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On the Differences between the Classical and the “Western” Marxist Conceptions of Science

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ABSTRACT: This essay aims to provide an account of the differences between what I call the “Classical Marxist” conception of science which was adhered to by Marx and Engels and further developed by Boris Hessen and others on the one hand, and the conception of science which characterizes “Western Marxism” as it developed through the work of the theorists of the Frankfurt School on the other hand. I argue that Western Marxists such as Herbert Marcuse and Max Horkheimer did not in fact successfully criticize the logical positivist account of the modern natural sciences. Instead I argue that they implicitly accepted the positivists’ characterization of the modern natural sciences (as they interpreted it) and then proceeded to devalue the modern natural sciences on this basis. I also show that Marcuse and Horkheimer, even though they presented themselves as revolting against the alleged “economism” of Classical Marxism, ended up endorsing a view of science which is functionally equivalent to a reductive economic conception of science. I argue that the Classical Marxists’ conception of science is far richer and far more interesting than either a stereotyped “economic” conception of science or the Western Marxist conception of modern science as merely an element in a historical process centered on the oppressive universalization of instrumental reasoning.

KEYWORDS: History and philosophy of science, Marxist philosophy of science, Hegel, Marx, Engels, Western Marxism.

*Time was when man had a heaven, decked and fitted out with endless wealth of thoughts and pictures. The significance of all that is, lay in the thread of light by which it was attached to heaven; instead of dwelling in the present as it is here and now, the eye glanced away over the present to the Divine, away, so to say, to a present that lies beyond. The Spirit’s gaze had to be directed under compulsion to what is earthly, and kept fixed there; and it has needed a long time to introduce that clearness, which only heavenly realities had, into the crassness and confusion shrouding the sense of things earthly, and to make attention to the immediate present as such, which was called Experience, of interest and of value. (Hegel, preface to *The Phenomenology of Spirit*)*

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THIS BRIEF ESSAY WAS OCCASIONED by my encounter with a self-identified Polish “critical theorist” at a conference on Hegel in the summer of 2018. After pointing out to him that his views were incompatible with any kind of respect for the epistemic authority of modern natural science, I was told that “we [presumably meaning “progressive scholars” or “leftists,” or something of that sort] should just give up on science.” This essay is an attempt to understand this point of view, especially in relation to what I regard as the “Classical Marxist” conception of science. I do not intend to dogmatically present the standpoint of “critical theory” or “Western Marxism” as a heterodox degeneration from the “lofty standards of classical Marxism,” even if it is clear that my sympathies are with the latter. However, I do intend to point to the chasm which separates the standpoint of Classical Marxism with respect to science from the standpoint of some tendencies of “critical theory” or “Western Marxism” with respect to science.¹ The aim of this article is not to provide an exhaustive account of what the first generation of Frankfurt School theorists thought of science. Instead, I aim to contrast the standpoint of Classical Marxism with certain tendencies in the writings of Horkheimer and Marcuse, which can lead one to adopt reductive views about modern science and technology.²

It is clear that Marx and Engels took themselves to be engaged in some form of science [*Wissenschaft*]. Hence, the claim that “we [Marx and Engels] know only a single science, the science of history” (Marx and Engels 1976a, 28). However, from the fact that Marx and Engels took themselves to be engaged in some kind of *Wissenschaft*, we cannot make direct inferences about their views regarding the relationship between their science of history and the natural sciences. For the German word ‘*Wissenschaft*’ can be used to refer to organized bodies of knowledge in general (Beiser 2011, 6). I.e., it does not necessarily carry the connotations of a body of knowledge that deals with natural phenomena and which seeks to describe them in terms of quantitative relations (which I take to be the connotations of the English word ‘science’ today). More evidence is needed in order to grasp

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1. Critical theory insofar as it has historically been associated with the Frankfurt School has been sometimes referred to as “Western Marxism,” hence the use of the interchangeable labels (Kautzer 2017). Although some scholars have also argued that Frankfurt School theorists eventually brought about a break with “Western Marxism”, see the overview in Kautzer 2017, 59–60.
 2. This claim does not apply to the most prominent member of the second generation of Frankfurt School theorists; Jürgen Habermas. For Habermas, “it is not science per se that legitimates domination, but science mediated by technology” (Ray 1979, 170).

Marx and Engels’ view. This evidence comes in the form of Marx and Engels’ attachment to the unity of science thesis.³ For the quotation reproduced above continues:

[...] we know only a single science, the science of history. One can look at history from two sides and divide it into the history of nature and the history of men. The two sides are, however, inseparable; the history of nature and the history of men are dependent on each other so long as men exist. (Marx and Engels 1976a, 28)

Further support for the claim that Marx adhered to the unity of science thesis is to be found in *The Economic and Philosophical Manuscripts of 1844*: “natural science will in time incorporate into itself the science of man, just as the science of man will incorporate into itself natural science: there will be one science” (Marx 1975a, 304). As Helena Sheehan (2017 [1985], 50) has noted, it is quite ironic that Marx expresses himself so clearly in relation to the unity of science thesis in the text which has been taken by “critical theorists” (and/or “Western Marxists”) to give us the “anti-positivist” Marx who did not think that there was a place for the natural sciences in the articulation of a critical social theory.⁴ The dispute about to what extent Marx and Engels (especially the latter as depicted by the “anti-Engels literature”,⁵ which has become a kind of cottage industry and which depicts Marx as a Jesus of Nazareth figure whose doctrines have been corrupted by Engels, who in this narrative gets cast as a modern St. Paul) were “positivists” is important in relation to this discussion, but I do not intend to take it up here at any great length.⁶ However, I will note that the Frankfurt School theorists (specifically Marcuse and Horkheimer) did not attempt to refute logical positivism qua philosophy of science. Indeed, its members largely accepted the logical positivist view of science (and a very simplistic version of that as well),⁷ and then proceeded to reject or at least devalue natural science on this basis (Sheehan 2017 [1985], 400; Honneth 2005, 302). As Habermas puts it: “Adorno and Horkheimer are convinced

