The ontogenesis of cinematic objects: Simondon, Marx, and the invention of cinema

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The ideas of Gilbert Simondon have recently surfaced in debates on cinema and its development in modernity. Pasi Väliaho (2013) has considered early cinema in terms of individuation and affectivity; Thomas Lamarre (2011) has considered the magic lantern as technical object and "dark precursor" of animation; Bernard Stiegler (2010) has considered cinema as a "mnemotechnical object". This paper will evaluate the contribution of Simondon's ideas on technical objects and on individuation as a model or paradigm for the development of early cinema, while questioning the primacy in Simondon's analysis of the demands of technicity over economic questions. Such analyses in fact return us to the canonical work of André Bazin (1967) on the ontology of the cinematic image and the dream of pure cinema. Earlier "materialist" analyses of early cinema from a Marxist perspective criticised Bazin's "idealist" account of age-old fantasies of moving images finally realised thanks to the development of available technologies, proposing instead that economic factors were more likely to account for the development of new machines and technologies – and thus of the cinematic apparatus, film and consequent entertainment industry. The question considered in this paper is where an interpretation of early cinema as technical object, emerging via a process of individuation, sits in relation to these earlier debates. This will be considered particularly in relation to Simondon's Du mode d'existence des objets techniques *(1958). Does Simondon's analysis expose the earlier materialist/idealist boundary as ill-founded? How do his concepts illuminate the development of early cinema in relation to ideas on invention, technology, culture and machines? Does a conception of the birth of cinema as individuation complicate or obfuscate questions about labour and machines familiar from Marxist analysis?*

Though Gilbert Simondon's work is only recently finding a wider Anglophone readership, we might characterise two of the prime attractions of his work for contemporary film and media studies as first, a series of ontological or metaphysical conceptions that allow for analysis of a wide range of objects and that overcome traditional oppositions between nature and culture; and second, an explicit concern with aspects of communication, information and technology that anticipate more recent media theory by some decades.

The focus of this article is on the latter aspect of Simondon's work, especially on his account of invention and the ontogenesis of technical objects. Specifically I will consider the invention of cinema itself through the lens of Simondon's conceptions, considering whether his work allows us to overcome oppositions between "idealist" and "materialist" accounts of the origins of cinema. The discussion will necessarily be general and in some cases provisional due to the scope of the article – but then many of the canonical discussions of this question in the literature make very broad claims about the genesis of cinema, from at least André Bazin onwards. To render the discussion manageable, the focus will be on the very early days of cinema – though there would obviously be much to say about subsequent developments in moving image technology in relation to Simondon.

I will consider the following questions in particular, without proposing to answer them definitively. First, whether it is the creative imagination of human beings, which is responsible for the invention of cinema. Second, whether developments in early cinema can be seen, in Simondon's terms, as a rational process of autonomy and concretion – or one of "hypertely", an exaggerated specialisation that is a temporary stage of the moving image of limited potential for evolution. And third, whether the relation of the machine, and technical objects, to human alienation in labour, has any bearing on the consideration of cinema as technical object. The latter two questions, in particular, will bring the analyses of Simondon in relation to Marxist debates on the origins of cinema.

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The invention of cinema

Cinema is notable for its dependence on innovations in various fields, from optics to electricity, from the chemistry of plastics to the development of photography. I will not recap the developments of these fields here but, as Leo Enticknap (on whose account of cinema's technical history I draw extensively in this article) summarises:

> by 1889 the three essential ingredients of the first mass-produced form of moving image technology were in place: the ability to induce the perception of continuous movement effect mechanically, photographic emulsions which were fast enough to produce the images needed for these devices and a strong, flexible and transparent film base to support them on (Enticknap, 2005, p. 10).

By 1895 these images were finally being projected, by the Lumières in France and by Edison in the United States.

André Bazin provides one of the canonical considerations of the invention of cinema in his widely known essay, "The Myth of Total Cinema" (1967). Bazin's focus in the essay is not historical considerations of primacy or technical innovation so much as the relationship between imagination and invention on the one hand, and the economic and technological development of cinema on the other. The starting point for his reflections is the first volume of *Histoire générale du cinéma* by Georges Sadoul. Bazin admires the book for what he discerns as "a reversal, in spite of the author's Marxist views between an economic and technical evolution and the imagination of those carrying on the search" (Bazin, 1967, p. 17). For Bazin, it is as if despite himself, Sadoul is forced to recognise the causal primacy of age-old fantasies of moving pictures, and more recently a nineteenth-century craze for realism, over economic and technological factors, which lag behind.

