



# DREAM 2047

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## Climate Change: A Call for Awareness



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... think scientifically, act scientifically... think scientifically, act scientifically... think scientifically, act...

## Science Communication and (Human) Values



**Dr. R. Gopichandran**

Jucan & Jucan<sup>1</sup> (2014) give an excellent account of the basic framework of science communication. This includes approaches scientists should consider to optimize on impacts expected of such communication. The interplay of target groups and their information needs and enablers of action to follow are also well defined. Importantly beginners in science communication will find in this paper a valuable snapshot on the types of communication and methods used to fulfill their respective objectives. It will be a great idea for policy and decision makers too in the interface of public and collective action to understand these essential elements of communication.

I place these considerations for especially emphasizing on the latter.

1. It is important to be clear about the processes of assessing impacts of science communication. Qualitative and quantitative attributes are distinctly different for process of reaching out and enabling circumstances that determine well informed action.
2. We cannot afford to overlook the uniqueness of the agenda of science for public good. This is distinctly different from a business agenda. Social, economic and environmental costs / consequences of such interventions are complex. This therefore, calls for strategically important and clear understanding of immediate, medium-term and long-term sustainability; wherein public good is central.
3. Scientists / any other community of knowledge leaders / generators should upfront state the limits and limitations

of their interventions. These two elements are robust determinants of sustainability and cannot be shrouded with arrogance or one-up-manship.

Public policy guided by science should duly recognize such values as transparency and inclusiveness. Transparency is about consideration-3 stated above. Inclusiveness is about ensuring a seamless and assured access to benefits for all citizens in every walk of life.

Dietz<sup>2</sup> (2013) elaborates on values of science in his paper, I consider classic. This is due to the definitions he articulates. Great learning for beginners in the field of science communication and certainly for other arm-chair communicators who refuse to acknowledge their own ignorance. I wish to indicate a few other aspects of human values, I believe science communication should adopt. The first of these is humility. Science communicators should never bulldoze each other in the first place, with a holier than thou / smarter than thou attitude. This humility should be derived from the second aspect; and that is about acknowledging the vastness of opportunities to communicate. For heaven's sake, communicators should never speak of their own subject or geographic domains and claim greater sincerity of purpose than of fellow communicators. Expertise, wisdom and clarity of purpose will reveal themselves if absolutely genuine and almost altruistic. There is no place for arrogance, self-aggrandizement.

Is it not hypocrisy for science communicators to be arrogant, self-perpetuating and manipulative? In fact, the geographic and cultural landscape of India and countries with comparable richness

provide unique and immense opportunities for science communication. It is important to recognize and integrate with the knowledge capital of her citizens; as also of other countries. More the communicators and institutions in science communication, merrier it is. Charity probably begins at home. Communicators should practice inclusiveness; acknowledge each other's strengths and assist communities, to co-evolve in so far as their information / knowledge domains are concerned. Such human values as truth and compassion should guide the coming together. There is enough space for all willing to serve the cause of truth to come together.

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2. Dietz T 2013 Bringing values and deliberation to science communication. *PNAS* Aug 20, 110; suppl. 3: 4081–14087 [http://www.pnas.org/content/110/Supplement\\_3/14081.full.pdf](http://www.pnas.org/content/110/Supplement_3/14081.full.pdf) other interesting sources: <http://www.4sonline.org/society>; <http://journals.sagepub.com/toc/sth/current>

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# BMI number and Health Consequences



*Jyotsna Devi*



*The body mass index (BMI) is a measure of the body weight relative to height that applies to both adult men and women. It is commonly used to classify underweight, overweight and obesity in adults. It can be used as a screening tool to identify possible health risks, but it is not used for diagnosing a medical problem.*

Weight poses a great threat to life for more than 1 billion overweight and 300 million obese adults, globally. The economic boom and the easy availability of packaged food combined with reduced levels of physical activity have made adolescents as well as adults more susceptible to obesity. It has been predicted that 20 percent of Indian females and 16 percent of males will be overweight by the year 2020. The incidence of chronic diseases too may rise akin to the obesity and overweight levels. Obesity at any age carries with it dangers of diabetes, elevated abnormal lipid profile, heart disease, stroke, arthritis, breathing difficulties, sleep apnoea and snoring, gallstones, gout, a higher incidence of cancer and fertility problems. Various parameters are used to assess health and predict longevity, or in other words, how fit a person is. The most widely used parameter is the body mass index or BMI.

## What is BMI?

The body mass index (BMI) is a measure of the body weight relative to height that applies to both adult men and women. It was invented in 1832 by Belgian statistician-sociologist Adolphe Quetelet, and was known as the Quetelet index. The BMI is calculated by measuring the weight in kilogram and dividing it by height in metres squared, but it is also easy to read on the chart.

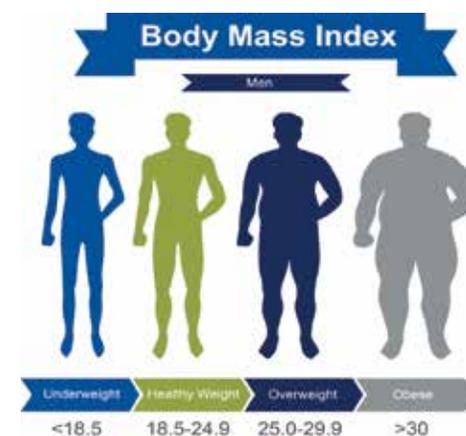
Example: Weight=70 kg, Height = 170cm (1.70m)

Calculation:  $BMI = 70 \div (1.70 \times 1.70) = 24.22$

## Category of BMI range

BMI is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. The classification recommended by WHO is as follows:

Classification	Asian range	World wide range
Underweight	Less than 17.50	Less than 18.50
Normal weight	17.50 – 22.99	18.50 – 24.99
Overweight	23.00 – 27.99	25.00 – 29.99
Obese	Above 28.00	Above 30.00



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BMI values of Asian countries are different because there is additional fat content and difference of fat distribution on the body in Asians. It is important to use the relevant scale for Asians to get proper identification of risk.

## BMI variations

The recommended weight status according to the BMI may vary from time to time and country to country. For example, in Japan and Hongkong, normal BMI ranges from 18.5 to 22.9, overweight from 23.0 to 24.9, and obese 25.0 and above. In Singapore, the BMI cut-off figures were revised in 2005 with an emphasis on health risks instead of weight. Normal adults (BMI from 18.5 to 22.9) have low risk, overweight adults (BMI from 23.0 to 27.4) are at moderate risk, and obese individuals (BMI of 27.5 and above) are at high risk of developing heart disease, diabetes and other health problems.

BMI, interpreted using standard weight status categories, are same for all ages (20 years and older) and for both sexes. For children and teens, the interpretation of BMI is both age- and sex-specific because the amount of body fat differs between girls and boys and also changes with age. The correlation between BMI number and body fatness may not be applicable for athletes, because highly trained athletes may have a high BMI because of high muscular mass rather than increased body fatness. In addition, at the same BMI, women tend to have more body fat than men. Older people (above 65 years) on average, tend to have more body fat than younger adults.

