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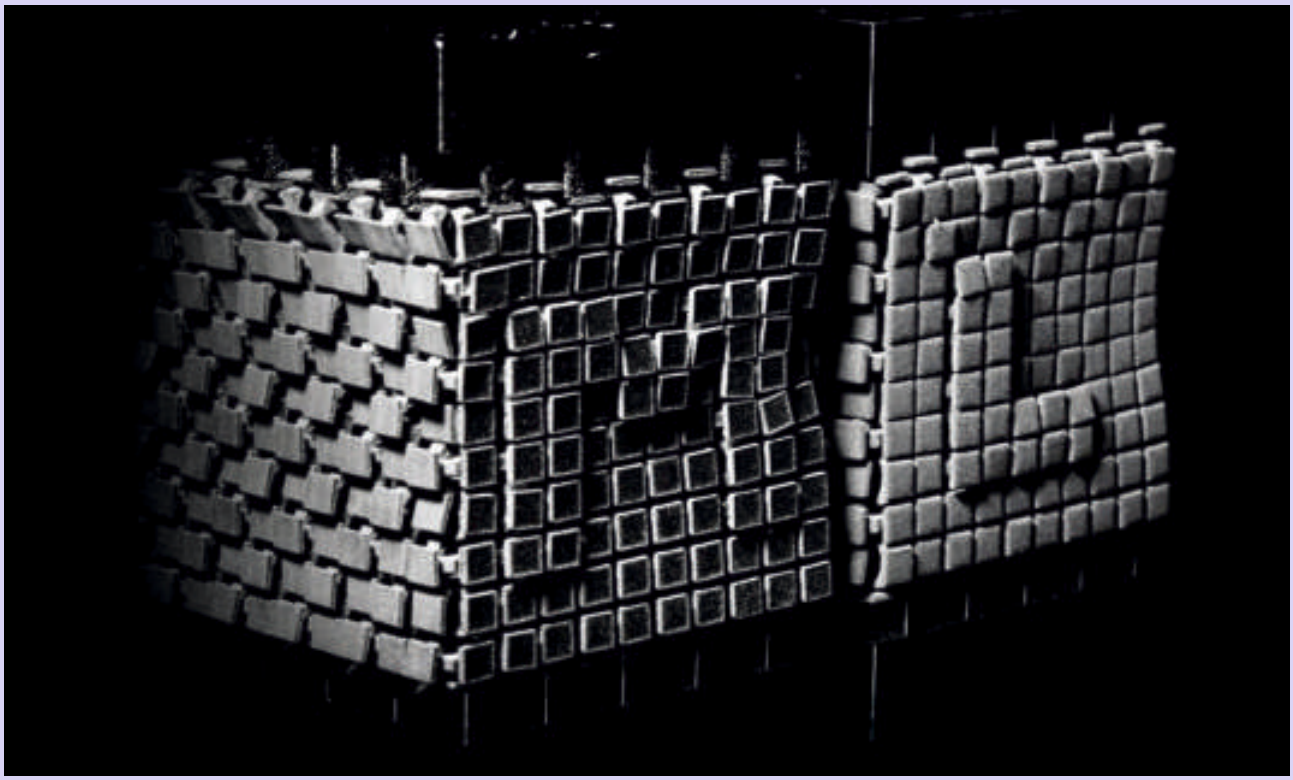


Figure 1 Two combinatorial mechanical metamaterials designed in such a way that the letters M and L bulge out in the front when being squeezed between two plates (top and bottom). Designing novel metamaterials such as this is made easy by AI. Credit: Daan Haver

Mechanical metamaterials are sophisticated artificial structures with mechanical properties that are driven by their structure, rather than their composition. While these structures have proved to be very promising for the development of new technologies designing them can be both challenging and time-consuming. Researchers at University of Amsterdam, AMOLF, and Utrecht University have recently demonstrated the potential of convolutional neural networks (CNNs), a class of machine learning algorithms, for designing complex mechanical metamaterials. Their paper, published in *Physical Review Letters*, specifically introduces two-different CNN-based methods that can derive and capture the subtle combinatorial rules underpinning the design of mechanical metamaterials. The researchers showed that even if machine learning is typically a "black box" approach (i.e., it does not always allow researchers to view the processes behind a given prediction or outcome), it can still be very valuable for exploring the design space for metamaterials, and potentially other materials, objects, or chemical substances. This could in turn potentially help to reason about and better understand the complex rules underlying effective designs.

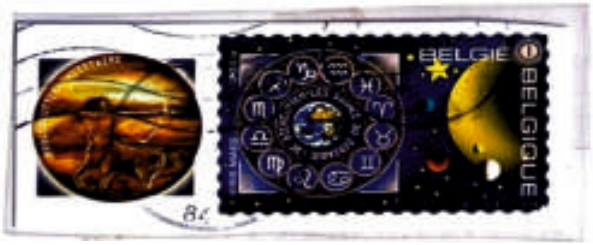
(https://phys.org/news/2022-11-machine-infer-complex-mechanical-metamaterials.html)

The Story Of Cosmology Through Post Stamps 30

HUMAN EXPERIENCE OF THE SKY ***ZODIAC CONSTELLATION***

Zodiac are the group of 12 ancient constellations which fall in the background of apparent path of the sun and moon across the celestial sphere (ecliptic). The passage of the sun through Zodiac is cyclic and determine time of year.

Odd Shape Souvenir Sheet **– depicting 12 zodiac constellations, each occupying 30^0 of celestial longitude. Stories associated with constellations and their pattern given on the outer margin of the disc, while the inner circle depict four main constellations which are visible during four main seasons**



Self-Adhesive Stamp **used on the piece of a cover-show A disc of 12 constellation symbolically represented in ancient Greek symbol. Image of Constellation Sagittarius is in embossed pre print**

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The Bulletin is the official organ of the IAPT. It is a monthly journal devoted to upgrading physics education at all levels through dissemination of didactical information on physics and related areas. Further, the Bulletin also highlights information about the activities of IAPT.

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Two Polestars on the Horizon of Indian Physics Education

Within a span of ten days, we celebrated birthdays of two doyens of IAPT Prof. Babulal Saraf (2nd December) and Prof. HS Hans (22nd November). Both were founder members of IAPT, and were given the responsibility of steering then nascent organisation of Physics Teachers as presidents of IAPT, Prof. Saraf being the founder President in 1984 and Prof. Hans succeeded him in 1987. Both had a mission to serve Indian physics by playing leading roles in university sector. Prof. Babulal carved a path for teaching and learning physics by doing and by developing a centre of Physics Education in Physics Department Rajasthan University with a made in India perspective about 50 years ago. Its spirit is today reflected in Innovation Hub programme of IAPT. He left most prestigious organisation of India BARC to carry forward his vision of innovation for Physics Education.

Prof. HS Hans left an American dream to come back to India, and brought an atom smashing machine (Rochester-Chandigarh Cyclotron) which paved the way for training and research in experimental Nuclear Physics. A work horse for Prof. Hans's students, machine is still working and is an early day example of science collaboration between India and USA. He created a team of dedicated students to carry forward the task and are today across the length and breadth of Indian accelerator facilities. Cyclotron in the Physics Department Panjab University Chandigarh is like a pilgrimage for young science students. It has always been in the bucket list of any educational tour of schools, undergraduate and post graduate colleges/universities who visit Chandigarh.

They both have left us an inspiring legacy which must be carried forward by IAPT with vigour and imagination. I am glad to share with you dear reader that IAPT has decided to celebrate year 2023 as birth centenary year dedicated to the memories and work of Prof. Saraf and Prof. Hans. We will bring out their memoirs through the eyes of their colleagues and students and organise a chain of programmes through our regional Councils across the length and breadth of India to inspire them that if you are determined you can do it. I would like each member of IAPT to celebrate this occasion by participating in activities being planned for the year 2023 befitting to their achievements.

For IAPT team, year 2022 has been a year to initiate many programs with a mission to Reaching out to Unreached. This can be the best tribute to these, not one but two Polestars in the field of Physics Education and Research in India.

In December 2023 IAPT and IIT Ropar will together organise International Conference of Physics Education (ICPE) granted by International Union of Pure and Applied Physics (IUPAP). We can have a perspective on these luminaries and their work in that conference as well.

IAPT is looking forward to step in the New Year 2023 with more spirited efforts for the cause of Physics Education in Particular and Science Education in general through our flagship programs.

With Seasons Greetings and a Very Happy New Year.

PK Ahluwalia

PHYSICS NEWS

World's first optical atomic clock with highly charged ions

Highly charged ions are a common form of matter in the cosmos. The outermost electrons are more strongly bound to the atomic nucleus than in neutral or weakly charged atoms. Therefore, highly charged ions react less strongly to interference from external electromagnetic fields, but become more sensitive probes of fundamental effects of special relativity, quantum electrodynamics and the atomic nucleus.

For atomic clocks, one has to cool the particles down extremely in order to stop them as much as possible and thus read out their frequency at rest. Highly charged ions, however, are produced by creating an extremely hot plasma. They cooled it by special technique to reach quantum ground state. They achieved a measurement uncertainty of 2 parts in 10^{17}- comparable to many currently operated optical atomic clocks. The methods used are universally applicable and allow many different highly charged ions to be studied. These include atomic systems that can be used to search for extensions of the Standard Model of particle physics.

Read more at: https://phys.org/news/2022-11-world-optical-atomic-clock-highly.html

Original paper: Physical Review X, Nature. DOI: 10.1038/s41586-022-05245-4

New quantum phase discovered for developing hybrid materials

Osaka Metropolitan University scientists have discovered an unprecedented phase transition during which crystals achieve amorphous characteristics while retaining their crystalline properties.

$Ba_{1-x}Sr_xAl_2O_4$ is a crystalline solid. However, the researchers found that at higher Sr concentrations than the structural quantum critical point, $Ba_{1-x}Sr_xAl_2O_4$ exhibits the thermal characteristic of amorphous materials. As a result, a combination of a glassy Al-O network and a periodic Ba arrangement is realized.

Applying this technique to various materials will possibly help us create hybrid materials that combine the physical properties of crystals, such as optical properties and electrical conductivity, with the low thermal conductivity of amorphous materials.

Read more at: https://phys.org/news/2022-11-quantum-phase-hybrid-materials.html

Original paper: Physical Review B. DOI: 10.1103/PhysRevB.106.134111

Electron pairing in quantum dots as a new approach to qubit research

A conventional computer performs operations using bits, which can be either zero or one. A quantum computer, on the other hand, uses “qubits". Qubits can be photons, electrons or any system that can exist in so-called quantum states. Because these states can exist simultaneously, it allows you to hold much more information and access immense computing power. One of the several promising candidates as the building block of a future quantum computer is a so-called topological qubit, based on pairs of equal-spin electrons. Although pairs of electrons with opposite spins (called Cooper pairs) can be found in most naturally occurring superconductors, materials hosting Cooper pairs made of equal-spin electrons have been much harder to engineer in a controlled way.

The researchers do demonstrate the existence of an equal-spin pairing by using quantum dots defined in a specially grown semiconductor nanowire. They demonstrate the pairing by showing that breaking a Cooper pair can result in two electrons with equal spin polarization.

Read more at: https://phys.org/news/2022-11-electron-pairing-quantum-dots-approach.html

Original paper: Nature DOI: 10.1038/s41586-022-05352-2

Soumya Sarkar
IISER Pune
India

Survey Report: Investigation of Lab Based Physics Education in India

Vivek Wagh[a], Subhash Chandra Samanta[b], Rekha Ghorpade[c], Kulwinder Singh Mann[d,*]

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ABSTRACT

A national survey has been undertaken by Indian Association of Physics Teachers (IAPT) dedicated to Dr D P Khandelwal (DPK), the founder member of the IAPT. Khandelwal Centenary Committee (KCC) constituted for the same investigated the current scenarios of lab-based physics education in India. The survey consisting of some tricky questions designed, each for students and teachers of Higher Secondary (HS) and Under Graduate (UG) classes. With the help of many active members of IAPT, the KCC designed four google forms (HST: Teachers for HS, HSS: Students of HS, UGT: Teachers for UG classes, UGS: Students of UG Classes) and circulated on the national level using IAPT network. Both teachers and students participated in this survey on the national level. The huge data of collected responses, its analysis, summary and conclusions have been presented in this work. IAPT's action plan has been mentioned for the betterment of physics education on the national level.