Bazin goes on to characterise the cinema therefore as an "idealistic phenomenon", which "owes virtually nothing to the scientific spirit".[1] Obviously developments in science, technology and industry facilitate the development of cinema, but as with nineteenth-century visual culture generally, there is underlying its genesis "an integral realism, a recreation of the world in its own image, an image unburdened by the freedom of interpretation of the artist or the irreversibility of time" (Bazin, 1967, p. 21).

On the one hand, myths of moving pictures appear to Bazin to provide a timeless motive for the various nineteenth-century (and earlier) forms. On the other, a specific nineteenth-century concern for realism (as opposed to the illusionism of earlier *trompe l'oeil*) increasingly motivates the quest for cinematic images – and this accounts for the medium's genesis rather than scientific and technical innovation themselves. This emphasis on realism is clearly consonant with Bazin's film aesthetics in his other articles, where the long takes and deep focus of Gregg Toland's cinematography for Orson Welles and William Wyler, as well as the strategies of Italian Neorealism, are all said to privilege the depiction of "reality" on screen. The development of cinematic technologies of, for example, sound and colour in fact brings film ever nearer to its origins: "In short, cinema has not yet been invented!" (Bazin, 1967, p. 21).

Evidently this idealist version of the invention of moving pictures has been criticised in more recent decades. Though not responding to Bazin, an account by A.R. Fulton from 1960 argues "The ingenuity and effort, not of artists, but of inventors, mechanics, photographers, engineers, and manufacturers, made the machine possible" (Fulton, 1976, p. 32). Primacy of material determinants is also a feature of Marxist-inflected theorising of the cinematic apparatus in the 1970s on (many relevant articles are collected in Rosen 1986 and De Lauretis and Heath 1980). In historicist accounts such as Michael Chanan's, economic factors play a "determinate (but not determining) role" (Chanan, 1996, p. 11); in much apparatus theory, the separation of technology and image, apparatus and representation itself is called into question, in the positing of cinema as apparatus or *dispositif* (Comolli, 1980).

The virtues of these latter, materialist accounts of the invention of cinema are still considerable and do not consist simply of a "vulgar" Marxist reduction of film, *qua* superstructure, to the economic base. In the work of Jean-Louis Baudry, Jean-Louis Comolli and others, the separation of representation and substrate is challenged through the notion of the apparatus, which at its broadest includes the spectator posi-

[1] Although this statement may claim indulgence for oversimplification from its mode of presentation, its essayistic form.

tioned through the address of the screen. However, these models have been criticised for their monolithic positing of cinema as a system "suturing" the spectator into a remorselessly ideological set-up, something which has been questioned by more recent attention to audiences informed by ethnographic and empirical studies. Baudry's own appeal to Plato's allegory of the cave (in Rosen, 1986) implies a timeless model of moving pictures that although most thought-provoking, might be said to neglect the mechanisms through which such systems emerge and become.

In this light, the attractions of Simondon's analyses for a consideration of the emergence of cinema are numerous. One of the most notable features of Simondon's work is its priority of ontogenesis over stasis, the processes through which individuals *become* rather than their existence as objects conceived as static or reified. Moreover, ontogenesis and individuation, by which things organic and inorganic become, extend to chemical, organic, psychic, technical and collective entities – thus incorporating all of the aspects we might conceive of as contributing to the development of cinema.

In *L'Individu et sa genèse physio-biologique* (1964), individuation as such is the key concern in the ontogenesis of chemical and biological entities. In *Du mode d'existence des objets techniques* (1958, henceforth *MEOT*) the focus is on technical objects and their becoming. Thomas Lamarre sees Simondon's concept of technical objects in terms of "specific modes of existence of technological devices or apparatuses without positing a substantialist or metaphysical distinction between technical objects (mechanism) and natural objects (organism)" (Lamarre, 2011, p. 128).

Ontogenesis of technical objects

Some of the broad features of Simondon's analysis of technical objects will therefore be considered here. The second page of the introduction of *MEOT* defines the technical object as, simply, "something that has a genesis" (Simondon, 2007, pp. 6-7). The object does not exist prior to its becoming but is present at each stage of this becoming; it is united from the inside through a "principle of internal resonance". Simondon's concern early in the book is to outline how this genesis occurs, moving from an abstract unity of separate elements to an ever more concrete, internally resonant system.

