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MOSES' LAW AND MOORE'S LAW: MORE!

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And when thy herds and thy flocks multiply, and thy silver and thy gold is multiplied, and all that thou hast is multiplied; Then thine heart be lifted up, and thou forget the LORD thy God, which brought thee forth out of the land of Egypt, from the house of bondage. . . And thou say in thine heart, My power and the might of mine hand hath gotten me this wealth. But thou shalt remember the LORD thy God: for it is he that giveth thee power to get wealth, that he may establish his covenant which he sware unto thy fathers, as it is this day (Deut. 8:13-18).

Come ye, say they, I will fetch wine, and we will fill ourselves with strong drink; and to morrow shall be as this day, and much more abundant (Isa. 56:12).

The drunkards who enjoyed their lifestyle had faith in the future. It would be like today, but much more abundant. They believed that they would forever dwell in the same sort of world, and their fortunes would continue to improve. They would experience the joys of economic growth, no matter what their personal habits were. This is the faith of the wastrel who believes that money really does grow on trees, and that he owns these miraculous trees. Furthermore, his unmanaged workers will not find ways to confiscate a growing portion of the wealth on those magical trees.

There is something almost pathetically naive about such a view of the future. The future is supposed to be the same, yet much better. But "better" inescapably means "different." Things cannot get better and also stay the same. There is an unbreakable law of nature: **You cannot change only one thing.** This world is interconnected. It takes enormous faith to believe that change is always beneficial. It takes even more faith to believe that change will be beneficial for me, and that nothing will change in the world around me which has produced all these benefits for me.

Covenantal Sanctions and Feedback

Moses warned the generation of the conquest that the underlying cause-and-effect structure of economic growth is based on the law of the covenant. "But thou shalt remember the LORD thy God: for it is he that giveth thee power to get wealth, that he may establish his covenant which he sware unto thy fathers, as it is this day" (Deut. 8:18). The visible blessings of God in history serve as **covenantal confirmations** for covenant-keeping societies. These blessings are supposed to reinforce men's faith in the reliability of God's covenant promises in history. God had sworn faith to their fathers, Moses said, and the visible external blessings which they and their heirs would

experience in Canaan should increase their faith in God's faithfulness. Greater faith should lead to greater obedience; greater obedience should lead to greater external wealth; and so on, year after year. This is a program of **positive feedback**.

Covenantal sanctions are not always positive. They can be negative. "And it shall be, if thou do at all forget the LORD thy God, and walk after other gods, and serve them, and worship them, I testify against you this day that ye shall surely perish. As the nations which the LORD destroyeth before your face, so shall ye perish; because ye would not be obedient unto the voice of the LORD your God" (Deut. 8:19-20). Isaiah's description of the optimistic drunks was supposed to warn the nation of the consequences of moral rebellion. The good times would not go on indefinitely. Negative sanctions would eventually come. **In the absence of covenantal faithfulness, today's blessings point to a coming period of crisis and judgment.**

Over a century and a half elapsed from the era in which Isaiah preached until the Babylonian captivity of the Southern Kingdom. In the Mosaic timetable, things moved slowly. But the covenantal reality was nonetheless in force. Blessings would not go on indefinitely in the face of widespread moral rebellion.

This raises the question of time perspective. **Sanctions that lie beyond one's time perspective cease to be meaningful.** If a society is short-run in its perspective, this will have repercussions on its ethics.

Time Frames and Progress

Because men today are intensely present-oriented, they consider three or four generations in the future to be irrelevant for their present decisions. The pace of social change is much faster today than it was in Mosaic Israel. Nations rise and fall within the time frame of Isaiah's prophecy and its fulfillment. This has shortened men's practical time perspective.

Meanwhile, there has been a profound lengthening of modern man's theoretical time perspective. Men think more and more in terms of evolutionary time scales. This has been true since the eighteenth century. A century before Charles Darwin, Christians had begun to abandon belief in the six-day creation. The geological strata seem to deny the possibility of a young earth. These long time frames allow men to think as though God has been shoved out of the universe in both directions: past and future.

Men have become short-run decision-makers because they assume that the human race is temporally autonomous. They do not believe that God threatens any society with negative sanctions. They dismiss God as a factor in their practical calculations, since He is too far removed temporally. Moses warned men to consider (1) the long-term inter-generational effects of their beliefs and actions (Ex. 20:5) and (2) the world's

short cosmic time frame (Ex. 20:11). Modern man ignores both warnings.

