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Transhistorical perspectives on commodities, fetishism, and world-systems: Technologies of exploitation through five thousand Years

Perspectivas transhistóricas sobre mercadorias, fetichismo e sistemas mundiais: Tecnologias de exploração ao longo de cinco mil anos

Perspectivas transhistóricas sobre mercancías, fetichismo y sistemas-mundo: Tecnologías de explotación a través de cinco mil años

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ABSTRACT: Commodities, export production, money, market prices, wage labour, capital accumulation, and technologies contingent on world-systems can all be traced back to the Bronze Age. The continuities make it analytically difficult to identify a certain point in history at which 'capitalism' was born. The Inca example illustrates how capital accumulation and exploitation through long-distance exchange can be identified even in the absence of money. Modern markets and Inca ritual suggest two alternative ways of obscuring physically unequal exchange by projecting illusions of reciprocity. The maize beer served by the Inca had a function similar to that of the modern wage. The fictive reciprocity of modern market prices appears to be an example of a more fundamental phenomenon of social metabolism that can be identified even in the non-monetary economies of the prehispanic Andes. No less than the cotton factories in industrialising Britain, the maize terraces of the Inca represented capital in the sense of a material, productive infrastructure continuously augmented through a cultural mystification of unequal exchange. We may today recognise the role of industrial technology in the world-system as a new strategy of time-space appropriation. The novelty of the Industrial Revolution was to delegate exploitation and inequalities to the combined logic of markets and machines.

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Keywords: Commodities. Fetishism. World-systems. Time-space appropriation. Capital accumulation.

RESUMO: Mercadorias, produção de exportação, dinheiro, preços de mercado, trabalho assalariado, acumulação de capital e tecnologias dependentes de sistemas mundiais podem ser rastreados até a Idade do Bronze. As continuidades dificultam analiticamente a identificação de um determinado ponto na história em que o "capitalismo" nasceu. O exemplo inca ilustra como a acumulação de capital e a exploração por meio de trocas de longa distância podem ser identificadas mesmo na ausência de dinheiro. Os mercados modernos e o ritual inca sugerem duas formas alternativas de obscurecer a troca fisicamente desigual, projetando ilusões de reciprocidade. A cerveja de milho servida pelos incas tinha uma função semelhante à do salário moderno. A reciprocidade fictícia dos preços do mercado moderno parece ser um exemplo de um fenômeno mais fundamental do metabolismo social que pode ser identificado até mesmo nas economias não monetárias dos Andes pré-hispânicos. Assim como as fábricas de algodão na Grã-Bretanha industrializada, os terraços de milho dos incas representavam capital no sentido de uma infraestrutura material e produtiva continuamente ampliada por meio de uma mistificação cultural de trocas desiguais. Hoje, podemos reconhecer o papel da tecnologia industrial no sistema mundial como uma nova estratégia de apropriação do tempo-espaço. A novidade da Revolução Industrial foi delegar a exploração e as desigualdades à lógica combinada de mercados e máquinas.

Palavras-chave: Mercadorias. Fetichismo. Sistemas globais. Apropriação do tempo-espaço. Acumulação de capital.

RESUMEN: Las mercancías, la producción para la exportación, el dinero, los precios de mercado, el trabajo asalariado, la acumulación de capital y las tecnologías dependientes de los sistemas-mundo pueden remontarse a la Edad de Bronce. Las continuidades hacen que sea analíticamente difícil identificar un punto determinado de la historia en el que nació el "capitalismo". El ejemplo inca ilustra cómo la acumulación de capital y la explotación a través del intercambio a larga distancia pueden identificarse incluso en ausencia de dinero. Los mercados modernos y el ritual inca sugieren dos formas alternativas de ocultar el intercambio físicamente desigual proyectando ilusiones de reciprocidad. La cerveza de maíz que servían los incas tenía una función similar a la del salario moderno. La reciprocidad ficticia de los precios del mercado moderno parece ser un ejemplo de un fenómeno más fundamental del metabolismo social que puede identificarse incluso en las economías no monetarias de los Andes prehispánicos. Al igual que las fábricas de algodón de la Gran Bretaña industrializada, las terrazas de maíz de los incas representaban el capital en el sentido de una infraestructura material y productiva continuamente aumentada a través de una mistificación cultural del intercambio desigual. Hoy podemos reconocer el papel de la tecnología industrial en el sistema-mundo como una nueva estrategia de apropiación del tiempo-espacio. La novedad de la Revolución Industrial fue delegar la explotación y las desigualdades en la lógica combinada de los mercados y las máquinas.

Palabras clave: Mercancías. Fetichismo. Sistemas-mundo. Apropiación espacio-temporal. Acumulación de capital.

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Introduction

In this paper, I shall begin by examining the concept of 'commodity' as analysed by Karl Marx and as understood by proponents of the concept of 'commodity frontiers.'[1] I shall consider whether it is really valid to think of commodification as a major historical discontinuity defining capitalism, which leads on to the question of how to define capitalism and how to identify the fundamental discontinuity between premodern and modern societies. I shall trace parallels between commodity flows in the Bronze Age and the global context of the Industrial Revolution, emphasising how misleading it can be to conceptually separate a technology from the social relations from which it springs.

As a foil against Eurocentric studies of the economic history of Western expansion, I shall then turn to the prehispanic kingdoms of the Andes, societies which must be considered to have existed at maximum distance from European capitalism. They were not only paradigmatically premodern in terms of historical time but also completely isolated from European developments in terms of geographical space. In order to test our use of concepts such as 'commodity' and 'capital,' I shall consider the economic, social, and cultural contexts of prehispanic Andean artifacts and accumulation, emphasising the role of investments of biophysical resources such as labour time and agricultural land. What, at an abstract level, did ancient Andean trade goods and infrastructures have in common with those of late eighteenth-century Britain, and in what sense were they different? Is it feasible, for instance, to think in terms of 'commodity chains' and 'capital accumulation' when speaking of cloth production and terrace construction in the prehispanic Andes? What is the significance of money in the comparative study of exchange and exploitation? To what extent has the modern compulsion to assign monetary values to everything shaped our

[1] My *Concise Oxford Dictionary of Current English* (1990) defines 'commodity' as either 'an article or raw material that can be bought and sold' or simply as 'a useful thing.'

understanding of social and human-environmental relations? These are some of the questions I shall address in what follows.

