From the 1857 Introduction to the 1867 Preface: Reflections on Marx's Method in the Critique of Political Economy

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Abstract

Marx noted in the Preface to the 1867 edition of capital that beginning is difficult in all sciences. His work on this text reflected Marx and Engels's view that there was only one science: history, embracing nature and society. Unsurprisingly, the natural sciences shaped their work in important ways. My article notes the impact of Darwinism, thermodynamics and cell biology in Marx's analyses and examines the third of these in detail. When Marx eventually settled on the value-form of the commodity as his starting point in *Capital*, he described it as the economic cell form of the capitalist mode of production. This reflected a new step in his critique of political economy. For, in contrast to his account of two previous methods of political economy outlined in the 1857 Introduction, his subsequent interest in cell biology suggested a third method that would sublate and supersede them. The commodity provided the simplest, most apparent, and most immediate elementary unit of the capital relation and would serve both as a presupposition in his analysis and its eventual posit (result) as the analysis unfolded all its contradictory and dynamic implications for the logic of capital. This reflects his re-reading of Hegel's *Science of Logic*, which was also concerned with the choice of starting point in exploring an organic totality. The cell analogy was useful as Marx sought the best starting point for his critique. In this context, I identify six parallels between cell biology and Marx's analysis of the capitalist mode of production that might have influenced his starting point and subsequent analysis. But they remain analogies and did guided neither his substantive research nor its presentation, which reflects the historical specificities of the capital relation. The article ends with some general conclusions on discovery, methods, and the method of presentation.

Keywords

Capital; cell form; cell theory; commodity; method of presentation; method of research; money; natural sciences; starting point

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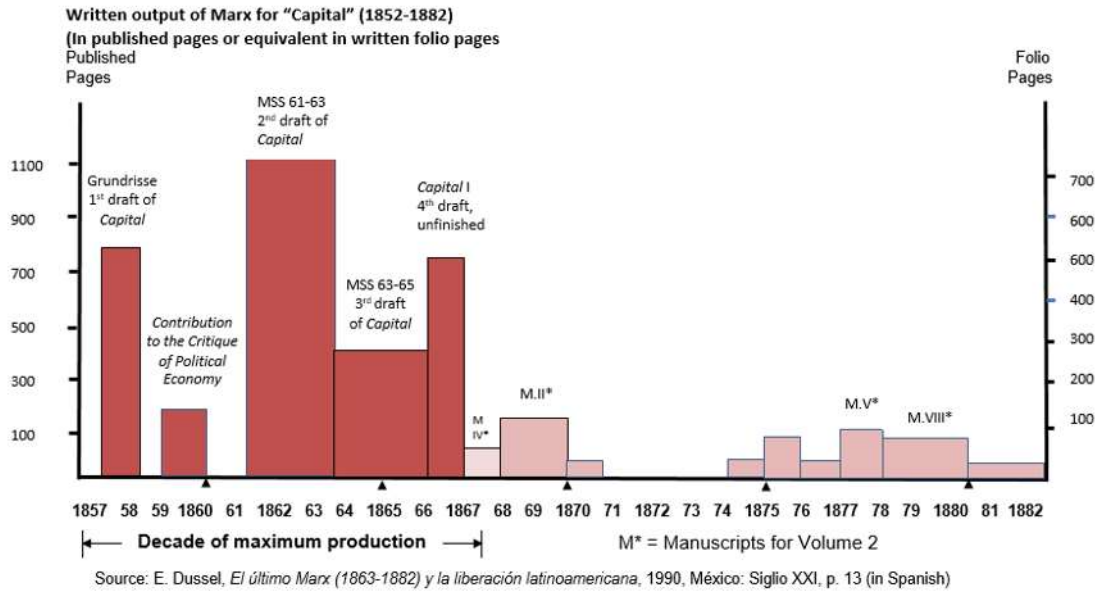
Marx intended to write a short book on method once he had finished *Capital*. In 1858, he wrote to Engels that this text would comprise 2 or 3 printers' sheets, i.e., between 32 and 48 printed pages, and present "the *rational* aspect of the method in Hegel's *Logic*" (Marx to Engels 16 January 1858; *MECW 40*, p. 249). Ten years later, in 1868, following the publication of the first volume of *Das Kapital*, he wrote to Dietzgen that, "when I have shaken off this economic burden, I shall write a 'Dialectic'. The correct laws of the dialectic are already contained in Hegel, although in a mystified form. They must be stripped of this form" (Marx to Joseph Dietzgen, 9 May 1868, *MECW 43*, p. 31).[1] Marx had previously made several passing comments on method, starting in the 1840s, and he would pen others, including an afterword to the second German edition of *Capital* (1873) and his marginal comments on Wagner's textbook on political economy (1879-80) (Marx 1975). Yet there are few extended discussions of method, let alone a coherent overview, in his published work, making it harder to discern Marx's method of research and how he used the dialectic (Gamble & Walton 1972; Sayer 1979; Beamish 1992; Jánoska, Bondeli, Kindle, & Hofer 1994; Germer 2001; Arthur 2004; Pepperrell 2011; Hanzel 2014, 2015; Moseley & Smith 2014).

This article focuses on changes in Marx's account of his method between the preparation of the incomplete 1857 Introduction to the *Contribution to the Critique of Political Economy* and the writing of the Preface to the first edition of *Das Kapital, vol. I,* which was published in 1867. This interval was the period of maximum production in Marx's preparatory work for *Capital*, with c3150 pages compared with c750 draft pages over the next 15 years (Dussel 1990, see Figure 1 below). It was also the time when Marx settled on his method of presentation (*Darstellungsweise*) as well as the basic plan for *Capital*.

> According to Rosdolsky (19[6]8: 27),[2] the definitive plan for *Capital* was announced by Marx in a letter to Engels from 1865. However, this plan had been established during the writing of the *Economic Manuscript of 1861-1863*, as evidenced in the section "The revenue and its sources," where Marx exposes the complete logical system of *Capital*. In fact, many important questions were set during this period, and

only then would Marx write and re-write his work in a way that resulted in the three complete volumes (de Paula et al., 2012, p. 171).

