Benoît Turquety

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Toward an Archaeology of the Cinema/ Technology Relation: From Mechanization to "Digital Cinema"[1]

Benoît Turquety

"The Last Machine?": The Digital Age and the 1930s

Considering the historiography of the cinema from the outside – that is, re-establishing it within the context of the social sciences of the time – strange coincidences emerge.

As is well known, the history of the cinematic medium has established itself from the very beginning as a technological history. The reasons for this fact are numerous and complex: from patents and their economic – or patriotic – implications, to the pedagogy of the mechanisms of the illusion to the curious. In any case, all the historical essays on moving pictures published between 1895 and around 1925 conceive their task as the description of the evolution of the machines, and the historical-ideological determination of the important innovations. The history of the medium began to be conceived differently when it began to be perceived as an art form, a transformation that can already be sensed in Terry Ramsaye's book of 1926, and is completed in Paul Rotha's 1930 volume and Bardèche and Brasillach's 1935 history of film.[2]

But in fact, during that time, the history of technology as a discipline was not yet founded. Its project was constructed precisely during these early 1930s. So there seems to be an odd historical delay or missed beat between the evolutions of the history of cinema and of the history of technology, the first being technologically oriented before the second emerged, and then turning away from the machines. A strange coincidence.

Actually, the 1930s emerges as a crucial moment regarding the general presence of technology in culture. It was a time when technology entered the sciences as a major theme, in nearly all disciplines. So how come historians of cinema lost interest in technology precisely at the moment when technology caught the attention of other historians, philosophers, scientists, etc.?

These coincidences raise a number of questions, and particularly that of the existence and nature of a link, in the 1920s and 1930s culture and sciences, be-

tween cinema and technology. If cinema is perceived as a technological art, it may also be that at the time, technology itself was perceived within a conceptual sphere centered on the cinema. The cinema would have acted as a cultural model to represent technology in a wider sense, embodying some of its most characteristic features: mechanical, modern, involving speed and vision, the cinema would be "the last machine." This, after all, may be the reason why the transition from analog photochemical inscription to digital encoding suddenly makes the medium unsure of its own identity: if it is still a "technological art," it may well be that what we mean now by *technology* is not what was meant by the term when cinema was institutionalized. And it may well be that our contemporary concept of *technology* has shifted to another conceptual sphere, where the cinema's place is not central – if it exists at all. At the time of mechanization, *technique* and *technology* were cinematic notions; in the digital era, the link between the *cinema* and those concepts has changed, because the paradigms have changed around them, perhaps the *episteme* itself.

I would like to approach this problem by proposing an exploration of the modalities of the penetration of technological issues in the scientific field of the time, especially in France and Germany, with a particular attention to the place and function that cinema may have had in this penetration.

The French in the 1930s show – like people in other countries – an obsession for technology. Its most obvious form is the recurrence of debates on mechanization. Ironically, the constant repetition of the theme in the writings of the time is reproved in each of the texts that participate to the phenomenon. The problem of the machine is of course not new. It could be traced back at least to the Renaissance, in the filiation of the medieval "mechanical arts," to then grow through many historical variations, as can be observed in the works of Filippo Brunelleschi or Leonardo da Vinci, in the numerous and massive "machine theaters" of the 16th and 17th centuries, the exhibitions of models of machines from the 17th century onwards, the theories of La Mettrie or Descartes on the "man-machine," Vaucanson and Jaquet-Droz's automatons, the *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers*, etc.

This question of the machine became of particular, structural importance for the 19th century, on several levels. During the first years of the century, a new branch of knowledge was formulated, notably with the first lessons given at the French École Polytechnique by Gaspard Monge: kinematics. The purpose of this science is the systematic study of machines, and especially the classification of their basic elements: mechanisms. It kept developing through the century mainly within the framework of engineering schools, producing several important works with Charles Laboulaye or Franz Reuleaux. In the opening of his 1885 course of "Pure Kinematics" at the Faculté des sciences in Paris, Henri Poincaré gave the following, beautiful definition: "Kinematics is the study of movements regardless of the causes that produce them, or to be more exact, it is the study of

all possible movements."[3] But this science, aiming first at the education of a technological elite, deals above all with description and classification, sometimes analysis: the historical dimension, as well as the construction of a coherent theoretical framework, are out of its scope.

Besides, the second half of the 19th century is the time when the motif of the machine penetrated deeper and deeper into the literary and artistic field, from the novels of Emile Zola, Jules Verne or Villiers de l'Isle-Adam, to the avant-gardes of the first decades of the 20th century.

This progressive cultural impregnation seemed to end up, during these 1930s, in a form of explosion of the question affecting all the areas of culture – as well as politics. This certainly had to do with the expansion of Taylorism in the organization of work within the industry, as well as with the proliferation of machines in everyday living, which gave a new dimension to the theme. Is the machine liberating, a source of well-being and an embodiment of progress? Or is it enslaving, imposing its rhythms to the worker and its obtuse materiality to the thinker? Chaplin's 1936 MODERN TIMES is only the tip of a huge iceberg of productions of all natures – including films, with the works of Eisenstein (STAROYE I NOVOYE, 1929), Vertov (CHELOVEK S KINOAPPARATOM, 1929), but also Ralph Steiner (MECHANICAL PRINCIPLE, 1930), Eugène Deslaw (LA MARCHE DES MACHINES, 1927), Joris Ivens (PHILIPS RADIO/SYMPHONIE INDUSTRIELLE, 1931), etc. A condensation of the questions involved could be found in the concluding chapter of Bergson's 1932 *Two Sources of Morality and Religion*, bearing on the relation between "Mechanics and Mysticism,"[4] or in the title of Lewis Mumford's *Technics and Civilization* (1934) – that "and" being in fact more threatening than one could think...

