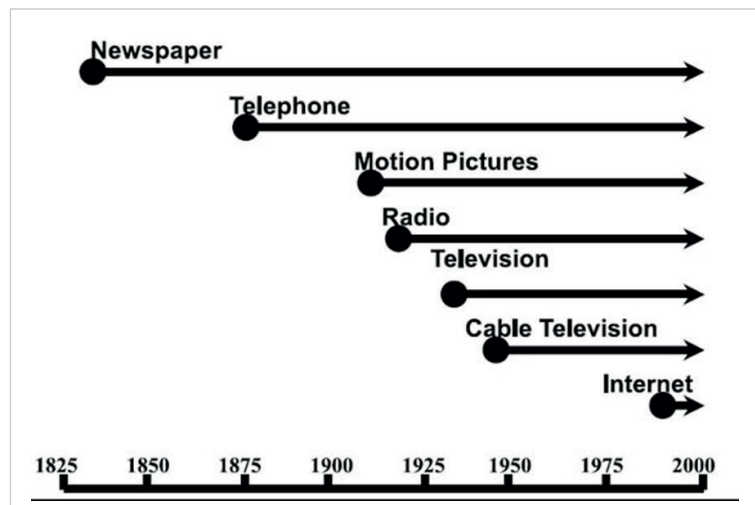
> Unlike Media History, Media Evolution proposes a reticular (non-sequential) model of media change that gives great relevance to intermedia relations (for example, relations of competition, cooperation, convergence, divergence, etc.)

sion is so strong that we can consider them as direct precursors of Media Ecology and, above all, of the Evolution of the Media. It could be said that Media Ecology and Media Evolution are two approaches that, like Ferdinand de Saussure's signified and signifier, constitute two sides of the same coin (**De-Saussure**, 1945) (Figure 2).

5.3. A proto-discipline under construction

Media Evolution is a *proto-discipline that studies media change from a long-term, holistic, intermedia, reticular and complex perspective*. The goal of this proto-discipline is not to predict the future of the media ecosystem but rather to understand its past and contemporary transformations. This definition can be decomposed and analyzed in all its parts:

Proto-discipline

Media Evolution is far from being a consolidated discipline. Even this definition should be considered as a mere operational characterization of an ongoing theoretical work. The first steps of Media Evolution should be aimed at identifying continuities and discontinuities, emerging and adaptive phenomena within the

Figure 2. Media Ecology and Media Evolution as complementary approaches (**Scolari**, 2013a)

processes of media change. At the same time, it must refine its own dictionary of concepts and strengthen exchanges with the closest disciplines and theories presented in the previous sections. Concepts such as *media life cycle, emergence, domination, adaptation, survival, extinction, co-evolution, remediation* and *media niche* are candidates for occupying a place of preference in this dictionary.

If Media Evolution is a new "intellectual trading zone" (**Waisbord**, 2019), an emerging "scientific conversation" (**Scolari**, 2008; 2009) in Media and Communication studies, then the identification and activation of a network of interlocutors is an open process that goes far beyond the authors, texts and contributions presented in the preceding sections.

Long term

As we have seen, Media Archeology favors a focalized perspective (a close-up, as a photographer would say) while Media History is constructed through media sequences often expressed through a linear narrative. In this context, Media Evolution proposes activating a 'wide-angle' vision of media change, understanding this amplitude from a double spatial and temporal perspective. **Fernández** (2018) proposed three "observation distances":

- the *macro perspective* (oriented towards society, culture and their respective "key elements of conflict": social classes, lifestyles, etc.),
- the *meso perspective* (closer to social phenomena, this perspective is oriented towards "scenes of conflict and exchange"), and
- the *micro perspective* (oriented towards "the products and their processes") (**Fernández**, 2018, pp. 35-36).

In this framework, Media Archeology should be located in the micro perspective, while Media Evolution would aspire to deploy a macro perspective of media change. However, in the same way that Charles Darwin needed to collect fossils to build his grand theoretical framework, the media evolutionist must often work with media fossils that are located at the micro perspective level. The dialogue between Media Archeology and Media Evolution thus acquires a strategic character: if the former proposes a micro-focus often centered on a single device, the latter aims to rebuild media change from the perspective of large media networks, actors, relationships and processes.

