



THE MALNAD TECHNICAL CLUB  
**TECHSANDHYA**

## Intelligent Design

The Wright brothers didn't have to look for ideas when building their airplane: They studied birds, and Velcro was born when a Swiss engineer picked burrs off his clothing. The act of copying nature to address a design problem isn't new, but over the last decade the practice has moved from obscure scientific journals into the mainstream. The term "biomimicry," popularised by American natural sciences writer Janine Benyus in the late 1990s, refers to innovations that take their inspiration from flora and fauna. Biomimicry advocates that with 3.8 billion years of research and development, evolution has already solved many of the challenges humans now encounter. "We often see nature as something you mine for resources, but biomimicry views nature as a mentor," says Carl Hastrich, an assistant professor at the Ontario College of Arts and Design University in Toronto, Canada, one of the few schools that teach biomimicry. From all around the globe, here are five natural sources of inspiration for inventions that promise to transform every sector of society.

In 1941, George de Mestral was out hunting with his dog one day when he noticed that sticky burrs with their hundreds of tiny hooks had attached themselves to his pants and his dog's fur. This were his inspiration for Velcro.

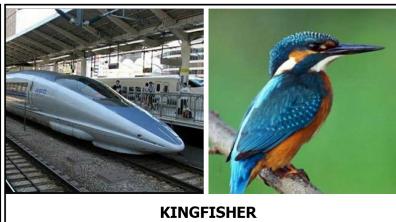
### WHALE

While browsing in a gift shop one day, US biologist Frank Fish came across a sculpture of a humpback whale. He was perplexed to find bumps on the "wrong" side - the front edge of the flipper. If this sculpture is right, Fish thought, then one of the cardinal lesson of fluid mechanics is wrong: until that point, a smooth leading edge was believed to reduce drag. But Fish discovered that the humpback's flipper bump, known as "tubercles," improve lift and performance.

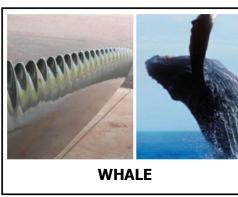
Today, WhalePower Corporation based in Ontario, Canada, develops and markets tubercle-enhanced fan blades that move 25 percent more air than conventional



VELCRO



KINGFISHER



WHALE



TERMITE MOUND



MORPHO BUTTERFLY

less electricity. This is a huge gain, considering that fans are used worldwide in ventilation, air conditioning, and by wind farms.

### KINGFISHER

Japan's Shinkansen bullet train zip passengers between the country's major cities at speeds up to 300 kilometers an hour. During test runs, engineers discovered that when one of the trains entered a narrow tunnel at high speed, atmospheric-pressure waves produced a deafening sonic boom that rattled windows 400 meters away. Hoping to solve this problem, engineer and avid birder Eiji Nakatsu asked himself if there was some living thing that manages sudden changes in air resistance as a part of daily life, and there was: the kingfisher. It dives from the air, which is a low-resistant medium, into water, a high-resistant one, with only a small splash. By redesigning the nose of the bullet train in the image of the kingfisher's beak, engineers reduced noise and cut electricity usage.

### TERMITE MOUND

Architect Mick Pearce was hired to design a building in his native city of Harare, Zimbabwe, that would remain cool without air conditioning, which is expensive to install and maintain. The idea of a termite mound, he says, "started as a rather light-hearted joke."

But the joke stuck- for good reason. It was believed at the time that the insects cooled their mud homes using an ingenious system that catches breezes at the base of the mound. Pearce's design uses fans to suck fresh air from the building's atrium and blow it upward the floors, and then into offices through skirting vents. Electricity costs are one tenth that of a comparable air-conditioned building, and Pearce's structure uses 35 percent less energy than six regular Harare buildings combined.