Machine, Technique, Technology

Before proceeding, two rather important distinctions have to be made, in order to specify cultural differences and intellectual traditions. The first is between *machine* and *technique*, and the second between *technique* and *technology*. In the various linguistic areas concerned by those questions, the dominant vocabulary is not always the same. For instance, if the *machine* can be considered as an obviously central object in the French cultural field of the time, this does not apply to *technique*. This last notion seems then barely constituted as such, hardly visible. It is during this 1930s decade that it will undergo a rapid expansion.

In English-speaking countries, this terminology has a rather different history. As Leo Marx summarized it in a 2010 essay:

> The word *technology*, which joined the Greek root *techne* (an art or craft) with the suffix *ology* (a branch of learning), first entered the English language in the seventeenth century. At that time, in keeping with its etymology, a *technol-*

ogy was a branch of learning, or discourse, or treatise concerned with the mechanic arts. [...] [T]he word then referred to a field of study, not an object of study.[5]

Marx then goes on to assert that this sense of the word *technology* is "now archaic," being replaced around 1900 by "the now familiar sense of the word – the mechanic arts collectively."[6] In an earlier essay, Eric Schatzberg describes "the current characterization of *technology* as the methods and material equipment of the practical arts," a meaning whose domination in the English language goes for him back to the 1930s, following the works of Thorstein Veblen.[7] In the field of film theory however – or of the theory of cinema history – Rick Altman has complained about another confusion. According to him, *technique* designates and should only designate ways of doing, whereas *technology* deals with the machinery, and should be strictly restricted to this area. That, for him, is a crucial distinction, as:

> The important thing to remember is that a dialectical understanding of history is destroyed from the start by any theory which reduces to one those practices that interact as two.[8]

But if technical objects and technical practices do have specific differences in their evolutions, the philosophy of technique has shown, from André Leroi-Gourhan to Gilbert Simondon, that their studies cannot be separated, for reasons that Altman himself partly suggests ("technology often automatizes an accepted technique"[9]). In fact, the history and theory of techniques have, at least in the French-speaking area, built themselves on that principle: *techniques* are both the machines and the ways those machines are used. And if the restriction of *technology* to the *logos* about techniques sounds now obsolete in English – as well as in common French uses, I must say – it has remained effective and fully pertinent for the French-speaking scientific tradition. In this perspective, *technology* designates the discourses about techniques, whether scientific or prescriptive, discourses which can be studied as a cultural object in themselves. This article here dealing mostly with the French tradition, I will stick to this terminology – but readers should keep in mind that devices *are* techniques.

(Cinema and) the Emergence of the History of Techniques

The foundation of the history of techniques as a discipline was provoked in France by objects that sound a bit far from the mechanization problem at first, but can in fact not entirely be separated from it. In the June 1926 issue of the *Revue de synthèse historique* a review by Marc Bloch was published of an essay by Major Lefebvre des Noëttes, "La Force motrice animale à travers les âges" [Ani-

mal Traction through the Ages]. The book by this "former cavalry officer who had the fine idea of contributing his professional skills to historical studies"[10] discussed the history of the horse harness, showing "the flaws of the antique harness" and emphasizing the elaboration of new techniques during the 11th century. The theme could evoke a somewhat austere book, were it not for the author's daring hypothesis, thus summarized by Bloch:

> Strictly limited in their use of animal motive force through traction [by the flaws of their harnessing systems], the antique civilizations have had to resort to a very extensive use of human motive force, that is to say of slave labor. [...] Reciprocally, western Europe has been spared the return of such atrocities thanks to the great inventions of the eleventh century.[11]

Entitled "Techniques et évolution sociale. De l'histoire de l'attelage, et de celle de l'esclavage" [Techniques and Social Evolution: About the History of the Harness, and That of Slavery], Bloch's review elaborated straightaway a certain number of the crucial problems of the historiography of techniques, which the book raises. Or, Bloch wrote:

> Perhaps would it be more exact to say that it raises only one, but very important [problem]: it leads us to wonder how technical development is related to economic evolution and to the transformations of social organization.[12]

Apart from specific methodological questions, the central problem of the history of techniques appears then as the problem of technological determinism, consisting in attributing, in a simple and unambiguous manner, cultural and political (or aesthetic) transformations to technical innovations. Mankind freed from slavery by harnessing techniques or enslaved again by the machinations of the industry is, centuries apart, twice the same problem. Technological determinism remained a central interrogation in film historiography, this time on the aesthetic level.

Those questions led Bloch and Lucien Febvre in 1935 to the realization of the first thematic issue of the *Annales d'histoire économique et sociale*, the journal they had founded in 1929. The issue dealt precisely with technology, titled "Techniques, History and Life." The issue was introduced by a programmatic and groundbreaking text by Lucien Febvre, "Reflections on the History of Techniques." It began with these sentences:

> Technique: one of those many words whose history hasn't been written. History of techniques: one of those many disciplines which must still be entirely created – or almost.[13]

The volume as a whole leaves the reader with the strong feeling of the conscious opening of an entirely new field, with the obvious enthusiasm that it can arouse, as well as the pressing need to set its methodological and theoretical framework.

