PERKEMBANGAN SAINS DAN TEKNOLOGI DARI PERSPEKTIF ETIKA KEHIDUPAN MANUSIA

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Introduction

Science and technology are seen as a prime thing in human life since entering the 21st century. Its development is advancing as the cost of using technology becomes more affordable and commercialised in line with human life. Perhaps the presence of technology in ancient times did not have a balanced ecosystem to support. Today, the rapid development has even become a race between developed countries such as the United States and Japan.The various benefits derived from the effects of development on human life. In addition, the results of its development have contributed to the advancement of the healthcare industry globally. Various new drugs and treatments can be developed to treat patients with various diseases. It also helps in preventing infectious diseases from spreading and sacrificing thousands of human lives as in the past. Today, it has made the medical laboratory an important institution for humans to study and find cures for diseases that harm human life. In addition, the results of its development have contributed to the advancement of the healthcare industry globally. Various new drugs and treatments can be developed to treat patients with various diseases. It also helps in preventing infectious diseases from spreading and sacrificing thousands of human lives as in the past. Today, it has made the medical laboratory an important institution for humans to study and find cures to diseases that harm human life. In addition, collaboration between science & technology also contributed to self -health observation when smart watches were successfully created. The wearer of this watch can see the heart rate which gives an indication of the level of health of an individual. If every individual can use this watch and take care of their health on their own, it can definitely give birth to a healthy and prosperous society. Although , various health benefits that we get as a result of the development of science & technology. Conservation and preservation of the environment can be realised with the development of science & technology. Every day we are broadcast with news of natural disasters that befall certain areas such as natural forest fires, landslides, flash floods and unusual storms. Scientists have already stated over the past few years that the world’s ecosystems are becoming unbalanced on deck because human greed is pursuing development without thinking about its effects. Industrialization, garbage disposal and various other problems that contribute to global warming as well as the greenhouse effect that disrupts the earth's ecosystem. So, science & technology is the saviour of the human species if it wants to continue to live on this earth. The creation of environmentally friendly technologies and alternatives to renewable resources need to be supported so that non

-renewable natural resources are not destroyed. For example, the use of electric cars that reduce carbon emissions and use renewable energy. Ultimately, the development of science & technology is important in maintaining the natural treasures that we have today for the sake of the future because today's generation is only riding on the resources and treasures that the next generation has.

Issues

1) The Relationship Between Science, Technology, And Human

Understanding the role of science and technology in the context of Muslim human beings is the most significant problem here. Muslims want to live a life in which they are completely loyal to Allah. They believe that nothing can happen without Allah's permission, but that people have free will. The angel Gabriel, according to Islam, delivered Allah's word to the prophet Muhammad. As a result, everything a person does has ramifications for their relationship with the Creator. This also suggests that whatever one does in daily life reflects a grasp of one's responsibilities and obligations. Activities involving science and technology are included in the activities, which are not limited to the confines of worship in the form of rituals.

All activities and studies linked to science and technology for a Muslim scientist must be in accordance with Islamic teachings' essential principles. When science and religion were separated, problems occur. As a result, understanding the relationship between creation and nature is important in the context of the Muslim individual, and it is an issue that must be considered by everyone.

2) Systems And Practices Of Science And Technology

Commercialization of scientific and technological research results is one of the major issues in science and technology. This occurs when the majority of those who fund scientists are preoccupied on product development. This activity frequently contradicts scientists' stated objectives, which are to focus on the advancement of scientific and technological knowledge.

3) Islam and Biotechnology

Dolly (the first mammal cloned from an adult somatic cell)

Due to the obvious fast development of biotechnology and the scope of human thinking, scientists and Islamic thinkers must react rapidly. This is because the majority of biotechnology-related issues are considered as incompatible with Islamic norms and belief systems. One example is cloning. Clone is viewed as a process that calls into doubt God's authority as Creator, raising the question of whether it is allowed or not. But in 1998, a special assembly of Islamic scholars and Kuwaiti Muslim medical practitioners held in Casablanca came to the conclusion that cloning does not contradict or question Islamic principles.

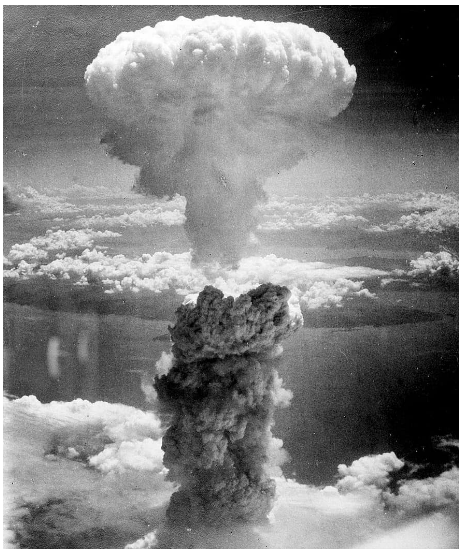
Cloning is only allowed in the case of plants and animals, according to the majority of scholars. This is due to the fact that human cloning would result in a slew of moral and societal issues. Although Islam allows the process of cloning plants and animals, but it is only for the purpose of increasing the output of such plants or animals.

4) Ethics, Morals And Belief Systems: Solutions to Science and Technology Issues

This topic involves the values and belief systems of every scientist. Since the end of Western colonialism, many people in the colonized civilization have accepted Western ideals and conventions, believing that through these principles they can achieve technological achievements similar to the industrial revolution.

In general, the dynamics and rapid growth of technology must be used in a human-oriented way. Every technocrat, scientist, and individual who uses technology must keep in mind the goals and objectives of human life, which are based on the success of this life and the next. The concept of al-Falah that is the success and happiness of the hereafter must be the priority of every individual in developing science and technology.