The commodity as analysed by Marx

Marx opened his monumental analysis of *Capital* with the famous first chapter called 'The Commodity.' A commodity, he says, is an object which satisfies human needs of whatever kind. Its usefulness is conditioned by its physical properties: 'It is therefore the physical body of the commodity itself, for instance iron, corn, a diamond, which is the use-value or useful thing' (Marx [1867] 1976, 126). The fact that two qualitatively different commodities may be equivalent in terms of exchange-value to Marx means that both are equal to a third thing: 'Each of them, so far as it is exchange-value, must therefore be reducible to this third thing.' He concludes that the only thing they can have in common is that they are products of abstract, average socially necessary labour. This is the source of their value:

> How, then, is the magnitude of this value to be measured? By means of the quantity of the 'value-forming substance', the labour, contained in the article. This quantity is measured by its duration, and the labour-time is itself measured on the particular scale of hours, days etc. … What exclusively determines the magnitude of the value of any article is therefore the amount of labour socially necessary, or the labour-time socially necessary for its production (ibid., 129).

Within his first five pages of *Capital*, Marx three times uses the expression 'therefore' to suggest that his foundational assumptions are logically incontrovertible, yet these assertions are all open to question. The use-value of a commodity can be conditioned as much by symbolic as by physical properties.[2] The 'third thing' which makes two commodities commensurable can simply be their market price, that is a certain quantity of money. This posed a conundrum even to Aristotle in ancient Greece (ibid., 151-152). Finally, there is no robust argument demonstrating that the economic value of an article is exclusively derived from the labour time socially necessary for its production, either in ancient Greece or nineteenth-century Britain. Yet, it is on these assertions that the edifice of *Capital* is founded. But these quarrels shall not detain us here. Of more immediate interest in this context is Marx's definition of commodity:

> In order to become a commodity, the product must be transferred to the other person, for whom it serves as a use-value, through the medium of exchange. … [The division between use-value and value] appears in practice only when exchange has already acquired a sufficient extension and importance to allow useful things to be produced for the purpose of being exchanged… (ibid., 131, 166).

Marx's most seminal contribution was to adopt the concept of 'fetishism' into political economy. The word 'fetish' derives from a Portuguese category referring to the worship of idols

[2] On the very first page of *Capital*, Marx observes that it makes no difference whether the usefulness of the commodity is that it satisfies human needs 'from the stomach, or the imagination' (ibid., 125).

in premodern West Africa. It was incorporated in European discourse on the history of religion through a text published in 1760 by Charles de Brosses (Morris and Leonard 2017). Marx pointed out that modern Europeans, too, are fetishists, in the sense that they attribute autonomous agency to commodities and money, obscuring the asymmetric social relations through which these artifacts are generated. The most tangible forms of fetishism are when material objects ('things') are endowed with imaginary powers of their own. In Marx's words, relations between people are represented as relations between things:

> The mysterious character of the commodity-form consists therefore simply in the fact that the commodity reflects the social characteristics of men's own labour as objective characteristics of the products of labour themselves, as the socio-natural properties of these things. … It is nothing but the definite social relation between men themselves which assumes here, for them, the fantastic form of a relation between things (Marx [1867] 1976, 164-165).

It is in this sense that Marx sees a decisive difference between capitalist and precapitalist modes of exploitation. In precapitalist Europe, Marx writes,

> the social relations between individuals in the performance of their labour appear at all events as their own personal relations, and are not disguised as social relations between things, between the products of labour. … In the ancient Asiatic, Classical-antique, and other such modes of production, the transformation of the product into a commodity, and therefore men's existence as producers of commodities, plays a subordinate role… Trading nations…exist only in the interstices of the ancient world… (ibid., 170, 172).

To summarise this brief rehearsal of Marx's position, he introduces *Capital* by asserting that the commensurability of commodities in the market is based on the fact that they all represent quantities of socially necessary labour time and that the commodity-form assumes general prevalence only with widespread production for exchange. In precapitalist societies, production and exchange generally do not alienate workers from the products of their labour to the point where the products are perceived as autonomous sources of power. He nevertheless concedes that production for exchange (and commodity fetishism?) has occurred 'in the interstices' between precapitalist societies, although playing merely 'a subordinate role.' Only with the 'capitalist mode of production' does commodity production (and fetishism) dominate social life.

Commodity frontiers before and beyond European capitalism

Given constantly expanding incentives for maximising monetary profits, so the conventional story goes, the 'capitalist mode of production' has generated a unique and relentless pursuit of a great diversity of commodities for trade or industrial processing. The global pursuit of such commodities, ranging from food crops, drugs, fibres, wood, fish, and animal parts to precious metals, gems, and other minerals, has pushed what Jason Moore and others have called 'commodity frontiers' ever further across the planet (Moore 2015; Beckert *et al.* 2021).

For Moore, only a subset of the resources used by expanding capitalism are exploited (defined as deriving from 'paid' work) through the money economy; the remainder – 'a global zone of reproduction (unpaid work) from the family to the biosphere' – is instead *appropriated* '(outside commodification but in servitude to it)' (Moore 2015, 191). Moore asserts that

> strategies of commodification and exploitation can work only to the extent that uncommodified natures are somehow put to work, for free or very low cost. In sum, capitalism must commodify life/work but depends upon the 'free ride' of uncommodified life/work to do so. Hence, the centrality of the frontier (ibid., 192).

The commodity frontier, in this view, can be understood as the very interface between the 'internal' operation of the capitalist economy and the un- or underpaid 'external' resources – labour, food, energy, and materials – that subsidise it. I have elsewhere explained why I find this theoretical framework incoherent and shall not let it preoccupy me here. Suffice it to say that the analytical distinction between 'exploitation' and 'appropriation' is deeply problematic. If the former means being 'paid' and the latter 'un-' or 'underpaid,' my immediate question is if the implication is that some wage workers are being fully compensated for their work, while all the un- or underpaid work is to be regarded as 'externalities' in the same sense as the term is used by mainstream economists? If some wage labourers are 'underpaid,' is their labour being exploited, or is it appropriated? Why is the occurrence of some (partial) monetary payment at all a significant distinction to be made in this context? This very distinction indicates an enthrallment with money that muddles the analysis. It is only by abandoning the implicit assumption that money can compensate for the dissipation of energy and other resources that economic theory can liberate itself from the conceptual constraints imposed on it – in both its orthodox and heterodox variants – by the artifact of all-purpose money.

This finally boils down, of course, to the role of money in what we think of as capitalism. An alternative perspective on global exploitation is that of 'ecologically unequal exchange' (EUE) (Dorninger *et al.* 2021), which focuses on the asymmetric material resource flows converging on core areas of capital accumulation. In this approach, money and market prices are understood as means of bringing about (and obscuring) such asymmetric flows, regardless of whether the transferred resources are 'paid,' 'underpaid,' or 'unpaid.' Market prices project an illusory image of reciprocity, disguising the global net appropriation of embodied labour time, land, energy, and materials. In focusing on the quantification of biophysical resource flows, the EUE perspective is able to abandon the economists' concern with monetary compensation and the purported 'value' of those resources. The notion that all commodities can be assessed in terms of a universal theory of value, whether based on labour, land, energy, or utility, ultimately derives from the artifact of all-purpose money, which is not only the source of capitalism but even conditions how the critics of capitalism think about it.