3. In this regard, Marx and Engels are closer to someone like Neurath than to someone like Horkheimer.

4. Also, see the critique in Saito 2017, 32–35.

5. For a critical assessment of this “anti-Engels” literature, see Sheehan 2017[1985], 53–60.

6. The Jesus and St. Paul analogy comes from (Sedgwick 1966, 183) who also criticizes the anti-Engels cottage industry.

7. The question of whether they adequately understood logical positivism will not be dealt with extensively here. However, there is good evidence to suggest that they misunderstood the views of at least some of the members of the Vienna Circle. See the brief discussion in footnote 10.

that *modern science* came into its own in logical positivism” (Habermas 1990, 111). They did not seriously raise the question of whether the logical positivist account of the natural sciences was correct in the first place. As the scholar of the Frankfurt School, J.C. Berendzen (2017) notes, Horkheimer often tended to conflate what he took to be the logical positivists’ theory of science with the actuality of scientific practice. We can briefly compare this approach to Lenin’s response to logical positivism (in its embryonic Machian form) in order to outline the different strategy which was pursued by Lenin. Lenin, far from conceding that positivism provides a correct account of natural science, argues that positivist anti-realism is incompatible with the history and actuality of modern science. Thus, for example, Lenin writes of Mach that “in his philosophical wanderings the physicist Mach has completely strayed from the path of ‘modern science’” (Lenin 2021, 40).⁸ Whether Lenin is correct or not in his critique of Mach is not the issue here. What is important is that Lenin unlike Horkheimer does not take the positivists’ word as the truth about the natural sciences. Horkheimer, by contrast, does not really criticize the logical positivist conception of science. He merely surrenders to the logical positivist conception of science, and then proceeds to reject any emancipative potential that can be attributed to modern natural science on this basis.⁹

With respect to the question of Marx and Engels’ alleged positivism, it is an unfortunate fact that much of this debate conflates scientific philosophy qua genus of philosophy that arose in the late nineteenth and early twentieth centuries (Richardson 1997), with logical positivism which was merely one species of philosophy of that genus (Viola 2013).¹⁰ Marxism in

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8. Lenin is also concerned with showing that the Machian understanding of the philosophical presuppositions of natural science is not shared by other physicists, e.g., Ludwig Boltzmann (Lenin 2021, 72).
 9. This idea was first suggested to me several years ago by Richard T. W. Arthur in the course of a conversation on the history of philosophy of science in the 20th century.
 10. Moreover, we can note that that there was tremendous diversity in logical empiricism as a movement, and that some of the members of the “Left-Wing” of the Vienna Circle thought that an adequate philosophy of science required the development of an adequate sociology of science, e.g., Otto Neurath and Philip Frank (Reisch 2005, 29; Reisch 2014, 374; Reisch 2017, 239). Hence, strictly speaking, Frankfurt School theorists such as Horkheimer oversimplify when they present positivism as only concerned with a second-order theory of the logical structure of scientific theories: “it [positivism] removed thought from philosophy and reduced the latter to the technique of organizing, by reproduction and abridgement, the matters of fact given in the world of of sense. In positivism, reason sustains itself through self-liquidation” (Horkheimer 1992, 39).

its classical form was also a species of that genus (Howard 2003; Omodeo 2016). Hence, to show that Marx and Engels were positivists of some sort it is not sufficient to claim that they held some thesis that was also held by several scientific philosophers (e.g., the unity of science thesis) whom we customarily subsume under the label of “logical positivism,” for this approach does not allow one to differentiate between different species of philosophy within the genus of scientific philosophy.¹¹

For now, we must deal with an obvious objection: how can one reconcile Marx’s admiring attitude towards science with his claim that by the eighteenth-century “big industry” had successfully made “natural science subordinate to capital and took from the division of labour the last semblance of its natural character” (Marx and Engels 1976a, 73)?¹² Moreover, did Marx not explicitly claim that science insofar as it is subordinated to capital contributed to human alienation [*Entfremdung*], which is the result of “this fixation of social activity, this consolidation of what we ourselves

Andreas Vrahimis (2020, 580–581) has shown that Horkheimer misattributed certain views to members of the Vienna Circle, such as the claim that they all subscribed to the ideal of value-free science and the claim that they were all committed to methodological individualism. On the manner in which the theorists of the Frankfurt School misconceived the project of the Vienna Circle as involving epistemology in the traditional sense, see Sachs 2020.

11. Hence, the Russian Machians whom Lenin argued against were not wrong in thinking that there were metaphysical overlaps between Marxism and logical positivism. However, they were wrong to think that scientific philosophy requires us to abandon scientific realism, because they were unable to see that empiricist philosophies of science simply cannot make sense of scientific practice. For a convincing critique of empiricist philosophies of science, see Arthur 1977.
12. This question also shows that Habermas is not quite correct when he says that “science and technology” are “for Marx an unambiguous potential for liberation” (Habermas 1990, 66). Marx and Engels were clearly aware that we cannot think of technology independently of its relation to specific class structures of domination (Miller 1983, 188–195). This view is essentially in agreement with the view enunciated by Marcuse in his 1941 essay, *Some Social Implications of Modern Technology*: “technology, as a mode of production, as the totality of instruments, devices and contrivances which characterize the machine age is thus at the same time a mode of organizing and perpetuating (or changing) social relationships” (Marcuse 1992 [1941], 138–139). However, we should note that Marcuse later deviates from the view of technics (qua instruments and machines) which is found in this essay. For in this essay, he writes of technics as neutral, a view which he would later abandon: “technics by itself can promote authoritarianism as well as liberty, scarcity as well as abundance, the extension as well as the abolition of toil” (Marcuse 1992 [1941], 139).

produce into an objective power above us, growing out of our control, thwarting our expectations [...]” (Marx and Engels 1976a, 43)?¹³

There are several possible responses to this objection. The first is to recognize that what Marx meant by natural science being rendered subordinate to capital is that science, under capitalism, becomes a branch of the productive forces in a given social formation (Rose and Rose 1976a, 6). On this interpretation, science qua productive force will eventually come into conflict with existing capitalist relations of production.¹⁴ This conflict model is outlined by Marx in his *A Contribution to the Critique of Political Economy*:

