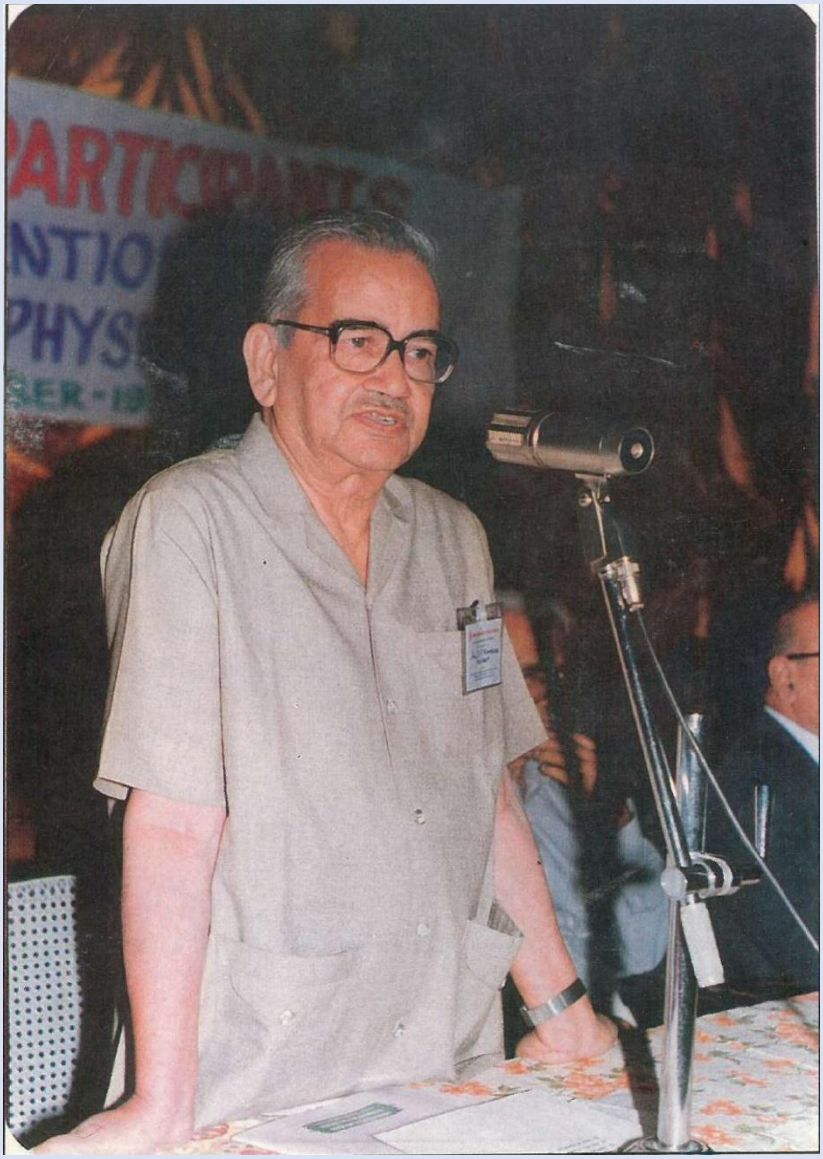
IAPT Founder

Professor D.P. Khandelwal



(01.10.1921 – 12.02.1996)

MEMOIRS

A collection

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PREFACE

The passionate physics lover Prof. D.P. Khandelwal is remembered by his students and co-workers as a compassionate teacher who had firm belief in centrality of youth, a communicator par excellence, enthusing and encouraging, and ever helping and supporting. Himself a brilliant student, he preferred teaching and research to worldly more lucrative Government civil service. His Ph.D. work carried out on a self- assembled fluorimeter got international acclaim and his subsequent research works on molecular dynamics and solid state spectroscopy related to contemporary front line problems and yet, he remained unwaveringly focussed on furthering the cause of physics education. Prof. Khandelwal visualised the need of a connect among teachers in the country at all levels – school, college and University. In Founding Indian Association of Physics Teachers, he created a platform for sharing ideas and views on matters Physics education. Under his guidance for initial 12 years, till his last breath, several regular activities were started under IAPT making it a vibrant association of people beyond boundaries across students, teachers and researchers for nurturing and supporting innovative programmes round the year. Team IAPT took forward the spirit and today with about 9000 life members the Association is on a strong footing.

