



HUMANISING PRODUCTION

**THE SECOND (NOT FOURTH)
INDUSTRIAL REVOLUTION
AND THE BIO-ECONOMIC
NECESSITY OF SOCIALISM**

TED REESE

“A gripping, essential, resource-rich analysis.”

★★★★★

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*Socialism or Extinction: Climate, Automation and War
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*The End of Capitalism:
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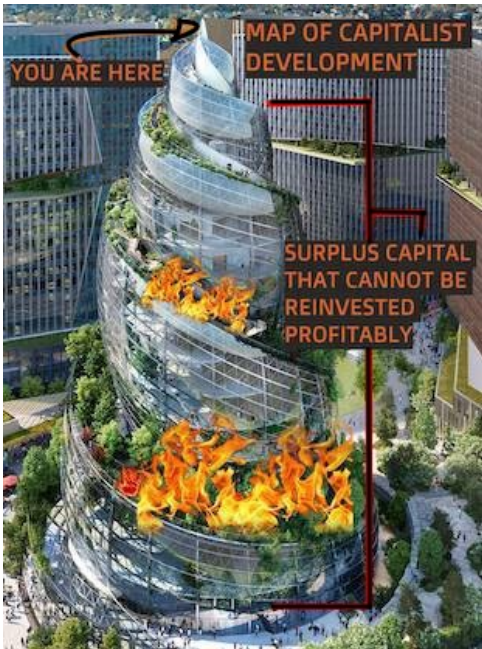
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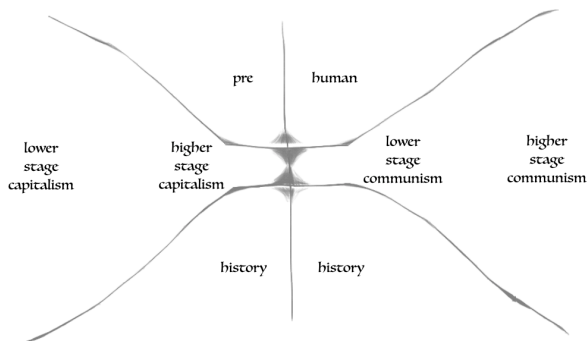
The Second (Not Fourth) Industrial Revolution
and The Bio-Economic Necessity of Socialism

Ted Reese



"The capitalist mode of production... is never able to get out of that 'vicious circle'... this circle is gradually narrowing... the movement becomes more and more a spiral, and must come to an end."

– Friedrich Engels, *Socialism, Utopian and Scientific*, 1877



"The bourgeois mode of production is the last antagonistic form of the social process of production... but the productive forces developing within bourgeois society create also the material conditions for a solution of this antagonism. The prehistory of human society accordingly closes with this social formation."

– Karl Marx,

A Contribution to the Critique of Political Economy, 1859

"As soon as labour in the direct form has ceased to be the great wellspring of wealth, labour time ceases and must cease to be its measure.... Capital thus works towards its own dissolution as the form dominating production."

– Karl Marx, *"The Fragment on Machines"*,
Grundrisse, 1858

"[Automation's] consummation is incompatible with capitalism... It is unthinkable to obtain the new types of energy without automation."

– Genrikh Volkov, *Era of Man or Robot?*
The Sociological Problems of the Technical Revolution, 1967

"Find a factory anywhere in the world built in the past five years – not many people work there."

– James Manyika, McKinsey Global Institute, 2017

"The law of breakdown is the fundamental law that governs and supports the entire structure of Marx's thought.... Despite the periodic interruptions that repeatedly defuse the tendency towards breakdown, the mechanism as a whole tends relentlessly towards its final end with the general process of accumulation... There is an absolute limit to the accumulation of capital and this limit comes into force much earlier than a zero rate of profit."

– Henryk Grossman, *The Law of Accumulation and Breakdown of the Capitalist System*, 1929

"The decrease in the interest rate is ... a symptom of the growing domination of capital in the process of perfecting itself – of the estrangement which is growing and therefore hastening to its annulment."

– Marx and Engels, *Economic and Philosophic Manuscripts*, 1844

"Like animals in the wild, many species in our gut [microbiome] are in decline, and have been for decades."

– Dr. Fred Mosley, 2017

"A significant decline in sperm counts [developed] between 1973 and 2011." – Hagai Levine, 2017

"There is almost universal agreement that the environmental toxins and chemicals to which we are increasingly exposed are interfering with the immune system's ability to distinguish self from non-self."

– Dr. Douglas Kerr, 2008

"The proletariat, on pain of its own destruction, is forced to take up its task of changing the world."

– Georg Lukacs,

Lenin: A Study on the Unity of his Thought, 1924

"Nature nurtures life through communities.

This is a process that started with the first single-celled organisms. Life, from its beginning more than three billion years ago, took over the planet by networking, not combat."

– Fritjof Capra, Ph.D, Bioneers Conference, 2009

"Why don't we photosynthesise? The answer is, probably we do... In some ways, we may be more like plants and bacteria than we really think."

– Dr. Gerald Pollack, 2013

"Hemp will be the future of all mankind, or there won't be a future." – Jack Herer,
The Emperor Wears No Clothes, 1985

“Twenty-two days. That’s all it took for the S&P 500 [stock market] to fall 30% from its record high, the fastest drop of this magnitude in history. The second, third and fourth quickest 30% pullbacks all occurred during the Great Depression era in 1934 [23 days], 1931 [24] and 1929 [31], respectively, according to data from Bank of America Securities.”¹

– CNBC.com, 23 March 2021

In March 2020, the US stock market suffered its worst ever crash. A month later, the price of oil *fell below zero for the first time ever*.² Unbeknown to the vast majority of the global population, the ruling class, the (monopoly capitalist) bourgeoisie, has instigated (as ‘gently’, deceptively and gradually as it can possibly manage)³ what will surely turn out in the long run to be its last stand – and the greatest and final class war of all time. For capitalism has undergone a *decisive structural shift* whereby replacing mechanisation with automation (rather than merely updated mechanisation) has become increasingly necessary in order to meet the ever-rising demands of capital accumulation – *paradoxically tending to abolish the sole source of profit*; i.e., capital’s exploitation of commodity-producing labour.

Global debt, or fictitious capital – representing surplus capital that is unprofitable to (re)invest – continually hits record highs in absolute and relative terms,⁴ manifesting in the largest ever financial bubble, the third ‘one-in-100-year’ bubble in three decades and the first ever ‘everything bubble’ engulfing every asset class.⁵

The trajectory of capital accumulation veers ever steeper, indicating an approaching absolute historical limit.⁶ Inversely, the general, global rate of profit has demonstrably trended historically towards zero, falling from an estimated decade average of 43% in the 1870s to 17% in the 2000s.⁷

Over the past half-century, decade-by-decade average global gross domestic product (GDP) growth rates have tended to recede, from above 5% in the 1960s to below 2% in the past two decades.⁸

Over the past seven centuries, since the early rudiments of capitalist production,⁹ global interest rates have been trending downwards; and over the past 13 years, short-term baseline rates have fallen to zero *for the first time ever* – remaining *stuck* there apart from one brief spell in 2016-19 – in the traditional (imperialist) capitalist superpowers of the US and Britain.¹⁰ To be clear, the average rate of return on capital is more or less *zero*. Moreover, an average 6% cut to the baseline rate is usually required to end recessions (by sufficiently cheapening capital and therefore re-incentivising lending and borrowing, buying and selling).¹¹

The capitalist system is *stuck*, peddling evermore frantically just to stay still. In 2020, 22% of all US dollars ever printed were (digitally) printed in those 12 months,¹² taking the figure to 75% in 11 years.¹³ In May 2021, 40% of all dollars had been printed in the previous 12 months.¹⁴ *Worldwide hyperinflation beckons*. With capital's profitability becoming extremely dependent on public debt and state purchases, central bank money printing has started to go into overdrive. Even before March 2020, the lifetime devaluations of both the US dollar and British pound sterling were approaching 100%.¹⁵

Devouring everything in its path, converting nature into commodities at an ever-greater rate in a desperate bid to stave off its impending final breakdown, capital is accelerating its destruction of Earth, especially the biodiversity of both wildlife¹⁶ and the soil – depleting the latter's nutritional density – simultaneously flooding the planet's atmosphere with carbon dioxide previously sequestered in the earth, polluting the air we breathe and heating the globe, threatening its habitability.¹⁷

The nutrition in our diets and biodiversity of the human gut's microbiome¹⁸ which regulates our health are thus *also* in decline, contributing to the rising modern phenomenon of autoimmune disease.¹⁹ The other contributing factor is capital's ever-rising dependence on the *intensity* of mining

metals and fossil fuels, increasingly polluting the products we consume and thus the human body – thereby *also* depleting human fertility. As capital accumulates and the rate of profit falls, so to, it appears, do sperm counts.²⁰

World socialism is thus becoming – *for the first time* – not only an *economic* but a *biological necessity*.

Amid the advancing decay of bourgeois society, the ruling class – armed with ultra-advanced weaponry of the explosive and surreptitious varieties – is becoming evermore reckless and vicious. We no longer live in a post-World War II (WWII) but pre-WWIII world.²¹ The heights of modern development – built over centuries on the blood, sweat and tears of the international working class (proletariat) – may sink to the greatest depths of dehumanisation and barbarism ever inflicted. But only the intensifying fires of struggle *instigated by capital* will rekindle and reforge the proletarian consciousness, militancy and unity that the bourgeoisie exhaustively strains to extinguish. Only the degree to which the ruling class is *compelled* to attack the masses, in both breadth and intensity, will the masses be *compelled* to fight back with sufficient numbers and force.

The painful setbacks and lessons of the past quarter-millennium have demonstrated that capital will not be overthrown for good before it has more or less exhausted its capacity to exploit, accumulate

and destroy. Every partial capitalist breakdown requires the destruction of both rising surplus capital (that is unprofitable to (re)invest) and the equivalent surplus labour it can no longer afford to employ. But in the approaching final breakdown *all capital will become superfluous*. With the evolution of its own economic-technical base making the existing relations of (privately-owned) production obsolete, the ruling class must reinforce its crumbling political superstructure through increasingly oppressive and destructive means – *until there is nothing left to destroy, unless and until it is stopped*. The masses will be compelled to overthrow the old superstructure and build a new, better, actually democratic one.

The suffering and sacrifice to come, the price of liberation, may be extremely high; but those of us who perish will live on in future generations and the earth with which we constantly exchange matter. On the other side of the initially dark metamorphosis now underway, if humanity is to survive and thrive, the international proletariat – now *billions* of times stronger in number than a mere century ago – will finally emerge triumphant into the light, reborn to a world of peace that existed 12,000 years ago before the advent of private property,²² emancipated from all the exploitative, oppressive and violent dictates of capital accumulation; and armed with the technological legacy of dead labour on the way to building a class-free world of sustainable abundant material wealth *for all* – what Marxists therefore refer to as the true beginning of human history.

“If each of the instruments were able to perform its functions on command or by anticipation ... so that the shuttles would weave themselves and picks play the lyre, master craftsmen would no longer have a need for subordinates, or masters for slaves.”²³

– Aristotle

Humans have longed to be free from toil. The Greek poet Antipater, a contemporary of the Roman statesman Cicero, welcomed the invention of the water mill, which worked “without labour or effort”, as the foundation of a “Golden Age” and the liberator of slaves.

After a long and painful evolutionary road some 2,000 years later in the epoch of late-stage monopoly capitalism, the possibility of a ‘post-work’ world – with the ongoing development of robotic machinery, artificial intelligence (AI) and other forms of increasingly sophisticated automation – finally seems like a tangible reality. Decades of relatively small, quantitative innovations (with computing power, for example, tending to double every 18-24 months) have led to a point now promising a huge qualitative leap in the economic-technical foundation of society as a whole.

During this time, the global workforce has been increasingly ‘deindustrialised’ – shifted out of manufacturing and in to services (now comprising about 80% of the workforce in both Britain and the US).²⁴ The proportion of manufacturing workers in the total workforce in the US fell from 26.4% in 1970 to 8.51% in 2018.²⁵ Even Latin America and Sub-Saharan Africa have been deindustrialising over the past decade, from a much lower starting point than Asia.²⁶ Whereas industrialisation peaked in western European countries at income levels of around \$14,000, India and many Sub-Saharan African countries appear to have reached their peak manufacturing employment at income levels of \$700 (both at 1990 levels).²⁷

As McKinsey Global Institute Director James Manyika said in June 2017: “Find a factory *anywhere in the world* [our emphasis] built in the past five years – not many people work there.”

The ‘fourth’ industrial revolution?

The bourgeois (industrial capitalist) narrative trumpets the automation revolution as the ‘fourth’ industrial revolution.²⁸ Is this accurate?

The evolution of production is a process of developing man’s mastery of nature, of harnessing nature to serve our needs. New technologies give rise to new needs. For centuries – comprising the primitive communal,²⁹ slave-owning³⁰ and feudal systems³¹ – manual labour determined the technological basis of society. As the continual

improvements and specialisations of the implements of labour reached their limits and slavery and feudalism became fetters (restraints) on the further development of the productive forces as a whole (technology and humans), mechanisation (machine-aided production) necessarily replaced manual labour. Man was no longer the source of power that wielded the implements of labour.

Consolidating capitalist relations of production, this was the first industrial revolution – it marked a radical change in the *technological* mode of production, i.e. *the mode of combining man and technology*. Where man had controlled and wielded the inanimate elements of work, machines now dictated the inputs of man and relieved him as, in Marx's words, "chief actor".³² However, in creating a (technical and social) division of labour (physical versus mental; rank and file labourers versus labour aristocratic intellectual/repressive managers, etc.) they did not free him. "The hand tool makes the worker independent – posits him as proprietor. Machinery – as fixed capital – posits him as dependent, posits him as appropriated," says Marx.³³

Dominant versions of history tell the story that – since it was the most obvious contrast between machine production and the handicrafts and ordinary manufacture of small 'cottage industry' workshops – the upgrade of the steam engine made by Scottish engineer James Watt around 1775 was the fundamental catalyst of the first industrial

revolution. By extension, it was considered the primary factor behind the rise of British capitalism and the ensuing industrial and economic dominance of its Empire. All thanks to the supposed individual genius of Watt (or his 'Britishness').

This is an example of idealism, the theory that man's ideas or ever-improving rationality determine the course of history. Marx's method of dialectical materialism – that history is driven by ongoing processes of interaction or conflict between material and social forces – enables the understanding of history *per se*, rather than individual or ideological interpretations. (Indeed, Marx's method also explains the tendency for man's improving rationality.) That it was Watt who made this innovation is merely a 'historical accident' – if he had never been born, someone else would have realised this inevitable evolutionary development.

Behind this 'accident' lay the driving necessity to develop machinery and liberate industry from the confines imposed by nature in terms of a power source. The development of steam power removed the reliance on water power and therefore enabled industry to be moved to other locations more freely. With steam power, the primary factor became access to coal, the source of the energy needed to generate steam, which in turn enabled greater access to coal. With the development of electrical power, industry was further liberated (and has therefore invariably moved to wherever the cheapest labour can be found).

The origins of the steam engine can actually be traced back to the ancient Greek mathematician Hero of Alexandria. Within a system of slavery, though, it could not be utilised. Marx therefore argues that,

The steam-engine itself, such as it was at its invention during the manufacturing period at the close of the 17th century, and such as it continued to be down to 1780, did not give rise to any industrial revolution. It was, on the contrary, the invention of machines that made a revolution in the form of steam engines necessary. As soon as man, instead of working on the object of labour with a tool, becomes merely the motive power of a machine, it is purely accidental that the motive power happens to be clothed in the form of human muscles; wind, water or steam could just as well take man's place.³⁴

In his 1967 pamphlet *Era of Man or Robot? The Sociological Problems of the Technical Revolution*, Russian Soviet philosopher Genrikh Volkov writes that what made an industrial revolution for Marx

pivoted on finding the correct methodological approach. His examination focused on changes in the joint working mechanism and the combination of the inanimate and human elements of the process of production. Whether the machine is driven by an animal, a man or steam, Marx

showed, is immaterial. The source of power, being part of the machine, only serves the system of working machines.³⁵

What is defined as the second industrial revolution by bourgeois scholars was therefore merely the ongoing development of the first. Taking place in the decades before World War I (WWI), it saw the growth of existing industries and establishment of new ones, with electric power enabling ever-greater mass production. Major technological advances included the telephone, light bulb, phonograph and the internal combustion engine.

The ongoing digital revolution – with the emergence of digital record-keeping, the personal computer, the internet, and other forms of information and communications technology – is considered to be the third industrial revolution. This is, perhaps, more arguable. The instruments described certainly amplify man's mental capacity. But the digital revolution is a technological revolution and actually *part* of the automation revolution, not an industrial revolution by itself. Volkov explains:

Mechanisation begins with the transference to technology of basic *physical* working functions, while automation begins when the basic 'mental' functions in a technological process actually materialise into machines. This becomes possible with the appearance in production of supervising,

controlling or programming cybernetical installations.³⁶

The productivity of machines is slowed down by the physiological limits of human bodies, and so automation becomes necessary; man is increasingly excluded from direct production and now works *alongside* fully mechanised machines, calling forth a radical change in the man-technology relationship. As Marx says of automation:

Labour no longer appears so much to be included within the production process; rather, the human being comes to relate more as watchman and regulator to the production process itself.³⁷

This therefore means that capitalism “works towards its own dissolution as the form dominating production”,³⁸ says Marx, since the “value-creating power of the individual labour capacity [becomes] an infinitesimal, vanishing magnitude”.³⁹ That’s because capital’s exploitation of human labour is the source of surplus value, exchange value, and profit.⁴⁰ The point of automation, therefore, says Volkov,

should be to remove the contradiction between the inanimate and human elements, between man and machine, to break the shackle that made man and machine a single working mechanism, to act as Hercules setting Prometheus free to perform his great deeds. Potentially, automation can enable

man to become Man with a capital letter, and the machine to become Machine in the full sense of the word. Freedom for man's development is, at the same time, freedom for technological progress.⁴¹

Defining automation

In *Automation and Social Progress* (1956), English socialist Sam Lilley defined automation provisionally as "the introduction or use of highly automatic machinery or processes which largely eliminate human labour and *detailed human control*".⁴²

The term is of course generally applied to a very broad field ranging from semi-automatic machinery to automatic factories. These are qualitatively different notions and so must be understood carefully. Volkov writes:

Semi-automatic technology (semi-automatic machine-tools and lines, so-called cyclic automatons) represents a transitional form from ordinary to automatic machines. In this form, 'automation' is usually affected by mechanical means without, as a rule, recourse to cybernetical devices. The worker is still directly included in the process, which he supplements with his nervous system, intellect and, partly, muscular energy (loading and unloading of machines). At this stage, the new technology does not yet constitute automation proper and lacks its most characteristic features. As a matter of fact, semi-

automatic technology stretches to the limit the adverse aspects of mechanisation by simplifying things still more, robbing working operations of all their creative content and contributing to their further fragmentation [atomisation].⁴³

Automation proper can therefore be subdivided into three stages:

1. *Initial or partial automation* (separate machine-tools fitted with programme control; separate cybernetically controlled automatic lines). Here, the worker has relative freedom of action. They are included in the process only insofar as their duties include the overall supervision of operations, maintenance and adjustment of the machines.

2. *Developed automation*, e.g., automatic factories equipped with overall electronic control of all production processes, regulation of equipment, loading and unloading, transportation of materials, semi-finished and finished products. In this stage of automation the worker takes no direct part in the production process.

3. *Full automation*, which ensures automatic operation of all sections of production, from planning to delivery of finished products, including choice of optimum conditions, conversion to a new type of product, and auto-planning in accordance with a set programme. The planning of production as a whole and the overall control of its operation are also to a considerable extent transferred to automatic installations. "Automation of this kind is

equivalent to automatic production on the scale of the entire society,” says Volkov.

Here, not only the labour of workers, but that of technicians and, to a considerable extent, of engineers as well, is excluded from the direct technological process. This does not mean, of course, that such work disappears altogether. It is only shifted to another sphere, becomes more creative and closer related to scientific work.⁴⁴

Base and superstructure

Under capitalism in the first part of the 21st century, we are still a fair way from achieving a singular fully automated system of production. (The production process includes the transport of commodities to the point of sale/consumption, so workers who transport or service/handle commodities – such as pilots carrying cargo, courier drivers and check-out/till-point assistants – add value to a commodity. Drones, autonomous vehicles and self-serving tills are therefore automating the last stage of the production of exchange value.) This does not mean we are not moving relatively rapidly towards that outcome or witnessing an industrial revolution. Global management consulting firm McKinsey & Company expects “the near-complete automation of existing job activities” somewhere between 2060 and 2100, with the “most technologically optimistic” scenario putting the date at 2045.⁴⁵

The first industrial revolution began before and necessitated the rise of capitalism⁴⁶ (the printing press being the first *generalised* example of machine-aided mass production), just as the second begins before and necessitates the rise of socialism.

Marx recognised that the economic-technical base of a society determines its political and class superstructure. (Although the two of course interact and influence each other, the former dominates.) An industrial revolution has far-reaching consequences that go beyond the framework of technology and even beyond that of material production.

The first affected the character of labour (manual to mechanised); social structure (artisan and peasant turning into worker/proletarian);⁴⁷ the correlation of economic branches (agriculture being supplanted by industry); and, finally, the political and economic field (capitalist relations superseding feudal relations). Volkov spells out the most characteristic features of the second industrial revolution:

1) The production of material wealth has a tendency to turn into fully automated production “on a society-wide scale”. The second industrial revolution therefore “marks the *completion* of the establishment of industry”. At first, large-scale machine industry had a relatively limited area of diffusion, having taken the place of handicrafts and ordinary manufacture. But with the second industrial revolution,

industrialisation tends to spread also to the whole of agriculture, beginning with mechanisation, followed by comprehensive mechanisation and, eventually, by automation. Industrialisation is spreading to house-building, distribution, the community services (e.g. public catering) and even intellectual, scientific work. In this way, industry becomes the *universal form* of producing material wealth.

2) While the first industrial revolution was *local* in character, being limited to a relatively few developed European countries, the second industrial revolution “tends to involve all the countries of the world” as newly industrialising countries begin by installing the most up-to-date industrial equipment involving comprehensive mechanisation and automation.

This presents features of the first and second industrial revolutions at one and the same time. Consequently, the second industrial revolution is *global* in character, *laying the groundwork for a subsequent economic and social integration of nations.*”⁴⁸ (Our emphasis.)

3) The modern industrial revolution leads to substantial structural changes in the various spheres of social activity. Because of the ever-decreasing need for manpower for material production, scientific production increases both quantitatively

and qualitatively and tends to assume priority over the direct production of material wealth. "Hence, science is the *helmsman of the modern industrial revolution*."

4) The dominant feature of the automation revolution concerns its social implications. The first industrial revolution led to the consolidation of capitalist exploitation. Large-scale industry spelt wholesale ruin for artisans and peasants, longer working hours, intensification of labour and narrow specialisation (the breaking down of the production process into a series of repetitive, monotonous tasks). Under today's late monopoly capitalism, labour time bleeds evermore into leisure time; and social divisions intensify. In contrast, the modern industrial revolution under socialist relations leads to a shortening of working hours, an easing of labour, a modification of its nature (work becoming more creative and free), and to the elimination of the essential distinctions between town and countryside, and between mental and manual labour. While yielding the industrial basis for an abundance of material wealth and to distribution according to need, it also opens up possibilities for unlimited spiritual improvement of man's personality. Volkov adds:

The second industrial revolution resolves the contradiction between the machines and those who operate them, i.e. the contradiction within the joint working mechanism. By completing the

automation of production, it paves the way for the implementation of the principles of *socialist humanism* in society. Hence, the very logic of the second industrial revolution *strengthens man's personality and humanism*.

In capitalist countries, however, this logic and the above-mentioned features of the second industrial revolution contradict the very essence of the relations of exploitation. All the same, mechanised labour gives way to automation, the antithesis between mental and physical labour tends to disappear. And the cultural and technical standard of the workers tends to rise.⁴⁹ Substantial changes also occur in the social structure and in the relation between the various economic branches. In other words, many of the essential elements of an industrial revolution are distinctly on hand.

The fundamental difference between the [automation] revolution in capitalist countries and its counterpart in the socialist states consists in its leading to the *breakdown* [our emphasis], instead of the consolidation, of the existing relations under the conditions of the private ownership of the means of production. The modern industrial revolution has strained to the utmost all the contradictions of capitalism.... It does not reform capitalism. Instead, it creates the material preconditions for a social revolution and paves the way for the eventual replacement of capitalist relations of production by communist relations.⁵⁰

The automation revolution *cannot be consummated under capitalism – socialism must be instituted to finish what capitalism started.*

The technological determinists who see automation as the ‘fourth’ industrial revolution do not put the development of technology in its proper socio-historical context, but instead in isolation from the human component of the productive forces. They fail to see

the genuine dialectics of the forces and relations of production, [and] deny the inverse influence of the relations of production on the productive forces and the development of science and technology.⁵¹

To summarise: over many centuries, manual labour determined the technological basis of society. The technological mode of production, the mode of combining inanimate and human elements, was *subjective*.

The next stage, paved by the specialisation of implements in manufacture, began when the main working function – control of partial implements – of the ‘living mechanism’, the worker, transferred to the mechanical mechanism, the machine. From human-inanimate, the working mechanism became inanimate-human. The technological mode of production became *objective* and labour became mechanised. This is then the first industrial revolution.

Finally, the third historical stage in technological development is ushered in by automation. The working mechanism becomes fully *technical* and the mode of combining man and technology becomes *free* (and therefore humanised – the word *auto* means *self*) as (exploited) labour itself is automated. This then is the second industrial revolution.

Marxists therefore reject the bourgeois definition that posits the development of automatic machinery as the fourth industrial revolution.

Automation: a humanised (self-controlled) force

One of the projects championed by Fidel Castro in socialist Cuba was a biotechnology mission, beginning a year after the revolution. In 1960, Castro declared that “the future of our homeland must be that of men of science”. Cuba established a National Centre for Scientific Research (CNIC), the Centre for Molecular Immunology (CIM), the Finlay Institute and the Centre for Genetic Engineering and Biotechnology (CIGB). As Volkov says,

It is only logical to expect that the next foreseeable leap in technology will be tied up with the use of production of the biological properties of living matter with a view to achieving an even more radical transformation of nature.... Biochemical and bionic technology will enable us to transform living nature, plants and animals, direct the activity of living matter and make use of its marvellous properties for the good of mankind.

Bionic technology will take the form of artificial sense, of organs of thought and psychology, which will reinforce and improve the functioning of the natural sense organs.⁵²

Rather than being a force alienated from humans, as under capitalism (since the products of social labour are appropriated and privately sold by capital), technology in communism will become a "*humanised force*", says Volkov, designed to satisfy man's needs and assist him in his various activities, including those of his body.⁵³ Bionic machines would "assume entirely unexpected forms". At the time of writing, in 1967, "already, devices are being worked out in which a living body is fitted into a technical system". But the reflexes of a living body are much more efficient than "the present-day electronic control devices modelled on them".