[...] at a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or – this merely expresses the same thing in legal terms – with property relations within the framework of which they have operated hitherto. From forms of development of the productive forces these relations turn into fetters. (Marx 1986, 263)

In relation to this point, we must recognize that Marx made a conceptual distinction between the fact that a thing x is subordinated to capital and the possibility that this same thing x can be a contributing factor in the demise of capitalism. The most obvious example of this distinction is Marx’s claim that even though there is a clear sense in which the working classes in different European social formations have been subordinated to capital, they can also be a contributing factor in the demise of capitalism (indeed for Marx they are the main agent which will bring about the process that will lead to the demise of capitalism). Hence, the sense in

13. This account of the development of social forces and social phenomena (especially commodities) which then come to control and structure the lives of their creators is quite similar to Max Weber’s account of what ascetic Protestantism inadvertently brings about: “as asceticism began to change the world and endeavored to exercise its influence over it, the outward goods of this world gained increasing and finally inescapable power over men, as never before in history” (Weber 2002 [1905], 121). In this respect, both Weber and Marx can be characterized as theorists of unintended consequences. Although Weber’s pessimism is much more pronounced and differentiates him from Marx.

14. This classical Marxist view was also upheld by J.D. Bernal and others (Rose and Rose 1976b). We also find it expressed in some of Horkheimer’s early writings, e.g., his 1932 essay, *Notes on Science and the Crisis*: “society in its present form is unable to make effective use of the powers it has developed and the wealth it has amassed. Scientific knowledge in this respect shares the fate of other productive forces and means of production: its application is sharply disproportionate to its high level of development and to the real needs of mankind” (Horkheimer 2002 [1932], 4). However, as I argue below, this model of science as a branch of productive forces is not the most fecund Marxist model of science.

which Marx and Engels speak of capitalism as creating its “own grave-diggers” (Marx and Engels 1976b, 496). One distinction between the view of science in the writings of Marx and Engels on the one hand, and the view of science in the writings of some members of the first generation of the Frankfurt School, is that the latter tend to underplay the importance of understanding science as a domain of struggle between different ideological, political, and social lines. By this I mean that instead of depicting science as a terrain of struggle, they have a tendency in some of their writings to reify science and forget that science is done by individual scientists, e.g., when Marcuse writes, under the influence of Husserl, that “the empirical reality constitutes, in a specific sense, the very concepts which science believes are pure theoretical concepts” (Marcuse 1992 [1965], 470). Horkheimer also tends to write in this manner: “the social genesis of problems, the real situations in which science is put to use and the purposes which it is made to serve are all regarded by science as external to itself” (Horkheimer 2002 [1937], 244). Strictly speaking “science” does not believe anything. It is individual scientists who are the bearers of propositional attitudes and who believe propositions. This is not merely a pedantic point, because when one begins to speak of science as believing (or disbelieving) certain things about its relation to its wider socio-historical context, then one obscures the fact that there are intellectual struggles carried out by individual scientists who adhere to opposing ideological orientations which represent different social groups with opposing interests.¹⁵ Marcuse and Horkheimer’s manner of writing about science can also lead to the conflation of what scientists think of themselves with what scientists do (and surely any “critical theory” worth the name cannot simply assume, without argument, that these two things are identical). What are needed are empirical studies which reveal the inner workings of the natural sciences, something which the first generation of Frankfurt School theorists never provided (Collin and Pedersen 2015, 49).

Another way to respond to the objection above (with respect to Marx’s admiring stance towards science) is to point out that Marx made a distinction between science as such and the self-understanding of scientists. Marx made this distinction when he pointed out that the limitations of mechanical or abstract materialism become evident “from the abstract and ideological conceptions expressed by its spokesmen whenever they venture

15. For a relatively contemporary example, we may point to Stephen Jay Gould’s intervention in the debate about IQ and biological determinism (Gould 1996).

beyond the bounds of their own specialty” (Marx 1975b [1867], 494 fn.4).¹⁶ In other words, Marx thinks that the dominance of capitalist relations of production can lead to distortions in terms of how scientists understand the relationship between their results in relation to a narrow domain of inquiry and the significance of those results for wider social issues. Moreover, it can lead to distortions regarding how they conceive of the relationship between science and its social context, i.e., thinking of science as completely insulated from its social context (Rose and Rose 1976b, 23–34). On this Horkheimer would agree with Marx and Engels: “in traditional theoretical thinking, the genesis of particular objective facts, the practical application of the conceptual systems by which it grasps the facts, and the role of such systems in action, are all taken to be external to the theoretical thinking itself” (Horkheimer 1992 [1937], 208). However, arguably, it is not a necessary condition for being a good scientist that one should also be a good historian, philosopher, or sociologist of science.¹⁷ Arguably Newton, for example, misunderstood or at least misrepresented his own method.¹⁸ While a critique of the sciences in a manner that emphasizes the socio-historical genesis of science qua social activity is necessary, it is not clear that this should be a task for scientists and that they should be criticized for failing to do so. Herbert Marcuse does not seem to make a distinction between the content of scientific activity and the self-understanding of scientists (Sedgwick 1966, 175). To this extent, Marcuse’s critical account of science is not critical enough, in so far as it takes scientists at their word (i.e., if some of them say that they are positivists and that positivism is the most appropriate philosophy of science, then he just simply assumes that modern science is indeed positivist).

My suggestion is that the key issue here is the theory of ideology as understood by Marx and Engels (and those who upheld the classical Marxist view). For one could argue, as Marcuse and Horkheimer have argued in some of their writings that the very methods and results of science are ideological distortions that reflect the dominant capitalist relations of productions with their attendant universalization of instrumental rationality

16. For contemporary examples, we can point to someone like Richard Dawkins.

17. Although it may very well be the case that some knowledge of the history and philosophy of science can help a practicing scientist improve qua scientist.

18. As Mario Bunge puts it, “Newton praised inductivism in the same book, his monumental *Principia*, where he expounded the earliest fruit of the hypothetico-deductive method in natural science” (Bunge 2012, 29).

