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Dr. D.P. KHANDELWAL - Founder of IAPT
(1.10.1921 - 12.2.1996)

Remembered by IAPT fraternity on the 24th Anniversary of his journey to heavenly abode

PHYSICS NEWS

Scientists accurately measure the probability of electron capture by the neon-20 isotope nuclei for the first time

A large international team of researchers has empirically measured the probability of electron capture by the neon-20 isotope (^{20}Ne) for the first time. The team has published two papers in the journal *Physical Review C* describing their achievement and explaining how their experiments pertain to the decay of intermediate-sized stars. Prior research has shown that at the end of their life, small stars form white dwarfs before dropping their outer layers. And large stars end with a supernova burst, resulting in the formation of a neutron star or black hole. How intermediate stars die has not been so well defined. Prior research has also shown that one of the defining factors that determines which way an intermediate star will die is the rate of electron capture by ^{20}Ne and, as a result, the rate at which fluorine-20 (^{20}F) appears. But until now, the probability of transition by such nuclei had not been accurately measured in a laboratory experiment. In this new effort, the researchers have done just that. The experiments were carried out at the JYFL Accelerator Laboratory in Finland. There, the researchers bombarded a carbon foil with ^{20}F nuclei, forcing them to become embedded in the foil—they then measured the radioactive decay. Next, they calculated the probability of a transition. They report that they found 0.00041 percent of ^{20}F nuclei decayed to ^{20}Ne^{0+}. ***Read more at***: https://phys.org/news/2020-01-scientists-accurately-probability-electron-capture.html

Original paper : *Physical Review Letters (2019).* DOI: 10.1103/PhysRevLett.123.262701

Spider-Man-style robotic graspers defy gravity

Specially designed vacuum suction units allow humans to climb walls. Scientists have developed a suction unit that can be used on rough surfaces, no matter how textured, and that has applications in the development of climbing robots and robotic arms with grasping capabilities. Researchers Xin Li and Kaige Shi developed a zero-pressure difference (ZPD) method to enhance the development of vacuum suction units. Their method overcame leakage limitations by using a high-speed rotating water ring between the surface and suction cup to maintain the vacuum. "There are many applications of our design, but we think the wall-climbing robot will be the most useful," said Li. "Compared to other wall-climbing robots, the robot with our ZPD-based suction unit achieves surprising improvement in performance". The centrifugal force of the rotating water eliminates the pressure difference at the boundary of the vacuum zone to prevent vacuum leakage. It can maintain a high vacuum pressure inside the suction cup.

Read more at: https://phys.org/news/2020-01-spider-man-style-robotic-graspers-defy-gravity.html

Original paper: *Physics of Fluids (2020).* DOI: 10.1063/1.5129958

AlphaZero learns to rule the quantum world

The chess world was amazed when the computer algorithm AlphaZero learned, after just four hours on its own, to beat the best chess programs built on human expertise. Now a research group at Aarhus University in Denmark has used the very same algorithm to control a quantum computer. This research group under the direction of Professor Jacob Sherson has just used the computer algorithm AlphaZero to learn to control a quantum system.The research group at Aarhus University has, via computer simulations, demonstrated the broad applicability by applying AlphaZero on three different control problems that could each potentially be used in a quantum computer. The team was very impressed with AlphaZero's ability to learn, as the lead Ph.D. student Mogens Dalgaard described: "When we analyzed the data from AlphaZero we saw that the algorithm had learned to exploit an underlying symmetry of the problem that we did not originally consider. That was an amazing experience. "

Read more at:https://phys.org/news/2020-01-alphazero-quantum-world.html

Original paper: *Quantum Information (2020).* DOI: 10.1038/s41534-019-0241-0

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BULLETIN OF INDIAN ASSOCIATION OF PHYSICS TEACHERS (ISSN 2277-8950)

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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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H.C. Verma awarded Padma Shri

Congratulations to Professor H.C. Verma, Vice-President of IAPT and former Professor of IIT, Kanpur on being honoured with Padma Shri Award for his contribution to Physics Education. It is truly a great accolade for a dedicated teacher. Our IAPT and the entire fraternity of Physics teachers in India has a reason to be excited and happy at this honour being conferred on him. IAPT is proud of having him as the Vice President.

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.

From the President's desk...

We should celebrate success and acknowledge hard work. My January good wishes to IAPT fraternity also carried with it a lament that there is low participation in several of our all-India initiatives. This invited a number of comments from readers that I have ignored the many emphatically positive achievements of IAPT. At the very least these comments signal the fact that people are indeed reading the Bulletin so the complaint which our editor Prof. Kushwaha had in this matter, will now be a trifle less acute.

The participation in NAEST and NANI has grown several folds over the last decade. It now numbers in the tens of thousands. The Anveshikas are vibrant centers with a large number of teachers participating in discussions on physics and scientific topics as well as in grooming the next generation. The NGPE exams have likewise seen a remarkable rise in participation and number close to ten thousand. Every year it has been followed with further training of selected UG students in camps. I recently returned from the camp at BITS Goa and it was an exhilarating experience. Not to forget the National Student Symposium (NSSP) organized annually in Chandigarh for the last several years and which has seen enthusiastic participation by students nationally. These two are in the crucial undergraduate sector. Besides, as reported in the last EC meeting, several RCs registered a very good participation of students at the regional level essay competitions in 2019. The NSE this year saw a participation of two-hundred-thousand students from all corners of the nation. As we perhaps know these exams lead to the international Olympiads, all the students who return from these international events come back with medals. This year all six school students in the Junior Science Olympiad came back with six gold medals putting India at number one in the world at the high school level. These students were guided by IAPT teachers. Our best students in Junior Science and Physics stand shoulder to shoulder with the very best in the world and IAPT has played a major role in establishing this. The Asian Physics Olympiad is an IAPT managed affair and we have discharged our duties credibly here too.

At the regional level we have several centers active – Midnapore, Indore, Jaipur and many others. I deeply apologize if I do not mention them all by name; it would take several pages. A large number of workshops/symposia for students and teachers are held monthly in all parts of the nation. There are only sporadic reports about this in the Bulletin and we do not hear about them. It may be mentioned that at the EC meeting in October 2019 we reversed the order of the agenda and heard the regional council representatives first as an acknowledgement of the significant work done by this silent majority.

Finally, criticism is always welcome as it helps us to strive, to struggle and not be complacent.

Vijay A Singh
President IAPT

Article

Why the oceans are blue and so are the distant hills

D. Syam

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Abstract

Blue colour of distant hills and the various shades of blue of the oceans are well known colours of nature. In this article we have tried to explain how these colours arise through scattering of sunlight. The correct explanation for the blue colour of large and fairly deep bodies of water was provided by Prof. C. V. Raman.

Introduction

Clear blue sky, blue oceans and distant blue hills convey to us a feeling about the vastness of this world and a sense of freedom. Why clear sky is blue was explained by Lord Rayleigh a long time ago [1]. However his assertion that oceans are blue because they reflect the blue light from the sky was proved incorrect by Prof. C. V. Raman. The apparent colour of a hill depends on its distance from the observer. Here, variation of intensity of scattered light with distance from the scatterer plays a crucial role. These issues are discussed in this article.

Blueness of oceans and deep lakes: Fig.1 and Fig. 2 provide vivid examples of blue water bodies.

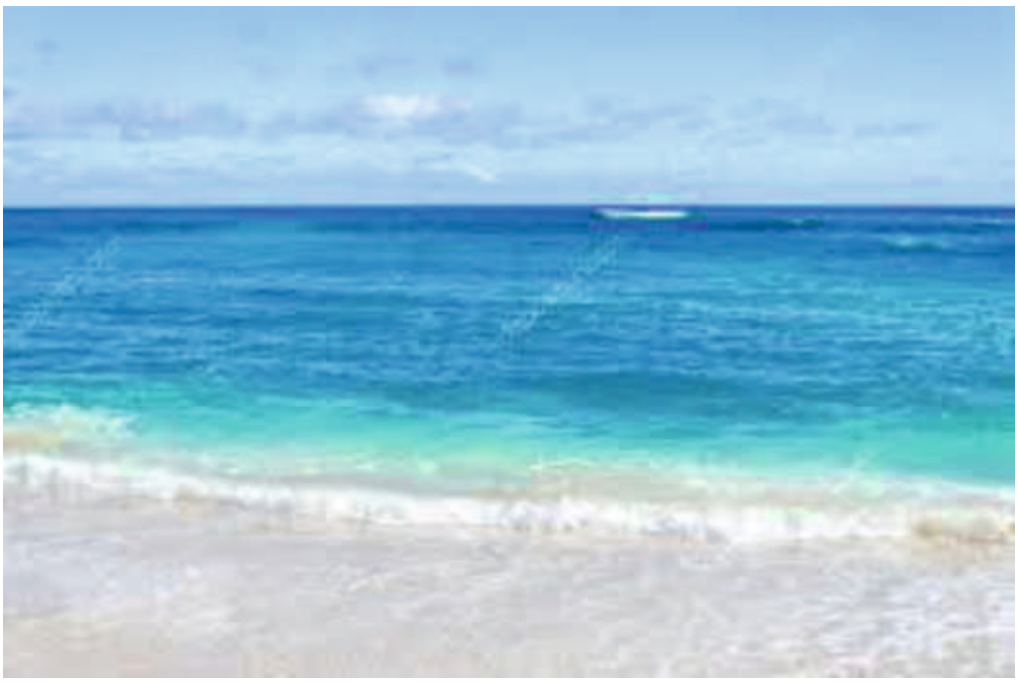

Fig. 1

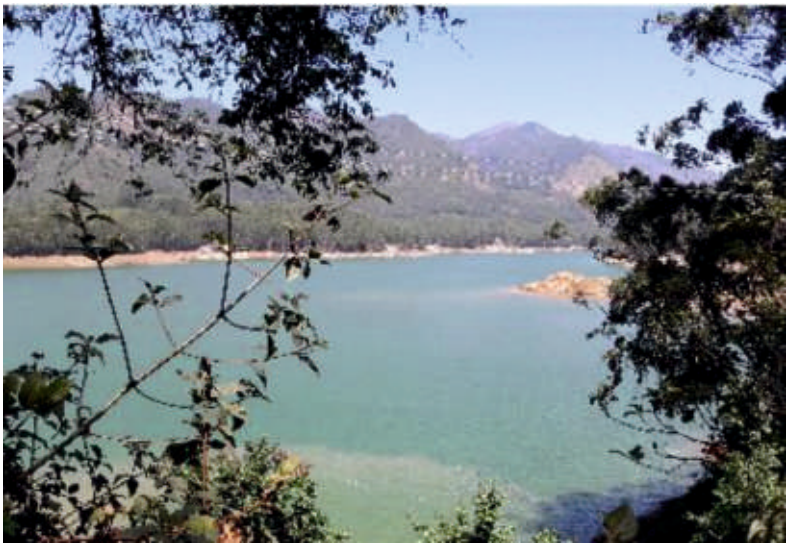

Fig. 2

How do they acquire their blue colours?