> Media Evolution, understood as a diachronic discipline, could be considered as the complement of

Intermediality

Media are not alone. If Marshall McLuhan postulated that

> "no medium has its meaning or existence alone, but only in constant interplay with other media" (2003a, p. 43),

James Curran suggested that Media History's orientation toward describing individual media (history of radio, history of television, etc.) had led to "fractured and incomplete understandings of the historical role of mass media" (2002, p. 135). For the German researcher Jürgen Müller (2010)

> "the point of departure for this new approach was the necessity to account for an irrefutable fact: it had simply become unacceptable to see "media" as isolated monads. The familiar media theories and media histories were
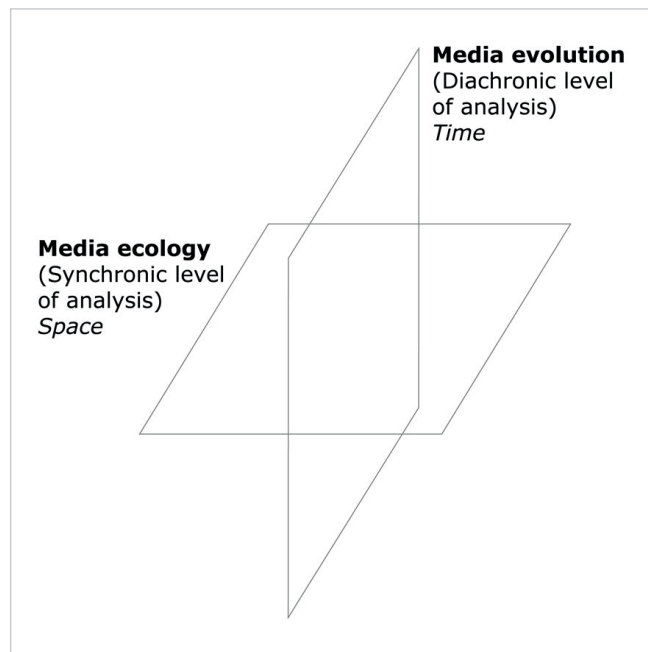
no longer able to meet research expectations; it had become necessary to turn one's attention toward contemporary audio-visual phenomena and their mutual relations, and to study their complex interactions" (**Müller**, 2010, p. 18).

The need for an intermedia perspective is clear, not only from an evolutionary approach to media change (see the exhaustive works of **Elleström**, 2010, 2014, 2019, and 2020). For example, the mutations of television and newspapers in the last two decades cannot be understood if they are isolated from developments in the field of video games or the evolution of online information, respectively; the same could be said of the evolution of papyrus and parchment two thousand years ago. The new generation of media historians is aware of the need to incorporate an intermedia approach in their studies and to pay attention to the relationships between the different media when they analyze their transformations (for example, **Balbi** and **Magaudda**, 2018). Researchers who analyze political communication and media activism have also incorporated the intermedial dimension into their studies (for example, **Treré**, 2019).

The analysis of the relationships between the different media has a very seductive and at the same time challenging pending task: to develop a map or taxonomy of the possible intermedia relationships. The media compete with each other and organize themselves into niches (**Dimmick**, 2003) to better manage this struggle. However, media also cooperate and establish alliances (see, for example, the current synergies between cinema, video games and the comics industry, or cooperation between the railway, the telegraph and the press in the 19th century). These synergies not only affect the production processes but also the narratives and reception processes of all the media involved. Sometimes the cooperation extends over time and ends up simultaneously and dialectically transforming two media; in that case, one could speak of a co-evolutionary process. An evolutionary theory of media change should put media relations high on its research agenda.

Holistics

Holistics holds that the properties of any type of system (physical, biological, chemical, social, economic, mental or linguistic) must be considered as a whole and a sum of its parts. According to Smuts,

> "wholes are not artificial constructions of thought: they actually exist; they point to something real in the universe, and Holism is a real operative factor, a vera causa" (**Smuts**, 1927, p. 88).

For Smuts, the idea of totality should not be limited to the biological domain, since

> "it covers both inorganic substances and mental structures as well as the highest manifestations of the human spirit (…) As Holism is a processes of creative synthesis, the resulting wholes are not static but dynamic, evolutionary creative. Hence evolution has an ever-deepening inward spiritual character; and the wholes of evolution and the evolutionary process itself can only be understood in reference to this fundamental character of wholeness" (**Smuts**, 1927, pp. 88-89).

In the second half of the 20th century, holism led to systems thinking (**Von-Bertalanffy**, 1968). From this perspective, biological, sociological and technological systems are so complex that their behavior often generates emergent phenomena. Or in other words: these emergent configurations cannot be deduced from the properties of the elements that make up the system. In the context of a theoretical reflection on the evolution of the media, holism should be understood as synonymous with the "systemic" or "ecological" approach.