## Health problems associated with low BMI

A low BMI is often due to malnutrition, but can also be caused by genetic make-up or illnesses like hyperthyroidism and diabetes. At low BMI, body does not get enough of the nutrients and energy needed. A BMI less than 18.5 carries its own hazards – susceptibility to external temperature, especially to cold (because of a lack of an insulating layer of body fat), fatigue and lack of stamina, iron-deficiency anaemia and a weak immune system with frequent infections. The body needs protein to assemble and make white

blood cells and antibodies, which fight infection and thus prevent from getting sick. Underweight individuals often don't take in enough protein, fat or other nutrients to support a healthy immune system. Bone loss occurs with a low BMI because essential minerals leach out of bones in order to provide the muscles of body with the needed minerals not provided by the diet. Bone loss can result in osteoporosis, a condition where bones are too thin and fracture easily. In women, low BMI is associated with menstrual problems and reduced fertility. Underweight individuals are also at risk for cardiac abnormalities, such as mitral valve prolapse, arrhythmias and heart failure.

## Health problems associated with high BMI

Research has identified the health risks associated with high BMI values. Blood cholesterol is more likely to be high. Elevated blood cholesterol hardens arteries, and increases blood pressure. Over time, the added strain on the heart increases a person's risk of heart attack and heart disease. Some people may also be at risk of developing gallstones, and non-alcoholic fatty liver disease. Having a BMI over 30 is a risk factor for developing sleep apnoea, a respiratory problem in which breathing stops or becomes very shallow for short periods during sleep. There is also a risk of developing type-2 diabetes and increased weight elevates blood sugar values in those already diabetic. One serious health hazard is development of osteoarthritis in older people which is characterised by the breakdown and eventual loss of joint's cartilage in the knees, hips, lower back, shoulders and fingers. Extra weight means extra stress on the joints. Certain types of cancer, including colon cancer, breast cancer and endometrial cancer are associated with obesity. Women may have menstrual irregularities and complications of pregnancy. Obese people also suffer from emotional stress and psychological disorders.

## Waist circumference

Although all body fat is same, where it is stored can make a difference in the risk for health. Obese individuals tend to differ in the regional distribution of fat within the body. Measuring waist circumference helps screen for possible health risks that comes

with overweight and obesity. If it is more than 35 inches (89 cm) for women and more than 40 inches (102 cm) for men, there is an increased risk of lifestyle diseases. To correctly measure your waist, stand and place a measuring tape around the narrowest part of the waist above your hipbones. Measure your waist just after you breathe out.

## Waist-to-hip ratio

The waist-to-hip ratio (WHR) is another criterion for determining health risk. Measure your waist at the smallest circumference of your natural waist,



usually just above the belly button and the circumference of your hips at the widest part of your buttocks. To determine the ratio, simply divide your waist measurement by your hip measurement. Ideally, it should be 0.7 for women and 0.9 for men. People who tend to gain weight mostly in their hip/buttocks have roughly a pear shaped body while people have more of an apple body shape if they gain weight in the abdomen. Health risk associated with W: H ratio is different for males and females as can be seen in the chart below.

Waist-to-hip ratio		Estimated health risk	Estimated body shape
Males	Females		
0.95 or below	0.80 or below	Low	Pear
0.96 to 1.0	0.81 to 0.85	Moderate	Avocado
1.0 +	0.85 +	High	Apple

## Ideal body weight

Body weight and shape are a balance of energy intake (dietary calorific content) against output, i.e., calorific burn from exercise and activity. The body needs calories for functioning of internal organs, operations of the brain, temperature control, breathing, and to maintain heartbeats. Our body produces calorie by metabolism from food we eat and burns it too. If energy intake is less than expenditure, weight is lost. When the calories consumed are in excess of expenditure, the body saves them in the form of fat. Thus weight is gained. It is this fat you need to burn off to reduce your weight. You need to burn 3500 calories to reduce 500 gm of fat. At all ages, we need to maintain our BMI at 23. So for us Indians, ideal body weight is calculated by multiplying the height in metres squared by 23. Our body produces calorie by metabolism of food that we eat. If you have ideal body weight, try to maintain it. If you have less or more than the ideal weight, try to gain or lose weight by adjusting your food intake which depends on person's body weight. To lose weight, take in 20 calories/kg, to maintain weight you require 30 calories/kg and if you want to gain weight you have to consume 40 calories/kg.



do muscle strengthening exercises, lifting light weights and yoga for 20 minutes a day. Physical activity helps the body to maintain healthy level of insulin and blood sugar. This prevents damage to blood vessels and internal organs such as the heart and the kidney. Regular exercise blunts obesity's ill



## Attaining ideal BMI

If your BMI is low and you want to gain lean mass to reduce your health risks and optimise your energy levels, begin by exercising regularly and slightly increasing your calorie intake. This should be done in a healthful manner, i.e., consume a balanced and nutritious diet. Weight gain should not come from high-fat, high-sugar foods, such as cookies and cakes, but from nutrient-dense foods like nuts, cheese, dried fruits and low-sugar yogurt. You can increase your caloric intake by snacking between meals with healthy and nutritious foods, but not junk foods.

BMI over 25 can be tackled by reducing the food intake and increasing the amount of exercise. Aerobic activity (running, jogging, brisk walking, cycling or swimming) for 30-60 minutes a day can result in significant loss of fat. You can also

effects even with little or no weight loss. You can try a change in your lifestyle like:

- Walk to your neighbourhood market for groceries instead of ordering on phone for home delivery.
- Ride a bicycle to work place if possible.
- Climb stairs and do not use lifts.
- Develop hobbies like gardening, cooking, crafts etc.
- Play some games in the evening.
- Try doing your household chores.

## Conclusion

BMI is one way to measure a person's weight status. However, it does not take into account the body fat percentage which varies with age, sex, ethnic group and activity level. Thus it is not an accurate measure of

excess fat. It is just a simple way of seeing if your weight is appropriate for your height. It can be used as a screening tool to identify possible health risks, but it is not used for diagnosing a medical problem. Lifestyle diseases are on rise with increase in number of overweight and obese adults. So try to achieve your ideal body weight and maintain it by eating a balanced diet and exercising regularly. Regular exercise has enormous physical and emotional benefits too. Besides reducing the risk for high blood pressure, high blood cholesterol, diabetes, obesity and osteoporosis, regular exercise can be helpful in raising your general mood and reducing the risk for depression. However, don't be taken in by the advertisements and go for weight loss drugs and surgical procedures as these have side effects. You can take special care to keep your weight at a healthy level. Eat nutritiously, exercise as appropriate, and maintain other healthy lifestyle habits. Thus balancing energy intake with energy expenditure is necessary for a desirable body weight.

