*Truth emerges more readily from error than from confusion*

Francis Bacon

**Physical Economics**

The Value of Human Activity.

**Aim: To establish the link between financial currency and energy usage as the most reliable and consistent measure of Wealth and Progress.**

**The human brain is the most complex object in the known universe.**

**This could turn out to be wrong but it is so according to the current state of knowledge**.

The human brain is reckoned to be the most complex object in the known universe. The hairless, naked, unarmed, slow and weak species of primate probably survived its genesis only because of its intelligence, which may have come about merely as an accident of nature, merely the result of peculiar and excessive genetic mutations.

It may also be incorrect. There may be objects on faraway worlds far, far more complex than the human brain. But according to the current state of knowledge by our species on this planet, the human brain is the most complex object in the known universe.

Whether this is by design or simply a freak of nature, the functions of the human brain offer us a definition of human beings as distinct from other known animals on planet Earth. Whether by design or by accident this definition of human beings, through incorporation of the laws of thermodynamics, provides us with a comprehensive philosophical view of our existence and potential.

1.

**A definition of human beings incorporating the**

**laws of thermodynamics. Entropy. Prometheus.**

Human beings are the species of animal that, through technology produced by the interaction of its intelligence and its environment, increases the quantity of energy and mass that it converts from one form to another. Economic activity results from this.

It may be as Jing Chen (2005; 2008) theorises, that the purpose of this is to reduce entropy and that the human mind has evolved for this very purpose. It may be that myths like that of Prometheus contained a primitive insight into this phenomenon. It may be that this definition is incorrect and insignificant. It may be that this definition is correct but insignificant in the grand scheme of all things.

The claim of Physical Economics is that, in accordance with the current state of knowledge it is plausible and it is the best theory available. Furthermore, the definition of human beings according to Physical Economics is also the definition of Progress and of Wealth, denoting that humanity is destined to progress.

**A Definition of Progress according to Physical Economics. A Definition of Wealth according to Physical Economics. The law of conservation of energy. Other definitions of Progress. The limits of human progress and the total energy in the universe.**

According to the law of conservation of energy: energy cannot be created, only transformed or transferred from one form to another. According to Physical Economics: Progress is the increase in the amount of energy humanity converts from one form into another.

There are other valid definitions of Progress. Amongst others, Stephen Pinker (2017) has described several methods of measuring progress, all of which are reasonable, credible and valid. These include a reduction in war deaths per capita, the overall trend of democratisation, the decline in homicides over the world, life expectancy, reduction in extreme poverty, environmental improvement, economic growth, protection of the planet from exploitation, the amount of carbon released into the atmosphere per dollar of GDP and of course rises in GDP itself.

The claim here is that the definition of Progress offered by Physical Economics is the most consistent and reliable measure of all. Physical Economics is not a prescriptive ideology. The limits of progress are merely considered and the possibilities acknowledged.

Nonetheless, there is a valid question: whether, at the dawn of the space age, as humanity continues to increase the amount of energy it converts into different forms through technology conceived by the most complex object in the universe, if it is indeed too fanciful to ask what the limit to the amount of energy that passes through human technology will be.

Nikolai Kardashev’s Scale, as described by A.S. Deller (2018) provides some perspective.

The Kardashev Scale

In 1964, Russian astrophysicist Nikolai Kardashev, who had been searching for evidence of potential intelligence in cosmic signals, devised a scale by which we might measure the levels of technological advancement such civilizations might display. This came to be known as, rightly, the Kardashev Scale, and it breaks technological civilizations down into 3 main groups, based on how much energy the society has access to use:

Type I (¹⁰¹⁶W), Type II (¹⁰²⁶W), and Type III (¹⁰³⁶W).

Since 1964, some astronomers have added Type IV (¹⁰⁴⁶W) and Type V (basically infinite energy access).

It is important to understand where the scale officially begins, with Type I: The amount of energy available to this civilization equates to all of the radiant energy that can be harnessed from its nearest star. In our current state on Earth, where we utilize fossil fuels and have barely scratched the surface when it comes to the possibilities of solar, geothermal, nuclear and other sources, we are still what might be called a “Type 0” civilization. It could take a couple of centuries for us to get close to being a Type I.

A Type II civilization can harness ALL of the energy available from a star, not just radiant energy. A civilization at this level might encompass a sun with a Dyson sphere to collect every bit of heat and light it outputs, and might also have a mastery of fusion and be able to create a power source that is nearly star-level on its own.

Type III, being able to control energies of stars, would be so advanced that they would likely be in the process of galactic colonization, and given enough time (read: millions of years, perhaps longer) eventually be able to harness the energy of their entire galaxy.

Types IV and V were considered too fanciful by Kardashev himself, taking the harnessing of energy to the universal and then all-potential-universes levels.

If going from Type 0 to Type I takes a civilization roughly 500 years (starting with the beginnings of our industrial use of fossil fuels), then the growth from Type I to Type II might take another 1000 years, and from Type II to Type III, another several thousand years would be expected before any appreciable amount of galactic colonization might be occurring.