Reticularity

Whether as a theoretical-analytical model or as a narrative scheme for the presentation of scientific results, Media Evolution rejects linear or sequential conceptions of media change. Thinking about the evolution of the media ecosystem, and, by extension, the evolution of technologies, as a network implies definitively leaving behind technological and social deterministic models. In this sense, Media Evolution shares a relational vision that is very close to that of the Actor-Network Theory (**Latour**, 2005). In a media ecosystem it is possible to identify an interconnected network of technological, individual, institutional, textual actors, etc. If the researcher thinks in terms of networks of actors, relationships and processes, what emerges is a much more dynamic vision than the classic conceptions based on technological or social determinisms (**Scolari**; **Rapa**, 2019; **Scolari**, 2021).

Complexity

Is the Darwinian variation + natural selection formula the only possible model for understanding the exuberant diversity of species that exists on our planet? In the second half of the 20th century, some researchers suspected that Charles Darwin's model was not enough. Without contradicting the principles of evolutionary theory, researchers such as **Kauffman** (1995) attempted

> If Charles Darwin needed to collect fossils to build his grand theoretical framework, the media evolutionist must often work with media fossils that are located at the microperspective level

> The new generation of media historians is aware of the need to incorporate an intermedia approach in their studies and to pay attention to the relationships between the different media when they analyze their transformations

to answer this question by developing a broader theoretical framework based on concepts such as *chaos, emergence*, and *self-organization*. Any sociologist, biologist, semiotician, economist or media researcher of the 21st century should take into account the hypotheses and models generated by the sciences of complexity.

> In the context of a theoretical reflection on the evolution of media, holism should be understood as synonymous with the "systemic" or "ecological" approach.

Talking about *complexity* is not simple at all. A system is complex when it is made up of interrelated elements that exhibit emergent properties that are not apparent from the sum of the individual parts. In these cases, the system is *self-organized*. The intensification of the interactions between elements increases the complexity of a system. In complex systems, Kauffman explains, a minor change can cause catastrophic transformations in the behavior of the whole. In these systems

> "The whole is more than the sum of the parts or, perhaps more appropriately, the whole is different from the sum of the parts (...) The complex has much more to do with the nature of the interactions than with the nature of the objects that interact, although the latter impose some limitations on what can happen at the next level" (**Solé**, 2009, pp. 19-25).

Stuart Kauffman and other scientists from the Santa Fe Institute (New Mexico), such as the economist Brian **Arthur** (2009), argue that the evolution of technology is based on principles similar to those that govern the biological domain. This opens the door to broader applications of biological analytical metaphors, concepts and categories to technological change. Many media and communication researchers broadcast on the same frequency; for example, in *Mediamorphosis: Understanding new media* Roger Fidler (1997) argued that

> "by recognizing that the human communication system is, in fact, a complex, adaptative system, we can see that all forms of media live in a dynamic, interdependent universe. When external pressures are applied and new innovations are introduced, each form of communication is affected by an intrinsic self-organizing process that spontaneously occurs within the system. Just as species evolve for better survival in a changing environment, so do forms of communication and establishes media enterprises" (**Fidler**, 1997, p. 28).

This approach to emerging phenomena that feeds on computational models and simulations could be enriched with other experiences, for example, the work on complexity by **Morin** (2008) and **García** (2006).

Unpredictability

A scientific prediction is (or should be) a rigorous formulation based on empirical data that predicts what will happen under certain specified conditions. Levinson argued that his anthropotropic theory could help researchers in the difficult task of predicting the future of communications, but doing so is not easy given that the future is

> "open, unpredictable, imprescriptible" (**Levinson**, 1999, p. 185).

From a different theoretical point of view, Dimmick (2003) also agrees that the future of media systems is unpredictable. Even if some kind of short-term anticipation were feasible

> –"based on analysis of past competition, we believe it is probably possible to anticipate displacement effects, perhaps a few years prior to their occurrence" (**Dimmick**; **Rothenbuhler**, 1984, p. 118)–

both long-term prediction and the formulation of causal laws are out of reach:

> "Like the biologist, the researcher interested in the [...] media cannot appeal to universal laws like those of chemistry or classical physics [...] Like the biologist, who also studies complex living systems, the social scientist inhabits a world where prediction is difficult at best, and explanation must be won without recourse to causal laws" (**Dimmick**, 2003, p. 1).

If researchers consider the media ecosystem as a complex system and its evolution as an emergent phenomenon, as proposed by Robert K. Logan, then the properties of that system

> "cannot be derived from or predicted from the properties of the components of which it is composed" (**Logan**, 2007b, p. 19).