Keywords: *Physics; Teachers; Students; Science; Practical; Experiment*

1. INTRODUCTION

Dedicating to celebrations of the birth centenary of the Founder of IAPT and Great educationist Dr D P Khandelwal (DPK).

DPK's principal motive in all his activities was the betterment of lab based physics education leading to a better scientific society. He devoted his entire academic life for this purpose. Beside main stream physics research, he remained busy in physics education research also. The outcome of this endeavour was his book: A Laboratory Manual of Physics (For Undergraduate Classes). DPK believed that health of lab based education was not conducive for better science education. All of us also experience that a gap has been created due to an increasing trend of dummy admissions/classes for preparing the MCQ-based entrance exams of engineering courses and ignoring the prescribed hands-on training programs (Practicals) at higher secondary (HS) level. To fill the gap caused by the lack of practical training of higher secondary students (HSS), the Department of Science and Technology (DST) in the year 2008 has started the Star College Scheme. This scheme is under the banner of the department of biotechnology (DBT). It provides strengthening grant to UG-science colleges for procuring multiple copies of science laboratory equipment so that basic practical hands-on training can be provided to the UG science students. So that they can pursue life-sciences as their career.

Thus to check the current scenario of the affectivity of such schemes and efforts made by the IAPT to stop the worsening of the lab based education, the national level data was required for the same. For these reasons Khandelwal Centenary Committee (KCC) had been constituted to undertake a survey for a better understanding of the present scenarios in the domain of lab based physics education. The KCC consisting of the following members: Dr S C Samanta (Convener), Dr K S Mann (Editor), Prof. R Gorpade, (Co-editor), Dr V Wagh (Analyst) and other senior members of the IAPT such as: Dr P K Dubey, Dr U Sharma, Dr S K Sharma, Dr O P Sharma, Dr S Minhaz Hossain, Dr P Panchadhyayee, Dr M Sayal, and Dr P K Ahluwalia. Similar survey was initiated by Dr T Ananthakrishnan in 1994, when Dr Khandelwal was alive. Recently in 2021, the KCC completed the four-folded survey both at HS and UG levels.

2. OBJECTIVE

The primary aim and objective of this survey is to uplift the lab-based physics education in our country. The links of the survey have been posted at: https://bit.ly/SURVEY_IAPT

3. METHODOLOGY

The survey questions have been mentioned in Table 1.

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Majority of the questions were in the multiple choice type. The KCC has finalized the survey questions after many reviews. Thus, four separate sets of question-bank (QB) have been prepared, two QBs for students of HS + junior UG (Semester-I & II) classes and students of senior UG (semester: III-VI) + PG (Semester-I) classes, respectively. Similarly, two QBs for their respective teachers. The received responses as well as identity of the responders (participants) have been kept confidential. The data has been analysed to ascertain the ground reality in the realm of physics education, and not for any other purpose.

The Survey has been conducted at the IAPT's regional councils (RC) level in the online mode using the Google-forms.

4. RESULTS AND DISCUSSION:

Analysis of the huge data collected from the responses of questions of the survey (Table 1) has been performed by KCC under the stewardship of Dr Wagh. The summary of the analysis has been listed in the following sections:

4.1 Performance in lab sessions:

About half of the students admit that good lab work at lower level helps really to perform better at the higher level. The remaining halves do not think so because most of them do not perform the lab tasks or perform half-heartedly.

4.2 Handling of equipment:

Whatever may be the reason, a major part of the students don't get a chance to see and feel the working of the instruments they are using. This is not good for motivating students in innovative work. Some remedial measures have to be taken so that students are more innovative and creative during lab exercises.

4.3 Coherence between theory and experiment syllabus:

60% teachers (UG&HS) consider the practical syllabus is not in consonance with the theory. But majority of PGS take a contrary position.

On this issue there is a huge discrepancy in responses. Truth would come out through investigation.

4.4 Alternative method of doing experiments:

Most of the time the students are to perform routine experiments routinely. If they are asked to try alternative methods then they would be more innovative and creative; consequently, they would get the ideas for project work, exhibition models etc.

4.5 The lab orientation demonstration:

The lab orientation through demonstrations is the most important task of the teachers. But on this issue, there is wide discrepancy between the responses of the students' group and teachers' group. This reveals that students are interested to participate in the demonstration of experiments, but teachers are reluctant to conduct them. For resolving this issue, IAPT needs investigation.

4.6. Use of Significant digits and task of uncertainty analysis is seriously compromised:

So, we must take initiatives to motivate students to analyse errors and use proper significant digits while quoting their results. This should be included in practical QP.

[In this context considered opinion of DPK was that analysis of errors could be done as a group discussion first among teachers and subsequently with the students [2]]

4.7. Size of lab groups of students:

Groups with 2 students are ideal, but this happens only with less than 50% of the students; more than 50% of them are compelled to work in the groups of three or more.

4.8. Weightage to the project work:

It is interesting to note the responses to the Q: Do you give weightage to the project work in the final marks? 83% HST confirm they give weightage, while the corresponding response of UGT is 74%. This gives a clear message that project work is included in syllabus at all levels, which is not.

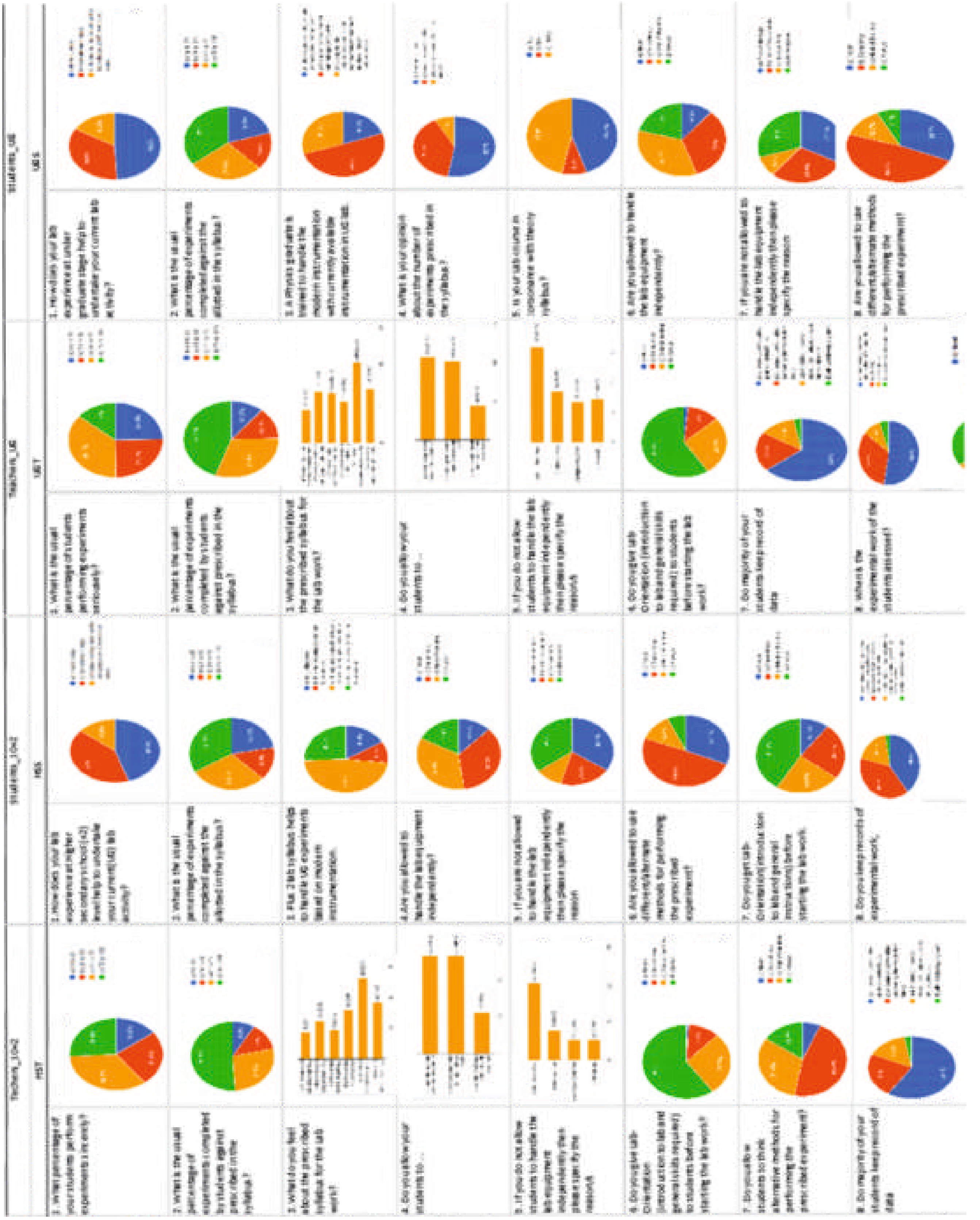
[As regard project work, DPK felt that this should 'evolve' while some others opined that project work should be a planned activity]*

4.9. Use of common instruments:

It is unfortunate that about 10% to 18% of HSS+UGS (both group of students) report they are not comfortable with common instruments like Vernier-callipers, screw gauge, stop watch, spherometer, travelling microscope, etc. Even the senior UGS are quite uncomfortable with instruments like spectrometer, digital-Multimeter, signal generator, CRO etc.

4.10. Reasons of doing or not doing experiments:

83% of the students participate in lab exercises for learning physics concept and 37% of them opine that they do it for better grades. On the other hand, 37% dislike the experiments because they are trivial and boring and 36%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HST
Students_10+2
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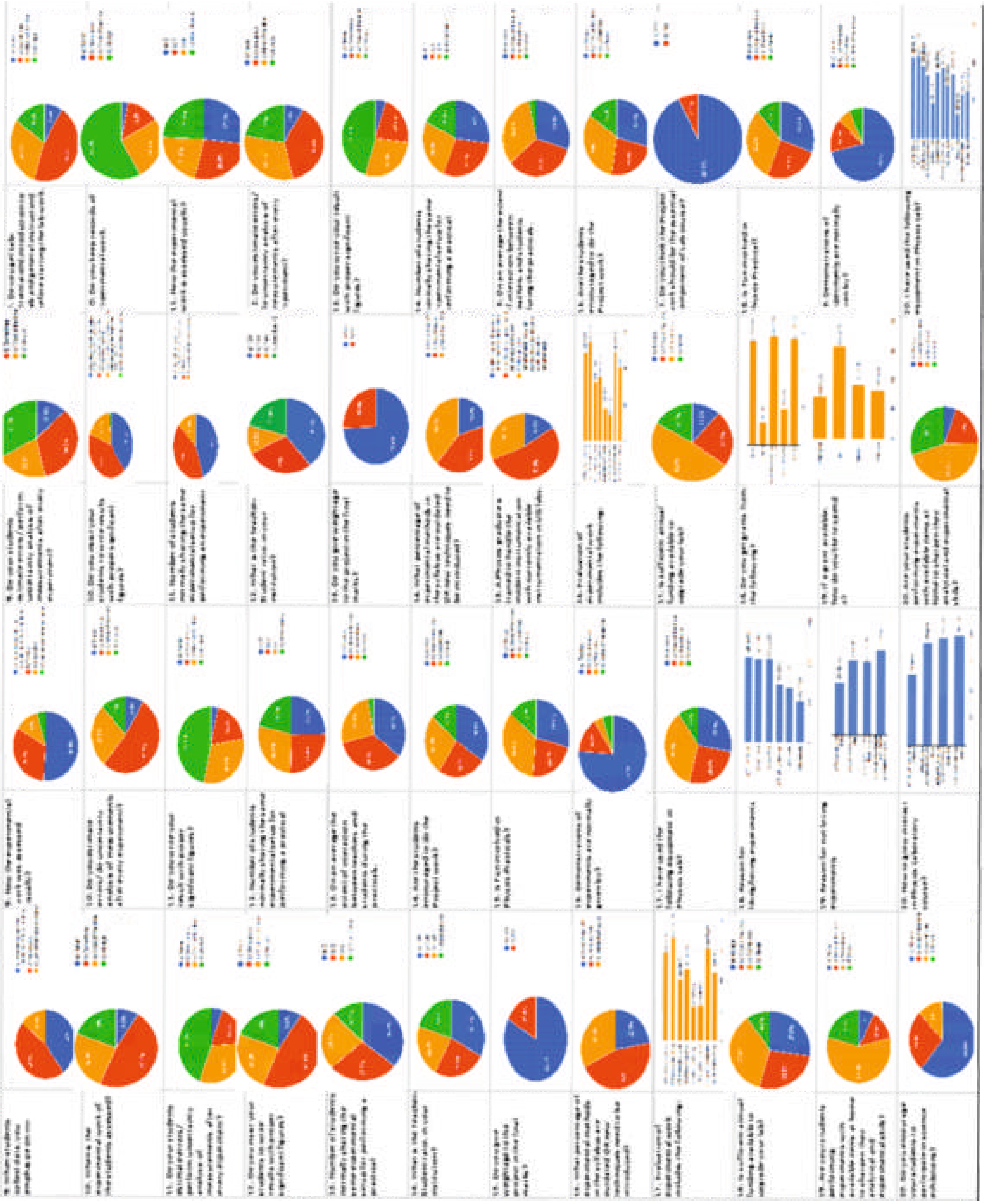
Teachers_UG
UGT
Students_UG
UGS



do not participate in lab exercise because this is not useful for admission into professional courses.