Prof. Khandelwal left mark on umpteen people. Some penned down their reminiscences which were published in different issues of IAPT Bulletin. This volume presents a collection of such write-ups. It begins with a visionary article by Prof. Khandelwal himself, 'Physics Education in India – Challenges and Opportunities', which gives an insight into his thoughts and views on the subject. The collection of reminiscences has been broadly divided into four parts, viz., by, family and friends; colleagues and contemporaries; IAPT fellow travellers and flag bearers; students – formal and otherwise.

The write-ups shed light on different facets of the persona of Prof. Khandelwal, viz., roots and value system, down to earth and unassuming nature; caring and an inspiring father and family elder; sports lover, poet at heart and prolific writer; sensitive to the calls of society be it Mahatma Gandhi's call for Quit India movement or the urge of social reform; resolute character leading to participation in freedom movement and never to make use of it for drawing any benefit in long professional career, and standing up for a just cause even at the cost of personal suffering; undeterred passion for physics – completing M.Sc. even after a year's break (owing to participation in freedom movement); innovating ways to help – arranging funds for setting up Library for poor students at Nainital by staging Charity programmes, facilitating Library to students at Agra College till late night beyond College hours by making themselves responsible for locking up the Library at the end, and introducing ELCB (Extra Low Cost Books) programme under IAPT; ever contemplating to take science to common man - setting up mobile science museum on wheels in Agra, and conceptualising Centres for Scientific Culture under IAPT; and perseverance, self-confidence and selflessness in pursuit of a worthy cause.

IAPT is bringing out this volume at the culmination of Prof. Khandelwal's centenary year celebrations. It is hoped that it will inspire students, teachers and physics lovers in general to do their bit for raising the quality of science education, particularly physics education, in the country.

We are grateful to IAPT for entrusting us with the responsibility of preparing the volume. Thanks are due to Prof. S.C. Samanta and Prof. P.K. Ahluwalia for providing material and for suggestions.

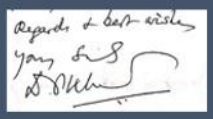
Jaipur
March, 2022

B.K. Srivastava
Y.K. Vijay

Lest we forget

A Birth Centenary Tribute

- **Relevance as part of a slogan can be seriously misinterpreted. An Einstein, a Michael Faraday or an SN Bose may be refused assistance in the name of irrelevance and innumerable humpty dumpties may receive generous grants in the name of relevance without producing anything tangible.**
- **Involvement of Physics Community in educating the public is what is needed. The process will make us think of the public as an integral part of the educational (and research) program, and in the event we will learn to think of the students as a perspective citizen, rather then an inert recipient of whatever we feed him.**
- **The syllabi, the text books, the modes of reaching and evaluation will then automatically change in a direction which will make us less alien to the society.**



(Editorial note by Prof. DP Khandelwal to an Article, Physics Education and Relavence to Social Needs by C Manhoran Dairam)

Curated by Prof. P,K Ahluwalia, Former Prof. Himachal Pradesh University Shimla, 26.11.2021

Physics Education in India – Challenges & Opportunities

D P Khandelwal
2A/229, Azad Nagar, Kanpur

(Appeared in the IAPT Bulletin Jan. 1989)

I. Introduction: Indian science has made tremendous progress since Independence, and we can be reasonably proud of this fact. Unlike other under-developed countries, we in India had already an established structure of science education and research at the time of Independence. However, in this context two questions come to mind:
a) Have we progressed and contributed as much as we could have?
b) Does the present state give us hope and assurance that the momentum will increase substantially in the future?