Figure 1. Written Output of Marx for *Capital* (1852-1882)



These ten years are crucial, then, for exploring important changes in Marx's understanding of his scientific method. He was especially proud of this approach, claiming that the composition of the whole argument in *Capital* would be hailed as a triumph of German scholarship (*Wissenschaft,* or disciplined scientific study) (Marx to Engels, 20 February 1866, *MECW* 43, p. 232). It is worth stressing Marx's description of *Capital* and its organic character in the light of the assertion that there is only one science. This is the science of history, "the history of nature and the history of men [sic]", which included their co-evolution "so long as men exist" (Marx & Engels 1975, pp. 28-9n). For, as is now increasingly acknowledged, Marx's interest in nature and the natural sciences had profound implications for his developing critique of political economy and, indeed, political ecology (on the latter, see, especially Saito 2017).

Marx and the Natural Sciences

Writing on nineteenth-century scientific development, Friedrich Engels noted that Ludwig Feuerbach (*1804-†1872) "had lived to see all three of the decisive discoveries — that of the cell, the transformation of energy, and the theory of evolution named after Darwin" (1990, p.

372). In more detail, and in Engels's order of presentation, which matches their historical sequence in Western Europe, these scientific breakthroughs comprise:

First, **"**the discovery of the cell as the unit from whose multiplication and differentiation the whole plant and animal body develops" (Engels 1990, p. 385). This discovery was initially the joint work of Matthias Schleiden and Theodor Schwann, who had worked respectively on plant cells and animal cells, and discovered that the two kinds of cell shared the same properties. They presented their findings in *Mikroskopische Untersuchungen über die Übereinstimmung in der Struktur und dem Wachstum der Thiere und Pflanzen* (1839, translated into English in 1847, reprinted in 1910). It inspired other work on cell biology, physiology, metamorphosis, and metabolism, including by Ernst Haeckel, another leading German cell biologist, who was also an ardent supporter of Darwin. Marx and Engels were familiar with Schleiden and Schwann and other work on these topics.

Second, the law of the transformation and conservation of energy established implies that "the transformation of energy, which has demonstrated to us that all the so-called forces operative in the first instance in inorganic nature — mechanical force and its complement, so-called potential energy, heat, radiation (light, or radiant heat), electricity, magnetism, and chemical energy — are different forms of manifestation of universal motion, which pass into one another in definite proportions so that in place of a certain quantity of the one which disappears, a certain quantity of another makes its appearance and thus the whole motion of nature is reduced to this incessant process of transformation from one form into another" (Engels 1990, p. 385).

Third, "the proof which Darwin first developed in connected form that the stock of organic products of nature environing us today, including man, is the result of a long process of evolution from a few originally unicellular germs, … these again have arisen from protoplasm or albumen, which came into existence by chemical means" (Engels, 1990, pp. 385-6).

Engels's statement about Feuerbach also holds for Marx (*1818-†1883), who was interested in contemporary science and tried to keep up-to-date with advances in many fields. Engels had already referred to the first two discoveries in a letter to Marx on 14 July 1858, when he referred to cell theory and thermodynamics; and Marx in turn had written excitedly about Darwin's new book on the *Origin of the Species* in a letter to Engels on 13 December 1859 (Engels to Marx, July 1859, *MECW* 40, p. 329; and Marx to Engels, 13 December 1859, p. 551).

The most familiar of these discoveries for most Marxist commentators is the third in the sequence, namely, Darwin's theory of evolution. His *Origin of Species* was published in English in the same year as Marx's *Zur Kritik der politischen Ökonomie* (Contribution to the Critique of Political Economy) and had a far bigger impact, including in Germany, than Marx's work of that year (Marsden 1999, pp. 102-104). Marx praised it highly and considered it to have achieved in natural history what he and Engels had realised for the domain of human history.[3] His comments on Darwin during the period that he was preparing *Capital* have focused attention on this discovery. In addition, Marx considered, half seriously, that Darwin had introduced the class struggle into nature with his account of natural selection. More significantly, in the Preface to the first German edition of *Capital I*, Marx wrote that, for him, "the evolution of the economic formation of society is viewed as a process of natural history" (1996, p. 10; cf. afterword to second German edition, 1996, p. 18). He proceeded to identify analogies between natural selection and the evolution of tools and technology in the division of labour (Marx 1996, p. 346; cf. pp. 489-913). He also interpreted competition as a crucial mechanism of natural selection in relations among those "hostile brothers", individual capitalists, in whose competition, "one capitalist kills many" (Marx 1998, p. 252; Marx 1996, p. 750; cf. Moseley 2002).[4] He commented, probably semi-seriously, on "natural selection" in the labour force (1996, pp. 274-5); and he almost certainly drew his contrast between a bee's hive-building capacities and the achievements of the worst architect from Darwin's discussion of hive-bees' "inimitable architectural powers" (Darwin 1859, pp. 227-8; Marx 1996, p. 188).

The influence of the second discovery, the transformation of energy, has been recognized more recently. This occurred through examination of Marx's *Exzerpthefte* (excerpt notebooks) from the 1850s and his published and unpublished drafts of *Capital* rather than because of Marx's public pronouncements or correspondence. Its significance emerged through his analysis of the transformative power of the steam engine in industrial production and his reading of texts on labour-power (Wendling 2009). The growing unification of theories about energy embraced animal and human physiology – another topic on which Marx made extensive notes. An important result of this discovery for Marx is his discussion of *Arbeitskraft*, translated as labour-power, the capacity or potential to perform living labour – a concept that was absent from classical political economy. According to Rabinbach, it was not Marx but Hermann von Helmholtz who originated the term (Rabinbach 1990, p. 46). Von Helmholtz extended the scope of the term "*Kraft*" beyond its original context, where it described the forces unleashed

by machines that converted chemical or heat energy into mechanical energy, to describe all of nature, including human labour, in terms of this sort of conversion. Rabinbach further notes that, "[w]ith this semantic shift in the meaning of 'work,' all labor was reduced to its physical properties, devoid of content and inherent purpose. Work was universalized" (1990, p. 47). Marx regarded his concept of labour-power as one of two "best points" about *Capital*, because it allowed him to describe the two-fold character of labour once it is divided into concrete and abstract labour (Wendling 2009, p. 52; citing Marx to Engels, 24 August 1867, *MECW 42*, p. 407). In this context, while concrete labour refers to specific modes of expending human labour-power (cf. Marx, 1996, pp. 52-55), abstract labour refers to the common quality of different kinds of human labour in the abstract (1996, p. 71). The abstract character of labour power is continually rebased through innovation and competition and becomes socially necessary labour time in specific spatio-temporal contexts (Postone 1993). Temporality and (ir)reversibility were also key emerging themes in thermodynamics at the time (expressed in the notion of entropy) and crucial to Marx's exploration of the political economy of time.