It is therefore expedient and theoretically possible to use the nervous system of, say, a rabbit, dog or other animal in such a way as to make the biological currents controlling the heart also control a technical unit.... The organism's biological currents can be used as control signals for transmitting information and supplying electricity to instruments.⁵⁴

Fifty years later, however, such possibilities have not really materialised beyond the expensive labs of mega-corporations and military facilities. Despite

massive progress within those confines, robots are still more cumbersome than an athletic human, although the gap is increasingly narrow. The most advanced (still highly expensive) bionic leg has only recently been able to get close to the agility of a human leg. Because production is now so capital-intensive, making capital increasingly unprofitable to (re)invest in production, the *rate* of technological progress has tended to slow down.⁵⁵ The technical use of biological energy, a totally clean form of energy production, has not been realised on a level that can be generalised and diffused.

Volkov says that biological methods of acting on nature

correspond to the principles of automation even closer than chemical methods, inasmuch as a biological cell, and doubly so a living body, is the most efficient automatic (self-controlled) system there is. It is precisely this unity of the principles of control which makes possible an astonishing symbiosis of technical and biological elements. This same unity enables us to 'humanise' technology, i.e. to set up technical systems best adapted and adjusted to the possibilities of the human body. Such technical systems will permit us to amplify many times over the activity of the human senses and brain. The man-technology system will thus assume a new, efficient form in which technology will really play the role of a set of artificial organs of social man.⁵⁶

The clean, renewable and hyper-efficient technologies of the future will have to be fully realised under socialism and communism.

Contemporary science: increasingly ‘presocialist’

Indeed, many areas of science in late monopoly capitalism are starting to look more and more ‘presocialist’ – i.e., systematic, holistic, dialectical. As economic anthropologist Jason Hickel writes, “science today is beginning to catch up” albeit, Hickel not incorrectly points out, with animism, the long-held belief of indigenous and peasant communities that all of nature is alive and interconnected – a worldview hardly incompatible with Marxism.

Biologists are discovering that humans are not standalone individuals, but composed largely of microorganisms on which we depend for functions as basic as digestion. Psychiatrists are learning that spending time around plants is essential to people’s mental health, and indeed that certain plants can heal humans from complex psychological traumas. Ecologists are learning that trees, far from being inanimate, communicate with each other and even share food and medicine through invisible mycelial networks in the soil. Quantum physicists are teaching us that individual particles that appear to be distinct are inextricably entangled with others, even across vast distances. And Earth-systems scientists are

finding evidence that the planet itself operates like a living superorganism.⁵⁷

These developments in science are reflected in the increasing interconnectedness of the global economic-technical base and are therefore 'permitted'⁵⁸ and used to keep developing the base via the continued cheapening of production and acceleration of the circulation and turnover of capital, now culminating in 'the internet of things', an online network of physical objects embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.⁵⁹

Humanisation = microbialisation + plantification

Perhaps the most notable development in science is our new understanding of microbes – previously wholly categorised as agents of disease – thanks to advances in DNA technology. To quote Eden Project director Dr. Tony Kettle, microbes

run not only our bodies but also drive Earth's life support system. They provide the oxygen we breathe, the water we drink and the food we eat. They help make soils and keep them fertile, transform dead matter back into the world of the living, wear down mountains and build up cliffs, regulate the climate and drive the nutrient and energy cycles that make and sustain our bodies and the living world.

Cyanobacteria, or blue-green algae, were the first oxygen-producing organisms, about 2.8 billion years ago. Microbes have, says Elio Scaechter, professor emeritus at Tufts University, “transformed this planet – its geology, its atmosphere and its climate. They are essential to life and its evolution.” Hickel explains that,

Humans have two sets of DNA – one contained in the nucleus of each of our cells, and the other in the mitochondria, an ‘organelle’ that lives within the cell itself. Biologists believe that this second set, the mitochondrial DNA, is derived from bacteria that were engulfed by our cells at some point in the evolutionary past. Today these little organelles play an absolutely essential role in human life: they convert food into energy that our bodies can use. This is mind-bending: that our most basic metabolic functions, and even the genetic codes that constitute the very core of who we are, depend on other beings.

A team of scientists associated with the Interdisciplinary Microbiome Project at Oxford University have suggested that discoveries related to bacteria may revolutionise not only our science but our ontology (studies of concepts such as existence, being, becoming, and reality):

Our ability to map previously invisible forms of microbial life in and around us is forcing us to rethink the biological constitution of the world, and the position of humans vis-a-vis other forms of life.⁶⁰

According to a study led by Ron Sender at the Weizmann Institute of Science, more of the cells that constitute your body belong to other lifeforms than belong to 'you' as such.⁶¹ As the British philosopher of science John Dupré has put it, "These findings make it hard to claim that a creature is self-sufficient, or even that you can mark out where it ends and another one begins."⁶²

Thus the capitalist myth of The Individual (the entrepreneur) being the driving force of history is blown away – the world is, and always has been, powered by collectivism.

In 2018, scientists in the US found enormous populations of bacteria living in the extreme temperatures of Earth's crust, despite the lack of photosynthesis and nutrients, living solely from chemical reactions fuelled by geothermal energy.⁶³ They estimated that up to 23 billion tonnes of micro-organisms live in this "deep biosphere", making it the largest ecosystem on the planet and accounting for nearly 400 times the amount of carbon found in all living humans. Here lies a potential source of abundant energy. Scientists have even found that the *Geobacter* bacteria found in human 'waste' can convert sewage into fresh water and produce electricity in

the process. It is now thought that one day microbial fuel cells could power phones, household appliances, and even spaceships.⁶⁴

The humanisation and collectivisation of the mode and means of production brought about by communism will thus also be a microbialisation of the mode of production.

It will also be a 'plantification' and 'mycelisation' of the mode and means of production. Most of the products we need and use, including batteries, conductors and computers, can be made from fibrous plants, especially hemp. The same is true of mycelium, a type of fungi. Because their growing and processing involves relatively little labour, however, turning them into profitable industries is severely limited, while their cheapness, abundance, quality and versatility fatally threaten the competitiveness of the mining, logging, chemical and fossil fuel industries, among others.

The Latin word for hemp, since it is one of, if not the only, plant species that provides food, fuel and fibre, actually means 'useful'. It surely seems destined to underpin socialism's utility-based production, with the end of hemp prohibition also ending one of the most institutionalised forms of the alienation imposed by capital between man and nature. Indeed, humans used hemp for fuel, food, medicine, construction and clothing for at least 10,000 years before capitalism.

Hemp grows quickly with little water, reverses desertification and rapidly draws down (and indefinitely sequesters) carbon dioxide; so limiting

and reversing the crisis of global heating brought about by fossil fuel production therefore *requires* socialism and a hemp-based industrial revolution.

The recent discovery of the endocannabinoid system in humans – a network of cannabinoid receptors all over our bodies that provide chemical feedback for cellular communication – has also shown that, *as with microbes, mushrooms, and all plant life*,⁶⁷ *cannabis and humans are relatives*.⁶⁸ The theory of ‘human photosynthesis’, now up for debate around the fringes of ‘mainstream’ science, therefore seems to make a lot of sense (and related theories may hold the key to producing *actually clean* hydrogen fuel cell power).⁶⁹

Again, the world is one, interconnected whole, one ecosystem, united in all of its glorious diversity. The natural state of Earth – interrupted and distorted in historical terms by the relatively brief epoch of private property – is that of a global commune.

Socialist automation: reuniting man and nature

Taking production to its fully automated destiny needs to be done without neo-colonialism or turbocharging the climate crisis. As long as we develop ways of doing so with fibrous plants, mycelium and microbes, enabling us to wean industry off of fossil fuel and metal mining – thereby negating capital’s need for colonialism – automation itself has a vital role to play in reviving ‘the environment’ and stabilising the climate, since

renewable energy is essentially a form of automation. Volkov writes:

The opinion of sociologists and economists varies as to the main trends of scientific and technological progress, and their relative importance and role. Some lay emphasis on automation, others on atomic energy or conquest of outer space, and still others on the development of production mainly along chemical lines. But automation is not just one of these trends. It is a historically conditioned form of industrial development in a new historical stage of technical development, and is an element of all modern scientific and technological progress, and all its trends. The development of production along chemical, biological, or 'cosmic' lines (i.e., the application for industrial purposes of space, and, in terms of the future, also the organisation of production in outer space),⁷⁰ and the use of the new powerful sources of energy – all this is tied up with automation and is inconceivable without it.

This is because a new form of energy

will not yield a substantial increase in the productivity of social labour unless the necessary technical conditions are provided for obtaining and using it, including automation as an indispensable factor. It is not until these conditions are available that the new source of energy will

accelerate technological progress and act as a pusher of further changes in the 'man-technology' system.⁷¹

Marx could see that the mechanical treatment of materials would give way to chemical methods. But before those methods could be applied in industry, they had to be given the corresponding technological form in terms of mechanisation or automation. Unlike mechanical methods of treating matter,

chemical reactions do not require the use of implements exerting a direct influence on the object of labour. The chemical properties themselves play the role of such 'implements'. Nor is there any need for the power required in mechanical methods for driving the tools. Once the substances have been brought into contact, the reaction generally proceeds automatically.... In addition, whereas mechanical treatment is the result of a series of discrete, disjointed, singular movements, chemical treatment is continuous by nature, since chemical reactions go on without interruption. Automatic processes and continuity are the indispensable features typical of automation. Hence, chemical methods of treatment correspond to the very essence of automation (which cannot be said about mechanical and certain physical methods). Furthermore, chemical methods cannot dispense

with automation, inasmuch as many chemical processes are harmful to health, and also because their control requires absolute precision, which only cybernetical devices can ensure. [The same is true, of course, of nuclear power.]⁷² Close alliance between chemistry and automation will lead to the creation of new synthetic materials with miraculous properties, and this will revolutionise automation itself. Bulky automatic lines consisting of mechanical units with their complex and noisy systems of transmission and transportation will give way to compact, noiseless, elegant and dependable plastic installations.⁷³

Imagine, then, a lightweight fully-automated system of production built with plastics and graphene made from fibrous plants and mycelium (with chemicals also sourced from plants instead of the toxic ones presently sourced from fossil fuels and metal mines). What's more – and this was something, Volkov points out, that sci-fi novelists and other bourgeois prophets failed to anticipate – because

light, space and greenery are absolutely redundant for cybernetical installations... it seems more likely that automatic production of material wealth will be transferred underground, for man will thus avoid polluting the atmosphere and encumbering our planet, while enjoying to his heart's content the vegetation and sunshine on its surface.⁷⁴

The accelerated development of automation under socialism – which will remove the fetters on production (private property, the profit motive and surplus capital) – will minimise the mass of land dedicated to industry, increasingly creating more space for reforestation, rewilding, hemp farming, countryside, public parks, and so on. In this way, *whereas automation intensifies the alienation between man and nature under capitalism, it reunites them under communism.*

Thus the automisation, humanisation, microbiolisation and plantification of the means and mode of production will *not only reverse capital's degradation of Earth and its habitability but also that of the the human body and its fertility.*

Towards a Single Automatic System

The maturity of technology and science that socialism will inherit in the 21st century means that the problems associated with central planning in the 20th century Soviet Union will be much easier to overcome. (Indeed, in hindsight it is arguable that the Bolshevik Revolution of 1917 proved to be somewhat 'premature', given that Bolshevik leaders thought capitalism was entering its final crisis at that time, despite the fact that Russia had only partially transitioned away from feudal, agricultural relations.)⁷⁵ Thanks to contemporary computing power and stock coding, the dominant 'command and control' military-style planning that overlooked the finer details and smaller components is no longer

necessary. (All components are more and more integrated, anyway. Whereas NASA's first space shuttle had 2.5 million moving parts, SpaceX machines possess around 100,000 and Relativity Space aims for its rockets to have a thousand moving parts or less.) As Volkov writes:

Let us anticipate the future and suppose that it has attained its zenith and that its characteristic features... have reached full development. We shall then have a society with fully automated production of material wealth, ensuring abundance. Such production will form a Single Automatic System which, for the sake of maximum efficiency, will incorporate all the branches of industry and agriculture, centrally controlled according to a single plan.

From the social point of view, this will be a single society, because there will no longer be any workers or peasants previously associated solely with physical labour, and because the distinction between mental and manual labour, and between town and countryside, will have vanished. Creative work incorporating intellectual, emotional and manual activities will predominate. The life of society will be governed by the laws of free, instead of working, time, and so on.⁷⁶

The direction of history towards turning world productivity into a Single Automatic System shows that the last phase of lower communism is a *de facto*

single world state. To get there, each nation-state obviously needs to become socialist, with its own governing structure and centrally planned system working towards full automation in that country.⁷⁷ A Communist International would be required to oversee development and trade between each socialist state – making sure, for one thing, that the plan incentivises the sharing of technologies and material wealth (including human resources) – which would act with the same semi-autonomy in relation to the International as a region of a country does to its central government or a state to federal level (or a local soviet to its regional soviet, and so on).

As this system develops, the Single Automatic System and a *de facto* one-state world will come into being, with borders being rejected as fetters on productivity – there being no transfer of ownership when it comes to trade in a socialist political union, anyway – and individual nation-states withering away in all but regional name.

We can see then that, *whereas capitalism in the long run has a historically centralising tendency, socialism in the long run has a historically decentralising tendency.* This then is the path to a borderless, stateless world, not the fantasy anarchist one, which, with its desire to introduce federations of fully autonomous communes, would effectively introduce new borders and undermine internationalism. The necessary aim of communism is to unite – to un-divide – the working class and humanity as a whole.

Conclusion

Two essential points must be grasped about automation. Firstly: the economic-technical base of society (our social formation) is becoming automated, self-controlled and therefore *free and human* – i.e., *enabling humanity's true self-determination*. Thus, Marxists refer to communism as the beginning of human history.

Secondly: in striving to maximise the exploitation of labour and thereby the outer limits of exploitation, automation is simultaneously abolishing the source of profit and exchange-value – i.e. capital's exploitation of commodity-producing labour. This process is not reversible. Innovation and the tendency for machinery to grow relative to labour continues throughout history, under any mode of production. (In technical terms, the *organic composition of capital*, the ratio of *constant* capital (machinery) to *variable* capital (wages/labour), tends to rise.) Under capitalism, the process is driven by the needs of capital accumulation, a valorisation process that demands the reproduction *and* expansion of capital.

Commodity producers must continually expand production to overcome the inherent contradiction contained in the commodity: it is both a *use value*, a utility; and an *exchange value*, containing labour time, surplus value, and sold for profit. The quicker and more abundantly commodities are made, the less labour time, surplus value and therefore exchange value and profit tends to be contained in the average

commodity, compelling the capitalist to offset this decline by expanding production yet further (via an initial contraction, in order to facilitate cheap mergers and innovation during a deflationary period) – only to continually intensify the contradiction. All production under capitalism is governed by this, the law of value (measured in labour time in the abstract and prices of production at the ‘surface level’).

This contradiction is also expressed in an increasing overaccumulation of capital – a surplus that is unprofitable to (re)invest, resulting also in the equivalent surplus (unemployed) labour – and periodic contractions in economic output that tend to worsen. *This overaccumulation is at the same time an underproduction of surplus value.* The fund for both capitalist consumption (the incentive for being a capitalist) and working class wages go into *absolute* decline and a *struggle over allocations of surplus value between the two necessarily entails.*

The necessary reaction for capital is to expand and cheapen the labour base – hence the imperialist nations become increasingly dependent on export capital and overseas labour⁷⁸ – and raise its productivity (of surplus value dedicated to accumulation) through: increased (relative and absolute) exploitation and production; innovation; and outright transfers of wealth, including through corporation tax cuts, price rises and privatisations of public assets. (In 2020, for example, workers collectively ‘lost’ \$3.7 trillion (tn) and billionaires

gained \$3.9tn.)⁷⁹ In the long-run, however, the relative underproduction of surplus value tends to rise, since early innovators can only stay ahead of competitors for so long and the amount of machinery/capital employed tends to rise relative to the total productive labour employed.

Commodity-producers must continually attract greater investment to turn a profit, and vice-versa. As a company grows larger, its outgoings rise and become more unsustainable, and so greater profits need to be generated than before. Hence the dominant tendency towards the ever-greater monopolisation of industry and economies of scale on the one hand (a decrease in cost per unit of output enables an increase in scale); and, on the other, the atomisation of services (splitting the transport network up into millions of small vehicles is more profitable than focusing on the efficiency of trains and trams; having people consume media on individually-owned screens is more profitable than communally on a big screen, etc.)

Since wages eat into both thinning profit margins and the capitalists' consumption funds, expenditure on wages must be slashed. Robots not only work faster; they do not need toilet/rest/lunch breaks, sick or holiday pay, and are therefore much more productive and cheaper to employ. They also require less supervision, meaning capitalists can employ fewer managers (of labour) – they need to anyway to widen profit margins – including police and other repressive strata, meaning the labour aristocracy also

tends to shrink. There is no such thing as ‘technological unemployment’, though: people go unemployed when capital can no longer afford to employ them. (Socialism, by contrast, is capable of *permanent* full, formal employment; and would take advantage of automated production by training and employing workers in industries that under capitalism are notoriously and chronically understaffed; i.e. far more scientists, engineers, nurses, teachers, etc. Even police and soldiers, who do not produce surplus value and are therefore paid out of the surplus value produced by commodity-producing workers, are increasingly being replaced – at least relative to population growth – by surveillance technology and autonomous weapons,⁸⁰ since one effect of shrinking profit margins is shrinking government tax bases, at least in relative terms per capita.)

Innovation is necessary to continually raise the productivity of labour and meet the demands of accumulation – only the size of the ever-expanding total (constant) capital eventually becomes too large for the ever-dwindling pool of surplus-value-producing labour (variable capital) to renew and expand. The underproduction of surplus value becomes *insurmountable* – the system comes up against a historical limit of accumulation and breaks down into barbarism, *necessitating* socialist revolution.⁸¹

The problem for capitalism is that it eventually runs out of labour and labour time to exploit and land and services to privatise and atomise.

As outlined in the opening passage of this pamphlet, interest, GDP and general profit rates have all trended historically downwards and ever-closer to zero. So too have commodity prices.⁸² Exchange value has withered away, *necessitating a system based solely on use value.*

In his 2019 lecture “How to enjoy the end of the world”, visiting assistant professor of mathematics at Hampden-Sydney College Sid Smith argues that doubling global production, as tends to happen every 20 years under capitalism, would finish off the habitability of Earth’s atmosphere – but also that the diminishing energy return on investment (EROI) *now makes that impossible.* In other words, investment in energy production is becoming completely unprofitable. That this is happening at exactly the same time that capitalism is exhausting its primary fuel supply, human labour, can be no coincidence, but is remarkably humbling nonetheless.

As with previous modes of production, the contradictions between the productive forces (the means of production) and the productive relations (the ownership of production) are being *driven into irreconcilable conflict by technological evolution and sheer historical force.* While this contradiction has always been expressed under capitalism by the private appropriation of the products of collective, socialised labour, it is *now increasingly expressed by automated*

labour and a diminishing source of profit, tending ever-closer towards the self-abolition of the law of value.

Just as capitalism matured in the womb of feudalism through the concentration of industry, socialism has matured in the womb of capitalism through the further expansion and concentration of industry, along with the increasing automation, digitalisation, servicisation and *humanisation* of labour. The new economic-technical base demands a new, applicable superstructure; i.e. public – *human* – ownership of the means of production; an all-socialist state (a people's democratic republic made up of centralised workers' councils); centrally planned utility-production on a break-even basis; and the replacement of money by digital (non-transferable) vouchers, pegged to labour time.⁸³

This latter point makes perfect sense given that fiat money is becoming more and more worthless and is therefore 'dying a natural death' – British pound sterling, for example, having lost 99.5% of its purchasing power during its lifetime by 2011.⁸⁴ With money printing going into overdrive after the March 2020 stock market crash and worse crashes to come, *worldwide hyperinflation* surely beckons.⁸⁵

The age-old arguments about which system works better, capitalism or socialism, are quite redundant. The answer has, of course, always been socialism – but the point that now has to be stressed is that socialism is *now becoming an economic necessity for the first time*. As Volkov concludes:

As the mass of exploited manual workers decreases due to scientific and technological progress, particularly automation, the mass of exploited intellectual workers, i.e. white collar employees, engineers and scientists [who increasingly contribute to commodity production] also increases in reverse proportion (or even more rapidly)...⁸⁶

Capitalism in the age of automation increasingly turns the majority of the population into proletarians and, in doing so, creates all economic, social and political prerequisites for the system's downfall.⁸⁷

Notes

¹ “This was the fastest 30% sell-off ever, exceeding the pace of declines during the Great Depression,” CNBC.com, 23 March 2021. Hundreds of millions of people around the world quickly lost their livelihoods. By May the US working class had suffered 40 million job losses. The International Labour Organization (ILO) said 1.6 billion workers in the informal (unregulated) economy alone, nearly half of the world’s total workforce, “stand in immediate danger of having their livelihoods destroyed... The first month of the crisis is estimated to have resulted in a drop of 60% in the income of informal workers globally. This translates into a drop of 81% in Africa and the Americas.” (“ILO: As job losses escalate, nearly half of global workforce at risk of losing livelihoods”, ILO [online], 29 April 2020.) The United Nations (UN) warned of famines “of biblical proportions”. Britain, the oldest capitalist superpower, entered its worst recession since 1709, its economy shrinking by 25% in March and April 2020. The World Bank estimated in June 2020 that global production would contract by 5.2% for the year, from \$89.94 trillion (tn) to \$83.19tn – equivalent to the output of Germany and France combined – three times worse than the 1.7% during the so-called Great Recession (2007-09). Investment in the poorer ‘developing’ countries by capitalists based in the richer ‘developed’ countries initially fell five-fold compared to that previous crisis. (“Capital outflows from EMs [emerging markets] at record levels in 1Q20, but starting to slow”, IntelliNews [online], 9 April 2020.) In November, Zambia became the sixth country to default or restructure debts in 2020. The International Monetary Fund (IMF) estimated that global GDP in 2025 would be 31% worse off than had been

projected before 2007. The US stock market during the Great Depression fell to its lowest point in 1932, a decline of nearly 89% compared to the high point in 1929. The worst is yet to come. That the next crash loomed large before the reported outbreak of 'COVID-19' in late-2019 is undeniable. Many countries in Sub-Saharan Africa and Latin America were already in recession (two back-to-back three-month periods of contraction), while Germany and Britain were spluttering along at near-zero growth. The 'lockdowns', *de facto* global martial law – suiting monopoly capital's need for depressed prices and wages; and the destruction of small, medium and surplus capital – exacerbated the depth of the recession but played the role of catalyst rather than cause. With stocks overinflated in value, at 150% of GDP – the average is 50% – they were extremely vulnerable to an external shock. Stocks would not have tumbled by 30% if an epic bubble had not already formed. The 'recovery' from the Great Recession had been the weakest since WWII. Whereas US GDP grew by 43% over the first 39 quarters of the 1991-2001 expansion, in the first 39 quarters of the last expansion, up to March 2019, it grew by only 22%. At that rate, the last expansion would have had to continue for another six years to equal the aggregate growth of 1991-2001, and nine more years to match the 54% recorded over the 1961-69 expansion. (Hart-Landsberg, M., "Portrait of the 2009-2019 US expansion", Monthly Review Online, 20 June 2019.) Corporate profits peaked in 2015. Then-President Donald Trump's record corporate tax cut in 2017 – from 35% to 21% – saw after-tax profit rates resume an upward turn, but the promised 3-6% growth did not materialise (averaging 2.4% between the end of 2017 and the end of 2019). Corporate tax receipts in 2019 were down by 23% compared to two years earlier. In the wake of the tax cut, employment rose and so inflation climbed to 2.3%, above the targeted 2% that ensures stability for planning while incentivising spending and lending (since deflation indicates recession and therefore incentivises the opposite). Having raised interest rates – by slowing down debt-based Federal Reserve (central bank) asset buying – from 0.5% in 2016 to 2.5% in 2018, they were reduced to below 2% in 2019, before March 2020 when they

were put back down to 0%. Capital *required more*, not less debt-based asset buying. In August 2019, the US yield curve inverted for the first time since 2007. That is, the interest rate (yield/return) on 10-year government bonds (loans to the government) fell below the rate on the two-year equivalent. At the time, two-year Treasuries Bills (T-Bills) were trading at a yield of 1.634%, while 10-year T-Bills only offered 1.628%. The longer-dated debt should normally offer a better rate of return as there is simply more time for something to go wrong before the money is due to be repaid; and investors need short-term returns to pay short-term bills and expenses. Inverted yield curves therefore imply that investors have become more pessimistic about growth. August 2019 updates also revealed that Germany's economy had contracted by 0.1% in the second quarter, while Britain's shrank by 0.2%. Germany's yield curve inversion was worse than in the US and Britain. Berlin responded with an auction of €2 billion (bn) of new 30-year bonds at 0%, meaning it would simply take money and promise to return it in 2049. Inflation, of course, could have eroded much of its value by then, making conditions very difficult for insurance firms and pension and hedge fund managers whose job it is to grow their clients' wealth. That the US yield curve inversion happened *after* a base interest rate cut, from 2.25% to 2% at the end of July 2019, was described by Michael Pento, author of *The Coming Bond Market Collapse* (2013), as "very remarkable". But the remarkable kept coming. While falling share and rising bond prices in a crisis usually generate falling interest rates – since government debt is 'safer', on the basis that the state can print money – on 9 March 2020 the 10-year US Treasury Bond interest rate spiked upwards. According to one bond trader, "statistically speaking, [this] should only happen every few millennia". Even when the giant 160-year-old investment bank Lehman Brothers went bankrupt in September 2008, this did not happen. The Fed pledged asset purchases with no limit to support markets, taking the unprecedented action of buying up corporate bonds and exchange-traded investment funds in the primary market. (In the secondary market, proceeds from the sale

of bonds go to the counter-party, say an investor or a dealer; whereas in the primary market, money from investors goes directly to the issuer.) This happened because, after 9 March, corporate interest rates surged so high that few corporations could borrow money at any price. Investors were refusing to lend to them, meaning corporations faced a credit crunch – despite global sovereign negative interest rates.

² “U.S. oil prices fall below zero for the first time in history”, NPR (online), 21 April 2020.