(Honneth 2005, 302).¹⁹ If one believes that “science in our own time is more closely related than in the past to production” (Ciccotti, Cini, and de Maria 1976, 47), and that under capitalism, the extent to which science becomes ideological both in its methods and its results is a function of the extent of its ties to production, then one can come to believe that science has become completely ideological (in the strict negative Marxist sense). Thus, we can see how some tendencies in the writings of the first generation of Frankfurt School theorists depict science as irredeemably oppressive.²⁰

The key issue which must be brought to light in order to understand the differences between the pessimistic view of the emancipatory potential of science which is found in some of the writings of the Frankfurt School and the relatively optimistic view which was upheld by those who we can subsume under the label of “Classical Marxism” revolves around the theory of ideology and its scope. We must begin by noting that theory of ideology as applied to science under capitalism cannot merely mean that science is conditioned by socio-economic conditions. For the distinctive feature of classical Marxist philosophies of science was that they held that all knowledge, including scientific knowledge, was conditioned by socio-economic conditions, without believing that this fact by itself is sufficient to cast doubt on the rationality of science or the truth of specific theories (Sheehan 2017 [1985], 5).²¹ I have argued elsewhere that the classical Marxist version of the theory of ideology is not (despite some rhetorical abuses) a theory of refutation, i.e., it does not seek to establish the falsehood of the view/theory that is being labeled as ideological. Instead it was used in order to *explain* why the false theory/view in question was held, despite its obvious falsehood (relative to the evidence that the people who

19. The influence of Weber on the members of the Frankfurt School is clear in the manner in which they center the notion of instrumental reason, as well as their often remarked upon pessimism.

20. However, it would be misleading to think that this is the entire story. For as Honneth (2005, 302) has noted, a key transformation was the manner in which the Frankfurt school came to see knowledge engendered by labour in negative terms. For example, the claim that “the man of science knows things to the extent that he can make them” (Horkheimer and Adorno 2002, 6) becomes an indictment of the epistemological framework of science in the writings of Horkheimer and Adorno. This, of course, involves a complete turn away from Marx’s claim that labour (humans acting on nature) is in some sense the very foundation of human knowledge (Bloch 1971, 151).

21. Horkheimer was, of course, aware of this: “it is not for social interests to decide what is or is not true; the criteria for truth have been developed, rather, in connection with progress at the theoretical level” (Horkheimer 2002 [1932], 3).

held it had available to them).²² The falsehood of the view/theory that was being labeled as ideological was to be established using *independent arguments prior to the application of the theory of ideology* (El Nabolsy 2019, 245). The key point here is that claims to the effect that a given theory is ideological must take into consideration the evidence that the individual (in this case, the scientist) who held that theory had available to her. This involves taking into consideration the internal logic of her theory as a whole, as well as the standards which were used to evaluate what counted as evidence in her specific scientific field, which again involves taking into consideration the internal logics which governed that specific scientific field at a specific point in history and in a specific place.²³ From a methodological standpoint, we may offer a critique of at least some of the first generation Frankfurt School theorists for not taking immanent critique seriously enough when it comes to the natural sciences. One of the hallmarks of the Frankfurt School theorists is their commitment to immanent or internal critique, which ultimately has its origins in Hegel's metaphilosophical reflections. Internal critique is a critique of some claim which shows that the claim in question is illegitimate based on standards of normative or epistemic justification that are adhered to by the person who is advancing the claim. Thus, Hegel claims that: "the refutation must not come from outside, that is, it must not proceed from assumptions lying outside the system in question and that do not correspond to it" (Hegel 1969, 580). Hegel points out that if we attempt to refute a system (or in our case, a claim) by adopting standards of justification which are not recognized by the proponents of the system (or claim) in question, then "the [proponents of the] system need only refuse to recognize those assumptions" in order to reject our refutation (Hegel 1969, 580–581). The first generation of Frankfurt School theorists presented their critical theory of society as an internal critique of bourgeois society. For instance, Marcuse writes:

[...] critical rationality derives from the principles of autonomy which individualistic society itself had declared to be its self-evident truths. Measuring these

22. Some interpreters miss this point completely, e.g., Kwasi Wiredu (1980, 74) who writes that "the bite that that the theory of ideology seems to have derives from just this implication: that if and when one has shown that a set of ideas are determined by a definite development of productive forces and of the relations corresponding to them, one has thereby shown them not to have any independent claims to truth."

23. For example, Marcuse hardly ever refers to any work from physics or biology in his account of science (Sedgwick 1966, 175).

principles against the form in which individualistic society has actualized them, critical rationality accuses social injustice in the name of individualistic society’s own ideology. (Marcuse 1992 [1941], 147)

Methodologically speaking this internal approach to critique avoids begging the question. However, Marcuse and Horkheimer do not seem to have extended this approach to their critique of the natural sciences (Delanty and Harris 2021, 97). I suggest that we can undertake an internal critique of Marcuse and Horkheimer’s arbitrary delimitation of the scope of the method of internal critique when it comes to the natural sciences, i.e., we can criticize them on their own terms for failing to criticize the natural sciences in an immanent manner.²⁴

The application of the theory of ideology cannot be generalized to speak of all science (or science as such) as being ideological, as some of the adherents of the Frankfurt school’s approach to science and their contemporary followers seem to do.²⁵ If the label ‘ideological’ is indiscriminately used to describe both “race science” and “general relativity”, then it becomes clear that the very concept of ideology is not very useful for the study of the history of science. In other words, through depicting all of modern science as an ideological reflection of the capitalist mode of production, some of the writings of the first generation of the Frankfurt School and their epigones, empty the concept of “ideology” of any specific meaning. The assumption of the complete triumph of ideology, which leads to general claims such as “all men have become empiricists” (Horkheimer 1992 [1941], 30), is put forward without adequate justification.²⁶

24. Andreas Vrahimis (forthcoming) argues that the debate between Neurath and Horkheimer can be understood in terms of different answers to the question: is there a standpoint outside (and above) the empirically oriented sciences from which they can be critiqued? Horkheimer’s answer is yes, whereas Neurath’s answer is no. Framing the debate in these terms also leads to questions about the extent to which a Kantian notion of critique is compatible with a Marxist notion of critique. Especially if we understand the Frankfurt School theorists as attempting to synthesize Marxism with Kantianism (or a neo-Kantianism that has already historicized the *a priori*). For a discussion of the importance of Kant for the first generation of the Frankfurt School theorists, see McNulty forthcoming.

