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The North American Nanohertz Observatory for Gravitational Waves (NANOGrav) is a gravitational-wave detector that monitors areas in the vicinity of Earth using a network of pulsars. The NANOGrav collaboration gathered evidence of fluctuations in the timing data of 45 pulsarswhich could be compatible with a stochastic gravitational wave background (SGWB) signal at nanohertz frequencies. This SGWB signal could be produced by a network of cosmic strings born in the early universe. Researchers theorized that this network would evolve as the universe expands, producing closed loops when strings collide. These loops would then slowly decay into gravitational waves, resulting in the signal detected by NANOGrav.
(https://phys.org/news/2021-03-theoretical-pulsar-nanograv.html)

PHYSICS NEWS

New perovskite LED emits a circularly polarized glow

Researchers have developed a new type of LED that utilizes spintronics without needing a magnetic field, magnetic materials or cryogenic temperatures.Most opto-electronic devices, such as LEDs, only control charge and light and not the spin of the electrons. The electrons possess tiny magnetic fields that have magnetic poles on opposite sides. Its spin may be viewed as the orientation of the poles and can be assigned binary information -- an "up" spin is a "1," a "down" is a "0." In contrast, conventional electronics only transmit information through bursts of electrons along a conductive wire to convey messages in "1s" and "0s." Spintronic devices, however, could utilize both methods, promising to process exponentially more information than traditional electronics.

One barrier to commercial spintronics is setting the electron spin. Presently, one needs to produce a magnetic field to orient the electron spin direction. Researchers have developed a technology that acts as an active spin filter made of two layers of material called chiral two-dimension metal-halide perovskites. The first layer blocks electrons having spin in the wrong direction, a layer that the authors call a chiral-induced spin filter. Then when the remaining electrons pass through the second light-emitting perovskite layer, they cause the layer to produce photons that move in unison along a spiral path, rather than a conventional wave pattern, to produce circular polarized electroluminescence.

Read more at : https://www.sciencedaily.com/releases/2021/03/210312121330.htm
***Original paper* :** Science (2021). DOI: 10.1126/science.abf5291

Pivotal discovery could open new field of quantum technology called "Magnonics"

Researchers have announced that they can directly control the interactions between two types of quantum particles called microwave photons and magnons. The approach may become a new way to build quantum technology, including electronic devices with new capabilities.

Through smart engineering, the team employs an electrical signal to periodically alter the magnon vibrational frequency and thereby induce effective magnon-photon interaction. The result is the first-ever microwave-magnonic device that scientists can "tune" to their wishes. The team's device can control the strength of the photon-magnon interaction at any point as information is being transferred between photons and magnons. It can even completely turn the interaction on and off. With this tuning capability, scientists can process and manipulate information in ways that far surpass current versions of hybrid magnonic devices.

The discovery opens a new direction for magnon-based signal processing and should lead to electronic devices with new capabilities. It may also enable important applications for quantum signal processing,

Read more at : https://news.uchicago.edu/story/pivotal-discovery-could-open-new-field-quantum-magnonics
***Original paper* :**Physical Review Letters (2020). DOI: 10.1103/PhysRevLett.125.237201

Pankaj Bhardwaj
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Letter to Editor...

15 March 2021

The article "A few Practical Optical Devices" by D Syam published in March issue of Bulletin is quite interesting. Such lucid explanations of Abbe Prism, Fresnel's Lens etc., are really not available in regular text book. The ease of using these devices was explicit. His last statement, "Give it a try" is encouraging for students and teachers alike.

In fact, I have already done the corner-cubic retro-reflector for yet another use. By observing the number of images (eight) formed with an object touching all the mirrors, you can predict the solid angle of the corner as 4/8 steradian. I have made many more of these devices with mirrors enclosing corners and when demonstrated to students in classroom, they shout out the solid angles very confidently. A solid angle measuring device is innovated!

An apt article for novice experimentalists in the Bulletin.

Sarmistha Sahu

Announcement

In view of the pandemic, The NCICP Competition for the year 2020 has been cancelled.

Announcement for the next year competition will appear in the Bulletin in due course.

PD Lele

Dr. DP Khandelwal - A Multifaceted Personality

H.D. Bist[1] and Lalan Prasad Verma[2]
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Preamble

From his student days D.P. Khandelwal (DPK) had been brilliant and a man of independent ideas and disciplined values. After the completion of his graduation he got selected for Indian Civil Services; but he didn't join it under the British rule.

He participated in the national freedom struggle from Agra in 1943 during his second year of M.Sc. He initiated his friends and other students to join the freedom movement for our nation. As a result of this a warrant was issued under his original name (DP Rawat) to arrest him and stop his studies. But he changed strategy and changed his name to DP Khandelwal (DPK).

He was closely attached to physics and physics experiments from beginning and all along that remained his prime interest. He had more than 45years of very wide spectrum of teaching and research experience right from school level..

Synopis of his main assignments

He modified the B.Sc. syllabus and pattern of examinations at Agra University in 1967. As a result of this, a transformation was triggered in undergraduate courses all over the country.

Consequent changes were immediately introduced in High School and Intermediate classes in UP board which were later followed throughout the country.

DPK wrote several text books such as Optics and Atomic Physics, Thermodynamics and Statistical Physics, and Laboratory Manual of Physics.

In 1965 he was sent (by the Govt. of India (under the USAID program)) to visit USA and UK to study the development of teaching programs and organising teachers orientation courses/ programs. He was also associated with many academic bodies.

In this presentation, we highlight his contributions as:

1) Faculty Member and colleague plus Research Student (1954-1962) of Professor and Head of Department of Physics Dr. D.D. Pant (DDP) in Dev Singh Bisht (DSB) Govt. College, Nainital

Period	Institution	Position	Work for students
Jan 1943-47	Marvari Vidyalaya, Karachi	Teacher	High School and Inter
Jan 1947-48	Birla College, Pilani	Lecturer	Intermediate
July 1948-54	Agra College, Agra	Lecturer	BSc & MSc
Oct 1954-61	DSB Govt College, Nainital	Lecturer	BSc, MSc & Research
Oct 1961-63	Rajasthan University, Jaipur	Reader	BSc, MSc & Research
Oct 1963-69	Agra College, Agra	Professor	BSc, MSc & Research
Oct 1969-81	HBTI, Kanpur	Professor	B Tech & Research
1977	Rajasthan Univ Jaipur	Visiting Prof	In ULP Program
1981-1984	IIT, Kanpur	Visiting Professor	Research

2) Professor and Head of Physics Department at HBTI, Kanpur and adviser/close associate -family member (1969-1981) of his student myself (H.D. Bist (HDB) at IIT- Kanpur) and visiting- Professor in a Research Project of HDB (1981-1984)

3) Collaborator with Prof. B.L. Saraf (BLS)

4) planner/architect for founding of Indian Association of Physics Teachers (IAPT) in 1984 from IIT-Kanpur

1. DPK as Faculty Member and Research Student of DDP in DSB College, Nainital

In the year 1954 DPK got selected for lecturer-ship in DSB government PG College, Nainital for teaching of UG and PG classes. At that time Prof. DD Pant (DDP) was Head of the Department of Physics. During that period HD Bist (HDB) was student of the UG and PG classes (1954-58) and Ph.D. (1958-62) under DDP.

DPK was a very gentle and understanding person and an enthusiastic teacher. He had excellent knowledge especially in optics and instrumental designs. He would teach theory classes-continuously for 04 hours and after that would guide the students of UG and PG laboratories.

DPK was a true well-wisher of the students. He used to work at even solving their personal problems. DPK and DDP established a library for poor students of Physics Department of the DSB College. For this purpose funds were collected by staging charity programmes.

In 1971 he organized a summer Institute (workshop) at Nainital where 15 new B.Sc. level experiments were designed. The report of the summer Institute got wide acclaim and several experiments became part of the laboratories of different colleges. He had prepared a book on 18 new B.Sc. level experiments which was published by Vikas Publishing House, New Delhi.

1.1 DPK as Ph.D. Scholar with Prof. D.D. Pant

After getting appointment at Nainital, DPK joined research under the supervision of DDP. For DPK, his Ph.D. mentor remained a guide, a source of inspiration, philosopher and trusted friend. Their close friendship continued throughout their lives.

As first teacher-student of DDP, DPK helped DDP in managing teaching activities of fresh teachers and in establishing new teaching labs and new research labs/activities at Nainital. DPK remained the most favourite of DDP.

At that time the college did not have any facility for spectroscopic research. DDP and DPK decided to set up a fluorimeter for undertaking a research program on fluorescence spectroscopy. Under the guidance of DDP new UV, Visible and optical Spectrophotometers were set up. One Raman Spectrograph with mercury lamp excitation to record the spectrum in the form of permanent impression on the photographic plate was also improvised and this was used for recording Raman spectra both by Ph.D. and M.Sc. students.

The New Fluorimeter

Transformers, condensers, photomultiplier tubes and a small monochromator costing Rs. 2000/- were purchased at nominal cost. As a result within a year a non-recording fluorimeter was assembled under the guidance of DDP in one of the research labs in ground-floor rooms of Physics labs. This instrument started working within a year. DPK was the first one to complete his Ph.D. work on this Machine. Several other Ph.D. students and M.Sc. students used this self - assembled fluorimeter for their research/lab work.

DPK helped DDP in setting up of spectrometers, a glass-blowing workshop and liquid-nitrogen plant. B.C. Pande was also a great help in these activities.

DPK remained the most trusted colleague and enthusiastic research worker in the group of DDP.

He was the first one to submit a Ph.D. thesis in the Department, on "Deciphering the frozen spectra of uranyl salt". He made important contributions in the publications coming out of his own and my (HDB) Ph.D. work.

His work was extensively quoted including in a monograph "The Spectra of Uranyl Ion" by Rabinwitch and Belford (Academic Press, 1964). DPK also published his Ph.D. thesis in the form of a Book with a well known publisher.

As an interesting side story, after day's hard work DPK and DDP used to relax playing Bridge.

HDB did Ph.D. work during 1958-62 with DDP from DSB College, Nainital. In the Alumni List of DSB (Kumaun University, Nainital) HDB is at number one.

Tits and Bits to remember from association with Prof DDP

DPK internalised following two traits. I (HDB) also followed the two with sincerity.

a) Trait from DDP

"Finishing the job by the end of the day"

(अध्यवसाई का कार्य दिन के अंत तक पूरा किया जाता है) written on the way of his office in DSB college

b) Trait from Guru of DDP Prof. R.K. Asundi

"One should treat his associated students as members of his family".

DPK served at DSB College till 1961. Then he joined Rajasthan University, Jaipur, as Reader in Physics. In 1963 DPK was appointed as Head of the Department of Physics at Agra College and served there till 1969. This position provided him the opportunity of working for up-gradation of Physics syllabi and laboratories.

1.2 Publications during DPK and HDB Ph.D. work with active contributions of DPK as Assistant Professor and Ph.D. student under DDP

1. H D Bist, D P Khandelwal and D D Pant, 'Temperature Dependence of Fluorescence bands of Uranyl Nitrate Solutions', Curr. Sci. **28**, 433 (1959)
2. H D Bist, 'Fluorescence and photochemical action in Uranyl nitrate solution', J. Sci. Ind. Research Journal **188**, 387 (1959)
3. D D Pant and H D Bist 'Some Luminescence Phenomena in Uranyl Nitrate'- J. Sci. Ind. Research, Journal **19B**, 360 (1960)
4. D D Pant and H D Bist 'Infrared Spectra of Uranyl Salts'- Indian Journal of Pure and Applied Physics **2**, 107 (1964)
5. D D Pant and H D Bist 'Hydrolytic Uranyl Species and Their Emission Spectra'- Indian Journal of Pure and Applied Physics **2**, 233 (1964)

2. DPK collaborating with Prof. B.L. Saraf (BLS)

DPK and BLS knew each other from Agra College in 1948-49. DPK had joined as Lecturer and BLS was doing his M.Sc. DPK and BLS had their first formal collaboration in 1966. DPK was at Agra College and BLS was at Rajasthan University, Jaipur. They worked on a NCERT project (1966-69) for producing teaching material/experiments for classes VI – VIII. DPK was leading member of NCERT team at Jaipur and helped in development of 4 volumes of detailed teaching materials for school classes.

BLS was a great experimentalist and his work was always appreciated by DPK. They collaborated closely for designing experiments and equipments for student laboratories. The new experiments got wide national and international acclaim. Many of the experiments/equipments were supplied to IITs, Universities and colleges across the country and also outside. These were all fabricated in the workshop of Rajasthan University, Jaipur.

DPK had major contributions in development of two volumes of the book "Physics through Experiments" on the experiments designed and developed at Jaipur.

3. DPK at HBTI, Kanpur as Professor and Head of Department of Physics (1969-1981) and Visiting Professor in a Research Scheme of HDB in IIT-Kanpur (1981-1984)

In the year 1969 the Board of Harcourt Butler Technological Institute (HBTI) Kanpur announced the appointment of the first Professor of Physics and Head; it was Prof. DPK. He immediately joined HBTI.

He was closely associated with HDB since Nainital days and when he joined HBTI Kanpur, HDB was on the faculty in IIT Kanpur.

At that time his family was settled in Agra. DPK was requested to come and share the living residence allocated to HDB in the campus of IIT Kanpur. DPK accepted the invitation of HDB to stay with him in IIT-Kanpur and participate in HDB group's research activities after completing daily duties in HBTI. He spent time in labs and office at IIT Kanpur with HDB group

contributing for publications and experimental works. As a senior teacher and colleague for more than a year, DPK's experience was an asset for junior students and researchers in the IIT group of HDB.