In parallel, Marc Bloch published in 1931 the book *Les Caractères originaux de l'histoire rurale française*, translated by Janet Sondheimer in 1966 as *French Rural History: An Essay on Its Basic Characteristics*.[14] He specified in the introduction the principles of the "regressive method" that he proposed to apply to the landscapes of the French countryside, in order to be able to grasp "life itself, which is nothing but movement." The introduction closed on an analogy:

> To the recent past, the regressive method, used with measure, does not ask for a photography which would then merely need to be projected, always remaining the same, to get the frozen image of ages more and more remote; what it aims at grasping is the last reel of a film which it tries to unroll backwards, resigned to discover more than one gap, but resolved to respect its mobility.[15]

The cinema, then, does not appear in Bloch's work as a possible object of history, but as a model for historical work. The cinematic machinery combines in the most striking way several abilities of interest to the historian: it can go back in time; it can preserve the essential movement and instability of its object; and it can work in spite of gaps, not inventing false continuities to make up for its flaws, but taking advantage on the contrary of its fundamental discontinuity. One feels strangely close here to Walter Benjamin's theses "on the concept of history." History in itself should become cinematic: an epistemological transformation is at stake, which is exactly contemporary with the birth of techniques as a historical object.

But history is not the only discipline then affected by the emergence of an awareness of technical issues. Closely related disciplines, such as archaeology, undergo a similar movement. In 1936 André Leroi-Gourhan published one of his first important texts, "Man and Nature: An Essay in Compared Technology," in the seventh volume of the *Encyclopédie française permanente*, edited by Lucien Febvre. "Compared Technology" is conceptualized as a new method, the study of tools and ways of doing in different cultures. This turn in ethnology is then fully in touch with the most contemporary artistic problems, as appears through journals like *Documents*, edited by Georges Bataille in 1929-1930, and *Minotaure* between 1933 and 1939, where ethnographically oriented texts and photographs by Michel Leiris, Marcel Griaule and others were regularly printed.

"Techniques of the Body": Sociology, Psychology and the Cinema

In another area of social sciences, Marcel Mauss – of whom Leroi-Gourhan had been a student – presented in 1934 to the French Society of Psychology a paper entitled "Techniques of the Body," which was published two years later in the *Journal de psychologie*.[16] He explored the idea that our bodily and gestural habits, our ways of walking, swimming, sleeping, are not chiefly natural or personal, but chiefly collective: they "form a social idiosyncrasy – they are not simply a product of some purely individual, almost completely psychic, arrangements and mechanisms."[17] They are transmitted and learned, "the facts of *education* are dominant":[18] "In them, we should see [...] techniques."[19] This leads Mauss to redefine technique, and differentiate the notion from the objects to which it is too commonly reduced: "I made, and went on making for several years, the fundamental mistake of thinking that there is technique only when there is an instrument."[20] Mauss then proposes a definition: "I call 'technique' an action that is *effective* and *traditional*";[21] it is "a series of assembled actions [*actes montés*], and assembled [*montés*] for the individual not by himself alone but by all his education, by the whole society to which he belongs, in the place he occupies."[22] The term "*montés*" echoes with "the notion we have of the activity of the consciousness as being, above all, a system of symbolic assemblages [*montages*]."[23] The choice of the term *montage* for the technical cinematic operation of cutting and splicing – which is evoked here by the "series of assembled [*montés*] actions" – appears through Mauss's text as a moment of a wider circulation of the notion, linked with this context of reflection on mechanization.

The cinema does explicitly appear within this paper, as one of the means of this collective transmission that characterizes gestures as techniques:

> A kind of revelation came to me in the hospital. I was ill in New York. I wondered where I had seen girls walking the way my nurses walked. I had the time to think about it. At last I realized that it was in movies. Returning to France I realized how common this gait was, especially in Paris; the girls were French and they too were walking in this way. In fact, American walking fashions had begun to arrive over here, thanks to the movies.[24]

I would love to comment extensively on this anecdote, which intertwines the motifs of the cinema, America, the gaze, the walk and the girl in a particularly rejoicing way, but that might lead us away from our subject. Let us only note that the cinema here is not a technical object – a machinery that can be used for instance for a chronophotographic analysis of the human walk – but a mass media and a vector of transmission. It produces cultural transformations by diffusing social models, in particular those "body techniques," collective gestural constructions unconsciously disciplining our bodies.

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The Engineer and the Media: "Mechanology"

So it appears that in some cases, the transformations occurring in various scientific fields in relation with technical matters can be linked with a certain presence of the cinema in the intellectual culture of the time, either as a technical apparatus, or as means of massive diffusion of images. The question of technique materializes then on several levels, but it never entirely vanishes. In fact, these elements can be perceived beyond social sciences. A renewal of the conceptions of the machine is already taking place among engineers. An interesting example of such a change, *Réflexions sur la science des machines*, has been published in 1932 by the engineer Jacques Lafitte, whom Gilbert Simondon later recognized as an anticipator of sorts of his own work. Lafitte also proposed the foundation of a new discipline, the third such foundation in the few years studied in this article after Febvre's history of techniques and Leroi-Gourhan's compared technology: "mechanology." Lafitte renewed the principles of kinematics from within the discipline's tradition. He didn't classify mechanisms according to the movement transformations that they operate anymore, but according to the complexity of their relations to their environment. At the simplest level of this relation, Lafitte considered architectural constructions as machines, which singularly alters the way that the problem of "mechanization" can be seen.