5) Nuclear

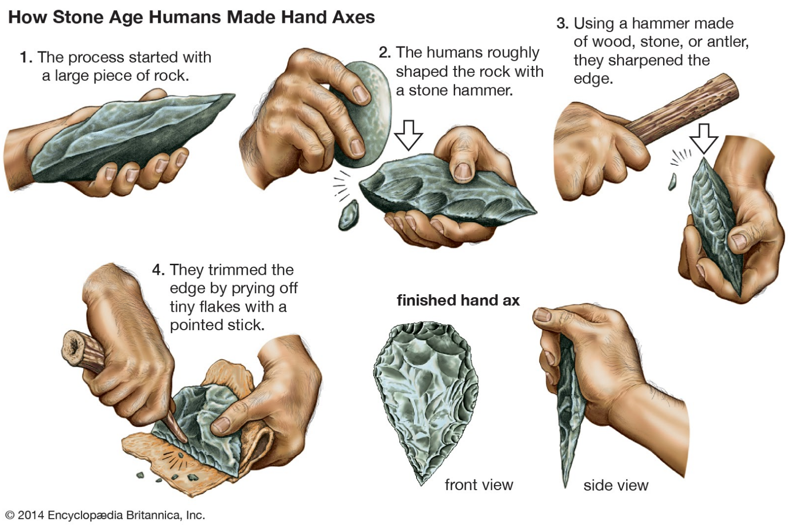
Nuclear Power plant and the power of atomic bomb in Japan

The atomic nucleus can be called by nuclear, and nuclear energy is defined as the energy created by nuclear processes. Nuclear fission and nuclear fusion are the two types of nuclear processes that may be employed to create energy. Nuclear power plants now in use are based on nuclear fission reactions, whereas nuclear fusion-based power plants are still in development and are likely to be useless in the next half-century owing to scientific challenges. This began with uranium mining, the primary source of nuclear energy. Nuclear energy has the benefit of being able to add value to products and serve as an alternative energy source. For example, in Japan, nuclear power is used to power daily life. Biosystems and the environment have been harmed by nuclear weapons. It is also hazardous to human health since it may cause a variety of negative consequences.

<u>**Technology In The Ancient World**</u>

The Beginnings—Stone Age Technology (To C. 3000 BCE)

Because prior historians and anthropologists' estimations of the formation of human species vary so considerably, identifying the history of technology with the history of humanlike species does not help in determining an exact point for its creation. Natural tools such as twigs and stones are used by animals on occasion, and the organisms who evolved into humans did the same for hundreds of millennia before taking the first great step of creating their own tools. Many back then, it took an eternity before they began constructing such tools on a regular basis, and even more aeons elapsed as they progressed through the steps of standardising and manufacturing their crude stone choppers and pounders—that is, establishing locations and assigning experts to the task. By the time of the Neanderthals (70,000 BCE), toolmaking had evolved to the point that Cro-Magnons could make more complicated tools that required the assembly of head and haft (perhaps as early as 35,000 BCE); while the application of mechanical principles was achieved by pottery-making Neolithic (New Stone Age; 6000 BCE) and Metal Age peoples (about 3000 BCE).



Earliest Communities

Except for the last 10,000 years or so, people have lived almost solely in small nomadic tribes, relying on their abilities to gather food, hunt and fish, and escape predators to survive. Most of these groups, it is plausible to assume, arose in tropical latitudes, particularly in Africa, where climatic circumstances are most suitable for a species with as weak body protection as humans. Although their colonisation of this region must have been severely limited by successive periods of glaciation, which rendered large parts of it inhospitable and even uninhabitable, it is reasonable to assume that tribes moved outward from there into the subtropical regions and eventually into the landmass of Eurasia, even though humankind has shown remarkable versatility in adapting to such conditions.

The Neolithic Revolution

Around 15,000 to 20,000 years ago, towards the ending of the last ice age, a handful of the societies most suited by location and climate began to make the change from savagery in the Paleolithic (Old Stone Age) to a more settled mode of life based on animal husbandry and agriculture The Neolithic Period, also known as the New Stone Age, saw significant population growth, an increase in the number of groups, and the beginnings of town life. Because of the rapid pace of technological invention and the resulting growth in complexity of human social and political organisation, it is sometimes referred to as the Neolithic Revolution. To understand the origins of technology, one must examine events from the Old Stone Age to the New Stone Age, all the way down to the formation of the first urban civilizations around 3000 BCE.

Stone

Stone is the material that lends these prehistoric ages their name and a technological coherence. Apart from bone antlers, likely used as picks in flint mines and elsewhere, and other bits of bone implements, no evidence of prehistoric people using other materials such as wood, bone, fur, leaves, and grasses before mastering the use of stone has been found. Early human stone tools, on the other hand, have survived in amazing quantity, and over millennia of prehistory, significant breakthroughs in stone tool technology have been made. Only when stones were fashioned purposely for specific purposes did they become tools, and in order to do so efficiently, suitable hard and fine-grained stones had to be located, as well as methods for shaping them and, in particular, putting a cutting edge on them. Although fine sandstones and some volcanic rocks were also commonly utilised, flint became a very popular stone for this purpose. There is a lot of evidence from the Paleolithic period that people were skilled at flaking and polishing stones to build scraping and cutting implements. Other substances, such as clay for pottery and brick, were introduced into service as the Neolithic Period progressed, and increased expertise in handling textile raw materials led to the fabrication of the first woven fabrics to replace animal skins. Curiosity in the behaviour of metallic oxides in the presence of fire sparked one of history's most significant technological breakthroughs, marking the transition from the Stone Age to the Metal Age.

Power

Another basic technology achieved at some unknown period during the Old Stone Age was the use of fire. Both the discovery that fire could be tamed and controlled, as well as the discovery that a fire might be started by persistent friction between two dry wooden surfaces, were significant breakthroughs. Although little power was derived directly from fire save for defence against wild animals, fire was the most important contribution of prehistory to power technology. Prehistoric tribes were fully reliant on people for the most part, but when they transitioned to a more stable pattern of existence in the New Stone Age, they began to gain some power from tamed animals. It's also likely that by the end of prehistory, the sail had evolved into a means of harnessing the wind for small boats, beginning off a long succession of advancements in marine transportation.

Tools And Weapons

The materials available to prehistoric peoples determined the fundamental tools they used. They were inventive in designing tools and weapons with points and barbs after they had mastered the methods of manipulating stone. As a result, the stone-headed spear, the harpoon, and the arrow became widely used. The spear-thrower, a notched pole with a sling effect, provided more thrust to the spear. The bow and arrow was an even more powerful combination, as evidenced by the earliest "documented" evidence in the history of technology, cave paintings from southern France and northern Spain depicting the bow in use for hunting. Slings, throwing sticks (the boomerang of Australian Aboriginal people is an unique surviving example), blowguns, bird snares, fish and animal traps, and nets all demonstrate the hunters' inventiveness. These tools did not evolve in a uniform manner, since each group created just the devices that were most suited to its own specific needs, but by the end of the Stone Age, they were all in use. Furthermore, the Neolithic Revolution had given several significant new tools that were not just for hunting. The potter's wheel, the bow drill, the pole lathe, and the wheel itself were the first mechanical uses of rotational action. Although it is impossible to say when these important inventions were conceived, their existence in early urban civilizations shows a link to the late Neolithic Period. Both the potter's wheel and the wheels of early automobiles provided constant rotational movement in one direction, powered by the operator's kicks. The drill and lathe, on the other hand, were developed from the bow and had the effect of spinning the drill piece or workpiece first in one direction and then in the opposite direction.