After shifting to a house near the campus of HBTI, he remained associated with research work in collaboration with HDB group at IIT-Kanpur.

DPK contributed to publication of one edited book and assisted in publication of 30 research papers with HDB group.

V.P. Tayal (VPT) - his Assistant Professor in HBTI and B.K. Srivastava (BKS) were guided by him at HBTI to collaborate in the lab of HDB at IIT Kanpur.

DPK supervised in all six students (J.K. Ghosh-1967, J.C. Joshi-1968, J.K. Jain-1976, BKS-1977, VPT-1978, K.N. Khanna -1982) for Ph.D. and published over 70 original research papers.

VPT guided two research scholars (Abha Bajaj and G.D. Tewari) but both of them were super-guided by DPK. They did their experimental work in the lab of HDB at IIT Kanpur. His daughter Sunita Khandelwal published a paper in the co-authorship of HDB.

In 1977 for one year DPK went on UGC deputation as Visiting Professor to work in the University Leadership Programme (ULP) at University of Rajasthan, Jaipur, in collaboration with BLS. DPK had one of the longest associations with BLS. He encouraged his student BKS to move to Jaipur for further assignments. At Jaipur DPK did very intensive work on new experiments and prepared new edition of volume-I and 1st edition of volume-II of 'Physics through Experiments'.

In 1974 he was the President of Kanpur Physical Society's committee for new B.Sc. courses in Kanpur University. After retirement from HBTI in 1981 he accepted the position as "Emeritus Professor" with HDB and remained there till 1984 at IIT Kanpur and rigorously guided research and extension work.

In 1993 he joined Poona University as Emeritus Fellow in a UNESCO Project "University Foundation Course in Modern Physics" with Prof. A.S. Nigavekar.

3.1 Books and Research papers from HBTI and IIT-Kanpur

Book – "LASERS and their applications in the Indian context" edited by H.D. Bist, D.P. Khandelwal and G. Chakrapani, published from Tata McGraw Hill, 1985.

Papers published –

1. V S Tomar, H D Bist and D P Khandelwal, 'Infrared Spectrum of Potassium Oxalate Monohydrate at Liquid Nitrogen Temperature', Applied Spec. **24**, 598-601 (1970)
2. V. N. Sarin, M.M Rai, H.D. Bist and D.P. Khandelwal, 'PR Separations and Relative G-Branch Intensities in Infrared Band Contours of Monosubstituted Benzenes', Chem. Phys. Letters **6**, 473-475 (1970)
3. M M Rai, H D Bist, D P Khandelwal, 'Infrared Band contours and PR Separations of Fluorinated Aromaties, 1-4 Difluoro- Benzene', Applied Spec **25**, 442-448 (1971)
4. B K Srivastava, D P Khandelwal and H D Bist, 'Anharmonic and coordination effects in the internal modes of water in $CoCl_2.2H_2O$ and $CoCl_2.2D_2O$', Applied Spec **29**, 190 (1975)
5. Bipin K Srivastava, D P Khandelwal and H D Bist, 'Infrared spectra of $BeSO_4.4H_2O$ and its deuterated analogue at 110K in 1200–250 cm^{-1} region', Pramana **7**, 401-406 (1976)
6. B K Srivastava, D P Khandelwal and H D Bist, 'Mechanical and electrical anharmonicities in the bending mode of water in some transition metal dihydrated dichlorides', Solid State Commun **19**, 985-987 (1976)
7. Bipin K Srivastava, D P Khandelwal and H D Bist, 'Infrared spectra of $BeSO_4.4H_2O$ and its deuterated analogue in 4000–1200 cm^{-1} region', Pramana **7**, 49-55 (1976)
8. B K Srivastava, D P Khandelwal and H D Bist, 'Changes in IR Spectra of Some Hydrates with

Different Window Materials, Aging and Pellet Pressure', Ind. J. Pure and Appl. Phys. **14**, 240 (1976)

9. B K Srivastava, D P Khandelwal, and H D Bist, 'Spectroscopic Correlation of OH Stretching Frequency Shifts of Water in Crystal Hydrates', Chem. Phys. Letters **39**, 366-370 (1976)
10. B K Srivastava, D P Khandelwal, Sunita Khandelwal and H D Bist, 'Internal Modes of and Potential Environments Around Water Molecules in $CuSO_4$, $5H_2O$ and its Deuterate' Chem. Phys. Letters **43**, 557 (1976)
11. Bipin K.Srivastava, D P Khandelwal and H D Bist, 'Intensities of wagging and rocking bands of water in $MnCl_2 \cdot 2H_2O$ and $CoCl_2 \cdot 2H_2O$', Chem Phys Letters, 55, 391 (1978)
12. V P Tayal, D P Khandelwal and H D Bist, 'Systematics of the Librational Modes of Water in Typical Transition Metal Sulphate Monohydrates $MSO_4.H_2O$ (M = Mn, Co, Ni, Zn)', Chem Phys Letters **55**, 136 (1978)
13. V P Tayal, B K Srivastava, D P Khandelwal and H D Bist, 'Librational modes of crystal water in hydrated solids', Applied Spectroscopy Review, Published online , **16**, 43-134 (1980)
14. G D Tewari, V P Tayal, D P Khandelwal and H D Bist, 'Vibrational Modes of Water in Nickel Formate Dihydrate', J Mol Structure **96**, 45 (1982)
15. G D Tewari, V P Tayal, D P Khandelwal and H D Bist, 'Vibrational Modes of Water in Zinc Formate Dihydrate', Appl Spectrosc **36**(4), 441 (1982)
16. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Phase Transitions in Magnesium Acetate Tetrahydrate', Chem Phys Letters **93**, 371 (1982)
17. O P Lamba, H D Bist and D P Khandelwal, 'Structural investigations on $Sr(NO_2)_2 \cdot X_2O$ (X = H, D): a vibrational analysis', J Mol Structure **101**, 223-231 (1983)
18. Anshu Agarwal, D P Khandelwal and H D Bist, 'Low frequency vibrational spectra of lithium formate monohydrate and its aqueous solutions', Can J Chem **61**, 2282 (1983)
19. M B Patel, S Patel, D P Khandelwal and H D Bist, 'Vibrational Studies and Phase Transitions in $Co(clO_4)_2.6H_2O$ and $Mn(c1O_4)_2.6H_2O$', Chem Phys Letters **101**, 93 (1983)
20. G D Tewari, D P Khandelwal, H D Bist and V P Tayal, 'Evans Holes in the Infrared Spectra of Some Transition Metal Formate Dihydrates', Can J Chem **61**, 2745 (1983)
21. S Ram, D P Khandelwal and H D Bist, 'Laser induced Fluorescence of Eu^{3+} in $Eu_2(SO_4)_3$. BH2O in Aqueous and Non-Aqueous Solutions in Lasers and Applications'- ed. H D Bist and J S Goela, Tata McGrew Hill, New Delhi, 161 (1984)
22. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Low-Temperature Infrared and Raman Spectra of $Co(CH_3COO)_2 \cdot 4X_2O$ (X = H, D)', Appl Spec **37**, 710 (1984)
23. G D Tewari, G S Raghuvanshi, D P Khandelwal and H D Bist, 'Study of Structural Phase Transition in NH_4SCN from Raman Scattering', Chem Phys Lett **103**, 328 (1984)
24. M Pal, A Agarwal, D P Khandelwal and H D Bist, 'Dynamic disorder of $(CH_3)_4N^+$ in $(CH_3)_4NX$ (X = Cl, Br and I) as studied by Raman Spectroscopy', J. Mol Structure **112**, 309 (1984)
25. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Fermi resonance in $M(CH_3COO)_2.4H_2O/D_2O$ (M = Mg, Co,and Ni)', Spectrochim Acta **41A**, 391 (1985)
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27. S Ram, D P Khandelwal and H D Bist- 'The Observation of Electronic Raman Effect in

Europium Sulphate Octahydrate', Proc. Int. Conf. Raman Spectro **9**, 630 (1984)

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29. G D Tewari, D P Khandelwal and HD Bist, 'Raman scattering study of phase transitions in NH_4SCN', J Chem Phys **82**(2) 5624-32 (1985)
30. M Pal, A Agarwal, D P Khandelwal and H D Bist, 'Incommensurate Phase in Teramethyl Ammonium Tetrachlorozinate: Evidence from Internal Modes', J Raman Spectros **17**, 345 (1989)

3.2 A synopsis of some prominent members of IIT Kanpur who enjoyed help and guidance from Prof. DPK

V.N. Sarin was the first employee as teaching - assistant in IIT- Kanpur and throughout the period remained as main supporter in the lab with HDB from 1962-2001. Sarin was in-charge of German infrared machine (UR-10) purchased in Rupee fund from Germany in 1962. He submitted and got Ph.D. with HDB. Dr. Sarin retired as Assistant Prof from IIT-Kanpur.

V.S. Tomar was Post Doctoral Fellow in a research scheme of HDB and Dr. Tomar retired as Senior Scientist from NPL, New Delhi.

M.M. Rai worked in a research project of HDB and got his degree with Prof. N.L. Singh in BHU.

BKS had individual UGC fellowship in HBTI and he is most prolific writer in the research group with DPK and published very thoughtful papers.

Sunita Khandelwal, G.D. Tewari, V.P. Tayal, G.S. Raghuvanshi, O.P. Lamba, M.B. Patel, Sushma Patel, Anshu Agarwal, S. Ram and M. Pal were associated with research group of HDB in IIT-Kanpur.

M. Pal is in-charge of research lab in University of Mexico.

G.S. Raghuvanshi was teacher fellow on deputation from a Govt College of Rajasthan and retired from the post of Pro Vice-Chancellor, Rajasthan Technical University, Kota.

Anshu Agarwal was faculty pursuing Ph.D. from IIT Kanpur in a HDB project and was selected as teaching faculty in a University near Gurugram.

O.P. Lamba is a research worker in USA.

J S Goela was Assistant Professor in IIT- Kanpur.

All scholars were engaged with the research lab "Central Optical Spectroscopy and Modern Laser Raman Spectroscopy Lab" of HDB, IIT- Kanpur.

4. Indian Association of Physics Teachers (IAPT)

DPK established IAPT in 1984 with the sole objective of upgrading the quality of physics education and physics teachers.

A steering committee of some eminent Physics teachers of IIT, HBTI and some colleges of Kanpur, prepared the statutes etc. The committee also decided for publication of a monthly Bulletin of IAPT.

IAPT was inaugurated by DDP at Kanpur who delivered a talk under the spell of Capra and Talbot – mixture of physics with mysticism.

First bulletin of IAPT came out on March 19, 1984. It was partly written in hand and partly typed. 1400 cyclostyled copies were posted to Physics teachers across the country. In its first convention held in October 1984 at Kanpur, an executive - committee was formed. Prof. B.L. Saraf was chosen as the first President of IAPT and DPK took up the responsibility of General Secretary continuing till Dec 1990.

From Jan 1991 onwards DPK was elected as President of IAPT for three successive terms and continued in this role till his last in Feb 1996. Under the platform of IAPT two major national level examinations were and are being organized throughout the country, viz., National Standard Examination in Physics (NSEP) and National Graduate Physics Examination (NGPE).

For looking at the growth trajectory of IAPT, we quote year-wise addition to the number of life members and present a plot of the net number of Life Members versus the years.

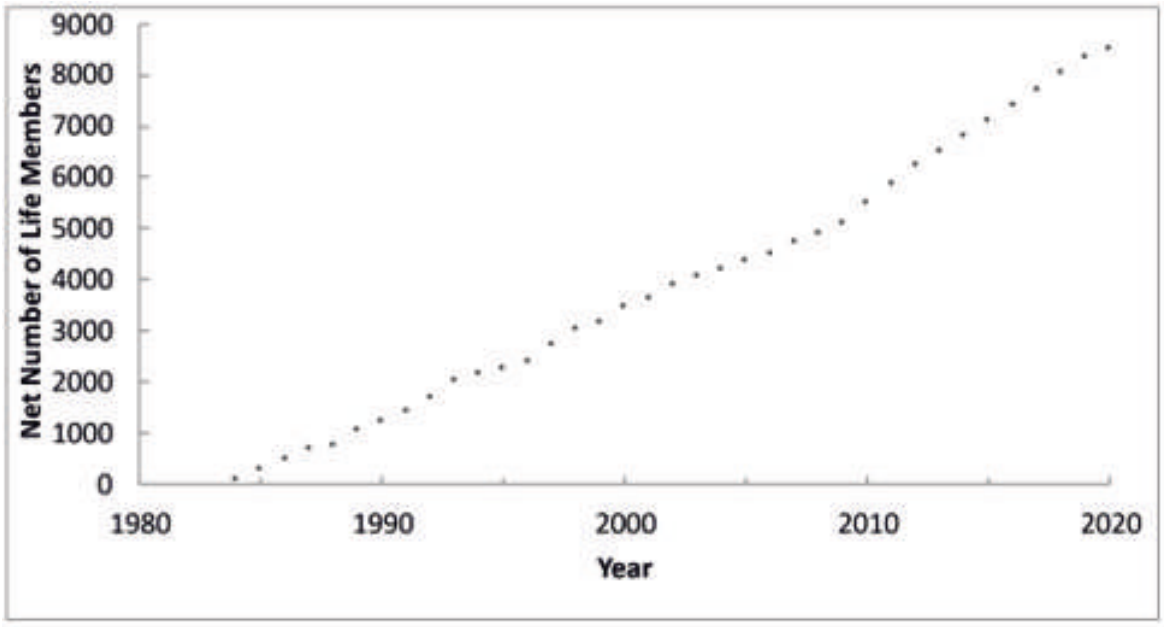
These depict an impressive growth of strength of IAPT founded by Prof. DPK. Starting from April 1984, the number of life members in Dec. 2020 stands at 8499. This is heartening and satisfying.