### MORPHO BUTTERFLY

Found in the rainforest of Central and South America, the Morpho butterfly is famous for its iridescent blue wings. Grind up these wings, however, and you'll get a drab powder. The butterfly's hue is an optical illusion called "structural colour," the effect of a reflective surface interfacing with light waves so that only certain colours reflect back. Research into the Morpho butterfly has resulted in revolutionary commercial applications: screens for computers, tablets and smartphones that use shifting microscopic plates, and clothing made of polyester and nylon fibers that can "mirror" a rainbow range of tints without dyes.

-Sanjana R Gowda

## Don't take the 'LIGHT MATERIALS' lightly

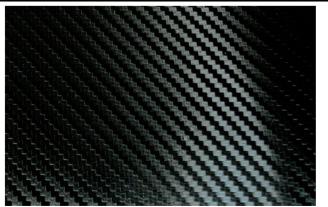
Now when the name 'light material' pops up, it is normal to be inclined to think about the composite materials like carbon fiber, fiber glass, etc. But apart from that there are many more behind the curtain which are just waiting to be unveiled. So this is an attempt to take you though some of many such materials which are out there.

There is a brief part of Japanese history which shows the use of Light materials. As they say, necessity is the mother of all inventions; survival in 12th century urged the usage of a simple piece of cloth made of silk called 'The Horo'. This was used to stop or entangle the deadliest ranged weapon of that time 'Arrow', almost same phenomenon is used in the modern warfare to stop a bullet only though another light composite material known as Kevlar.

Aerogel is a synthetic porous ultra-light material derived from a gel, which was formulated by Samuel Stephens Kistler in 1931, in which the liquid component of the gel has been replaced with a gas. The result is a

ice doesn't even show any sign of melting. Now with latest research, NASA and several other entities at the same time have successfully created an altogether new material called Airloy.

Airloy is a groundbreaking material which will change the world forever in terms of industrial revolution; it has the potential to push the boundaries of science farther. It combines the durability and hardness of regular plastics with ultra-lightweight insulating properties of aerogels. Their density is as low as 0.01 to 0.9 grams per cubic centimeter. To put that into perspective, water has a density of 1 gram per cubic centimeter. So this new material is over a hundred times lighter than water itself. It may well be possible to engineer it to handle an excess of 20,000 times its own weight. Plans are being made to use it in the space craft. Metal Matrix Composite (MMC) is a new type of metal, created



Carbon fiber

York University Polytechnic School of Engineering has been demonstrated recently that is so light that it can float on water but at the same time it is super strong. The material also hopes to enhance automotive fuel economy since it is pretty heat resistant while being light weight. It is a discovery that will be beneficial each and every field like aero-space, marine, construction, not to mention automobile to name a few. This new development of very light metal matrix composites can swing the pendulum

## Food for Thought

1.The Great Wall of China was a hoax, but pollution is not: The Great Wall of China is not visible from space, but china's air pollution is.

2.One Google search produces about 0.2g of CO<sub>2</sub>. But since you hardly get an answer from one search, a typical search session produces about the same amount of CO<sub>2</sub> as does boiling a tea kettle. Google handles about 1 billion search queries per day, releasing some 200 tons of CO<sub>2</sub> per day.

3.In 1945, an American scientist Percy Spencer realized accidentally that the radar transmitter used by the U.S. Army throughout WWII actually released enough heat- in the form of "microwaves"- that they could cook food. This technology was used to construct the first microwave oven within the next 2 years.

4."when you leave Taj, you take the Taj with you in your heart," The makers of Taj Mahal employed an optical trick so that as you move closer to the gate, the Taj keeps getting smaller or Taj seems to grow bigger as you walk away.

5.The Golden Gate uses the largest bridge cables ever made, long enough to encircle the world more than 3 times at the equator.

6.Austrian Physicist Friedrich Hasenohrl had published the basic equation  $E=mc^2$  a year before Einstein did.

7.Albert Einstein didn't do a single experiment in his lifetime but he worked out the theories yet he won the Nobel prize.

**Wolfram alpha:** This app allows you to hate math a bit lesser. Even though there is other math solving application available, this one stands out. It can solve even the trickiest of math problems. Just take a photo of it or simply write the question, and within seconds the answer is available. This app is only available on the Apple Appstore and is shortly to show its presence at Google Playstore.