But in the context of this essay, our attention is particularly drawn by Lafitte's short introduction to his book. These austere considerations of a technician impassioned by his objects, but who also appreciates Samuel Butler, H.G. Wells and Edgar Allan Poe, are presented to the reader through a double sort of mediation, by a piquing little scene. Here are the first sentences of the book:

> I own a phonograph and I have the rarer and charmingly provincial pleasure of having a philosopher as a friend. He is wise, though sometimes taken away by his disposition. He then becomes of sudden judgment.
>
> We had played a few records and I was preparing the machine again when he exploded:
>
> "No – he said – no, and again no. I definitely cannot bear that sort of music which is now distributed to us. And I think that you are, you and your kind, outstanding criminals. You cannot but invent and take us, each day more, in the network of the artifice. With your science, your progress, your machines, you go destroying, a little more each day, what is left of simplicity in the world. You smother in us the primal and divine spark, and because of you, each day, we are a little less free. Submitted to the machine, we suffer the narrow subjection to the products of our own creation."[25]

The crank thus suspended by philosophic furor, the narrator must leave there his records and engage in a plea for a better understanding of machines, which leads

him to let his friend and the reader know his reflections on a mechanological science. But "canned music" is not by chance the opener of the book: an important part of the debates of the time about mechanization does not bear on its directly political dimension – the way it affects the body of the worker – but on the danger of its cultural implications – a more metaphoric or symbolic enslaving, that concerns the mind and cultivated classes. When Élie Faure publishes in 1933 his "Défense et illustration de la machine" in the *Mercure de France*, he insists on that point: the opposition to mechanization is above all "the revolt of a whole class against the machine – for it's the ruling class who, after having created the machine, repudiates the incipient monster about to devour it."[26] The machine is for those opponents the sign of a new culture, where the artist is killed by the engineer, and the craftsman replaced by the worker. To this condemnation of the machine, "all take part," writes Faure, "sociologists and philosophers, poets and novelists, playwrights, and even filmmakers, God forgive me."[27]

The cinema and the phonograph – to which the radio must be added – are thus the major instruments of this destruction of culture by the machine, a destruction of the mind itself, *l'esprit*, to quote the term then mostly used.

Epistemology, Technique and the Aesthetics of Mechanized Reproduction

Physics and epistemology are also concerned by the double problem of the machine and of the technique – and there again, cinema finds itself playing a significant role. Gaston Bachelard's first doctoral thesis, "Essai sur la connaissance approchée" [Essay on Approximate Knowledge], defended in 1927, includes a chapter entitled "Knowledge and Technique: Approximate Realization." Bachelard questions science and technique's relations to the real and to rationality, to individuality and to generality, to accuracy and to approximation, to precision and to looseness. The manufactured, industrial object appears central to the text, defined by its characteristic properties of usefulness and convenience, its balance between "level of finish" and cost price, its "perfect generality."[28] The study of this object is the concern of kinematics, "a formal science of undeniable purity,"[29] writes Bachelard. In the essay, this industrial object is immediately linked with movement, and with its pure aesthetic enjoyment. According to Bachelard, "manufactured objects" possess,

> [A] schematic grace [...] of the same order as the Bergsonian grace that finds, following curvy lines and avoiding angles, a feeling of ease within perception, the easy anticipation of a movement, "the pleasure of arresting as it were the march of time and of holding the future within the present."[30]

The object contains "the aesthetic history of the fabrication," and founds an "occasional aesthetics," an aesthetics of "sharpness," of "clarity," which essentially lies in the rejection of detail and ornamentation in favor of the pure line. This new aesthetics, reminding one of Adolf Loos, seemed paradoxical to Bachelard in that it is based on a fundamental *lack* of individualization. Linked to mass production, it directly involves reproducibility:

> The object is not reluctant at being copied because the idea is not dispersed in the various samples, but remains manifest and entire in each with its harmony and its elegance.[31]

The technological beauty is the beauty of the idea. Some pages later, Bachelard wrote that, the freedom allowed to the technician by the latitude of the mechanical looseness being a false freedom, "in the end the engineer is not an artist choosing and signing a work full of personality, he's a geometer."[32] This may appear as a contradiction, the engineer being deprived of an artistic value that Bachelard seemed ready to grant to the industrial object. The explanation for this contradiction may lie in a certain disjunction between aesthetic experience and conception of art, a disjunction for which the emergence of technology in fields related – culturally or conceptually – to art holds some responsibility. Bachelard's obvious sensitivity to the aesthetic qualities of the industrial object isn't that common at the time: one of the frequent criticisms made of mechanization, that can be found in Bergson for instance, is the anxiety of standardization, everyone wearing the same hat.[33] In the debates of the period, the disruptions involved by technical reproducibility are not considered only in the case of the work of art, but affect all things – and perhaps beings.

In 1931, Bachelard reintroduced technique in his work. In his essay "Noumène et microphysique" "appeared for the first time it seems the notion of 'phenomenotechnique' which will become, from 1934 onwards, a fundamental category in Bachelard's epistemology,"[34] as Georges Canguilhem wrote. For it is unthinkable, according to Bachelard, to trust an immediate given of which science could do a simple "phenomenography": it must on the contrary be opposed "a phenomenotechnique by which phenomena are not found, but invented, but constructed from scratch."[35] This idea led Bachelard to confer a critical place to instruments, apparatuses and experimental procedures, considering them as crystals of theory and of history.