With advancements in food production, equipment have become even more refined. Gathering, hunting, and fishing were the primary methods of food production in Paleolithic times. If these measures failed to keep a society alive, it either relocated to better hunting grounds or died. New food-producing abilities were developed during the Neolithic Revolution to meet the demands of agriculture and animal husbandry. Digging sticks and the earliest primitive ploughs, stone sickles, querns that crushed grain by friction between two stones, and, most complicated of all, stone sickles were all used millennia before 3000 BCE, irrigation techniques for keeping the ground watered and fertile became well established in Egypt and Mesopotamia's great subtropical river valleys.

Building Techniques

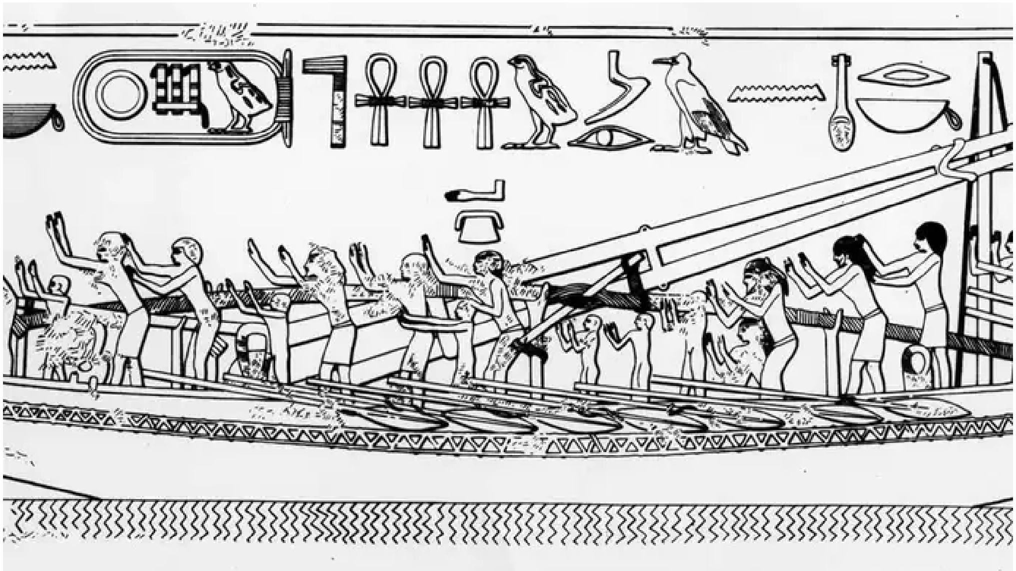
During the Neolithic Revolution, prehistoric construction techniques underwent substantial changes. Beyond what can be inferred from a few fragments of stone shelters, little is known about Paleolithic peoples' building abilities. However, several remarkable constructions were built during the New Stone Age, principally tombs and burial mounds, as well as other religious edifices, but also, near the conclusion of the period, household structures housing in which sun-dried brick was first used. Huge stone monuments, such as Stonehenge in England, still bear eloquent testimony to the technical skill, not to mention the imagination and mathematical competence, of the later Stone Age societies in northern Europe, where the Neolithic transformation began later and lasted longer than in the eastern Mediterranean.

Copper And Bronze

The fact that the era of the early civilizations coincides with the technological classification of the Copper Age and Bronze Age is a clue to the technological basis of these societies. The softness of copper, gold, and silver made it inevitable that they should be the first to be worked, but archaeologists now seem to agree that there was no true "Copper Age" except perhaps for a short period at the beginning of Egyptian civilization, because the very softness of that metal limited its utility for everything except decoration or coinage. Attention was thus given early to means of hardening copper to make satisfactory tools and weapons. The reduction of mixed metallic ores probably led to the discovery of alloying, whereby copper was fused with other metals to make bronze. Several bronzes were made, including some containing lead, antimony, and arsenic, but by far the most popular and widespread was that of copper and tin in proportions of about 10 to one. This was a hard yellowish metal that could be melted and cast into the shape required. The bronze smiths took over from the coppersmiths and goldsmiths the technique of heating the metal in a crucible over a strong fire and casting it into simple clay or stone molds to make ax-heads or spearheads or other solid shapes. For the crafting of hollow vessels or sculpture, they devised the so-called cire perdue technique, in which the shape to be molded is formed in wax and set in clay, the wax then being melted and drained out to leave a cavity into which the molten metal is poured.

Bronze was the most important material in ancient civilizations, and elaborate systems were established to ensure that it was always accessible. Metals were in short supply in the alluvial river basins, requiring importation. This demand resulted in tangled economic links and far-flung mining enterprises. Tin was in low supply throughout the Middle East, posing an especially serious situation. Bronze Age civilizations were compelled to hunt for metal sources well beyond their own boundaries, and knowledge of the civilised arts was gradually disseminated westward via the burgeoning Mediterranean trade routes.

Aside from the use of metals, the transition from New Stone Age to early civilization technology was relatively smooth, though there was a general increase in competence as specialised skills became more clearly defined, and there were massive increases in the scale of enterprises in building techniques. There were no substantial improvements in power technology, but there were considerable advancements in furnace and kiln design in response to the requirements of metalworkers, potters, and new artists such as glassworkers. During the later Egyptian dynasties, the sailing ship evolved into a major oceangoing ship with a wide rectangular sail rigged amidships, developing from a vessel with a small sail rigged in its bows and fit solely for sailing up the Nile River before the prevailing wind. This type of Egyptian and Phoenician ship could sail ahead of and across the wind, but they needed humans to make forward progress into the wind. Despite this, they accomplished amazing feats of navigation, sailing the length of the Mediterranean and even crossing the Atlantic through Hercules' Pillars.



Egyptian ship

Drawing of an Egyptian seagoing ship, c. 2600 BCE, based on vessels depicted in the bas-relief discovered in the pyramid of King Sahure at Abū Ṣīr, Cairo

Irrigation

Food production techniques also improved significantly over Neolithic ways, with one notable exception in the form of systematic irrigation. Egypt's and Mesopotamia's civilizations were strongly reliant on the Nile and the Tigris-Euphrates river systems, which both irrigated the earth with their yearly floods and renewed it with the rich alluvium they deposited. The Nile flooded with regularity each summer, and the civilizations that arose in its valley were among the first to master basin irrigation, which involved ponding back the floodwater for as long as possible after the river had receded, allowing enriched soil to produce a harvest before the next season's floods. The irrigation challenge in the Tigris-Euphrates valley was more complicated since the floods were less predictable, more violent, and arrived sooner than those in the Nile's northward flow. They transported extra alluvium as well, which clogged irrigation canals. During the summer months, the Sumerian irrigation engineers' job was to channel water from rivers, impound it, and distribute it to the crops in modest amounts. The Sumerian technique finally failed because it caused salt to accumulate in the soil, resulting in a loss of fertility. Both systems, on the other hand, required a high level of social control, which necessitated competence in measuring and marking off the land, as well as a complex legal code to assure fairness in the distribution of scarce water. Furthermore, both systems relied on complex engineering in the construction of dikes and embankments, canals, and aqueducts (with long stretches underground to avoid evaporation), and the use of water-raising devices like the shadoof, a balanced beam with a counterweight on one end and a bucket to lift the water on the other.