## VP website



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# Climate Change: A Call for Awareness



*Dr. Rajesh Grover and Dr. Loveleen Brar*



*There is an urgent need to sensitise the general population regarding global warming and climate change. With the opening of the Climate Change Theatre to the visitors, the PushpaGujral Science City will be making a major contribution to educate the masses and encourage them to take steps to be environmentally responsible.*

Rising fossil fuel burning and land use changes have led to emission of increasing quantities of greenhouse gases into the Earth's atmosphere. These greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide and ozone and a rise in these gases has caused a rise in the amount of heat from the Sun trapped in the Earth's atmosphere – heat that would normally be radiated back into space. This increase in heat has led to the greenhouse effect, resulting in climate change. The main characteristics of climate change are: increase in average global temperature (global warming); changes in

cloud cover and precipitation, particularly over land; melting of ice caps and glaciers and reduced snow cover; and increase in ocean temperature and ocean acidity due to seawater absorbing heat and carbon dioxide from the atmosphere.

## The greenhouse effect

The Earth gets energy from the Sun in the form of sunlight. The Earth's surface absorbs some of this energy and heats up. The Earth cools down by giving off a different form of energy, called infrared



*Not enough greenhouse effect: The planet Mars has a very thin atmosphere, nearly all carbon dioxide. Because of the low atmospheric pressure, and with little to no methane or water vapour to reinforce the weak greenhouse effect, Mars has a largely frozen surface that shows no evidence of life. (Source: NASA)*



*Too much greenhouse effect: The atmosphere of Venus, like Mars, is nearly all carbon dioxide. But Venus has about 300 times as much carbon dioxide in its atmosphere as Earth and Mars do, producing a runaway greenhouse effect and a surface temperature hot enough to melt lead. (Source: NASA)*

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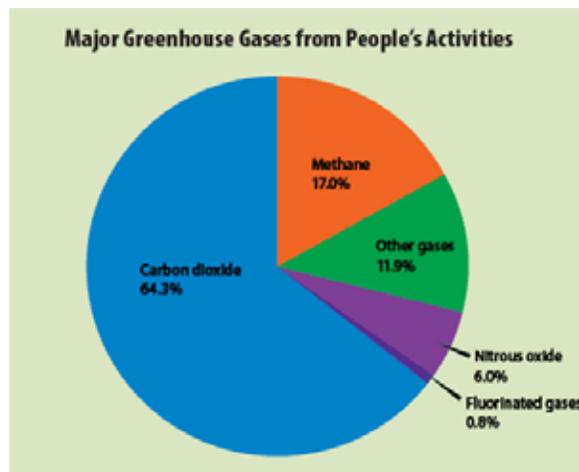
Dr. Loveleen Brar is Scientist B at Pushpa Gujral Science City, Kapurthala. Email: loveleen\_brar@ymail.com

radiation. But before all this radiation can escape to outer space, greenhouse gases in the atmosphere absorb some of it, which warms the atmosphere. As the atmosphere gets warmer, it makes the Earth's surface warmer, too. It is the greenhouse effect that has made it possible to maintain Earth's average temperature of 15°C, ideal for supporting life. If it were not for greenhouse gases trapping heat in the atmosphere, the Earth would be a very cold place with an average temperature of less than 0°C.

### When do greenhouse gases enter the atmosphere?

Whenever you watch TV, use the air conditioner, turn on a light, use a hair dryer, play a video game, listen to a stereo, wash or dry clothes, or microwave a meal... you are helping to send greenhouse gas into the atmosphere.

The Intergovernmental Panel on Climate Change (IPCC) is an intergovernmental body under the auspices of the United Nations, set up at the request of member governments, dedicated to the task of providing the world with an objective, scientific view of climate change and its political and economic impacts. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change dispelled many uncertainties about climate change. Warming of the climate system is now unequivocal. It is now clear that global warming is mostly due to man-made emissions of greenhouse gases (mostly CO<sub>2</sub>). Over the last century, atmospheric concentrations of carbon dioxide increased from a pre-industrial value of 278 parts per million to 379 parts per million in 2005, and the average global temperature rose by 0.74°C. According to scientists, this is the largest and fastest warming trend that they have been able to discern in the history of the Earth. An increasing rate of warming has particularly taken place over the last 25 years, and 11 of the 12 warmest years on record have occurred in the past 12 years. The global average concentration of CO<sub>2</sub> in Earth's atmosphere is currently about 400 parts per million. The IPCC

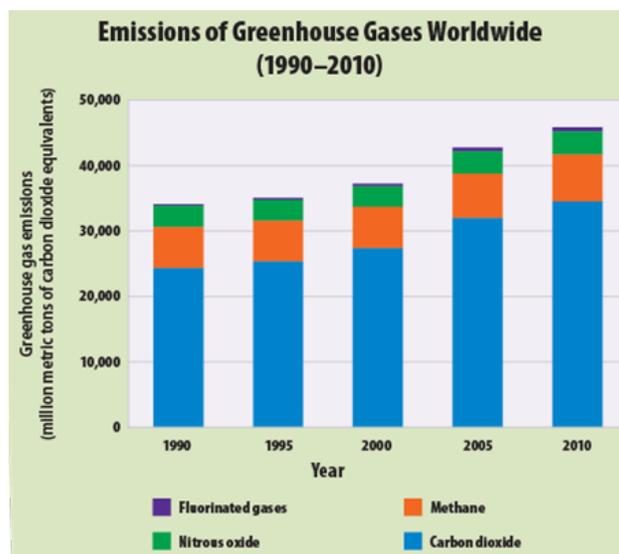


The size of each piece of the pie represents the amount of warming that each gas is currently causing in the atmosphere as a result of emissions from people's activities. (Source: Intergovernmental Panel on Climate Change, Fifth Assessment Report (2014)).

Report gives detailed projections for the 21st century and these show that global warming will continue and accelerate. The best estimates indicate that the Earth could warm by 3°C by 2100. Even if countries reduce their greenhouse gas emissions, the Earth will continue to warm. Predictions for 2100 range from a minimum of 1.8°C to as much as 4°C rise in global average temperatures (IPCC, 2007).

### Climate Change: The Indian Scenario

India is the fastest-growing major economy in the world. It is the fourth largest greenhouse gas emitter, accounting



Source: EPA's Climate Change Indicators

for 5.8 percent of global emissions. India's emissions increased by 67.1 percent between 1990 and 2012, and are projected to grow 85 percent by 2030 under a business-as-usual scenario (IPCC, 2007)

The key environmental challenges in India have become sharper in the past two decades. Climate change is impacting the natural ecosystems and is expected to have substantial adverse effects on India, mainly on agriculture on which 58 per cent of the population still depends for livelihood; water storage in the Himalayan glaciers which are the source of major rivers and groundwater recharge; sea-level rise; and threats to the country's long coastline and habitations. Climate change will also cause increased frequency of extreme events such as floods, and droughts. Erratic monsoon with serious effects on rain-fed agriculture, peninsular rivers, water and power supply. Drop in wheat production by 4-5 million tonnes, with even a 1°C rise in temperature. Farmers of countries like India and others dependent on agricultural economy will be worst affected due to change of rainfall pattern and desertification. In near future, the world will be facing scarcity of food and agricultural products. These in turn will impact India's food security problems and water security.