Belief in long-term economic and technological progress was not common until the seventeenth century. But as God has been pushed away from the present with respect to both creation and final judgment, Western men have grown accustomed to thinking of their own efforts as the exclusive source of progress. The postmillennial optimism of seventeenth-century Scottish and English Puritans was secularized by the Enlightenment: the idea of progress. Humanism's worldview has rested on faith in autonomous mankind's progress and evolutionary time scales.

If the time frame of the universe's origin and its conclusion (assuming that there will ever be a conclusion) really is vast – beyond what man or society can plan for – then man is off the supernatural hook. He deals, at most, with a non-temporal god who exercises authority outside of time and beyond the creation. There is no meaningful supernatural covenant in history. There are no predictable supernatural sanctions, so there is no supernatural law. Law without predictable sanctions is mere opinion.

Social Darwinism and Economic Planning

The Darwinian time frame allows man to remove God from the throne of history and to substitute men, either as **representative economic agents** who compete on an unregulated free market (right-wing Enlightenment humanism) or as **representative political agents** in charge of resource allocation through State coercion (left-wing Enlightenment humanism). Once man is thought to be in charge, men's belief in God's covenantal requirements for long-term economic growth disappears.

The new social Darwinism, unlike the old, believes that elitist experts can plan a better future through State action. Twentieth-century social Darwinism abandoned faith in the earlier vision of an impersonal, highly competitive free market in which men battle for control over resources. The economy is not like a Darwinian jungle, we are told, for man's brain represents a leap in evolution. Man, unlike the beasts, can plan. Therefore, experts should plan for the rest of us. They should be granted the authority to allocate many of society's resources. They will surely do the right thing – the morally right thing as well as the most efficient thing – unlike the amoral or immoral free market, which has no conscious planning agent in charge of the distribution of wealth.

Both the old and the new social Darwinism called for more knowledge, more planning, and more economic growth. The debate was over the best means of harnessing the division of labor: by State power or market competition. God was not in their plans.

Compound Growth

Men want compound economic growth. Compounding raises the question of time and environmental limits. If the rate of growth is slow, then in order for a capital asset to result in extended prosperity, it must go on for decades or even centuries. But if the growth process is not interrupted, eventually the process of compounding will produce a number that approaches infinity as a limit. The upward curve becomes exponential, shooting almost straight up.

Exponential curves eventually end. The population base hits the limits of its environment. Nothing material grows forever in a finite universe. With a rate of 2% growth per annum, any population becomes gigantic in a few centuries. This means that mankind will reach environmental limits to biological growth long before cosmic time runs out – in fact, long before the third millennium after Christ runs out. The limits to growth are reached rapidly in a finite environment. It takes about 25 years for a 3% rate of growth to double the size of the base. This

means the base is four times larger in 50 years, eight times larger in 75 years, and 16 times larger in a century. Like the famous story of the doubling of kernels of corn for each square on a chess board, the world runs out of corn long before the chess board runs out of squares. The compounding process takes longer when the rate of growth is slower, but the end result is the same: the limits to growth are reached.

We live in a finite universe. We are presently restrained in our little corner of the universe by the speed of light. There are other limits, such as the cost of space travel. We are tied to this earth for the time being. This makes our environment highly constricting.

The compounding process is a product of three factors: the original base, the rate of growth, and the available resources. Think of the growth process as a snowball running down a hill. The larger the original snowball, the sooner it reaches maximum size. The faster it is rolling, the sooner it reaches maximum size. The amount of snow on the ground, the steepness and length of the hill, and the physical properties of the snow all limit the growth of the snowball. At some point, it will stop rolling. It runs out of snow, runs out of hill, or gets too large to move.

The various zero growth movements argue that we are running out of resources – “snow” – and therefore we should do what we can to slow down the snowball before it absorbs all the snow in its path. A big snowball is not efficient, they argue. It is wasteful. It is better to spread the snow around. Forget about additional snowfall. Forget about letting the snowball stop by itself. It will go over a cliff, we are told, carrying all that valuable snow with it, crushing all those who get in its way. These groups are an exception to the Enlightenment's optimism. They understand that nothing compounds forever. Growth must eventually cease. They want to control this deceleration process by statist law.

