Hundred Years of the Atom

A Campaign centred around the centenary of the discovery of the atomic structure

The discoveries of the X-rays, radioactivity, the electron, quantum theory, and relativity during the golden decade 1895-1905 brought about a total revolution in the way we perceive nature; and ushered in the era of Modern Science. Discoveries made during this period gave rise to a spate of developments in physical and life sciences that has made the world we live in today. The discovery of the electron in 1897 prompted scientists to channelise their efforts to understand the structure of the matter. J. J. Thomson, the discoverer of the electron, proposed the plum-pudding model of the atom. However, the discovery of the atomic nucleus by Ernest Rutherford in 1911 established a dense core (nucleus) at the centre with positive charge and electrons with negative charge moving around it at large distances like planets around the Sun. This model had fundamental flaws as it did not confirm to the established laws of physics. Niels Bohr resolved this problem by introducing the concept of stationary orbits, or the orbits in which the electrons orbited without radiating away energy. This explained the experimental data for the hydrogen atom well and established the structure of the atom as proposed by him. Later, contributions of Wolfgang Pauli with his Exclusion principle put the Bohr’s theory of the atomic structure on a firm footing. This breakthrough could explain aspects like atomic levels, spectra of various elements, electronic configurations in various atoms and the periodic table, chemical reactions, and as a result helped unravel phenomena in life sciences as well. The structure of DNA could be established only through a thorough understanding of atomic and molecular properties.

Development of quantum mechanics and its applications related to atomic phenomena in 1930s opened up new vistas and contributed to technologies that have become a part of our daily life. It would not have been possible to develop transistors, lasers, television, atomic reactors, computers, genetically modified crops, MRI, or new drugs without a proper understanding of atoms of various elements and their physical / chemical properties. It may be realized that in any natural phenomenon, or in any laboratory application, it is disciplines like physics, chemistry and biology that come into play in an integrated...
manner, and it is the atom and its structure that are central to it. Hundred years of the atom have seen a sea change in the world we live in, the way we perceive the nature, and the consequent emergence of new technologies that have completely transformed the world.

You may be aware that in the past, NCSTC and Vigyan Prasar have jointly led countrywide campaigns on various occasions to take science to the people. Some of the major campaigns included the activities built around the Total Solar Eclipses of (1995, 1999, 2009), Venus Transit (2004, 2012), World Year of Physics (2005), International Year of Astronomy (2009), International Year of Planet Earth 2008", International Year of Biodiversity 2010 etc. The year 2013 marks the centennial of the discovery of the atom and presents us with yet another great opportunity to take science to the people. It also presents an opportunity to develop a variety of software on scientific concepts, their applications to various fields, and the technologies that came into being based on those concepts over the last hundred years.

Now VP in collaboration with NCSTC is undertaking this initiative in a campaign mode titled "Hundred Years of the Atom". The Campaign will be centred around the centenary of the discovery of the atomic structure. The main objectives of the programme are :-

a) Communicate to the general public about the evolving perception of natural phenomena since the discovery of the atomic structure in 1913; and the progress in science and the advances in technology that have taken place ever since.

b) Popularise science and technology (S&T) in general through activities related to various phenomena centred on the atoms.

c) Organise 6 zonal training programmes (North, East, South, West, Central and North-East) to train Master Resource Persons (MRPs) say, 50-60 in each zone to carry out intensive activities related to various atomic phenomena. These MRPs would train more Resource persons in their own states.

d) Bring out activity packages/kits/articles/booklets in Hindi/English at the school level explaining various atomic phenomena/applications giving historical and scientific details to be used as resource materials; and for distribution in schools, science clubs and to interested individuals.

e) Develop Power Point (PPT) presentations on basic information on development of atomic theory and its applications in physical and life sciences; and development of related technologies.

f) Organise popular lectures/demonstrations on atomic phenomena at schools/colleges in physical and life sciences for the general public.

g) Produce and air radio programmes related to the theme Hundred Years of the Atom.

h) Organise awareness campaigns in schools/colleges; and especially in rural areas to encourage them to celebrate the Hundred years of the Atom.

i) Develop a network of schools/institutions/organisations to promote/disseminate scientific information related to the conceptual development and our understanding of the atomic structure and phenomena, along with advances in related technologies.