For the first question the answer would be in the negative. The gap between the world science and India has increased with time so far as Physics education and research are concerned. With the same resources we could have done much more. In fact, we could have insisted on getting even more resources being put into Physics education and research if we had planned for the distant future, rather than for immediate interests. For the second question my answer is even more alarming- the base on which we are standing is not only not growing in strength, but is becoming weaker and weaker with time, and it is on the point of collapsing. There is an increasing brain drain away from science within India, so that what we get in science at the top echelons is extremely poor human material on the average. We have not appreciated this fact because we have been depending on "imported talents" far too long.

For the first assessment I will cite just one example. In the context of an International meet, I was party to the preparation of a book titled: "Lasers and Their Applications in the Indian Context" [1]. Part 1 of this contained a state-of-the-art review of the world situation, and part II had data about what we have in India. It was amazing to discover that, in this land of Raman, not one institution was doing experimental research on laser Raman spectroscopy. Also from research programmes specifically granted to produce prototypes of lasers to over to industry, not one came out with meaningfu1 results. I would suggest that preparation of such reports be made an integral part of similar meets in special areas, and the reports published for open view. Let if us educate ourselves on this if self-correction is desired.

On close analysis I find that the root cause of such serious lags is that we have failed to look at the entire structure of science education as an integral one. In particular, the top people do not want to spend time and thought to the distortions cropping up below. As examples, science made compulsory up to the High School (a fine idea indeed), but with no intensive preparation; creation of scientific temper in society is sought to be achieved through processions; the standards of syllabi and textbooks and examinations are lowered to ensure a certain pass percentage; and so on. Recently, a very useful Seminar on "Restructuring of Postgraduate Physics Experiments" was held [2] but instead of suggesting some programme for action, it 'appointed a committee'. It is high time we take firm decisions and pursue them with conviction.

II. Research and Postgraduate Education: At present about 75% of our of MSc's are coming out of institutions where there is essentially no research activity. Even where some research is going on, the gap between the MSc and research is becoming larger with time. On the experimental side the situation is quite pathetic. Many very expensive equipment lies under-used by a large factor. The worst is that the University system as such is being considered incapable of taking any large experimental project. The following steps need to be taken to rectify the situation:

1. A National Testing Service be introduced to ensure a minimal level at M Sc. Presently the UGC and CSIR have introduced one for the limited purpose of the of the award of the research fellowship. But the MSc's fill many other positions, including teaching positions, which affect continuing generations. The proposed N T S score could be used for a very wide range of purposes, and then it will force the weaker educational centres to raise their quality lest they die out. I would not propose obligatory or exclusive weightage for NTS score in any opening: but the very presence of NTS wil1 go a long way. In any case, we will then have an evidence for the planners and policy makers about where the different institutions stand. An important point is that NTS should include a considerable attention to the experimental side, and this should not give allowance to centres which do not have the basic equipment. Another possibility is that NTS score be given for different aspects of the candidate's capability and the weightage to these may be given differently by different agencies depending on the nature of job to be handled.

2. A decision must be enforced on the Government that in future when any large experimental research programme is floated, it shall not be handed over to an organisation outside the University system. It should be attached to some University or a group of them, and consequential administrative steps as needed may be taken. This will help reduce the gap between MSc teaching and research, and also put the University system and specialised research organisations at parity status.

3. For all expensive instrumental facilities in the Universities and Regional Instrumentation Centres and elsewhere there must be a log book system to ensure their optimal use. An agency should be empowered to periodically review these log books and suggest corrective measures in cases of serious under-use or non-use.

4. The talk of relevant Physics and 'job-oriented' Physics education must be curbed with firmness. Physics by itself is very relevant, and good Physics is of the utmost importance to the nation. What is needed to make the Physics understanding stronger and make a Physics laboratory more modern is very important. But any attempt to make Physics M.Sc.'s compete with those taking specialised engineering education will be self-defeating. In research programme the distinction between pure and applied is not sharp; our insistence should be on "meaningful" research, not tit-bits in the name of applied physics.