To address climate change domestically, the Government of India drafted its National Action Plan on Climate Change in 2008 that focusses on adaptation and mitigation actions through eight missions, each of which is a sectoral response to the impacts of climate change. Three of them – on solar energy, afforestation and energy efficiency – seek to slow down the growth of India's emissions. Another three – on agriculture, water and Himalayan eco-systems – are about initiating measures to adapt to the effects of climate change. The remaining two – on sustainable habitat and strategic knowledge – are service missions and seek to create more knowledge on useful climate responses. India has already announced a domestic goal under the Copenhagen Accord and Cancun agreements. The goal is to achieve 20-25% reduction of emission intensity of GDP in comparison with 2005 level till 2020.

## Pushpa Gujral Science City's initiative

The importance of communicating with the general public and engaging stakeholders is fully recognised by the Climate Change Convention itself. Article 6 on 'Education, Training and Public Awareness' urges governments to develop and implement educational and public awareness programmes on climate change and its effects, to ensure public access to information and to promote public participation in addressing the issue. Climate change is widely recognised as the major environmental challenge facing the planet Earth. To educate people on this pressing developmental issues in the world today, Pushpa Gujral Science City has set up a unique 'Climate Change Theatre', which is first of its kind in the country. This 18-metre diameter theatre has been set up in a dome-shaped building with the seating capacity of 125 persons with an investment of Rs.150 lakh. It provides the visitors an unforgettable experience aimed at sensitising the audience about the currently debated subject of climate change and global warming. Climate change is a science issue that is driving a technological and social revolution.

The Climate Change Theatre provides a unique experience with video shows on two screens – flat and dome-shaped – and illuminating static and moving fibreglass objects along with special light-and-sound effects, as the video displays storyline of the film.

The show outlines the serious and contemporary challenge of climate change. The 25-minute film explores what a worst-case future might look like if humans do not take action on current or impending problems that could threaten civilisation. The film starts with giving us a glimpse of our future – floods, droughts, earthquakes and similar other natural disasters. Coming back to the present, the Earth introduces itself and talks to the audience about current situation and the impacts it is experiencing due to global warming. The script of the film is connected to locally relevant issues, including people, places and examples that help audiences to connect and understand their role in the meeting this challenge.

The film deals with all the pertinent questions like: "What is climate change" and "What factors affect the climate of the Earth?" We hear a lot about greenhouse gases, but what are these? Why do these gases pose such a problem? Are seasons beginning to change? How has human life impacted global warming? How deforestation, rapid use of fossil fuels, urbanisation and uncontrolled population growth have added to global warming. The film explains the scientific aspects of all these questions.

Besides, the film also focusses on the impact of climate change. How climate has change affected our everyday life. The film discusses the changes that have already started



*An inside view of Climate Change Theatre at Pushpa Gujral Science City, Kapurthala*

affecting our lives like the abnormal weather conditions that are already happening and events such as the receding Gangotri glacier in Himalayas, which is retreating at a speed of about 30 metres in a year, endangering the lives of about 400 million people who live in the river's plains and depend upon it for their supply of water.

The film presents current statistics from the Intergovernmental Panel on

Climate Change. The other aspects covered in this part of the film are drop in agriculture production, the vulnerability of farmers of Himachal Pradesh to shift from apple cultivation to cultivation of other cash crops, people living in low lying coastal areas who have been rendered homeless and landless due to rising sea level. The rising sea level has not only affected the human population but also threatens the plant species of Sunderbans like the mangroves. This dominant species is threatened due to inland movement of saline water. With rise in the salinity, the plants are losing their red and green colours becoming like bare twigs. This is destroying the wild life of the region, especially the number of Royal Bengal Tigers is fast depleting.

The Climate Change Theatre also takes the visitors around the globe to explore the implications of a warming planet – from the North Pole to the south. Visitors are made aware of the latest climate science and the issues surrounding the human role in climate change in order to have a better understanding and appreciation for the issues involved. It also provides interesting information and education to the visitors about personal low-impact lifestyle choices they can make, that can eventually make a difference around the world.

There is an urgent need to sensitise the general population regarding global warming and climate change. With the opening of the Climate Change Theatre to the visitors, the Pushpa Gujral Science City will be making a major contribution to educate the masses and encourage them to take steps – even if small ones – to be environmentally responsible. ■

**Dream 2047**

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## STUDENTS AWARDS

LEVEL	NAME	SELECTION	AWARD
LEVEL-I	SCHOOL LEVEL	Top 3 Rankers per class will be SCHOOL winners (i.e. 18 students from each School). only if Minimum of 10 students per class are registered from a school.	<ul style="list-style-type: none"> <li>Certificate of merit</li> </ul>
LEVEL-II	DISTRICT LEVEL	Top 3 Rankers per class will be district winners (i.e.18 students from each district). [All the schools from that districts will be part of evaluation].	<ul style="list-style-type: none"> <li>Certificate of merit</li> <li>Visit to any one Research Institution within the district/state.</li> </ul>
LEVEL-III	STATE LEVEL	Top 3 Rankers per class will be State winners (i.e.18 students per state). [Winners will be from students appearing in state camp].	<ul style="list-style-type: none"> <li>State Camp Participation Certificate</li> <li>State Camp Memento</li> <li>Cash prize Rs. 5,000, Rs. 3,000 and Rs. 2,000 for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> ranker per class.</li> <li>Visit to any one National Research Institution.</li> </ul>
LEVEL-IV	NATIONAL LEVEL	<ul style="list-style-type: none"> <li>Top 3 Rankers per class will be National winners (i.e. 18 students at national level).</li> <li>Top 3 Rankers per class will be zonal winners. (i.e. 18 students per zone).</li> </ul> <p>[Winners will be from students appearing in national camp].</p>	<ul style="list-style-type: none"> <li>National Camp Participation Certificate</li> <li>National Camp Memento</li> <li>Cash prize Rs. 25,000, Rs. 15,000 and Rs. 10,000 for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> rankers per class.</li> <li>Cash prize Rs. 5,000, Rs. 3,000 and Rs. 2,000 for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> ranker per class in each zone.</li> <li>Visit to any one Research Institution from across the Globe.</li> </ul>



## IMPORTANT DATES TO REMEMBER

Registrations Open	01 July 2017
Registrations Close	20 September 2017
Upload of VVM Study Material	01 October 2017
Download Hall Tickets	From 20 November 2017
Date of Examination	26 November 2017, Sunday
Time of Examination	11:00 AM to 01:00 PM (120 minute)
Declaration of Result	26 December 2017
One or Two-day State Camp	Between 10 January 2018 to 25 February 2018
Two-day National Camp	12 & 13 May 2018

For more information you can log on to website [www.vvm.org.in](http://www.vvm.org.in)



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# Threadworm Infection in Children: Prevention is the best remedy



*Dr. Yatish Agarwal*



*Threadworm infection strikes young children most commonly. That's because they often touch and swallow the invisible worm eggs without having an inkling of what they are doing. Children can easily pick up another threadworm infection from friends or at school, so maintaining good hygiene may help prevent re-infection.*

Threadworms, also known as pinworms, are tiny parasitic worms that infect the large intestine of human beings. Pale white in colour, these worms are between 2 millimetres and 13 millimetres long, and look much like small pieces of cotton thread, and hence the name.