Kardashev may have considered humanity harnessing the energy of the entire universe and all potential universes through its technology to be fanciful. Yet he must have considered it. Max Tegmark (2014) writes that, by

measuring the geometry of universe-sized triangles, Einstein’s theory has let us infer the total amount of mass in our Universe. Remarkably, the atoms that were thought to be the building blocks of everything were found to make up only 4% of this mass, leaving 96% unexplained”. Furthermore, as “far as we currently know, our Universe contains about 1011 **galaxies, 1012 stars**, 1080 protons and 1089 photons (particles of light).

For some, there is a powerful need to believe in meaning in the universe and that there will be a teleological occurrence to satisfy this. Others have no need to believe that humanity has a destiny. Physical Economics does not argue that humanity will one day conquer the universe and harness the entirety of its energy. Nor does it deny the possibility of destiny. However, to prevent humanity from harnessing the total energy of the universe and then all potential universes, the trajectory of our energy usage will need to encounter insurmountable barriers.

**A worldview. Material dialectics was the core of left wing logic. Dialectics. The Culture War. A definition of Wealth coincident with Progress. Physical Constants. GDP. E=mc2 and the space-time continuum as dialectics.**

Whatever one’s feeling about the limits of human potential, Physical Economics can be placed within the core of a philosophical worldview. In this era of incoherent political discourse, Physical Economics offers a rational, science based framework for understanding the world.

The dichotomy of the past century and a half of left-wing versus right-wing politics has broken down. Pure market economics do not form the basis of any nation’s political system. Capitalist states constantly involve themselves in market activity, not least during the 2008 credit crisis when the US government provided hundreds of billions of dollars to rescue prominent financial firms. Moreover, despite the wealth gap and poverty in the world’s most successful capitalist country, which creates resentment and crime, much of the world’s working class obtains a living standard unimagined by the middle class just decades years ago, as the established definitions of social classes no longer reflect reality.

On the left, the term dialectical materialism has evaporated from socialist discourse. This is of immense significance because dialectical materialism formed the core of socialist rationale. Karl Marx’s greatest achievement was his theory of dialectical materialism, which inserted a rational core into socialism. Prior to Marx, socialists like Saint Simone and Robert Owen were in essence religious; 'utopian socialists' as Marx called them, as opposed to his own ‘scientific socialism’. Simone’s ‘New Christianity’ and Owen’s spiritualism need not be derided. But they should be acknowledged as non-scientific motivations for their socialism. What we have witnessed in recent decades is the hollowing out of socialist logic as dialectical materialism has more or less entirely vanished from socialist discourse.

The result is The Culture War; with an incoherent, dogmatic and quasi-religious left claiming the moral high ground by campaigning to raise the status of the world's victims, blaming all injustice on capitalism and arguing only on moral/ethical issues with no rational cohesion. While those on what is termed the ‘right’ default to traditional religions and national identities, which, though providing a spiritual raison d’être capable of warding off the psychological and existential crisis that the left’s incoherent outrage fails to contend with, also lacks a scientific core.

**The Definition of Wealth**

Physical Economics provides a scientific method by which a nation’s or a state’s wealth can be measured according to the following definition of wealth: Wealth is equal to the amount of energy that can be transformed from one form into another. This is also the most significant measure of Progress.

Energy cannot be created or destroyed, only transformed from one form to another. This is what we do: from the most basic biological functions to our most advanced technology, we transform energy and matter from one form into another. Moreover, there is a finite amount of energy in the universe, all of which was created at the time of the Big Bang. Thus there is a consistent standard against which to measure an economy.

Determining the value of an economy primarily on the amount of energy transformed from one form into another within that economy is a major undertaking. However, it will provide a definition that is clear and constant for economists to measure and it will be more accurate than all other measurements. It will require physicists and economists working together for a substantial period of time. The first step is the aim of Physical Economics: ‘To establish the link between financial currency and energy usage as the most reliable and consistent measure of Wealth and Progress’. Ultimately it will contribute to the unification of science, economics and philosophy.

Imagine a single human living alone on planet Earth. He owns nothing, no property, no wealth, no technology, no energy and no matter beyond his own body. He becomes hungry and catches a fish with his bare hands. He now owns a stock of energy and matter that will keep him alive; in other words, he has some wealth. The wealth he owns can be measured in relation to the entire wealth of the universe, the total mass and energy in existence. This could be refined to the amount of energy that his metabolism can release for the purpose of living but essentially the energy of the fish relative to the energy of the universe is his wealth.

Now imagine that he is not alone but belongs to a simple, primitive, village society. He has become good at catching fish with his bare hands and he takes some fish to the village to trade for other goods. The process of negotiation will not necessarily yield an exchange of equal energy or wealth to the fish. The invention of money provides some measurement towards equality but trade is of course always imprecise and dependent on innumerable variables, not only market demand but psychological values of art and prestige. However, the essence of the trade is the exchange of different forms of equal energy.

In that village they develop skills and technology. They catch dozens of fish a day because of improved fishing technology. They are a more advanced society than the man alone. Through their technology they are able to own more wealth, to convert more energy and matter from one form into another than the simplest human society, the lone human being.

Each individual owns a portion of the wealth of the village. That may be an equal portion if it’s some egalitarian society, or it may be whatever they’ve managed to obtain through their own efforts such as fish catching and through trading with other members of the village society. So, we have two measures: the measure of the entire village’s wealth and the measure of each individual’s wealth. Each individual’s wealth can be measured in relation to two things: the wealth of the whole village society and the entire wealth, or energy, of the universe.