5. For any research programme granted, there must be a condition is that the work conducted is subject to an open review. There is at present a nominal clause of that kind, but apparently the reviews are never quite stiff. In evaluating research publications, the

citation index method should be adopted. One most important consideration between those who continue doing research after their Ph D and those who do not continue research work at all after Ph.D; this is of especial importance in the educational system, where there has been very considerable penetration of very weak PhD's.

III. A Close Look at the Base of Education: The Internal Brain Drain: A child has a natural curiosity to explore, learn and master. Since science provides additional experiences, it should attract the child more than other subjects. But, science education as it obtains in India, by and large, does not provide that additional excitement. Worse is that in the name of science we ask for rote memorisation, often of items which are well beyond his comprehension. The result is that the child is repelled from science. To him science becomes a collection of statements, definitions and equations, not an area of exploration and excitement. That feeling is shared by the guardians and the public men. The overall result is that if the children and their guardians think of science at all it is done in terms of the careers for which it is a compulsory channel. In effect, only those children stay in science who have an eye on a professional course. I will cite one example of how we throttle science in our teaching and evaluation. Newton's law of universal 2 gravitation is given straight away as F = G mm`/r and then some calculations are done. How is this science, as distinct from algebra? The same topic could start with how the planets are distinguished from stars, how Tycho Brahe measured the positions of several planets night after night for several years, how Kepler failed to find a common pattern in the motions until he switched to the heliocentric reference frame, how from even minor deviations he had to switch over from circular to elliptic orbits and then gave his laws, and how Newton argued 2 that m be placed in the numerator and only r in the denominator would fit the motions. The introduction of **m`** and making **G** a universal constant has further Physics in them; the laboratory to determination of G, leading to deduction of mass of the earth would form the climax of excitement for the child. But how many books give it that way; how many teachers are themselves aware of the damage they are doing by giving the equation straight away, and how many examinations, if ever, ask for the background on which the formula was given?

Another example is from the laboratory. The simple pendulum experiment is given as “determination of g”. The child's first reaction is: 'Where is the free fall with which g is associated?' Then, the measurements involved are of length and time, where no skill is involved. The rest is algebra. There is great lot to see in the pendulum: dependence of its period on mass of the bob (let the child see for himself), on the amplitude, and on the length; then the way the amplitude falls with the number of oscillations and its dependence on the density of the bob material. But we do not let the student study any of these features. Any number of examples can be cited for this: verify Ohm's law (why not I vs V over a wide range?), determine force constant (why not F vs x study for different materials?), determine viscosity by Poiseuille's method (why not flow vs over a wide range?), motion under a constant force (why not motion under a general force, with the graphical method used?), and so on.

This is not the first time that these questions have been raised. A plea for exciting Physics teaching and exciting laboratory and open-ended experiments has been made repeatedly. I have often been asking:

I am afraid if compulsions of attendance were not there most students would not attend our classes. In any case, with our present kind of examinations, those who stay off may score the same as those who attend the classes!

It is for the teachers and research workers at the highest level to strongly intervene in the matter. Firstly, the education and research at the top level suffers. Secondly - and that is worse - the best brains are driven away from science in a progressive manner, which has a self-multiplying factor over the successive generations. Mere lamenting over it will not work. There is so much talk of brain-drain from India to the West; I wish there were even more serious talk of the brain-drain within India from the science fields to other fields.

One may attribute this brain-drain to the socio-economic factors and show helplessness. That is not the whole story. There always are a fair number of students who have very deep urge for exploration, innovative work, high philosophy, intellectual pursuits, etc. Despite al1 other lures they would still come to Physics if we are able to give an assurance that these urges of theirs will be fulfilled if they choose Physics as a career.

IV. Programmes for Action

A. Development of a model Undergraduate Physics Laboratory: A number of Workshops' involving actual user teachers from an all India cross section should be organised with the specific objective of evaluating the educative value of numerous alternative experiments developed at different places and coming out with a comprehensive write-up on some 100 experiments from which any UG lab may choose some 60 or so to make a 3 year programme. The workshop should take account of cost considerations, maintenance and repair factor and actual class-room workability.

