

Progress, Exponential Growth and Post-Growth Education

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Teleological progress is the underlying motif of modern culture, and informs education, innovation, and economic development. Progress includes a gradual increase in consumerism. Since the 1940s, the Keynesian Settlement and its embedded belief in progress is legislated in exponential 2-3% economic growth. Unfortunately, climate change is a direct result of the increasing amounts of CO₂e byproduct that gets expelled in the production of plastic consumer items, and this production increases exponentially year on year. We are now hearing serious concerns from scientists about the sixth great extinction, the Anthropocene epoch, and the end of modernity in ecological collapse. In this article I argue that climate change is an outcome of our dedication to progress and consumerism and I try and unravel the mechanics of exponential economic growth in contrast to an alternative model of economics and debt, first developed in Mesopotamia about 5000 years ago. The contrast may not be operationalisable in modern times, but it does offer a significant counter-argument to the concept of progress and shows that Steady State economics has been successfully implemented by a continuous civilization for thousands of years. The depth of the philosophical shift is illuminated in the understanding of Mesopotamian theology, astronomy, astrology, and understanding of cyclic, rather than linear, time. This type of critical account highlights the need for education to fundamentally challenge some key norms in modernity, from 'progress' to the sense of entitlement that consumerism and economic growth provide. Education is a key site for cultural transition, and as the constraints of climate change are making ever more clear, the moment to mobilise the educational sector is here.

Keywords: Economic degrowth; philosophy of technology; Heidegger; Axial philosophy; debt jubilee

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Introduction

In modern times there is a great deal of faith in the concept of progress and ‘growth’. Progressive technology, economic ‘growth’, social progress and development, development, consumerism, postmodernity, ‘neo’liberalism, and even the ‘post-human’; there is an ever expanding and ongoing impetus for a new and improved version of what we had before. Progress itself has taken over from the earlier motif of progressing towards some vaguely articulated utopia. Idealism and utopia is now *passe*. Progress as a concept is still very much *de rigour*. Climate change threatens to alter this perception of progressive change. Merely inverting progress, or utopianism, towards dystopia, catastrophe or nihilism does little to avert the notion of progression. The dynamic of inevitable direction, with accrual of change based on either innovation, or our fallen state of grace, are simply two sides of the same coin; faith in teleological development.

Teleological progress is assumed to engage individuals and also the unfolding goals of life itself. The translation of teleology from the utopian goal of the individual to a narrative that describes all species can be attributed to Darwin and Linnaeus. Survival of the fittest is situated as the basis of evolutionary change. While arguably this is how Darwin has been interpreted, rather than his own intention, ‘survival of the fittest’ implies a teleological process that gradually improves and improves, culling out the weaker varieties of the species and eventually producing nature’s ultimate survivor; mankind. Similarly, while the emphasis on ‘progress’ can be seen as mere change, the embedded normative implication in modernity is that it is change in a teleological direction (either utopian or dystopian).

At the time that education spread from the monastic classes and the merchants to the wider population, the concept of ‘progress’ was promoted, to ‘lift’ people out of the feudal era, and develop the norms and mores of capitalism and democracy. Meritocracy has been a core element of universal education. General provision, and indeed insistence that all children, from all classes, religions and ethnicity gain access to education is to make sure that the best rise to the top, and the dross sink to their own level, no matter where they were born or what dis/advantages they were born into. Progress is individuated through meritocracy and assessments. Through meritocracy, the most able students are visible, and are helped along the road to becoming society’s future leaders.

Being progressive, and allowing the poor to be upwardly mobile through educational merit are core tenets of the political ‘left’. Usually, at this moment in history, the left is criticised by the right, so the extremes of neoliberal free marketeers can lay claim to the ‘middle ground’. But I am suggesting something different; not a critique of left or right, but a fundamental critique of the project of modernity itself.

Modern education is built on a set of ideas that are co-dependent on one another. The interlocking concepts of universal access to individualism, equality, freedom, fraternity, and meritocracy provide the ethical and philosophical basis for universal education. There is another set of assumptions that are also co-extensive with the promoted premises of liberal democracy, and they are the basis of capitalism, globalisation, and free trade. Combined with a massive human population, these last three factors of globalised capitalism are the constitutive elements of consumerism, resource exhaustion and greenhouse gas emissions. My primary interest is how to think through a sophisticated, high tech, low impact type of economy and culture, that provides excellent infrastructure to support 7.5 billion people (and rising to

10 billion by 2100) safely, efficiently, and with a little impact on the planet as possible.