One incident which is depictive of special bond between DPK and DDP, also in the context of IAPT, is worth narrating. One of the first functions that DPK organized under the auspices of IAPT was felicitation of Prof. DDP. For collection of money for the purpose, DPK proceeded in his methodical way. He wrote to three groups of persons, viz., DDP's colleagues, students and some family members. He asked them if they would like to contribute for organising a felicitation function for DDP. Only when a substantial and favorable response was received, he asked them to forward their contributions. A befitting function was organized in Nainital. On behalf of his students/colleagues, a sum of Rs. 1.25 lakhs was offered to DDP as a token 'gurudakshina'. DDP did not accept the money for his person. He instead asked to distribute the same for three causes, viz., (i) growth of his village school, (ii) donation to Lasers and Spectroscopy Society in his alma mater BHU and (iii) for IAPT. It is genuinely hoped that IAPT, founded with such noble intentions, continues to play its avowed role towards physics education.

We thank Dr. B.K. Srivastava for reading the article and making suggestions. Thanks are also due to Dr Sanjay Kr Sharma, Secretary-IAPT, Kanpur, for providing year-wise life membership details.

Year; Number of Life Members*

1984;	66*	1985;	217*	1986;	200*	1987;	189*	1988;	65*	1989;	302*
1990;	180*	1991;	184*	1992;	275*	1993;	335*	1994;	126*	1995;	97*
1996;	143*	1997;	336*	1998;	300*	1999;	128*	2000;	291*	2001;	162*
2002;	293*	2003;	170*	2004;	124*	2005;	171*	2006;	125*	2007;	219*
2008;	185*	2009;	194*	2010;	416*	2011;	341*	2012;	376*	2013;	273*
2014;	292*	2015;	314*	2016;	296*	2017;	299*	2018;	323*	2019;	307*
2020;	185*										



Graphical representation of Net number of Life members versus years

ARTICLE

Spin network: Another important contribution of Roger Penrose and integral part of loop quantum gravity

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Spin network is another important discovery of Nobel laureate physicist Roger Penrose as well as integral part of loop quantum gravity. Loop quantum gravity (LQG) is one of the promising theory of quantum gravity which originates from general relativity and uses techniques of quantum field theory to get canonical quantum general relativity. Using the combinatorial principle of angular momentum, the spin network is formed; which is proved to be useful in LQG. The spin network represents quantized structure of the gravitational field, i.e., a quantum state of space; a granular space in which area and volume are discrete and hence, space is granular. By combining general relativity with quantum mechanics and using Penrose's spin network; a loop quantum gravity generates an atom of space with quantized area and volume. The spin network, which describes the quantized state of the gravitational field, are not located in space; rather they are themselves form space. The evolution of spin networks, i.e., the changing connections between one geometry and the next, then, gives rise to a spin foam. Adding spin foams in something called a superposition describes an emergent space-time, a fabric co- generated by the quantum physics.

I. INTRODUCTION

In year 2020, Nobel prize in physics was awarded to Roger Penrose with one half of prize for the prediction of formation of black hole in general relativity [1, 3] and the other half of Nobel prize was awarded to Reinhard Genzel and Andrea Ghez for the discovery of a supermassive black hole at the centre of Milky way galaxy [2, 4-7]. Apart from black hole formation theory, there is also one other discovery, i.e., spin network, which is the integral part of loop quantum gravity was discovered by Roger Penrose [8-11].

Here, a brief overview of spin network and its application with necessary introduction of loop quantum gravity is given. To understand why and how spin network is used in loop quantum gravity; firstly, loop quantum gravity is introduced.

II. INTRODUCTION TO LOOP QUANTUM GRAVITY

Loop quantum gravity (LQG) is one of the promising candidate of theory of quantum gravity in which spin network is the integral part. Loop quantum gravity begins from general relativity, then takes ideas from quantum chromo dynamics, and involves finding a method to convert the result into a quantum field theory (QFT – combination of classical field theory, special relativity and quantum mechanics) of gravity. As a result, one finds a fabric in which space is not continuous, but quantized. It comes in 'chunks' just like matter and radiation[24].

The key traits of loop quantum gravity are non-perturbative approach (an approach that cannot be described in terms of perturbation), background independence (equations that defines theory are independent of shape of the space-time and the value of field within space-time or in other way, The absence of space-time =Background independence), and diffeomorphism invariance (Laws of physics are invariant under differentiable coordinate transformation or it means that the action is invariant under changing of coordinate [23]

Background independence is manifested as system and therefore background is dynamical). It does not need extra dimensions, super symmetry, or complex traits to quantize gravity. Why one must need a theory of quantum gravity? In Quantum mechanics, space and time dimensions are not on an equal footing; therefore, quantum mechanics has variable of time, *t* in the Schrodinger equation and this time is absolute. Quantum field theory is a background dependent theory and non-dynamical; on the other hand, general relativity is background independent and dynamical and time is relative concept [23].

In quantum mechanics, electromagnetic, strong nuclear and weak nuclear interactions are quantized; hence, the gravitational interaction should also be quantized. Theory of general relativity has two main traits: diffeomorphism invariance and background independence. From Einstein-Hilbert action, one can say that, General theory of relativity is field theory. The important work is to find a background independent theory which can reconcile between quantum field theory and general theory of relativity [23].

Loop quantum gravity does not attempt to unify four fundamental interactions of physics, but rather only finds a background independent quantum field theory. LQG is free of Ultraviolet (UV) divergence; the UV divergences (if considered an integral diverges due to contribution of the object with unbounded energy; then, it is said to be UV divergences) are the result of basic assumption of Quantum field theory i.e., the considered background geometry is non-dynamical and smooth [23].

In LQG, space-time is assumed to be four-dimensional as it is originated from general relativity. One should not contemplate the universe in which space evolves in time; rather, space and time are indivisible part and can be iterated as space-time. Space-time is dynamical and created from the quantum of the gravitational interaction.

Background independence is manifested as diffeomorphism invariance of the action. However, LQG is looking for a quantum general relativity; it does not use established quantum field theory concepts because quantum field theory is background dependent theory. Instead of this, LQG takes help from states of Hilbert space, amplitudes of transition and operators from conventional quantum mechanics and modify it in certain way [17].

There are many books which describe loop quantum gravity in popular way with slightly technical background [24-29]. There are many classic textbooks which elaborate loop quantum gravity technically [18-22]. There are many standard and classic research papers which explain loop quantum gravity [12-17].

III. WHAT IS SPIN NETWORK?

In 1971, Penrose [8-10] built a discrete model of space depends on the concept of quantum mechanical angular momentum with the goal to build a consistent model from which classical, continuous geometry emerged in a limit. It was shown that spin networks could reproduce a 3 dimensional Euclidean space, this result is known as the spin-geometry theorem. The basic idea was to build up space-time and quantum mechanics simultaneously from combinatorial principles by using as primary concepts of the rules for combining angular momenta together. As result, continuous concepts, such as directions in space, should then emerge in a limit where the systems of angular momenta get more complicated [30].

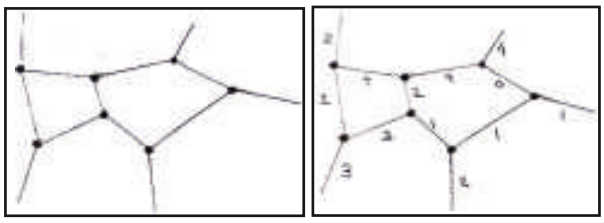
Penrose wanted to make theory discrete and without continuum. Therefore, to make theory discrete with relational nature; Penrose started from space-time continuum. One of the important concepts of Quantum theory is the superposition law. According to superposition law, one can create any linear combination out of *n* states if one has n states [8].

These are complex linear combinations;

therefore, again one has a continuum coming in the two-dimensional complex continuum fundamentally. Therefore, the idea of Penrose is to attempt and build up both space-time and quantum mechanics simultaneously from combinatorial principles, but not to attempt and modify physical theory. In the beginning, it is a reformulation, although, there will be some changes. Different things will suggest themselves in a reformulated theory, then in the original formulation [8].

In Quantum mechanics, angular momentum is discrete in nature; therefore, it may be connected with the structure of space-time deeply. The basic concept is to use discrete nature of angular momentum with the laws of combination of angular momenta and see one or other way one may create space from it or not [8].

Consider, one has an electron or some other spin ½$\hbar$ particle. Then one asks about its spin: is it spinning up or down? But how does electron know which direction is `up' and which direction is `down'? Alternatively, one can also ask the question whether it spins right or left. One can also ask the question whether it spins forward or backward. But the electron has only just two directions to choose from. Whether the alternatives are up and down, or right and left or forward and backward, rely on how things are connected with the macroscopic world[8].



Altogether, one can also consider a particle which has zero angular momentum. Quantum mechanics says that such a particle must be spherically symmetrical .So, among all these possibilities of direction there is only one direction that the particle can choose by considering its own rest frame of reference. Therefore, an object with zero angular momentum has only *one direction* to choose from and with spin one-half there will be *two directions* to choose from. In case of spin one, there will be *three directions* to choose from. Normally, there will be $2s + 1$ directions available to a spin s object. These are the choices available to the object regarding its state of spin. Though, one may choose to interpret the different possibilities when viewed on a macroscopic scale, the object knows about how many possibilities it can have from total available possibilities [8].

Thus, if the object, i.e., particle is resided in an *s*-state, there is only one possibility open to it. If it is resided in a *p*-state there are three possibilities, etc. It does not mean that all possibilities are things that, from a macroscopic point of view, one can necessarily think of as directions in all cases. The *s*- state is an example of a case where one cannot! Therefore, at the beginning, one cannot have the concept of macroscopic space direction built into the theory. Instead of this, one can only work with just these discrete alternatives open to consider objects or systems. Therefore, due to this indeterminacy, one cannot refer these alternatives as pre-existing directions of a background space. To get rid of this one should focus on only total angular momentum. Therefore, the basic concept here is the concept of total angular momentum not the concept of angular momentum; say for example, the *z*-direction, because, how one can define which is the *z*-direction[8]?

Consider that a universe is created from objects like that shown in fig.1. These lines are analogous to world-lines. One may consider time as going in one direction, say for example, from the bottom of the diagram to the top. In fact, it is not relevant which way time is going [8].

Fig.1: diagram of spin network (left side) with labeling to each line (right side)

Assign a number to each line which is said to be spin number. An integer number is assigned each

line. In general, angular momentum is taken twice of its actual value, in units of $\hbar$ [8]

$$\{2 \times (n\hbar/2),\ n = 0,1,2,3\ \ldots.\} \qquad (1)$$

Each line can depict some compound system which differentiates itself from other systems. It can be considered as isolated and stationary, with a well-defined total angular momentum. Consider that the particles or systems are not moving relative to one another. They only transfer angular momentum around, regrouping themselves into different subsystems, they may be annihilating one another or producing new units. In fig. 1 right hand side, the *2*-unit at the top on the left splits into a *4*-unit and another *2*-unit. This is merely the topological relationship between the different segments, with the spin-number values, which has significance. Here, no role will be played by the time-ordering of events (if excludes it conceptually). One can see fig. as time increased from the left to the right, instead from the bottom to the top [8].

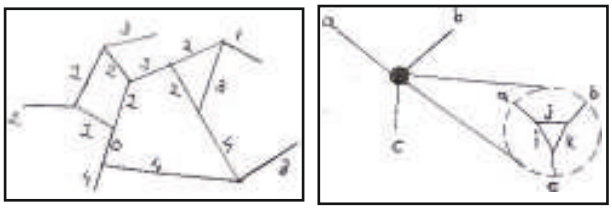


Fig. 2: pictorial representation of spin network (left side) with the vertex (right side)

In fig. 2 of left hand side, the number next to each line represents twice the angular momentum of an isolated and stationary subsystem, which is represented by the line and called an *n*-unit or *n*-edge (Eq. 1). Fig.2 left hand side represents rather abstract concept of spin network; thus, it has no spatial meaning, only a relational one, i.e. its defining properties are the relations between the edges. A crucial element of this fig. 2 is the trivalent vertex. In fig. 2 of right hand side the dashed circle indicates spin network structure at the vertex with internal labels *i, j, k* being positive integers determined by the external labels *a, b, c* [30].

$$i = \frac{a+c-b}{2}; j = \frac{b+c-a}{2}; k = \frac{a+b-c}{2} \ldots (2)$$

The triangle inequalities must be satisfied by the external labels and add up to an even integer, these conditions are needed as an expression of conservation of angular momenta [30].
By combining combinatorial rules and applying to real system it gets more complicated. The detailed mathematical structure of Penrose's spin network is given in many papers [8-12, 30].