4.11. Emphasis to be given on different aspects of procedure in doing experiment:

It is expected that the responses of the teachers on the issues like error analysis, quotation of significant digits, continuous internal evaluation and Introduction of surprise elements in practical QP, which are not ordinarily part of normal evaluation process, would be relatively less. But it is hard to conceive why the other items (such as collection of data, graph plotting, viva, etc.) which are always part of evaluation procedure have not received 100% responses from the teachers? It is really surprising. We need investigation to find practical solution for physics practical.

1. RECOMMENDATIONS

Mandate of IAPT is the "Betterment of Physics Education". But what was the meaning of this objective to the founding fathers of IAPT? Let us hear from DPK who envisaged the idea of IAPT in 1984 and was instrumental in fixing its goal. IAPT initiated the theory examinations like National Standard Examination in Physics (NSEP) and National Graduate Physics Examination (NGPE). With full academic and financial support from National Council of Educational Research and Training (NCERT), the team led by DPK appended a scheme for evaluation of experimental skill additive to the theoretical part of the examinations having two distinct parts- Part A and Part B. So the test with experimental components was named as Part C. Perhaps as a justification of initiating the Part C, DPK wrote the Editorial: "Focus on Experimental Skills" in the May issue of 1993, which begins with the sentence:

There appears to be total agreement that the greatest weakness in science education in India lies at the level of experimental skills.

So practically the theme of all the subsequent IAPT activities (like Centre for Scientific Culture, Workshops on "Physics through Experiments" for Plus Two teachers and Experimental Workshop for UG teachers), are concerned with experiments aiming at strengthening experimental skill. Even after DPK, the events like NCIEP, NAEST, INNOVATION HUB, NGPE, etc. are also incorporated in the realm of experimental physics.

In this perspective, we can quote the essence of another editorial, penned by DPK: "CARING FOR OUR MAJOR CONSTITUENCY" [3] :

.... As a recent survey shows out of every 100 students entering BSc with physics as a subject, only about 10 plan to take physics as a career in any form. Another 20 think of going into some area where Physics may be directly used. The rest 70 do not plan to have any use of Physics except as an intellectual growth, which they have no chance of getting later in life. They need physics to become better citizens. The numerous gadgets coming into use every day attract them to physics, (including solar devices, which are going to be used massively in near future even in rural areas, added by the authors) This is, therefore the major constituency for us Physics teachers and planners…… A child has infinite inquisitiveness. Somewhere we are killing it. Possibly, we are doing it at repeated points of learning. Let us make thorough enquiry into this. It is wrong to say that the students are not taking interest or that the society is not supporting us, or that the world has become so much worse for Physics. Only examine ourselves. Take direct responsibility, rather than search for scapegoats. See what we, as teachers of Physics, can do to rectify matters. Let us not fail our major constituency.

It is crystal clear from the above passages and the quotations that our founding father had defined our agenda and target with utmost clarity in no uncertain terms. So not to fail our major constituency, the KCC has undertaken this survey. Based on the outcomes of the survey and consistent with the agenda and target of the IAPT we like to suggest the following recommendations:

1.1 Demonstrations and exhibitions are absolutely necessary for attracting students to theory and lab classes:

The student responses have given a clear message in favour of classroom and lab demonstration to make physics learning joyful and exciting. Thus, not being a new discovery, it is known to everybody concerned with physics teaching and learning. In fact, the leading IAPT members have frequently spoken in favour of such activities. As a representative of all of them we are quoting DPK below. In September, 1991 issue of the Bulletin he wrote the Editorial: "Why the students should attend classes?" [4] He explained this was due to the fact that

.. Demonstration experiments are totally absent from our

class rooms.

.. Laboratories are no better. Since it is compulsory to complete a "lab record book, the student is forced to enter the lab to do something mechanically. But there are short cuts to this, some are openly encouraged (at least overlooked) by many teachers who treat lab time as relaxation time. The net result is an encouragement to dishonesty and unfair, which go right into the examinations and make mockery of " Science" education. If the class teaching had demonstrations, or critical discussions, the absent student would miss something. If the labs had some exciting experiments, or involved many variable parameters in wide range, which could not be grasped without actual handling, the students would stand to lose substantially.

So, to execute his suggestions we can follow the following scheme of activities:

Teachers should form a *SOCIAL GROUP* of enterprising and diligent students. In this group they can suggest the experiments that could be demonstrated in exhibition mode. The periodic conduct of educational exhibitions on specific subject domains should be included in the academic calendar of every HS school and UG College.

Similarly, before starting lab exercise in a semester all the experiments may be arranged in working mode in the lab with help of the senior students who have just done those experiments. The senior students can make several groups comprising of 2 students in a group. For effective involvement of a larger mass of students the interactive sessions are highly essential. In an interactive session students of a group would explain their views, concepts and procedure for a particular experiment before their juniors, in the presence of their teachers. The junior students must join the active interaction with the seniors who will demonstrate experiments in an intermittent mode. They will discuss a tiny portion of an experiment and provide clues to juniors. The junior students will answer to every question from seniors and not only learn how to proceed with the experiments, but can also share their new views/ways regarding the measurement. This exercise would also enable them to visualize physics concepts behind the experiments, which they cannot do in coaching classes where only theory is taught.

For building up basic ideas, methodology, concept of errors and significant digits, initially, such interactive sessions must be arranged with the choice of 3-5 well designed low-cost experiments. Multiple sets of these experiments must be given to the junior students who will interact after certain intervals i.e., just after the completion of intermediate steps by own hands. The aim behind the initiative will be then materialised to some extent.

If such events spare some time meant for theory classes, even then such interactive sessions should be given priority via igniting the spirit of visualizing physics in young minds. We can quote again DPK for guidance in this regard from his article "*Emphasis on learning science education programmes*" [5] (329, Nov 1991 IAPT Bull):

……Emphasis on learning, not teaching

*In his book "**Deschooling Society**" Ivan IIIich comments: "School is an institution built on the axiom that learning is the result of teaching. And institutional wisdom continues to accept the axiom despite overwhelming evidence to the contrary."*

There is no need to cite the contrary evidence, since pedagogists openly accept IIIich's view. Only, we have taken the wrong track at some stage and do not know how to change the track…

It is widely admitted that pupils do most of their learning without teachers. All they need is the right environment, good tools, exciting experimental facilities, rich library, and the freedom and time to play and browse….

[At one demonstration arranged for a group of students in UoP, DPK had told me not to tell or even indirectly give a hint at a particular span of observations. (That was an experiment on a filament bulb.) He told me(VHR) to hold myself only to a point where they would only observe the anomaly and would go back thinking about what was the reason. VHR]

So, the task for us, teachers is to create proper environment for learning.

1.2 Students should be allowed to perform experiments following alternative paths and handle equipment used in the experiment

Some experiments like verification of Ohm's law, figure of merit of a galvanometer etc. can be done following different procedures. Ordinarily, mercury in glass thermometer is used in Lee's experiment method for

determining thermal conductivity of a bad conductor. But one can replace thermometer with calibrated thermistor, thermocouple coupled with OP-AMP, or Pt-100. The students should be encouraged for new venture to explore new avenues though which such innovative ideas/techniques against the prevailing method of experiment/experimental measurement can be promoted. Even similar practice helps germinate ideas of project experiments in the mind of students.

It is true, teachers do not allow normally the students to handle the equipment for more than one valid reasons. Again every equipment has much learning content for which it is generally used. So, teachers should allow the handling under their supervision. But it would be no problem if they are motivated to handle and repair the equipment which are out of order, of their own. In fact, ultimately the institution will be benefitted as its defective instruments are repaired and students acquire more knowledge both in theory and practice. In the process, both students and teachers get ideas of project experiments from this exercise too.

1.3 **In labs students should record data faithfully in the tables designed by them.**

The Survey reveals that about 23% students do not prepare tables, of their own, to record data. This means that they lack much in the procedural understanding of the experiment. If supervising teacher pay attention to those students, then they would be able to follow the procedure as well as prepare tables for recording.

Again, 15% admit that they are used to manipulate data. Perhaps they do not know that it is a practice of dishonesty. In fact, this goes against the basic tenets of ethics associated with scientific culture and temper. So, the teacher has to intervene for remedial measures. Before that let us know the opinion of one of the founding members and education scientist Prof Surjit Singh on this issue, enshrined in his article "Science Practicals" [6] (in Bull, IAPT,1993)

… Sacrifice is mostly important. The sacrifice implies ethical practices which influence practical work deeply and hence the quality of observation/ measurements. While guiding, managing, or evaluating the skill of practical works, sincerity is essential for the teachers. His truthful conduct is not a private but a public affair. So, any activity in science has a ground of ethics, i.e., code of values to stand upon. That is the guide for a teacher's decision. These values must be practiced earnestly, doing an experiment is not enough, it must be done rightly.

These techniques require teachers to have a high level of competency. Truly, it is a sharp educational change. But that is the demand of modern education.

DPK emphasized that one of the aims of IAPT is to prepare better citizens. And the primary quality of a good citizen is honesty. So, teachers should motivate students to record data as obtained. But if any mistake is detected in data, the teacher should explain physically how and why error happens. He/She must comment on whether it is rectifiable or not. If not, the students should be encouraged to re-investigate the finding with every detail that may trigger new and novel outcome. In any case, students wouldn't resort to unfairness then following steps can be used to restore them to mainstream:

1. Annual educational exhibition

An Institution, a school or college, should ordinarily organize mandatory Educational Science Exhibition with exhibits from different domains of Humanities, Science and Technology annually preferably along with the celebration of National Science Day. In this exhibition, the students of the institution will present their artefacts in an interesting and exciting mode. The students, in general, would get an opportunity to delve into the other domains of knowledge.

2. Project experiments should be introduced - students' demand should be respected

The most startling revelation of the Survey is the willingness of a large number of the students (more than 65%) to undertake project experiments. Because they think that this will ensure their effective participation in lab-based activities and promote their experimental skill. To some extent, teachers are also supportive of the idea of project experiments. Of course, many teachers argue that students resort to copying in the name of doing project works. But that happens in case of syllabus experiments also. None of us tells that. But 15% students have admitted of their own that they manipulate data in lab experiments. So basically, it is a problem of the teachers in the domain of supervision. If we allow them to copy, be it in project work or in regular lab practice, they will copy. At least that is personal experience at UG level.

But the problem lies with the meaning and definition of project works. Let us hear from Prof V G Bhide, former Chairman, Physics Writing Team of NCERT and Former Vice Chancellor, Pune University about his views on Project works, he says:

" *Traditionally, demonstration experiments are supposed to be done by the teachers without any participation by the students. Consequently, demonstration experiments are seldom described in laboratory manual. However, we feel that students can and should participate in the process of setting up, demonstrating and improvising these demonstrations. In our opinion this participation will excite the students which may ultimately lead to very innovative demonstrations. Indeed, we feel that such participation by students could even be treated as performing a project for examination and/ or for demonstration in science exhibitions provided it reflects the evidence of creativity. It is with this perspective in mind that we have described experiments making clear the essential observations to be made by the students and also how to perform it. We sincerely hope that the teachers will not only demonstrate as many experiments as possible but also design and develop a number of demonstration experiments*."

