

CAPSULE



Origin of photosynthesis
Imperial College London researchers, studying *Heliobacterium modesticaldum* – an ancient bacterium – have found structures in it that suggest photosynthesis may have evolved a billion years earlier than is presently believed, and oxygenic photosynthesis need not have evolved from anoxygenic photosynthesis.



Love hormone
Oxytocin is believed to regulate maternal behaviour. Now, a study in *PLOS ONE* finds a group of cells activated by oxytocin present in one area in female mice but not in the same area in males. Activation of the receptors correlates with estrogen presence, implying the cells can induce maternal behaviour. The finding has potential for treating postpartum depression.



Fountain of youth
Senescent cells are the opposite of stem cells: they can never divide again. New research finds that ageing, senescent cells stop producing nucleotides, the building block of DNA. When young cells were prevented from producing nucleotides, the cells became senescent. The findings have potential to help with ageing and related diseases.

Reversible superglue inspired by snail epiphragm

Snails secrete a mucous film which dries to forms a glassy structure that fixes them to the substrate

SHUBASHREE DESIKAN

A hydrogel-based adhesive that combines strength and reversibility has been developed by a collaboration of researchers based in the U.S. and Korea. This combination is not easily found in adhesives. The group has drawn inspiration from snails in developing this adhesive.

Snail mucous

When snails are startled or encounter discomfort, they shrink into their shells. They secrete a mucous film around the opening of their shell, which on drying forms a glassy structure that both seals them in and fixes them strongly to the object they are sitting on. This structure formed by the dry mucous is called an epiphragm.

The strength of this epiphragm stems from the fact that before it dries it penetrates into the microscopic crevices on the surface the

IIT Madras: Breath humidity sensors for wearable electronics

It detects ethanol, acetone in oral breath of alcoholics, diabetics, respectively

R. PRASAD

A nanofibre sensor capable of sensing minute variations in relative humidity levels in the exhaled breath has been fabricated by a team led by T. Pradeep from the Department of Chemistry at the Indian Institute of Technology (IIT) Madras. The highly sensitive sensors can be integrated into wearable electronics and might have applications in assessing human metabolism and calorie burn rates.

The sensor can also detect traces of ethanol and acetone, two major components present in the oral breath of alcoholics and diabetics, respectively.

Quick response time

The sensors have very quick response time of about one second and can detect a range of relative humidity from 0-95%. The sensor was found to have high stability. “Even after exposing the sensor to ambient conditions for a week, we still found the response time to be about one second and could match the breathing rates quite effectively,” says Sathvik Ajay Iyengar who was a short-term student with Prof. Pradeep’s team and is one of the first authors of a paper published in the journal *ACS Applied Electronic Materials*.

The breath rate was measured for one-two hours prior to and after exercise. The heart rate is higher soon after exercise and this is reflected in higher breath rate. “We intend collecting breath rate over a period of few days to establish the relationship between heart and breath rate and metabolism,” says Pillalamarri Sri-



Portable: The nanofibre sensor can be easily integrated to the base of wearables such as common place masks, say (from right) Pradeep, Pillalamarri Srikrishnarka and Sathvik Ajay.

krishnarka from IIT Madras, the other first author of the paper.

The nanofibre mat is fabricated by electrospinning poly(vinylidene fluoride) and reduced graphene oxide. Coating the mat with polyaniline turns the mat into a sensor.

The moisture in the breath reduces the resistance of the sensing material thereby allowing more current to flow. So when a fixed voltage (1-2 volts) is applied to the sensor, there is more current that is detected when the sensor comes in contact with moisture in the breath.

“In the presence of humidity, 100-1000 times more current can be detected using our sensor compared with other sensors,” says Iyengar. “So when the current measured is in nanoampere range when other sensors are used, we were able to measure it at microampere range using our sensor.”