IV. HOW AND WHY SPIN NETOWRK IS THE INTEGRAL PART OF LOOP QUANTUMGRAVITY?

The spin network was proved to be useful in the field of quantum gravity; when, Indian-American theoretical physicist Abhay Ashtekar [13] rewritten Wheeler-Dewitt equation ($H\psi = 0$), i.e., it is time-dependent Schrödinger's equation ($H\psi = E\psi$) without time variable in simpler form and then Lee Smolin with Ted Jacobson [31-33] found some strange solution of this equation [26].

These solutions relied on *closed lines* in space. A closed line is seen as 'loop'. Thereafter, Smolin and Jacobson could write a solution to the Wheeler–DeWitt equation for every loop. Loop space representation of quantum general relativity was given by Carlo Rovelli and Lee Smolin [34]. Later on, this work was known as loop quantum gravity. From these solutions, slowly, a coherent theory begins to be emerged [26].

In the beginning, the research was concentrated on these lines and how they could 'weave' the

three-dimensional physical space. Thereafter, the key to understanding of the physics of these solutions relies at the points where these lines intersect was explained. These points, at which lines are intersected, are known as nodes, and the lines between nodes are known as links. A set of intersecting lines forms what is known as a graph, i.e., a combination of nodes connected by links, as in fig. 3 right hand side [26].

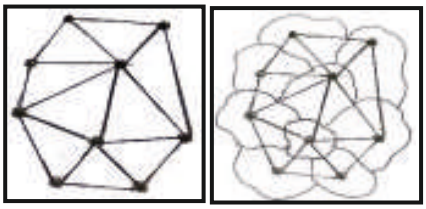


Fig.3: emergent picture of ring when weaves together and intersecting line in graph with nodes and link that forms atom of space.

A link is an individual quantum analogous to a Faraday line of electric field. No one can understand what it depicts: if one considers two nodes as two small 'regions of space', these two regions will be separated by a small surface. The size of this surface is its *area*. There are two quantum mechanical quantities associated with each line, i.e., area and volume [26].

The area, is a physical variable, and has a spectrum which is calculated using Dirac's equation. Area is not continuous, it is granular. Space seems continuous only because one cannot perceive the extremely small scale of these individual quanta of space [26].

According general relativity, gravity is deformation of space-time and space is dynamic; while according to quantum mechanics, every field should be made of quanta. So, gravity must be quantized; if, loop quantum gravity come into picture [26].

In LQG, the fabric is a system of interlinking 'loops' of gravitational force which form a 'spin network'. Loops of LQG which defines area and volume quantum of space has minimum value in terms of Planck length which is about 1.6×10^{-35}m. Different spin networks— different ways of interlinking the loops—define different quantum states of the geometry of space. The evolution of spin networks i.e., the changing connections between one geometry and the next then gives rise to spin foam. Adding spin foams in something called a superposition describes an emergent space-time, a fabric co-generated by the quantum physics [24]. Fig. 4 shows dynamic Evolution of quantum geometry in canonical quantum gravity approach of Loop quantum gravity [18].

Fig. 4: Dynamic Evolution of quantum geometry in canonical quantum gravity approach of Loop quantum gravity (courtesy: [18]).

Space is the gravitational field, and the quanta of the gravitational field are quanta of space: the granular constituents of space. The central prediction of loop quantum gravity is: space is quantized, and it is made of 'atoms of space' [26].

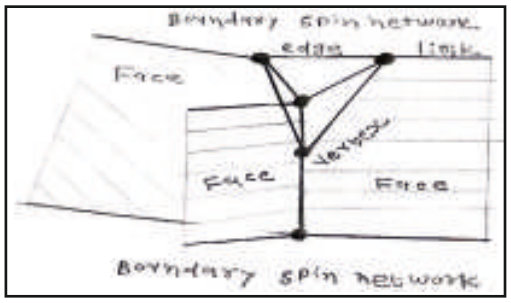


Fig. 5: atoms of space in LQG

Here spin network of Penrose comes into

picture. A spin network represents a quantum state of the gravitational field: a quantum state of space; a discrete granular space in which area and volume are also discrete.[26]

The important difference between photons i.e. which is quanta of electromagnetic field and the nodes of the graph is that photons exist in space; whereas, the quanta of gravity constitute space themselves. Photons are interpreted by 'where they are'. Quanta of space have no place to be in, because quanta of space are themselves that place. Quanta of space possess only one information which characterizes them spatially: the information about which other quanta of space they are adjacent to, which is next to which other. This information is depicted by the links in the graph. Two nodes connected by a link are two nodes in proximity. Two grains of space in contact with each other constructs the structure of space. [26]

The quanta of gravity are not *in* space; *they are themselves space or forming space*. The spin networks, which describe the quantum structure of the gravitational field, are not located in space. The location of single quanta of space cannot be defined with regard to something else but only by the links and the relation between them. In fig. 3 left hand side, if one goes from one grain to another grain along the links until one finishes route and return to the grain from which one started; one will have a loop. These are the origin of name 'loops' in loop quantum gravity [26].

V. CONCLUSION

Penrose's spin network is crucial to comprehend the theory of quantum gravity which originates from general relativity i.e., loop quantum gravity.

VI. ACKNOWLEDGEMENT

The authors are thankful to Physics Department, Saurashtra University, Rajkot, India.

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Three Days Electronics Workshop on Making of Projects

Venue: Department of Physics, DAV College, Bathinda (Punjab)

Date: February 22-24, 2021 **No. of Beneficiaries: 48**

Two Sessions Daily: 09:00AM-12:30PM (Morning) & 1:30PM-4:30PM (Evening)

Resource Person: Mr. Sukhvinder Singh, Coordinator, NIERT, Patiala

Sponsored: By DBT Star College Scheme **Incharge:** Dr. Gurpreet Singh

Coordinator: Dr. Kulwinder Singh Mann

In association with IAPT, Prof. Yashpal Association of Physics Students (YAPS), and sponsored by the DBT STAR College Scheme, the department of Physics, DAV College Bathinda organized the 3-day workshop from 22nd February to 24th February on "Electronics Projects". The workshop concluded with a lecture on career guidance and foreign Scholarships for science students.

The resource person for the workshop was Mr. Sukhvinder Singh, Coordinator, NIERT, Patiala. He gave hands on practical training to students for making electronics projects like rain dew detector, energy saver, Remote control tester, Circuit break-light sensor, Control of any electrical appliance by a remote, and Solar powered mobile charger. All the student actively participated and made projects themselves. Total cost of the equipments and components required for making of these projects was paid by the institution so that all the students completed this training without paying any fee. Mr. Singh also trained the participants in the basic skills for repair and maintenance of electronic gadgets.

On the concluding day of the workshop students were enlightened with various career prospects after BSc by Dr. Felix Bast, Associate Professor, Central University of Punjab. His talk was on the topic "What to do after B.Sc.? Opportunities in higher education and foreign scholarships." The lecture ended with an interactive session, where the students clarified their doubts on a range of topics like How to crack IELTS, alternative of IELTS, how to get placed in a reputed company, LinkedIn, YouTube, etc.

Both, these events were part of a weeklong celebration of the National Science Day 2021. It was attended by all the science students and faculty members of the college and also by faculty and students of other institutions via YouTube livestream. The function was graced by the presence of officiating Principal Shri Sandeep Bhatia, Registrar and IQAC coordinator of the college Dr. Kusum Gupta. The workshop concluded by a vote of thanks by Dr. Gurpreet Singh, Head department of Physics.

K S Mann

National Workshop on Science through Experiments

Venue: S S Jain Subodh PG (Auto.)
College Jaipur-302004
Dates: February 22-23, 2021
Co-ordinator: Dr. Balram Tripathi

A two days National workshop on Science through experiment was organized by S S Jain Subodh PG (Auto.) College Jaipur under DBT star scheme. In this workshop eight technical demonstrations were given by various experts and three hundred twenty two (322) UG students participated from various colleges of Jaipur.

On February 22, the first technical session, started by demonstration of Tornado effect, waves & vibrations by

Prof. M S Marwaha from Chandigarh. In his demonstration he talked about the tornado as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach up to 300

mph, by a simple model. The Second demonstration was by Prof. Y K Vijay from Jaipur on atomic forces & ordering. His demonstration was enjoyed by the students for various learnings in a very simple way.

The third demonstration was made by Prof. B N Das, from Kolkata. He focused on science puzzles by simple examples and students got mesmerized by his way of presentation.

On February 23 , the first demonstration was given by Mr. Luxmikant Sharma from Pilibhit, on Plasma ,

pressure & density. The next demonstration was made by Mr. A K Srivastava from Dholpur on surface tension and science puzzles. Mr. G S Menaria from Jaipur, demonstrated on electromagnetism & eddy currents while Dr. B N Das from Kolkata showed experiments on optics and its various phenomena's. The last demonstration was made by Prof. M.S. Marwah, on Bernauli's theorem and pressure effects…

Balram Tripathi

National Science Day Celebration, 2021

A popular talk on "The Golden Ratio- in Culture and Science" was delivered on 26th February, 2021 by Prof. Vijay A. Singh, President, IAPT, at Pragjyotish College, Guwahati, Assam. It was organized by Department of Physics, Pragjyotish College in collaboration with RC-17

The Principal of the college, Dr. Manoj Kumar Mahanta, welcomed Prof. Vijay A. Singh. Dr. Ranjita Deka, President of IAPT RC-17 gave a brief introduction of Prof. Singh. The Head of the Department of Physics Mr. Saumar Rajkhowa explained the significance of observing the National Science Day.

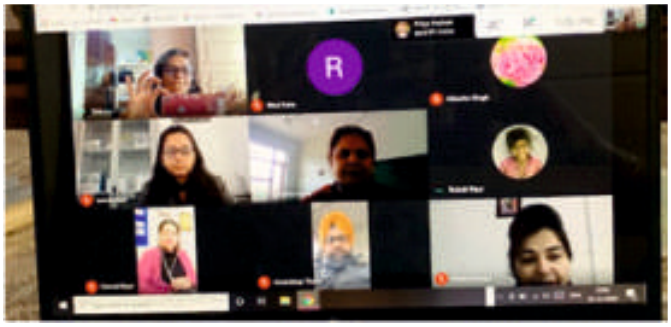
In his talk Prof Singh explained the significance of Golden Ratio. The Greek letter ϕ represents an irrational number, called the Golden ratio, a number close to 1.61 and a root of the quadratic equation x^2 -x-1=0. It is to aesthetics, what pi (=3.14) is to Maths and Physics.

Mr. Manab Deka, Secretary, IAPT RC-17, Dr. Jugal Lahkar and Mr. Dhanjit Talukdar of Department of Physics were the key persons in giving the technical support and making the event successful.

Ranjita Deka

Report (Ammani Anveshika)

Webinar



Organized: Dev Samaj College for Women, Firozepur City
Moderated by Ms Asma, Asst. Prof
Platform: Google Meets, Facebook and Youtube
Date: December 16, 2020 **Time:** 11am to 1pm
No. of teachers: 10 **No of Students**: 200 +
Class: Undergraduate **Topic:** Wonders of Physics
Resource Person: Sarmistha Sahu

The session on December 16 had 'Wonders of Physics' startled the onlookers. Only after the event of a monkey somersaulting and obeying the owner's command did the students wake up to have a hot discussion, to find out the cause of this miraculous feature! They are still communicating with us to arrive at the solution. The next event on the curious film on the wire-cube was still more fascinating. Smart children got the answer from an associated demo and spelt out very comfortably.

The rest of the time was fully engaged in fitting in the puzzle bits, one by one, to arrive at the formula for the planar as well as the solid angle by noticing the number of images formed in multiple plain mirrors. Students unravelled the mystery smartly and proved to be young scientists!

The interaction and discussion were in high tempo! A true scientific temper was aroused!

Dr Ramnita S Sharda, Principal's message to the students and the guests was thumping and bold. DSCW has risen to be the warrior of education for years.

Dr Asha gave a vote of thanks and wound up the program well.

Sarmistha Sahu
Coordinator

NOTIFICATION

National Competition For Innovative Experiment in Physics (NCIEP) 2020

As the participation at NCIEP 2020 was very poor (may be due to the pandemic COVID-19), it is decided to cancel the competition. This was discussed during EC meeting held online on Sunday, March 07, 2021, that the event NCIEP 2020 may be cancelled. However, those who have submitted their entries are allowed to defer their entries in the forthcoming competition, which will be held during 35th IAPT annual convention (Venue and Dates will be announced later).
The announcement of NCIEP-2021 is published in the current issue (April 2021) of IAPT bulletin.
I further request all the IAPT members to give wide publicity to this competition.

Rekha Ghorpade
Coordinator, NCIEP
Contact no. 9833569505
Email: ghorpaderekha081@gmail.com

National Competition for Innovative Experiments in Physics (NCIEP) 2021

This activity is being held since 2003, to encourage Physics Teachers to conceive and set up original innovative experiments in Physics. The Competition is held every year at the venue of the Annual Convention. Innovation rather than sophistication is the main theme and therefore the use of computers for data acquisition and display is not allowed.