A common type of worm infection, threadworms are particularly found in children under the age of ten years. A parent may notice them around a child's bottom or in their faeces.



These small worms do not always cause symptoms, but infected individuals often experience itchiness around their bottom. This can be worse at night and often disturbs sleep. The risk of other family members getting similarly infected is high, with a child being the primary case. Surveys have found that if a child is affected, nearly three-fourth of the household may be similarly afflicted.

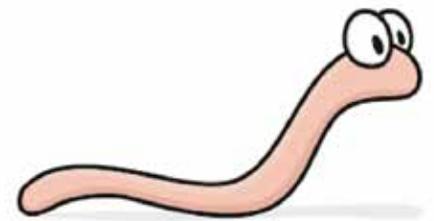
Humans are thought to be the only host. Animals cannot catch or pass on threadworms, unless the eggs are transported on the animal's fur following human contact.

## How are threadworms spread?

A threadworm infection is passed from person to person by swallowing threadworm eggs. A female threadworm can lay thousands of tiny eggs around the anus or, in a girl child, around the vagina. The female threadworm also releases mucus, which can cause an itchy bottom.

Scratching the anus or vagina, or wiping them after going to the toilet, can cause the eggs to stick to a person's fingertips or under their fingernails. If a person does not wash their hands, the eggs can be transferred to their mouth or on to food or objects, such as toys and kitchen utensils. These eggs are fairly resilient. They can survive well up to two weeks. If a person touches a contaminated surface, an infected object, or if a contaminated article touches their mouth, they might well get infected.

Once a person swallows the eggs, they pass into the bowel, where they hatch in the duodenum (the first part of the small intestine). After about two weeks, the worms mature and reach the adult size. They then begin to reproduce, and the female threadworm begins to lay eggs and hence,



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the cycle of infection starts again. The period of time from a person swallowing the threadworm eggs to their hatching and developing into a new mature worm capable of laying new eggs is 4 to 8 weeks.

### **Transfer of eggs**

Threadworm eggs can be transferred from the anus (or vagina) to any object a person may touch, including:

- bed sheets and bed clothes
- flannels and towels
- carpets
- children's toys
- kitchen utensils
- toothbrushes
- furniture
- a kitchen worktop
- bathroom surfaces

Threadworm eggs can survive on surfaces for up to two weeks. As well as being swallowed by a person who touches a contaminated object or surface, threadworm eggs can also be swallowed if they are breathed in. The eggs are so small that they can become airborne, for example, if you shake a towel or bed sheet that has threadworm eggs on it.

### **Why are children at the greatest risk?**

Threadworm infection strikes young children most commonly. That's because they often touch and swallow the invisible worm eggs without having an inkling of what they are doing.

The biggest cause is poor hygiene. Unless due attention is paid that they wash their hands each time they go to the toilet, they run a risk of contracting the infection. Coming into contact with objects contaminated by the worm's eggs is also common since children often share toys with other kids.

### **Risk from animals and pets**

Threadworms can only infect humans and are not spread in animal faeces. However, there is a small risk that threadworms can be caught from pets if the animal's fur becomes contaminated with eggs after an infected person strokes the pet. If another person then touches the animal's fur, the eggs could be passed on to them.

### **Recognising the symptoms**

Threadworms can be so silent, that an afflicted person may not quite notice

them. Surveys indicate that up to one-third of individuals with pinworm infection may remain totally asymptomatic.

### **Spotting threadworms**

In some cases, the parent of a child suffering the infection or a child himself may spot threadworms on his bed clothes or sheets at night, or notice them in his stools. The worms resemble threads of white cotton and are about a centimetre long.

### **Itching**

In most people, the threadworms come to the fore because of the intense itching around the anus, and around the vagina and perineum (the region between the anus and the genital organs) in girls. This itching typically disturbs a person during the night, and is caused by the female pinworms migrating to lay eggs around the anus and perineum.

The intensity of the itching might relate to individual sensitivity, being described variously as tickling, crawling sensations, or even acute pain.

While both the migrating females and the clumps of eggs are known to produce irritation, the exact mechanism responsible for this symptom remains unexplained.

### **Skin infection**

As the itching excites repeated scratching of the area around the anus, and the vagina, it can produce skin scratches. If bacteria enter the skin, a skin infection may result. Hence, a secondary bacterial infection can complicate the situation producing an inflammation of the skin and hair follicle (folliculitis). Wearing cotton gloves while sleeping may help prevent this.

### **Vaginal discharge**

In young girls and women, the worms may move onto the vulva and into the vagina, from there moving to the external orifice of the uterus, and onwards to the uterine cavity, fallopian tubes, ovaries, and peritoneal cavity. This can cause vulvovaginitis – an inflammation of the vulva and vagina. This causes vaginal discharge and itchiness of the vulva.

### **Insomnia**

Due to the intense itching, a person with a threadworm infection may face difficulty getting to sleep or staying asleep.

This tends to upset the quality of life.

### **Bedwetting and urinary infection**

Children, and particularly girls, may face the embarrassment of bedwetting. What precisely triggers the bladder irritability is still a mystery, although the pinworms can enter the urinary passage (urethra), and can rarely cause urinary tract infection because they may carry intestinal bacteria with them.

### **Seeking medical help**

If you think you or your child may have threadworms, you can see your family physician or a paediatrician if the child is less than two years old. You must exercise special care if you're pregnant or breastfeeding. In such circumstances, the recommended treatment is usually different.

### **Diagnosing threadworms**

Diagnosis depends on finding the eggs or the adult pinworms. Individual eggs are invisible to the naked eye, but they can be seen using a low-power microscope.

Threadworms are difficult to see because they are so small and pale. The best time to try to see the worms is at night, when the female worms come out to lay their eggs. If you are trying to see whether your child has threadworms, the best time to look is two to three hours after they have fallen asleep. The worms may be visible on your child's bottom, underwear, pajamas or bed sheets.

A doctor will usually be able to diagnose threadworms from the main symptom of an itchy bottom at night. A moistened swab may be taken from around the anus to pick up the eggs then a sample can be sent off to a lab for testing.

Alternatively, a transparent adhesive tape (e.g., Scotch Tape) can be applied on the anal area. It will pick up the deposited eggs, and diagnosis can be made by examining the tape with a microscope. This test is most successful if done for several days, because the females do not lay eggs every day, and the number of eggs varies.