**Myfridgefood.com:** This website is a treat for all foodies around the world. On this site you can put whatever you have in your fridge and it will tell you everything you can make out of them.

-Dendro Mihu and Amodhini SJ

back in favour of metallic materials. The ability of metals to withstand higher temperatures can be a huge advantage for these composites in engine and exhaust components, quite apart from structural parts. The magnesium alloy matrix composite has been enhanced by making use of silicon carbide hollow particles and exhibits a density of 0.92 grams per cubic centimeter, in comparison water has a density of 1g/cc. Apart from being less dense than water, it is also capable of surviving the rough conditions offered by the marine environment. As per the team, it will be ready for prototyping in 3 year's time.

-Sajjan Acharya

# TECHSANDHYA

## Apple's Rivals



APPLE Inc. is a multinational technological company founded by Steve Jobs, Steve Wozniak & Ronald Wayne, that designs, develops, and sells consumer electronics, computer software, and online services. Its hardware products are the iPhone, the iPad, the Mac, the iPod, and the Apple Watch. Apple's consumer software includes the OS X and iOS operating systems, the iTunes media player, the Safari web browser, and the iLife and iWork creativity and productivity suites. Its online services include the iTunes Store, the iOS App Store and the Mac App Store, and the iCloud.

Becoming the world's most valuable brand with a valuation of \$118.9 billion (in 2014) wasn't a piece of cake and it was a long journey full of cut-throat competitors. The range of products and services offered by Apple Inc. is broad, and thus the company has fierce competitors in several industries, ranging from personal computers to entertainment media to mobile payment systems. Here is a list of the technology giant's main competitors.

### Personal Computers & Operating System

While the personal computer running on Microsoft operating systems has remained a favorite of consumers since the 1980s, Apple has maintained a loyal following of users who report high satisfaction with the company's Macintosh computers and Safari operating system. Major competitors in this space include Dell, Hewlett-Packard (HPQ), Acer and Lenovo.

### Rivalry with Microsoft

The rivalry between Apple and Microsoft is one based primarily on the computer generation, starting from the earliest days of the desktop and can be dated back to 1990's when Apple had agreed to license certain parts of its graphical user interface (GUI) to Microsoft for use in Windows 1.0, but when Microsoft made changes in Windows 2.0, adding overlapping windows and other features found in the Macintosh GUI, Apple filed suit. Apple added additional claims to the suit when Microsoft released Windows 3.0. To this age, the OS X vs. Windows debate carries on, Windows is the same platform most of the world uses, Windows PCs provide lots of flexibility and customization (with both hardware and software), and has more software available than on any other platform, it provides a great gaming experience and on the other hand Macs offer a more straightforward approach to computing with fewer maintenance tasks, Macs face fewer virus and security issues. Macs software, on average, focuses more on its user interface and making your experience enjoyable than Windows software does. The competition between these two tech giants can be seen in other products too like the Apple's iPhone and Microsoft's Windows phones, Apple's iPod and Microsoft's Zune and the recent one Microsoft's Surface pro 4 and Apple's iPad pro tablet etc.

### Mobile computers & Operating systems

The iPod revolutionized the Apple business model and spurred an entire industry of mobile computing imitators. Apple is by far the most profitable and biggest selling company in this industry. Competitors include Google, Samsung, Nokia and Asus.

### Apple iOS Vs Google Android

Though there are other players too, the biggest rival of iOS is said to be Google's Android. Google's Android and Apple's iOS are both operating systems used primarily in mobile technology, such as smartphones and tablets. Android, which is Linux-based and partly open source, is more PC-like than iOS, in that its interface and basic features are generally more customizable from top to bottom. However, iOS' uniform design elements are sometimes seen as being more user-friendly. Android dominates the smartphone market share worldwide by virtue of its presence across wider price brackets, and being offered by a variety of phone makers. Apple has consistently maintained a healthy share of the global market despite having only about a relative minuscule number of devices on sale each year. Over the years, both operating systems have been filling the gaps, and Android has become more polished over time, while iOS became more flexible.