Urban Manufacturing

Pottery, wines, oils, and cosmetics, which had begun to circulate along the incipient trade channels before the arrival of metals, became the commodities traded for the metals in the early civilizations' manufacturing industry. The potter's wheel became popular for spinning clay into the required form in pottery, although the previous technique of hand-building pots from rolls of clay continued in use for various reasons. The development of many types of press in the manufacture of wines and oils, as well as cooking, brewing, and preservatives, supported the claim that chemistry originated in the kitchen. Cosmetics were also a product of the culinary arts.

The wheeled vehicle developed slowly to fulfil the varied demands of agriculture, trade, and war. Pack animals were still the major mode of land transport. The chariot debuted as a weapon in the latter category, even though its usage was restricted by the difficulties of harnessing a horse. Metal plates for armour were developed thanks to military technologies.

Building

The most significant advancements in construction technology concerns the size of operations rather than any individual breakthrough. Mesopotamia's late Stone Age inhabitants had already constructed extensively with sun-dried brick. Their descendants maintained the practise, but on a larger scale, to build the gigantic square structures known as ziggurats. The entire edifice ascended in two or three steps to a temple on the summit, with a brick core and facing walls sloping slightly inward and interrupted by regular pilasters constructed into the brickwork. Sumerians were also the first to erect columns out of native clay bricks, which also served as scribes' writing material.

Clay was uncommon in Egypt, but fine construction stone was plentiful, and builders utilised it to build the pyramids and temples that are still standing today as notable Egyptian monuments. Stones were pushed up the structure by rollers and elevated up the various tiers by ramps and balancing levers modified from the water-raising shade. The stones were sculpted by experienced masons and set in place by priest-architects who were evidently accomplished mathematicians and astronomers, as evidenced by the exact astronomical alignments. The arduous labour of building was very certainly performed by legions of slaves, which helps to explain both the achievements and limits of early civilizations. Slaves were typically the result of military conquest, which required a period of successful territorial expansion, however their position as a slave race could be maintained permanently. Slave populations supplied a skilled and inexpensive labour force for the big construction projects detailed. Slave labour, on the other hand, inhibited technical innovation, a sociological truth that goes a long way toward explaining the ancient world's relative stasis of mechanical development.

Transmitting Knowledge

Traders who went out in search of tin and other commodities, as well as craftsmen in metal, stone, leather, and other mediums, passed on their skills to others by direct instruction or by providing models that challenged other craftsmen to copy them, were the primary carriers of technological knowledge in the ancient world. During the 2nd millennium BCE, this transfer via intermediate contact took place between ancient civilizations and their northern and western neighbours. In the following millennium, the pace accelerated, with distinct new civilizations emerging in Crete and Mycenae, Troy, and Carthage. Finally, the emergence of the method of working iron fundamentally altered human societies' capacities and resources, ushering in the Classical civilizations of Greece and Rome.

Technological Achievements Of Greece And Rome (500 Bce–500 CE)

Greece and Rome's contributions to philosophy and religion, political and legal systems, poetry and theatre, and scientific speculation contrast dramatically with their comparatively little contributions to technology. Their mechanical invention was unremarkable, and even in the fields of military and building engineering, where they displayed considerable inventiveness and artistic sense, their work was more of a culmination of previous lines of development than a startling innovation. This seeming paradox of the ancient world's Classical period has to be explained, and the history of technology may provide some clues to the answer.

The Mastery Of Iron

The smelting of iron, which was developed by unknown metallurgists in Asia Minor around 1000 BCE and expanded well beyond the Roman Empire's provincial borders, was the most important technical component in the Greco-Roman world. By the time the Classical period began about 500 BCE, widespread usage of the metal had spread throughout Greece and the Aegean Islands, and it appears to have moved rapidly westward after that. Because of the high heat required in the furnace to conduct the chemical transformation (approximately 1,535 °C [2,795 °F] compared to 1,083 °C [1,981 °F] for the reduction of copper ores), iron ore has eluded reduction into metallic form for a long time. To get to this degree, the furnace had to be modified, and methods had to be created to keep the heat for several hours. These conditions were only accomplished on a small scale during the Classical period, in furnaces that burned charcoal and used foot bellows to amplify the heat, and even in these furnaces, the heat was insufficient to entirely convert the ore to molten metal. Instead, a little spongy ball of iron known as a bloom was created in the furnace's bottom. This was obtained by breaking open the furnace and striking it into wrought iron bars, which could then be fashioned as needed with more heating and hammering. Apart from its higher availability, iron was a tougher and stronger substance than previous metals for most applications, however the inability to cast it into moulds like bronze was a drawback. Some smiths created the cementation procedure for warming iron bars between layers of charcoal to carburize the iron's surface and therefore form a coat of steel at an early period. Case-hardened iron may be heated, hammered, and tempered to produce high-quality knife and sword blades. In Roman times, the best steel was Seric steel, which was imported from India in blocks of a few inches in diameter and made using a crucible technique that included melting the materials in a confined vessel to ensure purity and uniformity in the chemical composition.

Other Fields Of Technology

In terms of industry, transportation, and military technology, the Greco-Roman period did not achieve much. The key manufacturing crafts—pottery and glass production, weaving, leatherworking, fine metallurgy, and so on—continued along the lines of past cultures, but with significant stylistic changes. Athenian pottery, for example, was widely distributed along Mediterranean trade routes, and the Romans made good quality pottery available throughout their empire by manufacturing and trading the standardised red ware known as terra sigillata, which was produced in large quantities at several locations in Italy and Gaul.