At present our country has a robust infrastructure in the form of VIPNET Clubs (about 12,000), community science centres (in many States) and S&T based agencies (both Government and Non-government). Many of the these are well equipped to take up such programmes in terms of infrastructure and trained scientific manpower. Hundred Years of the Atom would be a concerted programme where these science clubs / centres and S&T agencies would be involved in the same activity for about a year, along with Government and non-Government organisations, thereby ensuring a much bigger impact all over the country.

It is stated that there is a dearth of appropriate
resource material produced indigenously on scientific topics at popular level in different languages. This programme would be an unique opportunity to develop thematic material. Distribution of this software / material to students / teachers of schools and colleges; and to general public would go a long way in triggering an interest in science among them. In particular, distributing the activity kits on Hundred Years of the Atom and other resource material to the 12,000 VIPNET clubs of VP would help fulfill this objective in rural areas in particular, as the experience in the past has shown.

The programme would be spread over 14 months starting from January 2014, next year. The Action Plan/ Phase-wise distribution of worked elements has already been work out. So, be a part of Campaign "Hundred Year of Atom" by identifying the role you can play. Time to time details about the MRPs training programme, software development and State level workshop will be given in the VIPNET News and Website of Vigyan Prasar. Your views and suggestions are welcome.

Source:

Concept note: Hundred Years of the Atom , A major Initiative for S&T Popularisation centred around the centenary of the discovery of the atomic structure: developed by and B K Tyagi (Scientist 'E', Vigyan Prasar) and Ujjwala Tirkey (Scientist 'E', NCSTC (DST), A Joint Initiative of National Council for Science and Technology Communication & Vigyan Prasar.
When the men on motorbikes shot him, four times in head, neck and chest, Narendra Dabholkar was crossing the bridge by the Omkareshwar temple in Pune, Maharashtra. But, he had no intention of offering a garland there, saying a prayer, pressing a coin in a priest’s hand, or adoring the Shiva Lingam. He did not believe in such rituals. In fact, they appalled him; and he had hoped to spread his scepticism all through the State of Maharashtra.

He was a slight and courteous man, with unfashionable spectacles, in simple khadi shirt, slippers and cotton trousers: no one to notice on the street. Yet over three decades, ever since he had decided to switch his work from curing bodies to curing deluded minds, he had become famous. The organisation he had founded in 1989, the Committee for Eradication of Blind Faith (MANS in its Marathi acronym), had 180 branches in the State. In village after village he and his activists would confront the babas, sadhus and other “godmen” who preyed on the poor and simple people, challenging their claims and reporting them to the police. He investigated and demystified cases of black magic and possession by ghosts; he campaigned against animal sacrifice, the prodigious waste of drinking water and good food during religious festivities, and the pollution of local rivers during the Ganesha festival as a result of the immersion of thousands of idols made of plaster of Paris.

Dr. Dabholkar exposed Sathya Sai Baba, a millionaire godman who appeared to make holy ash, gold chains and Swiss watches materialise from thin air. He also offered 21 lakh rupees (about $33,000) to any sorcerer who, under strict scientific supervision, could stay on fire for a minute without moving, duplicate a currency note, grow a severed limb two centimeters by the application of powder, or turn water into petrol. The sum remains unclaimed.

Much of the “black magic” he dealt with had simple, sad causes behind it. The wild, convulsing women in the temples of Ambabai and Dattatreya were not possessed, but were mentally ill—hysterical after years of poor food, risky births, and mistreatment by their families. When the poor came to his “mobile science” vans, bringing their stories of terrifying horoscopes, Dr. Dabholkar would hand them a telescope and patiently explain the profound indifference of the stars.

The only inexplicable thing, he would say (all other “inexplicable” things being rationally explained by natural laws), was that India in the 21st century was still so full of superstition. It launched its own satellites, but before a launch the gods would be invoked with flowers and sandalwood paste; its IT
capability was the envy of the world, yet people would not start a new project on “inauspicious” Saturdays. People still believed that their fates were in the hands of the gods, not themselves. They clung blindly to karma, which was a law for “sheep” and “slaves”.