### Rivalry between Apple and Samsung

Samsung uses android, Apple uses iOS and there is an ongoing global patent dispute between Apple and Samsung regarding the design of smart phones and tablet computer. In August 2011, Apple and Samsung were litigating 19 ongoing cases in nine countries; by October, the legal disputes expanded to ten countries. By July 2012, the two companies were still embroiled in more than 50 lawsuits around the globe, with billions of dollars in damages claimed between them. Recently Samsung agreed to pay \$548 million on the patent dispute. These disputes indicate the gravity of the cut-throat competition between these two to dominate the smartphone market. Introduction of many of the amazing features in phone like screen touch, siri, fingerprint sensor, the latest 3D-touch in iPhone 6s, the breakthrough designs and more flexibility in iPhones can be credited to the rivalry of these two world's top 2 smartphone vendors.

### Entertainment Media and Applications

The two major players in this space are Apple and Google, with the Apple iOS running on its iPhones and iPods, and Google Android running on most competitor phones and tablets. Each operating system interfaces with iTunes and the Google Play Store respectively, allowing users to purchase music, books, applications and other media. In 2015, the Wall Street Journal has reported that Google Play had 70% more app downloads than Apple's App Store in the first quarter of 2015, but Apple's app revenue was about 70% higher than on Google Play.

### Mobile payments

Entering the mobile payment industry in October 2014, Apple is a relative newcomer to this area. According to CEO Tim Cook, the company took on more than 1 million users in its first 72 hours, making Apple Pay larger than "all competitors combined." Key competitors in the mobile payment industry include PayPal and Google.

This healthy competition between the firms is the reason for the society to have a sense of comfort, a reason to trust them and also a raised expectation. One of the best outcomes of this healthy competition is that the price they charge will be limited and range of services to the customer increases.

If you can finish a work in 2 hours, Einstein can finish the same work in his 2 hours.

## Science Around Us

Human beings, we are the most intellectual species on the earth. We have the most important power, that is the ability to reason and question. This ability has brought us from Stone Age to the Modern Era and we do not know where it will lead to. In our journey, we have achieved some of the mind blowing things like reaching the Moon, constructing skyscrapers, curing and preventing some of the deadliest diseases, yet we fail to acknowledge science behind many things. Let us see.



### Where did the Gold on Earth come from?

Formation of elements takes a massive amount of energy. The Earth does not have enough energy so does the Jupiter. In fact, Jupiter would need to be 75 times larger to have enough energy for fusion to begin. The lightest elements (hydrogen, helium, lithium) were formed in the big bang.

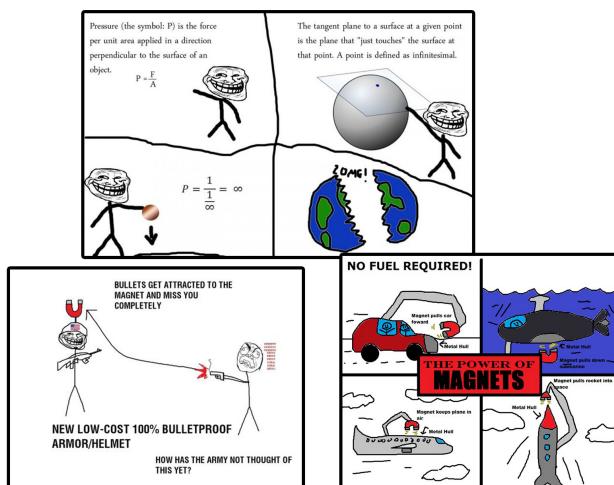
A young healthy star 'burns' hydrogen. The hydrogen is fused to helium. As the star ages it can become a red giant. At this point the helium can 'burn' into carbon, carbon can 'burn' into neon, neon can 'burn' into oxygen, oxygen can 'burn' into silicon, and silicon can 'burn' into iron. Iron is very stable. It doesn't release energy, so the star's element factory ends with iron. More elements can be produced in a supernova. Supernova nucleosynthesis can make silicon, sulfur, chlorine, argon, sodium, potassium, calcium, scandium, titanium, vanadium, chromium, manganese, iron, cobalt, and nickel. Then neutron capture processes (R-process and S-process) can produce some of the elements heavier than nickel.

