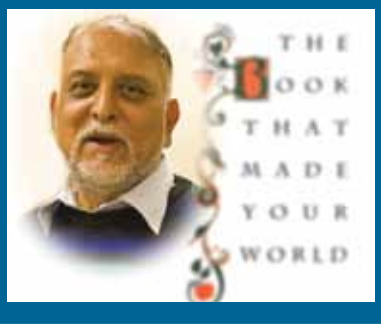
Technology: why did Christians develop it?



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When I visited Jinja, Uganda in 2000, I stayed on the shores of Lake Victoria – the world's second largest freshwater lake. Observing hundreds of women and children hauling water on their heads, I was struck by a puzzling question: Why were women staying near an abundant source of water and electricity, carrying water on their heads, morning and evening, 365 days a year?

Were they unaware of pumping technology? That couldn't be the case, because across the fields from my residence was an industrial complex that pumped water to 2,000 homes directly from Lake Victoria.

I found it difficult to respect a practice that forced women to engage in this drudgery while many men sat and played cards. Using their muscles to bring water was not merely a waste of billions of hours of labour; it also meant that families did not bathe enough, flush enough, or wash enough. These practices lead to easily avoidable diseases. It means further time and resources are wasted to cure illnesses. It condemns a whole people to work at a fraction of their energy. It produces stunted women and children who have less time than others to play, learn, and be creative. It epitomises the callous rule of a community.

Mind over muscle...?

My Jinja experience raised the questions: Why don't American women haul water on their heads? Why did Western people begin using their minds to do what most cultures used their muscles to do?

Neither Africa nor India lacks ingenious minds. The Egyptians living along the Nile built the pyramids while barbarians inhabited Western Europe. The problem was that the engineers who made pyramids to honour the bones of kings and queens did not bother making wheelbarrows for their slaves.

It is fashionable to reject technology. Mahatma Gandhi opposed it, and the city of Jinja has erected a huge statue to honour him. The problem is that the cultures that reject technology end up forcing human beings to get their water, grind their grain, and even to clean their "dry latrines".

Aldous Huxley, a distant devotee of Mahatma Gandhi, blamed Christianity for the ecological crisis of the modern world. He believed that technology developed in the West because, according to the Bible, God commanded human beings to establish their dominion as stewards over the earth.

Huxley's viewpoint began to be taken seriously after Lynn White Jr, a professor of history at Stanford, Princeton, endorsed it in an article in *Science* magazine.[1] White's historical research was impeccable. His interpretation of the sociology of technology seems right. He makes a valid criticism that Western civilisation, including the church, has often affirmed man's value at the expense of nature's value.

Nevertheless, it is usually the case that pollution kills far more people in technologically less advanced, non-biblical cultures. Cultures that can't pump water into their homes can't flush their toilets. In India, the lack of running water led to a shameful Hindu practice that embarrassed Mahatma Gandhi (but is still practised): forcing untouchables to carry others' excreta in a container on their heads.

Why did Western people begin using their minds to do what most cultures used their muscles to do?

Technology: fruit of a biblical worldview

Technology is a fruit of a biblical worldview. The Bible says that the human heart and mind have been corrupted by sin. Therefore, some of our choices are destructive. Even choices made in good faith can turn out to be harmful to nature and ourselves. Sin makes human authority dangerous in all spheres: familial, social, intellectual, political, religious, as well as environmental. Yet, you can't have creativity without authority. Every creator has authority over his creation. Every creator can delegate that authority to his children – even if they have the potential to abuse it.

There is no doubt the human creativity that results in technology has been abused. In most cultures, the ruling elite patronised technology if it made them stronger than their enemies. They welcomed technology for war, pleasure, prestigious monuments, and the oppression of their people. Only one culture has promoted technology for general welfare and for liberating and empowering the weak. Professor Lynn White Jr. thoroughly documented that humanising technology came out of biblical theology:

The humanitarian technology that our modern world has inherited from the Middle Ages was not rooted in economic necessity; for this necessity is inherent in every society, yet has found inventive expression only in the Occident [that is, the West], nurtured in the activist or voluntarist tradition of Western theology. It is ideas which make necessity conscious. The labour-saving power-machines of the later Middle Ages were produced by the implicit theological assumption of the infinite worth of even the most degraded human personality, by an instinctive repugnance towards subjecting any man to a monotonous drudgery which seems less than human in that it requires the exercise neither of intelligence nor of choice.[2]

The role of culture in technological development

The development of the watermill illustrates that culture is as important for the development of technology as ingenuity is. In 1935, Marc Bloch published his finding that the watermill had been invented at least a century before Christ.[3] Later, its usefulness for grinding grain was known in Afghanistan, on the border of geographic India. Almost everyone needed to grind grain, yet the use of the watermill never spread in Hindu, Buddhist, or Islamic

cultures. Christian monks in Europe were the first to begin the widespread use of the watermill for grinding and for developing power machinery.

