

## **National Scientific Temper Day (NSTD), 2018.**

**S.Chatterjee**

**President, All India People's Science Network (AIPSN)**

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Dear Principal Sir, Mr. G.V.Raju, the Academic Director, Mr. Mohan Murthy, members of staff and dear students, I consider it a great privilege to inaugurate the National Scientific temper Day observance programme, for Bangalore West. Today, we initiate it and move on towards the final observance on 20<sup>th</sup> August, 2018. This is a national level programme, conceptualised by the All India People's Science Network (AIPSN), to be observed as a citizens' programme, through deliberations and executions by several platforms of citizens. This programme has been discussed in the Bangalore district unit of the Bharat Gyan Vigyan Samithi (BGVS), of which your institution is the co-ordinating centre for the Bangalore District's Western Zone and your Principal Mr. G.V. Raju is the co-ordinator for this zone.

This is my first visit to your institution. I know that the Bangalore District Unit of the BGVS has conducted 6 programmes in the last one year in your institution. Most encouraging was the mass participation in the Copper Moon programme, in January this year, the Copper Moon , i.e. a total lunar eclipse being observed on 31<sup>st</sup> January, 2018.

We know that this institution was started in 1998, i.e. 20 years ago, with just 11 students and now 800 students are enrolled here and there are about 50 members of staff. So, I may ask you, "What is the level of your public outreach?" Let me try to find the answer. No, I do not know the exact number, but let me make a guess. Considering that every student's family has parents, one sibling, your outreach is about 2400 people. But someone will point out, " No, this is wrong. We may have more number of brothers and sisters, though some may be the only child of their parents. But, we also have friends to whom we talk. We have our relatives, and neighbours to whom we talk and with whom we discuss.

Thus, with these arguments , I have to admit that I was wrong. Then, I have to correct myself and tell, " Well, the number, 2400 gives your minimum outreach...." And that may settle things, until more data come to us.

This illustrates the method in science. It goes through dialogues, attempts to correct one's own understanding.

Someone may ask, " Why did you estimate that way?" This means that they asked me "WHY?" That "WHY" is very fundamental in science.

From this "Ask: Why" we may get "Tell :How?" This passage from "Ask: Why ?" to "Tell: How?" is what we follow in science. In the end, we might get what is called the, "Know-How." But that is a very long process.

In the National Scientific Temper Day campaign, we concentrate on the first step, i.e. "Ask: Why?" What can follow after that may be a mental process as also, one of practical experimentation with

our hands. The process of science is a combination of both, i.e. mind and the hand. This, in science we call the combination of “Experiment, Observation and Inference.”

Sometimes, we cannot perform experiments but nature keeps doing many such experiments, irrespective of us. Let us take an example. We know that there is day and night every 24 hours. When you “Ask : Why?” we are led to the answer that this happens because the Earth rotates around its own axis and completes this rotation once in every 24 hours. Many people gave this correct explanation but many did not believe in the beginning. Amongst those, who gave the correct answer, was the Indian mathematician and astronomer, Aryabhata , who lived about 1500 years ago. Further, question can be raised, “ Why are the lengths of day and night not equal, every day? Why are the timings of sunrise and sunset change everyday, no matter how small that change may be? But they return to the same value after 365 days?”

Here, we find that Earth's rotation around its axis cannot give the answer to the above questions. For that, we have to consider Earth's revolution around the Sun and also we have to bear in mind that Earth's axis of rotation about itself and the axis of revolution about the Sun, are inclined to each other at an angle of  $23.4^\circ$  .

With these, we get answer to the above questions but also about the change of seasons. But these did not come immediately. These needed the theory that Earth goes round the Sun and not the other way round. This idea, as we know, was given by Copernicus and followed and proved to be correct, by the works of Galileo, Kepler, Newton and Halley.

This exercise of “Ask: Why?” has to go on as a dialogue. It can be a dialogue between students, between students and teachers, between students and their family members, relatives and friends, as also between the teachers, their family members and friends.

To help this, we recommend some basic experiments that will make you “Ask: Why?” and lead to find the answer. These experiments are given in a booklet that will be provided to you.

We, in the All India People's Science Network have conceptualised this programme and many organizations, e.g. the Maharashtra Andhashraddha Nirmulan Samiti (MANS) have joined us in issuing a joint appeal to observe the National Scientific Temper Day. This appeal draws strength from an appeal that many leading scientists on the country, led by Professor Jayant V Narlikar, gave for participating in the National Scientific Temper Day observance.

Just as we are building a joint platform with many organizations, your institution being the co-ordinator for Bangalore West, must send out appeal to other schools and colleges in the neighbourhood. We know that the students from this institution reside within a radius of 15 kilometres from here. So , your outreach has a radius of 15 kilometres!