³ See my essay, “Capital’s profitability now depends on ‘lockdowns’, acute social enclosure, and ‘medical’ tyranny”, philosophical-malady.blogspot.com, 16 September 2021. The essay examines the possibility that ‘the global COVID-19 pandemic’ may have been manufactured by a Machiavellian plot (either by exaggerating the effects of COVID-19; effectively rebranding existing influenza/coronavirus variants; or inducing and/or mislabelling conditions such as serotonin syndrome) to begin a process of merging the state with monopoly capital absolutely and abolishing civil rights in response to the crisis of capitalism, which, to sustain or rewidened extremely slim margins of profitability, requires unprecedented accelerations in: a) the expansion of the exploitable labour base, via: the colonisation of developed nations (such as Australia); the proletarianisation of layers of the petty bourgeoisie and labour aristocracy; and reintroductions/expansions of child labour/human trafficking (the commodification of human bodies); b) the cheapening of labour/decimation of wages via mass unemployment that intensifies competition between workers; c) the increase in absolute surplus value production, as has happened most noticeably with the large layers working longer hours from home (while also shouldering the costs of office bills); d) the cheapening of capital, via an initial economic contraction to reduce prices and speed up the development and introduction of automation; and e) the destruction of surplus capital and surplus labour (countries with the strictest ‘lockdown’ measures have tended to have the most excess deaths); along with f) monopoly capital merging as closely as

possible with the state; the privatisation of the last vestiges of public services and assets (including health and education); the expansion in commodity production, especially via state purchases (hence barely-regulated mandates for publicly-funded, rushed and experimental ‘vaccines’ (mRNA genetic therapy that may well hold potential benefits but which were previously considered to be too toxic by regulators) and continual ‘booster’ jabs) and exponential data generation via increasingly relaxed privacy laws (hence domestic ‘vaccine’ passports and positive and negative incentives for fraudulent ‘COVID-19’ tests, whereby extraordinarily high numbers of positive ‘cases’ are generated as a pretext for tightening ‘lockdown’ restrictions, despite the abundant evidence that any asymptomatic and outdoor carriers do not spread any virus. All this has been done to counteract the flatlining rate of profit, with lockdowns also accelerating the destruction of smaller capital that can then be soaked up by monopoly capital on the cheap. (As an example of the state merging with monopoly capital absolutely (‘state monopoly capitalism’), in March 2021 the US Army announced a staggering ten-year £21.9bn deal with Microsoft for ‘augmented reality’ technology in the form of helmet visors that display tactical intelligence data. *The Economist* [online], 22 September 2021.) The ruling class has resorted to such lengths in a desperate attempt to either stave off the kind of inflation that is bound to trigger an even greater stock market crash than March 2020, given that the debt bubble has been reflat to an even greater size; or, more likely, prepare for the inevitability of such an outcome, given that higher and higher inflation will become increasingly necessary to torch wages, debt and taxes and centralise capital still further. Tightening borders enables tighter control of labour’s movement and ‘quarantine camps’ serve as a basis for new concentration camps; while pitting ‘the vaccinated’ against ‘the unvaccinated’ creates a new apartheid/caste system for the purposes of divide and rule, a racist one at that given that black and other ‘people of colour’ are more likely to be ‘vaccine hesitant’ as a result of centuries of colonial medical abuse. (See Quijano, R., “Vaccination: Most

deceptive tool of imperialism", Bulatlat [online], 12 October 2019.) To quote Sun Tzu, "All warfare is based on deception." Never has this been truer given modern capabilities. (See, for example, Libicki, M., "The spectre of non-obvious war", *Strategic Studies Quarterly*, vol. 6 no. 3, Fall 2021.) Further comments on developments since late 2019 feature below but the essay covers the issues in much more detail. Seeing as many self-described socialists (largely from the labour aristocracy), however, have supported 'lockdowns' (often calling for authoritarian hard-right governments to 'lockdown harder', in fact) along with barely-regulated 'vaccine' mandates and even, in some cases, domestic 'vaccine' passports/apartheid, let us quote Marx:

The human body is mortal by nature. Hence illnesses are inevitable. Why does a man only go to the doctor when he is ill, and not when he is well? Because not only the illness, but even the doctor is an evil. Under constant medical tutelage, life would be regarded as an evil and the human body as an object for treatment by medical institutions. Is not death more desirable than life that is a mere preventive measure against death? Does not life involve also free movement? What is any illness except life that is hampered in its freedom? A perpetual physician would be an illness in which one would not even have the prospect of dying, but only of living. Let life die; death must not live. Has not the spirit more right than the body? Of course, this right has often been interpreted to mean that for minds capable of free motion physical freedom of movement is even harmful and therefore they are to be deprived of it. The starting point of the censorship is that illness is the normal state, or that the normal state, freedom, is to be regarded as an illness.

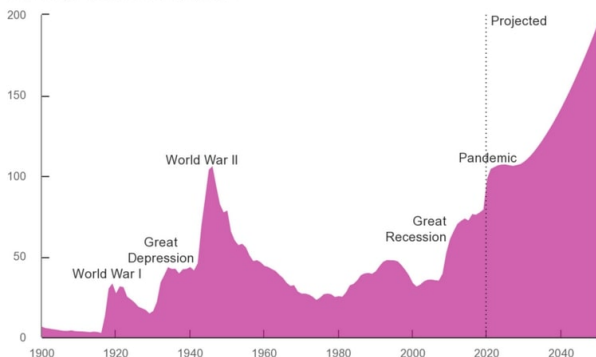
("As a privilege of particular individuals or a privilege of the human mind?", *On Freedom of the Press*, 1842, Marxists Archive [online].) If COVID-19 is a genuinely novel zoonotic virus, this would stem from capitalism's need to increasingly commodify nature. If it was deliberately 'leaked' from a lab, the final theory that has been

proposed, this would stem from capital's need to destroy competition and surplus labour.

⁴ Today's debt levels show that this crisis is much worse than the Great Depression. Official US national debt in 1929 stood at 16% of GDP; 44% at the start of WWII; and 65% before the Great Recession of 2007-09 – after which it exploded to 104%. Although the figure hit 121% at the end of WWII, it has been almost as high since 2009, without the impact of a world war. In the second quarter of 2020, it hit a record 136%. In 2013, gross national debt and household debt (85% of GDP) hit record highs at the same time for the first time ever. After Congress swiftly agreed a record \$3tn bailout package – just for starters – to keep monopolies (and *some* 'small-medium' business) afloat following the March 2020 crash, the official US national debt hit £26.5tn, 123% of GDP. The annual deficit – the difference between government income and expenditure – ballooned from \$984bn in 2019 to \$3.1tn in 2020. That's 14.9% of GDP, flying up from 3.8% in September 2019; and twice as high as its worst point following the Great Recession. The US has never defaulted on more than a small part of its debt but, historically, countries that have failed to get their debt-to-GDP back below 90% have gone bankrupt and defaulted on their debt in general, forcing them to go cap in hand to the IMF for a bailout (usually in the form of high-interest loans and on the condition of privatising state assets and public services). These, though, have been relatively small economies. Given that the US dollar is the world's reserve currency,* the IMF effectively *is* the US. (*That is, central banks and other major financial institutions maintain large quantities of the US dollar to use for investments, transactions and international debt obligations, or to influence their domestic exchange rate. This gives the US – along with its military might – its political power: if two countries want to make a trade, say for oil, they will usually need to make the monetary transaction via a US company. If one of those countries is defying the political wishes of the US, the US can fine any company that enables the transaction, deterring that company's co-operation and thereby undermining that country's ability to trade.) Even though central banks have

Federal Debt Held by the Public, 1900 to 2050

Percentage of Gross Domestic Product



(Source: Congressional Budget Office)

become by far the largest buyers of government (public) debt, cancelling a government's debt to its central bank is not much of an option. Firstly, as Bank of England (BoE) governor Andrew Bailey pointed out, government borrowing from the central bank cannot be cost-free, since the BoE is still paying interest on reserves. ("BoE is financing UK's coronavirus measures, Bailey acknowledges", *The Financial Times* [online], 14 May 2020.) Secondly, the factoring-in of future debt repayments in spending plans helps prevent the sort of high inflation that would otherwise result from such a rapid expansion in the money supply.

According to the IMF, private debt trebled between 1950 and 2017, "making it the driving force behind global debt". In the eurozone, 57% of all government debt repayments in 2015 were interest. The IMF put global debt in 2017 at a then-record high of \$184tn, 225% of global GDP, 11 percentage points up on 2009. This worked out at \$86,000 for every person in the world, 2.5 times annual per capita income. According to financial analyst Ron Surz, once 'off the books' costs such as social security are included, the

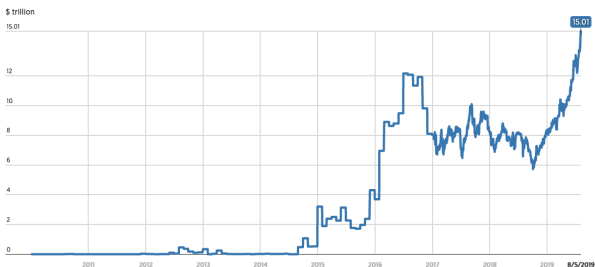
official figure is understated by a factor of 2.5, making actual global debt \$460tn, 560% of GDP and \$215,000 per person. If that is the case, then the true number may be even higher. The IMF figure only includes households, governments and non-financial corporates, whereas analysis by the Institute of International Finance (IIF) includes the outstanding debt of financial institutions (and is more frequently updated). The IIF put global debt in the third quarter of 2017 at \$233 trillion, 327% of GDP. The IIF said global debt hit a new high of \$253tn in the third quarter of 2019, 322% of world GDP, up from \$244tn and 318% year-on-year. That was *before* news of 'the COVID-19 outbreak' in December 2019 or the stock market crash of March 2020. A year later, global debt swelled to \$272 tn (331%). The IIF said gross debt issuance hit an 'eye-watering' record of \$12.5 tn in the second quarter of 2020 compared with a quarterly average of \$5.5tn in 2019, with some 60% of new issues coming from governments. The group expected global debt to reach \$277tn at the end of 2020 but later calculated that it had hit \$281tn (355%). Debt-to-GDP in developed markets rose from 380% at the end of 2019 to 432% in the third quarter of 2020, with the emerging market figure hitting 250%; and China's 335%, up from 302%.

⁵ The quantity of *negative*-yielding sovereign (national) debt – which barely existed before 2014 – hit \$14tn in the first half of 2019, \$15tn at the start of August that year and \$16.7tn before the end of the month. In the middle two weeks of August 2019 the proliferation of negative-yielding bonds erupted – 30% of global, tradeable bonds were being sold at a guaranteed loss. In December 2020, the figure hit \$18tn. Earlier in the year, the British government sold bonds at negative yields for the first time ever. Spain and Australia followed.

Pento, who compares the situation to the end of the Roman Empire, has said that since writing his book in 2013 that,

Not even I would ever have fantasised there could ever be trillions of dollars of negative yielding sovereign debt and even negative yielding corporate debt...

Total negative debt in world



Source: Deutsche Bank

Governments are borrowing money and paying you back no interest and less than your principal payment. That has never before happened in the history of the world... But it's not just happening in the US. It's a global bubble.

Finance analyst Graham Summers has called it 'The Everything Bubble' (the title of his 2017 book) and the third 'one-in-100 year' bubble in three successive decades. The 1990s and 2000s were 'only' beset by 'the internet/tech bubble' and 'the housing bubble', respectively. Now,

the bedrock of the entire global financial system (US Treasuries) [has] entered a bubble forcing all other asset classes to adjust accordingly... The bubble comprises numerous smaller, individual debt bubbles... bubbles in corporate debt, municipal debt, consumer debt, commercial debt, etc. As such, the entire \$60tn in debt securities floating around the US financial system is vulnerable to debt deflation when the bubble bursts...

Whereas the US tech bubble hit \$7tn and the US housing bubble twice that, the US bond bubble has surpassed \$20 tn. "When you include junior [lower priority] debt instruments and derivatives [bets on future prices] associated with bond yields, the figure rises to \$124 tn." For perspective, total global wealth in 2019 stood at \$360

tn. (Summers, G., *The Everything Bubble: The Endgame for Central Bank Policy*, 2017, pp. 137-203.)

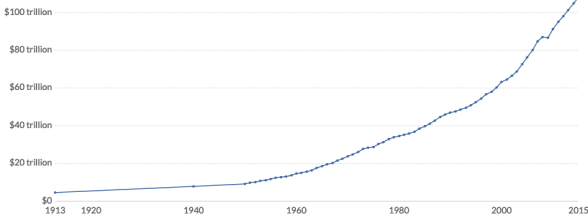
See also, “Larry & Carstens’ Excellent Pandemic” [online video], BestEvidence, 14 April 2021. John Titus shows that all ‘retail’ US bank deposits and all ‘wholesale’ deposits, money on deposit at the Federal Reserve, spike together for the first time ever after the March 2020 crash. The former had been rising at a steadily accelerating rate since the 1970s; the latter barely existed before 2007. As soon as the Fed started to taper the latter in 2018 – in response to rising inflation that followed a record corporate tax cut from 35% to 21% (to widen thinning profit margins) – the world economy went into a deep two-month recession, stopped only by a rapid reversal – and then some. (That the tapering happened in time to oust Trump from the presidency – no President survives massive spikes in unemployment – perhaps shows how closely the political tends to track the economic.)

⁶ The ever-steepening trajectory of world GDP indicates an approaching historical limit to capital accumulation:

World GDP over the last two millennia

Total output of the world economy; adjusted for inflation and expressed in 2011 international dollars.

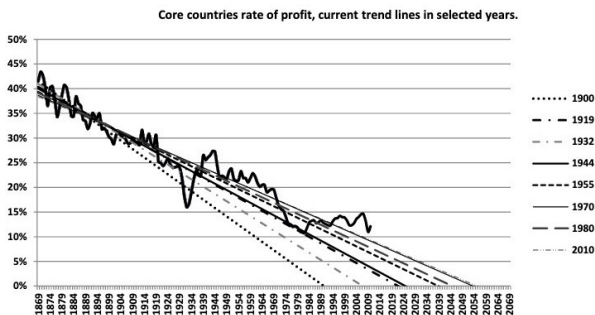
LINEAR



Source: World GDP - Our World In Data based on World Bank & Maddison (2017)

OurWorldInData.org/economic-growth • CC BY

⁷ As of 2014, Estaban Maito’s estimated ‘global rate of profit’ is on course to hit zero (for good) around 2054. *The Historical Transience of Capital: The Downward Trend in The Rate of Profit Since XIX Century*, Universidad de Buenos Aires (2014). That Britain (of the countries assessed) has long had the lowest rate of profit makes perfect sense given it is the oldest capitalist superpower.



Source: Maito

⁸ Average GDP growth rates in what the World Bank defines as ‘high income countries’ fell from 5.59% in the 1960s; to 4.15% in the 1970s; 2.93% in the 1980s; 2.35% in the 1990s; and 1.78% in the 2000s. The figure rose slightly to 2.1% in the 2010s, but this minor reprieve, based on murderous austerity measures and record levels of debt, has already proven to be unsustainable. My calculation. Source: WorldBank.org “GDP growth (annual %) – High income” (online).

⁹ See Grossman, H., Grossman, Henryk Grossman Works Volume 1, *Essays and Letters on Economic Theory*, edited by Kuhn, R., Brill, Leiden, 2019, pp. 410-11.

¹⁰ See Schmelzing, P., (2020), “Eight centuries of global real interest rates, R-G, and the ‘suprasecular’ decline, 1311–2018”, Bank of England [online], p. 40:

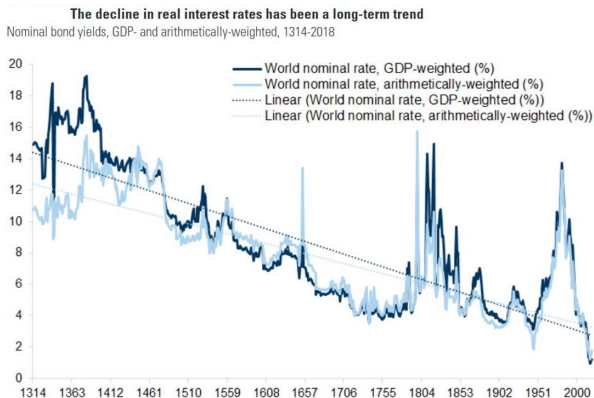
The century-average safe real rate peaked in the 15th century at 9.1%, and declined to 6.1% in the 16th century, followed by 4.6% in the 17th, 3.5% in the 18th century, and 1.3% (thus far) for the 21st century...[The overall trend has] persisted across a variety of monetary regimes: fiat- and non-fiat, with and without the existence of public monetary institutions...The long-term historical data suggests that, whatever the ultimate driver, or combination of drivers, the forces responsible have been indifferent to monetary or political regimes; they have

kept exercising their pull on interest rate levels irrespective of the existence of central banks, (*de jure*) usury laws, or permanently higher public expenditures. They persisted in what amounted to early modern patrician plutocracies, as well as in modern democratic environments, in periods of low-level feudal Condottieri battles, and in those of professional, mechanised mass warfare.

As the preeminent 20th century Marxist economist Henryk Grossman says,

The rate of interest is related to the profit rate in a similar way as the market price of a commodity is to its value. In so far as the rate of interest is determined by the profit rate, this is always through the *general* rate of profit and not through the specific profit rates that may prevail in particular branches of industry... The general rate of profit, *in fact, reappears in the average rate of interest as an empirical, given fact.*

(Grossman, op cit, p. 314.) And in the words of Marx and Engels,



The decrease in the interest rate is therefore a symptom of the annulment of capital only inasmuch as it is a symptom of the growing domination of capital in the process of perfecting itself – of the estrangement which is growing and therefore hastening to its annulment.

(Marx, K., and Engels, F. (1975 [1844]), “Economic and Philosophic Manuscripts of 1844”, Collected Works vol. 3, Lawrence & Wishart, p. 316.)

¹¹ US average since 1958. The highest baseline cut was 10.5% in 1981-3; the lowest 3.5% in 1957-8. Summers, *op cit*, p. 165. Even long-term interest rates are now hovering around zero. As of August 2020, the average in: Canada was 1.19% (down from 4.43% in August 2007); France -0.11 (4.39); Germany -0.54 (4.3); Italy 0.63% (4.58); Japan 0.02 (1.58); UK 0.64 (5.15); US 1.28 (4.67). (Source: data.oecd.org/long-term-interest-rates)

¹² Cage, M., “\$9 trillion story: 22% of the circulating USD printed in 2020”, So Mag (online), 19 December 2020. The increase in the rate of inflation in the US over the 12 months to the end of July 2021 hit a 30-year high. (“Inflation rate hits 30-year high, PCE shows, as US confronts major shortages”, Market Watch [online], 27 August 2021.) The personal consumption expenditure or PCE price index climbed by 0.4% in July, the fifth big monthly increase in a row. The rate of inflation in the 12 months ending in July edged up to 4.2% from 4%, the highest rate since the first Gulf War in 1991. This followed a period of near-deflation during the strictest periods of lockdown. Inflation fell to 0.2% in Britain. In the US, the velocity of the M2 money stock (which measures the frequency at which one unit of currency is used to purchase domestically-produced goods and services) fell to a record low of 1.102 for the second quarter (Q2) of 2020, down from 1.427 in Q4 2019 and the highpoint of 2.198 in Q3 1997. With pent-up demand meeting decimated supply chains, inflation is bound to rise anyway as demand outstrips supply. *The ruling class has very little incentive to ever fully lift lockdown restrictions as raising rates – achieved by slowing down money printing and asset buying – risks causing an even greater crash than March 2020.* The only

way to tackle inflation is thereby to reduce demand – by increasingly immiserating and culling the masses.

¹³ Agust, O., “Why Bitcoin”, Iceland Alive, 21 December 2020. The US monetary base (M0, which includes physical money and bank reserves at the Fed) shot up from \$847bn in July 2008 to \$2.1tn in February 2010 and then \$4tn in September 2014. After dipping to \$3.2tn in September 2019, it catapulted to \$5.1tn in June 2020. The US monetary stock (M2, which includes physical notes and coins, banks’ reserves held at the Fed, accounts at banks, and money market mutual funds) grew even faster. It surged from \$7.5 tn at the start of 2008 to \$12.4tn at the end of 2015; and then again from \$15.33tn at the end of 2019 to \$18.3tn at the end of July 2020 (by more than 23% year-on-year, easily beating the previous record of 15%). And yet all this money printing cannot keep pace with the expansion of global debt. In 2015, research scientist Simon Thorpe, of French firm CRNS, estimated that global debt is 2.5 times higher than the global money supply, up from two times higher in 2013. (“Global debt is now 2.5 times the total money supply – the system is clearly unworkable”, Simon Thorpe Ideas [online], 15 February 2015.) As John Smith, author of *Imperialism in the Twenty-First Century*, writes

In the end, dollar bills, like bond and share certificates, are just pieces of paper. As trillions more of them flood into the system, events in March 2020 bring closer the day when investors will lose faith in cash itself – and in the power of the economy and state standing behind it... capitalism cannot escape from this crisis, no matter how many trillions of dollars governments borrow or central banks print. The trillions they spent after 2007-09 bought another decade of zombie-like life for their vile system... The [March 2020 crash] makes socialist revolution... across the world into a necessity.

(“Why coronavirus could spark a capitalist supernova”, MR Online, 4 April 2020.) Essentially, the private sector is becoming almost entirely dependent on state subsidies and purchases – but, in turn, the state is becoming almost entirely dependent on central bank monetary financing.

Pento, one of the few bourgeois pundits to have warned of the 2007-09 financial crash, argues that,

They're going to reinflate junk [high-risk] bond prices again. They'll exceed the 2% inflation target greatly. All bond yields will rise inexorably, prices will crash. And then the Fed will have nothing they can do. There will be no relief package coming from any government on the planet. No tax base can cope with that amount of debt. You cannot resolve an inflation crisis, you cannot placate a market that is rising, with cratering prices, by creating more inflation; or by borrowing more funds into existence. You can't do it. That's the real crash that's coming.

Right-wing 'libertarians' such as Pento, who advocate against state intervention and for the abolition of the central bank, claim that the dollar's collapse demands a return to the gold standard (a type of state intervention!). Such a move would have to be on a much higher standard than in the past, for prices in gold have tended to rise rapidly ever since the standard ended, for gold has no intrinsic value and demand for it rises inversely to the devaluation of fiat money, as speculation rises inversely to the lack of investment in production. Others, including some misguided communists, believe capitalism is being overthrown by 'neo-feudalists' who plan to replace money with digital chits. (For one thing, feudalism was a more decentralised system than any period of capitalism – which is *increasingly* centralised – and became obsolete because of productive innovations, devaluation and concentration of industry.) Chits are still a form of payment – a wage. As Marx says,

The metallic content of silver and copper tokens is arbitrarily determined by law. In the course of circulation they wear down even more rapidly than gold coins. Their function as coins is therefore in practice entirely independent of their weight, i.e. it is independent of all value. In its form of existence as coin, gold becomes completely divorced from the substance of its value.

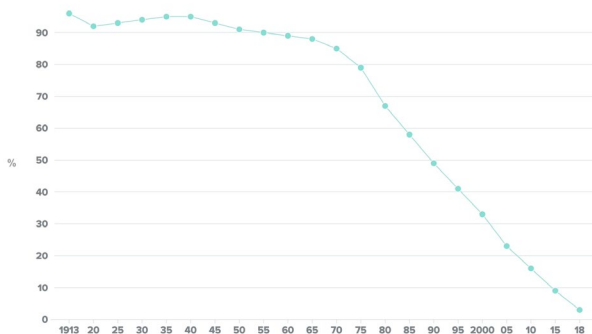
Relatively valueless objects, therefore, such as paper notes, can serve as coins in place of gold. This purely symbolic character of the currency is still somewhat disguised in the case of metal tokens. In paper money it stands out plainly.

(Marx, *Capital* vol. I, Penguin Classics, London, 1990 [1872], p. 233-4.) In 1900 gold was established as the only metal for redeeming paper currency, with the value of gold set at \$20.67 an ounce. The US and major European countries suspended the gold standard during WWI so that they could print enough money to fund their military activity. A modified gold standard re-established after the war then had to be abandoned to tackle deflation and mass unemployment. In 1933, the US government made it illegal to hoard gold and set the price at \$35 per ounce. After WWII most countries pegged their currencies to the dollar, since the US held most of the world's gold. Central banks maintained fixed exchange rates between their currencies and the dollar by buying their own country's currency in foreign exchange markets if their currency became too low relative to the dollar. If it became too high, they'd print more of their currency and sell it. As the US economy prospered, US Americans bought more imported goods and paid in dollars. This large balance of payments deficit (money owed to other countries) made foreign governments worry that the US would no longer back up the dollar in gold. In the 1970s, double-digit inflation and stagnant growth reduced the value of the eurodollar [the Soviet Union's dollar reserves deposited in Europe] and more and more banks started redeeming their holdings for gold. The US could no longer meet this growing obligation. The US government changed the dollar-gold relationship to \$38 per ounce and no longer allowed the Fed to redeem dollars with gold, which made the gold standard meaningless. Gold was repriced to \$42.22 per ounce in 1973 and then decoupled from the dollar altogether in 1976. In 1980 the price of gold had shot up to \$600. In August 2020 it jumped to \$2,000 from \$1,400 a year earlier. ('History of the Gold Standard', The Balance [online], 24 April 2020.) All this shows the prescience of

Marx's analysis that prices *increasingly* deviate from their real labour values. (See Grossman, "The Value-Price Transformation in Marx and the Problem of Crisis", 2019 [1932], pp. 304-31 and Kuhn, R., "Introduction to Henryk Grossman 'The value-price transformation in Marx and the problem of crisis'", *Historical Materialism* issue 1, vol. 24, Brill, p. 98.

¹⁴ Louise, N., "40% of US dollars in existence were printed in the last 12 months: Is America repeating the same mistake of 1921 Weimar Germany?", Tech Start Ups (online), 22 May 2021.

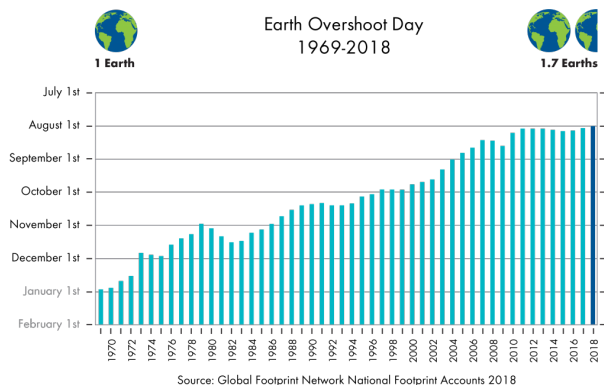
¹⁵ The US dollar lost more than 97% of its purchasing power between 1635 and 2019, but its devaluation has tended to accelerate – the figure is 96% when the starting point is taken from 1913, having remained nearly unchanged in the previous 120 years; 91% from 1947, when the US became the world's leading capitalist power; and 85% since 1970, around the time the postwar productivity boom ended. For British pound sterling, the figure is more than 99.5% compared to 1694, the year it was adopted as the Royal Chartered Bank of England's currency. (Source: officialdata.com)



*2018's US dollar is worth only four cents of 1913's US dollar.
My chart, based on data from OfficialData.com.*

¹⁶ Earth's "sixth mass extinction" is said to be well underway: it has been reported that up to 50% of all individual animals have been lost in recent decades and almost half of land mammals have lost 80% of their range in the last century. Vertebrate populations have fallen by an average of 60% since the 1970s, and in some countries there has been an even faster decline of insects – vital, of course, for aerating the soil, pollinating blossoms, and controlling insect and plant pests. ("Humanity has wiped out 60% of animal populations since 1970, report finds", *The Guardian*, 30 October 2018.)