Infinite God, Indefinite Limits

God is infinite. Thus, mankind's knowledge of God can never reach any limit. In this sense, there is no limit on man's knowledge. There are limits on knowledge in every time period, but in a world of limitless time and an infinite God, mankind could never reach a limit to knowledge.

This does not mean that man's knowledge can ever be infinite. Man cannot become God. There is a crucial distinction between God's infinitude and covenant-keeping man's dominion covenant, which involves an eternal increase in knowledge. This is the theological distinction between the Creator and the creature, between man's subordinate eternal temporal extension and God's original eternality. Mankind's existence is always analogous to God's existence. Man will experience eternity as a creature, not as Creator. God's temporal infiniteness is of a greater order of magnitude than man's. He got here first.

God is infinite in both history and eternity. This raises an interesting question: Is man's knowledge in history inherently unbounded by anything except time? Put differently, is there any environmentally fixed limit to the increase of mankind's knowledge through history? The biblical answer is: “Only eschatology.” As a species, we will run out of time before we run out of opportunities for increased knowledge. **Only when mankind runs out of time will the growth of mankind's knowledge cease in history.** Men will then move into eternity, which is qualitatively different from today's bounded time: in the curse-free New Heavens and New Earth (Rev. 21:1) and in the grace-free lake of fire (Rev. 20:14-15).

This raises another question: Must the argument for the limits to physical growth apply in the realm of knowledge? No. The possibility of compound knowledge is implied by Psalm 119: “O how love I thy law! it is my meditation all the day. Thou through thy commandments hast made me wiser than mine enemies: for they are ever with me. I have more understanding

than all my teachers: for thy testimonies are my meditation. I understand more than the ancients, because I keep thy precepts" (Ps. 119:97-100). The limits on our knowledge are primarily temporal. Given more time, we can increase our knowledge.

But aren't there limits to mankind's collective intelligence in history? Yes; man cannot become God. Man cannot achieve omniscience, but this is not the same as saying that there are permanent environmental limits on man's knowledge in history, other than time itself. The division of intellectual labor continues to add to mankind's knowledge.

Moore's Law

Then what about information? Is it also inherently unlimited? Yes. Furthermore, the price of information is dropping faster than the price of anything in man's history. Gordon Moore, co-founder of the Intel Corporation, observed in 1965 that the information storage capacity of each new generation of computer chips doubles every two years. So far, he has been wrong; it has doubled every 18 months. George Gilder has argued in his book *Microcosm* that Moore's "law" is a true law, not just an observation. He says this is true because computer chip technology has moved the most crucial part of man's economic environment - information - into the subatomic realm of quantum mechanics, a realm that is governed by forces that are beyond the known laws of physical cause-and-effect. Here, he says, there are no limits to growth. **There are no inherent limits to computer chip capacity, no law of diminishing returns.** This opens up the technological possibility of the unbounded growth of knowledge - or at least data - in history.

Let us pursue this idea. If the computer chip doubles in capacity every 18 months, then sometime before the middle of the twenty-first century, the information storage capacity of one chip will equal the estimated capacity of the human brain. Then, 18 months later, the chip will be double the brain's capacity. It will be quadruple in another 18 months, and so on. In short, we seem to be facing a real-world application of the mythical story of the chess board, except that in this case, we won't run out of "corn." The only limit is the number of "chessboard squares," i.e., 18-month units of time.

But how can men continue to design these ever-more complex chips? Won't we run out of human intelligence? Maybe men will, but what about computer-aided chip design? It is already here. **At some point, chips will do most of the work of designing the next generation of chips.** This points to the science fiction scenario of a world run by computers. They, not men, will be "smart" enough to design new chips. They will become creators. While I do not believe that chips will ever attain consciousness, there is this problem: **in the vast complexity of these designs, undetected by men, supernatural beings may operate.** Do angels operate in the realm of the quantum? If not, why not?

The famous medieval debate topic about the number of angels that can dance on the point of a needle may turn out to be highly relevant in the twenty-first century. It was a debate over the corporeality of angels. If there really are angels, then this is also the issue raised by Gilder's view of Moore's law. He is arguing that the computer chip - corporeal - is a physical bridge between man's cause-and-effect atomic world and the non-rational, merely statistical, subatomic realm of the quantum. Our rational realm of information will become progressively dependent on the efficiency of this technological bridge. But bridges can be crossed both ways. What dwells in the microcosm?