The first scientific discovery, that of the cell as the unit from whose multiplication and differentiation the whole plant and animal body develops, is the least remarked of the influences on Marx's critique of political economy. This is probably because its history is less known or because commentators have missed its significance. For, on the one hand, Marx mentions the economic cell form (*Zellenform*) or germ form (*Keimform*) only once each and elementary form (*Elementarform*) twice in the 3 volumes of *Kapital* compared with the more generic notion of simplest form (*einfachste Form*) (13 times); and, on the other, he employs many other analogies, metaphors or references drawn from the natural sciences. For example, *Stoffwechsel* (metabolism), first developed, as John Bellamy Foster notes, in the 1830s by scientists engaged in cellular biology and physiology and then applied to chemistry (notably by Justus Liebig) and physics (Foster 2013), occurs 28 times in *Kapital's* 3 published volumes. The concept is also applied metaphorically in the discussion of *conversion* and *reconversion* of different moments of the capital relation (commodity, money, etc.) in its expanded reproduction. Thus, there are over 1300 references in *Kapital I-III* to *Verwandlung* (conversion) and *Rückverwandlung* (reconversion), which are key terms in cell metabolism and thermodynamics alike. In addition, cell biology tends to be subsumed into Marx's more general interest in physiology and its relevance to anthropology and land economy.

Yet the influence of cell theory on Marx's work is hidden in plain sight. For, in the Preface to

the first German edition of *Das Kapital*, Marx wrote:

> The value-form, whose fully developed shape is the money-form, is very elementary and simple. The human mind has for more than 2,000 years sought in vain to get to the bottom of it all, whilst on the other hand, to the successful analysis of much more composite and complex forms, there has been at least an approximation. Why? *Because the body, as an organic whole, is more easy [sic] of study than are the cells of that body*.[5] In the analysis of economic forms, moreover, neither microscopes nor chemical reagents are of use. The force of abstraction must replace both. But in bourgeois society, the commodity-form of the product of labour — or value-form of the commodity — is the *economic cell-form*. To the superficial observer, the analysis of these forms seems to turn upon minutiae. It does in fact deal with minutiae, but they are of the same order as those dealt with in microscopic anatomy (1996, pp. 7-8, italics added).

2. Method in Political Economy

This discussion of method highlights the importance of epistemology as well as ontology. In the same text, Marx wrote: "every beginning is difficult, holds in all sciences" (1996, p. 7). This could be an indirect reference to Hegel's concern in the Science of Logic with "the difficulty of finding a beginning in philosophy", especially as, for Hegel, this was also a science, indeed, a pure science (*reines Wissen*) (Hegel 1998: 67; cf. 2010, p. 28). For Marx, however, regarding *Capital*, it refers in the first instance to the difficulties that he anticipated that his readers might have with the opening chapters (*ibid.*), which he felt obliged to rework several times and across different editions. And, regarding the more general critique of political economy, it could well refer to the difficulties that the Physiocrats and their opponents found in establishing the starting point of political economy. For, as Marx observed in the *Grundrisse*:

> The crucial issue was not what kind of labour creates *value* but what kind of labour creates *surplus value.* They were thus discussing the problem in a complex form before having solved it in its elementary form; just as the historical progress of all sciences leads only through a multitude of contradictory moves to the real point of departure (1987b, p. 297).

The progress of Marx's quest for an entry-point also involved many contradictory moves. Thus, his comment could also refer to his own difficulties in finding the right starting point for his critique of the categories, practices, and dynamic of political economy. Indeed, he spent several years looking for the best entry-point for his critique before he identified the commodity as the elementary form of the capital relation, which, as such, could provide the starting point for his critique. His initial critique, of Hegel's philosophy of law, began with the separation between state and civil society (1842-3); money was highlighted in *The Holy Family*, 1844, as well as the *Economic and Philosophical Manuscripts* (1844); then, with Engels, he turned to the social relations of production and reproduction in the materialist conception of history (*German Ideology*, 1845-6); revisiting capitalism, money once again became a key social relation (*Poverty of Philosophy* 1847); the 1857 Introduction returned to civil society; then Marx looked behind money to exchange relations (*Grundrisse*); and he finally settled on the commodity (*Contribution to the Critique of Political Economy* and the opening chapters of *Das Kapital*).

In addition, these challenges concerned not only the method of research but also the method of presentation that was appropriate for reproducing the real-concrete as a concrete-in-thought (see below). A fortiori, they also concerned the interweaving of phases of research, drafting, and final editing. And these in turn are obviously conditioned by the ontological assumptions about the object of inquiry – the real-concrete as it appears to the senses and is transformed into an object of scientific analysis. In this regard, of course, Marx adopted a materialist approach as opposed to the idealist approach favoured by Hegel. He discussed both approaches in general terms in his 1857 *Introduction* and, in addition, juxtaposed two methods of inquiry in political economy that ultimately do not seem to have been decisive in writing *Capital*.

The first method starts with a real and concrete precondition of production that remains an empty phrase, amounting to a chaotic conception of the whole, until it has been decomposed into its simplest determinations and then recomposed, this time as "a rich totality of many determinations and relations" (1986a, p. 37). This approach corresponds to the "descending" method of political economy in the 17th century and is illustrated by William Petty's *Political Arithmetyk* (1690) (Marx 1986a, p. 37). Early Political Economy took population as its "comprehensive" starting point in the real world – a category that was the most visible form in which the object of national economics appears. It then aimed to reproduce this "real starting point" in thought "as a synthesis of many determinations" (1986a, p. 38). While focusing on political economy, Marx criticized Hegel's phenomenology. Specifically, he attacked Hegel's

idealist premises, which take the real starting point as the product of the thinking mind rather than as having an existence "outside the mind and independent of it" (1986a, pp. 38-9).

The second method takes the simplest (or most abstract) element of a specific mode of production as its point of departure. It then explores the historical presuppositions of this element (its "concrete substratum"), the historical development of this elementary form into its most abstract expression; and its articulation with other elements to form more complex moments of production. It may also seek to show how more complex moments can be derived logically, with due recognition of historical contingencies, from the simple, elementary form that is chosen as the starting point. This "ascending" approach is characteristic of Classical Political Economy, as exemplified in Adam Smith's synthetic method in *The Wealth of Nations*. While praising Smith's theoretical breakthroughs, Marx criticized his treatment of bourgeois categories as universal or transhistorical and, relatedly, his emphasis on the formal rather than material aspects of capitalist production. The German nonetheless proposed to adopt the ascending approach in his critique of political economy. He aimed to identify the historical *differentia specifica* of the capitalist mode of production (hereafter CMP) vis-à-vis the elements common to production in general (a rational abstraction).