This paragraph has been quoted by Prof Ved Ratna and Prof R P Sharma in their essay: Project work and laboratory manuals in the physics curriculum package for senior secondary stage.

(Part II-An effort by NCERT and CBSE [7], published in IAPT Bull, p162, May,1997). According to the authors " *This para adds a new purpose to investigatory projects to be done by students*"

Prof Bhide and his writing group have added new dimension to the meaning of project works. In fact, there are other avenues also for realizing project works that has already been in Recommendation 2, the students should be allowed to perform syllabus experiments following alternative ways. Each exercise may be considered as a project experiment which will help the concerned students perform the same skilfully in examination. In a recent communication in the IAPT Bull, August, 2022, a group of CSC, Midnapore activists have shown how simple but meaningful experiments can be performed in home environment, each of which may be considered as an eligible project experiment.

Ideas of project experiment, while performing a routine syllabus experiment, come from a student if he/she is comfortable both in theory and practice, particularly concerned with the experiment which is being performed. This again corroborates the Einstein dictum: *theory decides what one has to observe in an experiment*.

But there should not be any list of project experiments included in a syllabus of school- as well as college- level. This is not in commensurate with the idea of project works. Rather, IAPT can publish a collection of the experiments that its members have published in the Bulletin at different times/ demonstrated in different stage science shows/exhibited in educational science exhibition, etc. The project supervisor may share the ideas of some of the experiments with his/her students and ask them to perform an investigative project incorporating new ideas in the realm of theory and measurement or both. It would be excellent, if the students generate the ideas also.

It may be noted the teachers will also be more encouraged to undergo some sorts of self-orientation through supervising project works which enable them to write research paper in the domain of physics education. Not only that as an outcome of such project works IAPT may build a repository of innovative and creative experiments, this would help students and teachers to get new and novel ideas of project works in near future; some of them may be chosen as demonstration experiments and exhibits also.

3. Students should be motivated to develop home lab for doing project works and hands on experiments

It is not difficult to understand that in absence of any formal lab, the ancient scientists had to do experiments at home only, with whatever materials available around. So, the concept of home lab is as old as the science itself. In the pandemic, IAPT organized the experimental skill tests (Part C) for NGPE in 2020 and 2021 on online platform. The students performed experiments at their home-desk with the materials sent through speed post. Many science bodies organized experiment-based events in this time, using online platforms for interactions; materials needed were collected from home or purchased from local markets. So, pandemic could not prevent them from doing science activities.

In this connection, we can look at the thought-provoking suggestions from the Internationally famous experimental physicist Prof B L Saraf given in his article: "Augmenting educational resources for maximizing achievement level in school education" [8] (IAPT Bull, October, 1991.Excerpts from the article are like:

Development of academic and technical materials

…. *The development work for the academic and technical material will be done by the teachers, students and expert agencies. It may be in the following form:*

- *Charts, diagrams, maps, sequence posters, tables, etc.*
- *Technical materials: apparatus, models, play kits, etc. for Science, math, geography, etc.*

The operational use could be under the following areas:

- *To be used in class room:*
- *To be given away to students for home study.*
- *To be borrowed by children and return;*
- *To be used for display in various places of interest.*

This was the prescription of the Prof B L Saraf for the upliftment of the standard of education of the rural children with whom he had been working in his sunset years. His message was clear and loud. Different teaching-learning materials including science apparatus are to be built not only by the teachers and the expert agencies but also by the students themselves. Children would borrow these materials for home study and return afterwards.

Prof Saraf understood that if the children are allowed to play with the above-mentioned materials, then they would learn by themselves. *He did not want to teach them but wanted to create a proper environment for learning.*

He together with DPK designed and developed about 22 experiments for Centres for Scientific Culture [9] (Teaching Physical Concepts Through Experiments -I, II and III, November 1991, December 1991 and January 1992). Each one of them can be an item experiment for home study- with which any student at senior secondary stage can learn a lot in different domains of physics.

But we do not need to confine ourselves within the limits of these 22 experiments or so, we can build a repository of such inexpensive experiments with collection of CSC, Anweshikas, individual IAPT members, NSEP Part C, NGPE Part C, IAPT lab manual for the workshops on 'Physics Through Experiments', NCERT Physics Lab Manuals for Plus two students, UG lab manual authored by DPK, etc. If our students are allowed to access them and encouraged to perform, they will be able to a) create demonstration experiments, b) prepare exhibits for educational science exhibitions, c) perform hands on activities and d) to undertake project works for examination. For this purpose, we need to prepare a Home Lab kit containing inexpensive experiments in different domains of Physics. The benefit of such kit will far outweigh the cost it incurs.

4. Students should be awarded if they undertake uncertainty analysis and quote results with appropriate significant figures

The survey reveals that our students do not give much importance to errors during the result analysis of an experiment. Consequently, they are quite unable to quote the result with appropriate significant figures. Prof D A Desai who was deeply associated with the selection and training of Indian team for International Physics Olympiad at Homi Bhaba Centre for Science Education published an illuminating article on this topic that entitled: 'The Education of Experimental Physics' [10], in the August ,1996 issue of the IAPT Bulletin. Let us quote extensively from him:

Generally, the education is confined to making the students conversant with various experimental procedures and use of instruments in measurements of various physical quantities with different orders of precision. Students learn how to handle the instruments, make measurements using them, and calculate the results using appropriate formulae and express them in some arbitrarily chosen significant figures without any awareness of the order of accuracy of their measurements and results. ***This is because no importance is given to stress this basic component of experimental physics at any level of education.*** *Choosing the number of significant digits in the final result is equivalent to making a statement of the order of accuracy of the final result. For example, when the final result of an experiment is expressed in two significant digits it means that the*

maximum possible error cannot be greater than 5%. If the significant digits are three then the maximum error cannot be greater than 0.5% and do on. (To understand this, consider the smallest number with two significant digits, 10; Any number less than 10.5 is rounded to 10 when two significant digits are to be retained. This means there can be maximum error of about 0.5 in 10 because of rounding. In terms of percentage this is 5% ….) This means that the number of significant digits cannot be determined arbitrarily as is usually done. A systematic analysis is essential for that.

But from the survey analysis we find that without systematic analysis of errors the students think final result can be quoted with appropriate number of significant digits. Again, error analysis could be performed in two steps. First, it has to be done considering the least count of the measuring devices. Second, step is to be taken to analyze the error statistically by making large number of observations. The second step needs considerable time which is hard to get in usual time span of a lab class. So, students can be given home task for the determination of the value of acceleration due to gravity (g) using a simple pendulum. Arranging a simple pendulum at home is not a great deal. Moreover, an ordinary tape is accurate enough for measuring the length (significantly large) of the pendulum and the stop watch in smart phone can be easily used for measuring time.

But the Survey also reveals that about 15% students are unable to use some of the basic measuring devices. To cope with this problem 25% of the total marks should be reserved for the short questions covering all the measuring devices. In these short questions students should be asked to find certain parameters, which she/he has not done in practical class. In this task the student not only finds the least count of the device but also determine the value of the parameter with the consideration of significant digits.

5. IAPT has to develop new evaluation strategy in physics practical following DPK

It is a common experience that most liberal awarding of marks is the norm of evaluation in physics practical, particularly at the senior secondary school stage. As marks are earned at ease, the students are not serious about lab exercise. Then what is the remedial measure? Let us consult DPK. He writes:

The ideal situation would be if the evaluation in experimental skill were made totally internal and the evaluation were spread over the work throughout the session. That should mean equal measuring rods for all the candidates of a given institution. There is very frequent talk about the teachers' integrity in this context. But I firmly believe that it is via the external evaluator that the integrity is shattered. If the local teacher himself were to evaluate his students, he would have to face the music (no alibis), and is bound to be far more careful in the awards of for the sake of his own reputation. In essence, a year round evaluation work, with possibly an open chart showing the assessments, would ensure elimination of unequal measuring rods, which arise if different students are evaluated on different experiments and exercises. ('On making the evaluation of laboratory skill more valid and reliable") [11].

As evaluation spread over all the syllabus experiments in a year, there would be no bias if the evaluator is honest, in a particular institution. But that may not be the case for all the institutions under a Board due to dissimilar responses of the different evaluators from each institution. But in that case a statistical analysis can be undertaken to normalise the mark distribution ("The normalization of raw scores of examinations at different centres on a common scale" [12]

The Survey shows that 36% students avoid lab classes because these are not necessary for cracking entrance examinations for higher studies or getting jobs. On this issue also one can quote DPK from the same article [11] :

…It is widely accepted that training in laboratory skills is essential part of science education. Even then, it is a pity that an evaluation of candidates in those regard is not considered in any of the entrance examinations for professional courses involving science and technology. This largely because such evaluation is not considered valid and reliable. It is in this context that one must search for methods that make both the reliability and validity of the scores in evaluation in this respect high.

Besides, in the regular examination at various Boards and Universities, we need reliability as between evaluation at different Centres and between different candidates at the same Centre. For lack of reliability here, many distortions occur, including a lack of faith in the system as such, leading ultimately to demoralization of

both students and the teaching community, particularly the honest and dedicated ones among them. The matter needs urgent attention.

His suggestions were:

1. *For all the entrance examinations involving science areas, the component of evaluation skills must be introduced. The MHRD should intervene in the matter and make it incumbent on IITs and State Government agencies to introduce this step, not leave the matter to their convenience. Let not the bogey of " absolute" marking system kill the spirit of science by ignoring practical work. They have introduced tests already, so let the second screening identify about 3-fold the number to be admitted, and let them go through this evaluation in experimental skills. We are aware even in IITs the first-year physics lab is among the most neglected. Let this neglect not stay for ever in the admission tests.*

2. *For all the Board's, we suggest that laboratory examinations be put in a format somewhat close to what we are following in IAPT, which is what we have borrowed from a respected international examination with adaptation to our situation. It is neither expensive nor beyond management.*

3. *A healthy option is to make the evaluation totally internal based on a year-round record displayed on a chart in the laboratory. Option 2 will give the internal teacher guidance from outside; but option 3 will give him much needed strength and authority, the absence of which is eating the backbone of all teaching: high level of confidence is self.*

It may be recalled that IAPT has organized NGPE Part-C 2020 and 2021 from online platform with very few examinees. But now we have come to know this is possible even with large number of candidates also. The information provided by Dr P Panchadhyayee, Secretary, RC 15 [13] on this count, is attached below

"As is said in the proverb, 'necessity is the mother of invention', people have already developed full-proof online proctoring systems for evaluating examinees in theory papers. Some institutes have already used it in assessing experimental skill of students for practical papers. Actually, proctor exam test is a term used to define a comprehensive human-based and AI-controlled online assessment that employs technology-enabled monitoring software to supervise an examinee from start to finish. A proctored exam uses a combination of video and audio to prevent cheating, which introduces multi-factor authentication technology to eliminate the risk of student impersonation. This type of proctor exam/test provides utmost strictness to an examination drive and eliminates any unwanted incident. Many such software are in use with multi-faceted modes. In the case of national-level examinations, a policy may be framed where experimental skill tests may be taken by employing online proctoring systems. It is to note that the chance of logistic problems will be less because such tests will be taken for the qualified candidates after preliminary/next higher level screening (wherever / whichever applicable). To our feeling, this endeavour must make the vision of DPK a reality".

So, we have to follow what DPK had said about thirty years back. Mind that 36% of the most brilliant students are not properly trained in experimental physics. We had seen its reflection on the poor performance of our students in International Physics Olympiad. Perhaps this is not good for the all-round development of the society. IAPT has to follow the path charted by DPK.

6. IAPT should undertake orientation of physics teachers towards experimental physics using modern technology

Prof A S Parasan, Pune University has made an interest comment in his essay: "Evaluation of experimental skills in physics" [14]

The comment is like this:

'Some universities (in USA before the second world war) there had a course called" Gentleman's physics " as an alternative to the regular physics course; the Gentleman did not have to do laboratory work! We in India are already there being gentleman Physicists….'