Category	Age	I st prize	II nd prize	III rd prize
A	≤ 45 yrs	Rs 5000/-	Rs 3000 /-	Rs 2000/-
B	> 45 yrs	Rs 5000/-	Rs 3000/-	Rs 2000/-

Please read the following guidelines:

1. The participant can be a teacher at any level or M. Phil. / Ph. D. awarded / pursuing student or ascientists from national laboratories or ascience communicator working in Sciencecentres, etc.He/She need not be an IAPT member.
2. The experiment should be an original one, designed by the participanthimself/ herself. It can be even a demonstration type experiment.
3. There will be two categories of entries and prizes on the basis of age. Top 3 experiments from each category A and B may be awarded cash prizes.
4. Please submit the write-up of experiment as an email attachment (word &PDF file) to the coordinator at the email id:**ghorpaderekha081@gmail.com** in the following format: Times New Roman, font size 12, line spacing1.5, justified, sufficient margins on all sides. It should contain title of the experiment, abstract of the experiment (not exceeding 300 words), detailed theory with necessary diagrams, procedure, observations, calculations, graphs, results and references. There is no limit for the number of pages. The participant should not write his / her name, name of college / school, etc. anywhere. This may reveal his/her identity.
5. The covering letter in the form of an email must contain: Title of the experiment, name of the participant (s) with age, category A / B, institutional affiliation of each participant, address for correspondence, email address and mobile number along with the following declaration :

   The proposed experiment is original, designed and developed by the participant(s) and not published / submitted elsewhere
6. Selected entries from each category will be invited for demonstration at the 35thIAPT convention.The dates and venue will be notified later.The invited entries will be paid full railway farefrom work place to convention place plusexpenses on carrying the equipment if necessary as per IAPT rules. In case of joint authors only one of the participants is eligible to receive TA (as per IAPT rules). The selected participant has tocome with his own setup for final demonstration.
7. Please feel free for any query at Tele. No. 09833569505
8. Decision of the judges will be final.
9. The abstracts of all the selected experiments will be published in IAPT bulletin after the competition. IAPT bulletin has ISSN number 2277-8950.
10. **Closing date to receive the entries is July 31, 2021.**

NOTE: Since NCIEP 20 was cancelled, the participants who have sent entries are allowed to participate at NCIEP 21 with the same work. However, they need not send the fresh entries.

Rekha Ghorpade
Convener NCIEP

Minutes of the IAPT EC Meeting (online)
held on Sunday March 07, 2021

A meeting of the Executive Council (Central EC) of the IAPT was held online, on Sunday March 07, 2021. The meeting commenced at 10.00 am, and continued till about 1.30 pm.

The members including the invitees present in the meeting were as follows.

1. Prof. Vijay Singh, President
2. Prof. K. N. Joshipura, General Secretary
3. Prof. ManjitKaur, Vice President North Zone
4. Prof. J. D. Dubey, Vice President East Zone
5. Prof. A. K.Jain, Vice President Central Zone
6. Prof. P. Nagaraju, Vice President South Zone
7. Dr. Oum Prakash Sharma, Member RC-01
8. Dr. Jaswinder Singh, Member RC-02
9. Dr. Anil Kumar Singh, Member RC-04
   (Also, Coordinator NGPE)
10. Dr. Anand Singh Rana, Member RC-05
    (Also, Coordinator NSE)
11. Prof. R. K. Khanna, Member RC-06
12. Prof. Viresh H. Thakkar, Member RC-07
13. Dr. S. B. Mane, Member RC-08
14. Dr. P. K. Dubey, Member RC-09
15. Dr. S. K. Patel, Member RC-10
16. Dr. M. S. Jogad, Member RC-12
17. Prof. S. Sankararaman, Member RC-14
18. Dr. SaswatiDasgupta, Member RC-15
19. Dr. Kishore Chandra Dash, Member RC-16
20. Dr. SwapanMazumdar, Member RC-18
21. Dr. Himanshu K Pandey, Member RC-19

Ex-Officio members

22. Prof. H. C. Pradhan, Immediate-past President
23. Prof. Bhupati Chakrabarti, Immediate-past Secretary
24. Prof.B.P. Tyagi, Chief Coordinator of Exams
25. Dr. V. V. Soman, Coordinator, NSEJS
26. Dr. Sanjay Kr Sharma, Secretary
27. Dr. D. C. Gupta, Treasurer

Co-opted members

28. Dr. T. R. Ananthakrishnan
29. Dr. S. C. Samanta
30. Dr. Arundhati Mishra

Invited members

31. Dr. Ravi Bhattacharjee, Coordinator APhO
32. Prof. Rekha Ghorpade, Coordinator NCIEP
33. Prof. J. P. Gadre, *Special Invitee*

The meeting started with brief opening remarks from the President Prof. Vijay Singh. Welcoming the members, he thanked them for being here, along with Dr. Sanjay Kr Sharma and Dr. Oum Prakash Sharma for facilitating the online meeting. The President mentioned about the members we unfortunately lost in the last few months. Although the Annual Convention could not be organized in Oct-2020 due to the Covid crisis, we have bounced back, and academic webinars have been arranged at a large number of places. We have to reinvent ourselves in the upcoming situation. Possibly we can have another EC meeting again for presentations of the RC activities.

Prof. Vijay Singh also mentioned about the activities planned for Prof. D. P. Khandelwal Birth Centenary Celebrations, and the online NSD programme of Experiments & Demo presentations by experts on Feb 28, March 01 under the DPKBCC. The IAPT voluntary exams were held successfully this time with special arrangements with Homi Bhabha Centre of Science Education (TIFR) Mumbai, under an MoU. We are moving ahead for organizing the APhO-2022 in our country. There is a suggestion to organize the National Students' Symposium in Physics in South India. Now with the advent of the Covid vaccine mixed online/offline mode programmes can be organized. He said that he had recently attended in-person offline Conference partly supported by IAPT in Assam. Our

budget for the next year would be rather tight he mentioned in the end.

The GS started with Obituary to our departed members. In the period since the last meeting, our esteemed IAPT members, Prof. R. M. Dharkar, Prof. K. C. Thakur, Dr. Tushar C. Pandya and Smt. Nandini Raha (from Kolkata), unfortunately left us forever. The meeting paid homage to them and observed a 2-minute silence.

Item-wise Agenda proceedings

Item 1. To read and confirm the Minutes of the previous EC meeting held online on June 25, 2020, and to discuss matters that may arise from the same.

The Minutes were published in our Bulletin in the Aug-Sept 2020 issue, and no comments /suggestions were received. In reply to Prof. B. P. Tyagi, the GS said that discussion on IAPT Constitution Amendments initiated in the last meeting would be continued in this meeting too. The EC passed the Minutes.

2. To receive and approve a brief outline of the IAPT accounts for FY 2020-2021; also the IAPT budget proposal for FY 2021-2022.

These were presented in some details by Dr. Sanjay Kr. Sharma and Dr. D. C. Gupta along with Shri Vinodji of our Kanpur office. The statement of receipts and payments during the FY 2020-2021 was displayed and explained with the excel table. There was some discussion, as Prof. Bhupati Chakrabarti sought clarification about the EMRS Workshops for Eklavya teachers, which were planned to be organized also in WB (RC-15), and he himself had contacted many teachers, but of late nothing was heard about WB while the Workshops were held in MP and Gujarat. Replying to this, the GS Prof. Joshipura admitted that things were moving very slowly, in spite of the fact that in IAPT we were ready for this since Sept-Oct 2020, and reminders were sent to New Delhi. The Workshop activity is sponsored by the Ministry of Tribal Affairs MoTA New Delhi, and from their side the instructions percolated down to state-level authorities and eventually to the school teachers, and the New Delhi authorities were able to coordinate first with MP plus Chhattisgarh and Rajasthan. The GS said that he was pursuing the matter; some more details were (to be) given in the GS Report in this meeting. On a query from Prof. Vijay Singh about the NANI accounts, Dr. Sanjay Kr Sharma gave a brief explanation. Prof. S. B. Mane (RC-08) asked about the annual seed money amount not yet given to their RC. Treasurer Dr. Gupta said that in a special situation this year, the seed money could not be disbursed. Dr. Mane offered to hold an online IAPT Convention under RC-08. Regarding the budget for the next FY, Dr. Sanjay Kr Sharma said that no definite statement could be made, while Prof. Bhupati suggested having another EC meeting to discuss the budget provisions. The President suggested to have first the Finance Committee meeting to assess what is 'in' and what is 'out', and then to have the EC meeting to apprise them of the financial status. Dr. Sanjay Kr Sharma requested all the RCs to submit their audited accounts, if not yet, by mid-April, so that the Finance Committee could take stock of the situation. The financial Report presented was accepted by the EC. The GS requested all the RCs and other organs of IAPT to observe austerity.

3(i). To receive and consider the associated suggestions on the brief reports (circulated in advance) to be presented by (a) The General Secretary Prof. K. N. Joshipura, and (b) The Chief Coordinator of Exams, Prof. B. P. Tyagi.

(a) The General Secretary's report

The GS began by thanking President Prof. Vijay Singh for his constant guidance and help to him in various IAPT tasks. Our last meeting also online, was held on June 25 2020 and Finance Committee meeting was arranged online, on September 21, 2020. The GS thanked all for keeping the IAPT flag flying, in spite of the corona crisis, and requested all to send their reports if not yet. The role of the EC member-representative was very important, as a link between the RC and the central EC. He thanked the members from whom generous contributions were received for contribution to the PM Cares Fund in July 2020.

He said happily that even in the trying times during 2020-'21, the voluntary **IAPT exams of the NSEs** as well as the **Anveshika NAEST** were conducted successfully with a good response, and congratulated the Coordinators. The GS requested all to visit our main website *indapt.org* frequently. Various announcements and reporting are being done there promptly, e.g. information on APhO-

2021 and preparations for organizing the APhO-2022 in (Dehradun) India were uploaded there.

Two other annual activities carried out this year were the following. (i) The annual IAPT DSM 2020 UG Teacher Award, in which there were 16 entries, went to Dr. Suchetana Chatterjee of Kolkata. We are thankful to the expert judges Prof. P. K. Ahluwalia and Prof. Y. N. Mohapatra. Dr. Sarmistha Sahu – Member Secretary of the Award Committee - has sent a detailed report in this regard. (ii)Annual Essay competition NCEWP – 2020 was organized and results have been declared. We thank Prof. S. K. Joshi & team, but as usual the teachers' participation was poor here.

The 3rd Annual **PRL-IAPT Dr. Vikram Sarabhai lecture** was arranged (online) on Feb 11 and an interesting lecture on *'Neutrinos- the invisible messengers'* was delivered by Prof. Ms. S. Goswami. On this occasion, PRL Director Dr. Anil Bhardwaj released an ebook *'I..do ..and ..I.. understand..',* published by RC-7, in memory of Dr. Tushar C. Pandya.

In an important development, Ministry of Tribal Affairs New Delhi, motivated and sponsored the online Teacher Training Workshops for Eklavya-EMRS schools, at the level of physics topics in the NCERT books 9th-10th. It all started in August 2020, with a query about IAPT from MoTA, and in response an initial proposal for Teacher Training Workshops was prepared and submitted to MoTA by the GS. I contacted RC-07 (Guj), RC-09 (MP) and RC-15(WB) to explore the possibilities of arranging online TTW. Soon I got their positive responses along with a tentative schedule and list of resource persons. After discussions a Workshop proposal was finalized by New Delhi, for EMRS teachers of MP first. TTW EMRS-Physics was organized first by RC-09 in October '20, while a few secondary teachers from Chhattisgarh and Rajasthan were also joined. In this Workshop, the Inaugural Talk was given by Padmashri Prof. H. C. Vermaand there were 20 lecture-Demos given by experts on various relevant topics. After a lull period, the next TTW EMRS was approved by MoTA for Gujarat, and it was organized by RC-07 during Feb 15-19, '21. The 5-day TTW started with an Inaugural Talk by Padmashri Prof. Anil Gupta Ex-IIMA. Congrats to both the RCs! This kind of Workshop can also be organized in other RCs like RC-15 (WB) as per the initial proposal, but there are not enough EMRS schools in a state, and for a combined Workshop with enough number of participants, the problem is of language. Even if it is organized in English, the question remains; how many of them will understand? The viable number of teacher-participants is between 30 and 60.

The year 2020-'21 marks the birth centenary of IAPT founder Prof. D. P. Khandelwal, and we have already formed **DPK BCC Committee**, with Prof. S. C. Samanta as the Convener. Actually a curtain raiser programme was held on Oct 01 (DPK birth anniversary) 2020 by CSC Midnapore and RC-15. The Committee has chalked out various programmes. On the occasion of this year's National Science Day, a very nice online programme was organized by the Committee on Feb 28 and March 01, wherein our leading experts (along with an expert invitee from Singapore) presented eye-catching experiments & Demo in Physics. The programme was streamed live on the IAPT YouTube channel.

Among the regular publications, the *Students' Journal of Physics* is published quarterly, for which we thank Prof. L. Satpathyand the IOP Bhuvaneshwar team. The annual physics magazine *Pragaami Tarang* is a Gujarati/English publication by RC-7, supported largely from the interest earned in the Corpus Fund established at our Kanpur office, and a partial support being received from the state council on Science & Technology, on annual basis.

In February 2021, IAPT RC-17 joined in organizing an offline in-person International Conference by a private University in Assam. Congrats as we are happy to note a good activity in NE region. President IAPT attended this Conference in person.

Besides, the GS thanked**Prof. Kushwaha & team** for regularly publishing the Bulletin even in trying times. The August –September 2020 issue was printed. The April – May and June - July issues were online. It has now resumed as the hard-copy as a monthly as usual. Prof. Kushwaha laments, "There is no feedback from the readers – neither appreciation, nor any complaint or suggestion of any kind!"