25. We may note that such assumptions are also carried forward in much of the contemporary “decolonial” discourse, e.g. (Grosfoguel 2009, 14), and the same criticism applies there as well.

26. It is Horkheimer who also writes that “since Descartes, philosophy was one great attempt to place itself as science in the service of the prevailing mode of production, an attempt opposed only by very few thinkers” (Horkheimer 1992 [1941], 39). This way of speaking

Moreover, this way of speaking of science in general, which neglects the internal logic of specific scientific theories, and specific scientific fields, is problematic in another way. For it involves the rejection of what we can call “the relative autonomy thesis.” According to this thesis, while the social relations of production exercise a causally determining effect on intellectual discourses (science, religion, philosophy, etc.), those discourses also have their own internal logics which cannot be ignored when attempting to understand, for example, the relationship between science and capitalism. The most well-known formulation of the “relative autonomy thesis” was made by Engels in a letter to Conrad Schmidt (October 27, 1890). It is worth quoting at some length:

As concerns those ideological realms which tower still higher in the clouds – *religion, philosophy*, etc. – they all possess from pre-historical days an already discovered and traditionally accepted fund of – what we would today call nonsense [*was wir heute Blödsinn nennen würden*].²⁷ All of these various mistaken ideas of nature, of the very creation of man, of spirits, magical forces, etc., have as their basis, in the main, negative economic grounds. The primitive economic development of the pre-historical period is supplemented by false ideas of nature, but in places it is often also conditioned and even caused by them. However, even if economic need has been the chief driving force in the advance of natural knowledge, and has become even more so, it would be altogether pedantic to want to seek economic causes for all this primitive nonsense [*Und wenn auch das ökonomische Bedürfnis die Haupttriebfeder der fortschreitenden Naturerkenntnis war und immer mehr geworden ist, so wäre es doch pedantisch, wollte man für all diesen urzuständlichen Blödsinn ökonomische Ursachen suchen*]. The history of science is the history of the gradual elimination of this nonsense, i.e., its replacement by new, but always less absurd, nonsense [*Die Geschichte der Wissenschaften ist die Geschichte der allmählichen Beseitigung dieses Blödsinns, resp. seiner Ersetzung durch neuen, aber immer weniger absurden Blödsinn*]. The people who supply it belong again to special spheres in the division of labor and imagine that they are working up an independent domain. And in so far as they constitute an independent group within the social division of labor, their products, inclusive of their errors, exert a *counter-acting influence* upon the entire social development, even upon the economic. Nonetheless they still remain under the *dominant influence of economic development* [...] But as a definite domain within

of an “attempt” leaves one open to the accusation of imputing intentions where there is no sufficient evidence. A proper application of the theory of ideology should avoid this highly psychological approach.

27. The term *Blödsinn* can also be rendered as ‘idiocy’ or ‘rubbish.’ Although Engels clearly did not think that falsified scientific theories were just rubbish, so it seems that his choice of *Blödsinn* is not really appropriate.

the division of labor, the philosophy of every age has as its presuppositions a certain intellectual material which it inherits from its predecessors and which is its own point of departure. That is why philosophy can play first violin in economically backward countries: France in the eighteenth century as opposed to England upon whose philosophy her own was based; and later Germany as opposed to both. But in France as in Germany, philosophy, like the general outburst of literary activity of that time, was a result of an economic upswing. The final supremacy of economic development even in these realms is now established but it takes place within the conditions which are set down by the particular realm: in philosophy, e.g., through the effect of economic influences (which in turn exert influence through disguised political, etc., forms) upon the existing philosophical material which our predecessors have handed down. Of itself *economics* produces no effects here directly; but it determines the kind of change and development the already existing intellectual material receives, and even that, for the most part, indirectly, since it is the political, jural and moral reflexes which exercise the greatest direct influence upon philosophy. (Engels 1934 [1890], 81).²⁸

It is clear from this passage that while Engels thinks that one can assign a dominant causal influence to economic factors (after all this is the very core of historical materialism as a theoretical framework for the study of history) when attempting to understand the history of science, one must not discount the internal logics of the given scientific theories that are being explained. Moreover, the fact that the economic element is assigned the dominant causal weight does not imply that it acts *directly* on science. The Hessen-Grossmann thesis as reconstructed by Gideon Freudenthal and Peter McLaughlin (2009) is an excellent example of this point. For according to this thesis, technology was developed in order to facilitate economic development, and early modern (seventeenth-century) science was able to make the advances that it did by studying the technology that was developed in order to facilitate economic development (*ibid.*, 4). Note that even if we think of the economic factor as ultimately causally decisive,

28. Note that in this context Engels is using the word ‘ideological’ [*ideologischen*] as a synonym for ‘intellectual world view’ (which is also how people often use the word today, i.e., when they speak of “competing ideologies”), and not in the narrow sense in which I have used it above. We may also note Engels’ anti-inductivist conception of the history of science. Unlike inductivist historians of science, Engels was not afraid to point out that the history of science is the history of the falsification of previous theories. For a critical account of standard inductivist histories of science in the nineteenth and twentieth century, see Agassi 2008, 129–174.

this thesis does not imply that it *acted directly on science*.²⁹ For according to this thesis, the purpose of early modern science was *not* the development of technology per se (let alone contributing to economic development), but rather the analysis of idealized structures as models of natural phenomena (Rosenthal and McLaughlin 2009, 16).³⁰ This point is of crucial importance because it undermines the view of science which is found in the writings of Marcuse. For Marcuse, “pure science has an inherently instrumental character prior to all specific application; the Logos of pure science is technology and is thus essentially dependent on external ends” (Marcuse 1992, [1965], 473). If by this Marcuse means to say that early modern science was developed with the aim of manipulating nature for the sake of commercial interests, then he is vastly oversimplifying.