While Moore's theoretical framing of commodity frontiers is problematic, the concept usefully highlights how the global material asymmetries of capitalism can be illuminated through empirical studies of specific commodity histories. It has been defined as 'the locus where extraction geographically expands, colonizing new land in search for raw materials (oil, minerals, biomass etc.)' (Conde and Walter 2015, 71). At the website 'Commodity Frontiers and the Making of Global Capitalism,' Sven Beckert, Ulbe Bosma, and Eric Vanhaute define commodity frontiers as 'processes of dynamic incorporation of new sites of natural resources in the world economy' (downloaded November 14, 2022). The main merit of the concept is that it broadens our view on the conditions for capitalist accumulation from myopic concerns with local class conflict within industrial nations to truly global perspectives on asymmetric resource transfers. It underscores that the emergence of industrial capitalism in Britain was contingent on world-systemic processes in the eighteenth century. This insight will no doubt encourage historians to intensify their studies of the myriad empirical specifics of particular commodity histories, but it should also imply a paradigm shift in our understanding of the Industrial Revolution.[3] The shift to new technologies for harnessing fossil energy was inextricably connected to the physical accumulation, through colonialism and slavery, of the material resources which made those technologies possible. In other words, the establishment of industrial capitalism in eighteenth-century Britain was not just a matter of accumulating money and encouraging innovative engineering, but simultaneously a process of material concentration. The Industrial Revolution relied on global conjunctures in *social metabolism*. As Beckert and his co-authors recently observed, the history of the expansion of commodity frontiers is 'a historical process so spatially, socially and structurally all-encompassing that it still awaits its persuasive analysis' (Beckert *et al.* 2021, 435). Beyond the libraries that can be filled with empirical commodity histories we must make an effort to reconceptualise economic history itself through a genuinely materialist lens, which finally succeeds in incorporating physical matter into social theory.

At the same time, however, this focus on the quantities of embodied material resources that are transferred in particular commodity histories must be combined with an acknowledgement of the semiotic idiosyncrasies that shape the shifting demands for various commodities. A sensitivity to the cultural semiotics of consumption, along the lines pioneered by Jean Baudrillard ([1972] 1981), should preclude the unwarranted assumption that a materialist perspective must couch commodity histories in a pragmatic idiom. Both theoretical contributions and empirical

[3] Although too rarely a problem for historians, the 'immense library of existing case studies does not add up to a systematized body of knowledge' (Beckert *et al.* 2021, 448).

global overviews convincingly show how arbitrary cultural whims may play decisive roles in propelling materially significant commodity histories (Sahlins 1976; Wolf 1982; Pomeranz and Topik 1999). Archaeology confirms that the specific semiotics of human economies have shaped social metabolism long before the fifteenth century, which is frequently referred to as the dawn of mercantile capitalism.

Although the speed of expansion clearly accelerated over the past 600 years (Beckert *et al.* 2021, 435), commodity frontiers were far from new to human history (Kristiansen *et al.* 2018). As early as 3,500 BCE, the ancient Mesopotamian city of Uruk imported copper, tin, lead, timber, charcoal, limestone, silver, gold, and gems from distant sources (Scott 2017, 192, 243). A commodity such as tin (for bronze production) could be extracted as far away as what is now Afghanistan. To procure all these essential imports, Uruk exported textiles, grain, pottery, and artisanal products (ibid., 192). The textile industry of Uruk, employing around nine thousand textile workers, was particularly crucial to this trade (ibid., 159). The underlying strategy, that is, the export production of textiles for the purpose of gaining access to remote commodities, was fundamentally the same as that employed by British industrialists five thousand years later.

World-systems from the Bronze Age to the Industrial Revolution

Bronze metallurgy is based on the alloying of copper and tin. It yields a metal that is harder than copper and thus more suitable for tools and weapons. In the third millennium BCE, it became a highly prestigious trade good among the kingdoms and empires of the Middle East and eastern Mediterranean. Because tin ores are naturally rare and the demand was high, the production of bronze generated wide-ranging networks of long-distance trade. In the second and third millennia BCE, Bronze Age societies from the Aegean to Babylonia manufactured and traded bronze that was crucially dependent on sources of tin in distant regions such as Kazakhstan, central Europe, Iberia, and Cornwall. Imports of tin and bronze to kingdoms and empires throughout this vast area in turn demanded a variety of valuable exports and promoted the maintenance of intensive exchange networks connecting polities and commodity frontiers from Cornwall to Kazakhstan.

The Bronze Age world-system illuminates the context of the British Industrial Revolution not only in the sense that it clarifies the significance and deep history of export production, but also in helping us transcend our habitual distinction between technology and society. In considering both these world-systems, five millennia apart, we have been inclined to conceptually separate material artifacts from the social relations of exchange which make them possible. Some technologies, however, owe their material existence to the specific ratios at which their component substances are exchanged. Bronze metallurgy was a material manifestation of trade networks

spanning Eurasia, relying on chains of market transactions such as those fortuitously revealed by excavations at the Turkish site of Kültepe (Kanes), where in the nineteenth century BCE Assyrian merchants each year traded huge volumes of tin from Central Asia and textiles from Babylonia for silver and gold from Anatolia and further West (Barjamovic 2018). In the Assyrian city of Assur, economic value was calculated with tin as currency (ibid., 118). As the rates at which silver was exchanged for tin determined the feasibility of bronze production in the Mediterranean, we must conclude that the bronze artifacts embodied social relations. It is, in other words, erroneous to think of these artifacts as detached from their global contexts of production and trade. I have made precisely the same argument for the steam engines of industrial Britain. Like the commodity fetishism of which it can be seen as an extension, technological fetishism deludes us into thinking of artifacts as independent of the social exchange relations though which they are engendered.

Both bronze metallurgy and steam engines were dependent on long-distance trade in strategic resources, both were sources of capital accumulation, and both have been understood primarily as products of the esoteric knowledge of specialists, while the requisite dependence on specific terms of trade has been disregarded and omitted from understandings of how the technologies are constituted. My point is that it is misleading to represent the feasibility of bronze objects or steam engines as contingent merely on the state of human knowledge, while keeping such knowledge conceptually separated from the social organisation of resource flows. Both bronze and steam technologies were manifestations of extensive social fields, conceptualised as world-systems, which they simultaneously embodied and reproduced. To understand bronze metallurgy and steam engineering primarily as technical phenomena, excised from the metabolism of world-systems, is to fetishise what are fundamentally social relations into purified material forms. To paraphrase Marx, it is to represent relations between people as relations between things.