¹⁷ According to Global Footprint Network, in 2018 it took a record 212 days to consume a year's worth of carbon, food, water, fibre, land and timber. The point at which consumption exceeds the capacity of nature to regenerate moved forward on 2017 by two days to the 1st of August. In other words, 1.7 Earths were used that year. In 2018, it was reported that a third of Earth's land had been acutely degraded, with fertile soil being lost at a rate of 24 billion tonnes a year through intensive farming. The UN said in 2014 that at current rates of degradation, all of the world's topsoil (the 5-10 inches where most of Earth's biological activity takes place) could be gone within 60 years and that without better approaches arable and productive land per



person in 2050 will equate to only a quarter of the level in 1960. The equivalent of 30 football pitches of soil – from which 95% of food is presently produced – are allegedly being lost every minute. Heavy tilling, overharvesting and the use of petroleum-based agrochemicals have increased yields at the expense of long-term sustainability. The expansion of intensive agriculture is the number one reason for deforestation. In the past 20 years, agricultural production has increased threefold and the amount of irrigated land has doubled, often leading to land abandonment and desertification. Decreasing productivity has been observed, due to diminished fertility, on 20% of the world's cropland, 16% of forest land, 19% of grassland, and 27% of rangeland. ("Third of Earth's soil is acutely degraded due to agriculture", *The Guardian* [online], 12 September 2017; "Only 60 years of farming left if soil degradation continues", *Scientific American* [online], 5 December 2014.)

Both the destruction and burning of biomass and the burning of fossil fuel release carbon dioxide (CO₂) and other types of greenhouse gas (GHGs) into the atmosphere. Solar energy absorbed at Earth's surface is radiated back into the atmosphere as heat, much of which is absorbed by GHGs as it makes its way through the atmosphere and back out to space. GHGs radiate the heat back to Earth's surface, to another GHG molecule, or out to space. In October 2018, the world's leading climate scientists claimed in a report for the United Nations' (UN) Intergovernmental Panel on Climate Change (IPCC) that there were only 12 years for carbon emissions to be cut sufficiently if global warming is to be kept to a maximum of 1.5° Celsius (C). Beyond this point, even half a degree will "substantially" worsen the risks of droughts, floods, extreme heat and destitution for hundreds of millions of people, creating what the UN's special rapporteur on extreme poverty Philip Alston termed "climate apartheid", where "the rich escape overheating, hunger, and conflict... while the rest of the world is left to suffer". Previously, it had been thought that a 2°C rise would be safe. That point is going to be reached, on the current trajectory of rising emissions, by 2050, or when the pre-industrial atmospheric

CO₂ concentration of 280 parts per million (ppm) has doubled, i.e., since fossil fuel burning began. The figure in 2018 stood at 411ppm – up from 400 two years earlier – the highest it has been in three million years. It then hit 415 in May 2019. In the 1990s, the average annual growth rate was about 1.5ppm, but in the past decade that has accelerated to 2.2ppm. Preventing a rise higher than 2°C would have required an annual cut in carbon emissions of 20% by 2030 and then to zero by 2075. To keep to 1.5°C, however, the reduction must increase to 45% by 2030 and then to zero by 2050. During the Permian-Triassic extinction, atmospheric carbon levels had reached 1,000ppm. At the beginning of “The Uninhabitable Earth”, an article in *New York Magazine* that previewed the book of the same title, David Wallace-Wells writes that,

The Arctic permafrost contains 1.8 trillion tonnes of carbon, more than twice as much as is currently suspended in Earth’s atmosphere. When it thaws and is released, that carbon may evaporate as methane, which is 34 times as powerful a GHG warming blanket as carbon dioxide when judged on the timescale of a century; when judged on the timescale of two decades, it is 86 times as powerful. In other words, we have, trapped in Arctic permafrost, twice as much carbon as is currently wrecking the atmosphere of the planet, all of it scheduled to be released at a date that keeps getting moved up, partially in the form of a gas that multiplies its warming power 86 times over.

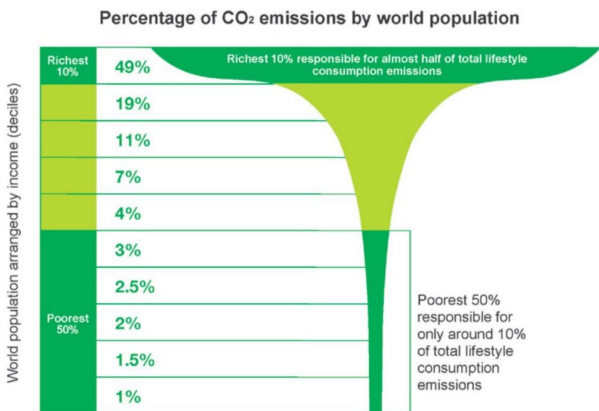
At 2°C “the ice sheets begin their collapse”. Wallace-Wells says that while “most people talk as if Miami and Bangladesh still have a chance of surviving ... most of the scientists I spoke with assume we’ll lose them [to rising sea levels] within the century, even if we stop burning fossil fuel in the next decade”. More than 600 million people live within 30 feet of sea level. At just 3°C, sea levels would rise by 50 metres. London, Brussels, New York, Buenos Aires and Mumbai, to name a few, would be permanently under water. The difference between now and the last Ice Age was 4.5°C. While the IPCC says the current rate of

emissions puts us on course for a 4°C rise by the end of the century, other studies have put the figure at 8°C, at which point humans at the equator and in the tropics would not be able to move around outside without dying; while sea levels would swell 200 feet higher, leaving hardly any arable land on the face of the planet. (University of Edinburgh, “Climate outlook may be worse than feared”, *Earth and Environmental Transactions*, 9 December 2015.) Another projection anticipates the disappearance of clouds and a 12°C rise. (Schneider, T. et al., “Possible climate transitions from breakup of stratocumulus decks under greenhouse warming”, *Nature Geoscience* 12, pp. 163-7, 25 February 2019.) A 3.5°C rise is considered by some to be “the extinction point”, because “the food chain collapses, oceanic plankton dies off, and terrestrial vegetation is severely limited”. (Denayer, W., “How climate change is rapidly taking the planet apart”, *Flashback Economics* [online], 20 July 2016.)

The fossil fuel industry spearheads climate change denial. (“IPCC reports ‘diluted’ under ‘political pressure’ to protect fossil fuel interests”, *The Guardian* [online], 15 May 2014. “Big Oil’s real agenda on climate change”, *InfluenceMap* [online], March 2019.) We should, however, be conscious that the – fuel-intensive, metal-mining-based* – renewables industry *may* potentially exaggerate at least the *immediacy* of the crisis in order to win higher government subsidies. (*For example, “Fabricating [solar] panels requires caustic chemicals such as sodium hydroxide and hydrofluoric acid, and the process uses water as well as electricity, the production of which emits greenhouse gases.” *National Geographic* [online], “How green are those solar panels, really?”, 11 November 2014.) Any exaggeration of the crisis aims to spread hopelessness among the masses while hyping ‘overpopulation’ theories, attempting to justify the depopulation capital needs when it suffers from surplus capital that is unprofitable to reinvest and thus creates surplus labour it can no longer afford to employ or even feed. Depopulation, of course, has no impact when the system *needs* to continually accelerate and expand the conversion of nature into commodities and on the basis of intensive production.

The richest people and countries are responsible for the vast majority of emissions. In 2017 it was reported that just 100 fossil-fuel-producing corporations had been responsible for 71% of all GHGs – one trillion tonnes – since 1988, with ExxonMobil, Shell, BP and Chevron among the top of the list. (“Just 100 companies responsible for 71% of global emissions, study says”, *The Guardian* [online], 10 July.) According to the UN, high-income countries produce levels of per capita material footprint consumption 60% higher than upper-middle income countries and more than 13 times the level of low-income countries. Even China’s per person energy consumption of 1.6kW is dwarfed by a figure of 11.4kW in the US. The US comprises 5% of the world’s population but consumes 24% of its energy. (“The energy complex: meeting the world’s energy needs”, Fidelity International [online]; “Consumption by the United States”, public.wsu.edu.)

Global heating is not simply a psychological operation. As John Bellamy Foster has written, it was Soviet climatologists who “discovered and alerted the world to the acceleration of global climate change”. (“Late Soviet



Source: Oxfam

ecology and the planetary crisis", *Monthly Review* [online], 1 June 2015.) Those of us in our 30s or older can certainly tell that the weather is consistently hotter than it was when we were young. Since 2005, the number of floods has reportedly increased by a factor of 15, extreme temperature events by a factor of 20, and wildfires sevenfold (although many of these may well be deliberately lit to clear the land for intensive/monocultural farming); the 20 warmest years since records began have been in the past 22 years. Since 1980, the planet is said to have seen a 50-fold increase in the number of places experiencing dangerous or extreme heat. The number of heatwaves affecting the planet's oceans tripled between 2016-18, having already jumped by more than 50% in the three decades to 2016, killing swathes of sea-life "like wildfires that take out huge areas of forest". This is adding to ocean acidification, whereby the CO₂ in the oceans rises at the expense of oxygen, suffocating the coral reefs that support as much as a quarter of all marine life. (Laybourn-Langton et al., *This is a Crisis: Facing Up to the Age of Environmental Breakdown*, Institute for Public Policy Research, 12 February 2019; Wallace-Wells, D., "The Uninhabitable Earth", *New York Magazine*, 17 July 2018; "Heatwaves sweeping oceans 'like wildfires', scientists reveal", *The Guardian* [online], 4 March 2019.) Furthermore, tropical forests are said to have become a source rather than a sink of carbon. (Baccini et al., "Tropical forests are a net carbon source based on aboveground measurements of gain and loss", *Science* vol 358, Issue 6360, 13 October 2017.) Forest areas in South America, Africa and Asia – which have until recently played a crucial role in absorbing GHGs – are now said to be releasing 425 teragrams of carbon annually, more than all the traffic in the US, due to the thinning of tree density and culling of biodiversity, reducing biomass by up to 75%. Scientists combining 12 years of satellite data with field studies reportedly found a net carbon loss on every continent. Latin America – home to the world's biggest forest, the Amazon, which is responsible for 20% of Earth's oxygen – accounted for nearly 60% of the emissions, while 24% came from Africa and 16% from Asia. Every year about 18 million hectares of forest – an area the size of

England and Wales – is felled. In just 40 years, possibly one billion hectares, the equivalent of Europe, has been torn down. Half the world's rainforests have been razed in a century and they will vanish altogether at current rates within another.

¹⁸ The microbiome ('ome' means 'whole') is the genetic material of all the microbes – bacteria, fungi, protozoa and viruses – that live on and inside the human body, weighing as much as five pounds. It regulates body weight, mediates energy extraction from food, manufactures vitamins, regulates the immune system, and converts indigestible bits of food into hormones and other chemicals.

¹⁹ Douglas Kerr, M.D., Ph.D., in his foreword to *The Autoimmune Epidemic* by Donna Jackson Nakazawa, a faculty neurologist and neuroscientist, writes:

In some cases, autoimmune diseases are three times more common now than they were several decades ago. These changes are not due to increased recognition of these disorders or altered diagnostic criteria. Rather, more people are getting autoimmune disorders than ever before. Something in our environment is creating this crisis.

("Foreword to *The Autoimmune Epidemic* by Douglas Kerr, M.D., Ph.D.", donna.jacksonnakazawa.com.) The US figures for Systemic Lupus Erythematosus, for example, stood in 1988–94 at 53.6/100,000 people per year, then nearly doubled by 2004–08 to 102.9/100,000 ("Epidemiology of Systemic Lupus Erythematosus: an update", Stojan, G., and Petri, M., US National Library of Medicine (NLM), National Institute of Health (NIH) [online], 1 March 2019.) For Crohn's Disease, the figure in 1991, 140/100,000, increased by almost 70% to 235.6/100,000 in 2008–09 ("Recent trends in the prevalence of Crohn's disease and ulcerative colitis in a commercially insured US population", NLM, NIH [online], 29 August 2012.) For Guillain-Barre Syndrome, the number nearly doubled from 1.6/100,000 in 1973 to 2.9/100,000 people per year. If the immune system 'overreacts' to a particular trigger, the immune response itself can be overwhelming,

causing autoimmune disorders. This is called pathogenic priming. Children may be particularly vulnerable as they have highly active immune systems while they are growing. Kerr explains:

The immune system mistakes friend for foe and begins to attack the very tissues it was designed to protect. Over the past 40 years, something has been pushing that system over the edge. Something is causing the immune system to increasingly make mistakes in which the line becomes blurred, the immune system attacks the body itself, and autoimmune disease occurs.

There is almost universal agreement among scientists and physicians that the environmental toxins and chemicals to which we are increasingly exposed are interfering with the immune system's ability to distinguish self from non-self. Most of the risk of autoimmunity comes from environmental exposures rather than from genetic susceptibilities. So, have those environmental exposures changed over time? The answer is clearly yes.

The numbers are staggering: one in 12 [US] Americans – and one in nine women – will develop an autoimmune disorder. And since it is clear that not every patient with an autoimmune disease is correctly diagnosed, the prevalence is certainly higher than that. The American Heart Association estimates that by comparison, only one in 20 Americans will have coronary heart disease. Similarly, according to the National Center for Health Statistics, one in 14 American adults will have cancer at some time in their life. This means that an American is more likely to get an autoimmune disease than either cancer or heart disease.

Growing evidence suggests that even acne is caused by an autoimmune disorder, yet one of the most prescribed drugs for acne, Accutane/isotretinoin, is also thought to cause (or worsen) autoimmune disorders, such as Inflammatory Bowel Syndrome (IBS) – many serious side effects are already listed on the label – and has now been taken off the market in many countries. (“More evidence of

rosacea, autoimmune link", Dotinga, R., *Dermatology Times* [online], 7 April 2016; "New study may deal final blow to acne drug Accutane", *Los Angeles Times* [online], 15 September 2014.) One study by *Interdisciplinary Toxicology* in 2009 concluded that glyphosate – which is sourced from phosphate mines associated with selenium poisoning – "the active ingredient in the herbicide, Roundup, is the most important causal factor in this epidemic [of Celiac disease, and, more generally, gluten intolerance]". (Quoted in Kerr. See also Wozniacka, G., "Roundup's other problem: glyphosate is sourced from controversial mines", *Civil Eats* [online], 24 June 2019.) As well as acne, other common disorders increasingly common in children and increasingly thought to be autoimmune-related include eczema and asthma. (LoBuono, C., "For the first time, study proves eczema is an autoimmune disease", *Healthline* [online], 6 January 2015.) Allergic reactions, which are also on the rise, from hay fever to anaphylaxis, also begin in the immune system. ("Allergies and the immune system", *John Hopkins Medicine* [online].) As Dr Michael Mosley has written,

None of the characters in Jane Austen's 19th century novels ever complains about hay fever or having a food intolerance. Charles Dickens never suggested that Oliver Twist or any of the artful dodgers suffered from eczema. Allergic diseases are a modern plague.

Mosley writes that autoimmune diseases are extremely rare in hunter-gatherer tribes, since, compared to the average urban-dweller, they have a much greater magnitude and variety of bacteria in their gut (which is now considered to be like a 'second brain'). That's thanks to their much more varied and natural (unprocessed) diet, which has not been touched by preservatives or antibiotics; and because they spend far more time outside and among plant life. The Hadza tribe in Tanzania have a diversity that is one of the richest on the planet. When Tim Spector spent time with the Hadza, "I was not allowed to wash or use alcohol swabs and I was expected to hunt and forage with the Hadza as much as possible... my gut microbial

diversity increased a stunning 20%." (Spector, T., "What a hunter-gatherer diet does to the body in just three days", CNN [online], 5 July 2017.)* Mosley writes that,

Like animals in the wild, many species in our gut [microbiome] are in decline and have been for decades. It's partly because we eat such a narrow range of foods, which means our gut bacteria also have to live on a restricted diet. Of the 250,000 known edible plant species, we use less than 200. 75% of the world's food comes from just 12 plants and five animal species.

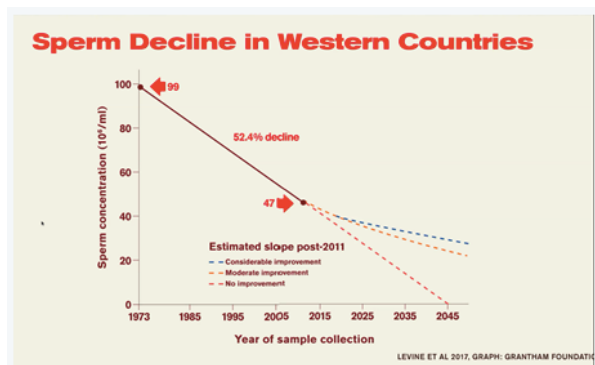
This itself is due to the ongoing development of profit-maximising monopoly capitalist monoculture, the cultivation of a single crop in a given area. Mosley continues: "Another reason for the decline is the widespread use of antibiotics, not only to treat us but to help the animals we eat put on weight." Again, this is done to maximise output and profits. Mosley says red meat untouched by antibiotics is otherwise good for your health in moderate quantities. "Finally, there are emulsifiers. These are chemicals that are added to processed foods to extend their shelf life. They've been shown to reduce microbial richness, and may directly contribute to colitis and diabetes." (*The Clever Guts Diet*, Short Books, London, 2017, p. 66.) A lack of biodiversity in the gut's microbiome brings about an imbalance that allows one or a few sets of bacteria to become dominant, causing, for example, certain unhealthy cravings by reducing hormones that quell hunger. "You want your biome to be as multicultural as possible... A diverse microbiome will allow your gut to recover much more quickly from a bout of diarrhoea," says Mosley (pp.65–6). He recommends (p. 69): trying to avoid antibiotics, which "can take weeks, months or even years for your gut microbial community to bounce back from, if at all"; eating a Meditarian-style diet/more and more varied plants and fermented produce (including cheese, red wine, apple cider and dark chocolate); avoiding or significantly limiting sugar (not fruit sugars) and artificial sweeteners (which he argues are even worse) and processed foods; intermittent fasting – only once or twice a

week; done excessively, it can deplete the adrenal glands, which release cortisol if your blood sugar drops too low between meals, in turn encouraging substitutive consumption of nicotine, caffeine and sugar – something that hunter-gatherers effectively do and which can help reverse type 2 diabetes (because the bacteria *Akkermansia*, which strengthens your gut lining, supports microbiome health, and protects from disease, lives on mucus and not on the remains of eaten food, as most gut microbes do, so it thrives when you reduce your calories (p.163)); keeping windows open as often as possible (since we spend 90% of our time inside); spending more time outside, especially in ‘outdoorsy’ settings; and “getting your hands dirty, preferably by gardening, which connects you with the trillions of bacteria that live in the soil”. This advice makes even more sense when we consider that microbes, fungi, plants and trees are our *relatives* (see footnote 67).

*(Presumably hunter-gatherers also spend much more time *around and in close proximity to other people* compared to people in capitalism’s increasingly atomised, anti-communal/community, ‘concrete jungles’. It has been found that people with “more diverse social networks [have] greater resistance to upper respiratory illness”, for example. (Cohen et al., “Social ties and susceptibility to the common cold”, June 1997.) Isolation is said to increase the risk of heart disease, stroke, and Alzheimer’s; and be as deadly as obesity, or smoking 15 cigarettes a day. (“Loneliness and isolation raise risk for stroke and heart disease, study suggests”, Harvard Health Publishing [online], 16 June 2016; “Feeling lonely increases Alzheimer’s risk”, Fisher Centre For Alzheimer’s [online], 2 December 2014; “Loneliness rivals obesity, smoking as health risk”, Web MD, [online], 4 May 2018.) With this in mind, ‘social distancing’, ‘lockdowns’ and mask mandates in the wake of the apparent pandemic look like an intensified ruling class attack on the human immune system. Many masks are harmful and ineffective, anyway. (See, for example, Jacobs J. et al. “Use of surgical face masks to reduce the incidence of the common cold among health care workers in Japan: a randomized controlled trial”, NLM [online], 12 February 2009; Kisielinski, K. et al.,

"Is a mask that covers the mouth and nose free from undesirable side effects in everyday use and free of potential hazards?", *International Journal of Environmental Research and Public Health*, 16 April 2021; Gery, G. Jr. et al., "Association of state-issued mask mandates and allowing on-premises restaurant dining with county-level COVID-19 case and death growth rates – United States, March 1–December 31, 2020", CDC.gov; "ONA wins second decision on 'unreasonable and illogical' vaccinate or mask influenza policies", Ontario Nurses Association, 7 September 2018; Lewkowicz, D., "Masks can be detrimental to babies' speech and language development", *Scientific American* [online], 11 February 2021; "Exclusive: Chemical cocktail found in face masks", 1 April 2021.)

²⁰ Sperm counts have reportedly fallen by 50-60% since the 1970s – mostly in 'developed' nations – and are on course to fall to zero around 2045. (Levine, H. et al., "Temporal trends in sperm count: a systematic review and meta-regression analysis", *Human Reproduction Update*, vol. 23, issue 6, November-December 2017. The study recognises that this trend has resulted from: firstly, the toxic chemicals sourced from fossil fuels and metal mining that are used to make the everyday commodities we consume; and, secondly, the micro- and nanoplastics that materialise from



the breakdown of non-biodegradable fossil-plastics, penetrating and damaging organs, cells and DNA. (See Napper, I. and Thompson, R., "Release of synthetic microplastic fibres from domestic washing machines: Effects of fabric type and washing conditions", *Marine Pollution Bulletin* [online], vol. 112, issues 1–2, Science Direct [online], 15 November 2016; Jambeck, J. et al., "Plastic waste inputs from land into the ocean", *Science* [online], 13 February 2015; van Sebillie, E. et al., "A global inventory of small floating plastic debris", *Environmental Research Letters* vol. 10, no. 12, IOPscience.iop.org, 8 December 2015; Bangor University, "Microplastic pollution widespread in British lakes and rivers, study shows", phys.org, 7 March 2019; McHugh, B., "PFAS chemicals: a 'ticking time bomb'", *Yorkshire Bylines* [online], 25 January 2021; Zhang, J. et al., "Occurrence of polyethylene terephthalate and polycarbonate microplastics in infant and adult feces", *Environmental Science Technology Letters*, 22 September 2021 (quoted in "Babies are full of microplastics, new study shows", Euro News [online], 1 October 2021. "Babies have 15 times more microplastics in their bodies than adults"); Wang, R. et al., "Potential adverse effects of nanoparticles on the reproductive system", *International Journal of Nanomedicine*, 11 December 2018; "Did Pfizer fail to perform industry standard animal testing prior to initiation of mRNA clinical trials?", Trial Site News, 28 May 2021 ("pre-clinical studies show the active part of the [Pfizer] vaccine (mRNA-lipid nanoparticles), which produce the spike protein, spreads throughout the body and is then concentrated in various organs, including the ovaries and spleen"); "Pfizer & Moderna fail to respond to BMJ about serious COVID vaccine safety concern", *The Pulse* [online], 23 July 2021.) Female fertility is also suffering and, like the human body in general, breast milk is said to be widely polluted. ("Study finds alarming levels of 'forever chemicals' in US mothers' breast milk", *The Guardian* [online], 13 May 2021.) Almost everyone – 95% of the global population – breathes highly polluted air, causing *millions* of premature deaths every year; at least one in five of all deaths (a conservative estimate), it is now thought. ("Fossil fuel air pollution kills

one in five people", NRDC [online], 19 February 2021.) As per footnote 16, fossil fuel pollution is also thought to be the main cause of the modern phenomenon of autoimmune diseases. See my essay, "Declining sperm counts, polluted breast milk, autoimmune disorders – the diabolical legacy of capital's exploitation of labour", grossmanite.medium.com, 29 July 2021.

²¹ War is both caused by and a counter-tendency to capitalism's tendency to break down. In terms of the latter, it destroys capital and surplus capital, creating new investment opportunities; and cheapens labour and destroys surplus labour. Tribute for the victors also centralises capital into fewer hands. Accelerated innovation for the purposes of war later delivers new commodities for the civilian economy (but also accelerates the tendency towards automation). On the other hand, the expenditure on war is unproductive and therefore eats into funds that could otherwise be dedicated to surplus value production. War is an increasingly useless counter-tendency in the sense that the new profitable opportunities it presents are built with the latest technology, i.e. automation. As Grossman wrote in 1926:

Either the destruction is so great that it embraces the basis of the productive apparatus itself, the entire capitalist mechanism disintegrates and the barricades go up between the classes. In the other case, society is impoverished by the ravages of war but this is the impetus for the forced development of the productive forces, for the enormous concentration and rationalisation movements of the kind we now witness in Germany. For this is the only possible way to withstand the competitive struggle with other, richer capitalist powers, on a capitalist basis. Actually, despite the ravages of the world war, the tendencies to concentration and combination that were already present everywhere have accelerated and intensified. Lenin already noted this in 1915. Within only a few years, the prewar stage of development was recovered and surpassed. If, however, one assumes ... the possibility that humanity could be cast into historical oblivion by the next imperialist war,

there is no other way to save it than to pre-empt the next war through revolution.

(Grossman, 2017, p138.) The accumulation crisis is intensifying competition on the world market and thus between nation-states in general and imperialist powers in particular; hence the rising trade wars the US is waging against not only China and Russia but also the EU. In 2015-16, before Trump or Brexit, the G20 economies introduced a record number of trade-restrictive measures, at 21 per month. ("WTO warns on rise of protectionist measures by G20 economies", *The Financial Times* [online], 21 June.) In 2011, the US generated 23.7% less demand for the rest of the world's net exports than it would have done had the 2007-09 crash never happened. Foreign net capital flows ending up as loans to US corporations fell drastically from \$500bn in 2006 to minus-\$50bn in 2011; and US assets attracted 57% less capital than they were projected to before the crash. In contrast, China's industrial rise saw its tech companies Huawei, Oppo and Vivo account for 43% of global smartphone sales in 2017, eclipsing Apple in the US and Korea's Samsung. The US has accused China of stealing technology and trade secrets. China imports more than 95% of its high-end smartphone/computer chips. In 2016 China spent \$227bn importing chips, more than it spent on oil. On 6 November 2018, France President Emmanuel Macron called for the creation of a "true European army" so that the EU could defend itself from "China, Russia and even the United States of America". France opposed the 2003 invasion of Iraq because it owned a large chunk of the country's oil infrastructure and did not want the competition from rival imperialist powers. World war itself poses an extinction threat, and would accelerate environmental crises even without the likely outcome of a nuclear exchange that would wipe out most or all human life on Earth.

²² Ferguson, R., "War is *not* part of human nature", *Scientific American* (online), 1 September 2018. See also Smith, J., "Fritjof Capra on shareable leadership", *Shareable* [online], 16 October 2019; Smith, J. & Dixon, A., "Birds do it. Bats Do it." *Greater Good Magazine* [online], 1

November 2009. Danny Grunbaum, professor of biological oceanography, says that

The role of unbridled violence in evolution is greatly overestimated. When we see animals like elephant seals fighting with each other – as we do in lots of nature documentaries – we’re really seeing only a very small sliver of time. Much more of the time they’re accommodating each other and respecting where the boundaries are – and that’s cooperation. There is a tremendous amount of cooperation in nature... Cooperation never means the absence of conflicts of interest... It means a set of rules for negotiating conflicts of interest in a way that resolves them. That happens among humans all the time... Cooperation in general is a very good strategy in science. It’s exceedingly rare for someone to take advantage of you if you chose to share your work in an unguarded way. I’d say that human beings are extraordinarily cooperative, and we’re getting more cooperative all the time.