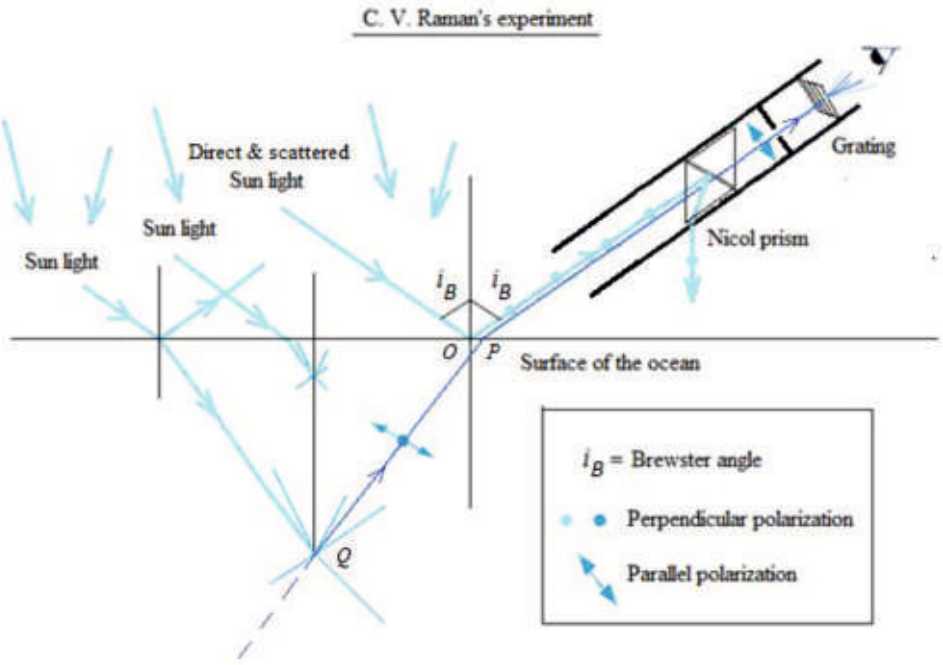

Fig. 3

In 1921, Prof. Raman returned from England to India by a ship. To pass time fruitfully, he carried with him a Nicol prism (mounted inside a tube), a diffraction grating and sundry other optical instruments. His primary intention was to verify, by direct observation, Lord Rayleigh's assertion that oceans are blue merely because they act as mirrors to the sky; consequently, the light they reflect (sunlight scattered by molecules of air) towards the observer is essentially in the 'blue' range of wavelengths.

Now, it is well known that when the angle of incidence of light (of wavelength, λ) on a transparent body equals the Brewster angle i_B (equal to $tan^{-1}n$, n being the refractive index for that wavelength), the reflected light is fully polarized (i.e. the electric field associated with reflected light is such that it is oriented) perpendicularly to the plane of incidence.

On the way, Prof. Raman sometimes took out his Nicol prism and the grating and went to the deck. He pointed the tube bearing the Nicol prism towards a patch of the sea that was relatively flat, making sure that the axis of the tube made an angle nearly equal to i_B (with the vertical direction) for 'sky-blue' colour of light. See Fig. 3. He hoped to extinguish the reflected light by rotating the prism by a suitable angle. If that could be achieved, Rayleigh's theory would have been confirmed. Prof. Raman discovered, to his surprise, that the Nicol prism was still passing a significant amount of blue light (obviously polarized in the plane defined by the axis of the tube and the vertical direction). Planting his grating behind the Nicol prism, he found that the transmitted beam comprised mainly of waves of shorter wavelength (i. e. deeper blue colour) than sky-blue light. So he concluded that the blue colour of the oceans (and of deep lakes) is mainly due to scattering of light by atoms and molecules located in those bodies of water [2, 3].

Blue colour of distant hills: In Fig. 4 we have shown a typical Himalayan landscape.

[Photo: Courtesy Dipak Roy]

Fig. 4

Clearly, in the above photograph, nearby hills appear to have a greenish hue, distant hills are bluish.

It must be realized that a distant hill only appears to have (i.e. as perceived by an observer, it seems to have) bluish colour. The same hill, seen from up close, will look very green if it is covered by trees.

To explain this apparent change of colour, it is necessary to compare the intensity of the scattered light received by the observer from the hill with the intensity of the scattered light reaching him from the sky along the same line of sight. Denoting the two intensities by I_{hill} and I_{sky} , we may write (taking into account Lord Rayleigh's famous formula relating scattering cross-section with wavelength λ viz. $\sigma(\lambda) \sim 1/\lambda^4$),

$$I_{sky} \propto \int_{\varepsilon}^{d} \frac{dr}{r^2} \cdot \int d\lambda \cdot \frac{k_{sky}}{\lambda^4} \cdot A(r,\lambda)$$

where r is the distance of a volume element of air along the line of sight. Here

$$A(r,\lambda) = e^{-\mu(\lambda)\cdot r},$$

$\mu(\lambda)$ being the attenuation coefficient of air and $\varepsilon(\sim 1.5\ cm)$ is the radius of the eyeball.

On the other hand, in view of the absorption characteristics of chlorophyll (which gives leaves their green colour) as shown in Fig. 6 [4], the intensity of the light reflected from a hill varies as

$$I_{hill} \propto \frac{1}{d^2} \cdot \int_{\lambda\approx 500\ nm}^{\lambda\approx 600\ nm} d\lambda \cdot \frac{k_{hill}}{\lambda^4} \cdot A(d,\lambda)$$

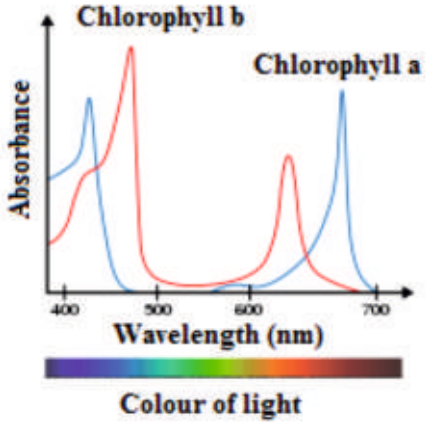

Fig. 6

In the above equations $k_{sky} = f(n_{air}, Z_{air}) \cdot I_\lambda$

where I_λ is the intensity of direct sunlight of wavelength λ; n_{air} is the number density of atoms of air and Z_{air} is their average atomic number. Note that I_λ depends on the time of the day and the latitude of the place.

Similarly $k_{hill} = f(n_{cll}, Z_{cll}) \cdot I_\lambda,$

n_{cll} being the number density of atoms of chlorophyll and Z_{cll} is their average atomic number. For relatively smaller distances, like d_1,

$$I_{hill} >> I_{sky} \quad (\text{as } k_{hill} \gg k_{sky})$$

and the hill appears to have green colour. See Fig. 5.

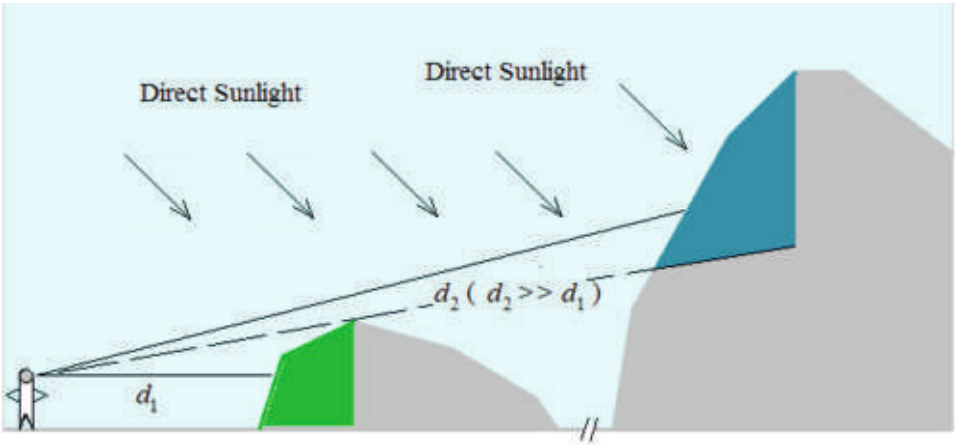

Fig. 5

But when d is large (like d_2), $I_{sky} >> I_{hill}$

the blue light scattered by the intervening layer of air ('sky') masks the green light from the hill; so the hill seems to have blue colour.

[Incidentally, in Fig. 3, the intensity of the light reaching the eye (at a distance d from P) after scattering from atoms in the ocean is given by

$$I_{ocean} \propto [\int \left\{ \int_0^{\infty} \frac{1}{(r+nd)^2} \cdot k_{ocean}(r\sin i_B, \lambda) \cdot e^{-\mu_{ocean}(\lambda)\cdot r} dr \right\} \cdot \frac{\cos i_B}{n\sqrt{n^2 - \sin^2 i_B}} \cdot (1-\rho_\lambda) \cdot A(d,\lambda) d\lambda]$$

where r is the distance of the scatterer (measured from P) along the line PQ and $n(=n(\lambda))$ is the air-to - water refractive index for light of wavelength λ. Also

$$k_{ocean}(r\sin i_B, \lambda) = I_{Sc}(r\sin i_B) \cdot \int g(\lambda, \lambda') d\lambda',$$

I_{Sc} $(r\sin i_B)$ being the intensity of scattered sunlight at the depth $r\sin i_B$ and $g(\lambda, \lambda')$, with λ' standing for the wavelength of the incident light, takes care of Rayleigh scattering, coherent scattering from small clusters of water molecules as well as the appearance of Stokes and anti-Stokes lines (Raman effect) in the scattering process. The quantity represented by ρ_λ is the reflection coefficient, at the air-water interface, for light of wavelength λ and polarization parallel to the plane of incidence. Recall that i_B is the Brewster angle for light of sky-blue colour.]

Concluding remarks:

Blue colour of distant hills and the various shades of blue of the oceans are well known colours of nature. In this article we have tried to explain how these colours arise through scattering of sunlight, though the mechanisms in the two cases differ in details. It is worth reiterating that the correct explanation for the blue colour of large and fairly deep bodies of water was provided, in 1921, by Prof. C. V. Raman.

References:

1. F. A. Jenkins and F. E. White, Fundamentals of Optics (McGraw-Hill Book Co.)
2. C. V. Raman, The Colour of the Sea, Nature (London), 108 (1921) p 367
3. G. Vekataraman, Raman and His Effect (Universities Press)
4. Adapted from: https://en.wikipedia.org/wiki/Chlorophyll

Article

Very Low Resistivity of a metal using an Instrumentation Amplifier

SarmisthaSahu* and Shravani Vijay Kale**
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Award Winning Experiment of NCIEP 2019 (Senior group)

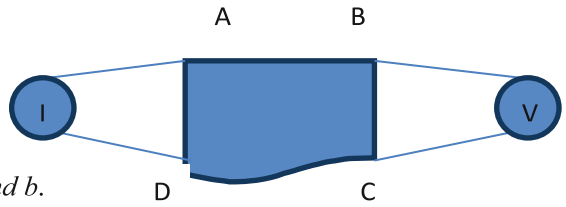
Abstract

Resistance - low, medium and high are determined by different methods. When it comes to determining very low resistance, it is a challenge. Errors creep in from the source, measuring device and, of course, the regular experimental error. Sometimes the error is so large that the order of the resistivity is badly missed. Here we have been able to overcome the problems by constructing a considerably good amplifier to circumvent the challenges posed by the measuring device. A very difficult approach like the van der Pauw is negotiated well to complete the measurements easily, measure current and voltage accurately of a thin metallic sheet, and you will be able to determine a very low resistivity. The second challenge was to calculate resistivity using a transcendental equation! But, even that became a child's play by contemplating on it. This was solved by a simple numerical method.

Aim: To determine the resistivity of metal (10^{-6} to 10^{-8} Ωm) in an Undergraduate and Pre-University laboratory without sophisticated instruments.

Van der Pauw[1] approach for determining the resistivity:

The sample in the form of a thin sheet should be homogenous, isotropic medium without any hole. With four probes on the sharp defined periphery of the sheet (2D), current is forced through one pair of probes A and B while voltage is measured in the other pair C and D, adjoining to each other. The ration V/I gives the resistance related to the surface Resistivity of the material. Now, if B and D are interchanged and current is now forced through AD and voltage is measured across CB, this voltage is called the Hall voltage (as it is the same voltage when a Magnetic field is applied in a perpendicular direction to the plane of the sheet).Fig.1



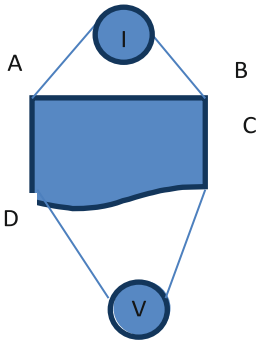


Fig. 1a and b.