Modern education sits within the constituting factors of global capitalism (in the early colonial period as much as now, in late capitalism) and provides a particular service to the structures of global culture and free trade. These can be seen in both the overt and hidden curriculum. Reading, writing and numeracy and a normative narrative for obedience, timeliness, and effort, along with certain bodily compartments for not fidgeting, sitting quietly, and enduring long hours of boredom or 'learning'.

Meritocracy is a crucial part of the educational system. It is the premise for setting aside genealogical lineage as the mode of ongoing social leadership, in favour of a system that allows talented and hard working people from any background, rich or poor, to ascend the ranks of society and assume leadership positions. Thus, meritocracy is integral to the democratic order. It is also integral to the capitalist order. Business interests also thrive with intelligent and hard working individuals in the organisation and at the helm. So the education system is supposed to sort these people from the bulk of the population and 'qualify' them to move up the ranks in either governance or business.

Over time, certain elements of the originating liberal philosophy of freedom, fraternity, and equality have become distorted or sublimated by the increasingly overt demands of corporate consumerism. Nowadays a great deal of emphasis in the education sector is on exam results, or vocational training rather than personal development or wisdom. Qualifications serve to enhance an individuals' Human Capital rather than their critical thinking skills or adaptability in a rapidly changing world. Even at its best though, modern education is premised on a normative context of global trade, economic growth, consumerism, individualism, discipline, and meritocracy. Even the most left wing, liberal form of education fundamentally rests on the dual concept of economic growth and egalitarian progress. And what, we might ask, is wrong with that?

Economic Growth and Egalitarian Progress

Capitalism is not an egalitarian project. It inherently tends towards monopoly and profit siphons upwards, leaving the working classes (the 99%) earning substantially less than the value of their work. In 1848, Marx pointed out in *Das Kapital* the tendencies of capitalism to make the rich, richer and the poor, poorer over time. He regarded it as a very unstable and problematic system that would inevitably 'progress' towards revolution and overthrow.

Marx's utopian vision of revolution was taken seriously by the economist, Keynes in his book, *The Means to Prosperity* (1933). An English Peer, Keynes had just lived through the 1929 financial collapse, which had devastated the USA and world economy. Hundreds of thousands of families were evicted or simply walked off their farms when drought turned millions of acres of American acreage into a giant dustbowl. These hardworking farmers walked off their properties with nothing, into dire poverty and high unemployment. Thousands of people starved, and many committed suicide. The American Dream of reward for effort and hardwork became disillusioned.

The financial Crash was the first example of global market collapse in modern times. In the post Crash context, Keynes made a compelling argument for a new type of economic management where governments would guarantee a stable overall growth rate of some 2 to

3%. The argument was that everyone could anticipate that their situation would improve by an average of 2 – 3% in the next year. Their wages would incrementally increase, goods would be more affordable, a slice of capitalist production would accrue to the working classes too, along with the privilege and great wealth that capitalism offered the owning class. Nowadays, the ‘left’ tends to refer to the Welfare State, another of Keynes’ ideas, and the ‘right’ wishes to dismantle the Welfare State in favour of free market provision. Both left and right have so deeply accepted Keynes’ vision of economic growth, and its associated technological and social progress that it is completely normative in global society. Nearly all countries have legislation ensuring a minimum 2-3% growth rate in gross domestic product (GDP). In ‘developed’ nations, the working classes now have access to television sets, sound systems, washing machines, vacuum cleaners, ovens, flush toilets, and mobile phones and supermarket food distributors.

In the 1930s, pollution and environmental devastation was already a problem, and famously Roosevelt solved the problem of the Great American Dustbowl by introducing the New Deal that included Welfare programmes that paid men for tree planting. Keynes however, and subsequent governments which have enacted the concept of economic growth and access to consumerism, failed to recognise the environmental and resource consequences of large scale consumerism. We have become so obsessed with the ‘right’ to consumer goods, to ‘high quality’ housing, to the new and the shiny, that it is very difficult to advocate for a simpler lifestyle. Simplicity is tied to deprivation. Subsistence living is regarded as poverty. Consumerism is a right that needs ‘development’, worldwide.