However, although it is not possible to predict the long-term evolution of any complex system, an appreciation of past transformations of the media ecosystem can be of great help in understanding contemporary mutations. Although long-term predictions cannot be made, it is possible to give some intelligibility to current processes and develop short- and medium-term scenarios by considering past changes. In other words, the analysis of the past helps us to understand the present and plan actions to improve the quality and functioning of media ecosystems in the future.

6. Conclusions: a discipline under construction

As a scientific discipline under construction, Media Evolution must face two tasks if it wants to start a process of epistemological consolidation:

- on one hand, it needs to generate a solid set of analytical concepts and categories, the basic bricks of any theoretical construction;

- on the other hand, it must define and test a set of research methods so that the results of empirical work can support theoretical production.

Pending theoretical tasks

Regarding the first task, evolutionary concepts that come from the natural sciences such as *emergence, co-evolution* and *adaptation* can be reinterpreted from a media perspective and should be part of a dictionary of Media Evolution. This centrality of concepts is strategic: if theories are statements, those statements can only be built with clearly defined conceptual bricks. The definition of concepts is the first step in the construction of a scientific discourse (**Greimas**, 1991). Concepts, understood as "abstractions that describe a portion of reality" (**Shoemaker** *et al.*, 2004, p. 15), must be defined, analyzed, compared and related to each other.

Sometimes scientific concepts continue to be used even if their ability to describe and explain the world has been clearly diminished (**Katz**; **Fialkoff**, 2017). **Beck** (2000; 2004) considered that most concepts in sociology "are misleading to some extent" (2004, p. 145) and used the category of "zombie concepts" to define categories that live on after death. Beck acknowledged that

> "maybe we need some new categories" but "we would have to make this shift in a very sophisticated way, with maybe some new concepts that are close to the specific people, networks and experiences we are working with" (**Beck**, 2004, p. 154).

Media Evolution does not want to eliminate any "zombie concepts"; its final objective, in any case, is to banish the linear and simplistic conceptions of media change to renew scientific conversations with new terms and statements.

Pending methodological tasks

Regarding the second task, Media Evolution is open to the use of quantitative and qualitative methods. Among the first, studies in the field of "distant reading" (**Moretti**, 1998; 2005; 2013) and "cultural analytics" (**Manovich**, 2013; 2020) indicate a possible way to research the evolution of media content from a quantitative perspective. Studies on technological evolution that have worked with simulation models or directly quantifying the modifications that devices have undergone over time could also be explored from the perspective of Media Evolution (**Arthur**, 2009; **Ziman**, 2000).

From the perspective of qualitative research, both Media History (**Startt**; **Sloan**, 1989; **Sloan**, 1991) and Media Archeology (**Huhtamo**; **Parikka**, 2011; **Parikka**, 2012) offer an interesting set of techniques that, suitably adapted, could be adopted by researchers of media evolution. The experience of Science and Technology Studies (**Bijker**; **Hughes**; **Pinch**, 2012; **Law**; **Hassard**, 1999; **Latour**, 2005) and evolutionary epistemology (**Ziman**, 2000) should also be considered essential references for studying media change with qualitative methods. Rather than develop its own method, Media Evolution should articulate a flexible and coherent set of techniques for collecting and analyzing data from the past to identify continuities and discontinuities.

Towards an evolutionary turn?

Charles Darwin's revolutionary theory served to integrate the biological sciences through an "evolutionary synthesis" in the first half of the 20th century (**Huxley**, 2009). Would it be possible to do the same in the domain of the social sciences? **Mesoudi** (2011) considered that the theory of evolution could play such a role in the social sciences:

> "'Macroevolutionary' disciplines, such as archaeology, comparative sociology, macroeconomics, history, and historical linguistics, would be united with 'microevolutionary' disciplines, such as ethnography, psychology, microsociology, microeconomics, and sociolinguistics, with the historical and comparative patterns identified by the former explained in terms of the individual level mechanisms studied by the latter. The recent spread of cultural evolutionary theory to disciplines such as history, economics, and archaeology suggests that such a synthesis is, in principle, possible" (**Mesoudi**, 2015, p. 391).

Perhaps one day Media Evolution will be part of that list of consolidated macro-disciplines that seem ready to be integrated into a broader evolutionary framework. Meanwhile, its priority is to consolidate a theoretical framework and a set of methodologies, while establishing exchanges with other evolutionary approaches with a biological, social or technological matrix.

> Media Evolution does not want to eliminate any "zombie concepts"; its ultimate goal is to banish the linear and simplistic conceptions of media change to renew scientific conversations with new terms and statements

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