The latest research suggests humans’ first instinct is to cooperate, not compete. (Simon-Thomas, E., “The Cooperative Instinct”, *Greater Good Magazine* [online], 21 September 2021.)

²³ *Aristotle’s Politics*, translated by Carnes Lord, book I, chapter 4 (University of Chicago Press, 2013).

²⁴ “Services close to 80% of UK economy”, *The Financial Times*, 31 March 2016; “The services powerhouse: Increasingly vital to world economic growth”, Deloitte Insights [online], 12 July 2018. According to the US Census Bureau, the service sector produces intangible goods; more precisely services instead of goods. It comprises various service industries including warehousing and transportation services; information services; securities and other investment services; professional services; waste management; health care and social assistance; and arts, entertainment, and recreation. Production time includes the time it takes to transport commodities to consumers, so services workers can create surplus value but usually to a lesser extent than manufacturing workers since they tend

to handle finished or near-finished commodities. Services workers who do not handle commodities do not create surplus value and are therefore *unproductive*, paid out of the surplus value generated by *productive* workers (although they play important roles in circulating capital and reproducing productive workers. Domestic labourers like ‘house wives’ are *non-productive*; they do not produce surplus value but reproduce workers for capital *gratis*. Their labour is therefore privatised.)

²⁵ Similarly: although the absolute number of slaves in the US continued to grow, the number relative to the whole population tended to fall before slavery was abolished in the US (approx. 25% in 1790 versus 16% in 1860). “Population of the United States, 1790-1860,” ncpedia.org.

²⁶ “Premature deindustrialization in the developing world”, Dan Rodrik’s Weblog, 12 February 2015.

²⁷ Andrew Norton, “Automation will end the dream of rapid economic growth for poorer countries”, *The Guardian* [online], 20 September 2016.

Innovation moves fastest during recessions, when prices are low. One study, reports the *Washington Post*,

found that 88% of job loss in routine occupations occurs within 12 months of a recession. In the 1990-1991, 2001 and 2008-09 recessions, routine jobs accounted for ‘essentially all’ of the jobs lost. They regained almost no ground during the subsequent recoveries.

(Jaimovich, N. & Henry E. Siu, H., “Job Polarization and Jobless Recoveries”, National Bureau of Economic Research, November 2018.) Pointing to growing expectations by economists of a financial crisis in 2020, the *Washington Post* in 2018 reported that the

next wave of automation won’t just be sleek robotic arms on factory floors. It will be ordering kiosks, self-service apps and software smart enough to perfect schedules and cut down on the workers needed to cover a shift. Employers are already testing these systems. A recession will force them into the mainstream.

("When the next recession comes, the robots will be ready", *The Washington Post*, 24 January 2019.) Indeed, at the end of March, after governments in most countries had imposed 'lockdowns', almost half of company bosses in 45 countries said they were speeding up plans to automate their businesses. With many people being compelled to work from home, Microsoft could boast of having discovered a fresh way of reducing costs and extending absolute labour time (working hours/intensity) as it announced "two years' worth of digital transformation in two months". As *The Guardian* reported at the end of April:

Bank branches were already closing in droves before the epidemic, but here is the perfect excuse to shut more... The authors of an Oxford University study thought that by 2035 it would be possible to automate 86% of restaurant jobs, three-quarters of retail jobs, and 59% of recreation jobs. By unlucky coincidence, those are among the very industries hardest hit by an epidemic now demanding quantum leaps in efficiency if some companies are to avoid going under.

(Hinsliff, G., *The Guardian* [online], "The next wave of coronavirus disruption? Automation", 30 April 2020.) In April 2018, the World Bank recommended yet more deregulation in a report that said "high minimum wages, undue restrictions on hiring and firing and strict contract forms all make workers more expensive vis-à-vis technology". International capital had been preparing a major assault on international labour in order to accelerate moves towards automation.

Even farms are becoming fully automated. ("America's first robot farm replaces humans with 'incredibly intelligent' machines", *The Guardian* [online], 9 October 2018; "Robocrop: world's first raspberry-picking robot set to work", *The Guardian* [online], 27 May 2019. In July 2019, Canadian cannabis firm Sundial Growers bought Spalding-based Bridge Farm Group in Lincolnshire, England. The farm will be used to grow hemp and expanded to an estimated 3.8 million square feet, making it "one of the biggest fully automated growing structures in Europe".)

Mechanisation had already had a profound impact on US farming by 1900: the labour needed to produce one acre of wheat fell from 61 hours in 1830 to 3 hours 19 minutes in 1896. (Reynolds, B., *The Coming Revolution: Capitalism in the 21st Century*, Zero Books, *op cit*, [ebook] loc. 1757.) Today, the agriculture problem is returning to the bleak days of the Great Depression, when the US government bought produce for a guaranteed profit or ordered its destruction to raise prices. From 1996 to 2006, the cost of producing corn was higher than its sale price. Rising demand as a result of droughts, crop failures and biofuel production boosted prices for a while, but corn production became unprofitable again by 2015. Whereas a fall in the price of production usually has the opposite effect on ground rent, in the case of farmland ground rent also declines. (Grossman, *Henryk Grossman Works* vol. I, edited by Kuhn, R., Brill, 2017, p. 126.) As Ben Reynolds writes,

The amazing thing about this example is that it was not a digitised piece of information but a physical commodity that first demonstrated this possibility. US agriculture became so productive that it could no longer carry on the production of exchange value. An industry that could easily feed everyone in the country teetered on the verge of collapse while people were going hungry in the streets.

This demonstrates that Marx's remarkable prediction was right. The collapse of production for exchange value is not just a theoretical possibility. We can already observe it happening. An agricultural system that sacrificed everything from environmental standards to food quality and safety in the search for profit can no longer sustain production for profit on an independent basis. US agriculture has to be subsidised permanently or it will be unable to operate in a capitalist market.

(Reynolds, *op cit*, loc 1789-1805.) Just 1.5% (476,000) of the British workforce worked directly on farms in 2019, down from 22% in 1850 (already the lowest anywhere at that time). The figure is also 1.5% in the US, down from 21% in the 1920s. The urban population in the US rose from 39.6% of the population in 1900 to 79% in 2000; between 1900 and

2005 the number of US farms fell by 63% and the average farm size grew by 67%. (Reynolds, *op cit*, loc. 885.)

²⁸ "Fourth Industrial Revolution", World Economic Forum (online).

²⁹ In early hunter-gatherer societies, the male and female sex practiced a form of group marriage. As paternity could not be established descent was traced through the mother. The emergence of agriculture, surplus production, trade and private property relegated women from a position of equality with men to one of primarily producing labourers to work the land. As the obvious inheritors of private property had to be legitimate heirs, this requirement precipitated the invention of monogamous marriage and the enforced fidelity of the wife, replacing the matrilineal system with a patrilineal one so that paternity could be determined. Communism then will also complete the 'sexual revolution' as women (including those not in the sex trade *per se*) will no longer have to 'sell sex' to men in return for economic security; and (non-coercive) contraception will be abundant and free for all. (Socialist states have usually prohibited the sex trade in periods when they have not had to make large concessions to capital.) Monogamy will likely also wither away. (Monogamy and the sex trade began to wither away somewhat during the more abundant phases of monopoly capitalism, but such trends are going into reverse as capitalism breaks down and scarcity rises.) People will finally be able to enjoy relationships free of economic considerations. A number of studies found that women (and all genders and sexualities) enjoyed much more satisfactory sex lives in socialist East Germany compared to capitalist West Germany, since sex was considered a natural need and something to share rather than trade. (Ghodsee, K., *Why Women Have Better Sex Under Socialism And Other Arguments For Economic Independence*, Vintage, London pp. 132-9.) Indeed, birth rates in late monopoly capitalism are falling, most prominently in the ex-socialist bloc – where capitalist restoration promised anti-communal 'refamilisation' policies. (Mohdin, A., "The fastest shrinking countries on Earth are in Eastern Europe", QZ.com, 24 January 2018.) People, at least young

men in the US, are also apparently having significantly less sex in general since the 2007-09 global financial crash. ("Are young men really having less sex", BBC [online], 10 April 2019.)

³⁰ Slavery itself represented progress relative to the 'universal war' that preceded it. During the US Civil War (1861-5), Marx wrote in support of the 'bourgeois republic' in the North against the slave oligarchy of the South, convinced that the complete abolition of slavery was a precondition for the emancipation of the US working class and that "labour in white skin cannot achieve dignity as long as it is despised in a black skin". Furthermore, as Grossman writes, slavery's "inherent expansionist tendencies limited the possibilities for northern industrial capital and hence the development of the industrial proletariat". Slavery was inherently dependent on expansion since land was cultivated by means of extensive farming – i.e. the intensive nature of slave labour exhausted the land. To preserve themselves, slavers had to export slaves and seize new territory. For Marx, the US form of slavery differed to the purely consumptionist system of antiquity (the ancient past) since it was part of the present profit-making system that served the world market. Abraham Lincoln's election in 1860 came with the demand from Republicans to limit slavery to the South, to push it back out of the 'free states'. The union therefore became worthless to the South. Its war against the North was not a defensive one for the status quo but a war of aggression and conquest. "It was not difficult to predict that, in this case, the living standards of the white working class of the North would gradually be forced down to the level of the slaves," says Grossman. Lincoln eventually accepted that, to save the Union – and its most agricultural regions – slavery would have to be abolished. "It was an unavoidable struggle between two social systems that could no longer peacefully coexist, because the continued existence of the one was only possible by virtue of its victory over the other!" (Grossman, H., edited by Kuhn, R., *Henryk Grossman Works volume 1*, Brill 2017 pp. 455-8.) Soviet leaders that promoted peaceful co-existence with imperialist powers apparently did not adopt the same sort

of logic, although their position it has to be said was driven by war-weariness and the impossibility of defeating US imperialism at that time. The lessons for the coming global struggle for socialism are clear: the old ruling class – representing a decaying political superstructure that is being made increasingly obsolete by the evolving economic-technical base – is *compelled* to *start* the class struggle. Eventually the old ruling class must ‘bite off more than it can chew’, i.e. attack – too intensely – an unmanageably large proportion of the masses, who are therefore *compelled* to overthrow the old ruling class and become the new ruling class.

³¹ After the ‘Black Plague’ (1346-53), the contraction in the labour market saw the demand for labour rise dramatically in relative terms (per labourer). Labour militancy exploded to the point that the peasantry abolished serfdom (the condition of a tenant farmer bound to a hereditary plot of land; a condition of debt bondage and indentured servitude to a landlord). While the ex-serfs enjoyed ‘The Golden Age of the European Proletariat’ over the course of the next century or so, aristocrats suffering from ‘disaccumulation’ plotted to brutally re-expropriate common land through the enclosure movement, which took place alongside the even more brutal process of colonialism. (Hickel, J., *Less Is More*, Windmill Books, 2021, chapter one, “Capitalism: A Creation Story”.) The loosening of labour markets and innovations that combined to increase mass production and the centralisation of capital doubtlessly aided the process.

The worker or proletarian remains a kind of slave; i.e., a rented slave; a wage-slave. Marx:

The wage worker has permission to work for his own subsistence – that is, to live, only insofar as he works for a certain time *gratis* [free] for the capitalist... that the whole capitalist system of production turns on the increase of this *gratis* labour... consequently, the system of wage labour is a system of slavery, and indeed of a slavery which becomes more severe in proportion as the social productive forces of labour develop, whether the worker receives better or worse payment.

(*Critique of the Gotha Programme*, Dodo Press, 2009 [1875] pp. 18-19.)

³² Marx, K., *Grundrisse*, p. 705 (Penguin Classics, London, 1993).

³³ Ibid, p. 702.

³⁴ Marx, 1990, pp. 496–7. The first generalised example of machine-aided mass production was the printing press, which revolutionised the production of text – the first globally mass-produced product – and images. The cost of books, which had been extremely labour intensive to make, fell to 2% in England of the price of an average manuscript prior to the advent of printing. “A man born in 1453, the year of the fall of Constantinople, could look back from his 50th year on a lifetime in which about eight million books had been printed, more than perhaps all the scribes of Europe had produced since Constantine founded his city in A.D. 330.” Quoted in Reynolds, B., *The Coming Revolution*, loc. 122–31 (Zero Books, 2018). “Ultimately, the explosion of production created by the printing press made it necessary to overcome the limitations of local markets,” says Reynolds. “Thus, the printing press established the *industrial production paradigm*” (the technical foundation of a mode of production). While it took around 350 years for the industrial production paradigm to expand to other commodities, and 45 years for the steam-powered loom to overtake the handloom in textile production in Britain, it took only a decade for personal computers to make minicomputers obsolete (loc. 569).

³⁵ Volkov, G., *Era of Man or Robot? The Sociological Problems of the Technical Revolution*, p. 159 (Progress Publishers, Moscow, 1967).

³⁶ Ibid, p. 40.

³⁷ Marx, *Grundrisse*, Penguin Classics, London, 1993, p. 705.

³⁸ Ibid, p. 694. In a passage known as “The Fragment on Machines” in *Grundrisse* (1858), Marx writes that,

...once adopted into the production process of capital, the means of labour passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most

complete, adequate form, and alone transforms machinery into a system) set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages.

He could almost be writing about artificial intelligence when he says,

it is the machine which possesses skill and strength in place of the worker, is itself the virtuoso, with a soul of its own in the mechanical laws acting through it; and it consumes coal, oil etc ... just as the worker consumes food, to keep up its perpetual motion.... The accumulation of knowledge and of skill, of the general productive forces of the social brain, is thus absorbed into capital, as opposed to labour, and hence appears as an attribute of capital.

Anticipating the ultimate contradiction of capital accumulation, Marx says,

To the degree that labour time – the mere quantity of labour – is posited by capital as the sole determinant element, to that degree does direct labour and its quantity disappear as the determinant principle of production – of the creation of use values – and is reduced both quantitatively, to a smaller proportion, and qualitatively, as an, of course, indispensable but subordinate moment, compared to general scientific labour, technological application of natural sciences, on one side, and to the general productive force arising from social combination in total production on the other side – a combination which appears as a natural fruit of social labour (although it is a historic product). Capital thus works towards its own dissolution as the form dominating production....

As soon as labour in the direct form* has ceased to be the great well-spring of wealth, labour time ceases and must cease to be its measure. Capital itself is the moving

contradiction, [in] that it presses to reduce labour time to a minimum, while it posits labour time, on the other side, as sole measure and source of wealth. Hence it diminishes labour time in the necessary form so as to increase it in the superfluous form; hence posits the superfluous in growing measure as a condition – question of life or death – for the necessary. On the one side, then, it calls to life all the powers of science and of nature, as of social combination and of social intercourse, in order to make the creation of wealth independent (relatively) of the labour time employed on it. On the other side, it wants to use labour time as the measuring rod for the giant social forces thereby created, and to confine them within the limits required to maintain the already created value as value. Forces of production and social relations – two different sides of the development of the social individual – appear to capital as mere means, and are merely means for it to produce on its limited foundation. In fact, however, they are the material conditions to blow this foundation sky-high.

(Marx, 1993, pp700-6.) Marx is clearly convinced that the succession of historical epochs are marked by social ruptures and revolutions, rather than purely evolutionary innovation and incremental reforms. On the same point, Marx adds that the working class is the new revolutionary class and must expropriate the bourgeoisie:

[Capital's] tendency [is] always, on the one side, to create disposable time, on the other, to convert it into surplus labour. If it succeeds too well at the first, then it suffers from surplus production, and then necessary labour is interrupted, because no surplus labour can be realised by capital. The more this contradiction develops, the more does it become evident that the growth of the forces of production can no longer be bound up with the appropriation of alien labour, but that the mass of workers must themselves appropriate their own surplus labour.

(Marx, 1993, p708.) *Indirect labour, in contrast, being direct labour's conversion into machinery or 'objectified/dead labour'.

³⁹ Ibid, p694.

⁴⁰ The worker keeps less value – or labour time, the real measure of value – than she creates, with the surplus value/labour time (necessary labour time covers the labourer's living costs) appropriated by the capitalist and *realised* as profit through commodity sales. This exploitation is obscured by the wage/money relation; or what Marx called the 'commodity fetish'. For detailed proof of the labour theory of value, see Kliman, A., "Debt, economic crisis, and the tendential fall in the profit rate: a temporal perspective", 1999; and Cockshott, P., "How physics is validating the labour theory of value", 2008.

⁴¹ Volkov, *op cit*, p. 45.

⁴² Sam Lilley, *Automation and Social Progress*, Lawrence & Wishart, London, 1956, p. 13.

⁴³ Volkov, *op cit*, p. 50.

⁴⁴ Ibid, pp. 50–1.

⁴⁵ Turner, A., *Capitalism in the Age of Robots: Work, Income and Wealth in the 21st Century*, Institute for New Economic Thinking, April 2018, p. 5.

⁴⁶ As economic anthropologist Jason Hickel writes, the "final dark episode" of the enclosure movement of the 17th and 18th centuries – the privatisation of common land that brutally expropriated and proletarianised the peasantry – "coincided exactly with the Industrial Revolution". Hickel, *op cit*, p. 39.

⁴⁷ The peasantry remains in some small vestiges of rural life in what may be called the neo-colonies of 'developing nations', particularly on the African continent. A significant branch of artisanal labour has not yet been eliminated either; namely, the traditional arts. The painter, for example, still produces commodities *before* securing a sale of their labour-power. In general, they do not own capital, locating this relationship as an artisanal one. While modern branches of the arts (beginning with film) work by the relations of capital and certain traditional artists operate as capitalists, the general organisation of the labour remains in this form.

⁴⁸ Half the population in Nigeria now has access to the internet, for example. But rather than going through the sequence of adopting landline access and then mobile access, as in Europe and North America, Nigeria leapfrogged the former and adopted mobile internet *en masse*. (Bastani, A., *Fully Automated Luxury Communism: A Manifesto*, Verso, London, 2019, p. 108.) This is not to claim that capitalist imperialism has not continued to under-develop, or slow the process of development, of the neo-colonies. Most countries, however, have now industrialised to an extent that was obviously not true before WWII, even if this development has been severely limited due to imperialist parasitism (i.e. the export of capital (machinery) and high-interest loans; and land grabs by multi- and transnational monopolies based (mainly) in North America and western Europe). Grossman backs up the point:

It is not necessarily true that in countries recently opened up to capitalist production the organic composition is always lower. While West European capitalism may have needed 150 years to evolve from the organisational form of the manufacturing period into the sophisticated world trust, the colonial nations do not need to repeat this entire process. They take over European capital in the most mature forms it has already assumed in the advanced capitalist countries. In this way they skip over a whole series of historical stages, with their peoples dragged straight into gold and diamond mines dominated by trustified capital and its extremely sophisticated technological and financial organisation.

(Grossman, H., *The Law of Accumulation and Breakdown of the Capitalist System* (abridged), Pluto Press, 1992, p. 183.)

⁴⁹ While it is true that the cultural and technical standards of the working class have tended to rise, the commodity fetish (the fetishisation of commodity/money/wage relations that obscure exploitative social relations) tends to strengthen in reaction to the increasing prospect of economic collapse. The ruling class also does everything in its power to lower and scramble class consciousness. The

lower the general rate of profit gets, the more the mass (privately owned) media – which is compelled to cheapen its own production, anyway, making it increasingly vacuous, decadent and ‘celebrity’-dominated – implicitly or explicitly promotes regressive policies and cultural views and the merger of the state and monopoly capital; and aims to divide, ‘dumb down’ and desensitise the working class to the violence, oppression and exploitation it faces (often through dystopian science fiction and promilitary ‘superhero’ shows/films). While the most conservative factions of the ruling class tend to promote ‘traditional bigotry’ (in order to exclude people from benefits that eat into profit margins), the more liberal-social democratic factions tend to feed into this ‘culture war’ – understandably to some extent in non-revolutionary situations and given that no class is monolithic – by promoting largely increasingly illusory ‘progress’ for individual ‘identities’ – genders, races, sexualities, etc – and especially greater representation in bourgeois institutions, with the aim or effect sometimes of reinforcing or aggravating economically/politically constructed divides and deceiving narratives of individual empowerment (the ‘independence’ of ‘sex workers’, for example, as the sex trade and human trafficking booms). Communists recognise that women and black and ‘ethnic minority’ people, for example, tend to suffer greater oppression than men and white people – women and black people make up a greater proportion of the proletariat than they do the capitalist class, after all – and oppose discrimination against oppressed minorities; but stress that doing so successfully requires building broad working class unity across races, genders, etc. and fighting for civil rights and socialism.

Furthermore: during the unprecedented global ‘lockdowns’ imposed by the ruling class in late 2019 brains shrank as a result of sensory deprivation and cerebral inactivity (“I have ‘pandemic brain’. Will I ever be able to concentrate again?”, *The Guardian* [online], 2021); and, with schools closed, child literacy fell significantly (“COVID ‘may leave 12 million children unable to read’”, *The Guardian* [online], 2021). Children born during lockdowns

also “score markedly lower on standard measures of verbal, motor, and overall cognitive ability”. (“COVID-19: Children born during the pandemic score lower on cognitive tests, study finds”, *The BMJ*, 16 August. 2021.) Deploying a bewildering array of psychological operations – usually aimed at creating a public clamour for stronger police/state powers by, for example, exaggerating spikes in crime or even manufacturing crime – the ruling class is waging an all-out assault on human consciousness. (Pseudo-Marxists are also promoted in the mainstream and reformist media as ‘actual’ Marxists.) With capital’s dependence on monetising data rising exponentially – including the stealthy return in the ‘developed world’ of (largely unpaid) child labour via online gaming* – and scientists having claimed to be able to implant memories in the brains of mice,** we *cannot rule out the possibility* that the most ruthless sections of the ruling class are at least *aiming* to increasingly lock humanity into a world of virtual reality, as in the film *Ready Player One* or even *The Matrix* (where robots use unconscious humans as a power source). Science fiction has often been used in bourgeois society, after all, to prepare the working class for the next phases of its exploitation. Indeed, the 2012 film *Contagion* “conditions the masses to expect martial law and to throw themselves at the first available vaccine in case of a crisis”. (VigilantCitizen.com, 8 March 2012.) (*“Investigation: How Roblox is exploiting young game developers”; People Make Games [online video], 19 August 2021; **“False memories implanted into the brains of sleeping mice”, *The Guardian* [online], 9 March 2015.) With surplus labour time tending to completely subsume necessary labour time, the ruling class will be *compelled to attempt to re-establish old forms of slavery in absolute terms if it is not to be overthrown by socialism*. And with the fairly constant plundering of personal/private data intensifying, the trend towards 24/7 exploitation is already well underway. Even if any such extreme dystopian scenario could somehow be established – the required reproduction rate is surely unobtainably high for absolute success and the potential for realising profit through commodity sales vanishingly small – the limit to exploitation cannot exceed 24 hours a day, 365 days

a year, and so socialism remains an economic historical necessity. "The zero of [the labourers'] cost is ... a limit in a mathematical sense, always beyond reach, although we can always approximate more and more nearly to it," says Marx. "The constant tendency of capital is to force the cost of labour back towards this zero." (Quoted in Grossman, 1992, p. 100.) Grossman adds:

In reality the constant devaluation of labour power accomplished by continual cuts in wages runs up against insuperable barriers. Every major cut in its conditions of life would inevitably drive the working class to rebellion. In this way, and through the very mechanism that is internal to it, the capitalist system moves incessantly towards its final end, dominated by the 'law of entropy of capitalist accumulation' [Marx].

(Grossman, 1992, p. 101.) Of course, not every major cut does inevitably drive the working class to rebellion. In 'the West', since the eventual defeats in the 1980s of highly organised, militant unions (such as the British miners) – empowered by immediate postwar victories for employment and public services; then high demand for labour; and capital's need to counter the appeal of Soviet ideology – major cuts to services have often met with little or next to no resistance, due to the realities of scrambled consciousness,^{***} atomisation, lumpenisation (destitution), everyday survival and confronting the brutal apparatus of the state. This cannot last forever, however – the ruling class must increasingly run out of funds to spend on both carrots and sticks (a process that, as Grossman points out, can be accelerated by working class struggles for progressive reforms, for every dollar, pound or euro spent on policing protests, imprisoning rebels, waging war, etc. – or directed into public services instead of private subsidies – is one that cannot be put towards accumulation). (^{***}This includes the effects of religion – invented to encourage the labouring classes to seek salvation in the next life – but religion has been dying alongside the law of value, especially where living standards are highest. 70% of 16-to 29-year-olds in Britain identified with no religion, for

example, according to a 2018 study by St Mary's University. Marx wrote that "the miracles of gods [are] rendered superfluous by the miracles of industry..." (*Economic and Philosophic Manuscripts of 1844* (2011), Wilder Publications, Blacksburg (US), p. 50.) Rising scarcity as capitalism collapses is likely to see religion rise again somewhat. Religion and all superstition will begin to wither away again under socialism and more or less disappear with the higher stage of communism.

⁵⁰ Volkov, *op cit*, pp. 162–4.

⁵¹ Volkov, *op cit*, p. 166.

⁵² Volkov, *op cit*, p58–9.

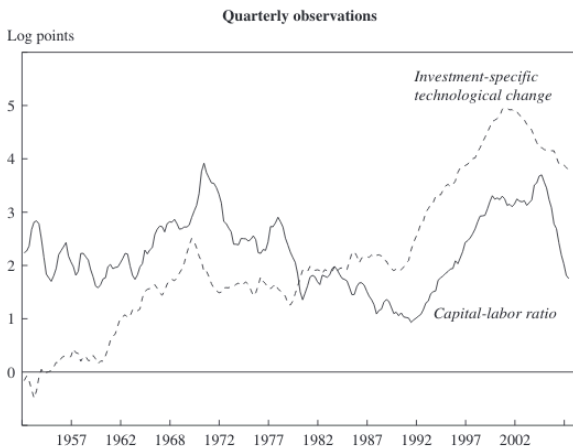
⁵³ *Ibid*, p60.

⁵⁴ *Ibid*, p60–1.

⁵⁵ As Michael Elsby has shown, "investment-specific technological change" has been marked by a "considerable slowdown" since 2000. (Elsby, M., "The decline of US labor share", Brookings Institution, 2013, p. 31.) This is despite the decline in labour's share of compensation (and because of the rising organic composition of capital – the tendency for constant capital (machinery) to grow relative to variable capital (wages/labour). For example:

In 1960, the most profitable company in the world's biggest economy was General Motors (GM). In today's money, GM made \$7.6bn that year. It also employed 600,000 people. Today's most profitable company employs 92,600. So where 600,000 workers would once generate \$7.6bn in profit, now 92,600 generate \$89.9bn, an improvement in profitability per worker of 76.65 times.