The scale of consumerism is phenomenal and it is growing at exponential rates. The GDP growth rate of 2-3% sounds trivial, but give an indication of scale, at present global consumerism is about 70 billion tonnes year. Consumerism grew 94% between 1980 and 2010 and is exponentially accelerating. If we continue on the exponential curve, we will produce over 100 billion tonnes a year by 2030 (UNEP, 2016).

In contrast to the normative premises of modern consumerism, there are multiple alternatives to economic growth (Schumacher, 1973 and many others). Subsistence living requires no consumer growth at all. Yet it does not preclude a mixed economy that involves international trade. Many communities engage in large and small scale trade within and outside their locale, without being constrained by legislated economic growth. In this article I want to investigate one such example, from Mesopotamia; arguably the earliest civilization which engaged with large scale production and large scale capitalist trade.

Shifting ‘backwards’ to subsistence living seems impossible from within the modern rubric of consumer culture. Heidegger wrote about the constraints of the modern world view at length. His work on the Technological Enframing is worth looking at in detail to think through the limitations of modern thinking and what needs to be overcome to engage with a new form of culture that produces less, and by extension, emits less greenhouse gases.

Ecological Belonging or Environmental Alienation

Heidegger argued in “The Question Concerning Technology” that modernity signals a profound shift in the essence of technology from its earlier, Greek beginnings. The essence of modern technology succeeds in ‘freeing’ us from the constraints of local ecological condi-

tions, and at the same time ‘alienates’ us from our belonging to place.

Aristotle analysed several core elements to the ‘telos’ of technology. The materials of the thing govern what shape and capacity it will have. The skill of the craftworker will dictate how proficiently and elegantly it is formed, and finally, the ‘final cause’, or telos of the item; in other words, the intention to make something in particular helps to form the item (as a ‘bowl’ instead of a ‘fork’ for example).

Heidegger argues that the essence of technology fundamentally changed with mass production of modernity. No longer is the technology an output of craft. Instead, it is produced at a much larger scale. The essence of modern technology, Heidegger argues, is ‘nothing technological.’

The question of scale impacts the philosophy of time, and especially the possibility of duration. The most significant thing about modern technology is that things can be *stored* in ways that were never possible earlier on. This means that the tempo of production no longer matters. It is the tempo of consumption that now dictates.

Seasons were the governing tempo to production in earlier civilizations. While some effort went into preserving food for cold seasons, most productivity occurred when the local environment combined with seasonal weather made it possible. Crops were sown, ripened and were harvested, trade predominantly occurred in local markets, and very high value goods were made in the winter months and traded when roads were open in summer.

In contrast, modernity places great emphasis on mass storage; giant warehouses for example, so that local people can access whatever products they wish, on demand. Lately, with the increase in shipping and air freight, localised storage is no longer at issue. Increasingly, the capacity of transport storage enables ‘just in time’ production. All these aspects of technology are aimed at the pace of consumer demand, not the pace of seasonal ecology.

To a large extent, this ability to trade stored goods has ‘freed’ communities from the savage and unexpected disasters in their local ecologies. If there is a drought and local produce is affected, communities can buy in staple products. This freedom has obvious benefits, and less obvious dangers. Local people are no longer as aware of their own local conditions, as they are no longer dependent on a good crop, or calm lambing period. This means they fail to notice warning signs that, for example, soil runoff is occurring, or rivers are getting polluted, or deforestation has reached unbearable limits for local wildlife. Heidegger notes that modern technological enframing means we can only understand the environment, and everything within it, including ourselves, as a potential commodity. Everything is ‘standing reserve’, waiting to be consumed (1977). The river, the field, the forest are all storage containers for fresh water, produce, stocks of wood. Nothing merely exists for its own value. It is all wrapped up in the market discourse of standing reserve.

Heidegger and the Line; Two Beginnings

The emphasis on the pace of consumerism as the governing motif of time and productivity also impacts all sorts of notions of self-understanding. Consumer needs are met immediately. There is no waiting for appropriate season, or for transport, or practical limitations of energy production. Consumer demand is immediate and other factors bow to its sway. Self care struggles with these demands of immediacy. Weight loss regimes promise ‘instant re-

sults', gyms promise instant fitness, supermarkets promise instant dinners. Instant gratification has become the motif of modernity. Mindfulness, for example, emphasises the 'now' as though past and future are irrelevant and psychological health is following the flow of 'nowness'. What is now? It is being seen as the instant of the breath. The shifting tides of idle thoughts.