In the village, the chief will probably own more than others. There might be slaves and some kind of class system. Whatever the society’s structure, there is of course more to trade than simply exchanging products of equal energy. The exact reason behind the human desire for art and objects of beauty can only be surmised. But we know that adornments matter. Modern and ancient buildings attract people to cities and they bring with them wealth. On an individual level this might also be the motivation for wearing jewellery and expensive clothes. Buying expensive clothes and adornments can be said to have a social value in that how we present ourselves to society may well result in improved opportunities for obtaining wealth through social interaction. There is also a kind of religious impulse attached to objects, which raises their wealth far beyond their practical value of how much energy can be extracted from them. So, these kinds of objects can be seen as anomalous to the theory of Physical Economics in one sense.

The Great Barrier Reef is that kind of anomaly. It has no practical value like a coalfield or oil reservoir. But it attracts tourists to Australia bringing wealth and it forms part of the Australian national identity. So, in another sense the Great Barrier Reef, like an expensive piece of jewellery or an art collection or even owning a football club, falls intrinsically within the theory of Physical Economics if it is viewed as a way of obtaining wealth, however indirectly.

Toby Green writes in detail about the shift in the meaning of credit from its moral meaning, which was closely associated with religious value until the sixteenth century, towards the expansion of credit and market institutions in West Africa and the economic revolution following the slave trade which saw the meaning of credit become ostensibly economic: “It thus moved from being a moral concept to one associated with material value; and this was how material value itself became a moral instrument” (2019: 271).

All forms of currency have relied on belief of some sort and have been fixed to that belief: whether, as Green continues, those different kinds of credit include shells, cloths, iron and copper bars, rum, enslaved persons, gold and silver, which express different kinds of values: “Currencies are tokens of value, and this is why they can hold different types of meaning – economic, religious and practical” (471); or whether, as with the attempt to unify the meaning of credit by linking the value of money with the gold standard; or, when the gold standard was no longer practical and fiat currencies were adopted in the last century and governments backed the value of money in ‘full faith and credit’ according to the US government (Chen, 2021). Like all currencies, fiat currencies have their advantages and disadvantages as Chen (2021) discusses. Below, under the heading ‘Physical Constants’, a more reliable measure of currency than belief will be defined according to Physical Economics.

Green is right that currencies hold different types of meaning but even these generally reduce to the universal value of energy exchange. Even the spiritual value of sacred objects or land generally reduce, in the same way as works of art, to a value of energy exchange. They hold influence over people’s actions and, while the energy of this influence is only calculable as part of the long-term energy usage of an economy, and will be allied to many changeable factors and subject to the temporal value systems of a group of humans at a particular time in history, it is the energy of influence over people that imbues them with holiness. To put it another way, it is the energy a religious symbol can motivate group members to expend, either in a particular cause such as a war or in the course of a lifetime, that give it its real value, or Wealth. The ruler of an ancient but extinct tribe’s crown or throne may once have held the power to cause men to fight and die for it. Now it will only hold an antique value and the value of its raw materials. Although its market value may yet hold the power to cause men to kill for it, the sacred value to bind together and influence the actions of the tribal members is no more.

The shift in the meaning of credit from a moral meaning towards an economic meaning may seem a loss of something intrinsically, even spiritually valuable in itself. But it must be noted that the moral meaning was, in Europe, ascribed by the Church to maintain the status quo. The same status quo that so feared the physics of Galileo because of the Progress it would unleash and the ensuing loss of status.

For centuries, the elites of the world preferred to maintain their exalted position than to increase the Wealth of their societies. Rather than lose their position at the top, they prevented Progress. Ezra Klein (2020:54) describes psychological experiments where groups prefer to give themselves less as long as the gap between them and a rival group widens: “Far from their behavior showing a pure desire to maximize their group’s gains, they often gave their group less to increase the difference between them and the out-group.” However, once the economic revolution described by Green began new groups, new classes formed and trade money began to challenge aristocratic.

The importance of status can hardly be overstated. Green (2019:103) comments that the main motivation for thousands of Africans to risk their lives in the attempt to migrate to Europe is not financial but status driven: “It is rare that someone will starve in a Senegambian village, but those who have no means are the ones to make the tea for their elders, wash the dust outside the house and do everything that their elder (and richer) peers demand. This is precisely why so many young people from West Africa are prepared to risk their lives crossing the Sahara in an attempt to reach Europe, since for them the social consequences and dishonour of remaining behind in perpetual insubordination are unbearable.” In *The Status* Game Will Storr writes that: “Status is the original form of currency, and the one that matters most” (2021:26). The significance of status is returned to briefly in Section 5 and requires many more studies like Storr’s in the coming decade to improve our understanding.

Measuring the precise value of an art collection or a piece of jewellery relative to the entire mass of the universe cannot be exact due to the complexities of the psychology of social status amongst innumerable other variables. Nonetheless, Physical Economics will provide the clearest measure of wealth when the exchange value of such adornments is considered similarly to the energy value of a fish.

From a simple, primitive society to the economies in the world today, technology is the main driver of historical progress. Technologies, from fishing equipment to the most advanced energy harnessing constructions, all work towards the same end: the transformation of ever more energy and matter from one form to another.

The greatest distinction between a primitive society and a modern is the amount of energy that is transformed. The greatest distinction between contemporary economies and future economies will be the amount of energy transformed. There are of course countless other distinctions but this is the clearest and most consistent measure. This is the claim made by Physical Economics.