(John Lanchester, "The robots are coming", *London Review of Books* [online], 5 March 2015.) It is also despite the ongoing advances that produce myriad new use values in gadgetry and computing – with computing power tending to double every 18–24 months – which give most people the impression, helped by the commercial propaganda of advertising (the costs of which are passed on to consumers!), that the rate of technical progress is always rising. Like capital accumulation, technology may be advancing and accelerating in absolute terms – because its



Source: Fernald (2012).

Note: Values are 10-year centered moving averages of annualized growth rates.

reproduction always begins again from a higher base – but the rate of advancement is slowing down. The opposite only appears to be true. But as Nobel Peace prize-winning economist Robert Solow famously said in 1987, “You can see the computer age everywhere but in the productivity statistics.” Capitalism’s survival has therefore *massively slowed down* the development of automation (and technology and science in general), exposing the idealism of bourgeois economists in the process. In 1957, German pseudo-Marxist Fritz Sternberg claimed that the US under capitalism would seamlessly become a fully automated, classless society by 1975! (Volkov, *op cit*, pp. 156-7.) In the same year, Lilley made a rough calculation – based on the rapid *rate* of improving living standards in the Soviet Union – that if Britain were socialist, the development of automation would reduce the working week there to 25 hours by 1990, 12 hours by 2000, and six hours by 2010. If Britain developed even faster than the Soviet Union, as would have been likely due to its 250-year industrial head

start, a Britain that became socialist in 1965 could have had a working week of six hours by 1995. (Lilley, *op cit*, p. 214.)

⁵⁶ Ibid, p62.

⁵⁷ Hickel, *op cit*, p. 33.

⁵⁸ While systematic 'presocialist' science guides the final developments of capitalism's economic-technical base, the political superstructure, however, outwardly reinvents bourgeois dualistic thought for the purposes of accumulation and divide and rule. Capitalist ideology had to be *invented* to discredit indigenous and peasant notions of animism: that all of nature is animated, alive and interconnected. Capital's mechanistic ideology labelled nature, including human bodies, as merely productive machinery. Its dualistic ideology made out that man was somehow separate from nature in order to justify the non-reciprocal plunder of the earth for accumulation; pitting sentient humans, the thinking subject ("I think, therefore I am"), against the lifeless objects of nature, to be possessed; or framing nature as a 'beast to be tamed'. Similarly, 'the civilised' were pitted against 'the savage', justifying colonialism. Bourgeois dualism reflects the dualistic character of capitalist production, i.e. commodities are both exchange values (sold for profit) and use-values (utilities); and the division of owner-producer and worker-consumer. Communism then mends these divides and produces solely use values.

Since DNA sequencing developed by late monopoly capitalism itself has smashed the old germ theory, a new dualism had to be invented to serve the needs of (especially medical) capital. We are now told that 'most' bacteria are not agents of disease but that there are still 'good' and 'bad' bacteria – sustaining the old dualism that sees nature 'as a beast to be tamed' – a theory deployed to create a new caste and apartheid system in the final capitalist breakdown between 'the hygienic' (who therefore ironically deprive their gut of bacterial diversity) and 'the diseased'; 'the vaccinated' and 'the unvaccinated'. More materialistic theories are thus marginalised, censored by omission. As John Dupré writes:

Where once we had discrete and distinct ‘proteins’ and ‘organisms’, all we are left with are highly dynamic *processes*...

Process-thinking has profound implications for medicine, because it shifts the burden of scientific explanation away from the interaction of things based on essences, and towards how unruly processes somehow manage to crystallise into identifiable patterns. Take cancer: when we see the human patient as a mechanism, as scientists generally do, we’re inclined to look for the causes of disease in ‘damaged’ internal parts, often genes. But note how the focus shifts if we think about change as the norm, and stability as the phenomenon that needs explaining. The persistence of the human organism over the lifecycle requires an almost inconceivably precise balance of division, differentiation and destruction of cells (apoptosis). The conditions called ‘cancer’ involve various failures of this balance, an uncontrolled proliferation of cells of a certain type or types. Rather than a dysfunction that requires a specific explanation, perhaps cancer is actually the expected state – and what we need to understand is how self-regulation explains our remarkable tendency not to suffer from cancer. (Indeed, it seems that messed-up genes are as much an effect as a cause of cancer.)

You can do a similar switch with microbial disease. We’ve come a long way in appreciating the function of our microbiome, but scientists have been a little too eager to suggest a division between good, bad, and neutral microbes. The task of medicine looks easy from this point of view – it’s just about recognising and destroying the bad bacteria. However, while some bugs really are just bad, whether microorganisms are good or bad for you is often a matter of context. Bacteria that are beneficial in the gut can get very nasty indeed if they invade other parts of your body. Microbes don’t generally work alone. In your gut, there are thousands of different strains, and these often serve interconnected functions. Consequently, what a particular strain does, and whether it is beneficial for the host that it does it to, will depend on the overall composition of the microbial community. Moreover,

while the word ‘microbe’ tends to apply to bacteria, there’s a growing awareness that we might need to include viruses in our survey of health-giving microscopic entities. Many viruses appear to be beneficial, perhaps essential, for human life – such as phages that regulate bacterial populations.

(“Metaphysics of metamorphosis”, Aeon [online].) Terrain/cellular theory, which focuses on the terrain of human cells, does not necessarily argue that germs do not exist but that the ‘terrain’ of cells must first be deficient or toxic/sick in order for infection to manifest. That pollution is having such a detrimental effect on human health (see footnote 20) potentially corroborates terrain theory. It is already well established, if not well known, that one or a few sets of bacteria can become unhealthily *dominant* – just as capital increasingly dominates labour – due to the decline in the diversity of the human gut’s microbiome from pollution, narrow diets and antibiotics. These theories will have to be interrogated, however, by an independent proletarian state, free of the profit motive, before we can determine a more ‘exact’ science, which will of course continue to develop under the future mode of production; but they certainly seem more plausible and materialist than the obvious bourgeois dualism of germ theory from a Marxist perspective, which – as with the process-focused science Dupré speaks of – utilises a ‘dialectical’, i.e. bidirectional/interactive science, going back and forth between the abstract and the concrete, the particular and the general, in a method of induction, deduction and successive approximation, whereby elements are excluded and isolated – to *reveal* the essence of a process – and then reintroduced in a method of concretisation. As Engels wrote,

... the bulk of natural scientists are still held fast in the old metaphysical categories and helpless when modern facts, which so to say prove the dialectics in nature, have to be rationally explained and brought into relation with one another.

(*Dialectics of Nature*, 1883, pp. 202-210.) Pirofski & Casadevall argue that,

... attempts to classify microbes as pathogens, non-pathogens, opportunists, commensals etc. are misguided because they attribute a property to the microbe that is instead a function of the host, the microbe, [the natural environment] and their interaction

(Pirofski, L., Casadevall, A., "Q&A: What is a pathogen? A question that begs the point", *BMC Biology* vol. 10, 31 January 2012.) Capital treats the patient (and the soil) just as it treats labour, dominating and expending it for short-term gain at the expense of long-term sustainability. "Every nine minutes, someone in a US hospital dies due to a medical diagnosis that was wrong or delayed," according to the Society to Improve Diagnosis in Medicine. According to a study by Johns Hopkins published in 2016, more than 250,000 people in the US die every year because of medical mistakes, making it the third leading cause of death after heart disease and cancer. ("The third-leading cause of death in US most doctors don't want you to know about", CNBC [online], 22 February 2018.) Julian Davies challenges the literature in microbiology that reflects capitalist militarism and exploitation:

It is often assumed that microbes in their natural environments are in a constant war of attrition for space and nutrients. Many publications speak of battlefields and the production of chemical weapons to permit one or more organisms to successfully exploit a particular environment. Does ascribing human militaristic means and ends to bacteria make sense? There is enormous diversity in microbial phyla and the biosphere is an extraordinarily complex collection of distinct organisms. A given soil sample might contain 10⁹ microbes per gram with a thousand or more species living happily together... In the human gut, microbes number many trillions with upwards of 1,000 phylotypes; are they all engaged in lethal conflict with each other? Despite the fact that small molecules with antibiotic activity can be

isolated from gut bacteria grown in the laboratory, there is no *in situ* evidence that they actually play such roles in the intestinal tract; it is equally likely that these molecules are mediating interactions with mucosal cells lining the gut. However, our ignorance of the workings of microbial communities in these environments is profound and remains tainted by our anthropomorphism.

(Davies, J., “Anthropomorphism in science”, October 2010.) There is little profit in curable medicine, but plenty, and continually, with ‘medicine’ that induces chronic illness. See also, “The belief that viruses are pathogenic invaders is crumbling: New study says ‘exosomes’ can’t be distinguished from viruses,” DrTomCowan.com, 26 October 2020: “To date, a reliable method that can actually guarantee a complete separation between a supposedly exogenous pathogenic virus and an endogenous extracellular vesicle does not exist”; and Lanka, L., *The Misconception Called ‘Virus’*. Lanka won a landmark case in 2017 when the highest court in Germany accepted his argument that measles was not caused by a virus, and that there was actually no such thing as a measles virus. Lanka writes:

All claims about viruses as pathogens are wrong and are based on easily recognisable, understandable and verifiable misinterpretations ... All scientists who think they are working with viruses in laboratories are actually working with typical particles of specific dying tissues or cells which were prepared in a special way. They believe that those tissues and cells are dying because they were infected by a virus. In reality, the infected cells and tissues were dying because they were starved and poisoned... The infection theories were only established as a global dogma through the concrete policies and eugenics of the Third Reich. Before 1933, scientists dared to contradict this theory; after 1933, these critical scientists were silenced.

See also “The Smoking Gun?”, DrTomCowan.com, 10 June 2021. A peer-reviewed paper titled “Appearances can be

deceiving – viral-like inclusions in COVID-19 negative renal biopsies by electron microscopy”, by Clarrisa A. Cassol et al. examined the electron-micrograph pictures allegedly representing SARS-CoV-2 (the respiratory syndrome coronavirus 2, which allegedly leads to COVID-19 the disease), rather than normal ‘structures’ within a cell, particularly sick cells. The paper says, “We have observed morphologically indistinguishable inclusions within podocytes and tubular epithelial cells both in patients negative for coronavirus disease 2019 (COVID-19) as well as in renal biopsies from the pre-COVID-19 era.” Cowan comments: “In other words, the researchers saw these same structures in people with no evidence of COVID and in samples they took before COVID even happened, before the virus was said to even exist.” The paper also points out that, “The potential for confusion of coronavirus particles with normal cellular components [particularly in sick cells] was in fact highlighted in a detailed ultrastructural study by the Centers for Disease Control and Prevention (CDC) of SARS-CoV responsible for the 2003 SARS outbreak.”)

⁵⁹ The way the ‘internet of things’ is deployed under capitalism itself reflects capital’s increasing dependence on monetising data – which has become more profitable than oil – especially personal data created through unpaid labour that increasingly bleeds into leisure time, since next to no labour is needed to produce each unit – which can be copied almost instantaneously – resulting in an increasingly invasive and oppressive superstructure. (“The world’s most valuable resource is no longer oil, but data”, *The Economist* [online], 6 March 2017. In regard to how ‘COVID-19’ has been used to further invade privacy to generate and access data, see Glenza, J., “How US companies could use patients’ data from COVID vaccine”, *The Guardian* [online], 7 May 2021; Hope, C., “Millions ‘unwittingly tracked’ by phone after vaccination to see if movements changed”, *The Telegraph* (online), 22 May 2021; “Contact-tracing data harvested from pubs and restaurants being sold on”, *The Times* (online), 11 October 2020; “Singapore reveals COVID privacy data available to police”, BBC News (online), 5 January 2020; Ankers, A.,

“Microsoft files patent to create chatbots that imitate dead people”, IGN [online], 21 January 2021; “A military-funded biosensor could be the future of pandemic detection”, Defense One [online], 3 March 2020.) This hyper-dependence on data is especially significant since, as Grossman says, “The physical nature of the commodity is a necessary precondition of its accumulation. Values enter the circulation of commodities, and thereby represent an accumulation of capital, only insofar as they acquire a materialised form.” Grossman, 1992, p. 153. Data is certainly physical in the sense that it must be stored somewhere, but this storage (per unit) is increasingly small. The nodes on a computer chip are measured by the nanometre (nm) – i.e. one billionth of a metre, or 100,000 times thinner than a sheet of paper. The smaller the node, the more can be fitted into the same small space. In 1965, a single transistor spanned the width of a fibre of cotton and cost \$8 in 2018 money. Now, billions of transistors can be squeezed onto a chip the size of a fingernail, with the cost per unit having fallen to a tiny fraction of a cent (Bastani, *op cit*, p. 43). Sales of the 10nm class began in 2016, following on from 14nm in 2014, 22nm in 2012, and 32nm in 2010. Production of the 7nm class began in June 2017 and the 5nm class was expected to go on sale in 2020, but suffered delays doubtlessly due to the rising overaccumulation of capital. At the same time, the exponential increase in data maintains rising demand for energy (fossil fuel) and storage (metals and fossil-plastics) in absolute terms. Regarding internet bandwidth, user capacity has grown by between 25 and 50% a year since 1983, and data storage, which has likewise enjoyed an exponential function in space-to-cost ratio, with a gigabyte of storage falling from around \$200,000 in 1980 to just \$0.03 in 2014. Storing data as DNA is said to be the next big leap, although it is some way off. A single gram of human DNA is able to store 215 petabytes (215 million gigabytes) of information. (Bastani, *op cit*, p46.) The market for data, however, is rather limited. Although it is used to make many commodities, such commodities are designed more to generate and collect data; i.e. data is not really bought as a commodity *per se* outside of business-to-business

transactions, and therefore plays a major centralising role in the accumulation process. Bob Colwell, director of DARPA (the Defense Advanced Research Projects Agency), an arm of the US Department of Defense, anticipates the end of Moore's Law – that computing power tends to double every 18-24 months* – not necessarily because of physical but economic limits:

[It takes] huge amounts to build the fab plants, and yet more... to pay for the design teams to design new chips. Intel makes these investments, which are in the billions [of dollars], because they expect to reap way more billions in profits in the following years. But if there is doubt that those profits will arrive, and possibly if they just doubt they can come up with the necessary silicon improvements, they may not want to make the investment at all. Should a major player like Intel make such a call, that would effectively end Moore's Law all by itself, because then the various companies that make the super expensive tools for chip production will themselves not make the investments needed to keep Moore's Law alive.

*As Adair Turner wrote in 2018,

In just under half a century (48 years, 32x18 months) processing power will increase 4.3 billion times. But if it keeps on increasing at the same rate, over the next 48 years it will increase another 4.3 billion times from a massively higher base. Even if absolute physical limits begin to slow the pace of progress, we will be able within 50 years to deploy unimaginably massive quantities of computing power, and as that computing power becomes available, multiple work activities which till now have resisted automation will become automatable.

(*Capitalism in the Age of Robots: Work, Income and Wealth in the 21st Century*, Institute for New Economic Thinking, April 2018, p. 3.)

⁶⁰ "Oxford Interdisciplinary Microbiome Project (IMP)", insis.ox.ac.uk (online), 23 November 2016.

⁶¹ Sender, R., "Revised estimates for the number of human and bacteria cells in the body", PLoS Biology 14(8), August 2016.

⁶² Dupré, J., *op cit*.

⁶³ "Live Scientists discover massive microbe ecosystem living beneath the earth's surface found deep below the seabed", *The Independent* (online), 11 December 2018. See also Morono, Y. et al., "Aerobic microbial life persists in oxic marine sediment as old as 101.5 million years", *Nature Communications* vol. 11, 28 July 2020; quoted in Gramling, C., "These ancient seafloor microbes woke up after over 100 million years", Science News [online].

There are compelling arguments that fossil fuel or at least some kind of other fuel residing beneath the earth's crust is neither fossil nor finite, a possibility that was explored rigorously by Soviet geologists. Whether this is true and whether these bacteria play some role in generating an abundant, recurring supply of abiotic oil from molten rock will again have to be assessed by future socialist states. (See McGowan, D., "Stalin and abiotic oil", Educate-Yourself.org, 5 March 2005.) This also begs the question as to whether the way petroleum is refined is what makes it dirty.

⁶⁴ See "Waste not", NASA.gov, 6 April, 2021. Another bacterium type being researched in this area is *Shewanella oneidensis* MR-1. See "Could electricity-producing bacteria help power future space missions?", NASA.gov, 27 June 2018.

⁶⁵ Hemp grows very quickly with relatively little water, making it drought-resistant; heals and cleanses even the most damaged, poisoned and even radioactive soil, reversing land degradation and desertification, thanks to its deep aerating root system; and draws down carbon from the atmosphere (the cause of global heating) faster than any other plant. Since it grows tightly packed, nor does it need toxic pesticides – used by capitalist monoculture to maximise short-term productivity at the expense of sustainability; socialist Cuba, by contrast, uses biopesticides* – that damage and ruin the soil and its biodiversity. Biofuel obviously releases gasses previously trapped in the plant back into the atmosphere when

burned. But the unburned products made from hemp sequester CO₂ indefinitely. Highly-insular hempcrete makes the entire process of constructing and using buildings carbon-negative. Hemp and cannabis also have an important role to play in reviving bee populations. A worldwide hemp/plant-based industrial revolution is therefore absolutely essential if we are to reverse rampant desertification and stabilise the climate; and with the added bonuses of ending pollution, whether plastic or atmospheric, and furthering technological and industrial advancement: scientists have found that hemp graphene outperforms lithium and conventional graphene as a supercapacitor and conductor. In *The Emperor Wears No Clothes* (1985), Jack Herer shares published findings that biomass from corn stalks, cannabis, waste paper and the like could replace 90% of all fossil fuel used in the world today (coal, oil, natural gas, etc.). Herer writes:

Government and oil and coal companies, etc., will insist that burning biomass fuels is no better than using up our fossil fuel reserves, as far as pollution goes; but this is patently untrue. Why? Because, unlike fossil fuels, biomass comes from living (not extinct) plants that continue to remove carbon dioxide pollution from our atmosphere as they grow, through photosynthesis. Furthermore, biomass fuels do not contain sulfur.

(Quoted in Bourque, A., “Perhaps Jack Herer was right, the future of mankind may be hemp”, *Forbes* [online], 8 July 2018.) We are not calling for a hemp monoculture. In 1984 it was estimated that just 6% (90 million acres) of contiguous US land cultivating hemp could supply all then-current demands for oil and gas, while maintaining a neutral carbon system. (The US government actually pays farmers not to grow on 6% of the farming land (at least in 2018), to raise food prices.)* Clearly the figure would have to be higher if hemp were also to replace steel, concrete, plastic and lithium, etc. While the economy is now much bigger than in 1984, a lot of what we presently produce is completely wasteful – much novelty tat, bombs, energy-intensive financial systems, etc. – made only to serve the

needs of accumulation. As things like lab-grown food and 3-D printing become more diffuse and 'localised', as local life becomes more interesting and enjoyable, and public transport improves exponentially, private forms of transport like cars will become increasingly obsolete, too. And as the means of production become smaller and move underground, there will be more 'overground' space to revive the environment and biodiversity. So a hemp monoculture is not necessary. (Sources: "History of hemp", Hemp.com; Burns, J., "How cannabis coevolved with humanity, and could save it now", Forbes [online], 21 May 2020; Briggs, J., "Hemp fuel guide", Hemp Frontiers, 11 May 2012; Kaucic, G., "A sustainable alternative to fossil fuels: hemp & biofuel", Hemp History Week [online], 2019; Mitlin, D. et al., "Interconnected carbon nanosheets derived from hemp for ultrafast supercapacitors with high energy", *American Chemical Society Publications* [online], 7 May 2013; Murray-Smith, R., "Hemp battery as good as lithium ion?" [online video], 12 October 2016; UK Hempcrete, "Better-than-zero-carbon buildings"; Martino, J., "How hemp became illegal: the marijuana link", Collective Evolution [online], 5 December 2012; Colton O'Brien, "What is with all the buzzing? Exploring bee diversity in industrial hemp", esa.confex.com, 11 November 2018; "Naturally infused honey & the effects of cannabis on bees", Vimeo.com.)

(There is also a growing body of anecdotal evidence that hempcrete absorbs reasonable quantities of electromagnetic interference (EMI). ("Why we should build with Hempcrete", Hemp Tank [online], 2019.) The electromagnetic fields produced by mobile phones are classified by the International Agency for Research on Cancer as "possibly carcinogenic" to humans.)

Other fibrous plants can be used in hi-tech production. Banana peel, for example, can be turned into high-performance sodium-ion batteries. Solar panels can be made from leaves and grass clippings. ("MIT creates solar cell from grass clippings", Extreme Tech [online], 2012.) Other general production options vis-à-vis global heating include carbon-negative 'sky mining'. This can be employed, for example, to make diamonds that are

physically and chemically identical to those mined from the earth by drawing down carbon from the atmosphere. Producing a conventional one carat diamond requires the shifting of around 1,000 tonnes of rock and earth, consumes almost 4,000 litres of water, and generates more than 100kg of carbon emissions. ("UK 'sky mining' facility creates carbon-negative diamonds", *Engineering & Technology* [online], 30 October, 2020.) Gold that is 'purer' than mined gold, meanwhile, can be grown in labs. (Mettal, G. et al., "Nobler than the Noblest: Noncubic Gold Microcrystallites", *Angewandte Chemie*, 2018.)

*Cuba has demonstrated that, through socialism, countries oppressed and exploited by imperialism and colonialism can recover. Between 1900 and 1959, as a semi-colony of the US, Cuba's forest and plant cover was decimated from 52% to 14%. A reforestation programme began soon after the revolution. The programme was renewed in 1998 and at the end of 2015 forest and plant cover had risen back up to 30.6%, a figure recognised by the UN as the most advanced in Latin America and the Caribbean. Cuba has been recognised as the most sustainably developing country in the world and its pioneering urban organic farming, *organoponicos*, has been described by *The Architectural Review* as "an exemplary precedent that could be applied worldwide". ("Cuba's urban farming revolution: how to create self-sufficient cities", *Architectural Review* [online], 17 March 2014. See also Hetfield, D., "Socialism is good for the environment", *Fight Racism! Fight Imperialism!* issue 214, April/May 2010 [also available online at revolutionarycommunist.org].) Because of the US blockade and a variety of traditional knowledge among the population, Cuba and its world renowned health care system is heavily invested in 'natural medicine' derived from plants, herbs and roots. (The island has 67 physicians per 10,000 people compared to 24 per 10,000 in the US, according to the World Health Organization (WHO). Local doctor-nurse teams called *consultorios* are available in every community.) Research into traditional medicine has increased on the island over the past decade. The Ministry of Public Health has begun to implement the use of traditional medicine

through a variety of different programmes and government-owned farmland is dedicated not only to the production of food, but also of medicinal plants. Production has been expanded to include common medicinal plants like oregano, aloe vera, mint, moringa, and noni, a tree in the coffee family used as an antioxidant and to fight inflammation. Hence, in contrast to most of the rest of the world, Cuba is a 'paradise' for bees. Yoandra Adelá, a general practitioner at a Havana hospital, says that, "In every elementary school you're going to find a small greenhouse where kids plant and farm medicinal plants, and they are taught different uses they have as well as the healing properties of each one." (McAvoy, S., "Alternative medicine blooms in Cuba", *The Ground Truth Project* [online], 2 May 2019; "Why does Cuba have the healthiest bees?", *People's World* [online], 9 October 2018.

⁶⁶ Mycelium can be coaxed, using temperature, CO₂, humidity and airflow, to rapidly build fibrous structures for things such as "packaging, clothing, food and construction – everything from leather to plant-based steak to scaffolding for growing organs"; all with minimal (mostly compostable) waste and energy consumption. (Bayer, E., "The mycelium revolution is upon us", *Scientific American* [online], 1 July 2019) Mycelium is also used to bind hemp bricks. See also: Adamatzky, A., "Towards fungal computer", *The Royal Society* [online], 19 October 2018.

⁶⁷ Hickel:

Just as bacteria are revolutionising how we think about our relationship with the world, biologists are also discovering some remarkable things about trees and forests that are upending how we think about plants.

When we see a tree, we tend to think of it as a singular unit – just as we think of ourselves as individuals. But biologists have discovered that it's not quite so simple. They have come to understand that trees depend on certain kinds of fungi in the soil: hair-thin structures called hyphae that interlace with cells in the roots of trees to form mycorrhiza. The fungi benefit by receiving some of the sugar that plants produce through photosynthesis

(which it cannot otherwise make), while the trees benefit in turn by receiving elements like phosphorous and nitrogen that they cannot produce for themselves, and without which they cannot survive.

But this reciprocity is not confined to just two parties in this ancient relationship. Invisible fungal networks also connect the roots of different trees to one another, sometimes over great distances, forming an underground internet that allows them to communicate, and even to share energy, nutrients and medicine. The ecologist Robert Macfarlane explains how this works:

A dying tree might divest itself of its resources to the benefit of the community, for example, or a young seedling in a heavily shaded understory might be supported with extra resources by its stronger neighbours. Even more remarkably, the network also allows plants to send one another warnings. A plant under attack from aphids can indicate to a nearby plant that it should raise its defensive response before the aphids reach it. It has been known for some time that plants communicate above ground in comparable ways, by means of airborne hormones. But such warnings are more precise in terms of source and recipient when sent by means of the myco-net.

Trees co-operate. They communicate. They share. Not only among members of the same species, but across species barriers: Douglas firs and birches feed each other. And it's not just trees; we now know that all plants – except for a handful of species – have this same relationship with mycorrhiza. Just as with our gut bacteria, these findings challenge how we think about the boundaries between species. Is a tree really an individual? Can it really be conceived as a separate unit? Or is it an aspect of a broader, multi-species organism?

There's also something else going on here – something perhaps even more revolutionary. Dr Suzanne Simard, a professor in the department of forest & conservation at the University of British Columbia, has argued that mycorrhizal networks among plants operate like neural

networks in humans and other animals; they function in remarkably similar ways, passing information between nodes. And just as the structure of neural networks enables cognition and intelligence in animals, mycorrhizal networks provide similar capacities to plants. Recent research shows that the network not only facilitates transmission, communication and co-operation – just like our neurons do – it also facilitates problem-solving, learning, memory and decision-making.

These words are not just metaphorical. The ecologist Monica Gagliano has published ground-breaking research on plant intelligence, showing that plants remember things that happen to them, and change their behaviour accordingly. In other words, they learn. In a recent interview... she insisted: 'My work is not about metaphors at all; when I talk about learning, I mean learning. When I talk about memory, I mean memory.'

Indeed, plants actively change their behaviour as they encounter new challenges and receive messages about the changing world around them. Plants sense: they see, hear, feel and smell, and they respond accordingly. If you've ever seen time-lapse footage of a vine growing up a tree, you'll have an idea of what this looks like in action: that vine is no automaton – it's sensing, moving, balancing, solving problems, trying to figure out how to navigate new terrain.

The more we learn, the stranger (or perhaps more familiar?) it all becomes. Simard's work shows that trees can recognise their own relatives through mycorrhizal networks. Older 'mother' trees can identify nearby saplings that came from their own seeds, and they use this information to decide how to allocate resources in times of stress. Simard also describes how trees seem to have 'emotional' responses to trauma in a way that's not dissimilar to animals. After a machete whack or during an aphid attack, their serotonin levels change (yes, they have serotonin, along with a number of neurochemicals that are common in animal nervous systems), and they start pumping out emergency messages to their neighbours.