Like Mahatma Gandhi, Dr. Dabholkar rejected India’s caste system. He himself was a Brahmin, but with progressive parents; was educated in elite schools. His social work had begun with a campaign to make villages have a single well for everyone—Dalits (then “untouchables”) and others alike. He continued in that vein by using tolerance and protection for inter-caste marriages.

His success rate, though, was low. For 18 years he campaigned tirelessly for a law against black magic, but his Bill was allowed to lapse until, on his death, a severely trimmed version was passed. Babas and politicians remained hand-in-glove. Hindu and right-wing rowdies tried to attack him in villages; once he was doused with kerosene and almost set on fire. But Dr Dabholkar, a star player of kabaddi (team-wrestling) in his youth, laughed that he could take a tumble or two. He placed his hopes in the young, whose company he delighted in, and set up flourishing teacher-training programmes to encourage rational thinking in schools.

He also taught by example. His life was simple: vegetarianism, teetotalism, and abstention from religious rites of any kind. Even his children were married without pomp or fanfare, in ceremonies that took only an hour rather than several days. His office, from which he ran a weekly newspaper as well as MANS, was bare except for a quote from Gandhi on the wall. His reverence for the Mahatma underlined the fact that, though an atheist himself, his organisation was neutral on the subject of God’s existence. He valued the highest reaches of Indian spirituality. It was exploitation by conmen that he condemned.

Naturally, he was also dedicated to non-violence. His critics accused him of wanting to destroy all religion; but even its idols he treated with respect. There was no other way, he said. In this, as in human rationality, he had unshakeable belief. His enemies did not.

Sandipan Dhar
sandipandhar@gmail.com
For Vinod Raina, who co-founded an alternative education organisation called Eklavya, education was not just about ensuring children learning to read and write, but about making a difference to the society. Despite being part of various decision-making bodies in the government (he was member of the Central Advisory Board on Education), he failed to convince policymakers of this belief of his.

In the winter of 2008, with barely a few months left of UPA-1, even officials of the HRD ministry had given up hope that Right to Education would see the light of day. The only person who would shrug off all cynicism with a wave of his hand was the mild-mannered Vinod Raina, the eternal optimist, who spent hours chiselling away at provisions of the historic legislation. That the Act was a watered down version of what Raina sought so passionately is another matter. He had sought a uniform schooling system for all, even insisting every government school be modelled on Kendriya Vidyalayas. The government, of course, dismissed these ideas, happy with a mere shell of the Act, without any substantial value addition.

Raina’s optimism emanated from his deep-seated belief that no government could afford to ignore a social intervention like Right to Education. This was typical Raina, part of the sixties’ set and a romantic to the core, who had relinquished a cosy Delhi University job as a Physics teacher to move to Madhya Pradesh to develop what came to be known as the Hoshangabad Science Project.

It was not an effort to make science teaching easier but to develop a new pedagogy not only of science but of other subjects also. As Apporvanand of DU says, “It developed into an educational thought that later became Eklavya and a precursor to the National Curriculum Framework of 2005.”

When the National Literacy Mission was launched, Raina traversed every nook and corner of the country, and would joke that he has seen every block of India. Through Bharat Gyan Vigyan Samiti, adult literacy was popularised throughout the country.

Raina’s greatest quality was his amicable nature. Not that he did not argue, protest or fight; he never stopped trying to reach out even to his radical opponents, especially when RTE was being formulated. Apporvanand calls him a quintessential “committee man” with immense capability to work with others and, if possible, find space for dialogue.

Much as Raina shunned publicity, the last few years were spent in the limelight as a pedagogue and a thinker who always had something new to say. When he was diagnosed with cancer four years ago, he only intensified his work as the malady spread further.

If education moved him, music soothed him. A regular in Delhi music soirees, music was Raina’s constant companion.