There are two measurement methods of the GDP of an economy as described by Thangavelu (2019): The first is the “total consumer spending on goods and services, investments made by businesses, government spending and net exports”; the second is the total national income, including: wages, rent interest returns and profits. The income approach, for the American economy adds: taxes, depreciation, and the net of foreign payments made to Americans versus U.S. payments made to foreigners”; other national economies will do likewise. These two methods of calculating the GDP of an economy provide “a measure of the monetary value of the goods and services it produces in a specific year”. However, they do not provide a definition of money itself so the measurement is relative only to the monetary value of goods and services in other economies. Physical Economics leads to a conceptual shift in defining what money is.

A superior method to estimate the GDP of a nation at any stage in history would require the entire sum of energy usage of the economy to be calculated, rather than the current methods described by Thangavelu. This measure explains how and why Europe eclipsed China and India, whose combined GDPs constituted 70% of the entire world’s GDP until the 19th Century (En.wikipedia.org, 2019). A study by J.P. Morgan in 2012 (Nye) charts the relative GDPs of China, India, Japan, Russia, Italy, Spain, the UK, France and the USA. Population, economic output, the enormous impact of the Industrial Revolution and the relationship between various nations are amongst the topics discussed. China and India’s proportion of the world’s GDP, from around 30% and 40% respectively at the time of Jesus’ birth to less than 10% each in the mid-20th Century are graphically demonstrated along with China’s recent increased proportion and the USA’s huge share. The methodology is not stated in this article and although the claim of Physical Economics, if put into practice, would not necessarily find a discrepancy with J.P. Morgan’s analysis and could likewise only reveal estimates of relative GDPs, it would be a superior method.

**Physical Constants**

Physical Economics provides a definition of Wealth, of Money and of Progress in similar fashion to definitions of distance and weight. In 1960 the [metre](https://en.wikipedia.org/wiki/Metre) was redefined in terms of the [wavelength](https://en.wikipedia.org/wiki/Wavelength) of [light](https://en.wikipedia.org/wiki/Light) from a specified source, making it derivable from nature. In 2018 the [kilogram](https://en.wikipedia.org/wiki/Kilogram) was also redefined making its official weight wholly derivable from nature.

The metre was historically defined by the [French Academy of Sciences](https://www.britannica.com/topic/Academy-of-Sciences-French-organization) in 1791 as 1/10,000,000 of the quadrant of the [Earth’s](https://www.britannica.com/place/Earth) circumference running from the [North Pole](https://www.britannica.com/place/North-Pole) through Paris to the equator. The [International Bureau of Weights and Measures](https://www.britannica.com/topic/International-Bureau-of-Weights-and-Measures) in 1889 established the international [prototype](https://www.merriam-webster.com/dictionary/prototype) metre as the distance between two lines on a standard bar of 90 percent [platinum](https://www.britannica.com/science/platinum) and 10 percent [iridium](https://www.britannica.com/science/iridium). By 1960 advances in the techniques of measuring light waves had made it possible to establish an accurate and easily reproducible standard independent of any physical [artifact](https://www.merriam-webster.com/dictionary/artifact). In 1960 the metre was thus defined in the [SI](https://www.britannica.com/science/International-System-of-Units) system as equal to 1,650,763.73 wavelengths of the orange-red line in the spectrum of the krypton-86 [atom](https://www.britannica.com/science/atom) in a [vacuum](https://www.britannica.com/science/vacuum-physics).

By the 1980s, advances in laser measurement techniques had yielded values for the [speed of light](https://www.britannica.com/science/speed-of-light) in a vacuum of an unprecedented accuracy, and it was decided in 1983 by the General Conference on Weights and Measures that the accepted value for this constant would be exactly 299,792,458 metres per second. The metre is now thus defined as the distance traveled by light in a vacuum in 1/299,792,458 of a second (metre | measurement, n.d.).

The kilometre also has its historical definition. In the basement of the Bureau International des Poids et Measures, Paris, is a small, platinum and iridium cylinder weighing exactly one kilogram. It was crafted in 1889 and ever since has served as the standard by which all other kilograms are measured. It is known as ‘le grand K’.

In 2018 this measurement system was replaced. John Pratt, chief of [quantum measurement](https://www.nist.gov/laboratories/projects-programs/search?combine=&term_node_tid_depth=All&term_node_tid_depth_1=5941) at the National Institute of Standards and Technology, which oversees weights and measures in the United States recently commented, “we could switch from a 19th-century definition of mass to a more 21st- or 22nd-century definition of mass. We could get it based on an idea more than an object. And that’s just beautiful, and I’m proud of our species for getting to this place” (Kaplan 2017).

The metre, the second, the ampere, the kelvin, the mole, the candela and the kilogram are all derivable from nature according to physical constants. The 2018 General Conference on Weights and Measures redefined the kilogram based on Planck’s constant. Planck’s constant was recently calculated to be: 6.626069934X10-34kg.m2/s. However, the monetary value of the product cannot presently be fixed by a constant.