Besides, Bachelard composed in 1933 an article on problems involving daydreaming and visual perception: "Le monde comme caprice et miniature" [The World as Whim and Miniature]. The photographic apparatus was invoked as a model for the description of the eye, rather traditionally even if Bachelard transformed the classical implications. He also described "the advantage of the experi-

ence with consecutive images," a perception protocol which allows to "decompose in time the excitation-sensation complex."[36]

At the same time, in 1932, Abel Rey, Bachelard's dissertation supervisor, founded in the Sorbonne the important Institute for the History of Sciences and Techniques, that would remain crucial for the history of the French tradition of epistemology and for the historiography of techniques. After Rey, Bachelard became the president of the institution in 1940, then Canguilhem in 1955.

The question of technique was also central for this other founding figure of 20th-century French thought, who was a major influence on Michel Foucault. Canguilhem's first two scientific papers were explicitly discussing this theme: "Descartes and Technique," his contribution to the important 1937 Descartes conference, and "Technical Activity and Creation" in 1938. Those two lectures promoted the "creative originality of technique,"[37] implying that we should consider technique within "a theory of creation, i.e., basically an aesthetics."[38]

"Technical Thought": A Cinematic Conceptual Framework

Technique reappeared again in the philosophy of science in those early 1930s along an almost opposite perspective. The work of Julien Pacotte, *La Pensée technique* [Technical Thought], published in 1931,[39] was largely informed by quantum mechanics, but – as opposed to Bachelard's positions – the book aimed at advocating pragmatism, and the focusing on technique appears as a means to "preserve physics from losing itself in the realm of abstraction by keeping it close to its object: the world of perception and action."[40] Pacotte argued that physics should be considered as a "general technique," this science being essentially experimental, and as a consequence technical since according to Pacotte "the two notions 'experimental' and 'technical' can hardly be differentiated other than by the theoretical purpose of the former."[41]

But the heart of Pacotte's work lay in another suggestion. It was centered on "a fundamental technical concept" that he drew from "the many and diverse technical operations of which it is the principle": that of "*technical transformation*." From this newly defined concept, he presented "the idea of a general science of transformation":

> The definition is abstract by its very generality; but its practical importance is emphasized by the great number of techniques whose purpose corresponds precisely to the concept thus defined: let's mention, among others, kinematic measures, intensive measures, recording, optical magnifying, photography, the cinematograph, the phonograph, the telegraph, the telephone, phototelegraphy, television.[42]

These apparatuses resurfaced many times throughout the book, along with several others: optical phonography, the lantern, slow and fast motion cinematography, the telegraphic strip, engraving, the chronograph, etc. These machineries taken as a whole constituted the epistemological model for Pacotte's conception of technique and, as a consequence, of science, as can be seen through the network of key notions on which the entire work is based: reproduction, optical mediation, transmission, recording, trace, inscription, etc. "Technical thought" was thus thoroughly shaped within a post-Mareysian or cinematic conceptual framework. It is because the privileged objects defining technique itself were for him those visual and sound apparatuses, that he can conceive the whole of technique as transformation. Pacotte's book is largely forgotten today, in spite of being mentioned several times by Canguilhem in "Machine et Organisme" (1946); but it strikingly reveals how the conception of technique of the early 1930s – or, to adopt the dominant terminology of today, of technology – has been radically reoriented by visual and sound technical apparatuses.

The second half of the 1930s was marked, as for technological matters, by some sort of acme: the International Exhibition held in Paris in 1937, entitled "Les Arts et les techniques dans la vie moderne." The cinema was central in the event, due to the Photo-Ciné-Phono pavilion but also to the use of the apparatus in almost all of the sections.[43] This exhibition was a sign of the continued presence of these questions in the field of art since the first avant-gardes, and of their diffusion in all areas of life. Its organization had several repercussions, as for instance the setting up in 1936 in the Conservatoire national des arts et métiers – one of the most important places for technical learning in France – of a course in electroacoustics, television and cinema called "Telephonovision."[44]

The event was prolonged from May to August 1938 by the publication of four successive special issues of the important journal *Europe* under the general title "L'homme, la technique et la nature" [Man, Technique and Nature]. The first issue was opened by Georges Friedmann, the last was closed by Lucien Febvre; contributors included Marc Bloch, Le Corbusier, Fernand Léger, Léon Moussinac (with an article on "Theatrical Technique"), Pierre Abraham, Darius Milhaud, André Spire and, H.G. Wells, among many others. Strangely, the cinema was totally absent from these issues, appearing only in a series of short critics by Léon Werth, situated outside of the thematic collection.

Between France and Germany: Benjamin and Around

This study should be completed by an analysis of what happened during the same period in other countries, for instance in Germany. The German specific intellectual tradition also gave to the technological questions an important development at the time, but on a quite different basis. The contribution of the Bauhaus, whose motto from 1923 onwards was "Kunst und Technik – eine neue

Einheit" [Art and Technique – A New Unity] certainly plays a significant role. On a parallel level, the theme finds many echoes within philosophy and art history. The very beginning of the 1930s saw the publication of two key essays, very different in content and approach, but whose influence would remain crucial for later developments. One was Oswald Spengler's book *Der Mensch und die Technik. Beitrag zu einer Philosophie des Lebens* (1931),[45] and the other was Ernst Cassirer's article "Form und Technik" (translated in English as "Form and Technology"[46]). In the latter, technique was defined as "the form of an acting," thus belonging to Cassirer's category of "symbolic form." It is important for us to recall that the essay was published in the 1930 book *Kunst und Technik*, edited by Leo Kestenberg,[47] whose sections examine successively "Music and Technique," "Word and Technique," "The Radio," "The Film," "The Sound Film," and "The Record." This division and the cultural landscape it defines regarding the problem of "Art and Technique" in 1930 are of course rich of implications for our subject. The very fact that film and sound film should be, in this context, considered in two different sections is already significant. The filmmaker Walter Ruttmann contributed to the first section a text entitled "Technik und Film."