These disturbing philosophical and theological questions will cease only if: (1) there are inherent physical limits to computer chip design; (2) there are inherent limits to capital available for chip production; or (3) time runs out. The second factor seems

to be the most compelling limit today: the cost of building a computer chip factory. But if chips will soon be designed and manufactured by chip-controlled, small-scale production processes, this limit might be overcome or at least postponed until chips are very powerful.

If today's rate of increased chip capacity continues, my grandchildren will live in a world in which a man's brain will be dwarfed, digitally speaking, by one tiny computer chip. Men think analogically, not in terms of ones and zeroes, but will "fuzzy logic" programs or advanced neural logic programs enable the digital design of chips to imitate men's thinking? Cynics argue that the slowness of computer software will always offset the increasing speed of chips. Or, as the phrase goes, "What Intel giveth, Microsoft taketh away." But the day will come when chip-based software will write software code. Maybe software will at last match the power of the hardware.

So far, the expansion of chip capacity has revealed what appears to be **a realm in which the law of diminishing returns does not apply.** If this continues to be true, the world in which mankind has lived will soon become unrecognizable.

Overcoming the Curse of Scarcity

The negative sanctions of sweat and thorns have burdened mankind since Adam's fall. The lure of economic growth is the lure of minimizing these limits. In its demonic form, this is the lure of transcending these limits in history. The compound growth process that has operated in the West for over two centuries has placed before man a vision of unlimited wealth. But there are always limits to wealth. Wealth is always comparative: "What do I possess compared to what I want or compared to what my neighbor has?" The tenth commandment, "Thou shalt not covet thy neighbor's. . .," will be operative throughout history.

Man's capacity for wanting more has always outstripped his ability to increase his wealth. Man's desire for more pleasures, lower costs, and faster service has more than kept pace with the increase in per capita output. *Forbes Magazine* (Sept. 23, 1996) quotes Art Buck: "You are financially secure when you can afford anything you want and you don't want anything" (p. 256). But this ignores the future: maybe you will want something some day. Maybe you will not be able to afford it. Uncertainty cannot be avoided in this life. Man's solution: "More!" Men serve Mammon, the would-be infinite god of "More!"

The point is, man's capacity for outrunning his income has always kept pace with economic growth. Must this be true forever? Is there a possibility for mankind to be satiated? With every new product comes the possibility of a "new, improved" version. Man is made in God's image. **Therefore, covenant-breaking man's satiety can never be reached, for God is infinite, and covenant-breaking man wants to become like God.** Man's capacity for consuming additional scarce economic resources will never end. In contrast, his ability to manage faithfully what he owns is always in question. Covenant-breaking man's quest for omniscience and limitless wealth is demonic, for man can never become God. Nevertheless, the desire for more knowledge is legitimate, and in fact is mandated by God as a means of dominion (Gen. 1:26-27). More knowledge does not necessarily imply infinite knowledge. It implies only the exponential curve, which approaches infinity (God) as a limit, but never reaches it.

The Exponential Curve of Knowledge

The question is: "Knowledge for what purpose?" There are covenant-keeping purposes. The prospect of ever-growing knowledge is a wonderful one: better to explore the infinite God and His works. The desire for ever-expanding information is not inherently illegitimate, but the desire for more knowledge in

order to replace God's knowledge is demonic. The dividing issue, as always, is covenantal faithfulness.

There are positive covenantal sanctions in history. There are also negative sanctions. The exponential power of the computer chip seems to present a brave new world of compounding information. But information is not a legitimate substitute for biblical wisdom: the knowledge of God's law.

This being the case, what can we safely say regarding Moore's law? This: **Moore's law is not a law in a world dominated by covenant-breakers.** It is at best a temporary description. There are limits to computer power; if not physical limits – the realm of the quantum – then surely covenantal limits. The computer chip is becoming modern man's version of the Tower of Babel: "And they said, Go to, let us build us a city and a tower, whose top may reach unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth" (Gen. 11:4).

This presents us with a problem. We cannot see what will reverse Moore's law. The chips do continue to get more powerful. The computing power available to us does keep increasing. **Therefore, so does our responsibility.** "For unto whomsoever much is given, of him shall be much required: and to whom men have committed much, of him they will ask the more" (Luke 12:48b). The limits of growth are always covenantal. This includes limits on our knowledge.