It was assumed that gold was also made in a supernova, but recent observations indicate that the heaviest atoms, including gold, are formed during the collision of two neutron star

### Is it possible to create a 4 Dimensional Object?

Let us understand this more practically. I'm going to give you certain amount of balls, which you must place in a certain layout. If you successfully place the balls in the correct layout, you climb a level, and the subsequent layout gets tougher.

Level 1: You are given two balls, which you must place in such a way that both are equidistant from each other. This is easy, because, wherever you place the balls, they will always be equidistant from each other.



## BRAIN WORMS

## TECHSANDHYA

**Level 2:** Now you are given three balls, and asked to place them such that they are equidistant from each other. I can see that you easily tackled this level. The Equilateral Triangle is the correct layout.



**Level 3:** This time, you have 4 balls to place equidistant from each other.



Figuring that was easily! Placing them on the vertices of a regular tetrahedron was the right approach!

**Level 4:** I'm giving you one more ball. Can you place this one and the



That's right! No one has ever done this before, and it is highly unlikely someone would.

You see, the fourth dimension can never be visualized by humans, and it is very difficult to create something in a space that we cannot perceive. Our reality can never be in 4D.

### Why are there sparks when two current carrying conductors come in contact?

If the two wires are at different voltage levels, a short circuit is created when they touch each other. That creates the spark. Air has a dielectric strength of 30 kV/cm. That is, if two conducting surfaces are placed 1 cm apart from each other, and subjected to a potential difference of 30 kV, the air between the surfaces breaks down and allows current to pass through in the form of a spark. If you reduce the gap between the surfaces, a lower potential difference is sufficient to break the air down. When you bring the two wires closer to each other, at one point, the gap is so low that the air between the wires is ionized and it breaks down, allowing a spark between the two surfaces. So, the spark actually originates before the wires even touch each other. When two wires of equal potential touch, there is no spark between them.

### Why does jumping into water from a greater height cause more injuries than a lesser one?

If you dive from a board at a comparatively lower height, you enter with a splash and the water cushions your fall, if you fall from a greater height, the water can't move out of the way fast enough and you get injured as severely as if you'd fallen onto concrete.

-Sharath

## DEGREE OF COMFORT

Everyday a new technology comes in and takes over the old technology, like water in a river, constantly flowing. We never live in the now, always thinking either of the past or the future and now just fades into the past. We think about it after someday when something new comes in. We have been evolving every day, for years, decades, centuries but we never notice what's happening around until it is replaced by something new. We came to know about earth's rotation only after a small telescope used in the seas led to a bigger telescope that saw planets. More than thousand years ago some Greek men rubbed fur with amber and found they were attracting each other. That was the discovery of electricity in our minds, that's where it all begins. We humans are curious; we dig for answers just like we dig for gold or copper. We dug enough to find electricity in our brains too.

We keep growing every day, where does it end? Why are we developing every day? Why is everything getting easy? Why is our degree of comfort rising? We use to walk miles or thousands of miles to reach places, now we can ride, float, fly there you name it. We could not communicate with people of other countries but now, it's an everyday game. Even in games we're cutting down on physical activity involved in the game and increasing the joy of doing it. Compare going into the arena full of monsters with doing the same on TV while sitting on a couch with juice and chocolates. Where is our degree of comfort? We never noticed it changing. Charles Babbage is the father of computer, hence technically saying, he is controlling all our minds. Everything starts with a simple idea of a person which gets better when it reaches other person, the next person adds more to it and the same goes on, an infinite loop, involving countless number of people and huge number of modifications. Evolution is a continuous process after all. If something runs for a long time,

we get bored, our brain asks for a change and that's how it all changes. Things around us change every day. No. We change them instead, every day, without even being actually aware, a reflex. Yes. This has almost become involuntary: Seeking for more and more comfort and making it happen.