When there are traces of

ethanol and acetone in the breath, the resistance of the sensor increases and conductivity reduces. Hence, there is a dip in the current measured from the baseline. “The reduction in conductivity is because of the absence of moisture – the hydrogen bond between the sensor and analyte [ethanol and acetone] is less likely to form,” says Srikrishnarka.

“Polyaniline is the major contributor of current conduction, and reduced graphene oxide complements it. The combination of polyaniline coating and reduced graphene oxide allows higher current conduction,” says Srikrishnarka. “In the absence of reduced graphene oxide, polyaniline can still conduct current but at a significantly lower level. The reduced graphene oxide alone does not help conduct current.”

“The coating of the mat with polyaniline occurs in water and so can be scaled up to get large-scale coat-

ings. This process also makes it easier, quicker and relatively more eco-friendly than other commercial processes,” says Prof. Pradeep. The nanofibre mat obtained is very thin and offers breathability. In order to integrate sensors like this into wearable electronics to monitor breath, resistance-free air flow is the key.

Portable sensor

To make the sensor truly portable, the researchers are using the popular Arduino prototyping platform coupled with Bluetooth module for collecting data wirelessly.

“We initially tested the sensor performance using an Arduino Uno and we observed a good response. We intend to team up with other departments to recognise patterns by using machine learning and to develop mobile-friendly apps to monitor health,” says Prof. Pradeep. The team plans to take the work forward via startup initiatives.

Predicting pollution levels using oceans’ memory

Patterns like El Nino can help predict weather conditions and pollution, nearly a season in advance

ASWATHI PACHA

Researchers from China and the U.S. have been successful in predicting air pollution levels in northern Indian States. The model they have developed shows 75% accuracy in predicting pollution levels, and the prediction can be done even a season in advance. The model takes into account certain climatic patterns related to the ocean which have a regulatory effect on the wintertime air pollution over northern India. Studying these patterns can help predict pollution levels.

India has been emerging as one of the world’s most polluted countries, with particulate matter PM 2.5 levels spiking more than 999 microgram per cubic metre in parts of Delhi last year.

Studying a combination of El Nino, Antarctic Oscillation and the anomalies in sea surface temperature during autumn (September-November), can help forecast the pollution conditions in winter (December-February).

The statistical model developed by the team can also help the government in adjusting policies and strategies for pollution control before winter comes, the paper published in *Science Advances* adds.

It is known that the aerosol over an area is modulated by meteorological conditions and circulation patterns. Stagnant weather conditions such as low wind speeds and descending air can favour rapid aerosol formation and accumulation. Understanding these climatic factors which influence the wintertime haze pollution can help foresee the future ventilation conditions too.

Also, the ocean data serves as a memory and large-scale climate patterns like El Nino can tell what the weather conditions and pollution will be, nearly a season in advance

The team constructed a computer model which incorporates the El Nino and Antarc-



Winter haze: The ocean data serves as a memory to foretell how the weather conditions and pollution will play out.

tic Oscillation data for autumn. Climatic data from the National Oceanic and Atmospheric Administration, U.S for the period 2003-2018 and the aerosol optical depth observed by various satellites were also used.

“It will help identify if the weather conditions will be favourable or unfavourable for pollution, helping the government frame a more stringent pollution control plan if needed,” explains Dr. Meng Gao, assistant professor at the Hong Kong Baptist University, China. He is the first author of the study.

The Antarctic Oscillation does not act directly to influence Indian climate but affects the Indian Ocean Meridional Dipole which in turn plays a role in our climatic conditions.

He added that there have been several studies in China connecting extreme pollution with East Asia winter monsoon, Arctic sea ice loss, the El Nino-Southern Oscillation, and Pacific sea surface temperature anomalies. The predictions from these studies have helped the government make the needed reforms, especially in its industrial sector, helping bring down pollution levels in the country.

Bees use complex memory for communication

Waggle run correlates with distance from food site to hive

L.T. ILAVENIL

Bees use waggle dance to communicate with their nest mates the flight distance and direction to foraging sites. Now, a research team led by Axel Brockmann at the National Centre for Biological Sciences (NCBS), Bengaluru, has studied how bees use complex memory to generate dance duration to communicate a change in foraging distance.