The production of valuables such as metals or prestigious textiles requires specialised knowledge and skills that are restricted to a minority. Brian Hayden and Tim Earle exemplify this with reference to imperial China, where 'knowledge of how to produce porcelains, silk, and tea was carefully restricted in order to maintain an export monopoly and thus increase value in internationally desired commodities' (Hayden and Earle 2022, 450). Mary Helms provides additional examples: 'Master navigators in Polynesia, smiths in Africa, metallurgists in the Americas, astronomers and astrologists in imperial China or among the Maya have all evidenced control of special forms of knowledge that granted them exceptional status' (Helms 1988, 12). She continues: 'Secrecy can connote many things, but common to all is the implication of concealment or reticence and the production of mystique' (ibid., 13-14). Hayden and Earle suggest that Bronze

Age chiefs in Europe similarly claimed to have access to magical or supernatural powers (Hayden and Earle 2022, 462-463). Earle writes:

> [D]uring the Early Bronze Age, bronze making was not a skill known broadly in northern Europe. Its secrets were no doubt highly esoteric, almost magical, known only to a few people. The technology involved complicated pyrotechnological skills necessary to obtain and regulate high temperatures, to work the metal, and to use the sophisticated lost-wax casting method... (Earle 2002, 316; cf. Kristiansen 1987).

Bronze objects, in the eyes of Bronze Age Europeans, owed their existence to the esoteric art of bronze metallurgy. As we have argued, however, this is not the whole story. For the bronzesmith to be able to practice his art, he must have access to the requisite amounts of copper, tin, and other substances. For these components to converge in proper quantities at a particular location, they must be conveyed over great distances and exchanged at certain rates. The art of the European bronzesmith, in other words, was contingent on the long-distance trade not only in metals but also in amber, cattle, slaves, and other exports for which they were exchanged.

The rates at which commodities are exchanged are social phenomena that must be included in our conceptualisation of technologies and other artifacts that are contingent on such exchange. Considerations of market prices and 'values' have preoccupied humans since the Bronze Age, always entwined with moral issues of justice and even religion (Warburton 2018). From the third millennium BCE, there are documented concerns in Mesopotamia and Egypt with equivalences between weights in silver and wool, volumes of grain, surface areas of fields, labour time, and other measures, suggesting that silver served as money and a measure of exchange-value for estimating market-based prices and even wages (ibid., 57, 61-62, 67). Through subtle transformations, such exchange rates or prices generated a reification of 'value' in the form of money tokens, ideally *symbolising* abstract equivalence but in practice fetishised into indexical bearers of value. We shall return to the topic of fetishism further on.

Theorising the history of commodity frontiers

A recent research agenda on the global history of commodity frontiers (Beckert *et al.* 2021) has been criticised for being Eurocentric as well as unduly focused on the past 600 years (Berg 2021, 454-455; Mostern 2021, 458, 461). It has also provoked criticism from economic historians for its efforts to generalise world history, as 'the past was much more complicated than that' (Findlay and O'Rourke 2021, 462). The two critiques are contradictory, as the first suggests that the categories could be extended in geographical space and historical time, while the second appears to be wary of the very ambition to generalise. Although no one could possibly advocate generalisation that is contradicted by historical facts, the careful application of social theory to

historical processes must be encouraged. As Ruth Mostern observes, 'there is a rough methodological divide between conceptually minded historical social scientists and empirically minded historians,' but '[t]houghtful efforts to bridge the gulf…are always welcome' (Mostern 2021, 457).

The concept of commodity frontiers, like that of ecologically unequal exchange, highlights the fact that it is impossible to theorise capitalism without implicating the extractive peripheries that provide urban, industrial cores with the resources required for their production processes. The peripheries, in other words, are as significant components of economic and technological expansion as the centres of capital accumulation with which it is generally identified. The extractive sectors have been conceptualised in terms of 'countryside' and 'agriculture' (Beckert *et al.* 2021, 437), as opposed to cities and industry, but it would be equally true to observe that the Global South as a whole is implicated in the economic and technological growth of the Global North. The geographical displacement of work and environmental loads from city to countryside and from imperial cores to their colonies has been characterised by David Harvey as a 'spatial fix' (Harvey 1982). It has been argued that this strategy of expansion dominated the 'early capitalist commodity regime' from the 1450s through the 1850s, when the 'technological fix' emerged as the dominant strategy of the 'industrial commodity regime,' which lasted until the 1970s (Beckert *et al.* 2021, 442, 445). This may be a useful way of theorising historical data on commodity frontiers, but a couple of observations should be added. First, the 'spatial fix' is not unique to the past 600 years, but applies equally to urban and imperial centres from Uruk to Rome. Second, the 'technological fix' established in the nineteenth century *is* simultaneously a 'spatial fix': the accumulation of technological infrastructure in industrial Britain was contingent on environmental load displacement and ecologically unequal exchange in the world-system (cf. Mostern 2021, 459). Indeed, '[s]patial fixes…remain powerful today, usually at the expense of tropical rain forests, grasslands, indigenous communities and biodiversity' (Beckert *et al.* 2021, 446). Looking back at the discontinuities of the nineteenth century, it appears as if the historical simultaneity of the Industrial Revolution and the abolition of slavery signified that violent and physically repressive exploitation of the victims of empire was being delegated to the coercive power of machines, markets, and free trade (Beckert 2014; Tomich 2004, 117; Hornborg 2023).

Given the definitions of commodities and commodity frontiers that we have considered so far, we can conclude that commodity production has occurred for more than five thousand years

and in a variety of cultural contexts.[4] The great discontinuity[5] represented by industrial capitalism in Europe was not a matter of inventing wage labour and production for the market in order to accumulate capital. Such processes of commodification, spurred by the potential for generalised commensurability inherent in money, had been a recurrent feature of urban life since Uruk. The essential discontinuity was the quantum leap in mechanisation granted by the harnessing of fossil energy in late eighteenth-century Britain. As Andre Gunder Frank observed, this technological development was 'a world economic process, which took place in and because of the structure of the world economy/system itself' (Frank 1998, 204). The industrial production of cotton textiles and other commodities which transformed the world economy at this time was itself a response to the markets created by slavery and other features of the colonial world-system. The incentives to develop new industrial technologies were not qualitatively different from earlier contexts of export production, but the expansive world-system dominated by the British Empire provided its core with access to unprecedented volumes of colonial resources and labour. Britain's technological progress was spectacular because it could outsource its resource requirements in ways previously unheard of. Steam technology germinated from the global conjunctures of the late eighteenth century. It signified a threshold in the integration of the world-system at which local productivity was physically contingent on global transfers of resources. This generalised dependence on world market prices is what distinguishes most modern technologies from their premodern predecessors.