Heidegger, following Nietzsche, has a much bigger understanding of 'now' (Heidegger 1982 Irwin 2010a, Irwin, 2015a, Nietzsche 1989). He encompasses a life, from its beginning to its ending, in its entirety; to understand 'now'. This big picture perspective, brings the formative features of the early years into light, along with the recognition that prospective ending reflects back on the way we live in the now. If there is a history of heart disease in the family then the prospect of a heart attack could or should have an impact on lifestyle and diet in your 30s. The prospect of nuclear war might politicise a young person and impact on their activities. The prospect of environmental dilemmas, especially world-finishing ones like climate change can also impose new decision making on the way people live their lives.

This format, of surveying the beginning and ends of a lifespan, in what Heidegger calls the 'two beginnings' to understand decisions in the 'now' is not restricted to individuals. Groups can be affected in the same way. Ethnic groups, or cultural groups, sports groups, religious groups, political associations, animal rights groups; any group, large or small also reflects on their past, on the formulating principles, and the prospects of finitude to make moral and political decisions in the present. Thus the duration of 'now' is not momentary, instead it is momentous. It incorporates the lifecycle, of the individual, the group, and even the civilisation, or the species.

Civilisation itself can be understood from the perspective of the two beginnings. That is the stance I want to take in this article. In other papers I have explored the 'second beginning' of climate change, which lets us know that our extinction and the demise of civilisation is immanent unless we figure out what elements of modern ways of life we need to abandon to diminish our greenhouse gas emissions (Irwin, 2010a, 2010b). In this article I want to explore the first beginning of modernity. The first beginning is usually attributed to the Ancient Greeks, as the emergence of democracy and philosophy in the 'west'. In order to understand the beginnings of the technological enframing of modernity, I want to look briefly at the 'first' computer, the Antikythera mechanism, which was found on an Ancient Greek shipwreck. But earlier still, is a civilisation that began writing, accounting and proto-modern forms of debt; Mesopotamia. To truly understand economics and especially growth in late modernity, we could look at its beginnings, 7000 years ago in the lands between two rivers.

The Beginnings of Modern Technology; Antikythera Mechanism

In 1901 pearl divers accidentally found a very large and very rich shipwreck off a tiny island called Antikythera in the Mediterranean. One of the many items pulled up from the wreck in the following couple of years was several lumps of badly corroded and ossified metal, with a large disc with tiny vee shaped spokes on it. It appeared to be a fairly large cog, with smaller cogs connecting to it. But in the plethora of bronze art and pottery, the mechanism was put into storage and largely forgotten for some time.

While initially recognised as potentially clockworks, it was not until 1951 that an Englishman called Price recognised the mechanism for the exciting find it is; the first analog computer; a clock of amazing sophistication, more than a thousand, four hundred years before clocks were ‘invented’ in Europe. The Antikythera mechanism confounds notions of progress, teleology, and philosophy of time in multiple ways. I want to argue that it completely reworks the limits of modern technological enframing. It also casts exponential growth into perspective; as a moment in history, rather than a legislative norm that must be maintained to stave off the class revolution.

To recap, the assumption of modern progress is that everything gradually becomes a better ‘fit’. This evolutionary principle supports the notion of ‘development’ that draws a sharp distinction between ‘fully modernised’ states in ‘developed’ nations, and incomplete modernity and continued reliance on subsistence and other localised economies in ‘undeveloped’ nations. Progressive politics aims to be more egalitarian. Democratic progress is seen as an improvement to the tyranny of feudal monarchy, or dictatorship. Democracy, while flawed, is a better fit for allowing the best of humankind to rise through the ranks, via the meritocracy of education and business, and become our most viable leaders.

Technology, and especially mechanisms that enable efficiency and mass production, inform our world view, according to Heidegger (1977). We no longer live in a world of craft work and seasonal care, but rather in the age of mass production. Our lives have become alienated from the environmental conditions of our locale. Our lives are characterised by ‘human capital’ and standing reserve. Globalised consumerism dominates productivity, and the way we understand everything in the world, including the environment and ourselves.