I am happy to say that we have received detailed reports of the **Anveshika NANI** activities carried out during

June'20-Feb'21. There were totally 76 events online or offline from 12 Anveshikas, and the maximum 20 were by BVN-IAPT Anveshika Delhi. The **NAEST competition,** a challenge this time, was also organized successfully, starting in July-'20, culminating in Feb-'21. We congratulate and thank **Prof. H. C. Verma & team.** We acknowledge with thanks the continued support in this regard from *Vigyan Prasar* DST New Delhi. All the reports will be uploaded on our main website.

A very important task taken up by the EC since the last meeting – actually even before - is on the Amendments in our constitution. The Committee is already working on this. **Prof. J. P. Gadre** Member-Secretary of the Committee is invited here. Let us thank Prof. Gadre, Prof. Kushwaha, Prof. Bhupati Chakrabarti and the President Prof. Vijay Singhfor continuous discussions. Let us converge here to a final amended version to be put up before the AGM in our next Annual Convention, Oct 2021. Winding up his report the GS thanked all and said, *Errors and omissions exempted…*! Here, Prof. Bhupati added two points; (i) the annual Prof. C. K. Mazumdar Memorial Workshop in Physics was held successfully by RC-15 recently, and (ii) the programme in memory of Prof. Khandelwal held by RC-15 and CSC-Midnapore on Oct 01, 2020 took place before the DPKBCC was formed.

Next, the GS invitedthe CCE to present the Report on IAPT Exams.

Item no. 3(i) (b). Report fromProf. B. P. Tyagi Chief Coordinator of Exams

The CCE reported that both the NSE and NGPE have been completed, and the evaluation was in progress. He explained the step-by-step process carried out to conduct the IAPT exams in this year of the corona crisis. For NSE-2020, online meetings were held with the National Coordinator Prof AnweshMazumdar (HBCSE, Mumbai). The MoU was finalized and signed on a stamp-paper, for the online exams this year, and the same would be ratified by the IAPT EC (now in the present meeting). Prof. Tyagi also elaborated several other details including the enrolments and the dates of the exams, called International Olympiad Qualifier IOQs 2020-'21. The results of the IOQJS 2020-'21 (Part I) have been announced and are posted on the Website. A list of 310 shortlisted students has been forwarded to the NC-HBCSE.

An important privilege of an examinee in the IAPT examinations is that he/she can write his/her grievances and queries about the question papers and the answers on the portal provided for. The answers are posted on the website. As a routine this year too we received queries and grievances through the web page. The major complaints were specific to the chemistry part of IOQJS.The final answer keys were posted after getting all queries resolved.

Prof. Tyagi said that, in the EC meeting we were required to accept a guideline for the IAPT examination, in particular for the framing of question paper, which is as follows.

2.8 The Chief Coordinator (Examination) will constitute a Paper Setting Board (PSB), a Moderation Board (MB) and Paper Grading Board (PGB) for NSE in each of the subjects such as Physics, Astronomy and Junior Science based on inputs from IAPT members who have experience and established integrity and will provide necessary guidelines. There may be overlap of members between the three boards. The CCE shall also advise the Gen Secretary ACT and ATBS to set up similar boards in respective subjects and to apprise him of the same.

2.9 The Boards may induct additional members, subject to the approval by the Chief Coordinator (Examination) to widen their scope, standard and expertise in the subject.

2.10 The primary function of the PS Board in each subject is to design a test paper of high quality for NSE in that subject and provide solutions.

2.11 The primary function of the Moderation Board is to moderate the question paper and its solution within the limits of specified syllabus if at all needed and that of the PG Board is to set appropriate standard for evaluation of the Answer Scripts/marked OMR. The PG Board will look into the queries about the respective NSE and take suitable decision after resolving all queries of the students/examinees. The same will be communicated to CCE who will finally freeze the solution and this will be binding for all.

2.12 After NSE in different subjects has been conducted, the Examination office will put the question paper on the

IAPT website along with the tentative solutions. Comments in an established format will be invited from the examinees and will be put before the PG Board. All the queries and objections will be resolved and reviewed by the Paper Grading Board and a suitably revised solution will be provided to CCE. The frozen solution will be put up on the IAPT website and will be a binding to all. The Chief Coordinator will submit a copy of question paper and the frozen solutions to the National Coordinator (Science Olympiads) soon after the NSEs are held. Reciprocally the National Coordinator is expected to provide the question papers and solutions of the second stage examinations to the Chief Coordinator (Examination) who is looking after all the NSEs.

After brief comments by Prof. Bhupati and Prof. H. C. Pradhan, the EC accepted and passed these guidelines as a robust procedure.

Highlighting the MoU, Prof. Tyagi informed that IAPT, Mathematics Teachers' association and the HBCSE had entered in the MoU which has been executed, and the Exams have already been conducted accordingly. He also outlined the financial aspects involved in the exams conducted this year. He emphasized that this was only a one-time arrangement due to the pandemic situation. After some discussion and a suggestion from Prof. Mrs. ManjitKaur, it was decided to upload the MoU to our website, and the MOU signed for IOQ 2020-'21 has been put up on our website *indapt.org* now. The MoU was passed by the EC.

Prof. Tyagi added that he had received, from the President Indonesia Scientific Society, a request for the participation of India in the International Applied Physics Olympiad *IAPhO*to be organized online by them in April 2021. However, later during the discussion Prof. Ravi Bhattachrjee pointed out that we could not participate in this Olympiad unless the proposal was routed through our National Steering Committee.

Next, Dr. Anil Kumar Singh, Coordinator NGPE presented his report. After the initial exams wereconducted successfully the crucial task was NGPE Part C Experimental test. This was also conducted online in a very special way, an excellent testing procedure was planned and executed by a team of experts Dr. Subhash Chandra Samanta (and team), Prof. Yogesh K Vijay, Dr. AkhileshTiwari, (late) Dr. Tushar C. Pandya, Dr. Devesh Kumar Tyagi, Dr. Gyan Prakash, Dr. Pramod Kumar, Dr. Anand Singh Rana, Dr. Prem Prakash, Dr. Anil Kumar Singh, Dr. Arundhati Mishra and others. The experimental kit was sent to the students in time and they were asked to arrange the kits at their own desks. In a unique examination conducted on August 23, 2020, there were three examiners for every batch of four examinees, all online…! Based on the overall performance in Parts A, B and C, five students have been selected to receive the prestigious NGPE-2020 Gold medals plus cash prizes. Next the NGPE 2021 was also conducted successfully in January last with4100 enrolments and 170 centres of examination.

Prof. Tyagi informed about an experimental Workshop for the NGPE state and national level toppers. The President and the EC congratulated the CCE and his team for conducting the exams successfully. His report and Dr. Anil Kumar Singh's report will be placed on our Website.

Prof. Tyagi will finalize the preparations of gold medals to be awarded, with the help of Prof. Rekha Ghorpade.

Item no 4. To consider and approve the Amendments in the IAPT constitution

The GS began by recalling that the pdf *Constitution_Feb_2021* and other documents had already been circulated to the EC prior to the meeting.He requested President Prof. Vijay Singh to brief the EC on this important matter, and then to Prof. Gadre to deliberate further. The President said that the Constitution Amendments were already approved by the EC in the last meeting, but some queries/issues were raised by some of our respected members. So, for inclusivity we reopened the matter, and a smaller Committee consisting of Prof. Kushwaha, Prof Bhupati Chakrabarti, Prof. Gadre (all three from the previous Committee) plus the GS and the President. This Committee took some time to finalize the Amendments, and these were sent as mentioned above, to the EC before the present meeting. Taking over the discussion, Prof. Gadre mentioned positive responses on the circulated documents, from Prof. Ravi Bhattacharjee and Dr. Himanshu Pandey. Referring to Constitution item no. 9(c) (ii) on the Regional Council elections, Prof. Gadre explained the change made. After inputs from Prof.

Bhupati in this regard, the latest correction in 9(c) (ii) was accepted. At this stage Dr. Oum Prakash Sharma, followed by Dr. D. C. Gupta, expressed the view that since the Amended constitution would be going to the Registrar of Society Office, the number of changes should be at the minimum, and it should be accompanied by justification. The President reiterated that a fine tuned document of Amendments has been prepared after due discussions, and now it must go to the AGM of IAPT, and then only to the Registrar (as was also pointed out by Dr. Sanjay Kr Sharma). The EC accepted the presently amended Constitution as per the pdf document *Constitution_Feb_2021* along with the correction in 9(c) (ii) as discussed in this meeting. Prof. Gadre with help from Prof. Bhupati will now prepare the corrected document along with a table of changes made including the justifications. This will be uploaded on our website at least two months before the ensuing AGM. An alert to this effect will be published in the Bulletin. The President happily thanked Prof. Kushwaha, Prof. Bhupati, Prof. Gadre and others for working passionately towards an amended Constitution.

Item no 5. Prof. D. P. Khandelwal Birth centenary Celebration programmes

In a brief report the Committee Convener Prof. S. C. Samanta gave the highlights. Articles on Prof. Khandelwal written by his past students have appeared in the February and March issues of the Bulletin. As regards the biography of Prof. Khandelwal the details of his early life were not available, said Prof. Samanta. Prof. Y. K. Vijay has already prepared a short video on Prof. Khandelwal. One of the activities encouraged by Prof. DPK was a Stage Science Show. Therefore, the Committee decided to organize a novel programme called KSSS, and the coordinator Prof. T. Ananthakrishnan contacted experts requesting them for short Demo presentations. This was coupled with the National Science Day, and the NSD KSSS online programmes were organized on February 28 and March 01, with a good response. The online platform for this programme was provided by Shri Vaishnav Vidyapith Vishwavidyalaya Indore, and an excellent hosting cum Admin work was done by the team of Dr. Uttam Sharma (Indore) Dr. Oum Prakash Sharma (Delhi) and Dr. Sanjay Kr Sharma. We thank the VC SVVV Indore for the kind gesture. The SSS programmes, e.g. on demonstrating the Olympiad experiments etc are planned to be continued.

Lab education was at DPK's heart always, and a survey on this at the +2 and the UG levels will be carried out; Dr. K. S. Mann of Bhathinda is already working on it. Further, an online competition for physics practicals for +2 students was organized jointly (through *Socrative* app) by RC-15(WB) and CSC Midnapore. Through voluntary contribution from an admirer of Prof. Khandelwal, a Home Physics Lab kit was prepared and distributed. The details can be shared and all the RCs are requested to take up such activities under DPKBCC. Prof. Samanta also recalled the Laboratory Manual book of Prof. Khandelwal.

At this stage, Dr. Sanjay Kr Sharma requested all to subscribe to the IAPT YouTube channel. Dr. O. P. Sharma suggested for having an announcement on this in our Bulletin, along with an appropriate QR code. Prof. ManjitKaur supported this suggestion.

Item no. 6. About the next Annual Convention, etc

This was considered along with plans for the next EC meeting and the AGM, plus our future programmes. The GS informed that SVVV University Indore which had offered to hold the Convention 2020 had again come forward to host the Convention 2021, preferably beginning on Oct 01, jointly with RC-09, hopefully in-person or offline. Prof. P. K. Dubey said that RC-09 was eager to organize the Convention, and SVVV VC Prof. Upinder Dhar had again extended academic and other support. The RC-09 had already held offline programmes around Indore.

The (last) item no 7. To take up any other matterfrom the Chair and/ or with the permission from the Chair;

Members were requested earlier to mail their suggestions in this regard to the GS in advance. The GS with permission of the Chair, put up an important point viz., that the tenure of the current Office Bearers and the EC will end on December 31st, 2021. The required election procedure for this would be started in time. The President said that probably an EC meeting would be called specially for that purpose, and replying to Prof. J. D. Dubey (VP, E) he said that the procedure would start from

June-July next. Prof. J. D. Dubey asked about the release of the annual share for his RC, to which Dr. D. C. Gupta said that it would not be possible to disburse the share/seed money to the RCs this year, but actual proposals would be considered.

The GS mentioned that the activity reports were received from some of the RCs, but we could not arrange their presentations in the EC meeting. We can think of a separate EC

meeting for presentations from RC representative members and from other organs of IAPT. Prof. Samanta supported this, and Prof. Tyagi suggested of holding the EC meeting, also to discuss the budget, in April end. The President talked about 3 future events viz., the Finance Committee meeting, the EC meeting one after another for the RC–reports and for the next elections. Prof. Nagaraju (VP, S), called upon to speak, proposed for organizing a National Students' Symposium on Physics in the southern region. This was well supported, he said, by Prof. Rajeshwar Rao (RC-22) and others; it could be preferably offline and at Bengaluru in Aug/Sept. The President inquired about the budget estimates, to which Prof. Nagaraju gave highlights. Prof. O. P. Sharma suggested members' contributions to manage the expenses like travel. Prof. J. D. Dubey asked if the proposed NSSP was in addition to the one at Chandigarh. The President said that organizing two such events would be difficult in the present situation, and asked for views from Prof. ManjitKaur (VP, N) involved in the annual NSSP being held regularly in Chandigarh. She said she did not have any problem, it would be a good idea to have it in other parts of India, but it would be better to talk to the other members of the Chandigarh team. Prof. J. D. Dubey and the President suggested for holding the NSSP at Chandigarh every alternate year, and arranging it in the South or other regions in between, as a new initiative in the DPKBCC. After discussions regarding the most suitable time for the event it was decided that Prof. Nagaraju would take up the matter further with the Chandigarh team. At this point, Prof. Ravi Bhattacharjee wanted to talk about the APhO-2021 to be organized online at Taiwan. Clarifying his views further, Prof. Tyagi said that his proposal was to organize a preparatory competition for APhO-2021 at Dehradun, where further discussions on organizing the APhO-2022 there could also be done. Prof. Ravi would write briefly on this to the GS and the President.