Transport

The sailing ship emerged as a seagoing vessel with a carvel-built hull (that is, planks meeting edge-to-edge rather than overlapping as in clinker-built designs) and a fully developed keel with stempost and sternpost, following earlier examples. A square or rectangular sail was used to catch the following wind, and one or more banks of oarsmen were used to move the ship when the wind was against it. By the early years of Classical Greece, the Greeks had developed a specialised battle ship with a ram in the prow, as well as a cargo ship that did not require oarsmen and relied exclusively on the wind. Both styles were taken over by the Romans, although with little innovation. They paid far greater attention to inland transportation than to maritime transportation, and they built a spectacular network of well aligned and well-laid roads, many of which were paved for lengthy miles, across the empire's provinces. The legions marched quickly along these key roadways to any crisis where their presence was necessary. The roads served a variety of purposes, including commerce growth, but their principal purpose was always military, as a critical method of keeping a huge empire under control.

From the Middle Ages to 1750

Medieval Advance (500–1500 CE)

The Middle Ages span the millennium from the fall of the Western Roman Empire in the 5th century CE to the start of western Europe's colonial expansion in the late 15th century, with the five centuries of the Dark Ages making up the first half of this time. We now know that the time was not as socially static as the moniker implies. To begin with, many of the later empire's institutions survived the fall and had a significant impact on the development of western Europe's new civilisation. The Christian church was the most prominent example of this sort of organisation, but Roman ideas about law and administration remained to have an impact long after the legions had left the western provinces. Second, and more importantly, the Teutonic tribes that migrated over most of western Europe did not arrive empty-handed, and their technology was better to that of the Romans in certain ways. Although much about the origins of the heavy plough remains unknown, these tribes appear to have been the first people with sufficiently strong iron ploughshares to undertake the systematic settlement of the forested lowlands of northern and western Europe, where the heavy soils had frustrated their predecessors' agricultural techniques.

As colonists, the invaders arrived. The Romanized residents of western Europe may have considered them as "barbarians," and their invasion undoubtedly disrupted trade, manufacturing, and urban life. The newcomers, on the other hand, brought with them an element of creativity and vigour. The success of the kingdoms of the region in either absorbing or keeping out the last of the invaders from the East had secured the conditions of comparative political stability necessary for the reestablishment of a vigorous commercial and urban life around 1000 CE, and the new civilization grew in strength and began to experiment in all aspects of human endeavour for the next 500 years. Much of this effort entailed rediscovering old global knowledge and achievements. As a result, the tale of mediaeval technology is essentially one of preserving, recovering, and modifying past achievements. By the end of the era, however, Western culture had begun to develop some astonishing technical advancements that would prove to be extremely important.

Innovation

The term "innovation" poses a significant issue in the history of technology. In theory, an innovation is something completely new, yet there is no such thing as an unprecedented technical innovation since an inventor cannot operate in a vacuum, and his creation must come from his own prior experience, no matter how brilliant. The issue of recognising an element of novelty in an invention is still a difficulty in patent law today, but it is made easier in many nations by the availability of comprehensive documentary records covering past innovations. However, few such documents remain throughout the Middle Ages millennium, making it impossible to explain how certain inventions were transferred to western Europe. The problem is particularly perplexing because many of the period's inventions were known to have been developed independently and previously in other civilizations, and it can be difficult, if not impossible, to tell whether something is spontaneous innovation or an invention that was transmitted through some as yet unknown route from those who had invented it in other societies.

The issue is significant because it leads to a dispute of interpretations regarding how technology is transmitted. On the one hand, there is the diffusionist view, which claims that all innovation originated in the ancient world's long-established civilizations, with Egypt and Mesopotamia as the two most likely choices for the ultimate source of the process. The notion of spontaneous innovation, on the other hand, holds that social necessity is the major predictor of technical invention. Because much evidence is absent, scholarship is still unable to tackle the problem in terms of Middle Ages technical advancements. However, it appears that at least some of the period's significant inventions—the windmill and gunpowder, for example—were conceived on the spur of the moment. Others, such as silk weaving, were undoubtedly transferred to the West, and, however original Western civilization's contribution to technical invention may be, there can be no question that, at least in its early decades, it turned to the East for ideas and inspiration.

Byzantium

Byzantium, the last stronghold of the Roman Empire located in Constantinople (Istanbul), was the immediate eastern neighbour of mediaeval Europe's new civilisation. It lasted for 1,000 years after the western part of the empire collapsed. The literature and traditions of Hellenic civilisation were preserved there, and through traders arriving from Venice and elsewhere, they were increasingly available to the West's curiosity and avarice. Apart from the influence of Byzantine masterpieces like the great domed structure of the Hagia Sophia on Western architectural style, Byzantium's technological contribution was probably minor, but it served as a bridge between the West and other civilizations one or more stages removed, such as the Islamic world, India, and China.

Islam

In the 7th century, the Islamic world had evolved into a civilisation of tremendous expansion force, imposing a unity of religion and culture on most of southwest Asia and North Africa. The importance of Islam in terms of technological dissemination lay in the Arab assimilation of Hellenic civilization's scientific and technological achievements, to which it made significant additions, and the whole became available to the West through the Moors in Spain, the Arabs in Sicily and the Holy Land, and commercial contacts with the Levant and North Africa.

India

Islam also served as a conduit for parts of East and South Asia's technology, particularly that of India and China. The ancient Hindu and Buddhist civilizations of the Indian subcontinent had long-established commercial contacts with the Arab world to the west, and with the Mughal conquest in the 16th century, they fell under considerable Muslim influence. Although Indian artisans developed an early expertise in ironworking and were well-known for their metal artefacts and textile techniques, there is little evidence that technical innovation played a significant role in Indian history prior to the establishment of European trading stations in the 16th century.

China

From around 2000 BCE, when the first of the historical dynasties arose, China has been a hotbed of civilization. It was a culture that valued technological competence in the form of hydraulic engineering from the start, because its survival depended on regulating the Huang He's energising but deadly floods (Yellow River). Other technologies, such as iron casting, porcelain production, brass production, and paper production, developed at an astonishingly early stage. As one dynasty succeeded another, Chinese civilization fell under the control of a bureaucratic elite, the mandarins, who provided continuity and stability to Chinese life but also acted as a conservative influence on innovation, resisting the introduction of new techniques unless they benefited the bureaucracy directly. The creation of the water-powered mechanical clock, which took on an inventive and intricate form in the machine produced under Su Song's supervision in 1088, was one such innovation. This was powered by a water wheel that rotated once every half-revolution as each bucket on its rim was filled in turn.

The ties between China and the West remained weak until contemporary times, but the infrequent encounters, such as those arising from Marco Polo's travels in 1271–95, alerted the West to Chinese technological superiority and sparked a robust westward transfer of methods. China gave the West knowledge of silk weaving, the magnetic compass, papermaking, and ceramics. In the latter example, Europeans admired the excellent porcelain brought from China for ages before being able to manufacture something comparable. The Chinese mandarinate, however, did nothing to stimulate innovation or trade links with the outside world after achieving a state of relative social stability. No social group in China arose under their influence that was comparable to the commercial elite that blossomed in the West and did much to encourage commerce and industry. As a result, China fell behind the West in technological capabilities until the twentieth century's political revolutions and social upheavals reawakened Chinese awareness of the relevance of these talents to economic growth and spurred a drive to learn them.