-Madhusudan SJ

The real danger is not that computers will begin to think like men, but that men will begin to think like computers.

## The Unsung scientists and locations of India



-Dendro Mihu

**"Artificial intelligence"... a threat? Artificial Emotional Intelligence"**

We've come a long way in science! Rocks, medicines and quantum physics - the human mind has created an entire civilization out of thin air. And it's still going strong. But what if, one day, this beautiful mind of ours could create something to replace itself, a machine smarter than us?

Computers are so powerful now, they are already better at doing lot of things than people. They are better drivers; they are better factory workers and as IBM's Watson proves, even better doctors. The next step for Artificial Intelligence (AI) now is to perform the most human of all human functions - independent thinking.

The prospect of AI excites and repulses people in equal measure. To get a clearer handle of what might happen and when, it's best to divide AI into three categories. The first of these is artificial narrow intelligence or what people call weak AI. This kind of AI is already in place, it's the kind of AI that uses big data and complex algorithms to arrange your Facebook timeline or beat you at chess.. Narrow AI has an intelligence that is limited to very specific arena. The next step of the AI ladder is artificial general intelligence or strong AI. This intelligence can be made possible, probably in about 30 years from now. The hurdles for creating strong AI are all about building machines that are going to be good at doing things which come very easily to humans but which machines have traditionally really stumbled with. Oddly it is so much easier to build a machine that can do advanced calculus than it is to build one that can get milk from the fridge, recognize granny or walk up the stairs. Our brains are brilliant at so-called everyday tasks like decoding 3D images, working out people's motivations and spotting casual sarcasm, with very far ahead of machines here. Some scientists doubt we will ever see strong AI but the majority of AI experts alive today seem to think that it will be there in the coming decades. So what will happen to the world once we have succeeded in creating an intelligence to rival or equal our own? Well the rivalry will be extremely short lived for one thing because the key point about strong AI is that it will be able to learn and upgrade itself on its own, without instructions. This is what makes it so revolutionary and so different to almost any machine ever built. The maker won't be in charge of mapping out all the possibilities of the things he or she has made. The machine will be given a baseline capacity but it can then build on this as it develops. It will be a trial and error learner with an infinite capacity to acquire skills. It'll have what AI professionals call recursive self-improvement.

## A Brief History of Cricket Bats

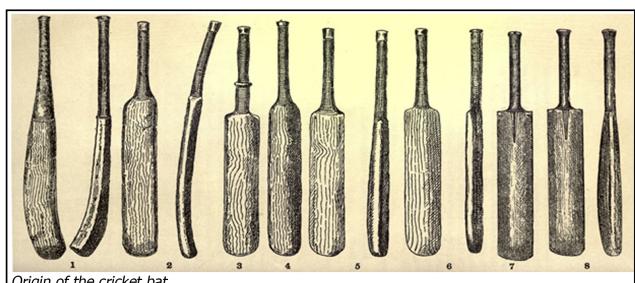
Six sixes in an over!!! Herschelle Gibbs? Yuvraj Singh? Now, what about the same scores using the oldest sticks you see in the picture? Least Probable? Yes. That is neither a Golf club nor a Hockey stick but a cricket bat way back then.

When cricket was in its cradle, the bats used, looked similar to a hockey stick. As the ball was delivered underarm and rolled along the ground, this design made sense. The laws of cricket changed to allow bowlers to loop the ball in the air whilst still bowling underarm. The change in law resulted in a corresponding change in the batting technique; here technology came into action with players starting to use a more vertical swing of the bat, as opposed to the horizontal 'sweeping' motion that was commonplace with balls rolling along the ground. So, the majority mass of the bat was concentrated at the front. This was the initial stage of cricket, where strength played a vital role.