Marx illustrated this approach from Hegel's philosophy of law, which began by analysing possession as the simplest legal relation. Next, referencing Adam Smith, he considers *labour* (not, be it noted, labour-power) as the simplest element identified in classical political economy and comments on the historical conditions in which "labour as such" (rather than specific kinds of labour) can become an abstract starting point for the analysis of modern political economy as labour becomes "a means to create wealth in general" (1986a, pp. 39-42). This anticipates the distinction between concrete and abstract labour (see below). After presenting the general abstract determinations that characterize all forms of society, attention must turn to "the categories which constitute the internal structure of bourgeois society and on which the principal classes are based" (1986a, p. 45). Next comes a progressive movement from more abstract-simple to more concrete-complex categories, culminating in the world market.

While Marx indicated his preference in the Introduction for the second method of inquiry, he did not follow it to the letter in subsequent texts on capital. Instead he chose the commodity as the simple, elementary, or most abstract starting point for his analysis rather than labour or other core categories mentioned in the Introduction. Commodities are mentioned only once in

the 1857 introduction and in relation to commodity prices rather than the commodity form. In contrast, money is referenced 11 times, capital in different forms appears 28 times, and labour and wage-labour together figure around 50 times (Marx 1986a: 17-44). The *Grundrisse* (1857-8) effectively begin with Chapter 2, on money, which ends rather than begins with some remarks on the commodity, and then moves to Chapter 3, on capital, which is ten times longer than that on money. In contrast, the commodity as the *Elementarteil* ("elementary unit"), "elementary existence", or "simplest concrete form" of the capitalist form of wealth is the first topic of chapter 1 in *Contribution to the Critique of Political Economy* (1859), followed by a chapter on money, with the expected chapter on capital being absent from the published version. This is also the starting point, of course, of the first volume of *Capital*. This could well be because labour-power cannot be the starting point because, whether it is regarded as an actual commodity or as a fictitious commodity, the commodity form would have to be taken for granted, rather than analysed. So, the commodity is logically prior to labour-power and must be considered before attention turns to the two special commodities: money and labour-power.[6]

Table 1 suggests that Marx adopts a third method in *Capital* compared with the various preparatory manuscripts. This method is indebted to the example of cell biology, which led Marx to take the simplest element of the CMP as his starting point: this does not mean that Marx employed the cell metaphor or analogy slavishly in a pseudo-scientific transfer of its concepts and mechanisms to the capital relation. But his reading of cell biology does seem to have affected the *substance* of his argument as well as its starting point. The substance is, of course, an unfolding of the *value form* of the commodity as the presupposition and posit of the unfolding dynamic, contradictory character, and inherent crisis-tendencies of the capital relation. As Roberto Fineschi notes, the commodity provides the ideal starting point because it is not abstract content but a unity of form and content. Specifically:

> ... the economic cell must at the same time express *the universal character of the content and the formal determinacy it assumes in the capitalist mode of production*. The commodity seems to respond to this need: this is the criterion for choosing it [as 1) the starting point]. 2) Its ability to represent at the most abstract level possible the unity of material content and social form is not, however, enough to characterize [the commodity as] the economic cell: *it must contain, potentially, in itself, the exposition of the whole theory of capital* (2001, p. 44, my translation, italics in original).

Table 1: From the 1857 Introduction to *Das Kapital, Vol 1* (1867)

	1857 Introduction		Kapital I <1867>
	Method 1	**Method 2**	**Marx's Method**
Example	Early Political Economy	Classical Political Economy	Critique of Political Economy
Starting point	Chaotic conception of the whole as it appears at first sight to a naïve observer	Decomposition of the whole by an informed theorist into analytically distinct but connected parts	Identify the ultimate morphological element that is also the nucleus of all further development
Initial object	The real-concrete	Several abstract-simple elements	The simplest element
Method	Descending analysis into constituent elements to better grasp the whole	Ascending synthesis to create rich totality that reproduces real-concrete as a concrete-in-thought	Logical-historical analysis of dialectical relations between the simplest element as both presupposition and posit of the whole

Source: Jessop (2018)

This excludes both the one-sided descending and one-sided ascending methods of Early and Classical Political Economy. It requires a unique combination of (1) logical analysis based on "the force of abstraction" (Marx, 1996, p. 8) to identify the simplest social relation of the CMP that can be linked *in potentia*, by virtue of its inherent contradictions, to other bourgeois social relations such that what is initially an immediate presupposition becomes, as the presentation reaches its conclusion, is revealed as the product of the capital relation as an organic whole; (2) historical analysis of the genesis of specific economic and social forms and their changing significance in different contexts; and (3) attention to the empirical details of relevant contemporary examples of the CMP to identify emergent tendencies and/or demonstrate the plausibility of logical arguments. This can be described, controversially perhaps because of its

negative connotations in other theoretical contexts, as a "logical-historical method" (for a defence of this term against various critiques of other usages, see Jessop 2018).

3. The Commodity as Starting Point

What happened, then, between 1857 and 1867 to prompt Marx to begin *Capital* with the commodity rather than one or more of the economic categories that received far more attention in the 1857 Introduction, namely, wage-labour, value, money, price, and capital? An obvious answer might be, as indicated above, that the commodity is logically prior to these specific forms of the capital relation and that it must therefore be presented first. Moreover, given that wealth in capitalist social formations presents itself (appears) as an immense accumulation of commodities, it also corresponds to Hegel's suggestion in the *Science of Logic* that this science should begin with the immediate (1998, pp. 67-72, 77-78; cf. 2010, pp. 27, 40, 134).[7] In addition to occasional remarks in correspondence and hints in the excerpt notebooks, we have four main sources for explaining this choice: Marx's *Preface* to the first German edition (1867); different editions of Volume I (1867-83); the initially unpublished "Chapter 6: Results of the Direct Process of Production" (1864), which intended to link Volumes I and II; and Marx's "Marginal Notes on Adolph Wagner's *Lehrbuch der politischen Oekonomie*" (1879-80).