Physical Economics will update the definition of money and progress in relation to a constant: the total energy/mass within the universe. This will be an estimation, which, like the accuracy of Planck’s constant, will no doubt need to be more precisely calculated. However, if there is a finite amount of energy and mass in the universe, then it is a constant and this constant is the total wealth of the universe. The wealth of any economy in the universe, whether of the entire world, of a group of nations, of a single nation or state, of a city, of a commercial company or of an individual human being, is a proportion of the entire wealth of the universe.

Several relationships between different kinds of wealth can now be determined: a single human being’s wealth relative to a society; a single human being’s wealth relative to the entire wealth of the universe; a society’s wealth relative to the universe and the relationships of wealth between individuals, companies and states as defined by Physical Economics. We can also see the relationships between the wealth of historical periods, for example the economies of ancient empires or the economies of China and India in the pre-industrial world or the economy of Great Britain during its period of industrialisation as defined by Physical Economics, and we can note that it is essentially technological advance that increases wealth. It is through technology that the amount of energy that humanity converts from one form to another increases. Although technology can be used to refine and increase energy efficiency, it is still the increase in the conversion of energy from one form to another that is the means by which progress occurs. Thus, an economy’s wealth is very much defined by its technological advance relative to other economies.

Similarly, as the entire GDP of humanity increases, its wealth relative to the entirety of the wealth of the universe will be its most precise measure. It is also the main measure and definition of human progress. Such a view inevitably encourages towards speculation about the possible teleology of the universe itself. This is so because, according to the laws of thermodynamics, energy and matter cannot be created or destroyed and because there is a finite amount of each in the universe. Therefore, the mind is given to wonder about a time when all the energy and matter in the universe passes through humanity’s technology and is converted from one form to another. Marx and Engels attempted to incorporate thermodynamics into an economic system yet were concerned by the religious or teleological implications (Foster and Burkett 2008).

While Marx rejected the ontological principle of dialectics, Engels did not and saw in nature evidence to support the three laws of dialectics:

1. The law of the transformation of quantity into quality.
2. The law of the interpenetration of opposites (unity of opposites)
3. The law of the negation of the negation.

*Engels provides a number of examples of the application of these laws. These examples are drawn more or less exclusively from natural science, reflecting Engels’s bias towards traditional materialism. For Engels the law of the transformation of quantity into quality, this law ‘of nature discovered by Hegel celebrates its most important triumph’ in chemistry. If, as Engels suggests, we look at the atomic composition of carbon compounds and the effect of quantitative changes in this composition the evidence appears quite convincing. Simple numerical changes in the numbers of carbon atoms and hydrogen atoms combined with one another produce vastly different substances, ranging from the gas methane (CH4) to the solid body hexadecane (C16 H34). Equally the behaviour of magnets and the relationship of pole in the transmission of electricity appears to confirm the second law of the interpenetration of opposites. Engels draws on mathematics to confirm the validity of the third law of the negation of the negation. In algebra by multiplying two minus qualities e.g. –a by –a, we obtain a positive quantity +a2. Proof of the same law can be found, Engels thinks, in differential calculus where two quantities are made ‘so infinitely small that in comparison with any real quantity, however, small, they disappear’.*

(Williams 1989: 211-212)

Had Engels lived to learn of Einstein’s equation E=mc2, he might have seen it as further evidence of the dialectical nature of the universe; similarly, the space-time continuum. Although Marx himself did not believe in the significance of dialectics in a cosmic sense, hence his philosophy of ‘dialectical materialism’, Engels and many other socialists did.

Dialectical materialism, the superiority of market economics and even ‘cosmic dialectics’ can be argued about and forwarded as preferred models or concepts. But it is not rational to call any one of them 'correct' theories. The point is that dialectics formed the logical core of socialism, while the rational cohesion of market economics once formed the core of the right-wing thought. Current political discourse generally is anachronistic. As science has advanced, political discourse has become entrenched in out-of-date analyses with a lexicon of left wing versus right and a vague definition of social class that cannot describe the societies and economics of the world today. This lack of logical analyses is symptomatic of the corruption of ideology into the chaos of identity politics.

Physical Economics does not prescribe a belief in market economics or dialectics of any sort. The proponents of market economics from Adam Smith onwards can be respected or criticised and the dialectical theories of Heraclitus, Spinoza, Hegel and Marx may be admired for their intellectual force without considering them as models for economies or societies. Physical Economics is primarily a way of defining Wealth and Progress that can provide reason and order to philosophical and political discourse.

**Progress. Fear of others. Existential crisis, worldviews,**

**Ideologies and Religion. Prometheus.**

Much of contemporary political sentiment is driven by existential fear. The left seeks meaning after the long death of socialism, its hysteria is a cry for religion, for an ideology or a coherent worldview. Its intersectional bundle of victim claims is merely a distraction from this crisis. While the traditional right seeks thesame in those more conservative but fast eroding islands of refuge, religion and national identity.

Both are motivated by poorly understood psychological impulses. Adam Smith took an optimistic view believing that greed was not

the ultimate driver of economics. He thought something else was going on, something deeper in the human psyche … ‘The rich man glories in his riches because he feels they naturally draw upon him the attention of the world … and he is fonder of his wealth on this account than for all the other advantages it procures him.’ This need for attention and approval was, for Smith, a fundamental part of the human condition. We strive to better our lot because we seek to be ‘observed, to be attended to, to be taken notice of’. It’s the dream that says status symbols such as wealth will make us perfectly happy that inspires us to ‘cultivate the ground, to build houses, to found cities and commonwealths, and to invent and improve all the sciences and arts, which ennoble and embellish human life; which have entirely changed the face of the globe’ (Storr 2021: 244).