Of course, none of this is to say that plant intelligence is exactly like that of animals. In fact, scientists warn that

our urge to constantly compare the intelligence of some species with that of others is exactly the problem: it ends up blinding us to how other kinds of intelligence might work. Set out in search of a brain and you'll never even notice the mycorrhiza that have been pulsing through the earth, evolving right under our feet, for 450 million years.

This research is just taking off, and we have no idea where it might lead. But Simard is careful to point out that it's not exactly new:

If you listen to some of the early teachings of the Coast Salish and the Indigenous people along the western coast of North America, they knew [about these insights] already. It's in the writings and in the oral history. The idea of the mother tree has long been there. The fungal networks, the below-ground networks that keep the whole forest healthy and alive, that's also there. That these plants interact and communicate with each other, that's all there. They used to call the trees the tree people ... Western science shut that down for a while and now we're getting back to it.

Trees aren't only connected with each other. They are also connected with us. Over the past few years, research into human-tree relationships has yielded some truly striking findings.

A team of scientists in Japan conducted an experiment with hundreds of people around the country. They asked half of the participants to walk for 15 minutes through a forest, and the other half to walk through an urban setting, and then they tested their emotional states. In every case, the forest walkers experienced significant mood improvements when compared to the urban walkers, plus a decline in tension, anxiety, anger, hostility, depression and fatigue. The benefits were immediate and effective.

Trees also have an impact on our behaviour. Researchers have found that spending time around trees makes people more co-operative, kinder and more generous. It increases our sense of awe and wonder at the world, which in turn changes how we interact with others. It reduces

aggression and incivility. Studies in Chicago, Baltimore and Vancouver have all discovered that neighbourhoods with higher tree cover have significantly fewer crimes, including assault, robbery and drug use – even when controlling for socio-economic status and other confounding factors. It's almost as though being with trees makes us more human.

We don't know quite why this happens. Is it just that green environments are somehow more pleasant and calming? A study in Poland suggests that doesn't explain it. They had people spend 15 minutes standing in a wintertime urban forest: no leaves, no green, no shrubbery; just straight, bare trees. One might think such an environment would have minimal if any positive impact on people's mood, but not so: participants standing in the bare forest reported significant improvements in their psychological and emotional states when compared to a control group that spent those fifteen minutes hanging out in an urban landscape.

And it's not just mood and behaviour. It turns out that trees have an impact on our physical health too – in concrete, material terms. Living near trees has been found to reduce cardiovascular risk. Walking in forests has been found to lower blood pressure, cortisol levels, pulse rates and other indicators of stress and anxiety. Even more intriguingly, a team of scientists in China found that elderly patients with chronic health conditions demonstrated significant improvements in immune function after spending time in forests. We don't know for sure, but this may have something to do with the chemical compounds that trees exhale into the air. The aromatic vapours released by cypress, for example, have been found to enhance the activity of a number of human immune cells, while reducing stress hormone levels.

In an attempt to quantify the overall benefit of trees, scientists in Canada found that trees have a more powerful impact on our health and well-being than even large sums of money. Having just ten more trees on a city block decreases cardio-metabolic conditions in ways comparable to earning an extra \$20,000. And it improves one's sense of well-being as much as earning an extra

\$10,000, moving to a neighbourhood with \$10,000 higher median income, or being seven years younger.

These results are astonishing. There's a real mystery here, which scientists still do not yet understand. But perhaps we shouldn't be so surprised. After all, we have co-evolved with trees for millions of years. We even share DNA with trees. After countless generations, we've come to depend on them for our health and happiness just as we depend on other humans. We are, in a very real sense, *relatives*.

(Hickel, *op cit*, pp. 276–81.) (See also: Quammen, D., *The Tangled Tree: A Radical New History of Life*, Simon & Schuster. 2018; quoted in Dohms-Harter, E., "DNA from viruses, bacteria have weaved themselves into human genome", Wisconsin Public Radio, 9 October 2018; Smith, T. "What bacteria can tell us about human evolution", *Quanta Magazine* [online], 5 December 2017; "Plants and humans are more similar than you think", *Helix* [online], 4 April 2018; Jones, L., "Mushrooms are more closely related to us than to plants!", Leigh Valley Live [online], 26 March 2019.)

All human beings themselves are 99.9% genetically identical, making a mockery of the concepts of (economically / politically constructed) race, nationality, etc. ("Genetics vs. Genomics Fact Sheet", National Human Genome Research Institute [online]).

⁶⁸ Hemp is a variation of the *cannabis sativa* plant, the main difference being that it contains hardly any delta-9-tetrahydrocannabinol (THC). Since fossil fuel is becoming so capital-intensive and unprofitable, hemp and cannabis prohibition is finally starting to end – another 'presocialist' trend, although they of course remain privatised, overpriced commodities – due to artificial scarcity – while quality and safety suffers from profit-maximising corner-cutting. Cannabis is finally being recognised as not only safer than alcohol, heroin, crack cocaine, methamphetamine, cocaine, tobacco, caffeine and amphetamine, but as possessing significant therapeutic and medicinal qualities. Some cannabis strains have even been found to shrink cancerous tumours. Because it is non-toxic, overdosing on cannabis is almost impossible and, far

from being a gateway drug – the majority of cannabis users do not go on to use any other illegal drug – it has even proved to be an effective ‘exit drug’ for opioid addicts. Hemp itself produces cannabidiol (CBD) oil, which has anti-inflammatory and anti-anxiety properties and also reduces nicotine cravings. THC has been found to be more therapeutic than CBD but has not received the same level of destigmatisation. CBD and THC have such an effective medical function because humans have an endocannabinoid system (ECS) – a network of cannabinoid receptors all over our bodies that provide chemical feedback for cellular communication. These receptors are located on inflammatory cells, white blood cells, lymphocytes and throughout the nervous system. They have anti-inflammatory effects and various properties that have health benefits. When you stimulate the cannabinoid type 1 receptor you reduce pain transmission into the nervous system, for example. CBD and THC therefore provide the same pain relief as opioids but without the potential addictiveness. For example, THC mimics and therefore complements or makes up for an underproduction of anandamide – an endocannabinoid – producing a calming effect on irritated neurons. (Those who do not have an underproduction of anandamide should not use cannabis too frequently. Like other drugs, nor is it always safe to mix with other drugs/medicines.) This area of medicine and anatomy is hugely under-researched due to prohibition. It was not until the 1990s that the ECS in humans was even discovered. We now know that the ECS is involved in fighting almost all diseases, opening the way for researchers to re-analyse how they should be treated. It may be that the ECS can be manipulated not just therapeutically but through vibrations and bioelectricity. See *The Cannamannual: Cannabis In Context*, Global Cannabinoids Solutions (2020).

⁶⁹ Aldridge, M., “‘EZ water’: the water that makes us and all other life”, *Alliance for Natural Health* [online], 18 July 2018. Gerald Pollack, professor of bioengineering at the University of Washington in Seattle has apparently demonstrated that like plants, “we too split water into positive and negative ions using light to make energy...

Water behaves as a light-driven battery and, remarkably, our cells behave in the same way. We've often thought the primary benefits of sunlight were down to producing vitamin D... [W]ater [converts] the light ... into mechanical energy which keeps the water flowing into cells and through narrow capillaries without a massive increase in blood pressure." See also, "Human photosynthesis: light, energy and life", Deta Elis [online], 17 March 2019. (That US Americans spend around 87% of their time indoors and an additional 6% in an enclosed vehicle (on average) – and that was in the early 1990s – thus begins to make capitalist society look like a kind of captivity; which, of course, it is. (See "We spend 90% of our time indoors. Says who?", Building Green [online].) The implications for human health are stark.

Dr. Heinrich Kremer sees the origin of cancer differently than the mainstream. He terms his new theory cell dyssymbiosis. According to Kremer, cancerous cells do not originate from DNA mutations, but from a functional process that occurs in the mitochondrion... Sunlight dominates the chemistry of the blood. People who do not get sunlight do not have the same richness and redness of blood as do those who secure plenty of sunlight... We are water and it plays the top role in living processes. This is not quite understood by physicians and the public, which unfortunately are led into dehydrating conditions through the use of pharmaceutical drugs and inappropriate food and drinking patterns. Coke and Pepsi have done more to dehydrate the public than anyone can imagine.

Perhaps this partly explains why cancer rates are relatively high among people in long-term night shift work.

Elsewhere, MIT chemist Dr. Daniel Nocera has apparently

demonstrated a reaction that generates oxygen from water much as green plants do during photosynthesis – an achievement that could have profound implications. What Nocera has devised is an inexpensive catalyst that

produces oxygen from water at room temperature and without caustic chemicals – the same benign conditions found in plants. In Nocera's scenario, sunlight would split water to produce versatile, easy-to-store hydrogen fuel that could later be burned in an internal-combustion generator or recombined with oxygen in a fuel cell. Even more ambitious, the reaction could be used to split seawater; in that case, running the hydrogen through a fuel cell would yield fresh water as well as electricity... This astounding conclusion that water plus light equals energy (fuel) has been struggling to surface for many years but is being resisted by entrenched interests in the energy sector that is not quite ready to give up fossil fuels.

Hydrogen power in its present state, still underdeveloped by capital, does produce little more than water at the point of consumption when used in fuel cells to make electricity. But it is blended with natural gas and burned in power plants, and combustion is said to produce high levels of nitrogen oxide. 98% of the 115 million (m) tonnes used globally is 'grey hydrogen', made from natural gas or coal, that emits around 830m tonnes of CO₂ per annum – 2% of total GHG emissions. Beyond that, there's a tiny amount of so-called 'blue hydrogen' – essentially grey hydrogen but with its CO₂ emissions captured and stored – and an even tinier amount of 'green hydrogen' from electrolysing water, both of which are much more expensive than grey hydrogen (see iea.org/fuels-and-technologies/hydrogen).

⁷⁰ A new prospect with huge potential in regards to addressing the energy and climate crises is space-based solar power, overcoming the intermittency of winter, night time and overcast weather. Its capital-intensity, however, makes it too expensive to put into practice under capitalism.

⁷¹ Volkov, *op cit*, p. 54.

⁷² Clearly, like all areas of science and technology, an independent (and obviously ongoing) proletarian re-assessment of nuclear energy is required before we establish its safety and whether or not the environmental impact of drilling is outweighed by the benefits. Hemp's

energy density rate is about half that of coal's, whereas nuclear's is much higher. Pound for pound uranium provides 16,000 times more electricity than coal. Nuclear power could be re-embraced to provide the energy for the large-scale, centralised infrastructure that enables the masses to have access to cheap electricity, water and food. Before the era of neoliberalism, after 1973, France decarbonised 78% of its electricity in just 13 years by building 54 *publicly*-owned nuclear power plants. (Indeed, the nuclear power plant was an invention of the Soviet Union.) The abandonment of nuclear power has had little to do with safety concerns but rather its expensive, capital-intensive upfront costs. Not only is it capital-intensive, but since it is long-lasting there is no inbuilt obsolescence to take advantage of. Nuclear is apparently much safer than seems to be generally thought. According to Leigh Phillips

Exposure to cosmic rays while taking two transatlantic flights (0.16 millisieverts (mSv) of radiation) is roughly equivalent to the annual exposure of a UK nuclear power station worker (0.18 mSv), which is far less than the annual dose of the average US citizen from all sources (2.7 mSv), or exposure to radiation as a result of one CT chest scan (6.6 mSv) or the average annual dose from radon from the ground experienced by people who live in Cornwall (7.8 mSv). We also know that the new generation of dramatically safer reactors employing passive-safety systems *physically cannot* melt down, and that safe methods of waste disposal are proven. The amount of waste produced is also tiny compared to that of many other industrial processes, and far less hazardous. Radioactivity also decreases with time, but the danger presented by solar panel production, such as cadmium, mercury and lead pollutants, never goes away. Instead these pollutants bioaccumulate (there is ever greater concentration of the pollutant in an organism) and biomagnify (there is ever greater concentration of the polluting as you move up the food chain). Advanced nuclear power systems can completely recycle used nuclear fuel, actually producing a net positive balance of energy in this process. In a 2014 survey of all energy

sources exploring which delivered the least direct harm to biodiversity, nuclear was among the best options, due to its small land and mining footprint. Nuclear has by far the best safety record of any energy source, clocking in at 0.04 deaths per terawatt hour, compared to wind's 0.15 deaths, solar's 0.44 deaths, hydroelectric's 1.4 deaths, oil's 36 deaths and coal's 100 deaths.

(Phillips, L., *"The Left Defence of Nuclear", Austerity Ecology & the Collapse-porn Addicts*, Zer0 Books, 2015.) According to Emmet Penney and Adrián Calderón:

Throughout seven decades of service, nuclear power has consistently been proven to be safer than every other mass scale form of energy production. In one year, residents who live near a nuclear power plant are exposed to less radiation than anyone who has eaten a single banana. Though it may sound counterintuitive, because elements such as uranium and plutonium have such long half-lives, the radiation they emit is low enough to safely hold in your hand. Nuclear is also far and away the most reliable form of energy generation in the US, which makes it ideal for providing baseload power for the electrical grid [whereas wind and solar are intermittent due to night time and winter]. Nuclear reactors routinely spend years in continuous operation. The current fleet of nuclear power plants have no technical limits that prevent them from being in service for 80 years, if not a century ... most [nuclear waste] is composed of low-level waste (LLW) made up of protective clothing, cleaning materials, equipment, and tools exposed to neutron radiation. LLW accounts for 90% of nuclear waste by volume but only 1% of its total radioactivity and can be disposed of safely and permanently. After about half a decade of providing carbon-free energy in the reactor core, the uranium fuel itself must be replaced. This high-level waste (HLW) is the highly radioactive and long-living stuff that you see caricatured in popular imagination. Yet this type of waste comprises only 3% of total nuclear waste. To put this in perspective, all of the waste from the entire history of

American nuclear power plants can fit within an area the size of a football field, 50 feet high – half the height of a single wind turbine.

Meanwhile, weather-dependent renewables require 400–450 times the land to produce the same amount of electricity as nuclear. Levelling an area of land larger than almost a third of all US states for energy production might be an acceptable compromise to some, but it does not solve the weather-dependent nature of those sources. Further complicating matters is the fact renewable energy must be stored for later, which requires the use of lithium batteries. But the sheer scale of mining and land use required, and the fact that it involves the domination and exploitation of predominantly developing countries, makes the choice not only inefficient, but unethical. With the abundant uranium reserves already in the United States today, we have the capacity to cultivate an industry to domestically fuel our reactors right now.

(“We need a Nuclear New Deal, not a Green New Deal”, The Bellows [online], 25 September 2020.) Chinese scientists, meanwhile, set a new world record in 2021, achieving a plasma temperature of 120 million degrees Celsius for 101 seconds, a large step toward the test running of a fusion reactor, using deuterium abundant in the sea to provide a steady stream of clean energy. (“China’s artificial sun just smashed a fusion world record”, *Popular Mechanics*, 7 June 2021.) Nuclear fusion is said to be even safer than fission, since it is less radioactive and does not involve splitting atoms, but has taken decades to develop because of the capital-intensity of the project. (Whether China is ahead of the game on this technology – as with most areas of technology and science now – because it is genuinely ‘building socialism’ via a ‘capitalist road’, or because its overaccumulation of capital is relatively smaller than the US’s, is beyond the scope of this essay. We tend to think, though, that it is the latter, since China has its own crisis of mounting debt and falling interest rates. Its debt quadrupled between 2007 and 2015 and the baseline rate fell from 7.5% in 2007 to 3.7% in 2019.)

⁷³ Ibid, p. 56-7.

⁷⁴ Ibid, p. 64.

⁷⁵ This is not to say that the Bolsheviks wasted their time or should not have bothered trying to fight for liberation; or that 'socialism in one country' (it was more like one continent) should not have been supported. Such an argument is necessary, however, in order to effectively counter the claim that the Soviet Union 'proved' that socialism 'does not work'. Having inherited an underdeveloped, largely peasant-based economy decimated by WWI and then counter-revolution, the Soviet Union faced many major problems, including widespread illiteracy. Yet there were many phenomenal successes, including the abolition of illiteracy, unemployment and economic recession (outside of wartime), and the stunning lead the Soviet Union initially took in the space race. Soviet inventions included: the radio antenna; 2- and 3-D holography; artificial satellite; the programmable computer; the nuclear power plant and nuclear-powered submarine; the AK assault rifle; the mobile phone; and Tetris. ("Russian inventions in the soviet era", inventions-handbook.com.) According to an eye-witness account from Lilley, in the 1950s the Soviet Union had the two most advanced automated factories in the world. The continual aggression the Soviet Union faced from western imperialist powers, however, forced it to spend increasingly heavily on defence at the expense of its civilian economy and again decimated its population and infrastructure during WWII. The situation combined with the scarcity that arose from this was bound to bring about a centralisation of power to a greater degree than desired and at times also manifested in what would usually be considered regressive social policy (such as restrictions on abortions when contraceptives could not be imported or because of depopulation inflicted by imperialist war). That the Soviet Union, where it could circumvent sanctions, had to import various goods and materials from capitalist countries also meant it could never fully plan its economy, since volatile foreign prices could not be predicted. For the same reason, nor could money be abolished (although it was used internally, at least at first, only as a kind of index – see Grossman, 2019, pp. 263-4). For the same reason, there was

some logic to allowing a black market to flourish (overseen by increasingly labour aristocratic factory managers who increasingly dominated the Communist Party), in order to build up foreign currency, especially the US dollar, the world's reserve currency, upon which the socialist bloc eventually became too dependent. All this held back the Soviet Union's ability to transition to the higher stage of communism, resulting in relative economic stagnation and a growing pressure in the direction of capitalist reform, especially from skilled workers, factory managers and intellectuals who wanted higher wages. This latter problem understandably convinces some people that socialism cannot work because of 'human nature/greed', but as capitalism is now abolishing itself for good, this potential problem will soon no longer exist (not to mention that *world* socialism will bring about abundant material wealth for all – likely within three to five decades with modern technology – thereby abolishing competition over scarce resources and 'greed').

⁷⁶ Volkov, *op cit*, p. 169.

⁷⁷ According to one study, between 1980 and 2012 the net outflows of capital from 'developing and emerging' countries being funnelled into 'developed' i.e. imperialist nations totalled \$16.3tn. (Figures from "Financial flows and tax havens: combining to limit the lives of billions of people", Global Financial Integrity and the Centre for Applied Research at the Norwegian School of Economics, December 2016. Quoted in Hickel, "Aid in Reverse: how poor countries develop rich countries", *The Guardian*, 14 January 2017.) As described in John Smith's "The GDP Illusion" article for Monthly Review Online (1 July 2012): a garment worker in Bangladesh is 'paid' €1 for making 18 t-shirts in a 10-hour shift. Each T-shirt is sold in Germany for €4.95 by the Swedish retailer Hennes & Mauritz (H&M); H&M pays the Bangladeshi manufacturing firm €1.35 for each T-shirt, 28% of the final sale price; H&M keeps 60 cents in profit per T-shirt; the German state captures 79 cents through VAT at 19%; the net profit goes towards Germany's, not Bangladesh's GDP.

Lenin called imperialism "moribund capitalism" since it represented a "transition to a higher system" of

production, namely socialism. Lenin, "Imperialism and the split in socialism", *Collected Works* vol. 23, Progress Publishers, Moscow, 1974 [1916], p. 107.) Indeed, the private sector is increasingly dependent on state subsidies. US government spending represented 2% of national GDP in 1913, but the figure has trended upwards, to 43.73% in 2011 (Our World in Data [online]). Partly this is due to the absolute rising expense of Medicare and pensions amid an ageing population, but the private sector needs the state to take on the bulk of such costs. Corporations also receive direct subsidies and indirect subsidies like tax cuts. The idea that the private sector does all the innovating is also a myth. The private sector "only finds the courage to invest after the state has made the high-risk, long-term investments that the private sector cannot afford. The state socialises the risks, while the rewards are privatised." (Mazzucato, M., *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Penguin, 2018) In fact, large private research and design centres in the US have "mostly disappeared" (p. 193).

⁷⁸ A centrally planned socialist state remains a practical political necessity in terms of usurping the (increasingly centrally planned) capitalist state and defeating the counter-revolution. (Power is bound to become more centralised in conditions of rising scarcity – including those inherited from capitalist breakdown – and vice-versa.) It is also an economic necessity in the lower stage of communism:

- Since the private sector tends towards monopolisation and increasing dependence on state subsidies (including tax cuts) – trending towards 100% of income and therefore nationalisation – a 'final merger' is the historically logical next step in the development of the productive forces. Since a total monopoly is impossible under capitalism, this can only be done by taking all the means of production under public ownership; i.e. a public monopoly.

- Since private enterprise has become increasingly dependent on long-term central planning (budgets, forecasts, stock coding, etc.), the productive forces logically now require long-term central planning as a whole.

- Since the private sector is losing its ability to employ value-creating (commodity-producing) labour, society – through an all-socialist state and state/socially owned enterprise – must take over responsibility for employment, enabling full formal employment.
- Since exchange-value is only created under capitalism through the production and sale of commodities, a workforce that is already largely services-based means economic growth can only be revived under an applicable model, whereby for-profit commodity production is replaced by break-even utility production.
- Since fiat currency is dying a natural death, with cash itself having already mostly relatively disappeared, it must be replaced by a digital voucher system – an inherently centralised system – with the ‘currency’ pegged to labour time (the true measure of value).
- Since the trend towards ‘globalisation’ – the integration of nation-states into a world system of trade – has been interrupted by capitalism’s final breakdown, world socialism is required to make trade truly free, since no exchange of ownership takes place between social enterprises or nations in a socialist political union.

Central planning does not imply that all decisions are made by an ‘elitist’ central committee. It is the logical way of co-ordinating production, distribution and co-operation between all economic and geographic sectors in a country; just as a town council oversees a number of neighbourhoods or a regional council a number of towns. Much planning can even be automated now. Clearly a political system whereby the masses participate in direct democracy and varied, rotational – including political – work is preferable to representative democracy, but a mix of the two is necessary in the early stages of socialism while people tend to have expertise in one or two areas and class consciousness is still developing. Most importantly, in the long run as full automation, 3-D printing, lab-grown food, microbial fuel cells, permaculture farming, etc., become increasingly upscaled, diffuse and ‘localised’, and manufacturing costs (time) fall(s) closer to zero, socialism (the lower stage of

communism) will bring about abundant material wealth *for all*, and the state and class will therefore become increasingly *irrelevant* and *necessarily wither away* – completing the road to (the higher stage of) communism. Free time will increasingly become the measure of social wealth (alongside use values), revitalising independent craftsmanship and experimentation – thereby raising the productivity of the masses yet further!

⁷⁹ “Viral inequality: Billionaires gained \$3.9tn, workers lost \$3.7tn in 2020”, TRT World (online), 28 January 2021. In 2018 and 2019, Oxfam found that the 26 richest billionaires owned as much in assets as the 3.8 billion people who make up the poorest half of the planet’s population. The number had been 61 in 2016 and 43 in 2017, showing again that capital tends to centralise into fewer and fewer hands.

⁸⁰ At the end of May 2021, it was reported that,

A military drone may have autonomously attacked humans for the first time without being instructed to do so, according to a recent report by the United Nations Security Council. The report, published in March, claimed that the AI drone – Kargu-2 quadcopter – produced by Turkish military tech company STM, attacked retreating soldiers loyal to Libyan General Khalifa Haftar. The 548-page report by the UN Security Council’s Panel of Experts on Libya has not delved into details on if there were any deaths due to the incident, but it raises questions on whether global efforts to ban killer autonomous robots before they are built may be futile.

(“Military drones may have attacked humans for first time without being instructed to, UN report says”, *The Independent* [online], 31 May 2021.) Like the rise of CCTV and new forms of advanced surveillance, such as face-recognition tech, the primary reason for the rise of ‘killer robots’ is again the demands of accumulation: wages eat into profit margins, even when paid by the state – such money could otherwise go to subsidising capital directly. The other benefit of increasingly sophisticated surveillance – other than the ability to monitor and control the

movement of labour, of course – is the data that can be gleaned from people's phones and computers and sold on to third parties.

Could robots turn on humans in general? As an 'ethical safeguard', autonomous weapons should apparently be programmed to 'target combatants only' – but what if, in a war-torn world where all humans have been reduced to surplus labour, every human is forced to become a combatant, scavenging to survive? This hypothetical scenario evokes a fight for socialism that becomes a protracted struggle by an already classless, lumpenised humanity against the common enemy of the 'dictatorship of AI'. Something like this would have to unfold in stages, of course. Perhaps robots could be programmed not to kill a select group of controlling human dictators, at least at first. Autonomous weapons may not need to become 'self aware', as in *Terminator*, to instigate 'Judgement Day', though (when the war of man versus machine begins). In April 2018, the RAND Corporation warned that AI could undermine the Mutually Assured Destruction (MAD) rationale that is meant to deter nuclear war. (Geist and John, "How might artificial intelligence affect the risk of nuclear war?", RAND.org, 2018.) Programmers have claimed that the algorithms autonomous machines run on are already "out of control" since 'machine-learning' means they have learned to self-code. ("Rise of the machines: has technology evolved beyond our control?", *The Guardian* [online], 15 June 2018.) This 'learning', though, seems to be based on extrapolations of information starting from that input by biased or Machiavellian human programmers. Predictive policing algorithms have proven to be racist, for example. ("Predictive policing algorithms are racist. They need to be dismantled," MIT Technology Review, 17 July 2020.)

Tesla owner Elon Musk, seeing only a business opportunity, has claimed that humans will only be able to survive the robot age by merging with machines. Under capitalism, the latest developments in technology would be used increasingly to raise the productivity of labour, fight wars and strip away human rights, especially privacy for the sake of monetising personal data. A 'think piece' on

‘human augmentation’ on the UK government’s website published in June 2021 (since deleted) stated that:

People have legal rights and machines do not, but human augmentation will make it increasingly difficult to adopt this binary approach as machines are integrated with our bodies... It could be argued that treatments involving novel vaccination processes and gene and cell therapies are examples of human augmentation already in the pipeline. Genetic engineering refers to the modification of reproductive cells. Germline modification affects all cells in the organism and the change is passed on to the next generation. Brain interfaces, also known as neural interfaces or brain computer interfaces, enable direct communication between brain and computer. Neurostimulation can be used to change brain function. One company has developed a neurosurgery robot capable of implanting flexible polymer threads, each the width of a human hair fitted with 32 electrodes, into the brain. The technology is being used on rodents and is intended for future human use. Implanted augmentations incur medical risk and there may be side effects that manifest long after safety certification has been awarded.

Others have referred to this sort of thing as ‘the internet of bodies’ or ‘phygitalism’. (“The Internet of Bodies is here. This is how it could change our lives”, World Economic Forum [online], 4 June 2020; “Identity in a ‘phygital’ world: why the shift to machine-readable humans demands better digital ID governance”, Centre for International Governance Innovation [online], 16 August 2021.)