Bees are known to waggle dance near the entrance of the hives. The duration of the waggle run of a dancing bee correlates with the distance between the food site and the hive. For instance, as the distance to the foraging site increases, the duration of waggle increases too.

The team used the honey bee species *Apis mellifera* for the study. “Most of the research on the brain and behaviour of bees around the world is done with the help of *A. mellifera* and therefore we could put our results into the context of all the research done previously,” says Dr. Brockmann.

Memory formation

To understand in detail memory formation in bees for waggle dance, the researchers trained a group of honey bees to forage food kept 300 metres away from the hive. When the food source was shifted to 400 metres, most of the bees took multiple trips to the new foraging site to update their dance. Till such time the bees formed the new memory, they displayed an intermediate dance duration indicating distances in between the new and old foraging locations.

“One must assume that the bees, when arriving at the new feeder site, know the distance between the feeder and the hive. If not, they will not be able to find the way back. The occurrence of intermediate dance durations indicates that the bees use memo-

ry of both distances when they update the dance information,” says Dr. Brockmann.

It was also noticed that the memory processes of bees responded differently depending on whether the foraging distance was extended or shortened from the original distance of 300 metres. When the feeder was shifted from the original distance of 300 metres to 200 metres and back to 300 metres, the bees were able to update the feeder distance following each shift and communicate the distance correctly through waggle dance.

In contrast, when the feeder was shifted from the original distance (300 metres) to 400 metres the bees were able to communicate the longer foraging distance. But when brought back to the original distance of 300 metres, it continued to exhibit the waggle duration for 400m.

“The foraging site at 400 metres was new to the bees unlike the one at 200 metres which the bees visited earlier during the training process. Therefore, when the feeder was first shifted to a novel site [400 metres] and then back to the original site [300 metres], honey bees did not update the waggle duration after the second shift. This is likely due to new memory interfering with the recall of an older one,” says Arumoy Chatterjee, a PhD student at the institute. He is the first author of the paper published in *Journal of Experimental Biology*.

“Previously, there was no easy way to dissociate the waggle dance activity of honey bee foragers from their foraging activity. Our experiments now provide us with the means to dissociate them, an essential first step towards understanding the mechanisms underlying the conversion of flight information to waggle dance information”, adds co-author Ebi George, another PhD student at the institute.

IISER Mohali finds that zebrafish use landmarks for navigation

The presence of colourful landmarks, visible even in turbid conditions, plays an important role in improving foraging success

R. PRASAD

Low to extremely turbid water conditions are quite common in areas that humans inhabit. Under such conditions, it is a challenge for fish to forage food as they rely on vision to navigate and find food. Now, in a study carried out using zebrafish, researchers at the Indian Institute of Science Education and Research (IISER) Mohali have found hard evidence to support how turbidity negatively affects foraging efficiency and how they learn to cope with it. The study was done in collaboration with IISER Kolkata.

The team led by Dr. Manjari Jain from the Department



Smart fish: The zebrafish used visual cues and landmarks to navigate to foraging sites.

of Biological Sciences at IISER Mohali found that with acclimatisation to turbidity conditions zebrafish did overcome the challenges

posed by reduced visibility. The study found that acclimatisation to the immediate visual environment does play an important role in de-

termining success in foraging food. The results of the study were published in the journal *Biology Letters*.

Colourful landmarks

In addition to acclimatisation, the presence of colourful landmarks that are visible even in extremely turbid conditions plays an important role in improving foraging success. The study could conclusively show that zebrafish use visual cues to navigate to foraging sites especially when turbidity is high and visibility is low.

“The cornerstone of the study is the visual learning capability of zebrafish. We found the wild freshwater zebrafish (*Danio rerio*) are cap-

able of using familiar visual landmarks to find food locations even when vision is compromised,” says Dr. Jain.