Another advantage that you have is that most of you come from agricultural background, i.e. from a very important section of the society. Food is the most important support system for life. We are no longer food gatherers, but produce our own food from nature by agriculture. It is an exercise in which both men and women take part, being thus an occupation that has a great level of gender equality. Early cultivators were also the early scientists: they learnt about seeds, water, manure, fertilizers, weather, rainfall, sunshine; designed and made the plough, sickle, dug channels and used the Persian wheel for irrigation etc. You can see, what extraordinary sweep of knowledge and engineering skills are involved in growing food. Early agriculturists were also the early astronomers, who made calendars on the basis of star-charts and these calendars told them, how far away they were from the “sowing-season” and warned them about the “season of flood”.

So many of you, here, are inheritors of this knowledge from your own families: a knowledge, which has been enriched and refined over centuries and are active areas of scientific research, e.g. in many of our agricultural universities, where the scientist has to do practical work in collaboration with agriculturists in the field stations. This field of agriculture has developed with inputs not only from the cultivator but also from the chemist, who knows about the properties of fertilizers and how to manufacture them, from the engineer and artisan who designs and makes the plough and from the industrial worker who makes the tractor, sprinkler etc.

Form this field of agriculture, we took an example, a little while ago. We told ourselves that a man needs 2500 kcal and a woman needs 2000 kcal, everyday for survival. So what should be the requirement for a year, for each one of them? Further, how much energy is needed, from our food, to maintain the Indian population and how much rice is needed for that? How to calculate?

All of you gave me the correct method. Consider first that about half the population are women and half are men. So, on an average we need  $(2500 + 2000)/2 = 2250$  kcal per day (Ask: Why?, here) then multiply the above number by 365 to get the annual requirement per person ( Ask: Why? here) and then multiply this by the population of India ( Ask: Why?) and then divide the above number ( very huge, for most of us!) by the calorific value of rice ( which is the number of calories that we get on digestion, from every gram of cooked rice). From this we will know, the amount of rice that is needed. You may now take as an exercise to find out from books and newspapers as to how much rice is produced. Do we produce more or do we produce less, than what is required?

These numbers are interesting. But a question would come, does everyone equally share the deficit and surplus of the total food production in the country?

This means that if there is a deficit, then does everyone go hungry or some do not?

Conversely, if there is a glut in food production, would everyone be fed according to the requirement?

Find the answer and then “Ask ; Why?”

There is also another important question that follows from the above example that we took. Actually, in India there are only 940 women for every 1000 men? Question is: WHY? Do we not care enough for them?

This does bring us to the answer to the question that is being asked by many: “What is the difference between the National Science Day and the National Scientific Temper Day?”

On the National Science Day, we celebrate C.V. Raman and K.S. Krishnan's discovery of the Raman Effect, on 28<sup>th</sup> February, 1928 – a great achievement. On that day we talk about science. On the National Scientific Temper Day, we not only talk about science but also about many more things, including science. It comprises a bigger platform, of which science is a part. National Scientific Temper Day deals with science of nature and science of society. It makes us: “Ask: Why?”

This term “ scientific temper” was introduced by India's first Prime Minister, Jawaharlal Nehru. It appears in Article 51 A-h of our constitution. It is the duty of every Indian citizen “ to develop scientific temper, humanism and the spirit of enquiry and reform.” This concerns every citizen and not scientists alone.

The date 20<sup>th</sup> August marks the martyrdom day of Dr. Narendra Dabholkar, who was a very

important messenger of scientific temper, carrying the message, “Ask : Why?” Some people must have been disturbed by this message and so they first gave him warnings, then death threats and then killed him on 20<sup>th</sup> August, 2013. But, we as citizens have the urge to “Ask: Why?” Dabholkar's murder did not stop this process of “Ask : Why?” Then they killed Mr. Govind Pansare, a leader of workers and a scholar on Shivaji. Even that did not silence our people. So they killed, Professor Kalburgi, who researched on Basavanna and told the people that Basavanna's message was one of dignity of labour, equality of human being irrespective of caste or gender and that Basavanna had told us that religious rituals were meaningless. For talking about these teachings of Basavanna, Dr. Kalburgi was killed. Last year, Gauri Lankesh, a fearless journalist was also killed. She was a fearless fighter against inequalities and injustices. She questioned these inequalities and injustices and “Asked: Why?”

These respected martyrs were silenced by taking their lives away. But the process to “Ask: Why?” continues and will be reiterated by mass participation on the National Scientific Temper Day, on 20<sup>th</sup> August.

Let us reiterate again, our constitution gives us the right to “Ask: Why?” And so we are doing it. This process will also expand the spirit of inquiry. Just two weeks before August 20, we will observe “ Hiroshima Day” to protest against the attack on Hiroshima with atom bombs, by the American government, on 6<sup>th</sup> August, 1945. This was an assault on humanism, on an unprecedented scale. To develop humanism, we must question these barbaric acts and “Ask: Why?” to the manufacture of such weapons of mass destruction. We all know the science behind the power of the atom bomb but scientific temper, questions the logic behind the savagery perpetrated with these weapons, and questions those who did it and those who do not regret it .

In summary, the National Scientific Temper Day gives us a wide platform, in which every citizen has an important role to play.