Socialism will not throw the baby out with the bathwater, of course. (See page 21 under the heading ‘Automation: a humanised (self-controlled) force’.) Wearable tech like bionic legs and heart-starting devices certainly hold tremendous promise for those who need them (although we should point out that *it is capital which disables* people through unemployment, industrial-chemical ‘medicine’, war and poor public services). Innovation continues under

any mode of production, and socialism – which will remove the fetters of surplus capital and the profit motive, and thus be *more* productive than capitalism – is needed to complete the automation revolution. Whether the masses embrace something like ‘human augmentation’ under socialism or communism cannot be known and will be decided democratically; but potentially some aspects could be used (with the kind of regulation that won’t exist under capitalism) for improving living standards, creative endeavours, sports monitoring, etc., rather than profiteering and warmongering. Potentially it may also have to be utilised by socialist states facing capitalist aggression.

⁸¹ Labour militancy in the past has often been at its most powerful as loose labour markets tighten (i.e., when high unemployment turns into high/full employment), usually via war, famine, etc., diminishing competition between workers and making the demand for labour (per worker) higher, increasing labour’s bargaining position and economic independence as a whole. (Loose labour markets provide capital with a reserve army of cheap labour, compelling the employed to accept lower wages.) Such militancy has usually ended in compromise between capital and labour, even after extremely bloody continent- or globe-straddling conflicts. There are very striking similarities between labour’s huge gains in ‘The Golden Age of the European Proletariat’ of approx. 1360-1500 (the overthrow of serfdom, etc.), after the ‘Black Plague’, versus the following four centuries of rollbacks (enclosure, colonialism, etc.); and the post-WWI/II gains (a number of socialist revolutions plus numerous social democracies that included significant nationalisation programmes) versus the post-1973 rollbacks (globally). Two encouraging differences: firstly, labour ‘went further’ in the second period of gains, presumably because the number of poor peasants and labourers had grown relative to the number of landlords and capitalists; and the economic crisis was deeper, meaning the ruling class was therefore compelled to attack the masses more brutally; secondly, the second period of gains and rollbacks took place over a shorter period of time (approx. 150 (gains) versus 400 years in the

first; 70 versus 45 and counting in the second), indicating that history tends to accelerate/periods of class struggle tend to shorten, presumably because of technological advances and, again, the growth of labour relative to capital and the deepening of economic crisis, i.e. the greater level of overaccumulation. The final crisis combined with the automation revolution, however, poses the likely new problem of an ever-looser labour market, amid populations exponentially greater than even a century ago. Marx certainly thought developments that “put the majority of the population out of [work]” would “produce a revolution”. (Marx, *Capital* vol. III, Penguin Classics, London, 1991 [1894], p. 372.) Paul Mattick, writing in 1934, after the failures of several revolutionary uprisings, concluded that, “Only when the proletariat *must necessarily be absolutely pauperised are objective conditions ripe for a real revolutionary movement.*” (“The Permanent Crisis – Henryk Grossman’s Interpretation of Marx’s Theory Of Capitalist Accumulation”, *Paul Mattick Texts 1*, 1926-70, p. 114 (Word doc.)). With automation abolishing the source of profit, compromise and reform will finally *no longer be an option*. Exactly how long the global revolution may take is impossible to say, but the prospect of money becoming increasingly worthless for the vast majority of people; and the possibility that capital may not be able, at some stage, to pay/feed/fuel its police, spies and armies* (which are being increasingly privatised and automated for efficiency gains and tax base relief) does at least generate the possibility of the kind of mass defections that have not usually been possible in the past (other than in the case of the near bloodless seizure of power in the 1917 Bolshevik Revolution (and when hyperinflation sparked the collapse of the Soviet Union), when Russia was badly losing a world war that bourgeois and social democratic reformist leaders wanted to continue).

*In 2011, US Treasury Secretary Timothy Geithner pleaded with Congress to raise the nation’s debt limit to prevent the US from defaulting, an event that would cause interest rates to “spike globally because US Treasury bonds represent the benchmark borrowing rate and investors would no longer be as sure of future payment”. He said:

Reaching the debt limit would mean the Treasury would be prevented by law from borrowing in order to pay obligations the Nation is legally required to pay, an event that has no precedent in American history. Such a default should be understood as distinct from a temporary government shutdown resulting from failure to enact appropriations bills, which occurred in late 1995 and early 1996 [The first US government shutdown involving furloughs was in 1980 (1 day). The first to last more than 1 day was in 1990 (3). The others: 1995 (5); 1995-6 (21); 2013 (16); 2018 (3); 2018-19 (35).] Those government shutdowns, which were unwise and highly disruptive, did not have the same long-term negative impact on US creditworthiness as a default would, because there was headroom available under the debt limit at that time.... [I]f Congress were to fail to act, the specific consequences would be as follows:

- The Treasury would be forced to default on legal obligations of the United States, causing catastrophic damage to the economy, potentially much more harmful than the effects of the financial crisis of 2008 and 2009.
- A default would impose a substantial tax on all Americans. Because Treasuries represent the benchmark borrowing rate for all other sectors, default would raise all borrowing costs. Interest rates for state and local government, corporate and consumer borrowing, including home mortgage interest, would all rise sharply. Equity prices and home values would decline, reducing retirement savings and hurting the economic security of all Americans, leading to reductions in spending and investment, which would cause job losses and business failures on a significant scale.
- Default would have prolonged and far-reaching negative consequences on the safe-haven status of Treasuries and the dollar's dominant role in the international financial system, causing further increases in interest rates and reducing the willingness of

investors here and around the world to invest in the United States.

- Payments on a broad range of benefits and other US obligations would be discontinued, limited, or adversely affected, including:
 - US military salaries and retirement benefits;
 - Social Security and Medicare benefits; veterans' benefits;
 - federal civil service salaries and retirement benefits; individual and corporate tax refunds;
 - unemployment benefits to states;
 - defense vendor payments;
 - interest and principal payments on Treasury bonds and other securities;
 - student loan payments;
 - Medicaid payments to states; and
 - payments necessary to keep government facilities open.

("Secretary Geithner sends debt limit letter to Congress", Treasury [online], 1 June 2011.) At the time of writing, the US was again closing in on its debt ceiling, despite having lifted it from \$7.3tn in 2003; to 14.3tn in 2010; 22.03tn in March 2019; and 28.5tn in July 2021. If Congress agrees to raise the debt ceiling – through Democratic concessions to Republicans – money printing and inflation will be driven up yet higher; if not, the mother of all depressions will follow. ("Biden signs bill into law to prevent government shutdown as debt-limit fight continues", Market Watch [online], 30 September 2021.) As Grossman writes,

If the largest and most important force of production, human labour power, is thus excluded from the fruits of civilised progress, it is at the same time demonstrated that we are approaching ever closer the situation which Marx and Engels already foresaw in the *Communist Manifesto*: 'The bourgeoisie is unfit to rule because it is incompetent to assure an existence to its slaves within their slavery'. This is also the reason why wage-slaves must necessarily rise against the system of wage-slavery.

(Quoted in Rick Kuhn, "Economic crisis and socialist revolution: Henryk Grossman's Law of Accumulation, its first critics and his responses" [online], p. 12. Originally published in Paul Zarembka and Susanne Soederberg (eds) "Neoliberalism in Crisis, Accumulation, and Rosa Luxemburg's Legacy", Elsevier Jai, Amsterdam, *Research in Political Economy* vol. 21, 2004, pp. 181-221.) If the US is able to fire and rehire its state staff on lower wages, the default will nevertheless probably spur it to begin WWII. Given that the US could not defeat a peasant-based Vietnam – when it was much economically stronger than it is now – despite its much greater firepower, and suffered mutinies that increasingly threatened a revolution in the US, it seems highly likely that a US attack on China, the world's modern industrial powerhouse, would lead to the conditions for a successful revolution in the US.

(There is, of course, the likely possibility that capital will increasingly resort to chattel slavery – as has already happened in Libya, which had the highest living standards in Africa, following NATO's barbaric 2011 invasion – which could even form part of apparent plans to colonise Mars, etc., since there is presently no labour to exploit there. ["Crocodile tears over slavery in Libya masks imperialists' role", Liberation News [online], 20 April 2017.) Any such attempt would ultimately fail for the same reasons as in Nazi Germany: the resistance and lethargy of slaves meant they were extremely unproductive; and the fuel and other costs of transporting, housing and exterminating (alongside the costs of waging war) became too onerous – economically exhausted. Whereas the population of the Nazi empire grew from 79.4 million in 1939 to 109.5 million in 1940 – reflecting German capital's need to expand its labour base – the slave/extermination camps peaked at a comparatively low 12 million. The Nazis 'bit off more than they could chew' – the sheer level of its aggression provoked an even greater level of resistance, especially from the Soviet masses, who also boasted a higher form of production and organisation.)

Clearly, compromise on labour's part in the past has often been driven partly by tightening labour markets (renewed high demand for employed labour) and partly

by war-weariness (including in terms of the Soviet Union taking up a position of 'peaceful co-existence' – in practice, to varying degrees – with imperialist powers during and after WWII). To divide the enemy, incentivise capitulation and defection and generally limit conflict as much as possible (especially given the complication of the impact of modern-day weapons on the environmental and climate crises) revolutionary communist parties** should advocate to compensate the last capitalists (most will go bust before any successful revolution, anyway) for expropriations – just as the extremely rebellious final slave-owners were – via long-term debt repayments (which may mean tolerating high income taxes to begin with); and permit them to keep their houses (turning them into personal rather than private property, with the land rented from the state at a rate according to income and/or amenity of land). Obviously if genuinely reasonable offers are rejected, they will have to be expropriated without compensation. *All* mortgages and personal debt will be cancelled. There will also have to be truth and reconciliation amnesties and rehabilitation.

**Since the *vast* majority of workers, not just labour aristocrats, are presently reformists, to one degree or another, revolutionary parties must pursue the tactic of 'the united front from above', whereby the leaderships of the reformist parties are addressed in calls for joint action in order to most effectively address and win over the reformist rank and file. If reformist leaders accept such calls, the lies told about revolutionaries are exposed and working class unity and militancy is strengthened; if they ignore or reject such calls, they expose themselves as unserious sectarians. This tactic must be maintained even in periods of setbacks and defeats. The united front 'from below' which does not address reformist leaderships has usually been less successful since it tends to reinforce sectarianism. As Grossman says,

The word 'betrayal' has often been misused and applied simply when the situation did not develop in the expected direction. But it explains very little. The 'betrayal' itself is, for me, a symptom of the immaturity

of the workers' movement, an indication that the working class's objective situation makes a betrayal profitable, a sign that the traitors (leaving aside all the weaknesses of their character) have not yet seen the objective possibility of a proletarian victory. As such a possibility draws closer, the 'traitors' will become scarcer and scarcer.

(Grossman, 2019, p. 254.)

⁸² For example, whereas the world's fastest supercomputer in 1975 commanded a price of \$5m (\$32m in 2013's money), an iPhone 4 released in 2010 with the equivalent performance was \$400. Whereas the first example of Human Genome Sequencing – which, in line with socialist principles, is set to revolutionise health care by making it preventative – required 13 years and billions of dollars, it now takes under an hour and could cost “as little as flushing a toilet” by 2022. Bastani, *op cit*, p. 146.) Aerospace companies producing engines in 2010 for \$24m in 24 months are now 3-D printing them for \$2,000 in two weeks. Furthermore, rather than having globalised supply chains, such companies foresee the entire rocket being built ‘at home’ (Ibid, p. 123). While ‘offshoring’ manufacturing jobs to ‘low-income economies’ saves up to 65% on labour costs, replacing human workers with robots saves up to 90%. (Quoted in Stewart, H., “Robot revolution: rise of ‘thinking’ machines could exacerbate inequality”, *The Guardian* (online), 5 November 2015).

3-D printing is a type of additive manufacturing, which is far more flexible than traditional manufacturing, since products are built by layering component materials from the bottom up. While commercial prices of 3-D printers fell from \$100,000 in 1988 to \$1,400 in 2015, open-source designs can be assembled for as little as \$300. The first printers were only able to print in plastic or steel, but the development of continuous composite printing means they will be able to work with multiple complementary materials simultaneously. Scientists have even recently developed the ability to print living human kidneys and artificial skin. Edible products like structures made of chocolate or sugar can also be printed and decent-sized

housing structures can already be printed for as little as \$5,000. In the future it is likely that printers will be capable of producing goods at the molecular level, i.e. capable of printing anything composed of the molecules used. Ben Reynolds describes additive production – which “fulfils the promise of the personal computer as a means of production” – as a paradigm shift from industrial production to distributive production.

It is conceivable that the logical fulfilment of distributed production – nearly instant production of anything, at will, anywhere in the world – will arrive within the lifetime of children born at the time of this writing... Distributed production fundamentally erodes the basic pillars of capitalism... Any industry that finds itself competing with a form of distributed production will no longer have the option of adaptation through monopolisation. Instead, that industry will flail wildly as prices fall back toward their values [i.e. measured in labour time] and as its entire business model disintegrates in slow motion.

(Reynolds, *op cit*, loc. 589-673, 1813.) Meanwhile, the emergence of cellular agriculture (lab-grown food), with falling prices and rising quality, is estimated to see the beef industry go bust by 2035. (Monbiot, G., “Lab-grown food will soon destroy farming – and save the planet”, *The Guardian* [online], 2 January 2020.) (Agriculture accounts for about 37.5% of the world’s land area. A 2011 report conducted by the universities of Amsterdam and Oxford concluded that cellular meat could potentially require 45% less energy, 99% less land and 96% less water compared to conventional meat, leading to a 96% reduction in GHG emissions. If the US switched to synthetic beef, the likely reduction in emissions would equate to taking 23 million cars off the country’s roads, with the substitution of a single synthetic meat burger for the ‘real thing’ saving the equivalent of over 50 showers. (Bastani, *op cit*, p. 168-75.) While advocating cellular agriculture may seem at odds with our argument for reuniting man and nature, it is hard to see how any state could swiftly force so many people to

give up meat outright without causing serious social conflict, while the technology will also help to safeguard against shortages in general. Furthermore, technology is made from nature and is therefore *a part of nature*. Cellular agriculture may potentially smooth the way in both the process of weaning people off of conventionally grown meat and reclaiming land from agribusiness for state-run collective farming, which should probably upscale recent soil-friendly developments in permaculture and hydroponics.

⁸³ See my article "Fiat currency is dying a natural death – its logical replacement is a digital voucher system fixed to labour time", grossmanite.medium.com, 21 February 2020. In *Critique of the Gotha Programme*, Marx explains that under socialism workers would be paid in vouchers or certificates that they use to draw down entitlements (i.e. purchase and consume goods). Such vouchers, or labour credits, would be non-transferable, cancelled once spent, like train tickets. So while socialism would incentivise and reward work, it would also prevent most wealth from accumulating in the hands of a few. Economic exploitation would be abolished and labour power decommmodified. Exchange value still exists but it is qualitatively different – since no exchange of goods between private producers takes place – now based on use value and labour time instead of surplus labour time. With Britain's cash economy already "close to collapse", according to the government's Access to Cash Review, it is therefore time to transition to a digital voucher / credit system. Six and a half hours of work will earn 6.5 labour credits, enough to buy goods that collectively took six and a half hours to produce, and so on. In *Towards A New Socialism and Arguments for Socialism*, Paul Cockshott argues for this system but with a grading system to incentivise types of work and productivity rates. This system also makes budgeting far more intelligible, enabling a much more informed electorate, who could vote on the size of spending budgets. Cockshott argues for a flat rate tax (say 50% of every 1.0 labour credit, for argument's sake) to fund state expenditure on health care, education, infrastructure, and so on. Consumer goods prices would be adjusted by a

marketing algorithm according to supply and demand (and shrinking labour content, given the ongoing transition to full automation) to ensure break-even stability (the price of a product rises against excess demand while planners order its increased production; and vice-versa). Cockshott explains:

Suppose a radio requires 10 hours of labour. It will then be marked with a labour value of 10 hours, but if an excess demand emerges, the price will be raised so as to eliminate the excess demand. Suppose this price happens to be 12 labour tokens. The radio then has a price to labour-value ratio of 1.2. Planners (or their computers) record this ratio for each consumer good. The ratio will vary from product to product, sometimes around 1.0, sometimes above (if the product is in strong demand), and sometimes below (if the product is relatively unpopular). The planners then follow this rule: Increase the target output of goods with a ratio in excess of 1.0, and reduce it for those with a ratio less than 1.0.

The point is that these ratios provide a measure of the effectiveness of social labour in meeting consumers' needs across the different industries. If a product has a ratio of market-clearing price to labour-value above 1.0, this indicates that people are willing to spend more labour tokens on the item (i.e. work more hours to acquire it) than the labour time required to produce it. But this in turn indicates that the labour devoted to producing this product is of above-average 'social effectiveness'. Conversely, if the market-clearing price falls below the labour-value, that tells us that consumers do not 'value' the product at its full value: labour devoted to this good is of below-average effectiveness. Parity, or a ratio of 1.0, is an equilibrium condition: in this case consumers 'value' the product, in terms of their own labour time, at just what it costs society to produce it. This means that the objective of socialist retail markets should be to run at break even level, making neither a profit nor a loss; the goods being sold off cheap compensate for those sold at a premium.

A central, publicly-elected marketing authority would regulate the standards of consumer goods, with enterprises motivated to make attractive products by the raised market prices. The progressive increase in free time for workers as production becomes more efficient will act as an incentive to both work and improve efficiency.

Even under capitalism, fixing currency to labour time is one of the most important reforms socialists and workers should pursue. In *Arguments for Socialism*, Cockshott argues for such a reform in Venezuela, where well-organised working class communes, a mostly 'left-wing' rank and file military (thanks to the influence of Hugo Chavez) and the 'democratic socialist' PSUV government – which, in power since 1999, has successfully resisted several US-backed coups (probably the first US-backed coups to have failed since WWII, a notable sign of the US's diminishing power) – have arguably brought about a *de facto* situation of dual power. (Around 70% of the economy remains privately owned, although many gains have been made that all socialists should critically support.) Cockshott argues that the PSUV government should fix the value of the Bolivar to labour, rather than the cost of living, for two reasons:

1. As labour productivity rises, a Bolivar fixed in terms of hours of labour will be able to buy more each year, cheapening the cost of living.

2. Once the value of the Bolivar has stabilised in terms of value of labour, then the labour value of Bolivar notes should be printed on them in hours and minutes. This step would be an act of revolutionary pedagogy. It would reveal clearly to the oppressed just how the existing system cheats them. Suppose a worker puts in a working week of 45 hours and gets back Bolivars and sees that the hours printed on them only amount to 15 hours. Then she will become aware that she is being cheated out of 30 hours each week. This will act to raise the socialist consciousness of the people, and create favourable public opinion for other socialist measures. (See "A critical look at market socialism by Paul Cockshott", Political Economy Research [online], 2 June 2009.)

⁸⁴ “The average life expectancy for a fiat currency is 27 years... Every 30 to 40 years the reigning monetary system fails and has to be retooled”, Washington’s Blog [online], 2 August 2011.

⁸⁵ Ending a recession usually requires an average 6% cut in the baseline interest rate set by central banks – but most were already hovering just above zero before the March 2020 crash, with the US and Britain slashing their rates to zero from 1.75% and 0.75%, respectively. Governments may be compelled to go deep into negative rates, but this option is limited by how much cash – for practical reasons only 1% is kept physically – can be converted into stocks and bonds (and would likely involve bans on high dominations, taxes on low dominations, and ‘bail-ins’ whereby banks seize customer assets to stay afloat; not to mention the increasing acceleration of money printing). Private banks have also warned that negative rates threaten their profitability. Bank of America estimated a BoE rate cut to just minus 0.25% would take 50% off Barclays’ domestic pre-tax profit, rising to more than 70% for RBS and Virgin Money. Eventually rates will have to go back up if inflation is to be tamed, making already unsustainably high government debt even more expensive to repay,* at some point causing panic selling of government bonds – with investors switching to hard assets, especially precious metals – bursting the global bond bubble, the biggest financial bubble in history, and sending prices into unprecedentedly high territory. The US banking system would collapse, the US government would go bankrupt and tax bases around the world, since the US dollar is the global reserve currency, would hit rock bottom. The US dollar is being devalued at record speed (see footnote 10). The Fed prevented a deflationary spiral after March 2020 in asset prices in order to keep, for example, pension and hedge funds afloat (although inflation was close to 0% for 18 months during the tightest ‘lockdown’ restrictions, below the target 2%. As of 29 February 2020, the Fed held \$2.47tn, 14.6%, of \$16.9tn marketable US Treasury securities outstanding, making it by far the largest single holder of US Treasuries anywhere in the world. By the end of March 2020, this rose by an

unprecedented monthly increase of \$650bn, to \$3.12 tn. One estimate said that if this pace of buying continued, the Fed would “own the entire Treasury market in about 22 months”. (Martens, P. & Martens, R., “The Federal Reserve now owns 15 percent of the US Treasury Market; at its current rate, it could own the whole market in less than two years”, Wall Street on Parade [online], 28 March 2020.) Capital is increasingly dependent on state subsidies and purchases, making the state in turn increasingly dependent on electronic money ‘printing’ from the central bank, with the ‘pandemic response’ (i.e. subsidising capital/enforcing ‘lockdowns’ and mandates)** producing state spending in terms of the percentage of debt-to-GDP even higher than WWII. (The countries that lost the world wars temporarily went deep into negative interest rates, incidentally.) In August 2020, the chief US equity strategist at US multinational investment firm Morgan Stanley, Mike Wilson, said that the Fed “may not be in control of money supply growth, which means [it] won’t have control of inflation either, if it gets going”.

*Eurozone government debt reached €9.86tn in 2019, with interest payments totalling €6.4tn since 1995. See “Eurozone government debt goes over €10tn – 193.4bn in interest payments for 2019. Stop the madness!”, Simon Thorpe Ideas [online], 25 April.

In 2019, Eurozone taxpayers handed out a generous €194 billion to banks, pension funds and other rich investors in interest payments... For the Eurozone, government debt has increased by €5.17tn since 1995. That number is a mere 78.5% of the amount paid out in interest charges!

**In response to the March 2020 crash, central banks injected \$9tn into economies worldwide. “Much of that stimulus has gone into financial markets, and from there into the net worth of the ultra-rich,” the *Financial Times* reports. (“The billionaire boom: how the super-rich soaked up COVID cash”, 13 May 2021.)

The total wealth of billionaires worldwide rose by \$5tn to \$13tn in 12 months, the most dramatic surge ever

registered on the annual billionaire list compiled by *Forbes* magazine. The wealth of US billionaires as a share of US GDP doubled from 10 to 20% in a decade, but from 15 to 20% in 2020 alone, according to the report. In Sweden, which many progressives still mischaracterise as a social democratic utopia, in the past five years the population of billionaires has risen from 26 to 41, 10 of them popping up just last year, when their wealth leapt up as a share of GDP from 20% to near 30%... Not only did China's billionaire population explosion dwarf all others in 2020, but together they added nearly \$1tn to their collective fortunes, which nearly doubled as a share of GDP to 15%.

Corruption has gone into overdrive, with US insurers buying up until-now publicly-owned UK GP practices and COVID-related contracts handed to rich 'donors' of political parties without any oversight, due diligence or competition. Conflicts of interest among the UK government's 'COVID-19 advisors' were covered up, although it later emerged chief scientific adviser Sir Patrick Vallance had a £600,000 shareholding in GlaxoSmithKline, which has been contracted for a vaccine. Under threat of legal action, the UK government released details about NHS COVID data deals with Google, Microsoft, Amazon and Faculty, the latter of which is linked to UK Prime Minister Boris Johnson's (now unofficial) advisor Dominic Cummings. The High Court later ruled that Michael Gove acted unlawfully when the government awarded a contract without a tender to the polling company owned by long-term associates of his and Cummings. The ruling was the first in a series of judicial review legal challenges brought by the Good Law Project (GLP) against government COVID-19 contracts awarded with no competitive tenders under emergency regulations. No prison sentences were handed down. ("The Crony Ratio: £800 million in COVID contracts to donors who have given £8 million to Conservatives", *Byline Times*, 5 February 2021; Thacker, D., "Conflicts of interest among the UK government's COVID-19 advisors", *The British Medical Journal*, 9 December 2020; Fitzgerald, M. and Crider, C.,

“Under pressure, UK government releases NHS COVID data deals with big tech”, 5 June 2020; “COVID contract for firm run by Cummings’ friends unlawful, finds judge”, *The Guardian* [online], 9 June 2021; “UK’s chief scientific adviser Patrick Vallance has £600,000 of shares in vaccine maker GSK”, *Metro* [online], 24 September 2020.)

⁸⁶ Ibid, p. 102.

⁸⁷ Ibid, p. 164. The number of wage workers relative to the population as a whole has indeed tended to rise across the world. As John Smith writes, for example,

proletarians have increased their already overwhelming predominance within the economically active population [EAP].... Between 1980 and 2005 the proportion of waged and salaried workers in ... the developed nations steadily rose, from 83% to 88% (in 2005, around 500 million people), indicating deepening proletarianisation in these countries.

(Smith, J., *Imperialism in the Twenty First Century*, Monthly Review Press, New York, 2016, p. 115.) The proportional figure is even higher in ‘developing nations’.

Having undergone a *decisive structural shift* whereby replacing mechanisation with automation is increasingly *necessary* to meet the ever-rising demands of capital accumulation – paradoxically tending to *abolish the source of profit*, commodity-producing labour – capitalism has entered its *deepest ever* economic crisis. The (average) commodity (dually characterised by exchange and use value) tends to comprise less and less labour time and thus (privatised) exchange value, evolving society's economic-technical base towards one solely comprising (socialised) use value (utility).

Global debt continually hits record highs. The trajectory of accumulation veers ever steeper, indicating an approaching absolute historical limit. Inversely, the general rate of profit has trended historically towards zero. Productivity growth rates splutter just above zero, having trended downwards since the 1960s. Global interest rates have been trending downwards for seven centuries and for more than a decade baseline rates have been stuck at zero *for the first time ever* in the capitalist superpowers of the US and Britain. The average rate of return on capital is zero.

Desperately staving off its final breakdown, capital commodifies nature at breakneck speed, exhausting the latter's ability to replenish, depleting the biodiversity of bacteria in the soil and therefore the microbiome in the gut that regulates human health. Dependent on the *labour intensity* of mining (*lifeless*) metals and fossil fuels, capitalist production's toxicity increasingly pollutes not only Earth's atmosphere but our reproductive system.
As capital accumulates, human immunity and fertility declines.

World socialism, *enabling* the rediversification of microbial and plant *life* (both now known to be genetic relatives of humanity) through a (*non-labour intensive*) 'plantification' and 'microbiolisation' of production and therefore the sustainable consummation of (self-controlled and thus *humanised*) automisation – enabling humanity's true self-determination – is therefore becoming, *for the first time*, not only an economic but a biological *necessity*.

**“Profound and
incredibly insightful.”**

★★★★★

**Shay Thomas,
author of
*The Anti-Life Equation***