“This is the first study to show the ability of zebrafish to use any landmark for navigation,” she says. The study highlights the important role of behavioural plasticity and spatial learning to cope with altered sensory environments, which in this case is increased turbidity of the water they live in.

Effect of turbidity

“Here we demonstrate the detrimental effect of turbidity on zebrafish with respect to foraging. Turbidity is likely to increase the metabolic cost associated with foraging

behaviour,” Dr. Jain stresses. “But what is unique is that within one month of acclimatisation they seem to deal with it. The foraging ability improves drastically. It highlights the importance of acclimatisation.”

If zebrafish do indeed learn to cope with turbidity and find food in a matter of one month, should the effect of turbidity on zebrafish matter at all? “Just because they are able to cope with turbidity in a month does not mean that chronic exposure to turbid water is not going to affect them. The resilience to survive in turbid water has not been studied,” she warns.

“If one of the sensory mo-

dalities is compromised in some species they are capable of switching over to another. But in the case of zebrafish we found they continue to use visual sensory to locate food,” Dr. Jain says. For the study, the researchers collected 160 zebrafish from a clear stream near Kolkata. The fishes kept in tanks were fed fish pellets and *Artemia* (genus of aquatic crustaceans). They were trained for two weeks to navigate and locate food. After training fish to find food, 75 fishes were split into three groups and the different groups were acclimatised for a month in clear, low turbid and high turbid conditions. The low turbid condition

mimicked coastal water and high turbidity mimicked an estuary mouth.

Acclimatisation

The researchers found that one month of acclimatisation was sufficient for fishes to forage food even when the turbidity was high.

Even during training, the researchers did find that zebrafish in turbid water did learn to use colourful stones as proxy for food locations. During the tests, even in highly turbid conditions, the ability to locate food was superior when there landmarks. Their ability to locate food was compromised when the landmarks were not present.

Life as one big BREADBOARD

Outcomes hardly matter; just do it as diligently as possible

SHANKAR GOPALKRISHNAN

The electronics laboratory sessions at the engineering college were eventful. A motley set of equipment lay scattered on the table – a breadboard, a display screen, a clump of wires and colourful beads comprising resistors, transistors and capacitors. The objective was simple: to follow a set of instructions, create an electronic circuit on the breadboard and read the resultant output waveform on the display screen. The breadboard had tiny holes into which you inserted the resistors and capacitors and connected them up with wires.

It would be unnerving especially if you were doing it for the first time. You had to contend with multiple challenges – instructions that were unclear, the pressure of time and the overbearing

presence of the professor who looked out for the slightest error to give you an earful! It was often an exercise in futility, and there were days when the experiments completely failed despite your best efforts. Still, you soldiered on.

If you managed to get the desired output waveform and successfully completed the lab work, it was deemed a miracle.

The miracle

One afternoon, a miracle did happen. The display screen suddenly sprang to life, and registered this most beautiful waveform. It was a sight to behold – a rainbow of sorts for our thirsty eyes!

We were a team of three and had struggled through the entire afternoon putting the pieces of the circuit together until the breadboard resembled a wild jungle... with wires hanging all over!

We impatiently waited until the professor was at the table to evaluate our artwork. It was our crowning glory moment. The professor's expression was inscrutable – he looked at the waveform with interest and then looked at each of us with equal interest. He carefully removed one of the resistors from the breadboard, reaching out for it between the wild undergrowth of wires. "Watch, my dears; the waveform output is still intact!" Our response was muted. "Yes, sir," we mumbled. In such a complicated circuitry, there could be some scope for redundancy, where the loss of a body part need not affect the overall health, or so we thought.