There are two ways in which improvement of technical objects may occur. The first is a "minor" improvement, which essentially compensates for undesired consequences of an existing object or technology. The second is a "major" one, which changes the functioning of the object by essentially boosting the synergy of its various functions (Simondon, 2007, p. 19). In this way, a minor invention can prevent a major one, through compensating for essential drawbacks or weaknesses through artifice.

Minor invention can thus proceed according to "hypertely", an increasing specialisation that risks a sterility that would preclude further genesis. One type of hypertely is an *adaptation* of the technical object without a loss of integrity or autonomy; the other form involves its *fragmentation*, "as in the case of the division of a single original being into towing unit and unit towed" (Simondon, 2007, pp. 27-28). Here Simondon gives the example of a glider as a hypertelic technical object that has fragmented. A glider has obviously lost autonomy in its inability to take off and propel itself. A further "mixed" example is where a technical object is adapted to its milieu, such that the object requires a particular type of environment in which to function. Simondon illustrates this with clocks synchronised with different frequencies of mains electricity – which would not work outside their country of origin.

The more promising case is when evolution moves in the direction of autonomy and concretisation (Simondon, 2007, p. 29). This is where the genesis of the technical object conditions its milieu instead of vice versa as above. Simondon's informative example here, one which he returns to frequently, is the Guimbal turbine, in which the generator powering the turbine is for the first time introduced into the pressure pipeline. Formerly size precluded its insertion but now, through a casing of oil around the generator, the mutual action of the oil and the water in the turbine permit, through improved cooling, the inclusion of a smaller generator.

Simondon's (2007, p. 30) point is that the functions of the oil and the water in Guimbal's turbine are "overdetermined", aside from their prime functions of insulation and powering the turbine, these fluids permit improved cooling, which allows for a more autonomous and less unwieldy generator: "The water becomes multifunctional: it supplies the energy that activates the turbine and the generator, and it evacuates heat produced by the generator; the oil is also remarkably multifunctional: it lubricates the generator,

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isolates the coil, conducts heat from coil to crankcase, from which it is evacuated by the water" while preventing water from entering the casing due to the oil's higher pressure. In short, the use of oil in the casing proves to be far from arbitrary – not only insulation, but also increased cooling and efficiency issue from its introduction and its fruitful synergy with the action of the water in the turbine itself.

Simondon (2007, p. 30) utilises this example to illustrate "adaptation-concretisation" whereby "it is in fact thanks to the new conditions created by the concretisation that this concretisation is possible". In our example above, the versatility or multi-functionality of the oil and water stem from the introduction of the oil as a way to insulate the coil from the turbine. The point is that this happens all in one go, rather than as a gradual introduction of compensatory elements. As such, this is a model of concretisation: the self-conditioning of the technical object.

Ontogenesis of cinematic objects

It seems difficult to sustain Bazin's assertion that cinema "owes virtually nothing to the scientific spirit". When we consider cinematic exhibition, for instance, we note immediately that "many early motion picture projectors were supplied in the form of mechanisms which used the same light source as a magic lantern, thus enabling exhibitors to use both still and moving images interchangeably" (Enticknap, 2005, p. 11). It is also well documented that many early innovations were motivated by studies of motion and of the persistence of vision. Cinema develops from earlier visual cultures and science, adapting in some cases existing technologies and certainly utilising novel ones when they facilitate its development.

It is commonplace to observe in relation to early cinema that many of the innovators of pre-cinematic moving images were lone individuals: dilettantes and gentlemen inventors. In many cases they were motivated by scientific or technical interests rather than envisioning cinema as a mass entertainment (Edison is usually seen in the latter terms – though considering the appeal of cinema as ephemeral). In this respect they embody what Simondon in his 1968-1969 seminar advances about the typical inventor of the nineteenth century, as being independent of the material networks which supported earlier forms of labour but constrained them in space and time, working instead on small-scale models "at the disposal of their means of operation as well as their mental equipment" (Simondon, 2005, p. 76). The nineteenth-century inventor synthesises, alone, available sciences and technologies in order to form new machines, conceived of deductively. In terms of early cinema we can think of Eadweard Muybridge's adaptation of the magic lantern projector for animal motion studies or Étienne-Jules Marey's photographic "gun", capable of taking 12 pictures serially in a second, as obvious examples of such a process. Obviously these scientific and technical interests needed investment – sponsors or personal fortunes – and were themselves dependent on the economic networks of existing industries.