29. This point is completely missed by some anti-Marxist philosophers of science, e.g., Agassi (2008, 148–150).

30. Horkheimer (2002 [1937], 195) references the work of Henryk Grossmann, however, it seems to me that he did not grasp its significance, insofar as he does not recognize that the debate was about whether one could provide a historical materialist explanation of the rise of early modern science that recognizes that early modern science dealt with idealized structures and was not primarily oriented towards the improvement of the means of production. Grossmann’s solution is to try to show that the key concepts of modern mechanics emerged from reflection on actually existing machinery: “L.B. Alberti, Leonardo da Vinci, Nicolo Tartaglia, Girolamo Cardano [...] derived their mechanical concepts and theorems not from the division of labor in manufacture, but from the analysis and observation of machines and their performance” (Grossmann 2009, 141). Jake McNulty (forthcoming) has attempted to provide a sympathetic reconstruction of Horkheimer’s views on science in his *Critical and Traditional Theory*, and while I am deeply sympathetic to McNulty’s project of showing the relevance of historical materialism to debates in philosophy of science, I do not share his view that Horkheimer’s approach represents a promising starting point for such a project. McNulty convincingly shows that Horkheimer held a version of Quine-Duhem thesis, e.g., (Horkheimer 2002 [1937], 194–195). However, McNulty does not in my view successfully show that the underdetermination of theory by data is a necessary condition for a historical materialist account of science to get off the ground. The Hessen-Grossmann thesis, for instance, does not presuppose any version of the underdetermination of theory by data thesis. Furthermore, it is not clear that a strong version of the underdetermination of theory by data thesis would hold if we abandon the assumption of radical empiricism (Okasha 2000, 290) and Horkheimer himself is a critic of empiricism. Moreover, McNulty does not adequately question whether Horkheimer’s account of the relationship between science and technology is historically accurate. According to McNulty, Horkheimer thinks that “scientific research and its applications in the various sectors of industry are inseparable” (McNulty forthcoming, 33). However, this claim taken as a claim that applies to the history of modern science and technology in general is, as we have seen, not accurate.

The technological basis of early modern science (e.g., the instruments that made early modern science possible), may have been brought into being as a result of commercial interests, but in the hands of natural philosophers these instruments were often turned towards less immediately utilitarian purposes. For example, the telescope was invented in the Netherlands in 1608, and it had a clear military application, and of course, a commercial one, insofar as Dutch economic prosperity was dependent on their ability to control key naval routes (Wootton 2015, 214–215).³¹ However, when Galileo set about making his telescope, he was invested in creating a telescope that would be pointed towards the heavens. This explains why he put so much effort into making telescopes that were far too powerful for military use. Galileo created ten telescopes with a magnification of 20x or better (Wootton 2015, 214–215). In the Netherlands, there were no telescopes with this magnifying power, not because the Dutch could not make them, but because telescopes of such magnifying power were useless for military purposes. We can understand the development of the technological basis for early modern science in the context of the development of capitalism, however, this does not imply that early modern natural philosophers were primarily interested in fulfilling the functional requirements of the capitalist mode of production (through applying theories in order to refine technology). The example of the telescope also illustrates another mistake in the approach of some of the first generation theorists of the Frankfurt School when it comes to their discussion of science, namely the conflation of formalization for the sake of predictive power with the pursuit of domination of nature (e.g., Horkheimer 1992 [1941], 47). In the case of early modern astronomy increased predictive power was not tied to increased manipulative power over the phenomena whose motions were being predicted, let alone the domination of nature.³² A historical materialist account of science does not in fact require that we should explain early modern science as developing to fulfill the needs of early capitalists. However, it does require that we should establish causal connections between the technological advances which were pushed forward by the needs of a new economic system and the technology which made early modern science possible (whether directly through instruments or through conceptual models which became psychologically

31. On the structure of the Dutch early capitalist system, see Arrighi 1994, 127–143.

32. And we note here that the manipulation of natural phenomena is a necessary condition for the pursuit of a grand project aimed at the “domination of nature,” but it is not by itself sufficient. Hence, the two must not be seen as identical.

possible only through material transformations in early capitalist societies).³³ The danger with overemphasizing the instrumental aspects of the early modern sciences (and modern science in general) is that we neglect the representational aspects of modern science in a manner that provides support, albeit inadvertently, for the discourse of contemporary neo-liberal university administrators who take the allocation of resources for the natural sciences to be justified only insofar as they serve business interests.³⁴

Whether the relative autonomy thesis is coherent (and whether if coherent, it is correct) is another issue altogether. However, one must point out a final irony in some of the writings of some of the members of the first generation of the Frankfurt School with respect to science and its relation to capitalism. For at least some of the first generation Frankfurt School theorists and their followers took themselves (and are often understood) as rebelling against the alleged economism of classical Marxism, i.e., its alleged reduction of history to economic factors (Kautzer 2017). Although, one can argue that by portraying science as irredeemably ideological insofar as it has come to completely reflect the demands of the capitalist mode of production, and by effectively abandoning the “relative autonomy thesis” in relation to science,³⁵ their position on science ends up being more functionally equivalent to the “economistic standpoint” than the position of the classical Marxists. For while it is true that Marcuse and Horkheimer often frame their position in terms of the universalization of instrumental reasoning as opposed to economism *per se*,³⁶ the universalization of instrumental reasoning ends up being functionally equivalent to economism in relation to how science and its history are understood. This is ironic insofar as they took themselves to be rebelling against the “economism” of the classical Marxists. In fact, the latter’s position on science, by recognizing the relative autonomy of science, is far less reductive than

33. I.e., we can ask under what social and economic conditions does it become psychologically possible for several thinkers to conceive of the universe as a machine (rather than as an organism, for instance)? Without the real concrete proliferation of machines, a mechanistic worldview cannot emerge as a dominant worldview. Note that here we are engaging in a descriptive investigation. I.e., this does not have anything to do directly with showing that the mechanistic worldview is false (or true).

34. For a more detailed discussion of this point see Collin and Pedersen 2015.

35. Yet, some of them, like Adorno, maintained a version of the relative autonomy thesis with respect to other cultural domains such as art (Zuidervaart 2015).