Theory: For current entering through A, current density at a distance *r is*

$$J_+ = \frac{I}{\pi r} = \sigma_s E \text{ where } \sigma_s \text{ is the conductivity}$$

$$E = \frac{I\rho_s}{\pi r} \text{ where } \rho_s \text{ is the surface resistivity of the material.}$$

$$\text{At a reference point } r_0 \text{ where potential is zero}$$

$$V_+(r) - V(r_0) = -\int_{r_0}^{r} E.dr = -\frac{I\rho_s}{\pi} \ln\left(\frac{r}{r_0}\right)$$

$$V_+(r_D) - V_+(r_C) = -\frac{I\rho_s}{\pi} \ln\left(\frac{r_D}{r_C}\right) = V_{DC}^+$$

And the current flowing out from the sheet at point B has a contribution

$$J_- = -\frac{I}{\pi r} = -\sigma_s E$$

$$V_{-}(r) - V(r_0) = -\int_{r}^{r_0} E.dr = +\frac{I\rho_s}{\pi}\ln\left(\frac{r}{r_0}\right)$$

$$V_{-}(r'_D) - V_{-}(r'_C) = +\frac{I\rho_s}{\pi}\ln\left(\frac{r'_D}{r'_C}\right) = V^{-}_{DC}$$

$$R_{AB,CD} = \frac{V^{+}_{CD} + V^{-}_{CD}}{I}$$

and after interchanging B and D, we get

Hence the resistances is $R_{AD,CB} = \dfrac{V^{+}_{CB} + V^{-}_{CB}}{I}$ .....(I)

On solving we get

$$e^{-\frac{\pi t R_{AB,CD}}{\rho\rho}} + e^{-\frac{\pi\ tR_{AD,CB}}{}} = 1$$

This equation applies to any arbitrary shaped sample where ρ is the bulk resistivity and *t* the thickness of the sheet. Van der Pauw found the solution by ***integral conformal electronics***[3].

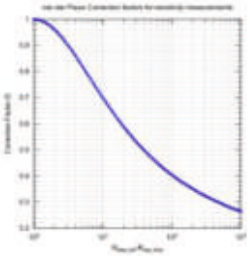
This transcendental equation cannot be solved algebraically. But for symmetrical shapes (like a square) the resistances are same, so the equation can be simplified to give

$$\rho = \frac{\pi R}{\ln 2} t = 4.53Rt \text{ .....(II)}$$

For other geometrical shape samples, a correction factor *f*, dependent on the aspect ratio *L*/*w*is included in the formula as shown,

$$\rho = \frac{\pi}{\ln 2}\left[\frac{R_{AB,CD} + R_{AD,CB}}{2}\right] t\, f \qquad \text{.....(III)}$$

where f is the correction factor of the sample depending on the ratio of the resistances. f can be obtained from literature (*refer* Graph 1) [3]



Graph 1 Correction factor vs ratio of the resistances in both the orientations.[4]

The theory is complicated but surprisingly, the resistivity can be determined easily.

For a resistance (1D) of length *L* , area of cross section *A* and resistance *R*, resistivity is given by

$$\rho = \frac{RA}{L} \text{ ..... (IV)}$$

Calculation by Numerical Method [Innovation One]

The relation between the resistance and resistivity of the material is given by

$$exp^{-\frac{\pi t R_{AB,CD}}{\rho\rho}} = 1 - exp^{-\frac{\pi t R_{AD\,CB}}{\rho}} \quad \ldots\ldots\ldots(I)$$

where t is the thickness of the sheet, R the resistances in the two different orientation (refer Fig.1 a, b) and ρ is the resistivity of the material.

When the resistances are not equal, the equation cannot be solved analytically. A transcendental equation cannot be solved by separating ρ from the rest of the terms and substitution of the known terms. But a simple graphical method can be exploited to determine the resistivity.

Let LHS of the Equation (I) be y_1 and RHS be y_2. Plot y_1 versus ρ and y_2 versus ρ in proper units in the same sheet and note the intersection point. The point of intersection gives the resistivity of the material.

This method is used for determining the resistivity of all the shapes, irrespective of whether the resistances are equal or not as shown in the Graphs 2&3; method **(V).**

Experiment:

PART A :**Resistivity by Van der Pauw method**.

1. Cut thin sheets of Brass (homogenous, isotropic sample without any holes) into a square, a rectangle, an irregular shape.
2. Spot welded four wires on the edge of the pieces as shown in Figure 1.
3. Measure the thickness t of the sheet using a micrometer.

   (i) Square sheet
4. Connect a constant current source (of good stability) in the High current mode, to terminals AB.
5. Connect a micro-voltmeter[#] (of very high internal resistance) to CD.
6. Measure the current I_{AB} and the voltage V_{CD}. Change the current in steps of 20 mA and note the corresponding voltage and current for 6-8 pairs.
7. Calculated the ratio V_{CD}/I_{AB}. Call it $R_{AB,CD}$
8. Then, connect the constant current source to AD and the micro-voltmeter[#] to BC.
9. Measure 6-8 pairs of current –voltage, I_{AD} and V_{BC} as in Step 6.
10. Calculate the ratio Vc_B/I_{AD}. Call this $R_{AD,CB}$
11. Determine the resistivity of the material of the Square using Formula (II) using average R and (IV)
12. Repeated the steps 4 - 10 for (ii) **rectangle** and the (iii) **irregular** sheet.
13. Determine the resistivity of the material of the RECTANGLE using Formula (III)and (IV) .
14. Determine the resistivity of the material of the IRREGULAR piece using Formula (I) by numerical method[## (IV)].

Compared the average *Resistivity* with the standard value from the literature and was well within the range. The standard resistivity for brass is 6 to 9 μΩ cm. Note: The result obtained for steel sheet is even better (Not shown here).

Sample Observations:

Resistivity by Van der Pauw method

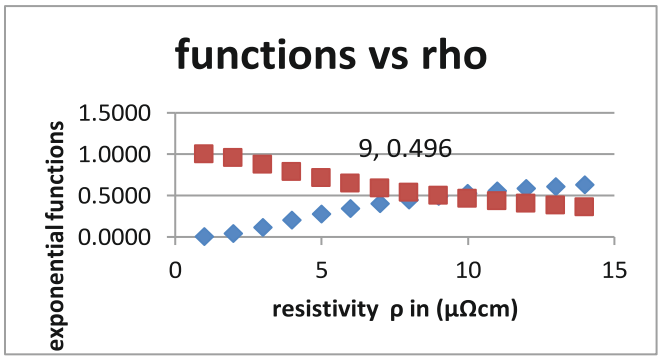
Square: thickness t= 54μm Current is in the HIGH Current Mode

I(mA) from CCS	V (mV) (in 200mV range)	V/I=$R_{AB,CD}$ Ω	I(mA) from CCS	V (mV) (in 200mV range)	V/I=$R_{AD,CB}$ Ω
96	3.1	0.03229	112	4.6	0.04107
111	4.9	0.04414	159	5.7	0.03585
159	6.0	0.03774	261	8.0	0.03065
203	7.2	0.03547	369	10.5	0.02846
260	8.3	0.03192	461	12.6	0.02733
363	10.6	0.02920			
460	12.7	0.02761			
		0.03405			**0.03267**
	$R_{AB,CD}$=	**379.01**	**μΩ** (corrected for the gain of the amplifier)	$R_{AD,CB}$=	**363.63**

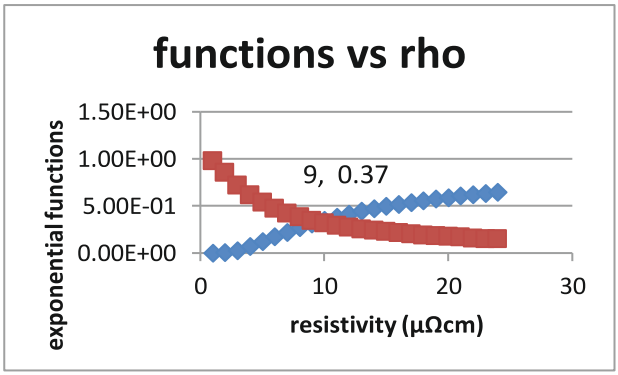
Resistivity ρ= 4.53 R_{avg} t = 9.08 μΩcm

Calculation by Numerical method for rectangular sheet

ρ μΩcm	exp(-π$R_{AB,CD}$*t/ρ)	1-exp(-π$R_{AD,CB}$*t/ρ)
1	0.0016	9.98E-01
2	0.0402	9.54E-01
3	0.1173	8.72E-01
4	0.2004	7.86E-01
5	0.2764	7.09E-01
6	0.3425	6.42E-01
7	0.3991	5.86E-01
8	0.4477	5.37E-01
9	0.4895	4.96E-01
10	0.5257	4.60E-01
11	0.5574	4.29E-01
12	0.5852	4.02E-01
13	0.6098	3.78E-01
14	0.6317	3.56E-01



Graph 2.Resistivity is 9 μΩcm for regular sheet.



Graph 3.Resistivity is 9 μΩcm for irregular sheet.

IRREGULAR SHAPE: thickness t= 50μm

I(mA) from CCS	V (mV (in 200mV range)	$R_{AB,CD}$ Ω	I(mA) from CCS	V (mV) (in 200mV range)	$R_{AD,BC}$ Ω
501	27.8	0.055489	513	9	0.017544
406	22.4	0.055172	409	7.5	0.018337
304	17.5	0.057566	305	6.1	0.020000
198	12.2	0.061616	205	4.7	0.022927
105	7.3	0.069524	107	3.3	0.030841
		0.059873			0.021930
	$R_{AB,CD}$ corrected	**666.38**	**μΩ**	**$R_{AD,BC}$ corrected**	**244.07**

ratio of the resistances =	2.92
correction factor f=	0.9
resistivity ρ=	π t ($R_{AB,CD}$ +$R_{AD,BC}$) f /2ln(2)

ρ = 9.2 μΩcm*(using correction factor, an approximate value)*

Results:

1. **Resistivity of brass by Van der Pauw method using the formulae is 9μΩcm**
2. **Resistivity of brass by Numerical method is 9μΩcm**

[Innovation Two] and Modification in the Experiment:

A good quality micro-voltmeter is not available in a UG lab. And the cost is fairly high.
We have constructed a circuit using AD 620 to amplify the input volt 89.8 times, so the output voltage is in millivolts (*mV* can be measured with a good quality milli-voltmeter).

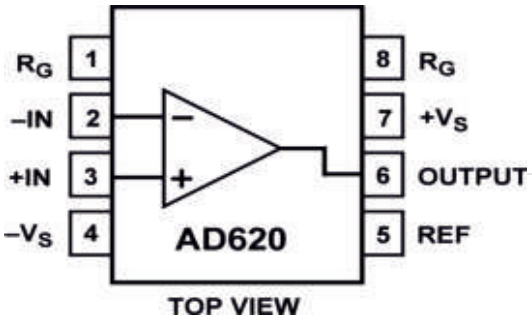
Instrumentation Amplifier: AD620 [2]

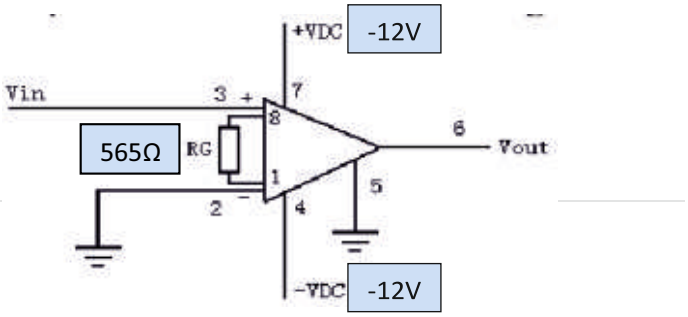
The AD620 is a low cost, high accuracy instrumentation amplifier that requires only one external resistor to set gains of 1 to 10,000. Furthermore, the AD620 features 8-lead SOIC and DIP packaging that is smaller than discrete designs and offers lower power (only 1.3 mA max supply current), making it a good fit for battery-powered, portable (or remote) applications.