Let us begin with the Marx-Engels correspondence. On 14 July 1858, Engels wrote to Marx:

> One has no idea, by the way, of the progress made in the natural sciences during the past, 30 years. Two things have been crucial where physiology is concerned: 1. the tremendous development of organic chemistry, 2. the microscope, which has been properly used only during the past 20 years. This last has produced even more important results than chemistry; what has been chiefly responsible for revolutionising the whole of physiology and has alone made comparative physiology possible is the discovery of the cell—in plants by Schleiden and in animals by Schwann (about 1836). *Everything consists of cells. The cell is Hegelian "being in itself" and its development follows the Hegelian process step by step right up to the final emergence of the "idea"—i.e. each completed organism* (*MECW 40*, p. 326).

This observation could have been a trigger, especially as Marx acknowledges in a letter written on 4 July 1864, that, in the natural sciences, Engels is always ahead of him and "I always follow

in your footsteps" (*MECW 41*, p. 546). As this letter also indicates, he certainly begun reading extensively in histology, cell biology, physiology, and related disciplines.

This exchange occurred in the year after Marx penned the 1857 Introduction. It may explain why, in contrast to its focus on *method in political economy*, the 1867 Preface highlights *method in the natural sciences* and their interest in the micro-foundations of macro-level phenomena. This would hold for cell biology, thermodynamics, and Darwin's theory of evolution among other fields of inquiry. Specifically, in an allusion to the newly burgeoning field of histology and its accompanying cell theory or cell doctrine, Marx mentions the role of microscopy and chemical reagents (staining agents for making tissue structures more visible).

Marx then presents "mikrologische Anatomie" (where micrological refers to the analysis of phenomena at a microscopic scale) as the model for his point of departure, with a view to moving from the commodity as the economic cell-form of the CMP through the process of cell formation, differentiation, repetition (simple reproduction), and growth (expanded reproduction or accumulation) to provide a complete account of the whole organism formed by a social formation dominated by the CMP. Moreover, as Marx also noted, because microscopy cannot be applied in the analysis of social forms, it must be replaced by "the force of abstraction" (1996, p. 8). Abstraction is not a purely logical procedure. It must relate to the object of inquiry. In the case of Marx's critique of political economy, it is guided by the case of England's capitalist development up to the 1860s as the closest parallel to physicists' observation of natural processes where they exist in their most typical (*prägnateste*) form with the least external disturbance and/or to their conduct of experiments in conditions that isolate the normal case (in German, *rein* or pure) (1996, p. 8). Later, Marx will show growing interest in France as an instantiation of finance capital and in the USA as a site of even more advanced forms of the capital relation regarding the enterprise form and finance.

I now present six key propositions in cell theory that could have inspired Marx. These propositions draw on texts in cell biology, physiology, histology, and so on, that Marx and Engels were likely to have known directly or indirectly:

1. All living organisms – plants and animals alike – are composed of one or more cells (Schwann 1847). Or, as Virchow put it: "the cell is really the ultimate morphological

element in which there is any manifestation of life, and … we must not transfer the seat of real action to any point beyond the cell" (1858, p. 3; 1860, p. 3).

2. Following from this, the cell is the most basic unit (*Elementarteil*) of life (Schwann 1847).
3. Cells lead independent lives that, at least in animals, are shaped by the life of a larger organism of which they are part (*ibid.*).
4. *Omnis cellula e cellula*, i.e., "every cell arises from another cell" (Virchow 1855, 23; 1860, 27). [8]
5. Cellular reproduction depends on metabolic exchanges with the environment (including other cells) that convert food/fuel into energy to run cellular processes, create the building blocks for cell formation, and eliminate waste.
6. Embryonic cells can – but need not – differentiate into other kinds of cell, generating the higher order forms (specialized tissues, organs) that comprise a functioning organism.[9]

These points find parallels, conscious or unconscious, in Marx's analysis of the commodity, the circuits of capital, and the differentiation of different moments of the value-form and other categories of the capital relation. Here I draw on the preparatory works to *Capital*, different editions of *Capital*, and the comments on Wagner. Thus:

1. The living organism or *Gesellschaftskörper* (social body) of the CMP depends on the dynamic arrangement of the value form and its cognate forms into concrete-complex relations (Marx 1987a; 1996).
2. The elementary unit (*Elementarteil*) of the value form is the commodity (1996, p. 45), which is also the economic cell form (*Zellenform*) of the CMP (1996, p. 8).
3. Commodities lead independent lives that are shaped by the life of the CMP of which they are a part – they are both presupposition and posit of both simple and expanded reproduction (see below).
4. *Omnis merx e mercibus,* i.e., every commodity from commodities.[10] This can take the form of simple commodity circulation, i.e., C-M-C, or of the circuit of capital, with the potential for expanded reproduction, i.e., M-C-M'). As Marx wrote, "[i]n capitalist production of products as commodities, on the one hand, and the form of labour as *wage-labour,* on the other, becomes absolute" (1989a, 445, italics in original; cf. 1989a, p. 375).

5. Production, distribution, and exchange are analysed as metabolic processes, examining how different elements are converted into each other and how a "metabolic rift" can produce pathological effects in the overall production process as it unfolds in time-space (see especially Foster 2000; Saito 2017).
6. Embryonic contradictions in the commodity as cell form (or germ form) of the value relation generate further developments in the capital relation. These include the initial two special commodities (labour-power and money as universal equivalent), the price form, money as capital, and so on. For example, the commodity form of value "is a mere germ form (*Keimform*), which must undergo a series of metamorphoses before it can ripen into the price form" (1996, p. 72).[11] More generally, contradiction is the generative mechanism that drives the metamorphosis of the value form and of capitalist societalization.

One possible reason for taking the commodity as the starting point for a critique of the categories, social relations, and dynamic of social formations in which the CMP is dominant is that Marx identified an essential contradiction in this cell-form. This was the contradiction-in-unity of use-value and exchange-value in the value-form of the commodity. On this basis, he unfolded the complex dynamic of the CMP – including the necessity of periodic crises and their creatively destructive role in renewing accumulation.

While the first two points need no elaboration here, the other four points do merit discussion.