The fetishism of money, commodities, and machines

Marx's deliberations on market commensurability ultimately boil down to an investigation of what he calls 'the mystery of money': 'Since the magnitude of the value of a commodity represents nothing but the quantity of labour embodied in it, it follows that all commodities, *when taken in certain proportions*, must be equal in value' (Marx [1867] 1976, 136, 139; emphasis added). Rather than recognising the artifact of all-purpose money as a source of the very concept of value, Marx understood money (such as gold) as a specific commodity which gradually began to serve as a universal equivalent. In principle, following Marx's view, the value of gold should be determined by the socially necessary labour time required to extract it. However, the expectation that a money sign must refer to an objective measure of value, such as expended labour time, is a naturalistic assumption that does not apply to social phenomena. From a Marxian perspective, money should

[4] The argument that the world-system has been emerging for five thousand years was made long ago in an edited collection by Andre Gunder Frank and Barry Gills (Frank and Gills 1993).

[5] Kenneth Pomeranz famously refers to the 'great divergence' in the late eighteenth century between Europe and comparable Old-World cores of civilisation such as China (Pomeranz 2000).

relate to value as temperature to heat, weight to gravity, and area to space: each phenomenon is 'ontologically prior' to its measurement (McNeill 2020, 136). But heat, gravity, and space are physical phenomena, whereas value is a social phenomenon. Thermometers, scales, and rulers do not create physical reality, but socially constructed phenomena can be *produced by our modes of measuring them*. In applying analogies from natural science, Marx neglected the pioneering insight on social phenomena that was fundamental to much of his own thinking: that human categories are constitutive of economic systems. This is what justifies Marx's use of the concept of fetishism, yet, ironically, its full implications ultimately escape him. As David Graeber observes, money in capitalism paradoxically 'represents the value of labour, but wage labourers work to get money; it thus becomes a representation that brings into being what it represents' (Graeber 2007, 141).

There is a general inclination in human societies for objects to transition from symbols and other non-indexical representations to indexes – this is the essence of fetishism. A symbol is a sign that refers to something through social agreement, while an index signifies the actual identity of what it refers to. The paradigmatic instance of fetishism is when a fifteenth-century amulet or idol in West Africa symbolising a metaphysical being was approached as its material manifestation. Similarly, an artifact that symbolises a social relation, such as a gift or an obligation to reciprocate a service, tends to be identified with that relation. Although we know that a money token such as a paper bill is just a piece of paper that represents economic value,[6] that piece of paper *is* simultaneously the value it represents. Through such semiotic transformations, artifacts such as metals, cloth, and ornaments have for many millennia become endowed with value. The extensive trade networks that Uruk was involved in several millennia BCE pivoted on fetishised artifacts, some of which served as measures of value (T.C. Wilkinson 2018). Silver and textiles are prominent examples of such early forms of money. The material properties of metal, in particular, 'facilitate its use as a semiotic sign (symbol/index) for the abstract quantitative nature of value' (ibid., 35). This semiotic aspect of valuables is significant, as 'metals and textiles were used from very early on to ornament the body and thus materialize social roles on the body' (ibid., 48). Items of personal decoration have always been in high demand not just because they communicate a person's identity but because they are a *source* of identity: they become indexical signs because the status they signify is difficult to distinguish from the bearer's ability to procure and keep such objects. This aspect of commodity fetishism has become a more general foundation for the modern phenomenon of 'consumption.'

[6] David Graeber has argued that our money is ultimately a token of other people's obligation, or debt, to us, which is why it serves as a claim on other people's time or resources (Graeber 2011).

Having considered the fetishism of money and commodities, we shall again consider the fetishism of technology. What I have elsewhere referred to as 'machine fetishism' is an extension of commodity fetishism in that it refers to how (technical) artifacts are perceived as detached from the social relations through which they are engendered. When the commodities considered are technological objects, the fetishism attains a new dimension, because the operation of the technology tends to be attributed exclusively to its design, as if it had nothing to do with the social exchange relations through which its components were assembled. In obscuring social relations, this is as illusory as commodity fetishism in general, but now the illusion extends to the capacities of the machine, which are understood as deriving completely from its intrinsic powers. This is the modern magic of the machine, conceptually detached from the global asymmetries of which it is a manifestation. We have been so enthralled by its spell since the eighteenth-century turn to fossil energy that we are now imagining that, through sheer ingenuity, it will help us abandon fossil energy without requiring any asymmetric global resource flows.

Can premodern gifts be commodities?

Up until the expansion of fossil-fueled bulk transports in the nineteenth century, the long-distance transfer of goods was everywhere generally confined to 'prestige goods' or 'preciosities' such as fine clothing, precious ornaments, and luxury food. The main exceptions were the maritime or riverine bulk transports of cereals dating back to the early agrarian empires and evident also, for instance, in the sixteenth-century Baltic. Throughout the premodern Old World, the trade routes that connected distant societies primarily transferred high-value goods destined for elite display and consumption. For millennia, such trade provided incentives for specialised export production as well as for merchants. In Aztec Mexico, long-distance traders were not only merchants but also emissaries serving the imperial court. In Inca Peru, the purveyors of long-distance imports were so closely connected to imperial administration that commercial incentives appear to have been virtually absent. It seems that it was part of a deliberate Inca strategy to transform previously existing trade relations into tribute (Salomon 1986a, 1986b). Distantly derived items signifying high status – such as *Spondylus* shell ornaments and tropical bird feathers – were not open to economic competition but controlled and conferred by the Inca elite. They were gifts, not commodities for sale on the market.

In his classical essay on *The Gift*, Marcel Mauss highlighted a fundamental distinction between purchased commodities and gifts (Mauss [1925] 2016). The gift typically retains a semiotic attachment to the person from whom it originates, whereas the commodity does not. The 'spirit of the gift' refers to how it evokes the person of the giver, whereas the fetishism of the commodity

derives from the invisibility of the producer. The gift expresses and perpetuates a social relation between the giver and the receiver, whereas the commodity obscures and arguably denies such social relations. However, although diametrically opposed, both contexts are conducive to magical animation of the objects that are exchanged, whether by imputing to them features of specific gift-givers or an autonomous 'life of their own.' In both cases, the etymological roots of 'fetishism' (as referring to magic) are appropriate.

Given these observations, it is highly relevant to consider the economic organisation of the Inca Empire of sixteenth-century Peru. Not only was Inca civilisation up until the Spanish conquest completely isolated from European societies; in lacking the markets and money that the Spaniards recognised in Mesoamerica, its economy appears to have been fundamentally different from that of Europe. Ethnohistorical evidence clearly shows that Inca society did not produce for sale (Murra 1956, 2017). Goods were generally transferred between people not through market exchange, but as gifts. The *corvée* labour of the peasants, the ceremonial redistribution of valuables, even sacrifices to the gods were conceived as gifts. Like gifts everywhere, their purpose was to maintain trust in social relations. Yet, like commodities, the objects redistributed by the Inca elite included various kinds of materially or symbolically useful items such as food, clothing, and ornaments that represented substantial volumes of embodied labour time and were disembedded from the contexts of their production. In these respects, the products that were transferred throughout *Tawantinsuyu* shared the features listed by Marx as characteristic of commodities. The crucial difference vis-à-vis capitalism appears to be that the goods were not assigned monetary exchange-values and subjected to market logic. The question to be explored is how significant this difference is for the operation (and our identification) of exploitation and unequal exchange. If the existence of money and wage labour is essential to the exploitative logic of capitalism, their absence in Inca society prompts us to consider other mechanisms of accumulation that would have contributed to its economic inequalities.