Technological progress in the Western Middle Ages

Marburg historian Ernst Benz, said that "Christian beliefs provided the rationale, and faith the motive energy for Western technology."[4] Benz had studied and experienced Buddhism in Japan. The anti-technological impulses in Zen led him to explore whether Europe's technological advances were somehow rooted in Christian beliefs and attitudes. His research led him to the conclusion that the biblical worldview was indeed the key to understanding Western technology.

Christendom pioneered technological creativity because the Bible presented a God who was a Creator – neither a dreamer nor a dancer as Indian sages believed. God was the *architect* of the cosmos. He shaped man out of clay as a potter does, making man in his own creative image and commanding him to rule the world creatively.

Matter for a spiritual purpose

Jesus Christ's incarnation in a physical body and his bodily resurrection instilled into Christian philosophers the unique idea that matter was created for a spiritual purpose. Adam was created to take care of the earth, not to despise it or try to transcend it.[5] Benz realised that the Judeo-Christian view of reality and destiny produced and nurtured technology in four ways:

1. The Bible emphasised intelligent craftsmanship in the world's design.
2. The Bible suggested that human beings participate in divine workmanship by being good artisans themselves.
3. The Bible taught that we follow divine example when we use the physical universe for righteous ends.
4. The Bible challenged the West to use time wisely, because each moment is a valuable, one-time opportunity.[6]

Many scholars have reinforced, expanded, and qualified this thesis. For example, Robert Forbes of Leyden and Samuel Sambursky of Jerusalem pointed out as early as 1956 that technology arose because Christianity destroyed classical animism. The Bible affirmed the existence of spirits. It "secularised" the physical universe, however, by teaching that human beings, not spirits, were meant to rule over nature.

That worldview made it possible for the West to use nature rationally for human ends – though it is true that many in the West have abused technology to exploit nature in unjust or irresponsible ways.

Christian compassion

Biblical cosmology was not the only force behind the rise of the West's humanitarian technology. Christian compassion was an equally important factor. Christian spirituality has emphasised compassion, service, and liberation far more than the need to establish human dominion over creation.

Scholars have qualified Benz's thesis because not all versions of Christianity developed equally strong traditions of technology. Technology found a more fertile soil in the Western Latin church than in Eastern Greek Christianity. Some have suggested that the difference was that the Greek church tended to see humanity's problem as ignorance and therefore saw salvation as illumination. This view encouraged Greek saints to become contemplatives. Western saints, by contrast, tended to be activists, because they saw sin as vice – rebellion. The biblical idea of new birth included a reorientation of the will to do good works. This moral activism combined with a strong biblical work ethic proved conducive to promoting humanising and liberating technology.

Why did Christian monks develop technology? Why didn't Buddhist monks?

The curse of toil

The question is, *why did Christian monks develop technology?* Why didn't Buddhist monks? The Buddhist monks did not lack creative genius. In Afghanistan they excelled in architectural feats, such as constructing the enormous statues of the Buddha at Bamiyan, which lasted for a millennium before the Taliban destroyed them.

The Buddhist and Christian monks shared one problem in common: they could not take wives to grind their grain. A crucial difference between the two was that Buddhism required monks to beg for their food, whereas the Bible required Christians to work for theirs. The apostle Paul wrote that a person who did not work should not eat.[7] St. Benedict, who made the European monastic movement different from other religious traditions, paraphrased Paul, saying, "Idleness is an enemy of the soul".[8] To work was to be like God, because the Bible's God was a worker. He worked for six days to create the world and rested on the seventh.[9]

Benedict's followers accepted the dictum that work is prayer, but they also felt a tension. They had come to the monastery to pray, not to grind grain. The theological factor that resolved their tension and drove technology was that the Bible distinguished "work" from "toil". To work was to be like God, but toil was a curse on human sin.[10] Toil was mindless, repetitive, dehumanising labour. This distinction enabled Christian monks[11] to realise that human beings should not have to do what wind, water, or horses can do. People must do what other species cannot do – use creative reason to liberate human beings from the curse of toil.