What happened from this point on was nothing short of dramatic. The professor did quick work: he removed a capacitor here, a resistor there and uprooted wires by the

handful. Like dead pieces outside a chessboard, there was a now a growing heap of deadwood piling up outside the breadboard. "My dears, your waveform is still intact!" We knew something was wrong. Soon, the professor plunged his entire fist into the breadboard and exhumed whatever came in his grasp and exclaimed, "My dears, your waveform has still not changed!" Eventually, in a manic rage, he had emptied the entire breadboard of all its components. The waveform still smiled back at us, unaffected. The rest of the afternoon was not

pleasant. The professor asked for the lab record-books and scrawled, "repeat the experiment" in red across the entire page. He was evidently angry. The above incident is actually several decades old. To this day, I am baffled how the waveform output could be so precise especially when the breadboard was emptied out. There are plausible explanations, no doubt, of the circuit being 'shorted' or the display wires possibly connected back-to-back. I do not know. However, I do know this incident has taught some valuable lessons for life.

Often we wonder about our contribution to this world, our role in the scheme of things and how it will shape the future. As the years roll by, these larger-than-life questions nag us. We worry that if by a quirk of fate, we move on today, would we have done enough for the future, for the family, for society so that they are better off, just that little bit, because we lived. But there are no easy answers. It is here that the breadboard and the waveform come to our rescue. The waveform did not require the elaborate circuitry on the

breadboard at all. So too with life. The cosmic laws will take care of the future on their own. In front of these mighty laws of time, space and causation, my puny existence and contribution amounts to nothing. Hence, I need not worry about the future. The future will unfold on its own, regardless of me. This attitude frees me from unnecessarily carrying a load that I need not! If that is the case, do I need to struggle with the breadboard at all? Do I need to wire those elaborate connections? Can I simply eject out of the whole framework

if anyway my contribution amounts to nothing? No, I do need to wrestle with the breadboard and arrange those resistors and wires to the best of my ability. If I look back, those electronics laboratory sessions were important. We experienced the whole gamut of emotions – of elation and dejection, ear and futility (often on the same day). The tapestry of emotions made our lives richer. Without them, our lives would have been boring and hollow. The diligence, the teamwork, the common goal and the shared emotion... everything was essential and helped us emerge stronger and wiser. In the process, we had a lot of fun. So too with life. I am placed today in a particular role, to wire up some circuit on some breadboard. The outcome just does not matter. I only have to be busy in the process of wiring the breadboard as diligently as I can. That alone is my lot. Ours is not to question why. Ours is but to do and die! Therefore, we keep doing, like the busybee... with a heart for any fate. Still achieving, still pursuing, we learn to labour and to wait!