At the level of ideology, both the capitalists of Marx's time and the Inca elite were engaged in reciprocal exchange with the remainder of the population. Yet, both capitalist markets and Inca ritual should clearly be understood as arenas of *fictive* reciprocity, or there would have been no accumulation (cf. Godelier 1977). In different ways, the two elites were able to amass considerable material surpluses by representing asymmetric material flows as reciprocal. Given the historical and cultural distance, it is not difficult for us to conclude that the labour of Inca peasants on the emperor's terraced maize fields yielded vastly greater volumes of maize than the fraction of harvests that was used to brew the *chicha* with which they were compensated. To conclude that the exchange was asymmetric, we intuitively resort to biophysical metrics such as labour energy and crops. To

conduct a corresponding analysis of asymmetric exchange in capitalism, we would need to focus on the biophysical resource flows orchestrated by the predominant social institution for exchange, that is, the market. We would find, using modern methodologies such as Multi-Regional Input-Output (MRIO) analysis, that market prices in capitalism systematically obscure asymmetries in global transfers of biophysical resources such as embodied labour, land, energy, and materials (Dorninger *et al.* 2021). The comparison suggests, in other words, that the function of Inca ritual and neoclassical economics serve parallel purposes in the two societies: *both represent asymmetric exchange as if it were reciprocal*. To further pursue the analogy, we may consider the concept of 'capital accumulation' from a transhistorical and transcultural perspective. We might argue that the concept could be applied both to the textile factories of nineteenth-century Britain and to the agricultural terraces of the prehispanic Andes. In both cases, a productive, material infrastructure is expanded through a physically asymmetric exchange that is ideologically represented as reciprocal. This might qualify as a transhistorical and transcultural definition of capital.

A predictable objection, of course, would be that capital refers to money, which was absent in Inca society. This is indeed an incontrovertible fact, which would seem to invalidate any comparison with a capitalist economy, but the perspective introduced in the previous paragraph suggests that the biophysical metabolism of societies is a more 'real' (because more material) aspect of their organisation than the ideological idiom in which exchange is represented. 'Capital' can refer to both money and machines. A 'historical materialism' worthy of the name could be expected to focus on asymmetric flows of labour, energy, and materials, rather than flows of 'value.' There are certainly enormous differences between the British Empire and the Inca Empire, but at a deeper level we also find some intriguing parallels. In both societies, as we have seen, an elite minority subsists on the appropriation of embodied labour and other resources from an exploited majority, investing surplus resources in an expanding infrastructure designed to yield ever larger surpluses. Both societies are oriented toward military conquest of distant regions for the purpose of expanding the appropriation of human labour time and natural space, while justifying their expansion by referring to the superiority of their culture and religion. Elites in both societies are preoccupied with prestigious bodily decoration to communicate their privileged status, and much of this adornment – such as beaver hats in Britain and macaw feathers in the Andes (see below) – derive from distant regions (cf. Helms 1988; Sahlins 2017, 367-368). The list could continue; suffice to say that, at an abstract level, the differences are not as immeasurable as might be imagined at first sight. From a sociometabolic perspective, the decisive difference between preindustrial and industrial empires is that the latter are able to augment their *per capita* productivity by drawing on resources from their entire territory. Stated differently, they are able to locally mobilise efficiency-

enhancing technologies that are contingent on global resource flows. The *means* of time-space appropriation are different, compared to preindustrial regimes, but the aims are the same. As we shall see, the long-distance appropriation of human time and natural space is feasible with or without money, and with or without machines. In this sense, it is ultimately difficult to justify a decisive distinction between 'capitalist' and 'precapitalist' economies.

The materiality of prehispanic Andean gift economies

The material signs of elite status in ancient Andean kingdoms were not merely means of expressing the kinds of cosmological schemes that have been analysed by anthropologists, historians, and other researchers based in the humanities, but essential components of the sociometabolic logic through which the kingdoms emerged, reproduced themselves, and collapsed. They were as fetishised as money is to modern people, simultaneously charged with semiotic significance and material implications. This means that very practical matters regarding their availability could be of decisive importance for the fate of those societies. It thus seems unlikely that the recurrent core-periphery inversions in Andean culture history – tracing a sequence over two and a half millennia from Chavín de Huántar through Moche, Wari, Chan Chan, Cuzco, and almost also Quito – can be exhaustively accounted for in terms of emulation and what has been called 'galactic mimesis' (Tambiah 1985; Sahlins 2017, 353-354). Although predominant cultural narratives were definitely emulated by their neighbours, the political economy of these shifts no doubt implicated quite material factors that were literally beyond the horizons of the people who enacted them. If macaw feathers and *Spondylus* shell ornaments are insignia of power, then power hinges on controlling their supply. We must not only decode the signs of power but also confirm the *power of signs*. To acknowledge the interpenetration of semiotic and material aspects of political economy is to recognise that the procurement, control, and management of prestige goods such as feathers and shells – no less than the silver which lured the Spaniards – may determine the destinies of empires. It is noteworthy that we rarely deny the pivotal significance of precious metals in accounting for the economic history of European empires, while neglecting the role of preciosities in non-European ones. It suggests that we tend to think of silver and gold as 'real' values, while feathers and *Spondylus* are not.

To illustrate how premodern prestige goods, beyond serving as signifiers of social status, represent invisible but very material resource flows, we shall consider what Darryl Wilkinson has called 'the only true exotics' (D. Wilkinson 2018, 1372) of the prehispanic Andean world: *Spondylus* shells from the coasts of far northern Peru and Ecuador, and tropical bird feathers from Amazonia. The colourful Thorny Oyster (*Spondylus princeps, Spondylus calcifer*) does not occur naturally further

south than the far northern coast of Peru, but its shells – and beads and ornaments made from them – have been traded widely over the Andean area, beginning with imports to coastal Peru before 2000 BCE. While not as inaccessible as once thought, their extraction appears to have required considerable effort:

> Diving for these shellfish, especially the deeper water resident *Spondylus princeps*, was likely not easy; strong currents, turbid waters, natural camouflage, and strong attachment to substrate may have made these shellfish difficult to harvest even at shallower depths than originally thought (Carter 2011, 63).