As might be expected by modern technology, the Antikythera mechanism promotes a kind of efficiency. It is a clock; but more than hours and minutes (Mesopotamia words), the Antikythera mechanism tracks the pathway of the five known planets, and the cycles of the sun and moon. On the front face is the annual cycle of the sun and the moon, including a small ball that shows the phases of the moon. The two large dials on the back face of the mechanism track the Metonic and Saros cycle, showing when the lunar and solar years coincide, (in the modern calendar, every 18-19 years). Not only does it demonstrate when the moon realigns with the sun over such a long period, it also accurately predicts lunar and solar eclipses, including the colour and ‘wind’ or climatic conditions that are likely with each eclipse. It is remarkably accurate, and makes use of sophisticated and extremely well informed geometric mathematics. But its efficiency is of another order to that of the modern time piece. Very importantly, the aim is not the pace of consumerism, but rather cyclic patterns of time, over longer periods than the productivity of annual seasons. Thus, despite being the first known example of ‘modern’ type of technology, the ethos, the meaning, and the worlding of the Antikythera mechanism is of another order altogether.

Philosophy of Time

The philosophy of time indicated by the Antikythera mechanism is quite different from the teleological or exponential model used in modern times. It is cyclic, not linear, it is following the grand cycles of the solar system, not the hours and minutes of industrial routine. It is not engaged with the consumerist ‘now’ but rather the whole of the solar system.

There were plenty of mechanisms to count hours and even minutes in Ancient Greece and earlier. Many of these were hydro-clocks, sand clocks, or hydro corkscrews. The word ‘minute’ is from the Mesopotamian Sumerian language. The Antikythera mechanism was involved with time on a great scale. It was a cosmological world clock.

There is some debate about where and when the Antikythera mechanism was made, either Rhodes or Syracuse, both part of Ancient Greek, or Ionian, culture. The calendar of events included in the mechanism starts with the Olympic games in Nemea and sophisticated astronomical research has shown that the star positions correspond to 206 BC (Freeth 2002a, Freeth 2002b, Freeth et al. 2006).

The mechanism is definitely set in Greece, yet Greek maths had already embarked on trigonometry, and the Antikythera mechanism is firmly rooted in much older, Babylonian geometric mathematics (Carman and Evans, 2014). What’s more, a few Greek astronomers were arguing that the sun, rather than the earth was the centre of the solar system, but the Antikythera mechanism remains earth centric. The intimate knowledge of the cycles of the planets and the detailed descriptions (written in Koine Greek script (Freeth et al. 2006) of the eclipses derives from well established, older mathematics, that emerged thousands of years earlier, in Mesopotamia. While the Antikythera mechanism can be described as the ‘first’ analog computer, a distinct marker of the beginning of modernity, it is itself firmly entrenched in a much older form of technological enframing; in the cyclic world of Ancient Mesopotamia, ancient China, Ancient India, Ancient Egypt, and Ancient Greece.

The technological enframing of the Ancient world was based on the cycles of the solar system, and particularly the Metonic and Saros cycles. The Metonic cycle is 235 months which lines up the cycles of the solar system with the lunar cycles. The Saros cycle is 223 month period and shows the eclipses. The Antikythera mechanism also traces the 9 and 18 year cycles of elliptical lunar and solar orbits.

Important to my argument is that the cyclic nature of the cosmos governed the politics, ethics, social relationships and economics of Axial civilisations. It is very notable that in the early beginnings of democracy and capitalism, there is no affiliation, or faith, in exponential economic growth. Rather, it is the reverse. Complex modes of thought were developed to *avoid* exponential growth. Economics had to adhere to the cosmology of cycles in the same way that productivity was cyclic, and the solar system is cyclic.

Greece was not a democratic culture in the same, universal way that we now attempt to practice democracy (bearing in mind that women’s equality is still problematic, and limited franchise of prisoners and ‘foreigners,’ and even slavery, still permeates nearly all modern democracies). Yet Greece was more fundamentally egalitarian. The disparity between the very rich and the very poor was significantly less than it is today. At the same time, it was a culture that took slaves in combat, that had debt slaves, and that treated women as lesser citizens. Living conditions were sophisticated. They had the wheel and cart, traffic rules, running hot water, sewerage systems, metal instruments, knives and forks, artificial light, large libraries full of learned scrolls, and most of the *accoutrements* that we recognise as the modern way of life. Already in Ancient Greek culture, needless consumerism was seen as a problem. In Ephesus, a large stone tablet implored local citizens to refrain from over consumption. The Stoics made an entire ethics out of living simply. Some of the most famous philosophers were applauded for their low consumer, rural lifestyle. Urban centres tend to have the same, alienated, problem that Heidegger outlined as the technological *Gestell*. The

limits, seasonal or as a single resource, are little known in urban centres, and people tend to consume without regard for the wider environment. I want to argue that the Saros and Metonic Cycles were designed to regulate consumption practices to avoid the dangers of alienated, exponential consumerism, and keep citizens bound to the long term cycles of a planetary and lunar cosmology.