At this stage, Prof. Mrs. Rekha Ghorpade Coordinator NCIEP reported that the teachers' participation in NCIEP was extremely poor – just about 5-6 entries. There is one entry in the senior category, with a partner in the juniors' category! She asked for the views whether to organize the competition as such or to allow the participants to continue for the next year 2021-'22. Prof. ManjitKaur suggested having a certain minimum number of participants for holding the competition, but that would have to be announced in advance. Dr. O. P. Sharma asked as to what, if the situation remains the same next year. Prof. Manjit Kaur observed that the write-up of the toppers of NCIEP submitted to the Bulletin, was poor and it involved plagiarism in some cases, and that was required to be checked. Prof. J. D. Dubey pleaded for a quality in the competition, to which Prof. Rekha Ghorpade said that keeping the same in view, the first prizes was not given in the last two years. Prof. R. K. Khanna (RC-06) pleaded for follow-up of the competition, to motivate others. Prof. Mrs. Rekha said that she had been propagating about this in her lectures and programmes in Mumbai sub-RC. Possibly the presented work could be placed on the website. Dr. O. P. Sharma suggested for an aggressive propaganda, actually a 2-tier model he called it later; first an RC level event and then the national competition, and he outlined his RC's efforts. The Coordinator said that pre-competitions are organized by RC-01 and RC-07, and shared her experience. The situation is similar in the other two national competitions. In the EC meeting for the presentations on the RC activities, the representatives will be requested to encourage 3-4 entries per RC in the NCIEP. The GS added that he had no update on NCICP, but added that in spite of the fact that we had so many stalwarts giving experiment-Demo programmes, the teachers' participation was poor in NCIEP.

Closing the meeting, the GS thanked one and all for participating in the meeting. The President thanked Dr. O. P. Sharma, Dr. Sanjay Kr Sharma and Prof. P. K. Dubey for technical expertise and help, and the meeting ended.

K. N. Joshipura
General Secretary

Nandini Raha - An Obituary

December 3, 1939 - December 29, 2020

With profound grief, we report the passing awayon December 29, 2020, of Ms Nandini Raha, a life member of the Indian Association of Physics Teachers (IAPT) and a teacher of unwavering dedication to the cause of physics teaching and learning. She was 82.

Ms Raha upheld a value-system in all aspects of her life, and her stark and striking austerity commanded awe and respect from students and teachers alike. A strong advocate of disseminating scientific knowledge through hands-on experiments and demonstrations, she would be found going from table to table in physics workshops, whether meant for students or for teachers. This was a common sight particularly in case of the C K Majumdar Memorial Summer Workshops in Physics (CKMMSWP) organised by IAPT RC 15 (West Bengal, Andaman and Nicobar, Sikkim) jointly with some other institutions year after year. Likewise, she visited the IAPT-Midnapore College Centre for Scientific Culture at Midnapore College several times during various workshops for teachers and students and encouraged them in going ahead with their projects. Interaction with participants, as well as with organisers of workshops and seminars, kept her in close contact with a wide community of past pupils, teachers, researchers and workers in the field of science popularisation. All this --- coupled with her dignified but down-to-earth manners --- endeared her to all as their Nandini*di*.

Only child of her parents, Nandini was born in Kolkata (then known as Calcutta)on December 03, 1939, in a Brahmo family. Her father, Shri Hemendranath Raha, worked as an instrument keeper in Presidency College, Kolkata, and later in Bose Institute, Jadavpur Universityand Indian Statistical Institute (ISI), Kolkata. Prof. P C Mahalanobis appointed him in the ISI, creating a post for him and bestowed teacher status on him. Her mother, Ms Nalini Raha, went across the high seas to train herself under the direct guidance of Madam Maria Montessori in Italy.She taught in the Montessori Section of pre-primary students of Brahmo Balika Sikshalaya, a school situated in North Kolkata. Nandini*di*'s childhood was nurtured in an environment created by the well-known educationists of Brahmo Samaj whose contribution to the Bengal Renaissance is now history.

Ms Nandini Raha studied I.Sc. in Bethune College, B.Sc. in Scottish Church College and M.Sc. in Presidency College (now University), all under the University of Calcutta. Thereafter, following a stint as lecturer in Physics at Sarojini Naidu College for Women, Kolkata, she joined Bethune College, Kolkata, in 1963. During her service there, she gradually brought everyone --- especially teachers and students of the Physics Department --- into the folds of one big family inspired to excel in the cause of better teaching and learning. She kept notes of the latest news of many of her students and others even after retirement and maintained close contact with the Physics Department Alumni Association, Bethune College. She retired after 37 years, but, after a short spell, joined the M.Sc. Physics laboratories (Baker Laboratories) of Presidency

College (later, Presidency University), Kolkata. There she continued for another 20 years without taking any remuneration. Heavy rain, flooded street, her weak health condition --- nothing could deter her from arriving at Baker Laboratories in a rickshaw till the lockdown began. In numerous conversations with many during this last phase of her life, she sounded somewhat melancholic, being totally confined at home, gripped with a feeling of isolation. She expressed repeatedly her yearning to go back to Baker Laboratories. But this last wish of hers remained unfulfilled and, following a short ailment, she breathed her last.

Teaching and Nandini*di* were inseparable. Right from her college teaching days, she taught to be disciplined in the laboratory, record data and analyse them systematically so that the track of fundamental principles of Physics were never lost sight of. Sometimes she gave the students some small projects by means of which basic principles of Physics became intelligible to them. During the IAPT RC 15 programmes for college students, she not only inspired them to go forward with innovative and open-ended experiments, but also took keen interest in evaluating them. During the CKMMSWP-events, thorough evaluation of data sheets relating to the experiments, undertaken by the students, inspection of feedback forms submitted by the students and discussions with the students after their short lectures in students' sessions remained in her priority list.She made it a point to be present in all the Valedictory Sessions in these workshops and was seen giving away Participation Certificates. To encourage the young participants, she stressed the need for becoming humans of great value, often quoting Tagore on such occasions.

Despite having a frail health, Ms Raha hardly paid attention to her own self and remained a spinster. For the last few years of her life, her neck, torso and waist were visibly supported by a system of frames and belts in order to keep her upright. Sheer mental strength kept her being present at many physics-events. And what is more, she would frequently be seen disembarking from public transport (buses) near such event-venues.

All along, the enthusiasm of the inquisitive student and avid learner within Ms Raha always remained kindled. During every pedagogic seminar she attended, she was seen taking notes. With notebook and pen, she would even attend sessions where teacher-participants of Refresher Courses delivered short talks. Concurrently, she penned a number of articles on varied topics in various magazines and also regularly went through the IAPT Bulletin.

One cannot help wondering how, on August 15, 1947, a child Nandini --- then not even eight ---could pledge:

(1) I shall steer clear of caste distinction, untouchability and communalism.

(2) I shall strive for eradicating illiteracy from my country in order to spread the light of learning.

(3) I shall propagate the message of equality, liberty and fraternity.

(Translated from Bengali)

The fond memory of the quintessential Nandini*di*, a perfect embodiment of plain living, love for the students and aspiration for a better society, will be permanently engraved in our hearts.

The author wishes to express his indebtedness to the writers of some articles / interview consulted for this write-up.

Suman Kumar Roy

Formerly of Physics Department

City College, Kolkata

D P Khandelwal Birth Centenary Celebration
National Science Day Programme

Khandelwal Science Stage Show

Having organized the curtain raising programme for celebrating the birth centenary of Dr D P Khandelwal, founder of IAPT. On National Science Day a two- day Khandelwal Science Stage Show was organized on February 28 and March 1, 2021.

On February 28 at 10am , anchor of the event, Dr U Sharma, Secretary, RC 09 and HOD, Physics, SVV Viswavidyalaya, Indore, played the video in which Prof Y K Vijay showed in brief the life and work of Dr D P Khandewal. After that Prof Vijay A. Singh, President , IAPT, welcomed the audience and talked about his association with Dr Khandelwal while he was in the preparatory mode for launching IAPT, from Kanpur. He also informed the audience of the fact that science stage show was very dear to him, so the first centenary celebration programme was on KSSS. Prof Singh, thankfully acknowledged the infrastructural facilities provided by the SVV Viswavidyalaya, Indore for conducting this event from an online platform.

The Chief Guest of the two- day event, Dr Upinder Dhar, Vice Chancellor, SVV Vishwavidyalaya welcomed the audience and assured that IAPT would get similar help in future also. He said that the postponed IAPT Convention -2020 would be held in the session 2021-22 in his university.

Professor Joshipura, General Secretary, IAPT said that the message of NSD was to imbibe scientific temper in our populace.

Dr S C Samanta, the Convener, DPKCC Committee, informed the audience of the activities, the IAPT desired to undertake in his birth centenary year.

He remarked that a freedom fighter like Dr Khandelwal believed the reconstruction of the newly independent country was important and this could be achieved only through imparting better science education in general and physics education in particular. For these reasons, leaving aside the lucrative jobs, he opted for physics teaching. With these things in mind, the IAPT proposed a set of activities, like - to write his biography, collect his scattered works and publish articles dedicated to his memory, to survey the status of lab based physics education, to popularize physics experiments using inexpensive materials , to organize lectures based on his ideas, to organize Science Stage Shows for arresting internal brain drain etc. Dr Samanta emphasized that the present KSSS programme was just a beginning, *many more such programmes, involving experts in IAPT family, would be organized in future. Moreover, all these shows would be recorded and uploaded in the IAPT website so that anybody could view them at leisure.*. Dr Samanta also requested everyone to suggest any activity commensurate with Dr Khandelwal's thought and action.

Day 1: Khandelwal Science Stage Shows

Dr TR Ananthakrishnan took the Chair at 10-15 A.M. to preside over this session of KSSS. Dr Ananthakrishnan himself is an excellent presenter of science stage shows. In fact he is the brain behind the assembly of the eminent experts on SSS on a single platform.

He explained the importance of SSS for science communication and attracting students to science.

Afterwards, he invited - Dr B N Das, Dr B Chakradeo, Dr P K Dubey and Dr R. Bhattacharjee to present their shows in turn.

Dr Sanjay Kr Sharma proposed the vote of thanks. With this, the first day of the event came to an end at 12.30 PM.

Day 2: Khandelwal Science Stage Shows (Contd.)

At 10 AM, 1st March, 2021, the anchor Dr U Sharma invited Prof S B Welankar to take the Chair. Prof Welankar was associated with Holkar Science College, Indore; and IPS Academy, Indore. He is one of the senior most active members in IAPT family. He is instrumental in organizing a Lab Programme with instruments designed and developed by one of the greatest experimental physicists, Prof Babulal Saraf.

He introduced all the five experts for the day. He invited Prof Sow Chong Haur of National University of Singapore, Padmashri H C Verma, Dr T R Ananthakrishnan, Prof Y K Vijay and Prof Sharmistha Sahu, one by one. Each of them presented his / her show very nicely within their allotted time. Event was over at 12-30 PM.

Dr O P Sharma thanked all including the technical staff Mr Shrikant and Mr Parvez, for successful conclusion of the entire two- day event.

About the experts and their Shows

1. Dr B N Das, a senior member of IAPT family, who had direct contact with the legendaries like DP Khandewal and B Saraf, has presented numerous shows in the different parts of the country and beyond. This time, in his 25 minute-presentation he explained how light is made visible using Rayleigh scattering by chalk dusts, having sizes of the order of 0.5 micron. He explained the lateral inversion of images formed due to reflection at plane mirror. He tried to erase a misconception that rainbow is formed due to total internal reflection in water drops. But he could not show the formation of rainbow in lab environment due to paucity of time.

2. Prof B Chakradeo is another senior IAPT family member who has travelled the length and breadth of the country to present his excellent physics shows.. He received *HARIBHAU MOTE AWARD* for the creation of the best Science Teaching Aid, from Prof Vasantrao Govarika in 2000. It is interesting to note that his entire residence in Ambarnath (Maharashtra) is a physics workshop! On NSD he showed the mercury spectrum formed by the diffraction grating, prepared in his workshop, eddy currents (using a magnetic pendulum, copper plate and a thick aluminium slab), Faraday's laws of electromagnetic induction (using few LEDs, a coil wound over a cylinder and three magnets), magic bulb,(using a Darlington pair of two npn silicon transistors for amplifying the signal) that glows by body touch. He used a hollow prism containing fluorescent liquid and a powerful green LASER beam for explanation of various phenomena like fluorescence, Rayleigh Scattering, Compton effect, Raman effect etc. He finally concluded his excellent show through demonstration of various optical phenomena like reflection, refraction, total internal reflection etc., using a wonderful teaching aid, he designed and developed in his own workshop, which he euphemistically calls "Tiroscope".

3. Dr P K Dubey, who retired from PMB Gujarati SC College, Indore is a very active member of the Executive Council of IAPT. In fact, it would be difficult to organiz this NSD programme as part of DPK BCC without his active support. He is a member of the 4-member team responsible for online management of this NSD programme. In this programme, he demonstrated simple but interesting experiments to explain the meaning and use of the concept of centre of mass.

4. Professor R S Bhattacharjee has been looking

after the Indian participation in Asian Physics Olympiad competition as well as the selection and training of the Indian team, on behalf of IAPT.