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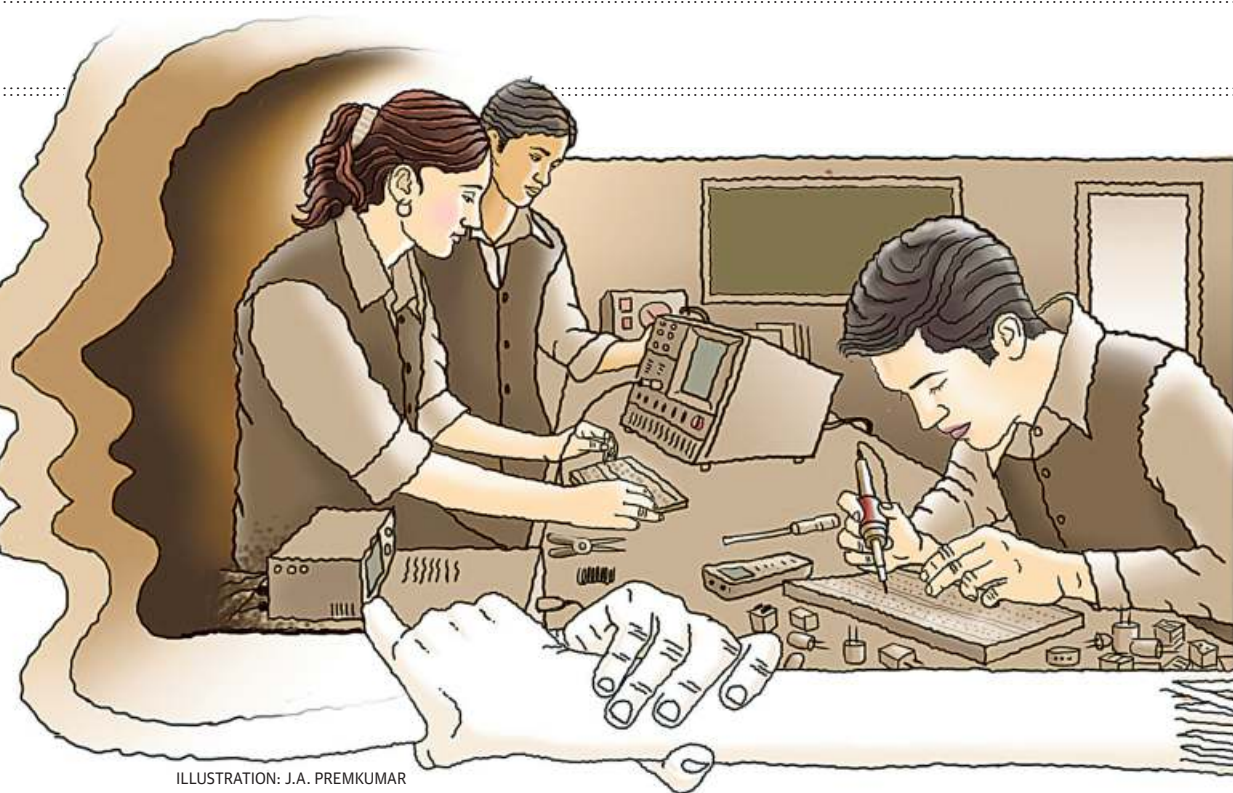


ILLUSTRATION: J.A. PREMKUMAR

The striking tales the rain tells

The universal truths and some age-old lessons of water management

C.N. PILLAI

Rain, or the lack of it, is very much on our minds today. Though about 70% of the surface of the earth is covered with water in the form of oceans, life on the land depends on precipitation as rain and snow.

The occurrence of precipitation is subject to the vagaries of nature, leading to unexpected droughts and floods. Man, over the ages, has adopted various strategies to propitiate nature and the gods to ensure adequate rainfall. The ancients were aware of the importance of trees and mountains in ensuring rainfall and conserving water. I recount two stories from Indian mythology to illustrate the point.

Bhagavatha Puranam contains chapters on Govardhan puja practised in Gokulam during Krishna's childhood.

This was an agrarian community whose livelihood was farming and cattle-rearing, and timely rain was important. Every year, they would conduct a puja or *yagam* to propitiate Lord Indra who was believed to be the one who controlled rain.

Once when Krishna was about seven years old, preparations were afoot for the annual Indra puja. Krishna questioned the elders of the community on the puja. When told about its purpose, he could not accept it. He argued that rain was a natural phenomenon and Indra, if at all involved in it, could act only according to the rules of nature. Scanty rainfall, if it happened, was the result of our own acts of commission



ILLUSTRATION: SATWIK GADE

and omission. (I am using modern terminology here for what I think Krishna meant by ascribing it to *karma*.)

He further said they were living in the foothills of the Govardhan mountain and the trees were responsible for bringing forth rain. We neglect the mountain and the trees at our own risk and Indra had no role to play in this.

So he suggested they perform a puja for the mountain. An environmental activist today could not have expressed it better. He was so persuasive that the people of Gokulam followed his advice. The subsequent events are well-known. Krishna's suggestion should be interpreted as a call to protect and conserve nature.

Bhagiratha's task

Let me now go fast backward to another era and another scenario. King Bhagiratha ruled his country in the foothills of the Himalayas. He was a troubled person. The souls of his forefathers were

doomed to perdition without salvation due to their own *karma*. Rituals had to be performed with holy waters from heaven to put their souls to rest.