The AD620, with its high accuracy of 40 ppm maximum nonlinearity, low offset voltage of 50 μVmax, and offset drift of 0.6 μV/°C max, is ideal for use in precision data acquisition systems, such as weigh scales and transducer interfaces. Furthermore, the low noise, low input bias current, and low power of the AD620 make it well suited for medical applications, such as ECG and noninvasive blood pressure monitors.

The low input bias current of 1.0 nA max is made possible with the use of Superβeta processing in the input stage. The AD620 works well as a preamplifier due to its low input voltage noise of 9 nV/√Hz at 1 kHz, 0.28 μV p-p in the 0.1 Hz to 10 Hz band, and 0.1 pA/√Hz input current noise. Also, the AD620 is well suited for multiplexed applications with its settling time of 15 μs to 0.01%, and its cost is low enough to enable designs with one in-amp per channel.

Connection diagram:





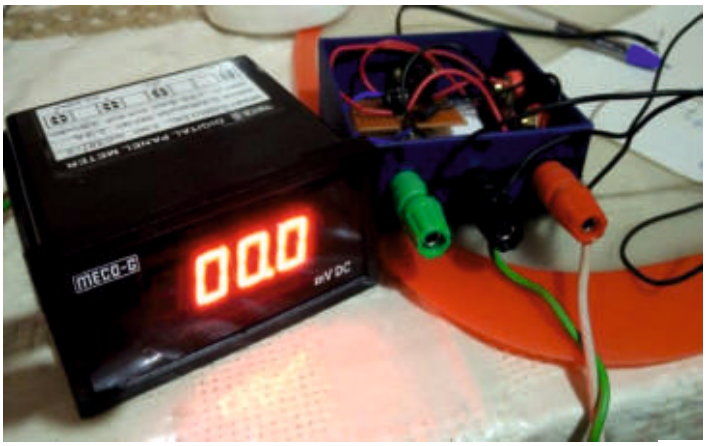
In our case, R_G =556 Ω and is connected to 1 and 8 pins. Input is given to 2 and 3 (the voltage that we need to measure in the experiment) .Output (pin no 6) is connected to a *mV* (range 200.0) and reads the amplified voltage in *mV*.

Of course, the pins 2 and 5 are grounded, and form the return path of the bias current. Ground returns for input Bias Current with thermocouple Inputs too.

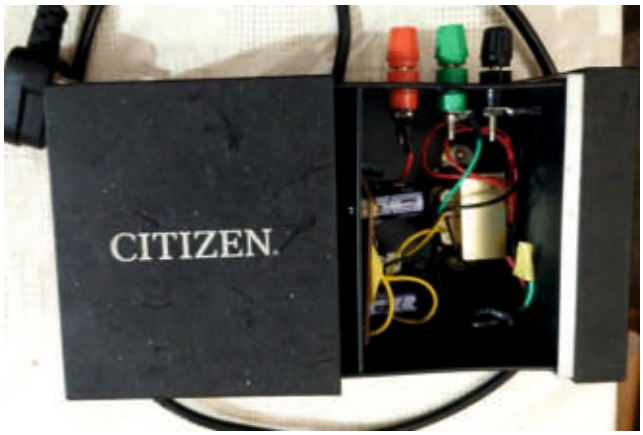
The **gain** is $$gain = \frac{4.94K\Omega}{R_G} + 1 \quad \text{.....(VI)}$$

$$gain = \frac{4.94e3}{556} + 1 = 89.8$$

The MECO-G brand mV is connected to the output pin no 6 and ground.



Instrumentation Amplifier (Our[#] micro voltmeter)



Dual Supply made by us and mounted in discarded boxes.

Figure 3.

After constructing the instrumentation amplifier on board,
calibration was done for different R_G to ascertain the gain. A satisfactory result (annexure attached) was obtained after connecting the bias pathway. Then, it was enclosed in a box with proper connectors for the V_{CC}, Input and the Output as shown in the picture. The ±12 V Dual Power Supply used for Vcc was also made by us.

Conclusion: This unit was very useful for measuring ***small*** outputs fairly accurately.
[#]This unit consisting of the Instrumentation-amplifier and the milli-Voltmeter, is our **micro-voltmeter** with sensitivity of 40 ppm.

The voltage required is given by $$V(required\ in\ \mu V) = \frac{Vmeasured\ in\ mV * 1000}{gain} \quad \text{.....(VII)}$$

Reference:1. https://youtu.be/nJeL7IeN80E
2. [Analog-Devices Rev.GPg 1 of 20]
3. Experiments in Physics, R Srinivasan, KR Priolkar, TG Ramesh
4. juluribk.com › 2012/01/08 › van-der-pauw-correction-factor

Workshops on Experimental Physics

Workshop-1

Date: December 12, 2019

Organized By:

Department of Physics, St. Wilfred College for Girls,Jaipur

No of participants:

3 teachers, 40 students of B Sc. - M Sc.

Resource Persons:

Prof. Y K Vijay (President IAPT RC-06**)**, Centre for innovation in Science Teaching, IIS University, Jaipur

Dr. Minal Bafna (EC member RC-06**),** Agrawal P G College, Jaipur

Department of Physics, St Wilfred College for Girls organized one-day workshop on "Innovative Enhanced Learning of Physics" on 12 December, 2019. Principal of the College, welcomed the resource persons. The Head of department, Dr Rashmi Saxena, explained the significance of such workshops in understanding the basic concepts of physics.

Prof Y K Vijay demonstrated and explained certain experiments of quantum physics through a low cost fabricated simple pendulum and magnet. He explained certain aspects of light using a laser beam. Dr Minal Bafna distributed sets of simple experiments to the students, arranged in a group of 3/4 each. She explained the theory and required circuits for each of the experiment. She assisted the students to make proper circuit and perform the experiments. The experiments performed were –(i) Study of R-L, R-C, LCR circuits using ac power supply (ii) Study of resistance of bulbs of different wattage connected in series and parallel combinations and estimation of their temperature (iii) Study of thermal conductivity using soldering iron (vi) Variation of current with resistance of bulb filament. (v) Doppler effect (vi) Coupled Oscillations (vii) Damped Oscillations. Each group was made to present their findings and analyse the results obtained and clarify their doubts and difficulties. The workshop ended with a photo-session of all participants and a vote of thanks proposed by Dr. Narendra Agrawal of the host college.

Workshop-2

Date: November 19, 2019

Organized By:

Department of Physics, G B Poddar College, Nawalgarh

No of participants:

4 teachers, 100 students of B.Sc-M.Sc.

Resource person:

Prof. Y K Vijay , Dr. Minal Bafna, Dr. Ankit K. Gupta , Agrawal P G College, Jaipur

Workshop on **Innovative Experiments in Physics** started with the address by Dr. V S Shukla, Academic Director, who welcomed the resource persons.

Dr Vijay gave a power-point presentation on various low cost experiments, explaining the basics of typical phenomenon like Doppler effect, Alpha particle scattering experiments, barrier potential etc. After that five sets of five different low cost innovative experiments were distributed among students in a group. Each group comprised of four students. Dr Minal Bafna and Dr. Ankit Kumar Gupta explained to the students the procedure to perform the experiments. The experiments performed were (i) Study of R-L, R-C, LCR circuits using ac power supply (ii) Study of resistance, current and voltage of bulbs of different wattage connected in series and parallel combinations and estimation of their temperature (iii) Study of thermal conduction and Newton's law of cooling using soldering iron (iv) Study of magnetic interactions using annular ring magnets and (v) Variation of current with resistance of bulb filament. Dr. Bafna and Dr. Gupta helped and supervised the students in performing the experiments. Each group was made to present their findings and analyse the results obtained. The students were quite excited and eager to share and learn. The vote of thanks was proposed by Dr. Satyendra Singh, Principal of the host college. He appreciated the efforts taken by resource persons of IAPT in making Physics look simpler and attractive.

Workshop-3

Date: November 15, 2019

Organized By:

Department of Physics, Agrawal P. G. College, Jaipur

No of participants:

10 teachers, 52 students of B.Sc III yr of Agrawal P. G. College.

Resource person:

Prof. Y K Vijay

The workshop on "**Innovative Experiments in Physics – Fun and Learn"** started with Naman Mathur, the

coordinator of the workshop welcoming the resource person Dr. Y K Vijay, staff members and participants. Dr. Minal Bafna in her address threw light on simplicity of such experiments and their role in understanding the concepts of physics. The key theme of the workshop was innovative ideas for experiments conducted in undergraduate physics laboratories to enhance the comprehension and learning of Physics.

First session:- The resource person Dr Vijay initially gave a talk and demonstration of experiments on phenomenon based on light explaining interference, diffraction, dispersion and Tyndall effect; and then using simple, coupled and compound pendulum, he demonstrated the Doppler effect, Rutherford scattering experiment, barrier penetration, crystal defects, etc. After seeing these demonstrations, the students got quite enthralled and were eager to learn for themselves.

Second Session:- The students were made to perform the experiments by themselves in a group of 4 or 5. Two sets of six innovative experiments (already mentioned in earlier reports) were distributed among twelve groups of students supervised by a teacher of the department. The teachers assisted in taking observations and analyzing the experiments.

Third Session:- After the experiments were over, each group of students was asked to present and interact about their work, the difficulties they faced and analysis of the results they obtained. This was the most interactive part and all their querries and doubts were clarified by Dr. Vijay.

In the end Dr. Minal Bafna proposed the vote of thanks. Dr. Vijay's efforts were well appreciated and applauded by everyone. Students filled the feedback forms wherein they asked for further such workshops.

Minal Bafna
Co-ordinator

34th Annual IAPT Convention-2019 & National Seminar
On
Recent Advances & Innovations in Physics Teaching & Research
IIIT Allahabad, Prayagraj, U.P.-211015

The 34th Annual IAPT Convention-2019 was organized at Indian Institute of Information Technology Allahabad, Prayagraj jointly by the Department of Applied Sciences, IIIT Allahabad and IAPT, from 13th to 15th October, 2019. The central theme of the convention was: "**Innovations in Physics Teaching and Physics Education Research**" and the sub-themes were: Use of information technology in physics teaching, Online physics teaching and learning, Physics teaching through simulation, Research for UG and PG students, Designing laboratory experiments for different levels, Teaching physics through assignments, Blended mode of learning and flip classroom, Evaluation method for school and college level, innovative methods for teaching physics, history of physics integrated into classroom teaching, inclusivity in physics teaching (gender, under privileged, differently abled etc.). Approximately 250 delegates registered for the convention. On the zeroth day of the convention, i.e., on 12th October, 2019, National Executive Council Meeting of the central body of the IAPT was held in the Auditorium Hall, Admin Building of the IIITA.

The Day-1: 13th October, 2019

The inauguration of the Convention saw the presence of former cabinet minister and physics professor (Dr.) Murli Manohar Joshi along with the President, IAPT Prof. Vijay A. Singh and the General Secretary, IAPT Prof. K. N. Joshipura. The convener, Dr. Akhilesh Tiwari, introduced the dignitaries, and welcomed all the guests present. He briefly introduced the IAPT programme and the schedule for the annual convention. Prof. Joshipura threw light on the history and the purpose of holding annual convention. He said, "IAPT is a grass root organization and a movement for upgrading physics pedagogy and physics teachers through various program and activities throughout the year." IAPT started in a modest way but today it is an expanding universe. He also highlighted the different exams associated with IAPT and the process that leads the students from a voluntary examination to the International Olympiads.