36. As Gerard Delanty and Neal Harris (2021, 90) note, “instrumental rationality” is “the master concept” through which early critical theorists understood domination in capitalist societies.

the position of Horkheimer and Marcuse. The standpoint of Horkheimer and Marcuse is closer to the Weberian account of the universalisation of instrumental rationality than it is to the classical Marxist conception of science as described above.³⁷ The Western Marxist position erases important distinctions which Classical Marxism preserves. In fact, despite the Hegelian pretensions of the former, it is characterized by a most un-Hegelian “one sidedness.” Thus, when Herbert Marcuse in the course of his exposition of Hegel in *Reason and Revolution* writes that “the form and content of scientific concepts [referring to ordinary first-order science undertaken from the standpoint of the understanding/*Verstand* in Hegelian terms] remain bound up with the prevailing order of things; they are static in character even when they express motion and change” (Marcuse 1955, 157), he neglects to note that Hegel was too knowledgeable about European intellectual history to simply believe that ordinary or first-order natural scientific discourse only led to a passive attitude towards the prevailing order of things, without recognizing its revolutionary significance at certain points in history.³⁸ In fact, for Hegel the key distinguishing feature which differentiates early modern European philosophy from ancient

37. The influence of Weber is evident in Marcuse’s account of the course of development of rationality and individual freedom from the early modern period to the present (see Marcuse 1992 [1941], 157).

38. The quotation from the preface to the *Phenomenology of Spirit* which serves an epigraph for this essay, continues: “Now we seem to need just the opposite: sense is so fast rooted in earthly things that it requires just as much force to raise it. The Spirit shows itself as so impoverished that, like a wanderer in the desert craving for a mere mouthful of water, it seems to crave for its refreshment only the bare feeling of the divine in general. By the little which now satisfies Spirit, we can measure the extent of its loss” (Hegel 1977, 5). To this extent Hegel obviously thinks that while the standpoint of the understanding is necessary, it is not sufficient. However, it seems that Marcuse neglects the world-historical significance that Hegel attributes to what later came to be called the Scientific Revolution qua progressive development. Hegel was first and foremost an Enlightenment thinker and he understood the significance of the Scientific Revolution in making the Enlightenment possible. When Hegel speaks of the medieval period he speaks as an Enlightenment philosopher. Hegel even says that in the middle ages “that which is most irrational, coarse and vile, [was] established and strengthened by the religious sentiment—this is the most disgusting and revolting spectacle that was ever witnessed” (Hegel 1900, 382). The key to understanding Hegel’s very critical attitude towards the middle ages is to recognize that Hegel was responding to the Romantic reaction to the Enlightenment’s rejection of everything that was medieval. By the beginning of the nineteenth century a kind of reactionary romanticism had developed in response to the alleged shallowness, coldness, individualism, and destructiveness of Enlightenment reason (read *Verstand* in Hegelian terms). If the Enlightenment as embodied in the French Revolution had attempted to erase the existence of anything that was remotely medieval, reactionary

Greek philosophy is the rise of early modern science: “without the working out of the empirical sciences on their own account, philosophy could not have reached further than with the ancients” [*ohne die Ausbildung der Erfahrungswissenschaften für sich hätte die Philosophie nicht weiter kommen können als bei den Alten*] (Hegel 1995, 176).³⁹ Hegel thinks that in studying early modern figures such as Descartes it is important to note that “philosophy

romanticism would attempt to revive the medieval past by celebrating medieval culture as it was embodied, for example, in Gothic art and architecture (Blanning 2010, 131–132; Fritzsche 2004, 123). Hegel observed this reactionary romanticism with alarm and much of what he says about the middle Ages should be read as a defence of the Enlightenment’s negative assessment of medieval culture against this reactionary romanticism. Hegel himself is almost explicit about this: “So self-contradictory, so deceptive is this medieval period; and the polemical zeal with which its excellence is contended for [by reactionary romantics], is one of the absurdities of our times” (Hegel 1900, 382). Hegel is here clearly taking romantics like Friedrich Schlegel and Novalis to task for idealizing the medieval period. For example, in 1815 Friedrich Schlegel claimed that “for very many of the best and noblest productions of modern genius, we are entirely obliged to the inventive spirit of the middle age” (Schlegel 1861, 160). Novalis in turn waxes poetical about medieval Europe in his *Christianity or Europe*: “those [i.e., the middle ages] were beautiful, magnificent times, when Europe was a Christian land, when *one* Christianity dwelled on this civilized continent, and when *one* common interest joined the most distant provinces of this vast spiritual empire” (Novalis 1996, 61). Hegel obviously did not think much of “the inventive spirit” of medieval Europe and he probably thought that only someone who lacked any sense of historical reality could have thought that serfs, for example, experienced the middle ages as “magnificent times.” Hegel’s negative attitude towards medieval culture provides the wider context within which to understand his attitude towards medieval philosophy (and his negative characterization of medieval culture should be understood as a defence of Enlightenment historiography against reactionary romanticism, though it should be added that the late Romantics never really took an active interest in scholasticism as such, though they certainly took an active interest in medieval Catholicism). For Hegel, medieval philosophy is barbaric to the extent that it expresses a barbaric culture. It should also be added that the use of the word ‘barbaric’ to describe scholastic philosophy has a very long history in humanist and in Enlightenment thought. For example, in 1520, Erasmus published a critique of scholasticism entitled *Book against the Barbarians*. When Hegel uses the word ‘barbaric’ (*barbarische*) he is invoking this history of criticisms of scholastic philosophy and situating himself within a specific historical polemical context. What is at stake in Hegel’s polemic with the romantics is giving the understanding (*Verstand*) its due. Hegel did not think that *Vernunft* could accomplish much without the understanding, despite the latter’s limitations.