As the degree of mankind's responsibility increases with the knowledge imparted by the power of the chips, society faces a problem: a growing snowball of rebellion. There are costs attached to rebellion. These costs accumulate – compound, if you will. "But in the fourth generation they shall come hither again: for the iniquity of the Amorites is not yet full" (Gen. 15:16). There are two ways for this degree of rebellion to be dealt with: by repentance and by comprehensive negative sanctions. The exodus is the model of the latter. The accumulated sins of the slave-holding Egyptian oppressors came due overnight.

Reversal or Revival

There will be a great reversal or a great revival. Today's world of compound economic growth cannot go on indefinitely. Neither can the accumulation of knowledge. While it may look as though knowledge can be compounded, even though physical output cannot be, this is an illusion. Knowledge is not free. The cheaper it becomes, the more of it will be demanded. As the spread of knowledge through the Internet increases men's responsibility, mankind will become dependent on this technological miracle. As the spread of evil accompanies the spread of knowledge, only one thing can head off worldwide judgment: the spread of the gospel through the same technology. Knowledge is not neutral. "Unto the pure all things are pure: but unto them that are defiled and unbelieving is nothing pure; but even their mind and conscience is defiled" (Titus 1:15).

We are in a race. It is a race against time. Six billion souls are on earth today. Their covenantal commitment will determine the limits of growth. It is also a race against the compound growth of sin. The sins of the Amorites eventually filled up. So had the sins of the Egyptians a generation earlier. There is no such thing as a free lunch. "For what shall it profit a man, if he

shall gain the whole world, and lose his own soul?" (Mark 8:36). Lower costs may reduce the **burden of scarcity** if men's appetites do not match or exceed their wealth, but lower costs do not reduce the **burden of personal responsibility**. On the contrary, lower costs increase this burden. The despair of modern man in the midst of plenty is a recurring theme in modern literature and modern social science.

There are two things that can happen to a covenant-breaking society's capital: destruction or transfer of ownership. The transfer takes place when another society inherits. **But because of the gospel, this covenantal transfer can take place through mass conversion.** A new society inherits the wealth of the old society. This is the meaning of conversion: redemption, i.e., buying back. Jesus Christ has redeemed this world. This means that those who are covenanted to Him will progressively inherit what He definitively purchased for them at Calvary.

Society is now on a collision course: growth vs. rebellion. We are seeing, as never before, the replaying of the Tower of Babel. Either the Mammon-worshipping masses will switch their covenantal allegiance or else their tower will be destroyed. (It is ironic, and perhaps even prophetic, that most microcomputer chips today are housed in "tower cases.") The world-transforming gospel of Moore's law will not be sustained if covenant-breaking men continue to ignore Moses' law, which in turn points them to the world-transforming gospel of Jesus Christ. There is only one sure road to **more**: Christ. There will be either a great revival or a great crash: the ultimate hard-disk failure.

Conclusion

The prospect of wealth for all is tied to the prospect of the gospel in history. The modern vision of compound economic growth, which had its origins in seventeenth-century Puritan postmillennialism, is a snare and a delusion if separated from the Puritans' covenant theology. Wealth-creation is not autonomous. The secularization of the Puritans' postmillennial vision has led to a culture-wide error: the idea of autonomous progress. "My power and the might of mine hand hath gotten me this wealth. I will fetch wine, and we will fill ourselves with strong drink; and to morrow shall be as this day, and much more abundant." Men have inebriated themselves with this vision for three centuries.

The existence of compound growth of material output points to the end of history. Nothing material grows forever in a finite world. Either history ends or material growth does. The faster the rate of growth, the sooner one or the other event will take place. Also, the existence of the compound growth of knowledge points to the end of history. With every increase of mankind's knowledge comes an increase in our covenantal responsibility. Eventually, the buck stops here – in history.

The practical question is this: How can today's international society sustain compound economic growth until the end of history? The answer is eschatological: through social transformation based on the worldwide spread of the gospel.

Moore's law is evidence that the sanctions are coming: positive for covenant-keeping or negative for covenant-breaking. Society will experience either a great reversal or a great revival. Let us pray for revival.

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