Prof. P. Nagabhushan, Director, IIIT Allahabad, spoke about the demerits of the Indian education system, where students study merely for passing the competitive examinations. His prime focus was on why students are being taught only a few subjects, so rigorously when the teaching and understanding both are just for the sake of admission into an engineering institute.

Dr. Vijay A. Singh focused his speech on the importance of the city of Allahabad. He said, "Allahabad is a place where even a parrot writes poetry". He introduced the audience with the prominent names associated with the city of Allahabad such as Chandra shekhar Azad, Surya kant Tripathi Nirala, Harivansh Rai Bachchan and several more.

The chief guest Dr.Murli Manohar Joshi, highlighted the importance of Hindi Language and his observations towards the changing Indian culture, especially the youth. He shared his teaching experience and said that there was a time when his class used to be filled more than the capacity as he used to teach in Hindi. But today, this has taken a 180 degree turn and students tend more towards English speaking courses. Dr. Joshi talked about how every developed country used their own language to communicate, especially in science and mathematics and do not indulge in unnecessary foreign language obsession such as English in India. Throughout his talk, he shared his many life experiences and congratulated the institute for organizing the IAPT convention and wished for its success. He also felicitated Prof. S G Mishra, a doyen of science and science popularization and Prof. R N Kapoor, one of the founders of IAPT.

The second half session of the first day included the invited talks and oral presentations. The session was graced by three invited speakers Prof. P.C. Deshmukh, Prof. B.P. Tyagi and Dr. Punita Varma. Prof. P.C. Deshmukh talked on –'Get the most from the least whether classical or quantum mechanics.' He ended his speech by talking about current research involved in Quantum physics. Dr. Punita Varma talked about the journey of dealing with a range of levels of research, concentric circle methodology and layered methodology of research. She presented the work done by her and her students and spoke about the telescope and observational

aspects of the sky. Along with this, Dr. R. Balakrishnan also gave an interesting talk on –'Girls in Physics - Gender equality or inequality' by raising burning social questions such as why are girls in low number. He concluded by saying that there should not be any gender barriers in the education system. He also stressed on the fact that although the concepts and language of physics is difficult to follow but it is not impossible. Prof. B.P. Tyagi talked about the IAPT examinations which are held every year. He emphasized that physics education itself makes a subject for realization of nature. National Graduate Physics Examination (NGPE) is held by IAPT which aims at ability of critical analysis and how to tackle different problems in exams. The examination is voluntary. The examination is meant only for Students of BSc I, II, III year (Pass, Hons, and Integrated). The mode of examination is in multiple languages. He also talked about National Standard Examination (NSE) for different fields of science i.e. Physics, Chemistry, Biology. In the evening session Annual General Body Meeting (AGM) took place.

The Day-2: October, 14, 2019:

The second day of the IAPT convention 2019 started with the academic session 2. There were 5 Oral presentations. The session started with Prof. P. Venkataramaih talking about how to make physics teaching interesting by explaining discovery of X-ray and discovery of Neutron. He elaborated how these experiments happened accidently in a simple manner. He put into light the Rutherford Bakerian Lecture which tells that if a nucleus contains protons and a neutral particle of mass equivalent to proton then such particles will have remarkable properties. He also discussed the frustration of Nobel Laureate Fredric Joliot about the nuclear reactor during the 2nd world war. He spoke on the efforts of Leo Szilerd to establish the Manhattan project. He concluded with an interesting fact about Oppenheimer's stanza from Bhagwad Geeta during nuclear test in 2nd world war which influenced many other scientists. This was followed by Prof. P.C. Deshmukh, who spoke about the time delay in atomic dynamics. He emphasized on the bending of light by gravity, mass created gravity and gravity bends space-time. Prof. P.C. Deshmukh. Prof. Vijay A. Singh discussed the 'Physics and the city Mumbai' with a suggestion that we should write essays of physics even for our cities. He also demonstrated a very effective Moiré effect to distinguish between real and fake currency notes. Prof. Joshipura spoke on-'Lunar and Planetary Mission Investigations: Physics plays the fundamental role'. He explained how physics can play a crucial role in estimating water on moon at different places.

Dr. Udachan, Prof Sarmistha Sahu, Kalpana Awasthi, Dr. V.S. Santhala and Dr. Satendra Kumar presented their Oral talks. The Oral talks were chaired by Prof. B.P. Tyagi and Rajesh Srivastava. Dr. Amit Kumar Jana demonstrated the fundamental experiments of physics like reflection, diffraction using the household things. He continued to show the dependence of the buoyancy force in a new experiment using a bottle and a ball. Dr Jana was succeeded by Dr Shirish Pathare, Dr. Achintya pal and Dr. Anwesh Majumdar. The session ended by the Poster presentations given by participants and experiments showed by B. Tech students. Students presented various experiments on demonstration of pendulum experiment and tesla coil etc. The evaluation committee Dr. Sanjai Singh, Prof. S.K. joshi and Dr. Satendra Kumar interacted with all poster presenters and evaluated them on their research and teaching skills.

The Day-3: October, 15, 2019

The 3rd and the last day of the Convention 2019 was equally exciting. The first session had two invited talks and four oral presentations. In a parallel session Prof. H. C. Varma also delivered a talk and demonstrated multiple experiments to students and teachers. Prof. Venkataramaih and Prof. Rajesh Srivastava awarded medals to the winners of the various compititions. The event coordinator for essay competition, Prof. S.K. Joshi gave a summary of the entries. There were 6 entries in the teachers' category and 30 entries in students' category. In the teacher category award was given to Mahendra Khandpekar from B.K. Birla College, Mumbai, G.S. Menaria from St. Teresa's Sr. Sec. School, Jaipur and Mihir Pal from Ram Thakur College, Tripura. In the student category, the award was won by Adnan A. Vahora, Swati Sharma, Neel Vadodaria, Amitabha Dey and Nisarg A. Rawal.

Award session was succeeded by Dr. Michael Ponnambalam's invited talk. He gave tips on how to put fire into your teaching. He emphasized on the idea that 'We want to see Indian become superpower before we die

and physics should play its crucial role.' He said that, “It is important to increase the quality of teachers and students by active interactive teaching. Physics is not transfer of knowledge, it is interaction.” He added that “Teaching is not one-man show.” He concluded by elaborating on why many people don't get success in teaching. According to him, “Teaching is a vocation, mission, and passion, and is carried forward by parental care.”

Vandita Srivastava took over the stage for starting the oral presentation as a first speaker. She discussed the status of higher education in India. According to All India Survey on higher education report of 2018-19, there are 993 universities in India. She provided the statistics of physics enrolment in UG and PG in universities. She concluded by speaking on -Measures to increase retention rate in Physics. She also emphasized on Physics education through ICT (Information Communication technologies) application opportunities. The next speaker Prasanth P talked about the 'Equipartition Theorem for Periodic to Chaotic Oscillator'. He emphasized on the simple harmonic oscillator to Duffing oscillator, a second order non-linear differential equation. Dr. Abhijit Poddar discussed about the Integrating simulations in topic-specific learning management systems in electronics. The applications not only contain all the relevant theory which can be accessed dynamically but also enable one to perform virtual simulations of the related laboratory experiment. The simulations have been integrated into the application judiciously so as to visualize the data, graphs and also the related theory at the same time on the same screen. The first session ended with the talk by Sarbjit Datta on the “Waveform analysis of the bouncing ball problem”. He estimated the velocity of ball after 'n'

Dignitaries on dais during Inauguration

Prof. R. N. Kapoor, felicitated by Dr. Joshi

Prof. S. G. Mishra, felicitated by Dr. Joshi

Dr. Joshi addressing the audience

Group Photo of participants of the Convention

collisions with the given surface and coefficient of restitution including the generation of noise before and after collision.

In the second session, the first speaker, Dr. Namrata Chandel talked about dielectric relaxation and thermally activated A.C. conduction in 3rd generation multi-component glasses. She mentioned several techniques of Synthesis of glasses and one of them is Melt quenching. She also mentioned the characterization of solids by XRD and DSC. She concluded her talk by mentioning correlated barrier hopping (CBH) model. Next, Dr. K. Subramanian discussed about "Visualizations in quantum mechanics". The presentation introduced the black-body radiation in a visual way. The basic question raised by the speaker was how to create "Visualizations". Particularly, speaker used the Matlab software for visualizing the black-body radiation. He also created the visualization of particle in a box problem by considering probability density and demonstrated the same for Rayleigh Jean's law and Planck's law. The next speaker Dr. M. S. Jogad talked about the Pb-Silicate Neutron diffraction data from Dhruva reactor experiment-structure factor correlation of atoms as an assignment. He talked about the preparation of glass using silicon and led putting at high temperature. He also discussed about how to convert data in real correlation function. The last speaker of the second session of the convention was Anil K. Singh. He talked about quantifying critical thinking in the teaching of physics. He stated that the thinking is the core of curriculum. He concluded his talk by defining two categories of thinking i.e. Red thinking which includes the higher order executive functioning, thinking that analyses and another one is Green thinking which includes instinctive, automatic and spontaneous thinking.

The 34th IAPT convention ended with the Valedictory function at the admin auditorium. The valedictory function was addressed by the president, Prof. Vijay A. Singh. Awards to the winners of different competitions, NAEST, NCCIP and NCIEP were given. G.Deepak group from IIIT-Allahabad, D. Usharani and Dr. Subramanian won prizes in poster presentation. Prof. H C Varma provided the statistics of NAEST held at different centers in different cities. He also presented IAPT Shilpa Nand Kumar Memorial Award at school level and college level. At school level, Pranav Prakash from Telangana, Shreyansh Ranjan from Bhopal and Aashi Mittal from Agra won the 1st, 2nd and 3rd prizes respectively. At college level, D. Sahi Mahatti from Hyderabad, Agamleen Singh and T. Meghna from Vijayvara won the respective prizes. The NCICP award was given to Suresh Parekh, Kumar Snehal Bataliyan and Bhavya Thacker. The NCIEP award was given to Faraz Mehndi from Mumbai, Avinash Jaiswal from Gandhinagar and Dr. Sarmistha Sahu. At the end, the general secretary Prof. K.N. Joshipura gave positive remarks and thanked everyone for coming. Convener of the convention Dr. Akhilesh Tiwari proposed the vote of thanks.