39. It is interesting to note that this Hegelian point about what is distinctive about early modern European philosophy has been recently reiterated by Justin E. H. Smith (2016, 178) in his account of the differences between early modern European philosophy and early modern Indian philosophy: “one very significant difference between European and Indian modern philosophy is the fact that in the former case the shape philosophy took, indeed the self-consciousness of philosophy as modern, was largely, or nearly entirely, a consequence of the emergence of modern science.”

and exact science were not yet separated, and it was only later that this separation took place” (Hegel 1995, 221).⁴⁰

Early modern natural science, far from being “bound up with the prevailing order of things” led to a profound transformation in how humans understood their place in the world. The new astronomy made it possible to think of the universe as infinite, e.g., in Giordano Bruno’s work (Drake 1973, 15). It also made it possible to de-center the Earth and to think of other planets as potentially hosting life (Wootton 2015, 234). The emancipative moment in the development of the natural sciences cannot be ignored without distorting the history of science.⁴¹ It is important to recognize that we should not think of the first generation of Frankfurt School theorists as completely oblivious to this point. For example, in some his early writings Marcuse recognizes the emancipative consequences of modern science: “matter-of-factness animated ancient materialism and hedonism, it was responsible in the struggle of modern physical science against spiritual oppression, and in the revolutionary rationalism of the Enlightenment” (Marcuse 1992 [1941], 143). However, in his later writings, Marcuse does veer quite close to some anti-modernist orientations, such as that expressed in Frank Raymond Leavis’s thought (Collin and Pedersen 2015).⁴²

40. Hegel’s emphasis on the importance of the connection between modern philosophy and modern science differentiates him from some of his contemporaries. For example, Christian August Brandis (1790–1867) in his *Von dem Begriff der Geschichte der Philosophie* (1815) did not think that narrating the history of philosophy (and especially the history of modern philosophy) requires understanding its relation to the natural sciences or to other disciplines (Catana 2013, 127).

41. As Gramsci (2016, 107) notes, “undoubtedly, the promulgation of the experimental method [in early modern science] separates two worlds in history, two epochs, and begins the process of the dissolution of theology and metaphysics and the development of modern thought, whose crowning is Marxism.” It was also the assimilation of some of the discoveries of the life sciences and of chemistry that made it possible for some eighteenth-century materialists such as Diderot to, in the words of Lenin (2021, 19), “come very close to the standpoint of contemporary materialism.” On Diderot’s championing of the life sciences and of chemistry, neither of which was of great interest to his friend and collaborator d’Alembert, see Furbank 1992, 85–99.

42. In general, if we interpret Adorno and Horkheimer as thinking of Nazism as the product of Enlightenment/ *Aufklärung* (e.g., in Ray 1979, 156), then we would have to say that Adorno and Horkheimer were engaged in self-deception. Germany on the eve of the Nazi takeover was not an “enlightened and developed” society (and of course, we can contest the meanings of these terms, but this is beyond the scope of this essay). In fact, Germany was characterized by the social and economic backwardness which obtained (and still obtains) in societies which possess dual economies (Anievas 2014, 286). As Jeffrey Herf observes, “Horkheimer and Adorno’s view of modernity during World War II was a very

Moreover, even in the early writings of Horkheimer we encounter oversimplifications in his recounting of the history of science. Horkheimer makes the assumption that the rise of early modern mathematical physics which abstracts from “secondary properties” involves a tendency to manipulate nature without care: “the less human beings think of reality in qualitative terms, the more susceptible reality becomes to manipulation. Its objects are neither understood nor respected” (Horkheimer 1992 [1941], 31). This is essentially a version of the familiar thesis that mechanistic theoretical orientations lead to practices which involve the degradation of nature. While there is some truth to this claim, we should also note that the historical record indicates that some Newtonians such as Stephen Hales (1677–1761) applied Newtonian “ideas about motion and the conservation of energy within systems to plant-atmosphere relations [...] [thus laying] the groundwork for critiques of the human impact on air quality and changes in vegetation” (Grove 1995, 159). Hence, it is unjustified to claim that “Enlightenment stands in the same relationship to things as the dictator to human beings” (Horkheimer and Adorno 2002, 6). To this extent it is important not to overstate the manner in which thinking of nature in terms of quantitative relations leads to ecologically unsound practical orientations. At any rate, some of the most well developed formulations for a solution to the current crisis generated by anthropogenic climate change, e.g. (see Ajl 2021), do not reject quantitative analysis but rather use it for emancipatory purposes.

German caricature” (Herf 2012, 84). Certainly if one wanted to observe “the wholly enlightened earth [which] is radiant with triumphant calamity” (Horkheimer and Adorno 2002, 1) during the 1930s and 1940s, one would not go to Germany, since it was not even close to being “wholly enlightened,” at best it was only “partially enlightened.” This would also explain why there was much resistance towards the reception of the work of the first generation of Frankfurt School theorists by Marxists in the global South who had to confront underdevelopment, e.g., in Egypt (Haggag 2019, 107). Marxists in Egypt like Mahmoud Amin Al Alem were right to think that the depiction of Enlightenment and modernity in the work of the first generation of Frankfurt school theorists was a caricature (and here we note that Ali Haggag misunderstands this point) which had to do with the peculiarities of Germany’s modern history and German intellectuals’ systematic self-deception about the real conditions of German culture before World War II. From the early nineteenth century to the mid-twentieth century, what took place in Germany was not the elevation of the formal instrumental reasoning that Adorno and Horkheimer associate with the Enlightenment over all other forms of cognition, instead what happened was that poetry came to be elevated over the “cold reason” of the Enlightenment (see Gay 2001, 46–69).

With respect to the analysis of the natural sciences and their place in their wider social and historical context, Hegel is closer to Engels and Marx, than he is to the Western Marxists.⁴³ To this extent, it is not even true that the critical theorists represent a return to Hegel. With respect to their stance towards the modern natural sciences, the Western Marxists and their contemporary epigones owe more to Nietzsche (and perhaps Weber) than they do to Hegel, or Marx and Engels.⁴⁴ It has been suggested by some that Western Marxism essentially expresses defeat (i.e., the defeat of revolutionary projects in Western Europe and North America). With respect to its stance on modern natural science, we may say that Western Marxism represents a defeat to positivism (as interpreted by the first generation of Frankfurt School theorists). Instead of attempting to refute positivist conceptions of science, the Western Marxists simply surrendered the field to the positivists. This surrender continues to be felt today in the attitude of some self-identified progressive thinkers and critical theorists towards the natural sciences.

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43. I have argued for this point at length in (El Nabolsy 2020).

44. On Nietzsche’s influence on Adorno and Horkheimer, see Habermas 1990, 122.

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