Being a theoretical physicist by profession, he utilised his scientific and rational mindset to be one of the pioneers of the People’s Science Movement in India. Raina himself believed in an inclusive and comprehensive learning methodology for children and tried for systematic quality improvement studies and not just evaluating the child on the basis of marks scored in maths or science. For him the outcome of the tests could not be the basis for evaluating the child.

I myself came to know about him through Prof. Anil Sadgopal, when I was an undergraduate student.
When I first met him while discussing with him I learned about the pedagogy utilised by organisations like Eklavya and BGVS (Bharat Gyan Vigyan Samiti). Dr.Raina started the adult literacy mode, and then extended it in 1989 in collaboration with the Government of India in the form of the National Adult Literacy Mission.

During the initial period while interacting with him on different occasions I was quite curious to know about the Hoshangabad Science Teaching Programme (HSTP). He invited me to experience the activities first hand. I still recollect that morning of my first visit to Hoshangabad in 1987. Across the breakfast table I got the chance to interact with Dr.Raina to know more about this program before I started my field visit. He told me how the HSTP program was started and later became an institute called Eklavya.

Initially it began in 1972 as an experimental programme in 16 rural government middle schools in the district. The implementation of the programme required another important institutional mechanism in terms of replication and expansion of the process. The need to involve motivated professionals to help catalyse and evolve teaching-learning materials and conduct teacher orientations saw the creation of a resource group drawn from institutions like Delhi University, Tata Institute of Fundamental Research, and IITs, and later from the Centre for Cellular and Molecular Biology and National Institute of Immunology, but most importantly, from colleges from within Madhya Pradesh. The involvement of college and university professionals was facilitated through a formal intervention of the University Grants Commission. Consequently, scores of science professionals would be seen at camp sand in schools in remote areas of the district, rubbing shoulders with village teachers to participatively create an activity and environment-based methodology for science teaching.

From a 16-school experiment, HSTP was expanded to cover all the middle schools of Hoshangabad district in 1978. This expansion saw the direct involvement of NCERT with the programme through its Regional Institute of Education located at Bhopal. Such geographical expansion was accompanied by a great deal of unease regarding the choice of the entry point of intervention. It had become increasingly evident that the foundations for under-achievement of children were laid at the primary level and as a result a majority of children at the middle level could hardly read a paragraph or do the simplest arithmetic. Doing better science at the middle level, though desirable, seemed hampered by the absence of a similar intervention at the primary level, beginning from class I. Dr.Raina told me, “The abysmal achievement levels of children we encountered have now been confirmed by the nation wide surveys done for DPEP (District Primary Education Project) by NCERT, but very few educational professionals believed us then. This underscores the point that merely providing access to schooling is insufficient unless quality improvement takes place in parallel, and not subsequently, if achievements are to increase and, most importantly, if non-enrolment and drop-outs due to lack of relevance and interest in elementary education have to be rectified.”

During 1980-82, important events were to shape the course for future action. Friend’s Rural Centre opted out of the programme in 1980 and Kishore Bharati’s priorities also started to undergo a change. It was increasingly felt that a future expansion of HSTP would have to go hand-in-hand with expansion in other subjects like social sciences, and definitely at the primary level. To undertake these responsibilities, Raina decided to give up his professional career and work full-time in Madhya Pradesh. Then, along with some of his other co-workers of HSTP, he founded a new group, Eklavya. The NGO part of HSTP was transferred to Eklavya in 1982 and it has carried forward the work since then.

By 1986, Eklavya, with the concurrence of the 'State Education Department', expanded the HSTP to school complexes of 13 more districts of MP. Significantly, it was able to locate and attract full-timers and resource persons to undertake the development of social sciences for middle schools and primary school teaching-learning processes. Choosing about 40 schools in both tribal (Betul district) and non-tribal regions, and during a period of eight years upto 1994, Eklavya completed the development, through intense field interaction, of an integrated primary school package called ‘Khushi-Khushi’ which included teaching-learning materials, teaching training methodology, non-invasive student evaluation methods, and facilitating administrative and management structure, all within the State Education Department, just as in HSTP. The basic approach continued to be activity, discovery, and environment-based, but at the same time incorporating many child development criteria keeping in mind the younger age of children compared to that in the HSTP.