Ad 3, the simple commodity is the presupposition of distinctive capitalist forms. Marx therefore proceeded from "the simplest social form in which the product of labour presents itself in contemporary society, and this is the *'commodity'"* (1975, p. 544). On this basis, Marx could then explore the "double life" of the commodity: as a commodity (which nonetheless presupposes that other commodities exist) and as an integral part of the CMP's overall logic. As he wrote in the *Grundrisse*:

> If in the fully developed bourgeois system each economic relationship presupposes the other in a bourgeois-economic form, and everything posited is thus also a premiss, *that is the case with every organic system*. This organic system itself has its premisses as a totality, and its development into a totality consists precisely in subordinating all elements of society to itself, or in creating out of it the organs it still lacks. This is

> historically how it becomes a totality. Its becoming this totality constitutes a moment of its process, of its development (1986b, p. 208).

Similar arguments are presented in the original draft of the chapter on money for *Contribution to the Critique of Political Economy* (1987c, p. 497). In addition, in the *1861-63 Manuscript*, Marx writes:

> It is as such a prerequisite that we treat the commodity, since we proceed from it as the simplest element in capitalist production. On the other hand, the product, the result of capitalist production, is the commodity. What appears [*erscheint*] as its element is later revealed to be its own product. Only on the basis of capitalist production does the commodity become the general form of the product and the more this production develops, the more do the products in the form of commodities enter into the process as ingredients (1989a, p. 301; cf. Marx 1996, p. 376).

Ad 4, regarding the proposition that every commodity stems from commodities, Marx argued in the unpublished Chapter 6 (written in 1864) that:

> *Commodities,* i.e. use value and exchange value directly united, emerge from the [labour] process as *result,* as product; similarly, they enter into it as constituent elements. But *nothing at all can ever emerge from a production process without first entering into it in the form of the conditions of productio*n (1989a, pp. 387-8, final italics mine).

Ad 5, highlighting metabolic conversion in the unpublished chapter 6, Marx wrote:

> The conversion of money, which is itself only a converted form of the commodity, into capital only takes place once labour-power [*Arbeitsvermögen*] has been converted into a commodity for the worker himself. … Only then are all products converted into commodities, and only then do the objective conditions of each individual sphere of production enter into production as commodities themselves (1989a, p. 359).

There are many similar comments in the preparatory and actual texts of *Capital*. Indeed, as noted, *Verwandlung* and *Rückverwandlung* occur over 1300 times in its 3 published volumes.

Ad 6, the commodity form is the common principle of development for other social forms. As the opening lines of the first German edition state:

> Der Reichthum der Gesellschaften, in welchen kapitalistische Produktionsweise herrscht, erscheint als eine "ungeheure Waarensammlung", die einzelne Waare als seine *Elementarform.* Unsere Untersuchung beginnt daher mit der Analyse der Waare (Marx MEGA^2 II.5 Kapital I 1867, p. 17, italics in original)

> [The wealth of societies in which the capitalist mode of production prevails, appears as an 'immense collection of commodities' and the individual commodity appears as its *elementary form*. Our investigation begins accordingly with the analysis of the commodity (my translation, italics in original)]

Marx repeats this point in his 1879-80 comments on Wagner's *Lehrbuch der politischen Oekonomie*:

> What I proceed from is the simplest social form in which the product of labour presents itself in contemporary society, and this is the "*commodity*." This I analyse, initially in the *form in which it appears*. Here I find that on the one hand in its natural form it is a *thing for use*, alias a *use-value*; on the other hand, a *bearer of exchange-value*, and from this point of view it is itself an "exchange-value." Further analysis of the latter shows me that exchange-value is merely a "*form* of appearance," an independent way of presenting the *value* contained in the commodity, and then I start on the analysis of the latter. … Thus I do not divide *value* into use-value and exchange-value as opposites into which the abstraction "value" splits up, but the *concrete social form* of the product of labour, the "*commodity*," is on the one hand, use-value and on the other, "value," not exchange value, since the mere *form* of appearance is not its own *content* (1975, p. 544).

In this sense, the value form of the commodity contains the embryonic contradiction that becomes the germ form (*Keimform*) of other contradictions. All forms of the capital relation can be unfolded dialectically from the value-form of the commodity, considered as the unity of exchange-value and use-value, as a unity of [historical] form and [universal] content. So,

Marx soon moves from the commodity to two of its special forms: first, labour-power (which also has a dual character as use-value and exchange-value and is also explored in terms of its dual character as concrete labour and abstract labour) (cf. Marx 1975, p. 546); and, second, money as the universal commodity, which is later analysed in terms of its metamorphosis into capital. Later Marx will explore another special commodity: land as private property and forms of rent (Marx 1998). In these and other cases, the commodity is the simple *concretum* from which all other forms can be derived through a combination of logical reflection and historical analysis (a logical-historical approach) in order, eventually, to reproduce the real-concrete as a concrete-in-thought, as "a rich totality of many determinations and relations" (1986a, p. 37). This argument recalls Hegel's *Science of Logic*, which begins with the immediate, simplest, most concrete notion and then reconstructs it so that, "although it is something thought, even abstract, the rational is at the same time something *concrete,* because it is not a *simple, formal* unity, but a *unity of distinct determinations*" (2010, p. 132).

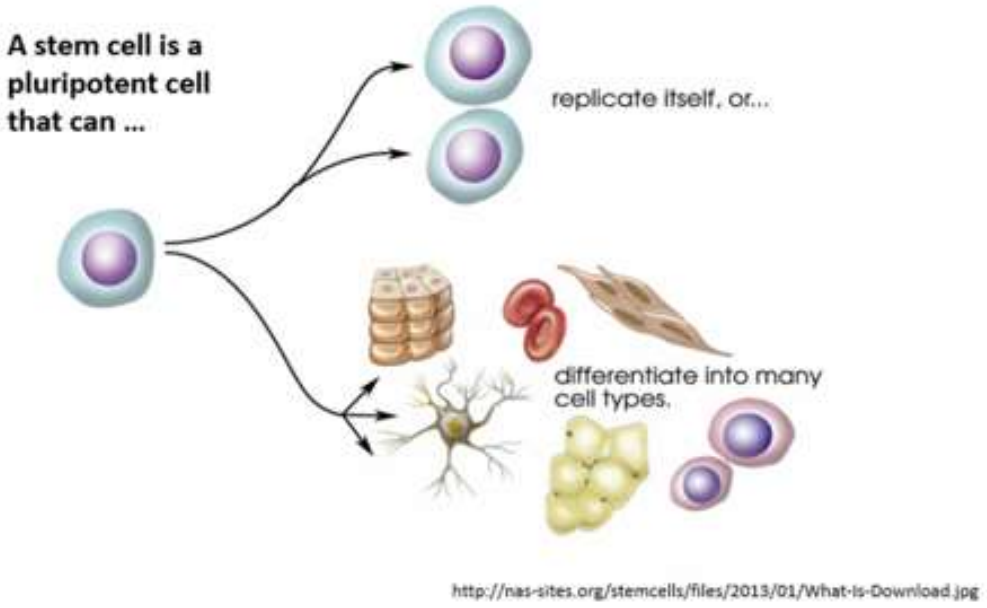
Igor Hanzel develops this argument persuasively in a recent analysis. He suggests that the commodity as a germ form is the equivalent of Hegel's elementary form:

> Why did Marx take this method from Hegel? The answer is, at least in my view, that Marx saw the strength of Hegel's method as proved by the fact that the latter employed it successfully in the construction of network integrating over two hundred philosophical categories. So, at least in my view, Marx could have viewed this method as suitable also for the construction of his network of categories of political economy. This network, according to my first tentative count, integrates at least 30 such categories. … Since Marx applied the cyclical feature of the method of ascent from the abstract to the concrete in Capital, it may seem that he made an attempt, like Hegel, at the creation of a network of categories as a purely self-justifying system. However, as shown above, Marx's network is, due to the methods employed in its construction, open to the theoretical treatment of new economic facts (Hanzel 2015, p. 436).

The Commodity as the Economic Stem-Cell Form?

As a dedicated lay follower of advances in the natural sciences, had he lived long enough, Marx would have learnt about stem cells within two decades of the first publication of *Das Kapital*. The key ideas were formulated in Germany in the 1870s and 1880s and finally confirmed

experimentally in the 1890s. The term appears in the scientific literature as early as 1868 in the works of the German biologist, Ernst Haeckel, who was also active as a second-generation[12] "scientific materialist", a current condemned by Karl Marx because it invoked science, including cell biology and Darwinism, in its attacks on scientific socialism (see Mitchell 1978). Haeckel originally employed *Stammzelle* to describe the unicellular ancestor of all multicellular organisms (Haeckel, 1868, 1874), later extending the term to describe the fertilized egg that gives rise to all cells of the organism (Haeckel 1877)[13] (see Ramalho-Santos & Willenbring



Source: prepared by Catherine Twomey for the National Academies, *Understanding Stem Cells: An Overview of the Science and Issues,* http://www.nationalacademies.org/stemcells. Academic non-commercial use is permitted.

Figure 2: The Dual Character of Stem Cells

2007). Then, adopting Haeckel's term, Theodor Boveri demonstrated that stem cells were carriers of germ plasm and were the starting points for embryological development of differentiated body cells as well as germ cells. Boveri's noted that stem cells had both a capacity for self-renewal and a capacity for differentiation (Maehle 2011, p. 11). Interestingly, it may not have been necessary to wait even two decades. For the general idea of stem cells was already implicit in the six key arguments from cell theory that were summarized above

Thus, given the cumulative knowledge about cells and stem cells, it is tempting to speculate

that, thus informed, Marx might well have described the commodity as the "economic stem-cell form" of capitalist social formations. It is now recognized that stem cells reproduce themselves through simple repetition but are also pluripotent, having the capacity to form very different kinds of cell with different properties and functions (see Figure 2). Likewise, the value-form of the commodity can be seen from two perspectives: as the elementary unit of the capital relation that reproduces itself through the circuit of capital *and* as a pluripotent stem cell that can differentiate [logically and/or historically] into many other special forms of the capital relation that are often essential to its expanded reproduction. The first perspective concerns either simple commodity production, which takes the form of C-M-C, or the metamorphosis (metabolism) in the circuit of capital in the form of M-C-M'. The second perspective – the pluripotency of the commodity form – indicates how the elementary contradiction in the value-form of the commodity between use- and exchange-value leads to differentiation. In addition to wage-labour and money, Marx discusses many other forms of the capital relation and the wider capitalist social formation (regarded here as an ensemble of forms). These also have their own specific properties, contradictions, and impact on the expanded reproduction of capital and the organic character of capitalist social formations. While the stem-cell metaphor enables these arguments to be stated more clearly, they were already implicit in cell theory as it existed in 1857-1867, when Marx was drafting *Capital*. Thus, the heuristic power of the stem cell analogy depends less on its capacity to restate Marx's arguments that its capacity to generate further insights.

For example, without drawing on this metaphor, I have proposed that the contradiction at the heart of the value-form of the commodity has parallels in other forms of the capital relation. They embody different but interconnected versions of this basic contradiction. They also impact differentially on (different fractions of) capital and on (different categories and strata of) labour at different times and places Thus, productive capital is both abstract value in motion (notably in the form of realized profits available for reinvestment) and a concrete stock of already invested time- and place-specific assets in the course of being valorized; the worker is both an abstract unit of labour-power substitutable by other such units (or, indeed, other factors of production) and a concrete individual (or, indeed, collective workforce) with specific skills, knowledge and creativity; the wage is a cost of production and a source of demand; money functions as an international currency exchangeable against other currencies (ideally in stateless space) and as national money circulating within national or plurinational spaces subject to state control; land functions both as rent-generating property (based on the private

appropriation of nature) and as a more or less renewable and recyclable natural resource (modified by past actions); knowledge is the basis of intellectual property rights and a collective resource (the intellectual commons). Likewise, the state is not only responsible for securing key conditions for the valorization of capital and the reproduction of labour-power as a fictitious commodity but also has overall political responsibility for maintaining social cohesion in a socially divided, pluralistic society. Taxation is an unproductive deduction from private revenues (profits of enterprise, wages, interest, and rents) and a means to finance collective investment and consumption (Jessop 1983, 2002, and 2011). The tension between the two co-existing poles, each of which is a naturally necessary or inherent feature of a given contradiction and, indeed, together define it in their opposition, generates strategic dilemmas on how to handle the contradiction. It also provides, as Marx noted more generally regarding the metamorphosis of the circuit of capital, the abstract possibility of crises in these different moments of the capital relation (see Marx 1989b, pp. 138, 143-4, and, more generally, pp. 130-50). To elaborate these claims inspired by (stem) cell theory is a topic for another paper.