These problems found a singularly complex development in Erwin Panofsky's work. The 1927 seminal essay "Die Perspektive als symbolische Form" was in fact actually a historical epistemology of a painting technique, even though the term "technique" did only rarely appear. But for Panofsky, that "quite specific, indeed specifically modern, sense of space or if you will, sense of the world" was justified and constructed by constant reference to the photographic technique – or, to adopt again the dominant vocabulary of *our* time, technology – the "habituation [...] to linear perspectival construction" being today "further reinforced by looking at photographs."[48] The distinctively cinematic problems did not appear in the text, except through the evocation of the "imaginary space" produced according to El Lissitzky "by mechanically motivated bodies, by this very movement."[49] That hypothesis did not sound very convincing to the art historian. But questions of a close nature returned throughout his work, whether in "Original und Faksimilereproduktion," published in 1930,[50] or of course in the text "On the Movies," whose first version came up as a lecture in 1936.[51]

Today, all those complex, heterogeneous and proliferating interrogations are often considered through the sole contribution of Walter Benjamin, "Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit." Composed in several versions between 1935 and 1938, the essay was published at the time only in the French version resulting from a collaboration between Benjamin and Pierre Klossowski, under the title "L'Œuvre d'art à l'époque de sa reproduction mécanisée" [The Work of Art in the Age of Its Mechanized Reproduction].[52] This French title sounds of course closer to the English translation generally adopted [The Work of Art in the Age of Mechanical Reproduction], in that it transposes the semantic field of the *technical* into that of the *mechanical*, a move whose importance can only

be perceived when considered within its original framework of conception and diffusion: the 1930s debates on technique/technology (and film). In fact, all the text would benefit from a rereading in the light of the discursive production of the time. This archaeological reconsideration of the "Work of Art" essay – to which this article here partly aims at initiating – seems necessary in order to perceive what actually constitutes the most crucial points of Benjamin's contribution.

For an Epistemology of "Digital Cinema"

The 1930s are the years of the emergence and construction of technique/technology as an object in all the branches of knowledge, provoking a complex – and sometimes rather strange – circulation of themes, motifs, interrogations and worries. Beyond the problem of "mechanization," technique appears as fundamentally collective, essentially general, non-individualized and thus constituting a threat to the individual – a problem to which Gilbert Simondon would later return, from a different perspective. By its essence and its products, it implies an aesthetics, but a singular one.

The cinema seems to play a major role in the cultural construction of the very essence of the technical. But in return, the concepts that the cinema uses for its own definition, even on an aesthetic level – *montage*, for instance – are themselves emanations of this wide circulation of discourses on technique and the machine. A certain number of questions traditionally related with the cinema, as for example the aesthetic implications of technical/mechanical reproducibility, have to be replaced in the wider scientific and cultural context of technology, considered as a specific epistemological domain, as it is in this domain that they are first constructed. In this field, the cinema appears at the heart of a network which goes beyond a strict "intermediality" to include visual and sound apparatuses not dedicated to entertainment or art, but also machines in a wider sense, industrial mass-produced objects, and perhaps even ready-to-wear clothes...

The 1930s show the elaboration of a fundamental, complex, multi-faceted relation between the two concepts of *cinema* and *technology*, *cinema* being characterized through technology, and *technology* through the cinema both as a technical apparatus, a machine, and as a cultural event, a media. What we would like to have shown here is how the construction of the two concepts has been contemporary and interdependent. This has implications for today's situation. The crucial, ontological interrogations that have taken over film studies and connected branches of knowledge with the shift to digital machines and technology, seem to us only partly explained by the actual importance of the changes involved, whether practical, theoretical or aesthetic. Those interrogations arise more deeply from the fact that digital techniques – machineries and processes, apparatuses and workflows – are perceived as belonging to a slightly different conceptual

structure than mechanics. They imply a shift in the concept of *technology*, which is quite perceptible in general culture. Given the way that our concept of *cinema* has been constructed, this shift builds a new conceptual environment around the notion of *cinema*, a new epistemological network that involves a reconstruction of the concept itself, even though the notion may seem unchanged. Understanding "digital cinema" has more to do with historical epistemology than with ontology.

48. Guy Debord, *La Société du spectacle* (Paris: Éditions Champ Libre, 1971), § 4; available at http://dumauvaiscote.pagesperso-orange.fr/la_societe_du_spectacle.htm.

49. Benjamin, *The Work of Art...*, 24.

50. *Ibid.*, 44, note 9.

51. *Ibid.*, 36.

52. *Ibid.*, 39.

53. *Ibid.*, 24.

54. Cf. Dominique Chateau, "La dernière séance?," *op. cit.*

55. Benjamin, *The Work of Art...*, 22.

56. *Ibid.*, 28.

57. *Ibid.*, 29-30.

58. *Ibid.*, 35.

59. Benjamin, *Écrits français*, 204.

60. Benjamin, *The Work of Art...*, 35.

61. Benjamin, *Écrits français*, 205.

62. Benjamin, *The Work of Art...*, 35.

63. *Ibid.*, 31.

64. *Ibid.*, 33.

65. *Ibid.*, 30.