While travelling to several districts of Madhya Pradesh with Dr.Raina I have witnessed how Eklavya
simultaneously took up curricular development programmes for primary education and for social sciences at the middle school level. The initial explorations in primary schooling were conducted in a few schools in a predominantly tribal block of Betul district; hence a sub-centre was subsequently opened in Shahpur to facilitate this interaction. The social science work was coordinated from the Hoshangabad field centre.

A pilot project for social science was initiated in nine schools of Hoshangabad, Dewas, and Bhopal districts in 1986, while a primary curricular package, called the Prathamik Shiksha Karyakram (Prashika), was introduced in seven schools in 1987, four in Shahpur, and three in Harda. The number of Prashika schools was scaled up to 25 in 1989 while one school in Bhopal dropped out of the Social Science project.

Along with the work of developing school curricular packages, Eklavya also pursued its mandate of devising educational programmes for the vast majority of children, youth and adults who are either left out of the schooling system for social, economic and cultural reasons or drop out because of the irrelevance of the education being imparted to them and injustices they face within the school system.

In addition, it took up a range of community and school-based activities that served a two-fold purpose. They supported teaching in schools and helped create an environment in the community that was receptive to new ideas and innovations in education. They also highlighted contemporary socio-political issues of concern, generating a debate on the use of science and technology for development, the objective being to foster scientific temper among the people.

This basket of activities included bal-melas, poster exhibitions, street plays, etc., organised in schools, villages and small towns; jathas, public campaigns and touring exhibitions that covered several villages in campaign mode; and creative activity workshops to train children to teach others. In addition, several village-level forums for children and youth were set up, including children’s clubs, study groups, youth groups, drama groups, etc. As part of this thrust, a network of libraries and reading rooms was also established at Eklavya’s field centres, mohallas in small towns and in villages, most of which were run by local volunteers.

Prominent among the non-formal and supportive educational activities during Eklavya’s first decade were the setting up of a forum to study local history, culture and traditions (1983-84), for which purpose Raina used to take part regularly in conducting workshops to discuss research methodologies and related concerns. They include the ‘Women’s Health’, ‘Bhopal Gas Tragedy’, ‘What Is Science?’ and other touring exhibitions/jathas (1984-86), the A n d h v i s h w a s (superstition) workshops (1985) and the Madhya Pradesh leg of the national-level Bharat Jan Vigyan Jatha (1987), which sought to foster scientific temper and generate awareness among the public on science-society, health and gender issues; the Parasia water quality testing project (1987), in which school children investigated the problem of drinking water quality in a coal mining centre; and a three-month contact campaign in remote villages of Dewas district focussing on literacy, employment, school education and environment problems, followed by cycle jathas by students to help set up district, block and village level samitis for intensifying work on these issues (1990).

The true quality of Vinod Raina came out when, under criticism from various fronts on Right to Education Act, he himself said that he knows that the Act is not perfect, but it is the big step which will lead to extensive amendments to improve it. For a person to accept the possibility of the future and make it change with the context and galvanized previous modus operandi, he does deserve an honorable goodbye.

Sandipan Dhar sandipandhar@gmail.com
Fun in Maths

Even though I have no money and no one gives me any, I can still say that my satisfaction is positive.

Can we say minus a minus equals plus?

What is the secret of your love affair with Sir TV channel?

Simple, I love him because he balances my money and takes care of my bills.

Cartoon by V.S.S. Shastri (Science - Math communicator)

520/1, 2nd Cross, Jayanagar, Kolar - 563101
Registration Form : Anko Ke Khiladi
पंजीकरण प्रपत्र : अंकों के खिलाड़ी

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4- Full Address with Postal Pin Code : ........................................................................................

5- Email & Mobile No. : ..............................................................................................................

6- Vipnet Club ID (If any) : ........................................................................................................

7- Profession : .............................................................................................................................

8- Do you want activity kit in Hindi or English : ........................................................................

For Online Registration: visit www.vigyanprasar.gov.in
You can send your Registration detail to :
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**International Year of Water Cooperation 2013**

**NOTICE**

In all your correspondence to VIPNET News, kindly write your complete address in capital letters (with pin) along with your Phone & E-mail ID. This will help VIPNET desk to reply your query much faster.