Archaeological discoveries of *Spondylus* are particularly prominent on the North Coast of Peru, from the Moche through the Chimú states, but the shells were also in great demand in highland polities from Chavín de Huántar through Wari to Inca. Recurrent finds of workshops devoted to manufacturing beads and ornaments from *Spondylus* indicate that huge amounts of labour were invested not only in harvesting the shells but also in processing and transporting them. The Inca established a special category of people (*mullu chasqui camayoc*) in charge of transporting *Spondylus* throughout the empire. An assessment of the scale of this trade in marine shells along the Peruvian coast and throughout the prehispanic Andes concludes that

> it must have been of massive proportions, since the shells not only accompanied the wide expansion of Chavín [900-200 BCE], but had penetrated every part of the Peruvian sierra and coast by the beginning of the Early Intermediate Period [200 BCE-AD 500] (Paulsen 1974, 603).

The shells were undoubtedly carried by llama caravans as well as by human porters. It is of course impossible to estimate the amount of human and animal labour involved in extracting, processing, and transporting *Spondylus*, but when the Inca gained control of the trade in the fifteenth century, there were clearly many thousands of people dedicated to procuring and distributing these items. Each *mullu* artifact encountered archaeologically in the south-central Andes thus represents a formidable input of human labour.

Andean imports of colourful bird feathers from the Amazonian lowlands were also massive in scale but for reasons of poor preservation generally underestimated by archaeologists. Wilkinson refers to the established conviction among archaeologists that exchange in exotic goods is a key impetus for state formation:

> In state-formation models that rely on trade in exotics, elites monopolise certain precious goods, which they use to provide sumptuary gifts to subordinate or provincial elites, thereby locking them into relations of dependency and obligation (D. Wilkinson 2018, 1367).

Wilkinson draws on historical evidence from the Spanish conquistadores and early colonisers to estimate the volume of this trade (ibid., 1366). A secretary to Francisco Pizarro in

1534 asserted that the storehouses in Inca Cuzco contained 100,000 dried birds. The chronicler Bernabé Cobo in 1653 remarked that the Inca valued feathered cloth above all other kinds, and he recorded a tribute payment to the Inca emperor that included 1,000 cages of birds. A census in 1549 recorded 200 people (a third of all weavers) merely in the Chupachu ethnic group specialised in the production of feathered textiles, prompting Wilkinson to conclude that 'there must have been thousands across the entire empire.' A single funerary cache from the Wari empire, several centuries earlier, contained 96 feathered panels covering around 150 m^2 and representing the feathers from 2,000-3,000 macaws (*Ara ararauna*). As Wilkinson concludes, '[t]he scale of labour represented by such objects – not just in terms of their manufacture, but also in the capture and transport of thousands of Amazonian macaws – is enormous' (ibid., 1369). He suggests that the Wari state was able to control the trans-Andean trade in bird feathers in exchange for coastal goods such as cotton and *Spondylus* shell. Based on modern studies of bird-trapping in Amazonia, he estimates that the Andean demand for parrot feathers would have required a trapping zone of around 100,000 km^2.

Having reflected on the political significance of exotic artifacts and the material conditions for controlling them, we shall also consider the materiality of valuable goods that are locally produced. As we have seen, the political economy of premodern Andean societies such as the Inca was based on redistribution. This means that locally derived goods destined to become gifts to be distributed by the emperor or other members of the elite were produced as tribute. These items embodied substantial amounts of human labour-time as well as the requisite agricultural land to support the labourers and yield the resources to be processed, such as maize and camelid fleece. In principle, the amounts of labour and land thus embodied in each unit of tribute should be quantifiable. Although some might wonder what relevance such quantification could have for an understanding of Inca society, the answer is that the very feasibility of Inca society hinged on the ratio between the quantities of labour and land that were embodied in tribute, on the one hand, and the quantity of labour into which royal gifts could be converted, on the other.

Based on archaeological, historical, and ethnographical sources, Ragnheidur Bogadóttir has meticulously calculated the average expenditures of labour time and demands on agricultural land that were embodied in the production of some key artifacts central to the metabolism of Inca society: textiles made from camelid fleece, maize beer, and stone masonry (Bogadóttir 2016). Given that every household was required to deliver at least one tunic of *awasqa* cloth to the Inca state each year, that one such tunic required around 233 hours of labour time (ibid., 97), and that there may have been approximately one million households in the empire, the labour time embodied in these

garments alone would have amounted to around 80,000 person-year equivalents.[7] Each tunic also required around 1,92 hectares of camelid grazing land, which means that the annual tribute of *awasqa* cloth represented a total of around 1,920,000 hectares of embodied land (Bogadóttir 2016, 98). Tracing the biophysical sources of such artifacts clearly evokes modern concerns with 'commodity chains' and 'life cycle analyses.'

The finer cloth known as *qompi* was a form of wealth reserved for elite consumption and ritual purposes. A *qompi* tunic, Bogadóttir estimates, required an average of 2,759 hours of labour and 0,13 hectares of irrigated *bofedal* pasture (ibid., 97). Assuming that the Inca elite entitled to wearing *qompi* amounted to around 25,000 persons and that they consumed two garments annually, she estimates that their consumption of cloth required the labour of 47,000 tribute-payers and 6,500 hectares of *bofedal* pasture (ibid., 99).

If it were feasible to juxtapose such figures with estimates of the amounts of labour and land into which gifts of cloth and maize beer (*chicha*) could be converted, it would be possible to more rigorously define the application of concepts such as appropriation or exploitation in Inca society. This would be one way of complementing the semiotic analysis of value systems – which define the cultural significance of cloth and maize beer – with the material metabolism with which they are entwined. Such estimates can only be fragmentary, as when we consider that soldiers in the Inca army were presented with two *awasqa* tunics annually, implying an exchange of 466 hours of embodied labour – plus the labour tribute embodied in food, lodging, footwear, weapons, and so on – for a full year's service. Public gifts of *chicha* can be similarly estimated, as when Bogadóttir calculates that some 50,000 participants in a ceremonial labour feast would have consumed maize beer embodying 58,000 days of labour and 59 hectares of agricultural land (ibid., 125). The production of *chicha* for these events also required huge amounts of firewood as well as pottery, all extracted through labour service to the Inca state.

Concluding his classic article *Cloth and Its Functions in the Inca State*, John Murra observes that, 'in the Andean area, the artifact of greatest prestige and thus the most useful in power relations was cloth' (Murra 1962, 721). It was customary for the Inca emperor to present gifts of cloth to the defeated kings of newly incorporated territories. Reflecting on what he calls 'the paradox of the gift-laden conqueror,' Murra pertinently explains how we should understand such 'ceremonial gifts to the vanquished, at the moment of their defeat:'

> [T]he compulsory issue of culturally valued commodities in a society without money and [with] relatively small markets can be viewed as the initial pump-priming step in a dependent relationship,

[7] I estimate roughly 3,000 hours as a person-year equivalent.

> since the 'generosity' of the conqueror obligates one to reciprocate, to deliver on a regular, periodic basis, the results of one's workmanship to the Cuzco warehouses (Murra 1962, 721).