Most histories of the birth of cinema are then written in terms of lone individuals, be they scientists or engineers, or perhaps magicians and stage performers, innovating and improvising from a wide range of motives. There then follows, usually with Edison as the indicative figure, the attempt to standardise and slap a patent on the technology in order to profit from it. Enticknap (2005, p. 16) summarises as follows: "a pattern emerges whereby a significant technological advance ... tends to happen in two stages: the research and development which makes the process technically viable, and the changes to economic and industrial practice which enables its widespread commercial use".

In terms of Simondon's analysis of the genesis of technical objects, the dependence, or otherwise, of technical invention on purely economic motives is not the focus – some might see this as in fact a lacuna in his work although it is true that he acknowledges contemporary motives of efficiency and utility in production as not true to the essence of technics. In any case, in early cinema historiography, the motives for its invention are not usually taken to be initially those of developing a mass entertainment industry – even Edison, the most commercially minded and litigious of its inventors saw the form as a diversion that audiences would soon outgrow, albeit one that promised profit in the short to mid term. Were the focus of this article on later innovations in cinema in the era of standardisation, say, the introduction of sound or colour technologies, the industrial and commercial pressures from an established mass entertainment industry would certainly be more immediately visible as determinants.

Whatever our verdict on these questions, in terms of the development of cinema, in order to consider the pertinence of Simondon's ideas on major and minor inventions, we can consider the introduction of

certain elements to cameras and projectors, which were crucial in the production of moving images, as to whether they embody the processes of adaptation-concretisation and hypertely outlined in the previous section. A couple of examples must suffice here.

One such element introduced into both camera and projector was the intermittent device, necessary to move the film, during shooting and projection in a non-continuous, regular manner. Put simply, if 16 frames per second was standard in the silent era of cinema (although this risks exaggerating the standardisation of cinema early on) then the film has to be moved on 16 times a second, then kept still after each of these movements for the exposure (in addition, the shutter has to be open for the exposure but closed while the film is moved on, to avoid the film developing while being wound on). The same is true for projection – the individual frames must be lit from behind, then unlit while the film moves on, then projected once more. In order to facilitate each of these processes, an intermittent device is required for the discrete movement of the film through camera and projector. A continuous movement of the film through a viewing device was acceptable for Edison's kinetoscope peepshow, but not on screen in front of an audience, where the image was too blurred unless each frame was kept in place during projection.

The intermittent devices used were variants of claw-and-cam devices and Maltese crosses. The first were familiar from industrialised sewing machines, allowing a strip of material to be advanced bit by bit before insertion of needle and thread (the movie camera–sewing machine analogy is featured in a montage sequence of Dziga Vertov's *Man with a Movie Camera*, 1929). The Maltese cross device "in essence converts the continuous drive from a cranking handle or motor into the intermittent movement of a shaft with a sprocket at one end, which engages the film's perforations" (Enticknap, 2005, p. 135). This gizmo replaced claw-and-cam devices by the early twentieth century in projectors since it was gentler to film stock as well as being extremely accurate in its motion.

Another element was the Latham loop (named after Woodville Latham) introduced to Thomas Armat's Vitascope projector after its invention in 1896. The loop "was a length of film positioned between the continuously moving sprockets which transported the film through the mechanism, and the gate in which it was intermittently held stationary" (Enticknap, 2005, p. 135). The devices inserted above and below the gate served as a shock absorber and are retained to present-day analog projectors.

We may ask then whether the introduction of the Latham loop and Maltese crosses constitute adaptation-concretisation or hypertely. And further, what would constitute evidence either way? Here we would have to consider whether these elements (which in Simondon's conceptions are component elements that are not "individuals" themselves) enhance the self-regulation and autonomy of the system and whether they do this through increasing the autonomy of the system or merely counteracting deficiencies inherent in the machine. The Latham Loop seems more straightforwardly to be an instance of minor invention: a device that serves to absorb shock inherent in celluloid as a material, without any other organic function. This is an adaptation that serves to compensate for a deficiency in celluloid itself as a medium for carrying photographic images.