"Applied science" or "applied theology"?

The popular misconception that "technology is applied science" keeps people from understanding that "humanising" technology is a peculiar product of the Bible. White wrote:

It is astonishing to our twentieth century minds how little impact Galileo and his circle had upon the technology either of their own time or of the following two hundred years. Until the seventeenth century, European technology had been both more sophisticated than European science and little related to that science.[12]

Historian Jacques Barzun tells us that science and technology merged only in AD 1890, after chemist Sir Alfred Mond persuaded a group of businessmen to take advantage of what we now call Research and Development. Only then did industry begin hiring scientists to find processes that engineers could embody in machines and appliances.[13]

Western technology is not a result of the Industrial Revolution. The Industrial Revolution was a result of the Western "invention of invention". Also, Western technology predates Western science by at least five centuries. The West became the global technological leader long before the birth of modern science:

The chief glory of the later Middle Ages was not its cathedrals or its epics or its scholasticism: it was the building for the first time in history of a complex civilisation which rested not on the backs of sweating slaves or coolies but primarily on nonhuman power.[14]

The collapse of the Roman Empire led to the Dark Ages, with political disintegration, economic depression, the debasement of religion, and a marked decline in literary, philosophical, and scientific pursuits. It was in the midst of that very darkness, however, that Christianity began revitalising the human spirit. One expression of this renewal was the origin of liberating technology. Its uninterrupted development has been traced from the eighth (possibly sixth) century to our day.[15] By contrast, the philosophical foundations of modern science were laid only in the 14th century,



Inventions driven by a biblical worldview (L to R): the wheelbarrow, the mechanical clock and eyeglasses

and science took off only in the 16th. Technological innovations took place in Christian monasteries, whereas science grew in Christian universities.

It is true that the Christian West used its technological superiority to colonise much of the world, and that technology has created serious dangers for humanity. However, it is ideological blindness to ignore the fact that technology functioning within a biblical framework has been one of the chief instruments of human emancipation. Let me give you a few examples:

The wheelbarrow and the flywheel

The wheelbarrow may have been a Chinese invention. If so, why did China's Hindu and Muslim neighbours fail to see its socioeconomic potential, cutting in half the number of labourers needed for hauling small loads by substituting a wheel for the front man of the handbarrow? It was not until the later part of the 13th century that the use of the wheelbarrow became popular in Western Europe. Ever since then, wheels have been displacing men everywhere, except in cultures where some human beings are deemed less human than others.

Whereas the wheelbarrow replaces a labourer, the flywheel multiplies the power of a labourer. A flywheel stores rotational momentum, which makes better use of fluctuating energy. It makes it possible to pedal a bicycle once and get the wheel to rotate many times. This ingenious invention first appeared in a book called De diversis artibus (1122–23) by Theophilus, a technologically oriented theologian and Benedictine monk. His book was motivated by his faith. It codifies the skills needed to embellish a great church for the glory of God. These skills that became the key to the economic success of the West came out of religious motivations.

Some people express their opposition to machines for pragmatic reasons; for example, new machines produce unforeseen consequences, such as causing unemployment or damage to nature. However, often the suspicion also has a philosophical dimension. What is the ultimate meaning of technology? Innovating for economic reasons is a relatively new phenomenon. Most inventors remain poor even today. Inventing new technologies requires tremendous dedication, intense labour, and many failures and frustrations. Why bother?

The Bible solved this problem for Theophilus. He did with technology what Augustine did with music. Technology was not just useful for him; it was also meaningful. Its purpose was to use human creativity for the glory of God and for the service of the weak.

The absence of that worldview prevented Indian monks from developing technology.

The mechanical clock

The mechanical clock provided the nursery of mechanical engineering in the West. Non-biblical cultures did not create mechanical clocks partly because they did not value time in the same way as cultures shaped by the Bible did.