But USA has recovered from this 'gentleman Physicist' syndrome, but we in India are still enjoying our gentleman status, we are still very gentleman, not ready to make our hands dirty by hands-on experiments. So Dr Khandelwal had written long back an Editorial: "The orientation of physics teachers towards experimental physics" [15]. In it he declared:

…. ". A stage has therefore come when one must organize teacher orientation programmes centred exclusively on

the experimental side. That will serve two purposes. First, there will be healthy atmosphere wherein everyone realize is that experimental physics is of basic importance of its own. Second, only places with a strong laboratory suited this purpose will come up with the orientation programmes. Obviously, that will mean the presence also of the dedicated persons who have developed such laboratories. Centre for Development of Physics Education (Jaipur) was one such centre at one point of time. It did excellent work in that direction, but the emphasis was not exclusively on lab work. I now wish it would be doing in future, since the dilution does damage to the essence of learning lab techniques.

The report of IAPT- Midnapore CSC we publish in this issue will show that now we have a

similar quite strong place for the development of educative experiments in Physics…."

Then he did not sit idle; he was not satisfied with the declaration alone. Before his unfortunate death, he brought huge money from the MHRD, GOI and UGC for conducting orientation Workshops. In his absence Prof B A Patki, Prof R M Dharkar and Prof D A Desai took the lead. They produced an excellent experimental kit and the corresponding Laboratory Manual. Along with others, CSC, Midnapore College also organized six 6-day Workshops: 'Physics through Experiments' involving 180 HS physics teachers.

Before the Workshops on 'Physics through Experiments' for HS physics teachers a workshop in experimental for UG physics teachers was convened in 1996 October under the joint auspices of the Department of Physics and CDPE, Rajasthan University with financial support from the UGC. The veteran professors like A W Joshi, B K Sharma and B L Saraf along with Y K Vijay and others supervised the academic activities of the teacher-participants in this 4-week long refresher course on experimental physics.

In both the IAPT activities, participation of the teachers was good, they worked for long hours beyond the stipulated time, but the final outcomes were not that as was expected by DPK. These activities failed to produce long-term effects for the improvement of experimental physics education.

But in the realm of physics education in general, the situation has been worse than what existed at the time of DPK. Everyone can see it and feel it.; all of us perceive that we are associated with a diseased physics education system. But we do not know how to diagnose and cure it. DPK also could foresee it, that is why he commented in the editorial: WAITING IN THE WINGS [16] (Bull.IAPT, October,1995):

The disease is universal. Whether it is a school teacher, or a professor in a university, or a leading research worker, or a fellow academy, everyone is waiting for somebody else doing things for him…..

IAPT was established as a platform for those who were prepared to do something on their own without waiting in the wings. It started on sound grounds, went along on doing many things which do not need a recount. But, of late, similar things are happening in the IAPT also. Even those accepting position in the executive council or on the editorial board of the Bulletin of the IAPT tend to think that it is for the General Secretary or the Chief Editor to do things; for their own self, just waiting in the wings will do! Take NSEP and NGPE works as an example. With 2500 life members, we should expect as many centres to come up. Bulletin churns out all the needed information; one has only to pick up link from there and initiate things. This does not happen. If it is left to the "office" to do all the work. With around 1000 institutions involved in IAPT membership, we should have as many library subscriptions; but we have less than hundred! The subscription does not earn IAPT extra money, since it is just at the cost level; but the IAPT message is what we want to reach widely. From 2500 readers we may expect at least 250 'letter to the editor' as responses/reactions/suggestions (leave aside articles). But we do not find even 5!

2. SUGGESTIONS

Based on the survey and literature review, following are the suggestions for improving the Lab based education in our country:

- Regular Lab-Course and Practical Exam Should be conducted with responsibility.
- Efforts are required for inculcating students interest in practicals by teaching them in a playful way.
- Special incentives should be provided to teachers / faculty involved in hands-on training programs.

- Proper weightage should be given to practical based questions in the entrance exams.
- Teachers training programs are required to break the chain reaction.
- Make compulsory Laboratory based Workshops / Orientations / Refresher Courses before joining and at the time of promotion of science teachers.

Even today, the situation at the IAPT level is not different, only one needs a multiplication factor.

So, we shall appeal everybody in the language of DPK. We really need his guidance even today: *Let waiting be over. Each member of the IAPT is as important as the President of the IAPT. Let there be no mistake on that count.*

With the development of new devices and materials IAPT is in a position of designing and implementing school level experiments at very low cost. Even we can interact with ourselves from virtual platforms for which we need minimum fund. So, IAPT can organize orientation of a large number of teachers at a very low cost. Yes, when real time experimentation is needed we have to do that in offline mode. For that we need fund and that may not be the 30% of total cost, had the entire workshop been conducted in the offline mode. We have to start only!

3. CONCLUSIONS

The current status of Lab based physics education in our country is producing partially trained science teachers for HS and UG students, thus further producing untrained science students. This cumulative process deteriorates the quality of science education in our country. This is alarming for the national scientific community.

To support and justify the recommendations we have quoted long from the Founder and founding members of IAPT only to demonstrate they had perceived the problems, the physics education had been facing that time, the Survey has helped to quantify them. *We have talked much. Let us follow DPK and start working. That would be our greatest tribute to DPK. DPK is still our torch bearer!*

ACKNOWLEDGEMENTS

All the KCC members: V A Singh, K N Joshipura, P K Ahuwalia, R Ghorpade, S K Sharma, S B Welankar, Y K Vijay, R Bhattacharjee, T R Ananthakrishnan, B P Tyagi as well as the senior IAPT members ouside this committes like P K Dubey, M S Sayal, SM Hossain, P Panchadhyayee, V Wagh, V H Raybagkkar, U S Kushwaha and many others helped immensely to undertake the survey and prepare this document. KCC appreciates warmly their efforts and acknowledges their contribution.

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Graphical Analysis of the Survey

REPORT

Congratulations
Life Member Dr Lalit Kishore honoured with C'Wealth Award-2021 for innovative STEM education project

Life Member, Dr Lalit Kishore has been awarded the Commonwealth Award-2021 – Findel CASTME Award – instituted by the Commonwealth Association of Science, Mathematics and Technology Eductors, London, for his innovative project "**Designing And Developing Teacher Handbook For Science Experiences At Remote Small Rural Primary Schools Through Use Of Mini-tools Kit: Essentiality Of Contextualisation And Teacher Empowerment**" submitted while being associated with a Jaipur-based NGO. Every year three awards are presented for the projects submitted by STEM educators from 54 countries working at primary, secondary, tertiary and community levels

Activity Based Workshop

Venue: MES KK School, Bangalore
No. of students: 85
Class: Std XI and XII
No of teachers: 8 Physics and 8 others
Visitors: 4 teachers of RC12A
Duration 11 am – 4.30 pm
Topic: **Creative science pedagogy- explore, examine, evaluate; an experimental workshop.**

Resource Person: Sarmistha Sahu and the Physics staff of MES Kishore Kendra.

The Principal and Vice Principal of the school made their presence, wishing the students a fun time exploring in an entirely new way. The welcome was cordial and pleasant surprises.

Principal And Vice Principal And Resource Person

A 15 mins presentation and interaction with the students on the science skills sets they need to acquire for exploring into the domain of the unknown.

The students were divided into teams of 5 and had to work on any one idea – LED and universal constant, LDR the variable resistance in the presence of light intensity, hand-made CD grating and spectral analysis and charging and discharging of a capacitor through an invisible resistor. The students had to comprehend the paper provided, plan their experiments, observe, collect data, analyze, hypothesize, solve the problem, and report their findings. They did much more!

The teams had a discussion among themselves, planned their strategy, set up the experiment, organized their readings, laughed, joked, sulked when the desired plan did not work and cheered when it was successful. The two labs had a festive look, visitors hob-knobbing, putting tough questions, assisting when students are in doubt, initiating brainstorming and enjoying the marvellous-charged atmosphere in the laboratories.

Even after a 3-hour long session of exploration, experimentation, excitement, and elaboration the students refused to leave for lunch.

The afternoon session in the ambience of a well-maintained conference auditorium, created especially for school students, was resounding with the joy of a memorable workshop. Each team shared their experience of the involvement, support, peer learning, gratitude to the facilitators, enthusiasm and experience in the first-of-its-kind workshop. They learnt a lot and expressed their excitement with a request-chemistry and biology departments can also conduct such workshops for them. The physics staff put forth their best efforts for a roaring success!

The executive officer of MES management placed the proposal-"We are planning 'open labs'after school hours, how many of you are willing to experiment without any marks or exams on your head?" and the whole group opted to dirty their hands.

A general remark from students, "The work was easy but challenging."

A new device LDR operating in a standard Wheatstone network- working as a team.

Sarmistha Sahu

Prof. D.P. Khandelwal Birth Centenary Activities

Organizer: Department of Physics & Electronics, Hislop College, Nagpur

Activities:

1. A **talk on "Physics Everywhere"** by Dr. Vivek Nanoti, Director (Engineering) LJTSS, Priyadharshini Group of Institutions, Nagpur. **Date :**23-09- 2022.
2. **Physics Quiz Competition** for UG students **Date:24-09-2022**.

Guest of Honor: Dr. Abha Khandelwal, Retd. Head, Department of Computer Science, Hislop College, Nagpur.

Programme Convener: Dr. L. P. Damodare

The Department of Physics & Electronics of Hislop College, Nagpur celebrated the birth centenary of Late Dr. D. P. Khandelwal for two days.

1. To make students aware of how **Physics helps to organize the fundamentals of the universe and perceive the connections between seemingly disparate phenomena.**
2. **Physics Quiz as a mind game, to encourage students to establish a relationship between theory and application of learnt concepts**.

On first day Speaker Dr. Vivek Nanoti, elucidated the perception of Physics around us. He sighted various examples to explain the hidden workings of the world all around us.

Dr. Vivek Nanoti, Dr Abha Khandelwal With Staff And Students

Dr. Abha Khandelwal shared various insights with the students and elaborated how Computational Physics can be used to solve and understand complex physics phenomena.

Prof. P. K. Ahluwalia, President, IAPT shared a pre-recorded audio-visual clip congratulating the efforts taken by Department of Physics and Electronics, Hislop College, Nagpur, spearheaded by Dr. (Mrs.) Abha Khandelwal. He stressed that the college should continue to conduct more engaging programmes to popularize the subject. Prof Y K Vijay Jaipur, Anil Khandelwal, Madhu Khandelwal, Pune and Dr Narendra Khandelwal, Jodhpur, graced the occasion with their virtual presence.

A Physics Quiz competition was organized on the second day, 24thSeptember 2022, for the B.Sc. students. Mr. Arun Brajkishor Shahu, Miss. Prajakta Amit Mendhe were placed first, and Mr. Kuldeep Kumar and Mr. Adarsh Durge were placed second. Dr. L. P. Damodare, was the quiz master. He conducted the quiz enthusiastically. The Competition was challenging and interesting. The audience and the participants enjoyed the competition with great intrigue.

Head, Department of Physics & Electronics Dr. Thomas Philip, Co-Conveners Dr. (Mrs.) J. N. Christy , Dr L.P Damodhare and staff Dr. N. M Gahane, Mr. M. G. Raut worked together to deliver a successful programme. Principal, Dr Prashant Shelke, Vice Principals Dr Pratik Michael and Dr Ajay Yoel graced the occasion with their presence.

Abha Khandelwal

Dr Abha Khandelwal presenting momento to Dr Prashant Shelke

Two Day Workshop on Experimental Physics

Venue: Hans Raj Mahila Maha Vidyalaya, Jalandhar
Date: 2nd-3rd November, 2022
Participants: 190
Convener: Dr. Meenakshi Sayal

A two day workshop on Experimental Physics was organized by HMV Collegiate Sr. Sec. School. The objective of this workshop was to provide hands on training to students of class 11th and 12th of rural area surrounding Jalandhar so as to inspire them for choosing Physics as a career at undergraduate level.