Bhagiratha was determined to cajole Ganga Devi herself from the heavens to come down to earth, and to this end, he performed rigorous *tapasya*. His arduous ef-

The ancients were aware of the importance of trees and mountains in ensuring rainfall

forts finally bore fruit and Ganga Devi agreed to come down to the earth.

But the fall of the waters would result in a deluge and the entire earth could be washed away unless means were in place to contain the floods. Lord Siva agreed to receive and hold the waters when they descend, in his tresses. Here Siva symbolically stands for the Himalayan mountains and his tresses for the trees, vegetation, hills, valleys and lakes.

Ganga Devi did descend in the form of heavy rains or cloudbursts and the waters were contained by the mountain.

But even that did not solve the king's problem. Water in the mountain is not water in the plains where the ancient ashes were waiting to be quenched, and that location was far away. Poor Bhagiratha went back to his *tapasya* and persuaded Siva to release the waters in measured quantities via rivulets and finally into the mighty Ganga, which flowed down the plains till it reached the grounds where the rituals were performed.

The purpose of reciting this well-known story is only to emphasise the importance of mountains and trees to regulate floods and in water management, to use a modern term. Disturbing the ecosystem of the catchment areas, be they the hills or the plains, can have disastrous consequences all around the region. The devastating flood that inundated Uttarakhand and the neighbouring Himalayan States in 2013 was attributed to the wanton destruction of the mountains in various ways by people for short-term gains.

In the present-day context, experts in this field are aware of these matters. While a spate of quick-fix measures are being undertaken, it is good to remember that such measures can only be of limited use, and long-term measures should be implemented on an ongoing basis.

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All in a day's work for this doctor

Two patients, the same kind of effort put in; one survives, the other dies

PINGALI GOPAL

The one-hour-old blue baby was brought in at 5 a.m. with rapid breathing. A quick examination and an X-ray established a diaphragmatic hernia – a defect in the muscle separating the abdomen from the chest. This allowed loops of bowel and other abdominal organs to enter the chest, compressing the lungs and the heart. The only course open was surgery.

As the paediatric and neonatal surgeon in the hospital, I gave the attendants a rough estimate of the cost, including the possible variances in the event of complications arising. I added that in case they are not happy to stay in that hospital, we would transfer the child to the government facility – and told the father to communicate his decision to the nurse.

The consent came after a few hours. The child was born after years of marriage. The father asked me to do my best; and sought a discount on the bill as he had limited means. I promised to do my best with the medical efforts and the bill too if everything went well. The child had a smooth surgery and went on elective ventilation.

I saw another patient just as I was coming out of the theatre, and as it happened, it was an exactly similar case. I groaned. The same bit of counselling went into the discussions with the family attendants. The father was absent in the proceedings. The attendants said he was working in Mumbai and was on his way. The treatment



ILLUSTRATION: SREEJITH R. KUMAR

started and the child underwent surgery the next day. The surgical findings were very similar, and the child went on ventilatory support.

On the third day, the condition of both babies started deteriorating, the cause being sepsis. For the next few days, it was a see-saw between life and death for them, amid our efforts. The

Thank you so much for saving the child. You are but God to us

babies would improve, raise hopes, and then sink a bit. I spent two consecutive nights in the neo-natal intensive care unit (NICU) over endless cups of tea. On the seventh day, the first baby started to improve; unfortunately, the condition of the second progressively deteriorated. The attendants of the second baby stopped buying medicines, and we had to supply them from our stock. The number of attendants started dwindling at a slow rate. Five days later, the first ba-

by recovered and was ready for discharge. The father came to my room and spoke, with tears in his eyes, "Thank you so much for saving the child. You are but God to us." Suddenly, he bent down along with his aged mother to touch my feet. I recoiled in shock. The father pleaded: he was extremely poor and had taken money from a loan shark. He built up his case slowly and finally managed to take a whopping quarter off the bill, and I approved it.