Scholarship on the Antikythera mechanism has concentrated on how it was made, and the sophisticated mathematics involved. Prime numbers and multiplier gears are used to reproduce the planetary cycles, and include the variation of ecliptic orbit with a slot and gear system. There are at least 30 cogs, and originally were probably twice as many.

The researchers realized that the ratios of the gear-wheels involved produce a motion that closely mimics the varying motion of the Moon around Earth, as described by Hipparchus. When the Moon is close to us it seems to move faster. And the closest part of the Moon's orbit itself makes a full rotation around the Earth about every nine years. Hipparchus was the first to describe this motion mathematically, working on the idea that the Moon's orbit, although circular, was centred on a point offset from the centre of Earth that described a nine-year circle. In the Antikythera Mechanism, this theory is beautifully translated into mechanical form. "It's an unbelievably sophisticated idea," says Tony Freeth, a mathematician who worked out most of the mechanics for Edmunds' team. "I don't know how they thought of it." (Marchant, 2006).

The mathematics of the Antikythera mechanism were not merely serving as surplus luxury goods, as some people have argued. To the contrary, the Antikythera mechanism was *worlding*. It was relying upon, and supporting a specific approach to interpreting the Ancient world; one that invoked a cyclic approach to time in its economic, regulatory and legislative governance. A cyclic approach to *regular* governance is vastly different from the exponential growth model that characterises the consumerist underpinning of teleological and exponential progress.

The cosmology involved in the Antikythera mechanism is mentioned, but has not been developed with any depth. To understand the worldview of the Antikythera mechanism better, I decided to investigate the culture from where the mathematics derived; Mesopotamia.

Mesopotamia as the First Beginning

Heidegger refers to Ancient Greece as the beginning of modernity, and this is a common trope for philosophers, who refer to various famous Greek philosophers with assurance; Aristotle, Plato, and in lesser more tangential ways to older individuals and schools. Philosophy has largely ignored the influence of mathematics and ideas from other Ancient cultures, including Egypt, Crete, Mesopotamia, India, China and others. Interestingly, Germany has been more focused on the archaeology of Mesopotamia than any other nation, and continued to make finds all through the Second World War. Much of the conceptual apparatus that informs modernity derives not from Greece, but from the land between the Euphrates and Tigris rivers. It was there that writing first emerged.

As nomadic pasturing gave way to settlements and city states, the regulation of pastoral

life in the fragile ecology of the river delta required accurate record keeping. The area was prone to drought, and irrigation was in place across the lands. However too much irrigation brings salt to the surface, so careful governance of the irrigation process had to take place.

Mesopotamia was one of the first civilisations, and like ours, they kept religion and government somewhat separate. It was largely a ‘capitalist’ market economy, that tightly regulated debt, interest, and expectations of productivity. Marks were recorded on clay tablets, and then wrapped in a clay envelope (Carmona and Ezzamel, 2007). To clear one’s debt was to ‘wipe the slate clean’. Writing was developed as an outcome of accounting. The scribes recorded in great detail how many sheep, goats or cattle had been loaned from one person to another, and for how long, and how many offspring could be expected over the duration. Interest rates were based on expectations of productivity. Those who couldn’t meet their debt obligations (which were passed onto the family at death) became debt slaves until their debt was paid.

With such precise regulations and record keeping, the Mesopotamians produced a governmentality that Foucault would recognise immediately (1979). But expectations of an increase in stock numbers, or of efficient bread production, that enabled interest on debt builds into the system, an irreducible economic growth. In the fragile ecology of the river delta, rising stock numbers was impossible to support. So the dangers of growth was immediately apparent. Mesopotamia managed to survive for 5000 years, so they had very good mechanisms for avoiding such ecological and economic disproportionality.