66. Benjamin, *L'Homme, le Langage et la Culture*, 156-157, note 1.

67. The translators of *The Work of Art...* do not refer to it as "aestheticization" but as "aestheticizing." Because this choice tends to weaken the concept, I shall follow the example of such critics as Russell A. Berman in *Modern Culture and Critical Theory: Art, Politics and the Legacy of the Frankfurt School* (Madison: University of Wisconsin Press, 1989), chap. 2, "The Aestheticization of Politics: Walter Benjamin on Fascism and the Avant-garde," 27.

68. Benjamin, *The Work of Art...*, 22.

69. *Ibid.*, 21.

70. *Ibid.*, 22.

71. *Ibid.*, 42.

72. *Ibid.*, 41.

73. *Ibid.*

74. *Ibid.*, 54, note 36.

75. "*Communism replies by politicizing art*," ibid., 42. See note 64. "Politicization," better than "politicizing" and in the same way as "aestheticization," gives the word a conceptual status — cf. Berman, *Modern Culture and Critical Theory*, 38.

76. *Ibid.*, 36.

77. In Pierre Daix, *Pour une histoire culturelle de l'art moderne: De David à Cézanne*, vol. 2 (Paris: Odile Jacob, 2000), 250.

Toward an Archaeology of the Cinema/Technology Relation: From Mechanization to "Digital Cinema"

1. This text is a revised version of a paper presented at the conference "Methods, Machines, Dispositives: Perspectives for a New Technological History of the Cin-

ema," organized by the author with Selim Krichane at the University of Lausanne in November 2012.

2. See Terry Ramsaye, *A Million and One Nights: The History of the Motion Picture* (New York: Simon and Schuster, 1926); Paul Rotha, *The Film Till Now: A Survey of the Cinema* (London: Jonathan Cape, 1930); and Robert Brasillach and Maurice Bardèche, *Histoire du cinéma* (Paris: Denoël et Steele, 1935).

3. Henri Poincaré, *Cours de M. H. Poincaré professé pendant l'année 1885-1886. Première partie: Cinématique pure – Mécanismes* (Paris: Association amicale des élèves et anciens élèves de la Faculté des sciences de Paris, 1886), 1 [my translation].

4. See Henri Bergson, *The Two Sources of Morality and Religion*, trans. R. Ashley Audra and Cloudesley Brereton (London: Macmillan, 1935), 229-275 (Chapter IV, Final Remarks: Mechanics and Mysticism).

5. Leo Marx, "*Technology*: The Emergence of a Hazardous Concept," *Technology and Culture* 51, no. 3 (July 2010): 562.

6. *Ibid.*

7. Eric Schatzberg, "*Technik* Comes to America: Changing Meanings of *Technology* before 1930," *Technology and Culture* 47, no. 3 (July 2006): 490.

8. Rick Altman, "Toward a Theory of the History of Representational Technologies," *Iris* 2, no. 2 (1984): 115.

9. *Ibid.*

10. Marc Bloch, "Technique et évolution sociale. De l'histoire de l'attelage, et de celle de l'esclavage," *Revue de synthèse historique* 41 (July 1926): 91 [my translation].

11. *Ibid.* [my translation].

12. *Ibid.* [my translation].

13. Lucien Febvre, "Réflexions sur l'histoire des techniques," *Annales d'histoire économique et sociale* 36, "Les Techniques, l'histoire et la vie" (30 November 1935): 531 [my translation]. Marc Bloch's (beautiful) essay "Avènement et conquêtes du moulin à eau" [Advent and Conquests of the Water Mill], quoted by Dominique Chateau in the previous chapter, appeared in the same issue (538-563), and can be read as, among other things, Bloch's final answer to the cavalry officer: water was another motive force, and the history of the mill interferes with the history of the harness.

14. Marc Bloch, *French Rural History*, trans. Janet Sondheimer (London: Routledge & Kegan Paul, 1966).

15. Marc Bloch, *Caractères originaux de l'histoire rurale française* (Paris: Les Belles Lettres, 1931), 15 [my translation]. The English version (*French Rural History*, trans. Janet Sondheimer [London: Routledge & Kegan Paul, 1966]) is unusable here.

16. Marcel Mauss, "Les Techniques du corps," *Journal de psychologie* 32, no. 3-4 (15 March-15 April 1936).

17. Marcel Mauss, "Techniques of the Body," in *Incorporations*, ed. Jonathan Crary and Sanford Kwinter (New York: Zone, 1994), 458.

18. *Ibid.*, 459.

19. *Ibid.*, 458.

20. *Ibid.*, 461.

21. *Ibid.*

22. *Ibid.*, 462.

23. *Ibid.*

24. *Ibid.*, 457-458.

25. Jacques Lafitte, *Réflexions sur la science des machines* (Paris: Librairie Bloud et Gay, 1932), 11 [my translation].

26. Élie Faure, "Défense et illustration de la machine," *Mercure de France* 839 (1 June 1933): 261 [my translation].

27. Faure, "Défense," 257 [my translation].

28. Gaston Bachelard, *Essai sur la connaissance approchée* [1927] (Paris: Vrin, 1973), 158-159 [my translation].

29. *Ibid.*, 156 [my translation].

30. *Ibid.*, 157 [my translation].

31. *Ibid.* [my translation].

32. *Ibid.*, 164 [my translation].