The cricket bat is traditionally made of willow wood, specifically the English Willow (*Salix Alba var. caerulea*), treated with raw linseed oil. The oil not only protected the bat from hard ball but also increased surface friction. The wood used was highly tough and shock-resistant. Not being easily dented or getting splintered by the impact of a cricket ball at high speed with a bonus of its light weight made it a perfect pick. The bat incorporated a wooden spring design where handle meets the blade.

When the rules of cricket changed and bowling overarm was introduced, the bats became straight and uniform in order to tackle the speeding ball. Bats had very thin edges. The distribution of the weight in the blade helped the desire of a 'feather' feel.

With the advent of straight bats, cricket shots changed with many players relying on touch rather than power. Leg glance and glides were at least partially made possible by the fact that the bat was light enough to be maneuvered easily. Late cuts and other shots that relied on



Origin of the cricket bat

timing rather than brute strength were quickly adopted as the bats of the day allowed greater improvisation.

As the technology grew, its influence on cricket also grew and the shape of the bat kept changing.

The bat was shaped like a paddle with deep 'V'. Due to this shape of the ridge, there was greater air flow in the follow through. However the more important reason for that shape was an increased power to weight ratio of cricket bat as it removed wood from areas where it was not of need while leaving the bat thick enough in the front. Further modifications were made so that majority of the weight was redistributed to the "sweet spot" of the blade providing more power to each stroke, whilst still having good balance and light "pick up".

The evolution wasn't mere in the design, but also in the type of the material used. A new type of bat that had Carbon fiber reinforced polymer which supported the spine of the bat was introduced. It was put on the bat to provide more support to the spine and blade of the bat, thus extending the life of the bat

and helping the ball to attain more range. Looking more equipped for rowing a boat than hitting the ball 20 rows back is the mongoose bat. It has a long handle and the entire mass is distributed in the meat of the bat.

Well that is cricket to you, a game initially known to its strength later developed into a game with elegant shots, from hook shot to scoop shot. With the intervention of science and thus improvements in the techniques, records are being broken every day. Technology has changed almost everything in the last three decades and even cricket has fallen for its Midas touch.



-Akshatha

This is crucial because it means there'll be no reason for AI to stall once it reaches the human level. The more intelligent the system becomes, the better at improving itself so that the more it will learn and do. This virtuous cycle equates to an exponential growth in intelligence that would leave humanity amazed, but also baffled, dwarfed and perhaps very scared. It might not take very long at all; perhaps only months the machine is cleverer than its creator. This is the moment that gets very exciting, it's a moment often referred to as the "singularity" which is where we encounter the third sort of AI -artificial super intelligence. Technically this is any AI that exceeds human levels of intelligence even slightly but any self improving super intelligence is going to be sure to improve a lot very fast indeed. AI that reaches this level

would soon be leagues ahead of us, and statements such as "well let's just switch it off" might be like trying to take down the internet with a slingshot. The prospect of such super intelligence appalls and excites people in equal measure. We're approaching to alternative futures with a speed and uncertainty of a skydiver who cannot quite remember if he is wearing a parachute or a rucksack. Some including Bill Gates, Stephen Hawking and Elon Musk are so scared they believe that, we were unlikely ever to be able to effectively control any super intelligence we create. Artificial minds will just single-mindedly pursue their aims and these aims may not necessarily coincide with ours.

The solution here is to develop a side of AI called AEI or artificial emotional intelligence.

This AEI would help us with all the tricky task at the emotional, psychological and philosophical end of things, would be helped with understanding our psyches, mustering our emotions, drawing out what true talents are and with that what we were best suited to do with our lives and guiding us to the people with whom you might form good and satisfying relationships. Most of the many psychological mistakes which allow us to waste our lives could be averted. Instead of fumbling through a mental fog of insecurities and inconsistencies we would be guided to a more compassionate happier and wiser future.

-Hitha

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