The literature on Mesopotamia is subdivided into various discrete discipline areas. Some are experts on the huge volumes of astronomical, mathematical data. Some focus on astronomical and astrological tablets. Mesopotamia developed the first astrology. They used astronomical events to divine events on earth, including comets, and a precise understanding of eclipses (which were a bad omen). Other scholars focus on the religious figures, some on literature, and others on the Kings, and their periods of governance, and legislature. I want to bring together some elements from these several disparate disciplinary fields. As I am a contemporary philosopher rather than an expert on Mesopotamia, I am floundering a little at the lack of interdisciplinary work that has been done in the field. So I will put out my speculative ideas with some trepidation, and endeavour to find scholars in the field to back up my, as yet not strictly substantiated, claims.

The Antikythera mechanism uses the old knowledge of the planets developed by Mesopotamian astronomer/ astrologers over many centuries. We can see on the mechanism that on the back face, one of the most important cycles was the 9 year Saros cycle and 18 year Metonic cycle which demonstrated the cycles of the moon, and its eclipses.

One of the main forms of regulating runaway economic growth in Mesopotamia, and later in Abrahamic, Muslim, and Christian religious cultures was the Debt Jubilee. In Mesopotamia, Debt Jubilees, called *misharum*, were associated with the death of the King. When the new King was crowned, all previous debt was null and void. The economy started from scratch. That meant that debt slaves were freed (although slaves from conquest were not), and all existing debt was annulled. The effect of this is to introduce a ‘cyclic periodisation’ of loans rather than the modern form of exponential increase.

However, some Kings had much longer lives than others, so in some cases the death of the King was not frequent enough to keep the delicate ecology of the irrigated land from overgrazing, over-watering, and salinity. Thus, some Kings would announce a Debt Jubilee at

certain times during their reign. Some of the known *misharum* are listed in the box (Hudson, 1993: 8).

The complexities of the planets, sun and moon, were watched closely, and I surmise (and unfortunately the scholarship has not been done as far as I know) that the prediction of an eclipse along with the Saros and planetary cycles, helped Kings to time their *misharum*. The mathematics to predict eclipses was part of the sacred knowledge of the priestesses. It must have been important that the general population not be completely aware when a debt jubilee might occur – or all loans would subside as one was due. And yet without sacred debt jubilees, Mesopotamia would be as susceptible as we are to exponential growth, and the perils it presents in the form of resource exhaustion, pollution, and in our case, greenhouse gas emissions and climate change.

Debt jubilees represent a radical egalitarianism, more far reaching than the Keynesian Settlement, that focuses on guarantees for welfare, education and healthcare, along with the expectation of 2-3% ‘progress’ each year. Cyclic debt jubilees contain no concept of progress, but rather remain tightly affiliated with the carrying capacity of the ecosystem. In those days, they avoided exponential growth by placing wealthy donors at risk of losing their loans every now and then. Debt jubilees reduce everyone back to a level playing field in a far more radical way than has been predicated by modern economics. At the very beginning of loans, accounting, and economics, restricting exponential growth was the aim of good leadership. It demonstrates that the earlier technological *Gestell*, that was built on a cosmology of cyclic seasonal growth was not alienated from the constraints of ecological conditions, but still allowed a sophisticated proto-‘modern’ lifestyle to exist, continuously, for five thousand years.

In contrast, modern technological enframing is alienated from ecological constraints through storage capacity, transport, and global market transactions. When local produce is threatened by climatic disasters, people simply trade their way out of their predicament (Irwin, 2015b). The Keynesian Settlement included legislation to ensure about 2-3% economic growth, that has grown exponentially over time (1933). Consumerism amounts to some 70 billion tonnes of product and with it commensurate amounts of greenhouse gas emissions.

Instead of planned jubilees, modern economics has unplanned, and devastating, economic collapses. The first was in 1929, followed by the stock market collapse in 1987, the housing collapse in 2008, and looming is the stock market futures derivatives bubble that is threatening to burst as I write this (see Graeber, 2011 and Keen 1995 for the connection between debt, economic growth and unpredictable financial collapses).

Attempts to ‘decouple’ economic growth from consumer products (and thus, CO_{2e} emissions) have meant that humanity’s best mathematicians have been developing ever more sophisticated financial mechanisms. These were found in the buying and selling of aggregated mortgage packages, that were described as ‘risk free,’ in the decade preceding the 2008 financial collapse. Lately the futures derivatives market has reached an estimated value of some 1.4 quadrillion US dollars. Given that global GDP is only 70 trillion, the futures market has to be largely built on speculative thin air. Sooner or later, faith in this market has to evaporate and when it does, all preceding crashes will look like a puddle in comparison to an ocean.