However, the main motivation of war is when nations “feel that they have been unjustly pushed down to a low rank”, writes Storr (217) in describing an anthropological study. And this is not only so for nations but for all groups of people and all individuals from large, multinational corporations competing for control of markets, to local street markets and all manner of clubs and societies, to the individuals within them and even down to the most intimate of individual relationships even within families. We fear the evil that we recognise in ourselves through its reflection in others. The evil others are capable of inflicting upon us in fear of us, we are capable inflicting upon them. The secondary purpose of the Atlantic Trade was to procure wealth from the enforced labour of Africans. The primary purpose was for the nations of Europe and later the USA to protect themselves against each other.

From the early forays into the trade in the days of Iberian supremacy to the establishment of the British Empire as the highest status global political entity, slavery and the Great Game were played out more in competition than in the rush to wealth. Britain and Holland’s fear of Spain were as much motivations to empire building as the riches therein. While in Africa, any polity such as Benin that refused to participate in the trade found itself falling behind its continental competitors (Green, 2019: 180-181). Even Britain’s eventual outlawing of the trade was as much driven by commercial competition as for humanitarian reasons as rivals were outcompeting it in the sugar trade (Williams, 2018).

The paradox of the American Revolution, is described by Edward S. Morgan (cited in Cruise O’Brien 1998: 271) as a people who:

developed the dedication to human liberty and dignity exhibited by the leaders of the American Revolution and at the same time have developed and maintained a system of labor that denied human liberty and dignity every hour of the day … “Free ships make free goods” was the cardinal doctrine of American foreign policy in the Revolutionary era. But the goods for which the United States demanded freedom were produced in very large measure by slave labor. The irony is more than semantic. American reliance on slave labor must be viewed in the context of the American struggle for a separate and equal station among the nations of the earth. At the time the colonists announced their claim to that station they had neither the arms nor the ships to make the claim good. They desperately needed the assistance of other countries, especially France, and their single most valuable product with which to purchase assistance was tobacco, produced mainly by slave labor. So largely did that crop figure in American foreign relations that one historian has referred to the activities of France in supporting the Americans as “King Tobacco Diplomacy”, a reminder that the position of the United States in the world depended not only in 1776 but during the span of a long lifetime thereafter on slave labor. To a very large degree it may be said that Americans bought their independence with slave labor.

Today, former colonies and victims of the age of empires are motivated more by global status than by wealth. This is essential to understand, amongst others nations, China’s determination to rise in status and the present challenges to the world order. Such nations are motivated by a desire never to be subjugated to abusive servility more than they are by the wealth that is accumulating by their progress.

This is why Environmentalism is doomed to failure. Attempts to “shift from a system that focuses primarily upon economic development to one that focuses on sustainable human development” (Hancock, Capon, Dietrich and Patrick, 2016: 246) will fail because environmentalism is not calling for an equal global distribution of wealth, rather, environmentalism is an elitist movement motivated by maintaining the high-status of a minority both within Western domestic societies and globally. Environmentalism is merely a foil for this aim. India, China and other developing nations are well aware of the history of wealthier states committing it to low-global status through colonial interests both at governmental and population level and they are not going to risk a repeat by halting their development. Governments will not risk the fear and anger of the population by committing them to more years of low-status at the mercy of other nations, other peoples. Raising status is imperative for protection from others. With such global inequality of wealth and status, there can be no solution to environmental problems.

In general, the desire for social status is stronger than the desire for wealth. Despite the intrinsic and intricate relations between wealth and status, as social status affords protection from others. Yet, the surest way of obtaining social status is through the accumulation of wealth. Prometheus has revealed the gods’ secret and we will continue to progress and to create wealth; nothing will prevent this. The human ability to create more and more wealth coupled with fear of others, leads us to seek ever more wealth and status in the name of security. Two dialectics can be seen here: The relation between wealth and social status and the relation between the individual and the collective.

Physical Economics does not provide religious security and it is not an ideology. Physical Economics is merely the best theory of Wealth and Progress available according to the current state of knowledge. It can form the logical core of a worldview but it is not necessarily a worldview. The choice comes down to the individual.

Humanity may not overcome the barriers to controlling all the energy in the entire universe. Yet the logic remains: We are already on a trajectory of converting more and more energy and mass from one form into another; we have begun space travel; the human brain is the most complex object in the known universe. Thus, the possibility that human existence will have relevance beyond this planet is real. Whether an individual or a collective chooses to value this reality or considers it too fanciful does not reduce the potential of Physical Economics, with its definitions of Wealth and Progress, to elevate discourse above the chaos of the Culture War. Moreover, it is important to recognise that this is a choice or rather, a wager of faith that each individual makes.

6.

**Constant doubt. The religious need. Macbeth and Pozzo.**

**Wagers of faith or an insurance policy. Pascal and Marx. The choices of belief versus nihilism and nihilism versus sacrifice. The suicidal, the psychotic and the need for religion. Individualism and collectivism.**

There is no choice. Rational, modern humanity, both individually and collectively, must live with constant doubt; there is no opportunity for certainty. Yet living with uncertainty requires some form of religion, whether we call it a belief system, a worldview, an ideology or a philosophy. As Camille Paglia (Lehmann 2018) writes:

… if religion is erased, something must be put in its place. Belief systems are intrinsic to human intelligence and survival. They “frame” the flux of primary experience, which would otherwise flood the mind.