Pinworms do not lay eggs in the faeces, but sometimes eggs are deposited in the intestine. As such, routine examination of faecal material gives a positive diagnosis in only 5 to 15 per cent of infected subjects, and is therefore of little practical diagnostic use. In a heavy infection, female pinworms may adhere to stools that pass out through

the anus, and they may thus be detected on the surface on the stool.

Adult pinworms are occasionally seen during colonoscopy. On a microscopic level, pinworms have an identifying feature of alae (i.e., protruding ridges) running the length of the worm

## Treating threadworms

If you or your child has threadworms, you must take special care that all household members must be treated, even if they do not have any symptoms. This is because the risk of spread of infection is very high. The aim of treatment is to get rid of the threadworms and prevent re-infection.

For most people, treatment will involve taking a single dose of a medication called mebendazole to kill the worms. If necessary, another dose can be taken after two weeks.

If you have threadworms and you're pregnant or breastfeeding or your child has threadworms and he or she's less than two years old, your family physician may not advise mebendazole. Instead, the doctor may advise you to simply focus on good hygiene measures.

In any case, even if the circumstances allow you to take medication, you must follow strict hygiene measures to avoid a re-infection. Be careful that during the treatment and for a few weeks next, the house and particularly the bathrooms and kitchen are washed and cleaned thoroughly.

## Medication

Mebendazole is the main medication used to treat threadworm infections. It can be bought over the counter and is available as a chewable tablet or a liquid.

The mechanism by which mebendazole works is simple. It arrests the absorption of sugar in the threadworms, causing their death within a few days. This medication is 90-100 per cent effective at killing the threadworms, but it does not kill the eggs. For this reason, due focus must be kept on upholding the hygiene measures which must be followed for the next six weeks.

Your attending doctor may recommend a second dose of medication if the infection continues two weeks after treatment. In rare cases, mebendazole can cause abdominal pain or diarrhoea,

particularly if the threadworm infection is severe.

## Pregnant or breastfeeding women

Medication isn't usually recommended for pregnant or breastfeeding women. Instead, you should simply follow the hygiene measures. See your family physician if you're more than three months pregnant, or if you're breastfeeding and you continue to experience problems despite taking hygiene measures. In certain circumstances, your family physician may consider prescribing medication.

## Children under two years old

Make sure you wash your baby's bottom gently but thoroughly every time you change their nappy. Also wash your hands thoroughly before and after changing their nappy.

Mebendazole is not licensed for use in children less than two years of age, but your family physician may decide to prescribe it off-label for children over six months.

## Preventing the spread

It is not always possible to prevent a threadworm infection, but you can significantly reduce your risk by maintaining good hygiene and encouraging children to do the same.

Children should wash their hands regularly, particularly after going to the toilet and before meal times. Kitchen and bathroom surfaces should be kept clean.

If your child is infected, encouraging them not to scratch the affected area around their anus or vagina. This will help prevent re-infection and reduce the risk of infection spreading to others.

Strict hygiene measures can help clear up a threadworm infection and reduce the likelihood of re-infection. Everyone in the household must stick to the following rules:

## Sanitise the house

Vacuum and wet clean the whole house thoroughly, paying particular attention to the bedrooms. This should be repeated regularly carefully.

Clean the bathroom and kitchen by damp-dusting surfaces and washing the cloth frequently in hot water. This should be repeated regularly.

Avoid shaking any material that may be contaminated with eggs, such as clothing or bed sheets. This will prevent eggs being transferred to other surfaces through air.

Don't eat food in the bedroom. You may end up swallowing eggs that have been shaken off the bedclothes.

## Hang out the washing line

Wash all night clothes, bed linen, towels and soft toys when you're first diagnosed. This can be done at normal temperatures, but make sure the washing is well rinsed.

## Wear your fingernails short

Keep your fingernails short. Encourage other members of your household to do the same. Discourage nail-biting and sucking fingers. In particular, make sure children don't suck their thumb.

## Wash your hands

Wash your hands frequently and scrub under your fingernails. Make it into a habit every time before you eat, after going to the toilet, and before and after changing your baby's nappy.



## Maintain personal hygiene

Bathe or shower regularly. It is particularly important to bathe or shower first thing in the morning. Make sure you clean the areas around the anus and vagina to remove any fresh eggs. Ensure everyone in your household has their own face flannel and towel. Don't share towels. Keep toothbrushes in a closed cupboard and rinse them thoroughly before use. Wear close-fitting underwear at night and change your underwear every morning.

## Circulate the simple rules

Children can easily pick up another threadworm infection from friends or at school, so maintaining good hygiene may help prevent re-infection. ■

# Recent Developments in Science and Technology



**Biman Basu**



*Scientists have long pondered over the question of egg shapes. Why do birds' eggs come in so many different shapes and sizes? In the past, bird lovers and scientists had come up with all sorts of hypotheses for egg shape – most related to the life history of the bird or the environment in which they live. New study showed that egg shape correlates with flight ability of birds*

## Robotic arm to clean up space debris

Since mankind entered the Space Age with the launch of the first Sputnik on 4 October 1957, thousands of artificial satellites have been launched by many countries including India. Many of those satellites have fallen back to Earth and have been destroyed on entering the Earth's atmosphere. But a huge number of defunct satellites and rocket parts and debris continue to remain in orbit. According to NASA's Jet Propulsion Laboratory (JPL), right now about 5,00,000 pieces of human-made debris such as old satellites and lost equipment are in orbit around our planet, which can be a threat to operating satellites, space vehicles and astronauts in space. To tackle this problem, researchers from Stanford University in USA and NASA's JPL have created a robotic gripper to grab and dispose of the debris. The interesting thing about the gripper is that it attaches to and captures space objects using a technique that the common gecko uses to stick to walls and surfaces. Similar to a gecko's foot, the robotic gripper is only sticky if the adhesive flaps are pushed in a certain direction. A prototype of the gripper has already been tested in multiple zero-gravity settings, including inside the International Space Station (*Science Robotics*, 27 June 2017 DOI: 10.1126/scirobotics.aan4545).

The need for a special gripper arises from the limitations of conventional methods like suction cups which don't work in a vacuum. Traditional sticky substances like tape are largely useless because the chemicals

they rely on cannot withstand the extreme temperature swings in space. Magnets only work on objects that are magnetic. Other solutions, including harpoons, either require or cause forceful interaction with the debris, which could push those objects in unintended, unpredictable directions in zero-gravity environment rather than capturing them.

The adhesives developed by the researchers have previously been used in climbing robots and even in a system that allowed humans to climb up certain surfaces. According to the researchers, they were inspired by geckos, which can climb walls because their feet have microscopic flaps that, when in full contact with a surface, create a Van der Waals force between the feet and the surface. These are weak intermolecular forces that result from subtle differences in the positions of electrons on the outsides of molecules.