As an antithesis to stage shows, which have their importance in enhancing lectures and initiating students to Science, is the act of performing experiments to validate theoretical principles, an essential component of Science, since Scientific theories have to be validated by experiments.

He discussed one such experiment included in the experimental competition of Asian Physics Olympiad (APhO)-2016. This experiment is based on the reflected diffraction patterns from non-uniform grooves, uniform grooves, grooves at an angle to the central symmetry and a mixture of non-uniform grooves and uniform grooves at right angles to each other.

Like all APhO experiments, the exercise was to test for multiple skills necessary for experimentation, viz.

comprehension, to relate to the equipment and terminology used in the experiment, relevant data collection, appropriate presentation in tables, appropriate and necessary graphs, analysis of data including errors and efficient reporting of results. The talk also highlighted how such skills are quantified.

5. Prof Sow Chong Haur, Professor and Head, Department of Physics, National University of Singapore, is an International expert on Science Stage Show. Thanks to Prof Vijayan of IIT, Chennai who contacted Prof Sow for the present programme, on behalf of IAPT. His show consisted of two events - 1.balancing bird and 2.dynamics of a Cartesian diver. He used the first event to explain the concept of the centre of mass while through the second event he demonstrated how buoyancy could be controlled and related physics concepts explained.

But he sent a most useful message for everyone on the importance of doing experiments:"One forgets if he only reads. One remembers if he sees and one understands if he does it". We expect this wonderful message would motivate a student all the time involved and inspired to do experiment.

6. Prof H.C.Verma does not need any introduction. He had almost single handedly developed and spread the National Anveshika Network of India (NANI) with the objective of popularizing physics experiment all over the country.

To illustrate his association with Dr Khandelwal, Professor Verma narrated how the water heater, designed and constructed by him in his childhood, had impressed Dr Khandelwal, when he visited his house in Kanpur IIT campus. This proves: the morning shows the day!

He began his show with a remark that a demonstration should have an element of surprise to make students curious and attentive. With this dictum in mind, Prof Verma demonstrated two experiments. One involved two Polaroids separated by a polyethylene sheet, illuminated with white light. Rotating one Polaroid, keeping the other fixed, beautiful coloration is obtained and that exhibits the birefringence and rotatory dispersion. In the second demonstration, he used a black box to explain some facets of electromagnetic induction again in surprise mode.

7. Dr TR Ananthakrishanan is still associated with Cochin University after 20 years of retirement. He is one of the few IAPT members who have the experience of working with Dr Khandelwal, particularly in conducting a survey to quantify the status of UG physics laboratories in our country.

He has a different style of presentation – he is used to explain physics concepts in a playing mode, using experiments. His present show was based on a single theme- the conservation laws in physics that have pivotal role in mechanics.

He explained the law of conservation of linear momentum by asking a student to play with a basket ball and a tennis ball.

The law of conservation of angular momentum was explained using a bicycle rim. His simple idea of rotating the rim with one end suspended and other supported by the finger is really ingenious.

The law of conservation of energy is explained with simple pendulums and coupling them by attaching them to a common rope is innovative. Now one can explain how energy transfer takes place and how it is conserved.

8. Prof Y K Vijay, who retired from Rajasthan University and has long experience of working with Dr Khandelwal and Prof Saraf in its Centre for Development of Physics Experiments. Following these two great legendaries, he has taken to popularize physics experiments and has remained engaged in establishing Innovation labs in the country.

He demonstrated experiments for visualization of the concepts of quantum mechanics. The molecular interaction is basically a dipole - dipole interaction. He visualized this through floating plastic balls in water, attached with magnets.

In the second demonstration, he took large number of small steel balls and enclosed them in two glass plates and tried to explain different structures with gravitational force acting on them.

In the next three demonstrations, he used a simple pendulum attached with a small magnet; to introduce anharmonicity, magnets are placed beneath the bob in attractive as well as in repulsive modes for creating different potential configurations, with which we come across in atomic physics. If the magnets placed beneath are also free to oscillate the energy transfer takes place either way from oscillator to pendulum or vice versa and through this he tried to explain the Raman's Stoke's and anti- Stoke's lines.

Finally using an air track with a small magnet as an incident particle and a nearby placed magnet oscillator as nucleus he tried to explain the alpha decay.

9. Prof Sharmistha Sahu has retired few years back from Maharani Lakshmi Amma Women's College in Bangalore after very successful teaching career there. She loves doing physics experiments - she is used to get almost always the first prize in NCIEP! After retirement, she is also engaged in popularization of physics experiments throughout the country.

Her present activity has been entitled as "Visualizing the thermal expansion- A classroom demo." In 25 minute- talk, she dwelt on explaining how visualization of thermal expansion of solid, liquid and gas could be achieved and quantified.

It wouldn't be difficult to measure the variation of the coefficient of thermal expansion of solids with temperature, because she could magnify thermal expansion, using two levers in succession, by 400 times!

She used a capillary for visualization of thermal expansion of liquid. It is possible, using this simple arrangement, to distinguish and measure both the coefficients of real and apparent expansion of liquids. Visualization of transparent gas is difficult. But she utilized the fact that expansion causes some object to move for making expansion gas visible.

The report has been prepared with inputs from Prof S B Welankar, Dr B N Das, Dr B Chakradeo, Dr P K Dubey, Dr R Bhattacharjee, Dr T R Ananthakrishnan, Dr YK Vijay and Dr S Sahu.

Subhash Chandra Samanta

Convener, DPKBCCC

The Second Meeting of DPKBCCC

The second meeting of DPKBCC Committee was held on 16 th March at 7PM from online platform. Prof BP Tyagi joined the meeting as an invitee. The following were the agenda:

1. To ratify the decisions taken in the first meeting.
2. To approve the activities undertaken in the period between the first and the second meeting.
3. To discuss the feasibility of organizing an Online Workshop for State and National toppers of NGPE 2021, dedicated to the memory of Dr Khandelwal.
4. To discuss the revival of NSEP Part C, dedicated to the memory of Dr Khandelwal.
5. Any other item(s) with permission of the Chair.

Prof KN Joshipura, Dr T R Ananthakrishnan, Prof SB Welankar, Prof R Ghorpade, Prof YK Vijay, Prof R Bhattacharjee, Prof BP Tyagi, Dr Sanjay Kr Sharma and Dr S C Samanta attended the meeting.

In absence of the President Prof Singh, Prof Joshipura took the Chair, the convener after s permission from chair took up the agenda order.

1. As the minutes of the first meeting have been published, So the house confirms the report of the first meeting.

2. Dr Samanta reported:

   i. NSD programme was conducted smoothly.

   ii. For DPK Commemorative Volume, one article has already been published in the Bulletin and some more articles have been received. But it is being difficult to collect biographical materials for writing the biography of DPK as nothing is known to us for certain periods of his life. However, Prof Y K Vijay, Coordinator of the concerned implementation committee, told that he had got some information from Mr Anil Khandelwal and also taken initiatives to collect his scattered articles and books for publishing the Collected Volume of DPK. Very soon he would convene a meeting of the concerned implementation committee.

   iii. RC 15 had completed the online competition in physics practical for Plus2 and the report published in the February issue of the Bulletin.

   iv. Preparation of the draft questionnaire for the Survey is continuing. Dr KS Mann , among others, is doing the job. Very soon a meeting of the concerned implementation committee, with invitees, would be convened for its finalization.

3 Dr Samanta also informed the house that in presence of Prof Tyagi, RC 15 has take certain decisions for organizing an Online Workshop on Experimental Physics for NGPE 2021 toppers in memory of DPK. In confirmation, Prof Tyagi elaborated the proposal.

4. Prof Tyagi informed the house that NSEP Part C could be revived but not in the current year, due to some practical reasons.

a) Prof Welankar suggests that there should be a notification in the Bulletin as regards writing articles for DPK Commemorative Volume and uploading of videos of experiments of the competitions like NCIEP in IAPT- KSSS tube. After elaborate discussion it was decided in this tube there should be three files exclusively for the videos of KSSS, NCIEP and APhO Experiments (to be approved by Professor R Bhattacharjee). Dr Ananthakrishnan would take initiative for the notification in the Bulletin.

b) It is also decided that as there are 60 award winning experiments of NCIPE, the IAPT can publish an e- book considering these experiments.

c) Dr Ananthakrishnan, Dr R. Ghorpade, Professor R Bhattacharjee and DrV V Soman (to be invited) would take the initiative as regards IAPT-KSSS tube and publication of the above mentioned e-book.

d) Dr Ghorpade reported that participation in NCIEP for this year is very poor. Prof Joshipura assured intervention requesting the ECMs and RCs for taking initiatives for motivating more participation particularly for the birth centenary year of DPK.

e) Dr Ghorpade informed that her RC is going to organize Summer Workshop on Theoretical Physics to be dedicated to DPK.

f) Dr Samanta requested Prof Joshipura and Prof Tyagi to motivate the RCs to organize activities similar to "Online Competition in Physics Practical" published in the February issue of the Bulletin. He further suggested that in this regard each RC, like RC07, should form a group including senior IAPT members as well as those working at the ground level for different activities including NSE. Dr Samanta would share the modalities of organizing such events with each group.

It was also suggested that this group will not only organize experiment related activities at the RC level but also organize theoretical lectures, commensurate with the thought and action of DPK.

As there was no other business, meeting ended with thanks to the Chair.

Subhash Chandra Samanta
Convener, DPKBCC Committee

Instructions for authors

For publication in the Bulletin

- All documents should be submitted in .doc/.docx format
- Fonts: Times New Roman
- Title: 14-Bold for Title
- Size: 12-bold for sections/headings
  11 for the text
- Total writeup: Maximum number of pages = 8

Sample:

The Perseverance has landed on the Mars

Astronaut Wiley
Moon UniversitySteller Space, US
email: unkown@starwars.org

Abstract
This is a sample text to guide the authors……..

Introduction
Please follow this pattern for preparing the draft of your paper….
and the references should be written in [ ].
...

References

1. B. Andersson and G. Gustafson, Nuc. Phys. B281 (1987) 289.
2. D.H. Perkins, Book in Particle Physics, 4th Ed., Cambridge University Press, (2014) 201.

IAPT National Competition on Essay Writing in Physics (NCEWP - 2021)

Writing makes one perfect, essay writing more so……

NCEWP is one of the three national competitions being held by IAPT every year. The competition is open to participants in two categories viz., students and teachers (including Science Communicators).

Category A - *students* of Higher Secondary /Jr. College, UG and PG levels;

Category B-*teachers* of Higher Secondary/ Jr.College, UG and PG institutions,also Science Communicators working in recognized institutions.

Essay topic for both the categories is:

MODERN PHYSICS AND MEDICAL DIAGNOSTICS

The idea is to explore the Physics of various Medical Diagnostic tools. As a keen scientist you need to share your observations, exploration and investigation. Your essay may be written considering the following points:

(i) Brief introduction to the topic.

(ii) Different types ofMedical Diagnostic tools {you may choose any **one** from the following}

(a) X-rays & CT scan (b) Ultra Sound (c) MRI (d) Lasers in Medicine (e)Nuclear Medicine

You have to describe in details the principles of Physics and working of the Instruments involved in these tools.

(iii) A short description of the diseases in which these tools are utilised.

(iv) The basic safety measures recommended by various Governments Agencies to run Labs for these tests.

General Instructions:

The essay be limited to 08 pages including figures/tables etc. type-written in the Times New Roman 11-point fonts, with 1.15 spacing. A format is given below:

IAPT National Competition on Essay Writing in Physics: 2021 (NCEWP – 2021)

Topic: -"MODERN PHYSICS AND MEDICAL DIAGNOSTICS"

Tick Category: A B

Author's Details (with Affiliation & Signature):-
Total No. of Words:-
Key Words (Maximum Five)

All entries will be subjected to the online plagiarism test. Only two entries per institution may be submitted in a category.

Important Changes in the IAPT Essay Competition NCEWP-2021

Looking at the Covid-19 scenario, restrictions are expected to continue in the near future. It will be difficult to assemble students at one place and conduct the essay competition, following rules of social distancing and other potential protocols.

Now all the RC's will conduct the regional level essay competition digitally. Students at all the levels i.e. Higher Secondary/UG/PG can submit their essays through e-mails to President/Secretary/EC member of the respective regional council.

Students will send their entries duly forwarded through respective school/college/institute to the appropriate Regional Council(RC) with all contact details clearly. The RC's will have the initial scrutiny at their level. They will select 2 best essays from each level. Thus each RC will submit 6 best entries to the national competition.

Similarly, Teachers & Science Communicators will send their entries through e-mails duly forwarded directly to the Coordinator/Member.

Exception: Retired teachers can self-attest their entry. All entries (in English only) will be scrutinized in all respects, and will be assessed by three evaluators.

The last date for essay submission is 30th July, 2021.

Final entries for the national competition must be submitted in PDF format by e-mail to any one of the following:

1. Prof. S. K. Joshi, Coordinator, NCEWP, Mail id:- joshisantoshk@yahoo.com
2. Dr.Himanshu Pandey, Member, NCEWP, Mail id:- himanshukrpandey@gmail.com
3. Dr.ShivanandMasti, Member, NCEWP, Mail id:- shivanandmasti@yahoo.co.in

S K JOSHI
Coordinator

To our readers

For change of address and non-receipt of the Bulletin, please write (only) to:
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