Workshop was inaugurated by Principal Dr. Ajay Sareen. She said that we should always focus on innovation and invention. She further said that learning by doing is powerful tool to understand Physics and inculcate interest in the subject. She encouraged the students to recognize their capabilities and to be self confident. Workshop Convener and Resource Person Prof. Meenakshi Sayal introduced the students to the Innovation Hub set up in the institution. Students from Govt. Sr. Sec. School Uggi, DAV Public School Bilga, Govt. Sr. Sec. School Rayya and Agyawanti Marwaha DAV Sr. Sec. School Batala enthusiastically participated. Concepts about Free, Forced, Resonant and Coupled Oscillations along with Symmetric and Asymmetric Oscillators were cleared. Ideas about vertical motion and circular motion were conceptualized by students while performing experiments. Laws of electromagnetic induction and working of Van de Graaf Generator were of great interest to the students. Enthusiastic response of the students ensured success of the workshop. At the end, teachers escorting students appreciated the efforts of host institution and asked for such more workshops to be conducted in future.

Meenakshi Sayal
EC Member

To our readers

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

IAPT RC 15 is going to organise a General Meeting of all IAPT Life Members of this region on **December 16, 2022 (Friday) at 07.30 pm** on Google Meet platform. To join the meeting honourable Life Members are requested to submit a Google Form after filling out the requisite information. Download the pdf file (Link below) and click on the Google Form link given in the pdf file.

Link of the pdf file: https://www.iapt-rc15.org/download/7166930592
1.pdf

Google Meet link will be sent via email
(iaptrc15@gmail.com) on 15.12.2022.

Secretary
RC-15

Guidelines for the contributors

The IAPT Bulletin recommends for publication:

- Articles, reviews and short notes on subject matter related to physics content and physics teaching at secondary, undergraduate and postgraduate levels. The write-up must offer some new insight into the topic under discussion. Mere reproduction of information available on the internet be avoided.
- Letters and comments on matter published in the Bulletin.
- Reports, news and announcements about important physics related IAPT activities/events in the country.

Articles, reviews and short notes

- Research papers in specialised fields of mainstream physics may not be sent. Research journals catering to specific areas of physics already exist. However, reviews of recent developments in various fields are welcome.
- All the matter should be sent by email to iapt@pu.ac.in. Acknowledgement via email will normally be sent within 10 days. Submissions received via post without soft copy may be considered provisionally, but if accepted for publication then soft copy must be provided. Authors should retain a copy of their write-up, rejected articles will not be sent back. Contributors should give their contact number as well.
- The length of the write-up should not, ordinarily, exceed 6 pages of the Bulletin, including diagrams, photographs, tables, etc.
- All matter received for publication is subject to refereeing. The editors reserve the right to abridge/alter the write-up for the sake of clarity and brevity.

IAPT activity reports

The report must contain the following:

- Name of the activity
- Date/duration
- Venue of the activity
- Organising institute along with collaborators, if any
- Sponsors, if any (IAPT, RC or any other funding agency)
- Summary of the activity
- Name of the coordinator/convener/organiser along with address, email and mobile number

Maximum two photographs, if available, may be sent separately via email, preferably of the activity or audience.

Please send the report soon after the activity is over, not later than, say, three months.

If you are sending reports of more than one activities for publication in one issue of the Bulletin, kindly send a consolidated report of all the activities in a single communication.

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Abhiram J, Secretary NSSP 2022 - Mob: 98446 54414

Important Dates

Symposium Date: December 21-23, 2022 (Wednesday to Friday)

Last Date for Submission of Abstracts: Nov. 25, 2022

Notification of acceptance of Abstracts: **Dec. 05, 2022**

Last Date for Submission of full Length paper / Registration:: **Dec. 10, 2021**

Guidelines for Submission

The soft copy of the paper in **MS-Word** should be sent to the **Email- nssp2022.karnataka@gmail.com**

Paper Specification:

Max. Length: Extended Abstract about 2 pages

Margin: 1" on all sides,
Font size & Line spacing: Times New Roman-12, Justified & 1.5

Title Page Title, Author, Affiliation, Contact Details, email, Phone number

Full length of the Paper About 6 pages including diagrams, tables, conclusion and references.

If paper is accepted, the paper will be published in student journal of Physics - International Edition, **ISSN 2319-3166.**

The format of the symposium consists of invited talks by experts, oral & poster presentations by the students and visit to Research Laboratories. The UG & PG students with Physics background can apply for the Symposium latest by **November 25, 2022.**

Registration fee

Outstation students: Rs. 850/- (includes hospitality & accommodation).

Local students: Rs. 500/- (excludes accommodation).

The selected papers will be communicated by **December 05, 2022** through our website.

Travel support (Bus / Sleeper class by train) will be provided to the selected papers (one person only).

Application Form & other details are available at the following websites:

www.iaptnssp.in www.bvjsci.org

www.ncjayanagar.com

Payment Mode: Registration through online
Account Holder: **IAPT RC 12A** | Account Number: **04752010003124**
Bank: **CANARA BANK** Branch: **Malleshwaram, Bangalore**
IFS Code CNRB0010424 | MICR Code 560015232

Click / Scan this QR Code for Registration

9th IAPT National Student Symposium on Physics (NSSP-2022)

Organized by

Indian Association of Physics Teachers

Regional Councils RC 12 & 12 A

and

Department of Post Graduate Studies & Research in Physics

The National College (Autonomous)
Jayanagar, Bangalore - 560 070

in association with

B V Jagadeesh Science Centre

Jayanagar, Bangalore

December 21 – 23, 2022

Venue:

B V Jagadeesh Science Centre

The National College (Autonomous) Campus,
Jayanagar, Bangalore - 560 070, Karnataka

ABOUT NSSP

In recent years, our country has taken a series of measures to induce the spirit of innovation and creativity into our Education system. Projects and Dissertations have become an integral part of UG and PG curricula as per the new National Education Policy. To foster a culture of innovation and creativity among the young students, IAPT has instituted the annual National Student Symposium on Physics (NSSP) exclusively for the UG and PG students. The Symposium provides a National forum to young students to present their new ideas and innovative work at an early stage of academic career. The yearly series started in 2013 in collaboration with the Department of Physics, Panjab University, Chandigarh. Eighth in the series was held at Indian Academy Degree College (Autonomous), Bangalore and NSSP – 2022 will be held during December 21-23, 2022.

ABOUT IAPT

A voluntary organization of Physics Teachers, Scientists, Professionals and other interested in physics (science) education in the country. Indian Association of Physics Teachers (IAPT) was established in 1984 by dedicated physics teachers and visionary (Late) Dr. D.P. Khandelwal with active support from like minded members with the aim of upgrading quality of physics teaching - learning at all level in the country. The Association operates through its 22 Regional Councils (RCs) grouped into 5 zones. There is a central Executive Council (EC) which coordinates all its activities.

Activities of IAPT:

Publications

Bulletin of IAPT – A monthly journal (40 pages) with the record of uninterrupted publication since 1984.

Journal of Physics Education – The IAPT has taken over the publication of this quarterly (previously published by UGC) publication since April 2001.

Student Journal of Physics – An International Edition (Earlier name-Prayas) – A quarterly journal carries out articles and research reports by UG/PG students.

Pragami Tarang and Horizons of Physics – Is a book series brought out for physics teachers and students.

Examinations for students

National Standard Examinations: NSE (NSEP, NSEC, NSEB, NSEJS, NSEA) – These examinations are conducted for +2 level students / higher secondary students every year since 1987. National Standard Examinations are held at 3 levels. These examinations constitute the first step towards participation in International Olympiads in respective subjects.

NGPE (National Graduate Physics Examination): This is conducted for Undergraduate level students every year. Gold medalists of NGPE, may join DAE directly through interview without appearing in the entrance test. S N Bose National Centre for Basic Sciences, Kolkata allows direct admission to toppers in NGPE after an interview for integrated Ph.D., programme. Five Scholarships have been instituted to encourage students to take up Physics as a career.

Extra Low - Cost Book (ELCB) programme - The aim is to help teachers build up their personal libraries.

For Teachers

NCIEP (National Competition for Innovative Experiments in Physics), NCICP (National Competition in Computational Physics) and Orientation Programmes /Seminars / Workshops / IAPT Dinabandhu Sahu Memorial Award: Awarded to Undergraduate Physics Teaching full time teacher as per UGC guidelines.

NCEWP (National Competition for Essay Writing in Physics) for both Teachers and Students.

NANI (National Anveshika Network of India): This provides a base for generating interest in Experimental Physics in students. There are about 22 centers and some more are in the offing.

CSC (Centre for Scientific Culture): The Centre established at Midnapore, WB, provides a year round exclusive facility of working experiments in Physics.

Conventions: A 3-day National Convention is organized every year, since 1984 on some specific theme. Papers are presented by members and lectures are delivered by experts in the field.

ABOUT NATIONAL COLLEGE

The National College, Jayanagar, Bangalore, is one of the Seventeen institutions being managed by the National Educational Society of Karnataka (NES), which was established in 1917 by Dr. Annie Besant with nationalistic ideas as the driving force. NES believes in empowering Rural Education and therefore a number of High Schools are being run in Rural areas, thus it is serving diverse educational needs of the society. The college established in 1965 has evolved with well-equipped Laboratories and Digital Library speak volumes about the academic ambience of the College. The learners will surely be able to find themselves growing into better individuals than what they are when they enter the portals of the Institution. The institution also aims in inculcating values of life and discipline among students. The National College became Autonomous in the year 2006 – 2007. The College is reaccredited by NAAC with A grade in the year 2017. The special feature of this institution is B.V. Jagadeesh Science Centre which incorporates a well equipped museum and spacious lecture hall. Dr. H.N. Kalakshetra is an added attraction for cultural programme. Multi-Gym and the sprawling Playground provide the necessary infrastructure and space for all Co-curricular activities.

The College offers UG courses in Science, Commerce and Arts (B.A, B.Sc, B.Com, B.C.A, New Tech – Based UG Courses). The College also offers M.Sc, in Physics and Mathematics and M.Com. The research facilities and the dedicated faculty available in the PG Departments are attracting other College students also to carry out their projects.

ABOUT BVJ SCIENCE CENTRE

Built by the NES of Karnataka as part of the College campus, B.V. Jagadeesh Science Centre is meant to promote popular science. The main motive is to popularise science and draw the young generation towards basic science in these days of frenzy about Information Technology and Bio-technology. The Centre has a library of non-technical Science books and popular science journals. The Seminar hall with all modern equipment, facilitates lecture programmes which are arranged on every 2nd and 4th Saturday of every month. The centre also has two museum halls which house various exhibits pertaining to different branches of science. Every Saturday, students from high schools can visit the Science Centre, have a close look at the exhibits and also get to know first hand the mechanism of the apparatus. The Centre has been made possible by the initial donation by Mr. B.V. Jagadeesh an alumnus of the The National College, Jayanagar and the National College, Basavanagudi who is now an entrepeneur in the United States. His contribution also forms the highest amount donated by any individual to the NES of Karnataka. As a token of gratitude the centre has been named after him. The rest of the total expenditure has been collected from the public and the Government. It is a pubic institution open to any one interested in Science-education, established with the hope that the younger generation will make the best use of it.

PEE KAY JAIPURIA & CO.
CHARTERED ACCOUNTANTS
Acharya Kuti, 1st Floor, 26/53, Birhana Road, Kanpur – 208 001
Telephone: (0512) 2315178, email: peekayjaipuria_co@rediffmail.com

FORM NO. 10 – B (See Rule 17 – B)

AUDIT REPORT UNDER SECTION 12A(B) OF THE INCOME TAX ACT – 1961 IN THE CASE OF CHARITABLE OR RELIGIOUS TRUST OR INSTITUTIONS

We have examined the Balance Sheet of INDIAN ASSOCIATION OF PHYSICS TEACHERS, KANPUR as at 31st March, 2022 and the Income and Expenditure Account for the year ended on that date, which are in agreement with the books of accounts maintained by the said trust or institution.