*Geckos can climb walls because their feet have microscopic flaps that, when in full contact with a surface, create a Van der Waals force between the feet and the surface.*

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Scientists tested their robotic gripper on NASA's reduced gravity aircraft, the *Weightless Wonder*. (Credit: Jiang et al., *Sci. Robot.* 2, eaan4545 (2017))

The researchers say the gripper they have developed is not as intricate as a gecko's foot – the flaps of the adhesive are about 40 micrometres across while a gecko's are only about 200 nanometres; that is, 200 times smaller – but the gecko-inspired adhesive works in much the same way. Like a gecko's foot, it is only sticky if the flaps are pushed in a specific direction and making it stick only requires a light push in the right direction. This is a helpful feature for the kinds of tasks a space gripper would perform. The pads unlock with the same gentle movement, creating very little force against the object. This ensures that the object being grabbed is not pushed away in the zero-gravity environment.

The current prototype of the gripper is made of laser-cut plywood and includes rubber bands, which would become brittle in space. According to the researchers, the next step would be to create a version made of longer lasting materials capable of being attached to the end of a robot arm hold up to high levels of radiation and extreme temperatures and test it outside the ISS.

### Freeze-dried space sperm produces healthy mice

Outer space is a dangerous place. For instance, the average daily radiation dose on the International Space Station (ISS) is more than 100 times higher than that on Earth and could damage the sperm and eggs that give rise to most animal offspring. Prolonged space flight has been known to have several deleterious effects on human astronauts including muscle loss and exposure to high radiation doses. But in a recent study,

freeze-dried mouse sperm has been found to remain viable after spending nine months on-board the International Space Station. (Freeze-drying preserves items by rapidly freezing them and then subjecting them to a high vacuum that dehydrates them.) The freeze-dried mouse sperm was stored on the ISS for 288 days from August 2013 to May 2014, at temperatures of minus 95 degrees Celsius. The sperm samples were then returned to Earth and a team of Japanese scientists employed *in vitro* fertilisation techniques, using both the space- and Earth-preserved sperm, to produce embryos. The embryos were transferred into female mice, which in turn successfully produced litters of healthy baby mice, totalling 73 in all. The team was led by Teruhiko Wakayama, a reproductive biologist at the University of Yamanashi in Kofu, Japan (*Proceedings of National Academy of Sciences*, 6 June, 2017 | doi: 10.1073/pnas.1701425114).



These healthy mice pups were born from freeze-dried sperm that spent nine months in orbit.

According to the researchers, the space-preserved samples did show evidence of slightly increased DNA damage compared with control samples preserved on Earth, but this was found to be largely repaired in embryos following fertilisation. The mice born from the experimental sperm were fertile and healthy, and there were no obvious genetic differences between them and pups born from control sperms kept on Earth. The *PNAS* paper also states that, when some of those pups had matured into adults and mated with one another, they produced normal babies, as well. According to the team, this suggests that there are no lasting fertility problems associated with space-based sperm.

These findings suggest that healthy animal offspring could be produced using sperm preserved in space and artificial insemination techniques. Many

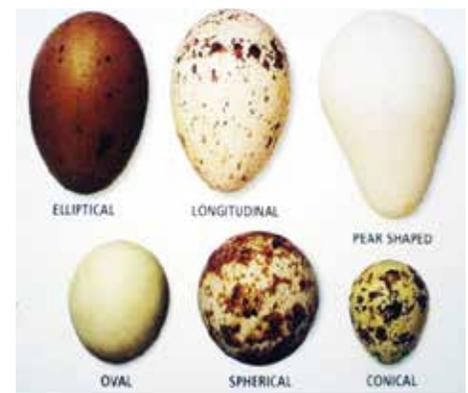
domesticated animals are already produced using artificial insemination. According to the scientists, freeze-dried sperm can be preserved at room temperature for up to two years and in a freezer almost indefinitely. This raises the possibility that a sperm bank in space could help protect animal species from catastrophes on Earth. The researchers say these findings also suggest that perhaps humans can one day reproduce safely in space.

The recent findings are significant because so far, in studies with a handful of organisms, including rats, fish, salamanders, and sea urchins, the results have been mixed. Rats did not manage to produce pups at all during a 1979 experiment conducted on the Russian *Cosmos 1129* satellite. While sea urchin sperm also did not do so well, fish, fruit flies, and nematodes successfully reproduced.

### How eggs get their shapes

To a housewife an egg is an article of food, and its shell serves to protect it from physical damage and to prevent the entry of dirt and microorganisms. To the hen an egg is a potential chick, and the shell serves not only as a protective covering but also as a source of calcium for the embryo and as a membrane through which the embryo breathes.

The surprising thing about eggs is that although they all serve the same purpose, they come in not only different sizes but also different shapes. Egg shapes range from almost spherical, as in case of some owls, to simple elliptical, as in case of the hummingbird, to that of a sharply pointy teardrop-shape, as in case of the sandpiper.



Bird eggs vary widely in shape and size.

Scientists have long pondered over the question of egg shapes. Why do birds' eggs come in so many different shapes and sizes? In the past, bird lovers and scientists had come up with all sorts of hypotheses for egg shape – most related to the life history of the bird or the environment in which they live. Other hypotheses included clutch size – the number of eggs in a clutch could influence egg appearance, with some shapes optimised for sharing the warmth; calcium conservation – spherical eggs have less surface area, which could help conserve calcium in places where the mineral is rare; and the roll factor – spherical eggs could easily roll off a cliff, while conical eggs roll in a tight circle, making them perfect for cliff-nesting birds. Some scientists had put forward the theory that precocial hatchlings – those that are usually capable of leaving the nest within a few days and are more mature at birth, like ducks – had asymmetrical eggs because the blunt ends have more pores, letting in more oxygen to help their brains develop faster before hatching. But recent research by a team of international researchers puts all these theories at rest and points to a strong correlation between egg shape and birds' ability to soar through the air (*Science*, 23 June 2017 DOI: 10.1126/science.aaj1945).

Six researchers from four countries and many disciplines – evolutionary biologists, computer scientists, mathematicians, and physicists – conducted the first comprehensive study to explain the wide range of shapes of bird eggs. For their study the team, led by researchers at Harvard and Princeton Universities, with colleagues in the UK, Israel and Singapore, used methods and ideas from mathematics, physics and biology to crack the egg-shape puzzle. The team examined photos of some 50,000 eggs from a vast digital collection at the University of California Berkeley Museum of Vertebrate Zoology. The eggs, which were collected by naturalists around the world during the 19th and early 20th centuries, came from a wide of bird sizes and locations. The team wrote a computer program called 'Eggxtractor' that picks out the egg in any image and measures its length, width, and shape. Using the programme, the researchers plotted egg shapes in terms of asymmetry and ellipticity, resulting in a gigantic map of bird egg shapes. The researchers found that egg shape was a continuum – with many

species overlapping. The shapes ranged from almost perfectly spherical eggs to conical-shaped eggs.

To find out the factors that led to the difference in shapes, the team introduced different variables like body mass, diet, nest type and environment into their computer model. But only when they used a variable called the 'hand-wing index' – a ratio that expresses a bird's flight ability – did the eggs turn out like they do in real life. The study showed that egg shape indeed correlates with flight ability on broad taxonomic scales, suggesting that adaptations for flight may have been critical drivers of egg-shape variation in birds and that birds that have strong flight ability also have eggs that are elliptical and asymmetric. So an albatross and a hummingbird, while two very different birds, may have evolved similarly shaped eggs because both are high-powered fliers.