But politics cannot fill the gap. Society, with which Marxism is obsessed, is only a fragment of the totality of life. As I have written, Marxism has no metaphysics: it cannot even detect, much less comprehend, the enormity of the universe and the operations of nature. Those who invest all of their spiritual energies in politics will reap the whirlwind. The evidence is all around us—the paroxysms of inchoate, infantile rage suffered by those who have turned fallible politicians into saviors and devils, godlike avatars of Good versus Evil.

This contradiction between the religious need and the impossibility of absolute faith obliges a new form of worldview. A spiritual aim of some sort is necessary for a complete and coherent worldview. One cannot not have a spiritual aim. It is intrinsic to existence. It is the negation of the negation for the reason that the opposite of belief is nihilism and nihilism cannot sustain human action. Physical Economics can thus be considered a rational means of living with faith and an alternative to nihilism. It is possible, as far as we know, that humanity will, through its technology, one day encompass and harness the entirety of energy and matter in the universe; therefore, it can be aimed at. A worldview that at once provides the possibility of a teleological universe in which humankind’s role is significant yet which is rational and strong enough to doubt this constantly can be derived from Physical Economics. This is the only choice. It is, perhaps, a modern expression of an age-old dilemma.

Shakespeare, according to Dr. Johnson, wrote with no apparent moral purpose. Yet,

… it commends a man who, after questioning the meaning of creation, comes to accept a design in it beyond our comprehending, and who therefore, after seeking to withdraw from life through an abhorrence of all that is ugly and vicious in it, is finally – though tragically not until death approaches – content to live life as it is, able to acknowledge, in word and deed, ‘The readiness is all’.

 (Jenkins. 1982)

It is Macbeth who, having given all to a self-centred quest and failed, cannot reconcile himself to nihilism:

Tomorrow, and tomorrow, and tomorrow,

Creeps in this petty pace from day to day,

To the last syllable of recorded time;

And all our yesterdays have lighted fools

The way to dusty death. Out, out, brief candle!

Life's but a walking shadow, a poor player,

That struts and frets his hour upon the stage,

And then is heard no more. It is a tale

Told by an idiot, full of sound and fury,

Signifying nothing.

Pozzo put this more succinctly (Beckett 1986), “They give birth astride of a grave, the light gleams an instant, then it's night once more."

Both express unbearable states of being for a human; nihilism is impossible to sustain even for the psychotic and the suicidal. The amoral psychotic needs society to survive and will ultimately be rejected by society if he does not adhere to social conventions, however superficially.  While the suicidal, even in the instant of intense nihilistic despair, needs a minimum of faith to summon the energy to commit the act. For the suicidal to find the will to live and for the psychopath to camouflage their amorality, the obligation is the same: Sacrifice.

The suicidal must make the choice to sacrifice through self-will born of the need for faith in life; faith in existence. The paradox of suicide as both the ultimate expression of nihilism and the ultimate expression of faith can return us to dialectical thinking and the continuum of belief and doubt, if we so choose. But even the psychopath will choose to sacrifice; will choose to value life over death, existence over nihilism, albeit a choice imposed by the will to survive in a society. Nonetheless, ultimately, when faced with the choice between belief and nihilism, almost everyone sacrifices: to whatever degree, everyone chooses to believe in a value to existence.

Self-sacrifice is the ultimate statement of belief in the value of an entity other than oneself, whatever that entity may be. It is the ‘ultimate decision’ in the sense of being final for the decision maker and in the sense of being the most significant feature of all human life, history and thought. Collective and individual histories are defined by decision-making. The extent to which human beings have free will correlates with freedom to make decisions.

Generally, the choice reduces to one between sacrifice and nihilism or between life and suicide. And generally, through reason, religion or whatever means, humans choose to believe in the worth of existence. It is a kind of wager reminiscent of Pascal’s wager on the existence of God and of Marx’s wager on the significance of history.

Pascal reduced belief in God to a choice.

"God is, or He is not." But to which side shall we incline? Reason can decide nothing here. There is an infinite chaos which separated us. A game is being played at the extremity of this infinite distance where heads or tails will turn up. What will you wager? According to reason, you can do neither the one thing nor the other; according to reason, you can defend neither of the propositions.

As there is very little cost in choosing to believe and a potential of eternal happiness, Pascal’s conclusion was to choose to believe because “it is this which will lessen the passions” and bring peace (Pascal. 2019 *Pens*é*e 233*).

Marx’s wager is the wager that human history has meaning: “Marxist faith is faith in the future which men make for themselves in and through history. Or, more accurately, in the future that we must make for ourselves by what we do, so that this faith becomes a ‘wager’ which we make that our actions will, in fact, be successful” (Goldmann 2013: 73). The yearning for an objective reality, “God for St. Augustine, history for Marx”, unites religion and science. Religion can contain the yearning, but science is the yearning.

Physical Economics does not demand any such choice. An individual may choose to believe in the human potential even to the point of reversing entropy, of mastering the laws of physics and harnessing, through its technology, the entirety of energy in a teleological universe in which, despite our faults and horrific crimes, human beings, individually and collectively are worth existing. Alternatively, an individual may choose the purely materialist approach: that we can measure our progress against the physical constant of the total energy and mass in the universe. Either way, Physical Economics provides a means of more accurately orienting ourselves in relation to the world around us.