In the case of an intermittent devices such as the Maltese cross, its purpose is so crucial to the projection of still images in a sequence to enable projection that it seems rather to inaugurate the possibility of projected moving pictures, and therefore to be an instance of major invention. As a case of adaptation-concretisation, we might argue that the incorporation of an intermittent device conditioned a new milieu of early cinema exhibition and spectatorship. It might take an expert in the technology of cinema to provide more reliable verdicts on which additions to the apparatus were merely compensatory, and which were undoubtedly "major" inventions in Simondon's sense!

Though after the period under consideration here, this also raises the question as to whether television and digital cinema, and so on, represent major inventions in the same "lineage" as cinema or whether they constitute entirely new technical objects. Simondon in *MEOT* writes: "The beginning of a lineage of technical objects is marked by a synthetic act of invention that is basic to a *technical essence*" (Simondon, 2007, p. 22). A lineage is marked by a stable essence, but productive of supplementary concretisations in its functioning. This is because after a given process of individuation, there remain pre-individual potentialities in the system making up the individual and its milieu. The question would be whether these more recent media share the essence of cinema or represent a new essence altogether. Is the "technical essence" of cinema moving pictures – or moving pictures through projected roll film? Perhaps we will come to see

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celluloid roll film as a type of hypertely – a dead end for moving pictures that required a new lineage of digital technologies to replace it.

In the case of a given lineage of technical objects, for Simondon, adaptation-concretisation involves a close relation to an "associated milieu" (Simondon, 2007, p. 31). This associated milieu exists only virtually before the invention; nonetheless, the invention realises or actualises this "techno-geographic" milieu as its own condition of possibility. "Invention", Simondon (2007, p. 33 translation modified) claims, "is a taking charge of the system of actuality by the system of virtualities". He draws a parallel here between individuation in the living being with its associated milieu – and creative invention of technical objects, in which once again a process of individuation is anterior to the creation of being and its milieu.

Furthermore, for technical objects, this associated milieu is possible only through human intelligence. This is where Simondon (2007, p. 32) gives an account of a necessary "creative imagination", a "conditioning of the present by the future" which creates the associated milieu and technical object by anticipation. In this priority of creative imagination anticipating the object, we can see here a potential rapprochement between Simondon's conceptions and Bazin's myth of total cinema – though what separates them is the closer intrication in Simondon's thought between the material genesis of technical objects and invention itself. Indeed, neither is conceivable without the other for Simondon. For Jean-Yves Chateau, Simondon's account is irreducibly material, indeed technological – and conceptions of invention call for "a psychology of reflection and of intelligence, which considers technical reality as a true invention, as the resolution of a specifically technical problem" (in Simondon, 2005, p. 51). We might say that Bazin's conceptions of moving pictures are more in line with what Simondon describes as "creativity" instead of "invention", the former being a less determinate, rather more unfocused process than the latter.

The emphasis in Simondon's account of the associated milieu seems to accord well with the emphasis of many accounts of early cinema on the wider technological and cultural context. Indeed, we would have to talk of associated milieux since these would bring in existing popular entertainments such as magic lantern shows, panoramas and dioramas, and optical toys; technical invention both by passionate amateurs (such as William Friese-Greene), sponsored polymaths (such as Muybridge) and financially motivated entrepreneur-inventors (such as Edison); as well as nineteenth century visual culture, especially urban, in the widest general terms.

As cinema proceeded from Edison's kinetoscope parlour, this associated milieu would come to include production facilities such as Edison's Black Maria Studio (Fulton, 1976, p. 25) and Méliès's purpose-built studio; distribution networks both of film and apparatus; exhibition venues; and just as widely, the development of spectatorship as such – new visual competences and affective investments from a rapidly proliferating demographic. This was the audience for early cinema, for what Tom Gunning (1990) has called the "cinema of attractions". As Pasi Väliaho (2013, p. 161) states, "the moving image, in its inception, produced transformational spaces where the individual became problematized and regulated in a new manner – not only in narratives and rhetorical figures ... but more importantly, in the spatial patterning of perception".

Indeed, Simondon is gesturing towards questions of perceptions and affects in the very brief passage in which he discusses cinema in *MEOT*. I will not linger over his characterisation of television as an inferior technology to cinema, but the terms he uses for cinema imply a high valuation:

> Cinematographic motion has a powerful hypnotic quality and pace that soften the reflective faculties of the individual in order to bring him to a state of aesthetic participation. Organized as a time series that uses visual terms, the cinema is an art and means of expression of emotions; there the image is a word or a phrase, not an *object* with a structure that can be analyzed by the activity of the individual being; there the image is rarely an immobile and shining symbol (Simondon, 2007, p. 59).