An interesting fact about the clock is that the core idea seems to have come from the Indian mathematician Bhaskaracharya's view of perpetual motion described in *Siddhanta Shiromani* (AD 1150). Muslim scholars discussed his compelling thesis for five decades after him, and then Europe's intellectual leadership discussed it for an additional fifty years.

Finally, in his influential work De Universo Creaturarum, William of Auvergne, bishop of Paris from 1228-49, put forward the suggestion to make a clock by putting these abstract mathematical notions to a practical use.

Why would a religious leader take such a keen interest in developing an instrument as mundane as the clock? In his fascinating study *Revolution in Time,* David Landes argues that clocks were invented because monks needed them.

The monks gathered for communal prayers seven times a day, including before sunrise and after sunset, when the sundial was of little use. Communal prayer required everyone to keep the same time. Hence the clock became a key instrument.

Practically, the monks needed to work and also to save time to pray. *Religiously*, they needed to work as a body, supplying one another with what was needed at a given time. They were also required to follow the divine pattern of finishing their work on time and resting on days mandated for rest.

The Bible-shaped culture made time management an aspect of establishing human dominion over the physical universe because the Bible saw time as a part of physical reality.

By contrast, in Indian culture, time was perceived either as an eternal but terrible god (Kai) or as a part of the cosmic illusion *(maya)*.[16]

India had religious communes and genius inventors. Why, then, did we fail to develop clocks or an indigenous tradition of mechanical engineering?

We lacked the biblical worldview and did not see the universe as an intelligent creation. We saw it either as divine or as a dream, but not as a real creative product of intellect, will, and work.

Because of this worldview, our monks did not spend intellectual energy to master and manage time. They spent their years finding ways to escape the endless wheel of time (*Samsara*) through mind-emptying meditation.

Their goal was to escape work, not to make it easier. They did not need clocks because they were seeking escape from social obligations; they were not seeking salvation from the curse of toil through communally synchronised economic enterprise.

Eyeglasses

Eyeglasses turned clock making and repairing into a revolution, speeding up mechanical engineering. Our first information about the invention comes from a sermon on repentance preached at Santa Maria Novella in Florence on February 23, 1306 by Dominican Fra Giordano. As in the case of clocks, the monks were the main patrons of eyeglasses. They needed them to study, especially to study the Bible.

Eyeglasses doubled the productive life of Western scholars and craftsmen. Because of eyeglasses, Christian monks in the West were able to spend their mature years poring over texts and technologies, giving birth to the Renaissance.

The opposite happened in India. Our monks did not develop technical aids to improve eyesight. They took pride in closing even perfectly good eyes in meditation. Even today our yogis "fly" to distant galaxies in "out-of-body" experiences. The Maharishi Mahesh Yogi, the promoter of Transcendental Meditation in the West, popularised one of the yogic techniques of levitation through meditation in corporate America.

Why would anyone invent airplanes if he can fly using daydreams?

Eventually the West succeeded in developing the technology to fly, while monks in the East continued to try to meditate, levitate, and fly.

God made Adam a living soul

Technology is integrating mind and muscles. It is breathing reflection (soul) into physical action (matter). That, according to the Bible, is the essence of man. Adam became a living soul when God breathed his Spirit into a material body. Technology develops when people who use their muscles are also allowed to develop their minds and have the leisure to use them.

Technology did not develop in the ivory towers of universities, but in the humdrum of Christian monasteries. Why?

Medieval technology did not develop in the ivory towers of universities, but in the humdrum of the economic life of Christian monasteries. Why?

Monasticism (as distinct from earlier asceticism) began as a reaction against the corrupting influence of Greco-Roman thought in the Christian church, especially the attitude that manual work was low class. Although this corruption eventually crept into the monasteries, initially the monastic movement was a quest for authentic, biblical Christianity. It followed the Bible in exalting the virtue of manual labour, as well as in cultivating a love for God's Word.

The Greco-Roman world was not alone in looking down upon manual work. That attitude was common throughout the ancient world. The God who liberated the Jews worked for six days and commanded human beings to do the same. That is the opposite of Hindu tradition, which conceives of God as a meditator or *Yogeshwar* (god of Yoga). It is virtually impossible to find a Brahmin guru in traditional India who resembles the apostle Paul – a rabbi who made tents for a living.[17] Brahmins said that manual work was the duty of lower castes, a result of bad karma from their previous births. Mahatma Gandhi was the first Indian leader who used a spinning wheel to try to import the Pauline work ethic into India: "No work, no food".[18]

Evil is in our hearts, not in technology.