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of the audit. In our opinion, proper books of accounts have been kept by the Head Office and the Branches/Regional Councils /Sub Regional Councils of the above named trust/institution so far as appears from our examination of the books and proper returns adequate for the purposes of Audit have been received from Branches not visited by us, subject to the comments/notes given below: -

as per "Annexure AR –10B"

A) That the accounts as shown under the heads "Advances due from" and under the head "Balances with Regional councils/ Centers / Offices" in the Balance Sheet are being operated by the In-charge and/or the authorized signatories of Respective Regional Councils/ Centers / Offices and same represents the total outstanding Balances due from the respective Regional Councils / Centers / Offices. The aforesaid due outstanding Balances includes Cash on Hand, Advances, etc and may also include Bank Balances, if any, being maintained by them which are stated to be in the name of trust or institution as well as may be in the name of the in charge/authorized signatory for the purpose of the institution.

B) That the following periods accounts and/or utilizations of grants have been incorporated by us which have been audited by other chartered Accountants and received by the head office during the year: -

1. *Regional Council-04 Uttar Pradesh* for period 2021-22 which have been audited by Sharad Nigam & Co., Chartered Accountants, Kanpur, Uttar Pradesh.
2. Regional Council -07 Gujarat for period 2021-22 which have been audited by Rajendra Natverlal Shah & Co., Ahmedabad, Gujarat.

C) That the following periods accounts and/or utilizations of grants have been incorporated by us which have been signed (without any report thereon) by other Chartered Accountants and received by the head office during the year: -

1. Regional Council-01 Delhi & Haryana for period 2021-22 which have been signed by Mohit G Gupta & Associates, Chartered Accountants, Noida Uttar Pradesh.
2. Regional Council-06 Rajasthan for period 2021-22 which have been signed by Ajay Kumar Vijay Vergia & Associate, Chartered Accountants, Jaipur , Rajasthan.
3. Regional Council- 08 Maharashtra for period 2021-22 which have been signed by Sushant Phadnis & Co., Chartered Accountants, Shahupuri Kolhapur, Maharashtra.

D) That the accounts and/or receipt and payment in respect of following branches have been incorporated by us which are un audited and taken from the statements submitted by the respective in-charge and received by the head office during the year: -

1. Pune, Branch
2. Dehradun, Branch
3. IAPT-Nani, Centre

E) That like earlier year grant received, if any, from any Government Departments to the extent they were utilized during the period have been shown in the Income & Expenditure Account and Expenditure incurred against receivable grant has been carried forward for adjustment there of on receipt of grant.

F) That as the income of the respective Endowment Fund and/or Corpus Fund is to be utilized for the purpose specified by the respective fund's/Corpus creators, hence to the extent the received income is utilized the same has been shown as contribution from respective Funds/ Corpus. The income and expenditure account and balance utilized during the year under review have been disclosed in the Balance Sheet only.

G) Interest earned on investment made for Endowment Fund created under the name and style as DD Pant,

Sultan Chand Trust, Omega Trust, Murli Laj Chugani is being accounted for on receipt basis. Utilization thereof for the purpose mentioned by the creators thereof and sundry expenses incurred if any there for are being accounted for on actual payment basis.

H) Interest earned on investment made for corpus Fund created under the name and style as ISRO, INFOSYS, PRL, DAE, Students Education Edu, Dinabandhu Sahu Memorial, Pragaami Tarang Gujarati Publication, Shilpa Nandkumar & Midnapur College CSC D.P Khandelwal is being accounted for on receipt basis. Utilization thereof for the purpose mentioned by the creators thereof and sundry expenses incurred if any there for are being accounted for on actual payment basis.

Subject to above,

And also, non incorporation of receipt and / or application of fund received/ applied Regional Councils for

Financial Year 2021-22 in respected of Regional Council-02 Punjab & Jammu Kashmir, Regional Council-03 Chandigarh & H P, Regional Council-05 Uttarakhand, Regional Council-09 Madhya Pradesh, Regional Council-10 Chhattisgarh, Regional Council-11 Andhra Pradesh, Regional Council-12 Karnataka, Regional Council-15 West Bengal , Regional Council-16 Orissa , Regional Council-17 Assam , Regional Council-18 Tripura , Regional Council-20 Jharkhand, Regional Council-22 Telangana , Sub Regional Council – 08 B Mumbai , Sub Regional Council-08 C Pune , Sub Regional Council -08 D Kolhapur/ Sangali & Sub Regional Council- 12 A Bangalore in respect of Nagpur Office & Chandigarh Office

Financial Year 2019-20,2020-21 & 2021-22 in respect of Regional Council-13 Tamil Nadu and Regional Council-14 Kerala, & For Financial year 2020-21 & 2021-22 in respect of Regional Council-21 Goa & Regional Council -19 Bihar & For F.Y 2020-21,2021-22 in respect of Anveshika Centre Kanpur.

In our opinion and to the best of our information, and according to information given to us, the said accounts subject to above give a true and fair view:

I. In the case of Balance Sheet of the State of affairs of the above-named Trust Institution as at 31st March, 2022 and

II. In the case of Income and Expenditure account of the excess of Income over Expenditure of the trust/society/institution for the accounting year ended on 31/03/2022

The prescribed particulars are annexed hereto.

For PEE KAY JAIPURIA & CO.
CHARTERED ACCOUNTANTS
Firm Registration No. 001335C

RADHA KANODIA
PARTNER
M.No.073806
Place : Kanpur
Date

ANNEXURE "AR – 10

ANNEXURE TO THE AUDIT REPORT

The referred financial statements. In the prescribed form 10 – B, are the responsibility of the Assessee. Our responsibility is to express an opinion on these financial statements based on our Audit.

We conducted our audit in accordance with the auditing standards generally accepted in India. Those Standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

Working Note Annexed to Annexure to from 10 (B) for the year ended 31st March, 2022 In the Matter of Indian Association of Physics Teachers

Gross Receipt		5003137	
Less Grant Received & Utilized		0	
Balance Net Receipts		5003137	
Less: 15% of Net Receipts		750471	
To be Utillised			4252666
Total Application		7981197	
Less Depriciation	112521		
Less Fixed Asset W/o	0		
Less Grant Exp.	0	112521	
Revenue Application		7868676	
Capital Application for Purchase of fixed asset	144600		
	144600	144600	
Total application for Current Year			8013276
Capital Application Flat Kanpur			0
(+) Short Utilization / (-) Utilization in respect of earlier year			-3760610

BALANCES WITH REGIONAL COUNCIL / CENTRE / OFFICE

Regional Council-01 Delhi Haryana	34585.00
Regional Council-02 Punjab, Jammu & Kashmir	2415.00
Regional Council-03 Chandigarh & H.P	39268.00
Regional Council-04 Uttar Pradesh	37087.00
Regional Council-05 Uttarakhand	6810.00
Regional Council-06 Rajasthan	362516.00
Regional Council-07 Gujrat	33358.00
Regional Council-08 Maharastra	13494.50
Sub regional Council-08 B Mumbai	31743.00
Sub Regional Council-08 C Pune	8803.84
Sub Regional Council-08 D Kolhapur Sangli	6506.50
Regional Council-09 Madhya Pradesh	62578.00
Regional Council-10 Chattisgarh	22999.97
Regional Council-11 Andhra Pradesh	5628.00
Regional Council-12 Karnataka	2133.10
Sub Regional Council-12 A Bangalore	53759.51
Regional council-13 Tamil Nadu	125838.15
Regional Council-14 Kerala	38601.00
Regional Council-15 West Bengal	194786.00
Regional Council-16 Orissa	20421.40
Regional Council-17 Assam	16216.32
Regional Council-18 Tripura	59052.00
Regional council-19 Bihar	1183.00
Regional Council-20 Jharkhand	5545.60
Regional Council-21 Goa	332704.66
Regional Council-22, Telangana	31464.24
Bangalore Office	0.00
Chandigarh Office	36888.95
Dehradun Office	1624132.81
Speed Post Office, Nagpur	105681.00
Nagpur Office	642554.00
Pune office	212922.86
NANI-IAPT Kanpur	55954.52
Anveshika Kanpur	10393.64
	4238025.57

INDIAN ASSOCIATION OF PHYSICS TEACHERS,KANPUR

Statement of Fixed Assets as at 31st March-2022

FIXED ASSETS Schedule "A"

Particulars	Rate	WDV as on 01-04-2021	Addition		Deduction	Total	Depreciation of the Year	WDV as on 31-03-2022
			More than 180 days	Less than 180 days				
		Rs	Rs	Rs	Rs	Rs	Rs	Rs
COMPUTER (KANPUR)	40%	69442.14	0.00	65500.00	0.00	134942.14	40877.00	94065.14
FURNITURE (KANPUR)	10%	163082.58	0.00	0.00	0.00	163082.58	16308.00	146774.58
ELECTRIC ITEM (KANPUR)	15%	12531.72	0.00	0.00	0.00	12531.72	1880.00	10651.72
MOBILE KANPUR	15%	26177.53	0.00	0.00	0.00	26177.53	3927.00	22250.53
FURNITURE (DEHRADUN)	10%	20048.79	0	0.00	0.00	20048.79	2005.00	18043.79
PRINTER (DEHRADUN)	40%	451.88	0.00	0.00	0.00	451.88	181.00	270.88
COMPUTER (DEHRADUN)	40%	45333.64	0.00	0.00	0.00	45333.64	18133.00	27200.64
COMPUTER (CHANDIGARH)	40%	9600.17	0.00	0.00	0.00	9600.17	3840.00	5760.17
FURNITURE (CHANDIGARH)	10%	6566.14	0.00	0.00	0.00	6566.14	657.00	5909.14
FURNITURE (RC-17)	10%	5501.81	0.00	0.00	0.00	5501.81	550.00	4951.81
PRINTER (BANGALORE)	40%	18.00	0.00	0.00	0.00	18.00	7.00	11.00
COMPUTER (BANGALORE)	40%	2228.22	0.00	0.00	0.00	2228.22	891.00	1337.22
FURNITURE (BANGALORE)	10%	33599.28	0.00	0.00	0.00	33599.28	3360.00	30239.28
PRINTER (NAGPUR)	40%	1913.60	0.00	0.00	0.00	1913.60	765.00	1148.60
FURNITURE (NAGPUR)	10%	5674.50	0.00	0.00	0.00	5674.50	567.00	5107.50
MOBILE (NAGPUR)	15%	3571.00	0.00	0.00	0.00	3571.00	536.00	3035.00
Air Conditioner (Kanpur)	15%	0.00	79100.00	0.00	0.00	79100.00	11865.00	67235.00
MOBILE (DEHRADUN)	15%	41146.00	0.00	0.00	0.00	41146.00	6172.00	34974.00
TOTAL		**446887.00**	**79100.00**	**65500.00**	**0.00**	**591487.00**	**112521.00**	**478966.00**

INDIAN ASSOCIATION OF PHYSICS TEACHERS,KANPUR

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH-2022

EXPENDITURE	AMOUNT	INCOME		AMOUNT
Stationery, Conveyance,Postage		**SUBSCRIPTION,DONATION,**		
Telephone, Remuneration,Misc Exp.		Annual Member Ship	5750.00	
Computer Maintenance,Office Rent		Student Membership	1000.00	
Legal Exp, Audit Fee		Donation	25000.00	
Electric Bill, Bank Charges	681288.25	Institutional Membership	20000.00	
Depriciation	112521.00	Grant From Ministry of Tribal Affairs	22500.00	**74250.00**
		Donation to Vinod		170000.00
Bulletin Publication & Distribution		**Bulletin Receipt**		
		Library Subscription	11200.00	11200.00
Printing , Postage,Telephone				
Address Pasting,Remuniration		**INTEREST**		
Software Maintenance,Misc.	2238780.00	On Saving Bank Account	53399.00	
		On Income Tax Department	0.00	
		On Fixed Deposited	1344617.00	**1398016.00**
		Books in Stock	83766.19	
		Receipt from Members	69371.00	**153137.19**
ELCB Opening Stock of Books	109487.70			
Book Purchase	91978.00			
Misc exp.	840.00	National Graduate Physics Exam. - 2022		
		Fee Received	807730.00	
NGPE Exam - 2022	**760372.00**	Sale of Raddi	9816.00	
		Old Q Paper	6300.00	**823846.00**
National Standared Exam EXP. 2021-22	2133122.33	**National Standared Exam 2021-22**		
		Contribution from HBSC	1221366.00	
EC Meeting Exp.	58096.00	A Pho	39297.00	
Convention & Competion Exp.	205312.00	Contribution from Sultan Chand Fund	0.00	
National Anveshika Network of India	369533.00	Q Paper Sale	8988.00	**1269651.00**
Regional Council-01 Delhi & Haryana	30048.00	Regional Council-01 Delhi & Haryana		11731.00
Regional Council-04 Uttar Pradesh	1500.00	Regional Council-04 Uttar Pradesh		815.00
Regional Council-06 Rajasthan	1124324.00	Regional Council-06 Rajasthan		1062502.00
Regional Council-07 Gujarat	49846.00	Regional Council-07 Gujarat		20889.00
Regional Council-08 Maharastra	14149.00	Regional Council -08 Maharastra		7100.00
		Exess of Expenditure over Income Transferred to Balance Sheet		**2978060.09**
Total Rs.	**7981197.28**			**7981197.28**