Speakers List

Date	Speaker Name	Affiliation	Topic of the Talk
13-10-2019	Prof. P.C. Deshmukh*	IIT Madras	Get the most from the least: whether classical or quantum mechanics
	Prof. B. P. Tyagi*	EC Member , IAPT	Keynote Speaker's Talk on IAPT Exams
	Dr.Punita Verma	Kalindi College, DU	IAPT DSM Award Speech
	Prof. K. N. Joshipura*	General Secretary, IAPT	Lunar and planetary mission investigations: Physics plays the fundamental role
	Thakur Prasad Yadav	Banaras Hindu University	Experimental demonstration: A visualize process for physics teaching
	Dr. R. Balakrishnan	Retired Professor	Girls in Physics - Gender equality or inequality
14-10-2019	Prof. P. Venkataramaih*	(1) Vice-Chancellor, Kuvempu University (2) Professor of Physics University of Mysore. (3) UGC Emeritus Fellow	Teaching Physics - How to make it attractive
	Prof Vijay A. Singh*	President, IAPT	Physics & the City of Mumbai
	Prof. P. C. Deshmukh*	IIT Madras	Time Delay in Atomic Dynamics
	Dr. Mukesh Jewariya*	CSIR NPL, New Delhi	Redefinition of International system (SI) Units
	Dr. Shirish Pathare*	Physics Olympiad Cell, Homi Bhabha Centre for Science Education	Physics Olympiad Experimental Program
	Dr.Achintya Pal*	Secretary,RC-15,IAPT	Innovative method of solution to celebrated Mice Problem
	Dr.Anwesh Majumdar*	HBCSE, TIFR	Towards a content-based epistemic measure in physics

	Dr. D. Sarala	St Anthony College For Women	Innovations in Physics Teaching
	Dr. L. A. Udachan	S.S Teqnoor Degree College	Innovative ways for Research at UG & PG Level
	Prof. SarmisthaSahu	Maharani Lakshmi Ammanni College	My Physics Teaching through Simulation
	Kalpana Awasthi	K.N.Govt.P.G.College,Gynpur,Bhadohi	Google Classroom: Interactive Teaching and Learning
14-10-2019	Dr. V.S. Santhala	Oxford College of Science, HSR layout Bengaluru	Online Physics Teaching and Learning
	Dr.Satendra Kumar	IIIT Una, Himachal Pradesh	विज्ञान-रस (A Poetic form of Fundamental Physics)
	Dr. Geetha R S	Vijaya College, Bangluru	Physics Experiments Using Smartphone with Sensors
	Dr. Amit Kumar Jana	RRMC, Kolkata	Role of hands-on demo experiments to promote physics teaching
	Dr. V.K. Saraswat	Gandhi Inter College Chhata	Marathon Numerical Achievement Test in Physics
	Bhanu Mani Dixit	Institute of Natural Sciences and Humanities, Shri Ramswaroop Memorial University, Barabanki 225003 U.P	Effective Assessment in Higher Education
	Dr. P Nagaraju	Indian Academy Degree College, Hennur Cross, Bengaluru	Designing low cost Experiments at the Undergraduate-level
	B. Siddlingeshwar	M S Ramaiah Institute of Technology, VidyaSoudha,MSRIT Post, Bengaluru	Computational Methods for Molecular Systems
	D. Usharani	MES College of Arts , Commerece and Science, Bengluru , Karnataka	Analyzing skills involved in solving problems based on graphical representations
	Prof. S. K. Joshi,	EC Member, Coordinator, IAPT	NCEWP (National Competition for Essay writing in Physics) Awards
	Dr. Michael*	University of West Indies	Tips for Putting Fire into Your Teaching

15-10-2019	Vandita Srivastava	Kanahiya Lal D.A.V. (P.G.) College, Roorkee	Retention Rates for Masters & Ph.D. Programmes and Role of ICT and UGR in Physics Education
	Prasanth P	Govt. Engineering College Thrissur	Equipartition Theorem for Periodic to Chaotic Oscillators
	Abhijit Poddar	Surendranath Evening College Kolkata	Integrating simulations in topic-specificLearning Management Systems in Electronics
15-10-2019	R. M. Shewale	Z.B. Patil College, Dhule	Evaluation methods at college level
	Sarbajit Dutta	St. Xavier's College Kolkata	Waveform Analysis of the Bouncing Ball Problem
	D. N. Bhosale	Yashvantran Chavan WaranaMahavidhyalay, Waranagar	Use of Blended Learning and Mobile Learning for Imparting Instructions in Physics at Under Graduate Level
	Dr.SwatantraKumar Gupta	RIMT Bareilly	Modelling of Translucent Concrete using Optical Fibers
	K. Subramanian	Retired Professor, Bangluru	Some Visualizations in Quantum Physics
	Girish Vekaria	Sir P T science College Modasa	Physics principles: The heart of athletics
	Abhijit P Sarode	Dr A.G.D.Bendale Girls College, Jalgaon	Role of Physics teacher in effective teaching in Colleges and Universities
	M S Jogad	Karnataka State Women's University Vijayapur	Pb-Silicate Neutron Diffraction data from Dhruva Reactor Experiment- Structure factor Correlation of atoms as an assignment
	Anil K Singh	Ewing Christian College Allahabad	Quantifying critical thinking in the teaching of Physics“Gendered action in the first-year students”

Note: The speaker’s names with an asterisk (*) are the Keynote INVITED Speakers.

More details about the talks and speakers can be downloaded from https://iapt2019.iiita.ac.in/34thIAPTConventionSouvenir&Abstractbooklet.pdf , the pre-conference proceedings of IAPT Convention-2019.

Akhilesh Tiwari
Convener

Workshop on Olympiad Level Experiments

Date: December 28- t30 2019
Timing: 10:00 am – 04:00 pm daily
Event: POLLEX VI
Venue: SGTB Khalsa College, Delhi University
Participants: 21 PGTs from 19 schools
Resource persons:
Dr Ravi Bhattacharjee, Dr Ogalapurkar, Pragya Nopany, Smita Fangaria

The POLLEX-VI – The Sixth Physics Olympiad Level Experiment or in other words a "Hands on Experiments with Olympiad Equipment", a Workshop was jointly organized by the IAPT APhO Cell and BVN-IAPT Anveshika. The "Hands on Experiments with Olympiad Equipment" are a follow-up to the robust APhO program. Under the expert guidanceof Dr Bhattacharjee & Dr Ogalapurkar, the teachers, working in teams, were exposed to higher order skills and experiments and introduced to various techniques required for good experimentation such as procedural understanding, handling of complex equipment, data acquisition, reporting, analysis and error estimation. The faculty was also made familiar with marking schemes that assess the multidimensional skills required for experiments.

The teachers enjoyed working on the special apparatus and appreciated the innovation in experiments. Many of them talked about how some parts of the experiments could be adopted in schools using the equipment available there.

Pragya Nopany
Coordinator
BVN-IAPT Anveshika, Delhi

Physics through experiments for high school students

Workshop-1

Date: December 27-28, 2019

Venue:

a) Government High School (co-education), Huzurabad, Karimnagar (Dist.)

b) Government High School (co-education), Krishna colony, Warangal (Dist.)

c) Vivekananda High School, Padmakshi temple, Hanamkonda

d) Govt. Residential Junior College for Girls, Hasanparthy, Warangal Rural (Dist.)

Target Participants:

High School and Junior college Students

Resource Person:

Mr. B. S. Achutha, VVS Sardar Patel PU college, Bengaluru

On the first day FN session, the programme was conducted at Government High School (co-education), Huzurabad, Karimnagar(Dist.) Dr. V.Rajeswar Rao, President RC-22 briefly introduced the activities of IAPT. About 100 students of 9th &10th class and 6 teachers attended the programme. Many experiments related to mechanics and light, pertaining to school level were demonstrated. These included concept of gravitation, Newton's laws of motion, simple harmonic motion, reflection, refraction and total internal reflection etc. In afternoon session same programme was conducted at Government High School (co-education), Krishna colony, Warangal (Dist.). About 150 students of 9th and 10th Class attended the programme. The students participated actively and interacted with the expert.

On the second day FN session, the programme was

conducted at Vivekananda High School, Hanamkonda. Mr. Achutha introduced the concepts of physics and demonstrated the experiments such as Newton's laws of motion, \simple harmonic motion, basic laws of light and demonstrated how different colours are obtained from primary colours. About 120 students of 9th & 10th class and 4 teachers attended the work shop.

In the afternoon session, the programme was conducted at Govt. Residential Junior College for Girls, Hasanparthy, Warangal Rural (Dist.). About 200 students of Intermediate I and II year attended the session. Dr. Rao briefly introduced the activities of IAPT. The experiments pertaining to 10+2 level were demonstrated

by Mr. Achutha. These included concept of gravitation, simple harmonic motion, conservation of angular momentum, forced vibrations and resonance, longitudinal waves, transverse waves, standing waves, Faraday's laws, Lenz's law etc. The students were very interactive.

S. Ravi Prasad Rao
Treasurer

Workshop-2

Topic: Microprocessor and its Applications

Date: 23-24 December, 2019

Venue: Kamala Institute of Technology & Science, Singapur, Huzurabad

Participants: Teachers:5, Students:23 of SRR Government Arts & Science College, Karimnagar, Telanagana State

Resource persons: Dr. B. Ramesh, Mr. U. Rajaiah and Mr. V. Vikram

IAPT(RC-22) in association with ECE Department of KITS College conducted a two day work shop on 'Microprocessor and its Applications' on 23rd -24th December, 2019.

On Day-1, after formal inauguration, Mr. V Vikram, Assistant Professor of ECE delivered two lectures on "Basics and architecture of 8086-Microprocessor" and "Pin-Diagram of 8086-microprocessor". In the afternoon session, there was a talk by Dr. B. Ramesh on Registers. He explained in detail various types of registers and how registers play a crucial role in the functioning of microprocessors and microcontrollers. Later he explained the programming of microprocessor. Mr. U Rajaiah, Asst Prof of ECE explained the execution of programmes and how to write operational code for a programme using Intel data code sheet. The participants learned how to operate 8086 microprocessors and tried to execute a few programmes.

On Day-2, in forenoon session, Mr. U. Rajaiah, Asst Prof of ECE explained the "Basics and Architecture of 8051 Microcontroller with the help of power point presentation and black board. In the afternoon session, laboratory sessions were conducted. Participants learnt to write and execute simple programmes on 8051 microcontrollers .The session ended with feedback from participants and vote of thanks.

A. Mahender Rao
Coordinator

Winter Camp in Physics and Astronomy

BITS- Pilani, KKB- Goa Campus

Date: December 19-22, 2019
Organised at: BITS Pilani (Goa Campus)

This winter camp, the IAPT-UGCP i.e. Indian Association of Physics Teachers – Undergraduate Camp in Physics, was jointly funded by Inter University Center for Astronomy and Astrophysics (IUCAA), Pune and Indian Association of Physics Teachers (IAPT), Kanpur and IAPT – Goa RC and BITS. It was primarily targeted towards undergraduate students pursuing their B Sc. in Physics. Students from among top 40 in the national level merit list of NGPE of Jan 2019 and students in the top 3rd or 4th rank from seven colleges in Goa were selected to attend this Camp. Forty two (42) students attended the Camp of which 16 were from all over India and 26 were from Colleges in Goa.

The Chief Guest, Prof. Ramesh Pai, former HOD, Physics Department ,Goa University and President (IAPT Goa RC) spoke about the activities of IAPT- Goa RC and how it encourages and supports such activities in Goa. Prof. Kandaswamy Subramaniam & Prof. Deepankar Bhattacharya, both resource persons from IUCAA and Prof. Arun V Kulkarni, Goa Coordinator and Professor of Physics at BITS Pilani, Goa Campus, laid out in detail the aims and objectives of the Camp which was to bring meritorious students in contact with active Physics and Astronomy researchers, teachers from Institutions Of Eminence. Prof. ES Kannan of BITS-Pilani KKB – Goa Campus proposed the Vote of thanks.
The resource persons covered wide variety of subjects in their lectures. Topics covered by the IUCAA resource persons included, Introductory Astronomy by Prof. Dipankar Bhattacharya, Fluid Dynamics and Magneto hydrodynamics in Astrophysics by Prof. Kandaswamy Subramaniam; and Relativity Theory and the Twin

Paradox by Prof. Aseem Paranjape. Topics covered by BITS faculty members included, Theory of Lasers by Prof. Prasad Naik, Quantum Measurement Theory by Prof. Radhika Vathsan. Method of Images in Electrostatics and Magneto-statics by Prof. Arun V Kulkarni and Atomic & Optical Physics by Prof. Raghunath Ratabole. The Director of BITS Pilani, Goa Campus, Prof. Raghurama G. offered useful career advice to the students.

In the Valedictory Function, Prof. Vijay Singh, the President of IAPT, the Chief Guest, awarded certificates to the participants. Ms. Malati Dessai, Assist. Professor of the Physics Department of Chowgule College, Margao, Goa proposed the Vote of Thanks.