The German monk whose biblical outlook effectively freed Christendom from the dichotomy of hand and head was Theophilus – a skilled metallurgist, a general craftsman, a stylish writer, a nimble exegete of Scriptures, and an up-to-date theologian. His work, *De diversis artibus*, which explains the flywheel, is the first major document on the history of technology. Prior to him, craftsmen in most cultures did not know how to write because none were trained as scholars. Those who wrote were not interested in technical issues.

The chief concern of Theophilus's book is the place of technology in the spiritual life of a monk. He cared only for the praise of God and nothing about the world beyond the cloister. At first this isolation from the "secular" world seems odd for a man with such practical gifts, until one realises that it was this very isolation from the world that enabled him to become more biblical and less worldly – that is, less influenced by the anti-labour, anti-technological snobbishness of classical Greco-Roman Europe and the corrupted Latin church. A passion for the glory of God kept technology from becoming an idol, a false and destructive god.

Gandhi: the evil of technology

If modern technology was a force for humanisation, then why do some postmodern critics condemn technology as a dehumanising force? During the previous millennium, biblical Christianity replaced a pagan world ruled by spirits, with a "secular" world stewarded by human ingenuity and technology. Today, many in the post-Christian West view machines as evil spirits. Hollywood, for example, is producing a whole genre of movies inspired by the idea that the human problem is not a conflict between good and evil, but between humanity and machines. Among the most popular of such movies are the *Matrix* trilogy, the *Terminator* series, and several episodes of *Star Trek*. Films such as *Crouching Tiger, Hidden Dragon* exalt the magic of Buddhist meditation rather than technological innovation. They ignore the fact that the historically proven wonder of the mind is technology, not meditation that empties one's mind.

Gandhi's idea that technology was evil and that a simple, natural life was morally superior came from British idealists like John Ruskin. Sensitive people like him had become critical of England's Industrial Revolution because of the exploitation, oppression, and other evils associated with its "dark satanic mills". Mahatma Gandhi brought this opposition to technology to India. Fortunately, Gandhi's younger follower Pandit Jawaharlal Nehru, who also studied in England and became India's first prime minister, knew that non-industrial societies can be just as wicked as their industrial counterparts. Evil is in our hearts, not in technology.

Nehru also knew that England's Christian conscience had struggled to minimise the evils of the Industrial Revolution. It turned industry into a blessing rather than a curse. Nehru led India away from Gandhi's emphasis on handlooms to mechanisation and industrialisation. In 2003, the Indian government approved a manned mission to the moon. Wise or unwise, successful or disastrous, the mission will be a symbolic climax of a national decision to overturn Gandhi's rejection of technology.

Conclusion: biblical liberation

Ability alone does not produce liberating technology. Jesus said people are like sheep, in need of good shepherds. Without shepherds, slavery will remain the norm – from the women in Jinja to the untouchables in India. Non-biblical cultures need more than technology; they need a philosophy that values people. Technology is indeed secular: a person of any faith or no faith can develop it and use it.

Only a society with a theological climate that values human dignity begins using technology as a force for human emancipation and empowerment.

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7. 2 Thessalonians 3:10.
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9. Genesis 1:3-2:2.
10. Genesis 3:17-19.
11. Not Christian ascetics, but the Benedictine monks who took vows of personal poverty, yet believed that work and economic productivity were a divine obligation.
12. *Ibid.*, 131.
13. Jacques Barzun, *From Dawn to Decadence*, 2001.
14. White, *Medieval Religion and Technology*, 22.
15. For further discussion see Angels in the Architecture by Douglas Jones (Moscow, ID: Canon Press, 1998). The authors argue that the Dark Ages weren't "dark" but were actually a beginning of a culture molded by the Bible. Critics may find some romanticising of the Dark Ages, but the authors do bring up fascinating points generally ignored by scholars.
16. Hollywood actress Shirley MacLaine effectively introduced the Indian concept of time to Western readers. See her concept of eternal "nowness" in her book *Going Within* (NY: Bantam Books, 1989).
17. Acts 18.3.
18. 2 Thessalonians 3:10.