Despite acquiring many Eastern skills, the Western society of 500–1500 was compelled to tackle the majority of its issues on its own. As a result, it changed an agricultural civilization dependent on a subsistence economy into a dynamic culture with greater productivity, allowing commerce, industry, and town life to expand on a steady basis. This was largely a technological feat of enormous proportions.

Power Sources

Despite acquiring many Eastern skills, the Western society of 500–1500 was compelled to tackle the majority of its issues on its own. As a result, it changed an agricultural civilization dependent on a subsistence economy into a dynamic culture with greater productivity, allowing commerce, industry, and town life to expand on a steady basis. This was largely a technological feat of enormous proportions. The introduction of the stirrup made the mounted warrior supreme in mediaeval warfare and initiated complex social changes to sustain the great expense of the knight, his armour, and his steed in a society close to the subsistence line. Once the horse could be harnessed to the heavy plough by means of the horse collar, it became a more efficient draught animal than the ox, and the introduction of the stirrup made the mounted warrior supreme in mediaeval warfare and initiated complex social changes to sustain the great expense.

Agriculture And Crafts

Medieval Europe was able to dramatically boost output thanks to new sources of electricity. This is evident in agriculture, where the introduction of new crops and the replacement of the ox with the quicker gaited horse resulted in a significant increase in the quantity and diversity of food, as well as an improvement in the population's nutrition and energy. It was also visible in the period's developing industries, particularly the woollen cloth industry, where the spinning wheel was introduced, partially mechanising this important process, and the practise of using waterpower to drive fulling stocks (wooden hammers raised by cams on a driving shaft) had a significant impact on the industry's location in England in the later Middle Ages. Late in the Middle Ages, the same idea was used to the paper industry, with the rags used to make paper being crushed by hammers similar to fulling stocks.

Architecture

Although few monuments from the Dark Ages have survived, the following decades of the mediaeval period were a golden age of construction. The major artistic contribution of the Middle Ages was expressed by Romanesque and Gothic architecture, which embodied substantial technological breakthroughs. The architect-engineers, who had obviously studied Classical construction principles, shown a willingness to deviate from their models, resulting in a style that was uniquely theirs. The cross-rib vault, the flying buttress, and the great window panels, which provided scope for the new craft of the glazier using coloured glass with startling effect, were their solutions to the problems of constructing very tall masonry buildings while preserving as much natural light as possible.

Military Technology

During the same time period, the fortified stronghold evolved from the Anglo-Saxon motte-and-bailey, a timber tower surrounded by a timber and earthen wall, to the formidable, fully developed masonry castle, which by the end of the Middle Ages had become an anachronism due to the development of artillery. The creation of gunpowder and the development of processes for casting metals, particularly iron, were integral to this breakthrough. Although the recipe for gunpowder had been known in East Asia long before that era, it only arrived in Western Europe in the mid-13th century. It is made up of a combination of carbon, sulphur, and saltpetre, the first two of which could be obtained from charcoal and volcanic sulphur deposits in Europe, but saltpetre had to be crystallised by a nasty process that included boiling stable sweepings and other rotting garbage. By the end of the Middle Ages, the process of combining these materials into an explosive powder had become a well-established but dangerous business.

Transport

Though there was considerable research in bridge building and canal construction, mediaeval technology made little advances to inland transportation; lock gates were invented as early as 1180, when they were used on the canal between Brugge (now in Belgium) and the sea. Where roads did exist, they were indifferent, and automobiles were cumbersome throughout the time. Wayfarers, like Chaucer's pilgrims, went by horseback, which would continue to be the finest form of interior transportation for decades.

Communications

While transportation technology progressed toward these revolutionary innovations, recording and communication systems advanced at a similar rate. The creation of the mechanical clock, the earliest of which exists in Salisbury Cathedral, England, and is propelled by weights and regulated by a verge, an oscillating arm interacting with a gear wheel, and dated 1386. By the mid-fifteenth century, spring-driven clocks had appeared, allowing for more compact mechanisms and paving the way for the portable clock. The simple compensatory mechanism of the fuse conical drum on the shaft solved the challenge of countering the spring's declining power as it unwound, allowing the spring to exert an increasing moment, or inclination to increase motion, as its power dropped. It has been suggested that the mediaeval obsession with clocks reflects a greater awareness of the necessity of timekeeping in business and elsewhere, but it can also be regarded as a fresh feeling of curiosity about the potential and practical applications of mechanical devices.

The Importance Of Development Of Science And Technology From The Ethical Perspective Of Human Life

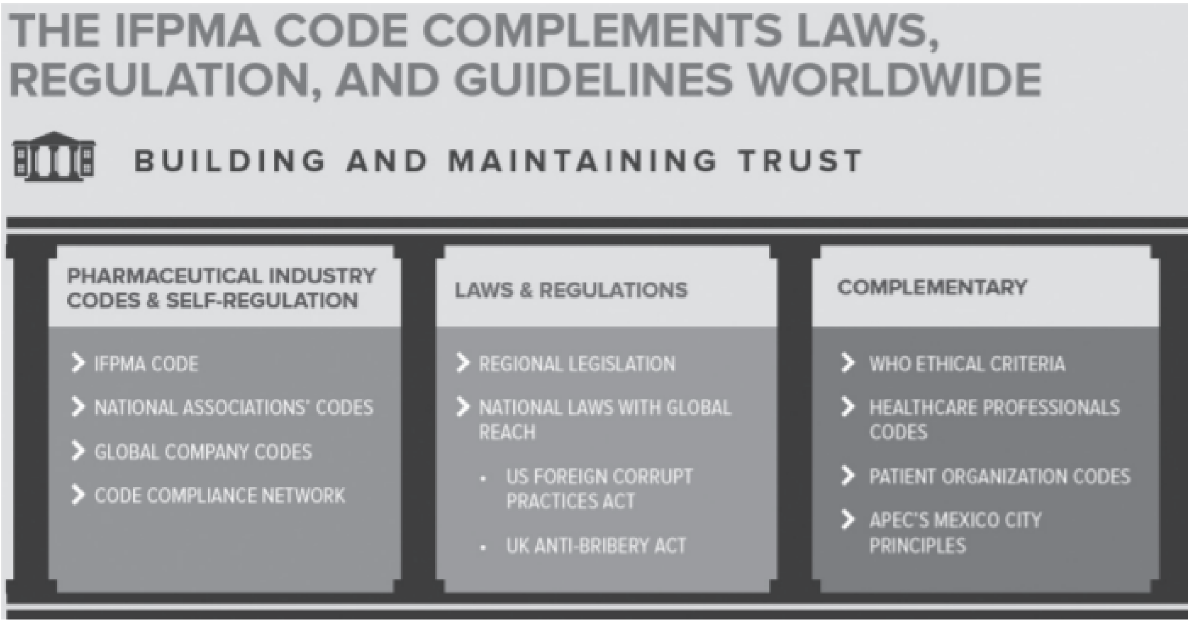
The ethics of science and technology are very important in this field. The first is to serve as a guideline for scientists and technocrats in their work. The presence of ethics provides guidance for scientists to know what needs to be done to ensure safety and make things work more orderly. The second is to limit what can be done. Researchers can learn about faulty ethics and avoid them when conducting research thanks to the existence of ethics. It also restricts what can be done to ensure health and avoid negative consequences. Furthermore, ethics is important in protecting human interests from science's greed, which undermines human security. When a person has attained their goal, they tend to follow their lusts rather than their intellect. When humans become overly preoccupied with science, greed might emerge. As a result, ethics can help scientists limit the development of new technologies that are damaging to mankind. In order to produce highly disciplined scientists and technocrats, science and technology ethics are critical. This is because scientists who follow the principles might train themselves to be more disciplined as a result of their presence. For example, scientists work diligently and meticulously, properly manage their time, and arrive on time. As a result, science and technology will advance, and scientists will be more successful as a result of the nature of high discipline. Ethics will also ensure that technology is used responsibly. Scientists may be unable to use technology at their leisure due to ethical considerations in research and technology. Other scientists will be able to utilise the technology as a result of this. As a result, existing technology may be employed, and there will be no waste. As a result, ethics is extremely important.