That evening, the second child died. The only person outside the NICU was an old lady to whom we declared the death. She said the attendants would come the next day. That day, two tractors filled with people landed at the hospital gate demanding to see me. My chamber was flooded with at least 20 people, smelling strongly of country liquor. And then came abuse, allegations of negligence, exploitation, and demands for compensation. A figure of one lakh rupees started floating around, an

impossible amount those days. Members of the local doctors' body and the police later added to the already cramped room.

Shouting matches between some of our more vocal doctors and angry members of the crowd ensued. The original attendants of the patient were completely missing from the scene of action now. After four hours, a deal was finalised on the intervention of some local politicians and the police. The hospital and the pharmacy are to waive the dues and pay some extra money for funeral expenses on 'humanitarian' grounds. There was a threat to me and the hospital from a mob. Amid slogans on loudspeakers, journalists taking photographs, and curious onlookers, the body of the child left the hospital.

I sat helplessly and burnt with impotent anger. The family had lost the child, but a doctor had just lost some faith. When a doctor hardens a little bit, what are the consequences for the medical profession and society? Two patients, the same kind of effort put in; one survives and makes me god and the other dies making me a devil.

Triumph and disaster stalks everyone, and it is well worth remembering the words of Lord Krishna: I am indifferent to triumph today, but still to handle disaster similarly. In their own ways, both the families managed a huge discount! I, god and devil rolled into one, went home, had dinner, and slept fitfully to see another day.

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How nature sorts us

No two lives are comparable, and no two achievements can be similar

G. SWAMINATHAN

I recently watched a movie on social discrimination and its perils. The Indian Constitution does not permit such acts, but unfortunately we live in a country soaked in discrimination from time immemorial.

Can we find any society where there is no discrimination? Probably not; only in terms of the degree there might be differences.

Let us look at this objectively. Nature, or the Almighty, or the Creator of this world – depending on your point of view – discriminates among everything. Is he or it not discriminating between an animal and a human from birth? Do we have the same geography and climate in every part of this un-

iverse? Does every human being or animal look the same though there are similarities?

Can we confidently say life is fair to everyone? When I mentioned this once to my friend, she asked: "Why do you expect life to be fair to everyone?" She was right. Life cannot be fair to everyone. So there is definitely a bias.

If we look at a human being's life from his or her birth, at every stage he/she has to face or find inequity. First, the looks and colour, then IQ, then education, then academic achievements, job or marriage, children, health, and finally, death.

Factually speaking, the whole world survives only because of discrimination. If

everyone is equal and same, life will just not move. An engineer cannot do the job of a doctor and a factory worker cannot execute the position of a CEO. One can argue that some start their career on the shopfloor and one day become CEOs. But such instances are far and few between.

Can we vouch that all the intelligent students reach high positions in their professions, or *vice versa*? I have seen many intelligent students who turned out to be mediocre in their careers while many of the mediocre and dull ones achieved great heights in the later part of their lives.

If everyone is intelligent there is no need for education; if everyone is beautiful, the world may not exist in

the lexicon at all. If everyone is rich, there will not be anyone to do the work. If everyone is healthy, there is no need for doctors. When equality is attained, one cannot talk about bigotry.

Life and humans are in black, white or grey. No two things are equal. No two lives are comparable. No two achievements can be similar. Life runs because the roads of life are made by destiny with several ups and downs. Everyone, except the blessed few, had no option but to pass through them.

A world without discrimination or distinction is an utopian concept. Contrasts only propel life.

So basically, nature itself differentiates everyone and every life and every act; we

humans exploit it to further our benefits, the rich and the poor, the educated and the enlightened, the good and the bad. So blame it not on humans but on nature!

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A son flies free

Seeming freedom and novelty for him, misery and apprehension for mother
RAMAN NAIR

My sin, the sin of sloth

Being lazy could be a state of mind that could well liberate you
ACHYUT NAMBIAR

Mock-meet and all that

Coping with a certain kind of ambiguity in vegetarianism
VIMAL KUMAR

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