It is interesting to note that *MEOT* was published in the same year as Claude Lévi-Strauss's *Anthropologie structurale* (1958). Chateau notes the polemics during this decade between ethnologists such as André-Georges Haudricourt and Georges Granai, on the one hand, and the structural anthropologist Claude Lévi-Strauss, who wished to subsume the analysis of technology and culture under a linguistic model. For Chateau, Simondon's own "process of concretisation of technical reality is radically of another order than

all that is language or that which, of course, without being it in one sense, can be analysed like a language" (in Simondon, 2005, p. 54). Structuralism too, in this sense, can be seen as part of the literary bias of culture *qua* "system of defence against technics" (Simondon, 2007, p. 1).

One of the most important points Simondon (2007, p. 59) is making in the discussion from which I have just quoted is that for him cinema is a "cinematic and dramatic action" rather than a graphics and thus it escapes the "encyclopaedic" thought of the era, which spatialises in series another series that is temporal in origin (there are obvious connections here with the analyses of Henri Bergson). This conception, as well as serving as a rejection of structuralism, reflects Simondon's (2007, p. 66) contention that "the primacy of letters in cultural education comes from that omnipotence of opinion; ... literary culture is therefore a slave to groups; it belongs to groups from the past".

Cinema might escape the alleged dead weight of an exclusively literary culture through its images being irreducible to words; perhaps too an interest in cinema might promote the more technical culture Simondon advocates, one in which an understanding of its mechanisms might overcome a historical resistance to technical objects: this for him will in fact be a humanism of sorts. He wishes to show that "culture fails to take into account that there is a human reality in technical reality and that, if it is to fully play its role, culture must come to incorporate technical entities into its body of knowledge and its sense of values" (Simondon, 2007, p. 9).

In the conclusion of *MEOT*, Simondon criticises once more hylomorphism as a model for technology and production, which is also his target at the start of his doctoral project. The artificial separation of form and matter as static terms is rejected for the process of taking form (*prise de forme*), which alone is the concern of technics. Simondon argues that instead of being exterior to this process in contemporary society, the worker "should be able to enter into the mould with the clay, make themselves at once mould and clay, live and feel their common operation in order to think taking form in itself" (Simondon, 2001, p. 329).[2]

Such a conception involves one of Simondon's key concepts, that of transduction. Here questions of ontology and epistemology overlap – for it is transduction that accounts both for the ontogenesis of technical and other objects, but also for our intuition of these, which occurs via a process of analogy. So inserting the worker into the self-regulating becoming of technical objects will overcome the psychic alienation of the operator too – through the worker's grasp of the process in reflexive thought (Chateau, 2008, p. 116). As Miguel de Bestegui summarises, "Transduction is not only an ontological category, then. It also designates the method of thought itself. As a method, the transduction does not remain outside thought" (De Bestegui, 2013, p. 173).

We might argue that cinema is an exemplary technical object for transduction not only of technical objects but also as a method of thought. Cinema works as a machine to produce perception and affect and in its positioning of the viewer via point of view, allows the spectator "to enter into the mould with the clay". Such a view brings us close to the ideas of Daniel Frampton (2006), who argues that film itself can be a medium for thought – transduction indeed appears to model such a process. An understanding of the technical nature of moving image technology, in its early days and now, would facilitate the insertion of the enlightened spectator into technicity and a genuine technical culture.

It is worth pointing out that the third part of *MEOT* provides an ambitious account of the genesis of various different phases in the relations between humans and the world. The first of these is a magic relation, which provides a unified system relating humans to the world. This is followed by a split into two phases, the technical and the religious. Each of these two split into a theoretical and a practical aspect (for technics: science and morality).

Simondon argues that in the end, it is philosophy that can reunite these various fields through transductively thinking their relation; this is its contribution to culture. However, there is a sort of intermediate case of aesthetic thought, the "neutral point between technique and religion" (Chateau, 2007, p. 43),

[2] I have used Ninian Mellamphy *et al*'s (2007) translation in progress of *On the Mode of Existence of Technical Objects* as far as possible – though since the translation is incomplete, later passages indicated through the earlier publication date (2001) are my own translation. All other translations from sources in French in the bibliography are my own unless otherwise stated.