33. Bergson, *Two Sources*, 265.

34. Georges Canguilhem, "Introduction," in *Études* by Gaston Bachelard (Paris: Vrin, 1970), 8. On the notion of "Phenomenotechnique," see Hans-Jörg Rheinberger, "Gaston Bachelard and the Notion of 'Phenomenotechnique,'" *Perspectives on Science* 13, no. 3 (Fall 2005): 313-328.

35. Gaston Bachelard, "Noumène et microphysique" [1931], in *Études*, 19.

36. *Ibid.*, 34.

37. Georges Canguilhem, "Activité technique et création," *Communications et discussions, Société toulousaine de philosophie* (Toulouse: Faculté des lettres, 1937-1938); in *Écrits philosophiques et politiques 1926-1939. Œuvres complètes*, vol. 1 (Paris: Vrin, 2011), 503 [my translation].

38. Georges Canguilhem, "Descartes et la technique," *ibid.*, 497 [my translation]. See on this aspect Jan Sebestik, "Le Rôle de la technique dans l'œuvre de Georges Canguilhem," in *Georges Canguilhem. Philosophe, historien des sciences. Actes du colloque (6-7-8 décembre 1990)* (Paris: Albin Michel, 1993), 243-250.

39. Julien Pacotte, *La Pensée technique* (Paris: Félix Alcan, 1931).

40. *Ibid.*, 136 [my translation].

41. *Ibid.* [my translation].

42. *Ibid.*, 63 [my translation].

43. Florence Riou, "Le Cinéma à l'Exposition internationale de 1937: un média au service de la recherche scientifique," *1895, Revue d'histoire du cinéma* 58 (October 2009): 31.

44. *Ibid.*, 52.

45. Oswald Spengler, *Der Mensch und die Technik. Beitrag zu einer Philosophie des Lebens* (München: C.H. Beck, 1931).

46. See Aud Sissel Hauel and Ingvild Folkvord, eds, *Ernst Cassirer on Form and Technology* (Houndmills & New York: Palgrave Macmillan, 2012).

47. Ernst Cassirer, "Form und Technik," in *Kunst und Technik*, ed. Leo Kestenberg (Berlin: Wegweiser Vg., 1930), 15-61.

48. E. Panofsky, *Perspective as Symbolic Form* [1927], trans. Christopher Wood (New York: Zone, 1991), 34.

49. *Ibid.*, 154.

50. E. Panofsky, "Original und Faksimilereproduktion," *Der Kreis* 7 (1930): 3-16.

51. E. Panofsky, "On Movies," *Bulletin of the Department of Art and Archaeology of Princeton University* (June 1936): 5-15. On this text, see the important article by Thomas Y. Levin, "Iconology at the Movies: Panofsky's Film Theory," *The Yale Journal of Criticism* 9, no. 1 (1996): 27-55.

52. Walter Benjamin, "L'Œuvre d'art à l'époque de sa reproduction mécanisée," trans. Pierre Klossowski and W. Benjamin, *Zeitschrift für Sozialforschung* 5, no. 1 (1936): 40–66.

Technē and *Poiēsis*: On Heidegger and Film Theory

1. Martin Heidegger, *Discourse on Thinking*, trans. J.M. Anderson and E.H. Freund (New York: Harper & Row 1966), 54.

2. See Tom Rockmore, *Heidegger and French Philosophy: Humanism, Antihumanism, and Being* (London: Routledge, 1995), and *French Interpretations of Heidegger: An Exceptional Reception*, ed. David Pettigrew and François Raffoul (Albany: State University of New York Press, 2008).

3. See Robert Sinnerbrink, "Heidegger and the 'End of Art,'" *Literature and Aesthetics* 14, no. 1 (June 2004): 89-109. One Heidegger scholar, for example, claims that it is hard to imagine Heidegger sitting in the cinema because the cinema's sensational images does not allow for proper "dwelling"; for films immerse us in the dispersed, distracted and inauthentic world of 'das Man' ('the anyone'). Jeff Malpas, *Heidegger and the Thinking of Place: Explorations in the Topology of Being* (Cambridge, MA: MIT Press, 2012), 229.

4. Martin Heidegger, "The Turning," in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York: Harper and Row, 1977), 48.

5. Martin Heidegger, "A Dialogue on Language between a Japanese and an Inquirer," in *On the Way to Language*, trans. P.D. Hertz (San Francisco, CA: Harper and Row, 1982), 1-54.

6. Heidegger, *Discourse on Thinking*, 48.

7. See, for example, Wilhelm S. Wurzer, *Film and Judgment: Between Heidegger and Adorno* (Atlantic Highlands, NJ: Humanities Press International, 1990).

8. Stanley Cavell, *The World Viewed: Reflections on the Ontology of Film* (Cambridge, MA: Harvard University Press, 1979), ix-xxv.

9. *Ibid.*, xiv.

10. *Ibid.*, xiv-xv.

11. *Ibid.*, xvi.

12. *Ibid.*, xvi-xvii.

13. *Ibid.*, xv.

14. See Marc Furstenau and Leslie MacAvoy, "Terrence Malick's Heideggerian Cinema: War and the Question of Being in *The Thin Red Line*," in *The Cinema of Terrence Malick: Poetic Visions of America*, ed. Hannah Patterson, 2nd ed. (London: Wallflower Press, 2007), 173-185; Robert Sinnerbrink, "A Heideggerian Cinema? On Terrence Malick's *The Thin Red Line*," *Film-Philosophy* 10, no. 3 (2006): 26-37, available at http:/www.film-philosophy.com/2006v10n3/sinnerbrink.pdf; Martin Woessner,