Implications Of Ethics In The Development Of Science And Technology

The application of science and technology is often to improve human life. Therefore, the role of ethics is key in applying these new technologies when it comes to discourse and policy making. In this setting, European discourses of reflective ethics and lay morality are firmly rooted in an ubiquitous risk governance paradigm, which is focused largely on basic person rights to protection from harm. In this setting, European discourses on reflective ethics and lay morality are firmly rooted in an ubiquitous risk governance paradigm, which is largely focused on basic person rights to protection from harm. In contrast, in the three situations we've discussed, the innovation discourse is prominent in China and India. The majority of this innovation discourse translates into conceptions of communal interests or requirements that should lead innovation governance in terms of the 'common good.' In Europe, they emphasise more on individual than community values, whereby in other regions community values are emphasized over individual values. In science and technology policy-making, China's political system, on the other hand, prioritises communal interests, with little public or ethical debate. In India however, despite its vibrant public debate culture, it lacks a reflective ethics discourse in science and technology policy-making. From here, we can infer that public discourse and debate is one of the implications of ethics in science development. Application of science and technology in our society cannot be implemented unless an ethical debate of its implications is carried out first. This is because these updates in technology will affect our society and with a public discourse held first, government bodies are able to come up with the proper policies to assure this new technology will not be taken advantage of by criminals. Thus, governments are able to ensure safety of the public when implementing these new scientific and technological advances.

Besides policy making, ethics have a very prominent role in the pharmaceutical industry as well. Since pharmaceutical companies are a part of the healthcare system, moral values like trust are particularly important. One of the implications of ethics in the pharmaceutical industry is companies taking extra measures to ensure that the relationship between industry and consumer is open and transparent which is being implemented globally. This is done by ensuring a close communication and interaction with healthcare professionals and their patients. This relationship ensures that, if possible, the information is balanced, factual, and based on the patient's best interests.

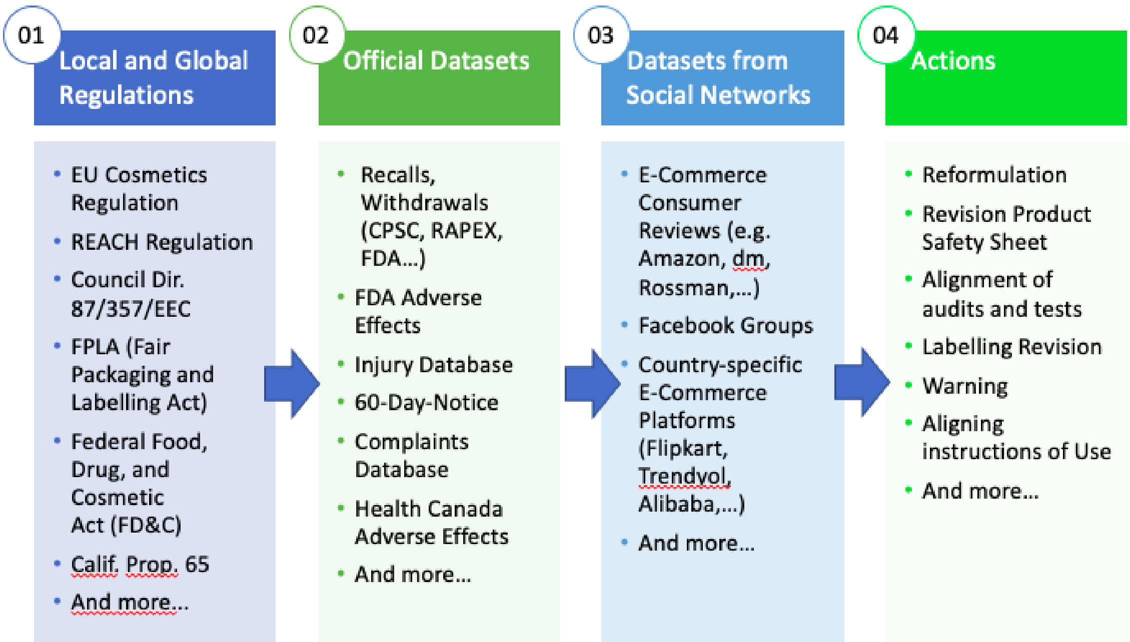
Therefore, to ensure ethical compliance, The Code of Practice of the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) has been used to create national codes of conduct for pharmaceutical businesses all around the world. The pharmaceutical industry has chosen a self-regulatory approach of ethical compliance through this code and the many national industry association codes that implement it around the world. This IFPMA code of practice and other national industry association codes, complements other regulations, laws, and standards that jointly regulate the pharmaceutical industry's ethical compliance.