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which tries to think the unity of the religious and the technical in a less systematic and more affective mode.

It is interesting to conjecture that cinema might also straddle several of these types of relation between humans to world. It is worth pointing out the origin of some cinema production and exhibition in nineteenth century magical entertainments.

> Many of the early film showmen were professional magicians, and early film culture owes a great deal to the ambivalent position which film held somewhere between science and magic – that is, a sense of the objective reproduction of the world on the one hand, and the magical creation on the screen of separate worlds on the other (Chanan, 1996, p. 15).

Chanan's quote brings out this sense of cinema partaking in a magical, technical and scientific relation to the world; obviously, too, it is an aesthetic response to the world also, one that is able at least potentially and for a given time to reconcile these divergent modes of relation.

Alienation and technical culture

Since we have been considering materialist conceptions of the birth of cinema, in relation to the contested nature of invention and technology, this article will finish by discussing the shared interest in Karl Marx and Simondon in the relations between machines, alienation and culture. It will be informative to contrast, briefly once more, the varying conceptions from an earlier avowed materialist with those of Simondon, who explicitly mentions Marx in his own analysis of these questions.

The question of alienation is associated with the writings of the young Marx, in the *Economic and Political Manuscripts* of 1844 especially. For Marx, the worker is alienated in capitalism from what he or she produces, since the latter is appropriated by the capitalist. Increased industrialisation and the division of labour exacerbates this experience. After Marx was writing, this was taken even further in the Fordist and Taylorist working practices of the twentieth century, to which Hollywood practice in the twentieth century is often compared, in its compartmentalisation of functions.

Another obvious reference here, in the relations to work and technology, is the famous "fragment on machines" from Marx's *Grundrisse* (Marx, 1993, pp. 690-712). Some of Marx's interest in machines is in the impoverishment of the worker and his or her increased exploitation (this argument is developed in the first volume of *Capital*). In Marx's nineteenth-century language, he argues, "The most developed machinery thus forces the worker to work longer than the savage does, or than he himself did with the simplest crudest tools" (Marx, 1973, p. 709).

Machines also play an important role in the organic composition of capital, for Marx. As capitalism develops, the amount of fixed capital, including raw materials and means of production, increases in relation to variable capital, the capital laid out in terms of labour. In the *Grundrisse*, Marx states that machinery is "the most adequate form of *fixed capital*" (Marx, 1993, p. 694). Put simply, machines and technology become the increasingly greater proportion of capital – and require fewer and fewer workers to operate for the same output as before. Dead labour weighs ever more heavily over living labour.

However, there are certain passages in Marx's work that present a countervailing tendency facilitated by the rise of the machines. This more positive aspect of the introduction of machines is often emphasised by Italian readers of Marx, especially of the *Grundrisse*. Paulo Virno (2007, p. 4) highlights the importance of machines in the development of "general intellect": machines testify to the extent to which "general social knowledge has become a direct force of production". Or in the words of Guido Starosta, "Marx not only claims that in order to be really free labor must become a consciously organised, directly social activity, but also that the consciousness regulating that emancipated productive activity must be of a general and scientific kind" (Starosta, 2011, p. 43). This development of general intellect will, according to these readings, anticipate and prepare for post-capitalist formations.

In fact, this conception of a general intellect is remarkably close to Simondon's own conceptions of a properly scientific culture. Both ideas imply the close implication of the ontogenesis of technical objects and human acts of creative invention. We can also point to a shared interest in ideas of alienation and la-

bour – but here their conceptions differ more markedly. Here we will consider Simondon's own arguments about alienation in contemporary culture.

In *MEOT*, alienation is first mentioned on the second page of the introduction, whose main cause in the contemporary world is, simply "failure to understand [*méconnaissance de*] the machine" (Simondon, 2007, p. 1). This is linked with what we have indentified above as, for Simondon, culture's attachment to the dead world of letters at the expense of technics. Later on these points will be expanded and explicitly related to Marx's early conception of alienation as related to the expropriation of the products of the individual worker's labour in capitalism. Simondon's (2007, p. 72) argument is as follows: "The alienation of man from the machine has more than a socio-economic meaning; it also has a psycho-physiological meaning; the machine no longer extends corporeal experience [*schéma corporel*] to workers or to those who own the machines". We can recognise in the *schéma corporel*, a rare reference to Maurice Merleau-Ponty, Simondon's doctoral supervisor, whose analyses in *The Phenomenology of the Perception* are brought to mind here.