Constantly doubting, refusing the certainty of either choice is the real demand of rational humanity at this stage of Progress, as Brecht’s Galileo describes faith in a scientific future:

In fact we shall question everything all over again … And whatever we wish to find we shall regard, once found, with particular mistrust. So we shall approach the observation of the sun with an irrevocable determination to establish that the earth does not move. Only when we have failed, have been utterly and hopelessly beaten and are licking our wounds in the profoundest depression, shall we start asking if we weren’t right after all, and the earth does go round.

(Brecht. 81: 1980).

Political discourse is lost in an anachronistic lexicon of left wing versus right wing, socialist versus capitalist politics. Progress has no coherent guide and its ever-faster pace has no known destination. Physical Economics provides a definition of Wealth and Progress. From this starting point the economic relations between individuals and collectives can be more rationally and accurately assessed. The choices, political, moral and ethical that individuals and collectives make can be reconsidered as decisions about how to use their share of energy, their proportion of Wealth as a guide for directing Progress.

**References**

Beckett, S. (1986). *Waiting for Godot*. London: Faber and Faber.

Brecht, B. (1981). *The life of Galileo*. London: Eyre Methuen.

Bellamy Foster, J. and Burkett, P. (2008). Classical Marxism and the Second Law of Thermodynamics. *Organization & Environment*, 21(1), pp.3-37.

Chen, J., 2021. *What Is Fiat Money?*. [online] Investopedia. Available at: <https://www.investopedia.com/terms/f/fiatmoney.asp#citation-12> [Accessed 14 December 2021].

Chen, J. (2005). *The physical foundation of economics*. 1st ed. World Scientific.

Chen, J. (2008). The Physical Foundation of the Mind. *NeuroQuantology*, 6(3).

Deller, A. (2019). *The Epic Scale of Spacetime*. [online] Medium. Available at: https://medium.com/swlh/the-epic-scale-of-spacetime-50e702cfef0 [Accessed 25 Apr. 2019].

En.wikipedia.org. (2019). *Great Divergence*. [online] Available at: https://en.wikipedia.org/wiki/Great\_Divergence [Accessed 25 Apr. 2019].

Encyclopedia Britannica. n.d. *metre | measurement*. [online] Available at: <https://www.britannica.com/science/metre-measurement> [Accessed 5 December 2021].

Goldmann, L. (2013). *The hidden God*. London: Routledge.

Green, T., 2019. *A Fistful of Shells*. Penguin Books.

Hancock, T., Capon, A., Dietrich, U. and Patrick, R., 2016. Governance for health in the Anthropocene. *International Journal of Health Governance*, 21(4), pp.245-262.

Kaplan, S. (2017). *Scientists are about to change what a kilogram is. That’s massive.* [online] The Washington Post. Available at: https://www.washingtonpost.com/news/speaking-of-science/wp/2017/07/05/scientists-are-about-to-change-what-a-kilogram-is-thats-massive/?utm\_term=.50857b088c18 [Accessed 25 Apr. 2019].

Klein, E., 2020. *Why we're polarised*. London: Profile Books Ltd.

Lehmann, C. (2018). *Camille Paglia: It’s Time for a New Map of the Gender World - Quillette*. [online] Quillette. Available at: https://quillette.com/2018/11/10/camille-paglia-its-time-for-a-new-map-of-the-gender-world/ [Accessed 25 Apr. 2019].

Nye, J. (2012). *Fascinating new graph shows the 'economic history of the world since Jesus'*. [online] Mail Online. Available at: http://www.dailymail.co.uk/news/article-2163610/Fascinating-new-graph-shows-economic-history-world-Jesus.html [Accessed 25 Apr. 2019].

O'Brien, C., 1998. *The long affair*. Chicago: University of Chicago Press.

Pascal, B. (2019). Pensée. [online] Ntslibrary.com. Available at: http://www.ntslibrary.com/PDF%20Books/Blaise%20Pascal%20Pensees.pdf [Accessed 25 Apr. 2019].

Shakespeare, W. and Jenkins, H. (1982). *Hamlet*. London: Methuen.

Shakespeare, W., Gibson, R. and Jordaan, C. (2012). *Macbeth*. Cape Town: Cambridge University Press.

Steven, P. (2017). *Why do progressives hate progress? | Steven Pinker*. [online] YouTube. Available at: https://www.youtube.com/watch?v=PnitLNObR7c [Accessed 25 Apr. 2019].

Storr, W., 2021. *The Status Game*. London: William Collins.

Tegmark, M. (2014). *Our mathematical universe - my quest for the ultimate nature of reality*. 1st ed. London: Allen Lane.

Thangavelu, P. (2019). *How to Calculate the GDP of a Country*. [online] Investopedia. Available at: http://www.investopedia.com/articles/investing/051415/how-calculate-gdp-country.asp [Accessed 25 Apr. 2019].

Williams, E., 2018. *Capitalism & slavery*. Franklin Classics, The University of North Carolina Press.

Williams, H. (1989). *Hegel, Heraclitus and Marx's dialectic*. New York: Harvester Wheatsheaf.