This observation is of crucial importance to our understanding of the social metabolism of stratified societies organised around principles of reciprocity. While a superficial interpretation of societies such as that of the Inca suggests an elite preoccupied with 'symbolic' things such as feathers, shells, and fine cloth, we have seen how flows of such artifacts are merely the medium through which the elite gains control over labour and other resources within and beyond its territories. In this sense, premodern and modern economies seem equally prone to focus on the semiotic values of the goods that are exchanged, while only vaguely aware of the quantities of human time and natural resources that are embodied in the goods. The 'preciosities' and 'primitive valuables' that propelled premodern exchange were no less material – in their origins and their consequences – than the commodities whose exchange-values preoccupy modern societies. To provide full accounts of either kind of social metabolism, we must acknowledge the embodied materiality of their economies.

Conclusions

The thrust of this paper has been to emphasize historical continuities over the *longue durée*. Whether we are looking for commodities, export production, money, market prices, wage labour, capital accumulation, or technologies contingent on world-systems, they can all be traced back to the Bronze Age. Although it is trivial to observe that the nature and scales of these phenomena have undergone fundamental transformations over the past five millennia, the continuities make it analytically difficult to identify a certain point in history at which 'capitalism' was born. To underscore this conclusion, I have considered some aspects of the metabolism of Inca society, which to many historians and anthropologists represent the very antithesis of capitalism.

The Inca example poses even more of a challenge to Eurocentric narratives of capitalism than the Bronze Age, because it illustrates how capital accumulation and exploitation through long-distance exchange can be identified even in the absence of money. It thus inspires comparison along a wider spectrum of societies than those conventionally accessible to economic history. Defining exploitation in terms of asymmetric transfers of embodied time and space means focusing on other universalising metrics than money, metrics that represent an incontrovertible biophysical reality rather than impalpable constructions of 'value.'

To identify the occurrence of capital accumulation, exploitation, and unequal exchange in Inca society requires a conceptual framework divorced from the logic of money analysed by Marx.

Any artifact or product transferred to or from the imperial warehouses represented a quantity of embodied labour and land. In principle, calculations of such quantities could illuminate asymmetric transfers of resources, veiled not by monetary values in the form of market prices, as in capitalism, but by ritualised reciprocity. From this perspective, capitalist markets and Inca ritual suggest two alternative ways of obscuring physically unequal exchange by projecting illusions of reciprocity. The comparison might thus invoke the Inca economy to highlight the fictive nature of modern market reciprocity.

The vast stores of food, textiles, and other goods that had been accumulated in Inca warehouses at the time of the Spanish conquest confirm that much greater volumes were given the emperor in tribute than he redistributed among his subjects. These stores may seem to make quantitative estimates of asymmetric resource flows superfluous. Nevertheless, attempts at translating the metabolic flows of Inca society into human time and natural space do not only illuminate the material processes through which this society was reproduced but also highlight fundamental, sociometabolic regularities – the appropriation of time and space – that it shared with other stratified social systems, including what we think of as modern capitalism.

The Inca elite appropriated the labour of its subjects by systematically invoking traditional concepts of reciprocity recognised among local peasant communities. A labour force could thus be mobilised to work agricultural land claimed by the emperor or his provincial governors in exchange for a generous consumption of maize beer and other foodstuffs. Such arrangements evoked the recurrent, communal work parties (*minga*) with which peasants were thoroughly familiar. Rather than a reciprocal flow of services between households, however, the labor parties hosted by imperial authorities were clearly asymmetric in terms of social metabolism. The maize beer served at these events obviously represented a mere fraction of the maize that was harvested on the emperor's terraces. Most of it was destined for the royal storehouses. In a transcultural sense, both the stored maize and the terraces on which it was grown can be understood as capital. In applying physical, non-monetary metrics to the Inca economy, we are thus able to provide the concept of 'unequal exchange' with a tangible, material definition. Such an approach is close at hand when we consider a stratified society lacking money, but it is simultaneously conducive to rethinking the asymmetries of capitalist societies. The challenge, in applying it to capitalism, is to identify structurally similar, systematic asymmetries in the social flows of biophysical resources such as labour time, land use, energy, and materials. Viewed in this light, market prices in modern capitalism are analogous to the ideological veil of the imperial *minga*. The maize beer served by the Inca had a function similar to that of the modern wage. As Maurice Godelier has observed, our task is indeed to unravel how, in different societies, unequal exchange is represented as fair.

Is the fictive reciprocity of modern market prices an example of a more fundamental phenomenon of social metabolism that can be identified even in the non-monetary economies of the prehispanic Andes? If so, it suggests that what we conceive of as 'capitalism' cannot be distinctly delineated, and that our attention should rather be focused on the underlying structures of physically asymmetric exchange of which modern capitalism is an instantiation. No less than the cotton factories in industrialising Britain, the maize terraces of the Inca represented capital in the sense of a material, productive infrastructure continuously augmented through a cultural mystification of unequal exchange.

Asymmetric flows of embodied labour and various forms of capital accumulation have been fundamental to diverse civilisations for millennia. Thus, for instance, the investment of precious metals in Roman armies to capture new slaves and conquer new territories (and new mines for precious metals) is formally cognate to nineteenth-century British investments of money in new technologies with which to conquer the world market. Both these strategies generated expanding cycles of capital accumulation.

The real novelty of the modern era was the harnessing of fossil energy to augment the material asymmetries of world trade. The combined logic of global market exchange and steam-powered British cotton factories intensified the net transfers of embodied labour and other resources to the imperial core from its peripheries. What is becoming increasingly apparent in our time is the fact that the celebrated progress of the 'productive forces' in industrialising Britain were subsidised by slave labour in plantations, mines, and other extractive zones of the world-system. The money capital that continued to finance investments in technological infrastructure – and the global appropriation of time and space that it represented – came from profits earned through exploitation. To thus contextualise the Industrial Revolution in historical time and geographical space is not to downplay the critical role of all-purpose money in making the accelerating global resource transfers – and the new technologies – possible. Without money there would have been no machines.

Rather than absolving 'technological progress' from this global sociometabolic context, we must today recognise the role of industrial technology in the world-system as itself a new strategy of time-space appropriation. In displacing both work and environmental loads to the periphery, it accomplishes a delusory neutralisation of exploitation. A consequence of the Industrial Revolution was to delegate the severe inequalities of slavery to the combined logic of markets and machines. The low-wage masses of the Global South have replaced the slaves on the plantations. Chains and whips have been superseded by market forces and technological progress. Against this background, it is no coincidence that the first nation to industrialise, embrace free trade, and establish

neoclassical economic theory was also the first nation to abolish slavery. The judgement on the extent to which this should be viewed as a victory of 'civilisation' should not be left to its beneficiaries in the Global North.

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