### Injured plants can warn their neighbours

When fresh grass is mowed it gives off a typical smell. We generally don't pay much attention to it and take it as normal. Recent study by a University of Delaware botany professor Harsh Bais and an 18-year-old high school student Connor Sweeney in USA indicates that the smell may in fact be a kind of warning signal to nearby plants about the injury to the plants being cut. A plant being damaged by pests also sends out similar signals, according to the researchers. They say, it may be helping the neighbouring plants boost their own defence systems for protection (may be not from humans!).

For their study the researchers worked with more than 1,000 seedlings of a plant, commonly known as mustard weed (*Arabidopsis thaliana*) and carried out dozens of experiments over a period of two years, to check and recheck their results. Seeds were placed in Petri dishes and test tubes containing agar, a gelatinous growing medium. Each batch of seeds would germinate after about six days, transforming into delicate-stemmed 5-cm plants with bright-green leaves. To begin with, Sweeney put two plants a few centimetres apart on the same Petri dish and made two small cuts on the leaf of one to simulate an insect's attack. The next day, the roots of the uninjured plant, rather than of the injured plant, were



*The smell of freshly mowed lawn may contain compounds that injured plants use to warn neighbouring plants.*

found to have grown noticeably longer and more robust – with more lateral roots poking out from the primary root (*Frontiers in Plant Science*, 2017; 8 DOI: 10.3389/fpls.2017.00595).

Further studies showed that a key growth hormone, auxin, was increasingly present in an unharmed plant when an injured one was nearby. It was also found that the unharmed plant strengthened itself by attracting more microbes in soil – the so-called "nutrients" – to its roots when in the presence of the injured plant.

According to Bais, "The reason why the uninjured plant puts out more roots is to forage and acquire more nutrients to strengthen its defences". It was initially thought that the roots of the injured plant may have sent some signal that made the unharmed plant grow more roots. But this possibility was ruled out by repeating the experiment multiple times, partitioning the plants to rule out any communication between the root systems. The only other option was that the plants were communicating through air and that the communication signals are in the form of airborne chemicals released mainly from the leaves. In short, mechanical wounding of *A. thaliana* plant facilitated the release of airborne volatile organic compounds that induced an elaborate series of defence mechanisms in the neighbouring seedlings.

The exact nature and composition of the volatile compounds being released is not yet known, but Bais is already investigating that question as a follow-up to the study. "But if you go through a field of grass after it's been mowed or a crop field after harvesting, you'll smell these compounds," he says. ■

# National Science Film Festival & Competition 2017 Details of Awards

A detailed report on NSFF 2017 is available in July 2017 ( Vol. 19 No. 10) issue of Dream 2047. You may also log-on to <http://www.vigyanprasar.gov.in/dream/index1.asp> to see all previous issues of Dream 2047.

## Category 'A': Films made by organisations / institutions

S.N.	Award	Film's title	*Directed by; **Produced by
1.	Golden Beaver Award	The Pangti Story	*SesinoYhoshu; ** PSBT, New Delhi
2.	Silver Beaver Award	Saving the Wild – Wildlife Rescue and Rehabilitation	* Rita Banerji; ** PSBT, New Delhi
3.	Bronze Beaver Award	Don't Burn Leaves	* Abdul Rashid Bhat; ** EMMRC, Srinagar, J&K
4.	Bronze Beaver Award	Srinivasa Ramanujan: The Mathematician & His Legacy	* NandanKudhyadi; ** PSBT, New Delhi

## Category 'B' : Films made by independent film makers/production houses

S.N.	Award	Film's Title	*Directed by; **Produced by
1.	Golden Beaver Award	The Same Tune ... Same Rhythm... (Ore Naadam...Ore Thalam...)	*/** K. V. S. Kartha, Kottarakkara, Kerala
2.	Silver Beaver Award	Ghar le Chal - Take me Home	* Matiur Rahman; ** Television Programme Company, New Delhi
3.	Bronze Beaver Award	Naula: Water Temple of Himalayas	*/** Shriniwas Oli, Lohaghat, Uttarakhand

## Category 'C': Films made by college students

S.N.	Award	Film's Title	*Directed by; **Produced by
1.	Golden Beaver Award	Point & Shoot	* Harsimran Kaur Anand; ** Srishti Institute of Art, Design and Technology, Bengaluru, Karnataka
2.	Silver Beaver Award	Song of Padma	*/**Asif Khan
3.	Bronze Beaver Award	Jal	*/** Arjit Mohan Shukla; Agra, UP
4.	Bronze Beaver Award	Burn	* Melvin Thomas; ** IIRBS, Kottayam, Kerala

## Category 'D': Films made by school students

S.N.	Award	Film's Title	*Directed by; **Produced by
1.	Golden Beaver Award	Brain's Fault	*/** Aditya, Lucknow, UP
2.	Silver Beaver Award	Ek Aasha	*Atiya Chaudhary; ** Utpal Shanghvi Global School, Mumbai, Maharashtra
3.	Bronze Beaver Award	<i>Gauraiya</i> , The Great Indian Sparrow	*/** City Montessori School, Mahanagar-I, Lucknow, UP

## Special Jury Award

S.N.	Film's Title	*Directed by; **Produced by
1.	Global Warning – Kashmir Chapter	* Jalal Ud Din Baba ** Mehbooba Bano, Ultimate Horizons, Srinagar, J&K
2.	Nature: A Source of Inspiration	* Girivinay Padegal; ** Delhi Public School, Bangalore South, Bangalore, Karnataka

## Special Award for Technical Excellence

### Research

S.N.	Film's Title	Researched by
1.	Srinivasa Ramanujan: The Mathematician & His Legacy	Nandan Kudhyadi

### Script

S.N.	Film's Title	Scripted by
1.	The Same Tune ... Same Rhythm... ( <i>Ore Naadam... Ore Thalam...</i> )	Lilly C.

### Cinematography

S.N.	Film's Title	Cinematographed by
1.	Point & Shoot	Harsimran Kaur Anand;

### Sound Recording and Design

S.N.	Film's Title	Recorded and designed by
1.	Point & Shoot	Harsimran Kaur Anand;

### Editing

S.N.	Film's Title	Edited by
1.	Saving the Wild - Wildlife Rescue and Rehabilitation	Rohit Gussain

### Graphics / Animation / Special Effects

S.N.	Film's Title	Animated by
1.	It's High Time	Ranjitha Rajeevan

### Direction

S.N.	Film's Title	Directed by
1.	Srinivasa Ramanujan: The Mathematician & His Legacy	Nandan Kudhyadi

### Category E: Films made on spot using mobile phone

S.N.	Film's Title	Directed and Produced by
1.	Kam Hoti Doorriyan	Manish Oli
2.	Search	Adarsh Prathap

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