Significant Accounting Policies are as per Annexure "AP"
AUDITORS REPORT
In Terms of our Report of Even Data Attached Herewith
For PEE KEY JAIPURIA & CO
CHARTERED ACCOUNTANTS
Firm Registration No. :001335C

Sd
PARTNER : Radha Kanodia
M No. 073806
Place : Kanpur

Sd **President**
Sd **Secretary**
Sd **Treasurer**

INDIAN ASSOCIATION OF PHYSICS TEACHERS

BALANCE SHEET AS AT 31ST MARCH-2022

LIABILITIES			AMOUNT	ASSETS	AMOUNT
CAPITAL FUND				**FIXED ASSETS**	478966.00
				Project Expenses to Nivim Nagpur	750000.00
[A] IAPT Life Members Fund				**INVENTORIES**	
As per Last Balance Sheet	6449727.00			ELCB [STOCK OF BOOKS]	83766.19
Add: Recd. During the Year	466501.00	6916228.00		SECURITY DEPOSITED	3000.00
[B] GENERAL FUND				IAPT MEMBERS FUND CASH/ BANK	6414954.50
As per Last Balance Sheet	34135172.14			**FLAT KANPUR**	**4557500.00**
Less.Excess of Expenditure over Income	2978060.09	31157112.05	**38073340.05**	**CASH /BANK BALANCE**	19483498.59
				Tax deduted at soure	956354.00
				Accrued Intt. Central Bank of India, Dehradun	546596.00
				Accrued Intt. Allahabad Bank Kakadeo, Kanpur	35716.00
				Accured Intt. Indian Bank Dehradun	397994.00
IAPT Building Fund as Per Contra			796777.50	IAPT Building Fund As Per Contra	789473.50
Advance:- Due To			514624.10	**ADVANCE DUE FROM**	779802.30
Audit Fee Regional Council-19 Bihar			1000.00	**BALANCE WITH REGIONAL COUNCIL/CENTRE /OFFICE**	4238025.57
Audit fee Sub Regional Council-08 D Kolhapur			200.00		
Allied Printer Dehradun			5390.00	**Sharda Graphics P Ltd**	22329.00
Parmesh Printer			44.00	**Duties & Taxes**	8132.00
Schamatics Minining P Ltd. Deharadun			328.00		
ENDOWMENT FUND AS PER CONTRA				**ENDOWMENT FUND AS PER CONTRA**	
IAPT - DD PANT ENDOWMENT FUND			148114.60	IAPT-DD PANT FUND	145667.60
IAPT-SULTAN CHAND TRUST FUND			45642.00	IAPT-SULTAN CHAND FUND	45094.00
IAPT-OMEGA TRUST FUND			34791.00	IAPT-OMEGA TRUST ENDOWMENT FUND	34647.00
IAPT-MURLI LAJ CHUGANI FUND			136928.25	IAPT-MURLI LAJ CHUGANI ENDOWMENT FUND	135190.25
CORPUS FUND AS PER CONTRA				**CORPUS FUND AS PER CONTRA**	
IAPT- ISRO CORPUS FUND			1079889.00	IAPT-ISRO CORPUS FUND	1063557.00
IAPT-INFOSYS CORPUS FUND			110628.00	IAPT-INFOSYS CORPUS FUND	108989.00
IAPT-PRL CORPUS FUND			26921.00	IAPT-PRL CORPUS FUND	26488.00
IAPT- DAE CORPUS FUND			569119.00	IAPT- DAE CORPUS FUND	559213.00
IAPT-STUDENTS EDU. DEVELOPMENT CORPUS FUND			56625.00	IAPT-STUDENTS EDU CORPUS FUND	56068.00
IAPT- DENABANDHU SAHU MEMORIAL AWARD CORPUS FUND			509766.00	IAPT- DENABANDHU SAHU MEMORIAL AWARD CORPUS FUND	511545.00
IAPT- PRAGAANI TARANG GUJARATI PUB CORPUS FUND			1179419.00	IAPT- PRAGAANI TARANG GUJARATI PUB CORPUS FUND	1162275.00
IAPT-SHILPA NAND KUMAR CORPUS FUND			704637.00	IAPT-SHILPA NAND KUMAR CORPUS FUND	629024.00
IAPT- MIDNAPORE COLLEGE CSC D.P KHANDELWAL FUND			1862616.00	IAPT- MIDNAPORE COLLEGE CSC D.P KHANDELWAL FUND	1832934.00
TOTAL Rs.			**45856799.50**	**TOTAL Rs.**	**45856799.50**

Significant Accounting Policies are as per Annexure"AP"

AUDITORS REPORT

In Terms of our Report of Even Data Attached Herewith

For PEE KAY JAIPURIA & Co

CHARTERED ACCOUNTANT

PARTNER: Radha Kanodia

M No.: 073806

Sd
President

Sd.
Secretary

Sd
Treasurer

INDIAN ASSOCIATION OF PHYSICS TEACHERS

(Registered under Section XXI of Societies Act 1860, Regd. No. K 1448)

Membership Form

(PLEASE FILL IN CAPITAL LETTERS)

To,
Secretary IAPT
Regd. Office
Kanpur-208017

Date.....

Dear Sir,
I wish to join IAPT as a

1) Life Member 2) Annual Member 3) Student Member 4) Institutional Member 5) Library

I am remitting a fee of Rs.....through Cheque/DD/UTR No.....

dt..... of.....Bank.

Name : .....

Qualification.....Sex.....Age.....

Official Address

.....

.....

.....Town.....Pin.....

Mobile No.....**Email ID** .....

Mailing address (if different)

.....

.....

.....Town.....Pin.....

Mobile No.....**Email ID** .....

Sincerely yours

MEMBERSHIP & SUBSCRIPTION FEES

(i)	**Life Membership**		**:**	**Rs. 2000/=**	**(US $ 460)**
(ii)	**Annual :**	**Institutional**	**:**	**Rs. 10000/=**	**(US $ 3000) [Rs 25,000 for three years]**
		Library	**:**	**Rs. 500/=**	**(US $ 150)**
		Individual	**:**	**Rs. 250/=**	**(US $ 100)**
		Student	**:**	**Rs. 250/=**	**(2 Yrs.)**
		Single Copy	**:**	**Rs. 25/=**	

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IFSC Code : IDIB000K521
Bank Name : Indian Bank
Branch : Kakadeo, Kanpur

Sanjay Kr. Sharma
Secretary, IAPT
Regd. Office : Flat No. 206, Adarsh Complex,
Awas Vikas-1 Keshavpuram, Kalyanpur, Kanpur-208017
iaptknp@rediffmail.com, Mob. : 09415404969

The Story Of Cosmology Through Post Stamps 31

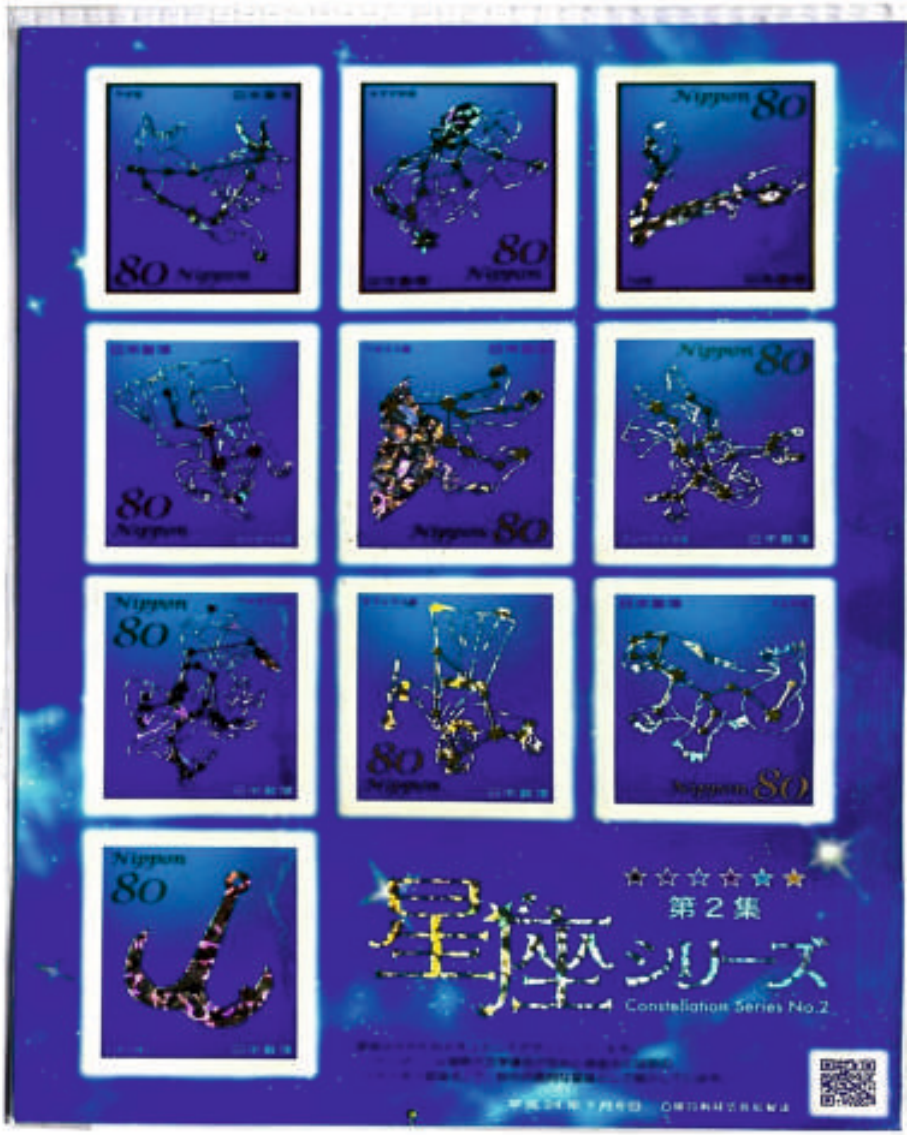
HUMAN EXPERIENCE OF THE SKY — *ASTERISM AND CONSTELLATION*

In observational astronomy Asterism is an informal but recognizable small group of stars that does not make one of the 88 complete constellations, recognized by IAU. Asterism often make use of bright stars in several constellations or part of single constellation described in term of well-known objects. Some of the asterism are- Winter Hexagon from Six constellations, The Plough, Spring and summer Triangle, The teapot of Sagittarius, The Big dipper of Ursa Major, the Great Square of Pegasus, the Sickle of Leo.

A sheetlet of 10 hologram /hot stamping stamps-

depicting some known sign of Constellation and Asterism with their prominent star – as seen in autumn

L-R: 1. Zodiac Constellation. Capricornus-
2. Zodiac Const. Aquarius- with Y shape Urn as an Asterism
3.Zodiac Constellation Pisces- with two celestial fishes-Venus & Cupid
4 Cassiopeia- consist a distinctive W Asterism formed by 5 bright stars,
5. Constellation. Pegasus- dominated by Asterism-Square of Pegasus.
6. Constellation. Andromeda-consist of neighbouring Andromeda Galaxy M31.
7.Asterism-Persesus-perseus et Caput Medusae
8.Conste. Cepheus- consist of hyper luminous Quasar with a Blackhole in Core.
9.Asterim Cetus-Sea Monster
10. Asterism- Anchor-Ikariboshi



A block -depicting modern view of personality traits associated with some Zodiac sign as describe in astrology

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FOUNDED BY (LATE) DR. D.P. KHANDELWAL

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