In modernity, debt jubilees take on a different flavour. At the turn of the millennium, in the year 2000 the World Bank was persuaded to forgive a lot of ‘third world’ debt, which has

had hugely positive impact on the region. On the other hand, when various banks have collapsed, in Italy, Cyprus, Argentina, and elsewhere, banks have swallowed the savings of thousands of personal savings accounts in a debt jubilee that supported the corporations and left vast numbers of middle class people impoverished in a global consumer context. As John Ozolins pointed out to me,

We already forgive a lot of debt – most of those billionaires whose paper fortunes collapsed during the GFC were not required to pay back anything. Some banks were too big to fail and were propped up by the long-suffering taxpayer. The only debt that does not get forgiven is that of poor people. They lose their houses and through taxes subsidize the rich (John Ozolins, PC, 2016)

Modern debt jubilees no doubt need to be substantively different to the early cosmology of Mesopotamia. Debt jubilees in an age of finance no longer connected to the gold standard is a vastly different situation to the debt owed to moderately wealthy individuals in your own community. The consequences are far less personal. Could it be possible - arguably, by 'resetting' all banks at once, that consequences for the banking industry would be of little meaningful consequence (they would still generate loans, just not deal in such huge monetary numbers). Yet in relation to exponential consumerism, the impact of a financial debt jubilee could be huge. Resetting finance to zero would wipe the need to produce 2-3% more surplus goods on the massive tonnage of consumer items already in circulation.

The days of believing that 'there are no alternatives' to a universal free trade economy are over. The second beginning, climate change, is bringing this fact increasingly to light (Irwin, 2010a, Monbiot, Klein,). The problem of consumerism and exponential growth is unsustainable resource consumption and ever-increasing production of greenhouse gas emissions.

My discussion of the Antikythera mechanism and the Mesopotamian solution to exponential growth is a kind of thought experiment. I hope that these ideas, from the first beginning of modernity, indicate potential ways of maintaining a lifestyle similar to our present day expectations, but without the alienation from ecological constraints that Heidegger alerted us to in his discussion of the consumerist technological enframing of the modern worldview (1977). I am arguing here that it is not technology itself, I believe, that alienates us from ecology. Rather, it is an enframing world view of consumer ethics, that is tied to an expectation of exponential growth and resource extraction, instead of a seasonal cosmology that orientates itself to the solar system, and the earth, that is our home. Debt jubilees are only one element of an integrated cyclic worldview. A subsistence economy as part of a mixed economy is also important to maintaining close contact to the delicate ecology of a particular place and season.

Post Growth and Educational Futures

Education is the site of cultural reproduction and transformation. Thus far, education has been ignored in the climate change discourse yet it is the traditional site for cultural induction and potentially cultural transformation. Yet educational institutions can only achieve this with direction, from sources such as this one.

Education has accepted and promoted the normative concept of economic growth, and tied it to the educational premise of equity and meritocracy.

Climate change exposes how problematic consumerism and exponential economic growth really is. As we become increasingly aware of the dissonance between consumerism, ‘success’ and the health of the environment and the community, education can no longer blindly promote a normative culture of economic success but must seek other markers of meritocracy and value.

Education that engages critical theory of a deep sort, won’t allow the apparent normativity of the dominant discourse of economic growth to continue unquestioned. Education can help students and the population at large encourage and expect governance techniques, policy, and regulations that bring economic growth back to the realm of reality. Continuous exponential economic growth is catastrophic to the relationship of communities with their environment. Exponential exploitation is a travesty, not a solution to the class divide in the unfurling progress of capitalism. Along with an increase in reliance on subsistence economy, techniques such as the sacred jubilee, or debt forgiveness, could become a normal and fundamental element of the financial management of national, sustainable, steady state economics. Having a critical evaluation of economic growth in the classroom is one element of opening the way for changes in governance and lifestyle to take place. Without this critical evaluation of the normative discourse of consumerism and economic growth we cannot transform enough to mitigate climate change, and without these deep cultural changes in expectations we will continue to plunder the planet, cause multiple extinctions, and jeopardise the conditions of life for ourselves and most other species.

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