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**Clue**

1. Water located beneath the earth’s surface in soil pore.
2. Water released by the melting of snow or ice.
3. Water that derived from precipitation.
4. Water that were trapped in the pores of sedimentary rocks.
5. Water that is not salty.
6. Water on the surface of the earth such as in a stream, river, lake, or ocean.
7. Water that contains many minerals.
8. Water that has more salinity than fresh water, but not as much as seawater.
9. A strange phenomenon which can occur when a layer of fresh or brackish water rests on top of denser salt water, without the two layers mixing.
10. Water from a sea or ocean.

**Winner**

- Mrs Mythili (Hyderabad)
- Mrs Pratibha (Delhi)
- Mrs Pratibha (Delhi)
- Mrs Pratibha (Delhi)

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**Answer Water Puzzle- 37**

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**Puzzle- 39 Based On Term for Water according to occurrence**

**Clue**

1. Water located beneath the earth’s surface in soil pore.
2. Water released by the melting of snow or ice.
3. Water that derived from precipitation.
4. Water that were trapped in the pores of sedimentary rocks.
5. Water that is not salty.
6. Water on the surface of the earth such as in a stream, river, lake, or ocean.
7. Water that contains many minerals.
8. Water that has more salinity than fresh water, but not as much as seawater.
9. A strange phenomenon which can occur when a layer of fresh or brackish water rests on top of denser salt water, without the two layers mixing.
10. Water from a sea or ocean.

**Winner**

- Mrs Mythili (Hyderabad)
- Mrs Pratibha (Delhi)
- Mrs Pratibha (Delhi)
- Mrs Pratibha (Delhi)

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**The puzzle has been Designed as part of International Year of Water Cooperation-2013**
Club speak

Indian Petting Karbaryashala

Dr. A.P.J. Abdul Kalam Petting Colony, Kolkata, Bihar, West Bengal. On 24th June, 2013, the Indian Petting Karbaryashala organized an event. This initiative aims to create awareness about petting colonies. This was the first event where the participants were introduced to various species of animals. The participants were also given the opportunity to interact with the animals and feed them. The event was well-received by the visitors, who expressed their happiness and gratitude towards the organizers.

Science Corner

Shri Samarath Madhyamik Vidyalay Maveshi, Taluka Akole, Dist. Ahmednagar, Maharashtra developed a Science Corner for creating interest in science, intellectual curiosity, and scientific vision in students. In Science Corner student's prepared new educational models and apparatus under the guidance of experts. Students express their thoughts about new creation and give information on the educational models.

Workshop on E-waste

Adharshil Disney Club, Sito Road, Abohar, Punjab organized a Workshop on E-waste. The Club aims to organize such competitions to develop confidence, leadership qualities, team spirit & positive attitude among students.

World Environment Day

IMC Banabidu Science Forum, Dandamukundpur, Puri, Odisha organized a plantation drive on the World Environment Day on 5th June, 2013. IMC Banabidu Science Forum in association with a community-based organization planted saplings in local school also. Guests on this occasion also added that it was the responsibility of every citizen to preserve the environment and wanted awareness to be created among school children. More than 200 free saplings were also distributed to the visitors so that they could plant them in their areas.

Annual Reports

Kalam Science Club, ZPHS Pulukurthi, Atmakur, Warangal, A.P. conducted many awareness programmes like mosquito eradication rally, AIDS awareness programme and Dental awareness programme during last one year. Club also organized school level science fair.

Workshop on E-waste

Madam Curie Club, New Delhi jointly organized a Workshop on E-waste with Sir Isaac Newton club on 27th December, 2013. Both clubs organized many programmes together during last one year. Workshop on E-waste was organized in association with Nokia. The resource person sensitized and motivated the students to opt for responsible recycling. Club members also visited Bio-diversity express, Mother Dairy Plant, Okhla Bird Sanctuary, Botanical Garden, Jim Corbett part and National Science Centre during last year.

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Quiz Competitions

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