Arun V. Kulkarni
Coordinator

Hands-on Physics workshop

Dated: January 20, 2020
Organized by: KIIT Anveshika, Bhubneshvar

One day Hands on Physics Workshop for B. Sc Physics (Hons.) students was held at KIIT IAPT Anveshika, KIIT International School, BBSR, which was inaugurated by Dr. Mona Lisa Bal Chair person of KIIT International School as chief guest. Mrs. Rinku Sarangi Vice Principal of KIIT International School as Guest of Honor. Prof. Sarmistha Sahu Coordinator of Ammanni IAPT Anveshika, Bangalore was the chief speaker & key resource person of the workshop. Dr. Mona Lisa Bal in her welcome address exhorted the students to be the path finders for others in the society. Mrs. Rinku Sarangi encouraged the participants to develop new strategies.
Selected forty students from different colleges & Universities participated in the workshop. The participants learnt hands-on working with spreadsheet, Potential 1D motion with functions, 2D motion (projectile) with numerical analysis, Corriolis force, centrifugal force, Quantum Harmonic Oscillator. Participants' feedback was very good. The workshop ended with vote of thanks by Mrs. Rajashree Mohapatra & certificates were distributed amongst the participants for their active participation.

Rajashree Mohapatra
Coordinator

To our readers

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The Managing Editor

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List of New Member from 01.01.2019 to 31.12.2019
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		DELHI		
13114	Deeksha Khere	New Delhi	L8165	110003
13161	Sudha Gulati	Delhi	L8209	110007
13167	Samit Kumar Mandal	Delhi	L8215	110007
13194	Kirti Ranjan	Delhi	L8241	110007
13195	Ashutosh Bhardwah	Delhi	L8242	110007
13196	Shashi Verma	Delhi	L8243	110007
13191	Mukesh Jewariya	New Delhi	L8238	110012
13164	Triranjita Srivastava	New Delhi	L8212	110018
13197	Namrata Agarwal	Delhi	L8244	110036
13269	Richa Sharma	Delhi	L8314	110042
13160	Seema Gupta	Delhi	L8208	110054
13216	Rachana kumar	New Delhi	L8263	110060
13081	Satyabrata Patnaik	New Delhi	L8135	110067
13158	Rachana kumar	New Delhi	L8206	11008
13162	Monika Bassi	Delhi	L8210	110085
13163	Savita Sharma	Delhi	L8211	110085
13166	Punita Verma	Delhi	L8214	110095
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13187	Neha Munjal	Faridabad	L8234	121001
13250	Ved Nath Jha	Faridabad	*1911	121002
13165	Ms Versha	Faridabad	L8213	121004
13036	Renuka Devi Kakarla	Faridabad	L8090	121010
12054	Shivani Kaushik	Gurugram	L8012	122001
13159	Pushpa Bindal	Gurugram	L8207	122009
13055	Sudhir Dahiya	Bahadurgarh	L8109	124507
		PUNJAB		
12058	Amrit Singh	Sri Anandpur Sahib	L8016	140118
13079	Shilpy Bhullar	SAS Nagar	L8133	140301
13082	Ashish Kapoor	Ludhiana	L8136	141001
13262	Mishu Gupta	Ludhiana	L8308	141001
13261	Charita Sharma	Ludhiana	L8307	141004
13260	Praveen Kumar Sharma	Ludhiana	L8306	141007
13263	Surbhi Sharma	Ludhiana	*1912	141008
13207	Sarbdeep Kaur Sidhu	Ludhiana	L8254	142026
12052	Sandeep Sharma	Amritsar	L8010	143005
12062	Mandeep Singh	Amritsar	L8019	143005
13204	Harleen Dahiya	Jalandhar	L8251	144011
12056	Raj Kumar Seth	Jalandhar	L8014	144012
12057	Sanjay Kumar Singh	Barnala	L8015	148101
13001	Kanika Aggarwal	Longowal	L8058	148106
13236	Mohit Kumar	Bareta	L8283‘	151501
12059	Bindra Kawaijeet Kaur	Malout	*1901	152107
13188	Uma Kamboj	Fazilka	L8235	152123
		CHANDIGARH		
13144	Mumtaz Oswal	Chandigarh	L8193	160030
13143	Vijay Sharma	Chandigarh	L8192	160036
13145	Karan Singh Vinayak	Chandigarh	L8194	160047
		HIMANCHAL PRADESH		
13021	Shiv Kumar Sharma	Solan	L8075	173211
13022	Raj Kumar Prashar	Solan	L8076	173211
13023	Rajni Sankhyan	Solan	L8077	173212
13019	Anant Vidya Nidhi	Solan	L8073	173213
13020	Pardeep Malhotra	Solan	L8074	173213
12084	Ram Murti	Una	L8041	174307
13271	Pawan Heera	Una	L8316	174308
13024	Dr. Kuldeep Kumar Sharma	Hamirpur	L8078	177005
13053	Dinesh Kumar	Kangra	L8107	177104
		JAMMU & KASHMIR		
13270	Ranjeet Kumar	Rajouri	L8315	185152
		UTTAR PRADESH & UTTARAKHAND		
13032	Omesh Bansal	Ghaziabad	L8086	201002
13063	Shambik Ghosh	Ghaziabad	L8117	201005
13126	Jyoti Parashar	Ghaziabad	L8177	201014

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13066	Manoj Kumar Sharma	Noida	L8120	201303
13252	Upasna Chandra	Greater Noida	L8299	201308
13178	Shrikant Verma	Etawah	L8225	206001
13150	Vipin Kumar Shukla	Kanpur	L8198	208004
13238	Bhupendra Singh Rathore	Fatehgarh	L8285	209601
12080	Gyanendra Kumar Yadav	Unnao	L8037	209861
13105	Dr. Rohit Kumar	Allahabad	L8158	211002
12095	Pramod Kumar	Prayagraj	L8052	211015
13189	Sanjai Singh	Prayagraj	L8236	211015
13217	Faizan Ahmad	Prayagraj	L8264	211015
13218	Shivani Saini	Prayagraj	L8265	211015
13219	Anup Srivastava	Prayagraj	L8266	211015
13220	Neelesh Gupta	Prayagraj	L8267	211015
13221	Ankit Singh	Prayagraj	L8268	211015
13222	Shailesh Kumar	Prayagraj	L8269	211015
13223	Sanjay Sharma	Prayagraj	L8270	211015
13224	Dinesh Kumar	Prayagraj	L8271	211015
13116	Manoj Kumar Vishwakarma	Varanasi	L8167	221405
13153	Umesh Chandra Srivastava	Mirzapur	L8201	231001
13171	Dr. Sanjeev	Bareilly	L8219	243006
12061	Shraddha Gupta	Budaun	L8018	243601
13206	Trilok Kumar Pathak	Dhampur	L8253	246761
13192	Rajesh Srivastava	Roorkee	L8239	247667
13016	Dr. Amit Kumar Sharma	Dehradun	L8070	248001
13033	Dr. Amita Raizada	Dehradun	L8087	248001
13034	Subhash Chander Virmani	Dehradun	L8088	248001
13049	Ms Twinkle	Dehradun	L8103	248001
13132	Pankaj Nautiyal	Dehradun	L8183	248001
13133	Keshab Sen	Dehradun	L8184	248001
13134	Dheeraj Dobhal	Dehradun	L8185	248001
13136	Priyanka Rawat	Dehradun	L8187	248001
13131	Sachin Sharma	Dehradun	L8182	248121
13208	Sandeep Singh	Dehradun	L8255	248171
13129	Sanjay Sajwan	Dehradun	L8180	248198
13035	Manoj Kumar Riyal	Tehri Garhwal	L8089	249199
13130	Peyush Sharma	Rishikesh	L8181	249201
13135	Prabhat Gupta	Rishikesh	L8186	249204
13251	Mukesh Kumar	Meerut	L8297	250004
13201	Alka Tyagi	Muzffar Nagar	L8248	251001
13202	Prabhat Kumar	Muzaffar Nagar	L8249	251001
13051	Sachin Kumar	Muzaffar Nagar	L8105	251318
13141	Anurag Tiwari	Pilibhit	L8191	262001
13014	Devlal Kamal	Nainital	L8068	263139
13071	Bhawani Shanker Kandpal	Bageshwar	L8125	263639
13256	Brijesh Kumar Pandey	Gorakhpur	L8302	273010
	RAJASTHAN			
13267	Jitendra Kumar Chawla	Jaipur	L8312	3000001
13056	Jai Kishan Rawatani	Jaipur	L8110	302004
13096	Mamraj Singh	Jaipur	L8150	302004
13265	Shiva Shakti Singh	Jaipur	L8310	302006
13062	Nazneen Bano Hussain	Jaipur	L8116	302012
13182	Ankit Garg	Jaipur	L8229	302012
13095	Amita Sharma	Jaipur	L8149	302015
12067	Anand Kumar Srivastava	Jaipur	L8024	302017
13059	Naveen Kumar	Jaipur	L8113	302017
13183	Abhishek Agarwal	Jaipur	L8230	302017
13264	Srinivasrao Nelamarri	Jaipur	L8309	302017
13061	Ashok Kumar Ramani	Jaipur	L8115	302018
13057	Manish Kachhawa	Jaipur	L8111	302019
13025	Gyanesh Soni	Jaipur	L8079	302020
13026	Kanika Maheswari	Jaipur	L8080	302020
13027	Neeraj Kulhari	Jaipur	L8081	302020
13028	Akansha Khandelwal	Jaipur	L8082	302020
13030	Rimpy Shukla	Jaipur	L8084	302020
13029	Nidhi Bhargava	jaipur	L8083	302021
13181	Ashok Sharma	Jaipur	L8228	302021
13058	Akhilesh Goyal	Jaipur	L8112	302033
13060	Ajay Gupta	Jaipur	L8114	302033

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13179	Shalini Dixit	Jaipur	L8226	302033
13184	Ravika Vijay	Jaipur	L8231	302033
13180	Gaurav Gupta	Jaipur	L8227	302039
13138	Sri Himanshu	Pali	L8189	306104
13240	Suresh Chandra Tiwari	Bhilwara	L8287	311001
13241	Ghanshyam Nuwal	Bhilwara	L8288	311001
13242	Sunita Chaudhary	Bhilwara	L8289	311001
13243	Manoj Lakhan	Bhilwara	L8290	311001
13244	Sanjay Godara	Bhilwara	L8291	311001
13137	Shankar Lal Patel	Udaipur	L8188	313706
12081	Shirish Kumbhar	Kota	L8038	324005
13237	Nathu Lal	Jhunjhunu	L8284	333001
13257	Ambesh Dixit	Jodhpur	L8303	342037
		GUJARAT		
13064	Vivek Pareshbhai Gujarati	Bhuj	L8118	370001
13154	Kosha Kanaiyalal Zala	Bhuj	L8202	370001
12092	Sejal Shah	Ahmedabad	L8049	380005
13072	Jahaan Parthbhai Thakkar	Ahmedabad	L8126	380007
13157	Rajendrakumar Dattatraya Deshpande	Ahmedabad	L8205	380009
13253	Megha Saleel Bhatt	Ahmedabad	L8299	380015
13127	Harshal Amit Sanghvi	Ahmedaabad	L8178	380052
13254	Kavil Parag Mehta	Ahmedabad	L8300	380052
13093	Manisha Mrunal Vithalpura	Ahmedabad	L8147	380058
13073	Ashok Kumar Singhvi	Ahmedabad	L8127	380064
13094	Tanushree Basak	Ahmedabad	L8148	382421
12093	Anil Kumar Tyagi	Ahmedabad	L8050	382424
13200	Harshad Jitubhai Trivedi	Himat Nagar	L8247	383001
12076	Arvind Sadanand Burde	Anand	L8033	388001
13048	Vibha Suryakant Vaishnav	Vallabh Vidyanagar	L8102	388120
12065	Dipika Babulal Patel	New Vallabh Vidyanagar	L8022	388121
12072	Sandeep VinodChandra Bhatt	Dakor	L8029	388225
13239	Neel Amratbhai Patel	Valsad	L8286	396045
13091	Kaushal Kishorchandra Thakkar	Nani Daman	L8145	396210
13092	Priyanka Kaushal Thakkar	Nani Daman	L8146	396210