Simondon's point is not to deny Marx's assertion that workers are alienated in capitalism; it is rather to deny that the basis of this alienation lies in private property and in the privation of the worker from ownership of the means of production. For Simondon, abolishing capitalism in itself will not end the alienation of the worker in contemporary societies. Rather, the root of this alienation is in the relation of the operator with the technical object. Technics itself is implicated in the question of alienation – only through integrating workers into production through a technical culture that will bring them an understanding of the individuated technical object, will alienation be overcome. Here once more, transduction provides the model both for the genesis of technical objects and for the intuition of this in reflexive thought. As we have seen, the operator must intuitively or reflectively "enter into the mould with the clay".

Though Simondon recasts the question of alienation as a problematic involving the worker's relation to technical objects, via technicity, Simondon is not denying the economic and social factors that Marx places at the centre of his accounts both in the early works and in the *Grundrisse*. However, for Simondon, the expropriation of the product of the worker's labour is a consequence of alienation from technicity and culture, not vice versa. As Vincent Bontems states: "From the moment that the machine is conceived only as a means of production and its operation is evaluated solely by the yardstick of a form of productivism, it determines in its turn an organisation of labour where men are inevitably alienated" (Bontems, 2013, p. 16). As Bontems underlines, for Simondon, a liberation of the worker will inextricably involve a liberation of the machine.

At first glance, Simondon's solution to the problem of alienation in contemporary labour might seem "idealist" in the old sense of construing it as a mental problematic – getting the workers more involved and providing them with a technical education that will allow them to intuit or reflect on the process. From a Marxist perspective this might appear to involve reconciling the worker to the existing relations of production rather than changing these relations themselves. However, Simondon states repeatedly that "productivism" and an emphasis on utility and efficiency directly obstruct true technicity – so liberation of the worker from a Simondonian perspective would inevitably involve changing the relations of production as they exist under capitalism.

In relation to cinema, this brings us once more to questions about production (as well as distribution and exhibition) in relation to the cinema industry's workforce. This takes us beyond the scope of this article but a consideration of labour in the moving image industries – and its nature as alienated or non-alienated in a Simondonian sense – would be an interesting one for the rapidly developing field of media industry studies. This would also, in relation to the question of a genuinely technical culture, situate such questions at the intersection of studies of media industries and studies of their audiences.

Conclusions

Perhaps Simondon's contention that liberating machines is the "same struggle [*combat*]" as liberating humans (according to Bontems, 2013), and that this is more fundamental than property relations in producing alienation, is the most contentious aspect of Simondon's conceptions for the more traditional materi-

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alisms. It could be argued that this makes his own work seem close to techno-utopianism.[3] Here too we should bear in mind Simondon's own position in the mid century at the Sorbonne and *grandes écoles*. This might seem to have given Simondon an environment, set of institutions and a wider culture that was welcoming to and supportive of a relatively autonomous technical culture, in ways that may not be true in our place and time. Apart from elite institutions in France, perhaps we can speculate that his conceptions are nonetheless compatible with a strain of democratic modernism associated with the expansion of higher education in the mid last century in Britain, or with social democracy generally in Europe after the second world war.

Attempts to imagine a post-capitalist society and culture are frequently dismissed as utopian, sometimes by Marxists and sometimes by others, writing about Marxists. There is little in Marx's work speculating on what post-capitalist formations might be like concretely, other than the withering away of the state. However, perhaps we can see in Simondon's advocacy of a technical, not just a literary culture, one driven by the ontogenesis of technical objects and not the extraction of surplus value, a glimpse of what a society not built on the division of labour and separation of manual and academic labour might involve. As Simondon (2001, p. 334) writes in *MEOT*, "The hierarchical distinction of the manual and the intellectual does not strike a chord in the world of technical objects". And perhaps, at the risk admittedly of sounding techno-utopian, cinema – or other forms of moving image – might play a role in fostering such a culture, for an audience encouraged to understand the ontogenesis of cinematic and other technical objects.

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[3] In relation to much later technologies, Christian Fuchs (2013) has recently argued out that we need to be sceptical about the liberatory potential *in itself* of participatory cultures driven by technology, pointing out for instance the unpaid labour involved in various forms of social media. The extremely one-sided participation of people in some of these forms of labour would not constitute non-alienated labour in either a Marxist or a Simondonian sense.

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