Conclusions

> … the role of Marx's dialectics was also to *grasp a structured totality where each element depends on its relation to other elements and the whole*. Since the totality of these relationships cannot be presented immediately the first difficulty is *where to begin*. Marx begins, in Part One, with the 'commodity' and its inner dialectical opposition between use-value and value, and then posits the 'value-form' as peculiar modality through which this contradiction is exhibited. From here *all that is presupposed* – all of the relations of capital as a whole – *is progressively posited*. So, although value presupposes capital, *value itself begins as an empty concept*, in the sense that *the complex determinations and relationships that constitute capital have yet to be analysed and presented* (Taylor & Bellofiore 2004, p. 12, italics added)

Nicola Taylor and Riccardo Bellofiore's extended comment can be related to Marx's suggestion that 'the body, as an organic whole, is more easy of study than are the cells of that body' (see above). The challenge is to relate the two within the organic whole. This involves considering the logic of discovery, the role of self-clarification, and the method of presentation. At most I would claim that cell biology is relevant to the logic of discovery, suggesting ways to link the commodity to the capitalist mode of production as the organic totality. Recognizing

the limits of reducing investigation of the social world to the logic of the natural sciences (whilst noting the unity of the natural and social worlds), it would make little sense to derive and develop the analysis of the CMP through strict analogical unfolding. Indeed, Marx was harshly critical of attempts to take analogies out of context. This was the basis of his criticisms of the German "scientific materialists" of his time, who sought to derive immediate political conclusions from the discoveries of nineteenth-century natural science, to which some of them were influential contributors. For example, at a time when the natural-scientific materialists were supremely popular in Germany, Marx directed an aside in Volume 1 of *Capital* at what he called "abstract materialism". He wrote:

> The abstract materialism of a natural science which excludes the historical process is defective, as we can see in a moment when we glance at the abstract and ideological conceptions voiced by its advocates whenever they venture beyond the bound of their own speciality (Marx 1996, pp. 375-6n).[14]

He made a similar point in another context in a letter to Engels:

> It is plain to me from this one note that, in his second grand opus, the fellow [i.e., Ferdinand Lassalle] intends to expound political economy in the manner of Hegel. He will discover to his cost that it is one thing for a critique *to take a science to the point at which it admits of a dialectical presentation,* and quite another to apply *an abstract, ready-made system of logic* to vague presentiments of just such a system. (Marx to Engels, 1 February 1858, MECW 40, p. 261, my italics.)

It follows that the method of research and the method of presentation must be substantively as well as formally adequate to the object of research. This was indicated in the 1857 Introduction but even the second method recommended by Marx identified too many starting points in the real-concrete. Marx's interest in cell biology provided the breakthrough necessary to find the unique, singular starting point from which other concepts could be unfolded and that would permit an eventual return to the commodity as a presupposition to show how it was also a posit, the necessary effect of the overall logic of an organic whole. This was also the method in Hege's science of logic. The difference is that Marx started with the real – the commodity – and not a concept.

Endnotes

[1] Cited in Beamish, 1992, pp. 1-2.

[2] De Paula et al. give the date as 1948; this is an error.

[3] Marx read *The Origin of Species* three times, from mid-November to mid-December 1860, in early to mid-June 1862, and in French sometime before mid-February 1869 (Sheasby 2004, p. 68).

[4] Marx to Engels: "It is remarkable how Darwin rediscovers, among the beasts and plants, the society of England with its division of labour, *competition, opening up of new markets, "inventions"* and the Malthusian "struggle for existence"" (18 June 1862, MECW 41: 381).

[5] Kölliker's *Gewebelehre* (*Histology*) opens with two remarks: microscopic anatomy (*mikroskopische Anatomie*) is now just as much one of the foundations of medicine as the anatomy of the organs and systems; and a basic study of physiology and pathological anatomy is impossible without exact knowledge of the most minute form relations (1852: iii, my translation). His book surveys the elementary parts (*Elementartheile*) of the body and the finer construction (*Bau*) of organs (1852, iii).

[6] Hegel wrote in the preface to the second edition of the longer *Logic*: "Thoroughness seems to require that the beginning, as the foundation on which everything is built, should be examined before anything else, in fact that we should not go any further until it has been firmly established and if, on the other hand, it is not, that we should reject all that follows" (1998, p. 41).

[7] "The definition with which any science makes an absolute beginning cannot contain anything other than the precise and correct expression of what is *imagined* to be the *accepted* and *familiar* subject matter and aim of the science" (Hegel 1998, p. 49). Hegel continued: "because that which forms the beginning is still undeveloped, devoid of content, it is not truly known in the beginning; it is the science of logic in its whole compass which first constitutes the completed knowledge of it with its developed content and first truly grounds that knowledge" (p. 72). This is also the case with Marx's method of presentation in *Capital.*

[8] *Omnis cellula e cellula* is attributed to François-Vincent Raspail (e.g., Florkin 1969; Harris 1999, pp.32-33; Bechtel 2006, p. 72n) but I have not found direct textual evidence for this. He did write that "the plant cell, like the animal cell, is a kind of *laboratory of cellular tissues*, which organize and develop themselves at its heart" (Raspail, 1833, p. 516, my translation, italics added). This might indicate *omnis cellula e cellula* (cf. Frobert 2011; Klein 1981). Virchow introduced the notion in an article in 1855; but it is not in the first German edition of

his book, although the idea is present (1858, p. 25). He originally wrote omnis cellula a cellula – modifying it to "e cellula" in an interpolation in the second edition, from which the English translation cited here was made (1860, p. 27).

[9] Schwann, for example, identified five types of human tissue that could emerge from an embryonic cell.

[10] Cf. Sraffa's analysis of the production of commodities by means of commodities (1960).

[11] Cf. McCarthy on the commodity as the "simplest category", the "*Keimform"* (or germ form), that "contains within itself the totality of all forms of capitalist social structure and their contradictions of the capital relation" (1988, pp. 115-16).

[12] Cf. On Haeckel as a second-generation scientific materialist, see Gregory (1997, p. x).

[13] This book was translated by E. Ray Lankester, a natural scientist who was a friend of Marx and Engels and attended Marx's funeral.

[14] „Die Mängel des abstrakt naturwissenschaftlichen Materialismus, der den *geschichtlichen Prozeß* ausschließt, ersieht man schon aus den abstrakten und ideologischen Vorstellungen seiner Wortführer, so bald sie sich über ihre Specialität hinauswagen" (Marx 1983, p. 303n).

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