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		GOA		
13175	Kalyani Maneesh Narkar	Panjim	L8222	403002
13177	Irshad Ahamad Shaikh	Farmagudi	L8224	403401
13176	Supriya Sandesh Onskar	Mapusa	L8223	403507
		MAHARASHTRA		
13268	Amar Ashok Jadhav	Pune	L8313	411001
13258	Abhra Pratip Ray	Pune	L8304	411027
13259	Uttam Sakhahari Kakade	Pune	L8305	411033
13198	Ramesh Baburao Bhise	Pune	L8245	412411
13199	Ajit Dnyandeo Suryawanshi	Pune	L8246	412411
13083	Madadev Baburao Pandge	Latur	L8137	413512
13226	Supriya Dattatraya Raut	Badlapur	L8273	421503
12094	Syed Qadeeruddin Chishty	Aurangabad	L8051	431001
13038	Vaidehi Vishwas Siras	Nagpur	L8092	440009
12075	Vandana Rajendra Kharade	Nagpur	L8032	440024
12074	Dilip Shankarrao Badwaik	Nagpur	L8031	440025
13112	Anand Mansaram More	Gondia	L8164	441601
13110	Priti Kisanlal Nagpure	Gondia	L8162	441614
13225	Sayli Ravi Guru	Chandrapur	L8272	442401
12070	Shirbhate Praful Dabarao	Yavatmal	L8027	442506
13015	Zakir Khan Salam Khan	Amravati	L8069	444906
		MADHYA PRADESH		
13228	Jayshree Sharma	Indore	L8275‘	452001
13234	Ankit Singh Chauhan	Indore	L8281	452001
13227	Ashok Singh Bais	Indore	L8274	452006
13231	Suprajnya Thakur	Indore	L8278	452009
13232	Aartee Sharma	Indore	L8279	452009
13229	Shraddha Argal	Indore	L8276	452010
13233	Pragya Palod	Indore	L8280	452010
13230	Jitendra Solanki	Indore	L8277	452771
13235	Manvendra Kumar	Indore	L8282	453331
13185	Ravi jain	Vidisha	L8232	464001
13205	Pukhrambam Dipak	Gwalior	L8252	474011
13214	Sudhakar Singh	Balaghat	L8261	481331
12060	Yashpal Singh Katharria	Jabalpur	L8017	482005

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13090	Dr. Sujeet Kumar Mahobia	Jabalpur	L8144	482005
13089	Dr. Vijayakumar M	Jabalpur	L8143	482011
13215	Rammanohar Vishwakarma	Beohari	L8262	484774
	CHATTISGARH			
13124	M.Z. Khan	Bilaspur	L8175	495001
	ANDHRA PRADESH & TELANGANA			
13010	L.N. Shubha	Secundrabad	L8064	500011
13000	Narsimlu Nachagoni	Hyderabad	L8057	500040
13212	Bakshi Venugopal Rao	Hyderabad	L8259	500075
12087	Sarap Krishna Prasad	Karimnagar	L8044	505001
12086	Velumula Kirankumar	Karimnagar	L8043	505002
13125	Chipra Madhusudan	Karim Nagar	L8176	505002
12088	Kompelli Krishasai	Karimnagar	L8045	505301
12085	Korri Ramachandram	Karimnagar	L8042	505451
12099	Srinivas Chinthapatla	Warangal	L8056	506002
12073	Chandramouli Odela	Warangal	L8030	506342
12096	S.Bhanu Prakash	Khammam	L8053	507002
12098	Deepa Seetharaman	Anantapur	L8055	515001
13017	Dr.Pratibha. C	Anantpur	L8071	515001
13050	Vedavathi Aluri	Anantapur	L8104	515001
13117	Dr. Syed Yusub	Vijayawada	L8168	520010
13118	Aruna Nayudu	Mylavaram	L8169	521230
13106	Shaik Nyamathulla	Nellore	L8159	524001
13041	S. Padmavathi	Srikakulam	L8095	532001
12068	Shasikala Rukala	East Godavari	L8025	533002
13039	V.Jaganna Dhasastry	Vizianagaram	L8093	535003
13044	Datla Rajani Verma	Vizianagaram	L8098	535003
13045	Tirumala Raju Madhavi Latha	Vizianagaram	L8099	535004
	KARNATAKA			
13080	Dr. Manu.S	Bengaluru	L8134	560003
13148	Hulkur Shankaraiah Prakash	Bangalore	*1909	560016
13203	Parasuraman. E	Bangalore	L8250	560043
12097	Uday Shankar.N	Bangalore	L8054	560080
13068	Veena S.N	Chintamani	L8122	563125
13069	Dinesh C.M	Chintamani	L8123	563125

OMNO	Name	City	Member No.	Pincode
13070	Chandrashekara R	Chintamani	L8124	563125
13002	Annie Mathew	Mysuru	L8059	570011
13037	Sofia Ranjini. S	Mysuru	L8091	570011
12090	Vinay Venugopal	Mysore	L8047	570016
13047	Chandra Shekara K.S	Mysore	L8101	570018
13173	K.Padma Prasad T P Karthikeyan	Mysore	L8221	570025
13012	Vipin Cyriac	Kannada	L8066	574214
13011	Rani Pattabi	Mangalore	L8065	575022
13170	Chandrappa H	Udupi	L8218	576210
13074	Dr. B.M.Mnohara	Devangere	L8128	577004
13247	Narasimha A	Kappa	L8294	577126
13249	Prasanna D.G.	Kappa	L8296	577126
13004	Yashashwaini T A	Chikkamagalur	*S2004	577139
13245	Jagadisha A S	Shivamogga	L8292	577201
13246	Umesh D	Shivamogga	L8293	577201
13248	Nagaraja E	Sagara	L8295	577401
13003	Madhu B.J	Chitradurga	L8060	577501
13013	Dr. Sunar Abdul Khader	Chitradurga	L8067	577501
13008	Dr. Geeta Chavan	Dharwad	L8062	580003
13005	Mallikarjun Rempue	Udgir	*S2004	585221
13007	Riddhi Sen Gupta	Kalaburagi	L8061	585367
	TAMILNADU			
13151	T. Arumanayagam	Chennai	L8199	600030
13152	R.Didheswaram	Chennai	L8200	600030
12077	E.Kavitha	Chennai	L8034	600037
13121	Shalini.S	Chennai	L8172	600037
12078	A. Chitra	Chennai	L8035	600042
13119	Ranjani. R	Chennai	L8170	600052
13186	D.Senthil Kumar	Chennai	L8233	600062
12071	Ramanathan Govindrajan	Chennai	L8028	600063
12079	Dr.P. Geetha	Chennai	L8036	600100
13120	Eunice Jerusha	Chennai	L8171	600107
12069	N.Nirmal Thyagu	Chennai	L8026	600127
13209	R.Navamathavan	Chennai	L8256	600127
13210	Sanjit Das	Chennai	L8257	600127

OMNO	Name	City	Member No.	Pincode
13122	Dr. R.Priya	Chennai	L8173	601206
13067	Amitabh Virmani	Chennai	L8121	603103
13146	Mariappan G	Trichy	L8195	621207
13042	P.R Venkatesh	Tiruchirapalli	L8096	621216
13168	Meenakshi A	Madurai	L8216	625020
13211	Sakthipandi K	Madurai	L8258	625706
13113	Dr. D. Sarvankkumar	Kalloorani	L8165	626105
13169	M. Siva Bharathy	Virudhu Nagar	L8217	626115
13140	S.Meenakshi Sunder	Tirnelveli	L8190	627412
13078	Vijiexta Arul Bindulim	Krishnagiri	L8132	635009
13077	Priya.S	Hosur	L8131	635109
13076	Suresh M	Hosur	L8130	635117
13043	P.Ramesh	Namakkal	L8097	637018
13147	Gohul Kumar M	Namakkal	L8196	637202
12055	A. Vaintha	Coimbatore	L8013	641038
13174	K K Koola Gounder	Coimbatore	*1909	641049
13255	Suhas Saha	Coimbatore	L8301	641114
13172	G N Arul Jagaratchagan	Ooty	L8220	643006
		KERALA		
13266	Passy Paul Karedan	Thrissur	L8311	680570
13009	Priya Rose T	Kochi	L8063	682022
12091	Rinku Jacob	Ernakulam	L8048	682024
13107	Saritha K Nair	Kothamangalam	L8160	686666
13018	Dr. Indulal C.R	Kollam	L8072	691505
		WEST BENGAL		
13031	Anjan Kumar Chandra	Kolkata	L8085	700006
13109	Garima Rajguru	Kolkata	*S2007	700006
13115	Aditi Ghosh	Kolkata	L8166	700016
13108	Santa Rajguru	Kolkata	L8161	700028
12066	Abdullah Mandal	Kolkata	L8023	700039
13084	Suparna Basak	Kolkata	L8138	700042
13052	Babita Sahoo	Durgapur	L8106	713205
13139	chirag Kelelkar	Kharagpur	*1908	721302
13065	Debolina Das	Purba Medinipur	L8119	721657
13054	Saswata Mukherjee	Purulia	L8108	723103
12053	Debabrata Biswas	Birbhum	L8011	731233
		ORISSA		
13046	Subhraraj Panda	Bhubaneswar	L8100	751003
13142	Tribikram Panda	Bhubaneswar	*1909	751007
12083	Naresh Chandra Mishra	Bhubaneswar	L8040	751016
13111	Santosh Babu Gunda	Jatni	L8163	752050
		ASSAM		
13149	Sunil Khijwania	Guwahati	L8197	781009
13085	Bhaskar Jyoti Hazarika	Guwahati	L8139	781012
13086	Jayanta Hazarika	Guwahati	L8140	781012
13087	Pranita Das	Guwahati	L8141	781012
13088	Jhuma Biswas	Kamrup	L8142	781012
13123	Mrinal Kumar Mishra	Barpeta	L8174	781311
		TRIPURA		
13100	Magdalene Hashangva	Imphal	L8153	795001
13101	Mayengbam Bishworjit Singh	Imphal	L8154	795001
13102	Laishram Dharendra Singh	Imphal	L8155	795001
13103	Lairenmayum Bikramjit Singh	Manipur	L8156	795001
13104	Hawaibam Binoychndra Singh	Imphal East	L8157	795008
13099	Nongmaithem Sanjiv Singh	Kakching	L8152	795103
13098	RajKumar Nabakumar Singh	Imphal	L8151	795126
13075	Dr. Biplob Sarkar	Agartala	L8129	799210
13155	Yendluri Chakradhara Singh	Agartala	L8203	799210
13156	Bheem Pad Mahato	Agartala	L8204	799210
		BIHAR & JHARKHAND		
13006	Alok Kumar Chaudhary	Garhwa	*S2004	822125
13040	Himanshu Kumar Sudhanshu	Gaya	L8094	823003
12089	Sayantan Sil	Dhanbad	L8046	826001
13097	Khushboo Kumari	Ranchi	*1907	834009
12063	Rakesh Kumar Ranjan	Siwan	L8020	841243
12064	Lal Babu Ram	Siwan	L8021	841246
13190	Prasant Kumar Singh	Chapra	L8237	841301
13213	MD Osama	Muzaffarpur	L8260	842001
12082	Raushan Kumar	Begusarai	L8039	851129

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INDEX

VOLUME 11 JANUARY-2019 to DECEMBER-2019