Interaction between pharmaceutical industry codes and other regulations and guidelines

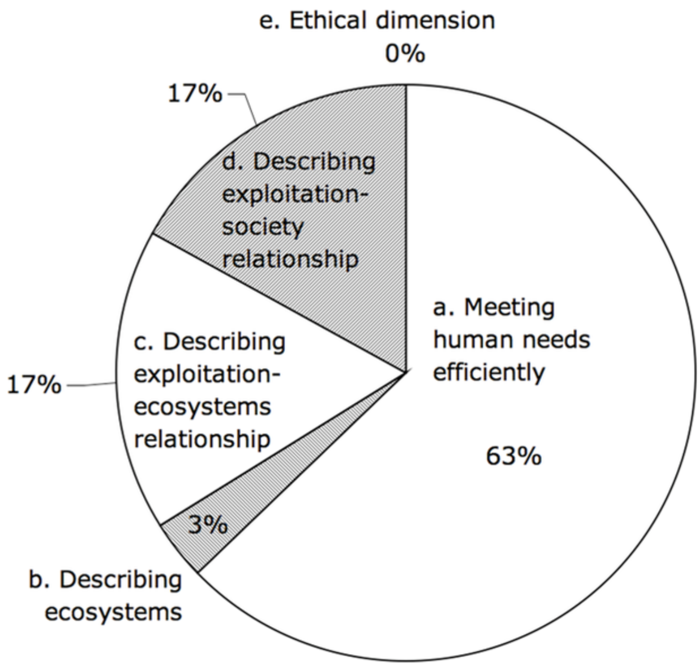
The IFPMA Code is not voluntary, despite the fact that it is self-regulatory. The Code is a requirement for both member corporations and national associations to join the IFPMA. All 30 pharmaceutical corporations and 48 national associations that are members of IFPMA are expected to follow and implement the IFPMA Code. National association codes frequently provide greater detail regarding what is necessary at the national level, and national association members are accountable for putting the more detailed code into practice in their own country. As part of the system of ethical compliance, most codes provide compliance and enforcement methods. In many circumstances, a company's own compliance policies go beyond what the IFPMA and national rules require.

Ethics have also influenced the cosmetics science industry to have better regulation of cosmetic products. This is due to consumer behaviour which has changed drastically over the years. One of the major effects of these regulations is the processes required before commercial distribution which is product testing. According to the FDA which is the United States Food and Drugs Administration, product testing is a required process in manufacturing to assure product safety. The beauty industry has had multiple issues regarding the ethics in manufacturing and how they get their ingredients. When these ethical issues rose, cosmetics manufacturers changed the formulation of the products in the lab to ensure the safest product for consumers. They do this by avoiding the use of harmful ingredients and irritants when formulating their products.



Pharmaceutical cosmetics companies back then were not criticised for manufacturing unethically. However, consumers over the years started engaging in public ethical discourses regarding their cosmetics and how the pharmaceutical companies' manufacture their products. This led to green marketing which has several meanings, it may be defined as commercial communications and consumer behaviour that reflect concern about the consequences of manufacturing and consumption on the environment. These manufacturers have always been responsible for chemical pollution of rivers because of their waste. With ethical discourse active amongst consumers, consumers are becoming more aware of river pollution and how cosmetic manufacturers are responsible for it. These consumers are called green consumers who have similar values in terms of environmental concern and understanding of the impact of excessive consumption on the rate of environmental damage. Because of high consumer demand for greener cosmetics products, these companies are forced to come up with recyclable packaging that can still keep their products stable. Aside from packaging, how these companies create their products were also questioned so these pharmaceutical companies were forced to formulate greener formulations of their beauty products to ensure less waste in the manufacturing process as well as create a proper drainage system to dump their waste. From here, we can understand that ethics have influenced the science in cosmetics to be more environmentally conscious from formulation to the end products.

Another honourable mention when discussing the implication of ethics in science is sustainability. What is sustainability ? Sustainability is the ability to meet our own needs without jeopardising the ability of future generations to meet their own demands in relation to natural resources, social and economic resources. William Clark, one of the sustainability science scholars, relates sustainability with ethics because sustainability is mostly about our moral interactions with the rest of the world. For example, ethics. He also mentioned that sustainability is inclusive of ethics. Now I agree with this notion because without the inclusion of ethics in sustainability discourse, we fail to think of the needs and demands of future generations to come, therefore allowing exploitation of resources to worsen. An example of the effective implications of ethics in sustainability science discourse has helped people realise how harmful single use plastic is. Now, most companies switch plastic straws with paper straws or metal straws. Another example is grocery stores have also charged for plastic bags. More and more corporations are making efforts to avoid the use of single use plastics. All because of consumers who participate in ethical discourses about sustainability.



Recent university cluster hires in sustainability. Vucetich & Nelson (2010)

We must also discuss how ethics impact the promotion of science. Promotion of science is defined by means motivating and engaging non-scientists to promote the benefits of science. Now, what I mean by this is that in ethics, authenticity and honesty is an important virtue. Thus, in every new scientific discovery, full transparency of the discovery must be disclosed in its promotion. Scientific reports must include honest results as opposed to withholding information. To fabricate data is a breach of ethical standards. Breach of ethical standards can result in removal from a job. These ethical standards have become a critical part in every scientific research and these ethical guidelines are key in assuring the validity of study findings as well as the safety of research participants.

Besides transparency, ethics have raised the importance of proper treatment of animals and humans. This requires the monitoring and balancing procedures to ensure that such individuals' health and safety are not jeopardised in either research laboratories as scientists or test subjects or their natural environments. Scientists are required to follow these principles. In fact, these principles have become so ingrained and normalised that scientists rarely think of them as it is just a method of practice for them. This importance of proper treatment of animals is also why animal testing is banned in more than 41 countries.

It is also due to ethics that scientists created inventions to help humans with their daily tasks. It was these inventions that helped develop humanity.

Summary

Ethics is an important consideration in science and technology. What is good and what is wrong must govern scientific research and progress. They aid with the safe conduct of science and the accuracy of scientific information. Ethics also ensure science and technology can be developed in the right way. Certain moral principles, such as care for people, empathy, and compassion, play a vital role in shaping science's study objectives and applications. It is necessary to infuse these humanitarian principles into research and technology while retaining and reinforcing science's inherent values. Ethical considerations should not be overlooked in the pursuit of scientific and technical advancement. Moral education's humanitarian ideals can enhance science's fundamental principles, such as objectivity, logic, pragmatism, honesty, and correctness. All of humanity is concerned with the issue of ethics and morality. While mankind may agree on broad moral concepts found in religions and moral education, disparities in the architecture of our moral systems, as well as the priorities and special demands of our separate cultures, may occur when dealing with specific difficulties and challenges. To summarize everything, the ethical perspective of human life is very important in order to develop science and technology.

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