These Workshops should not be simultaneous but in tandem, so that the results of one are available to the next one, and improvements go on at successive stages. Involvement of instrument- making industries later will ensure that the new components and instruments suggested are readily available for those who go in for the changes. About one-year time-bound programme, with some 6 Workshops conducted, should be assigned to a specific agency, and the conclusions should be given wide publicity with assurance of financial support from the administration.

Much of the input will certainly come from what numerous agencies have developed in recent years, the University Leadership Projects of UGC being the largest single group. But the teachers in these Workshops will make their independent opinions, and many new suggestions will crop up. Further, in the process we are bound to discover exceptional talent in some teachers, so as to make a continuing programme centred on them.

A preliminary preparatory work in this line has already been done in the form of a book which has attempted to absorb most of the recent developments, with open-endedness as the central theme. What is significant is that a very large part of the improvement in educative value and excitement can be brought about by changing the objectives, extending the parameters and using the existing equipment. Of course, with new

technologies coming, we must introduce experience with them at the BSc level, particularly where there is considerable depth in education involved. The need is to give a feeling that it is the user teacher who is at the centre of attention in making the recommendations.

Once a Model is ready (in about a year) the next step should be the orientation of teachers. This can be done at some 20 select institutions region wise, so that at least 2 teachers from every institution are covered in two years. Even in these programmes the participants should be encouraged to play with new ideas of their own, and talent thus spotted may be used as resource person in subsequent programmes.

The programme suggested must not be confused with the ASC (Academic Staff Colleges) programme of UGC. That is designed for new entrants, and (rightly) has emphasis on the methodology of teaching, on philosophy, culture, history etc. What is suggested here is a crash programme to speedily correct the distortions of about a century; its continuing is disastrous in a subject like Physics, we cannot afford to let matters get stagnant again.

It will be advantageous if the programme is handed over as a contract to a voluntary agency of national acceptance. The cost will come out less, the involvement more intense, and the commitment to time-bound, result-oriented character of the programme can be ensured.

B. Development of a Model School Level Physics Laboratory: In this area it is not easy to draw distinctions between experiments at class X level and those at +2 level, or between what is good for demonstration to a large group and what should go as an experiment to be done by an individual. Further, the very process of teaching will need some guidance about a mix of demonstrations, informative slides a logical build up, and so on. The task is thus more complex than at B.Sc. level. Limitations of the vision and subject background of the teacher available at this level are added factors.

For these reasons, the starting point is to make a group of some 20 schools available for field trials of the items developed and the methods of teaching introduced. A necessary condition is that the targets, like class X and +2 examinations, must not be disturbed, otherwise the logistics will get complicated.

We are aware that there are already some special centres working in this field. Of these the Hoshangabad Experiment (Eklavya) and Homi Bhabha Centre for Science Education are widely known. Yet, what is being suggested here is an intensive experiment directly involving some 20 schools and their teachers. The title we use is "Physics Laboratory", but it is obvious that a wide range will be covered, including the development possibly of a new kind of text book, demonstration items, slides, video materials etc. Also there is bound to be a close interaction with other science subjects, because at the school level tight specialisation is not desirable. The direct involvement of the teachers of the chosen schools is an integral part of the suggested programme.

Of course, space and funds will be needed for the work. If an agency governing some 20 schools takes the initiative, then funds can be managed by that agency, as a kind of

research in science education. The next is the problem of attracting some 8 to 10 academic persons from outside, who will come and stay at the chosen centre for about 2 to 3 years to work with the teachers and students. I am aware that it is difficult to get persons with wide vision and experience to undertake such a task. But that is where the challenge lies. If the task is assigned by invitation as a national challenge, then we are sure good persons wil1 come forth. It will be advisable to assign the task to a voluntary organisation of dedicated teachers which has a national perspective. The flexibility of approach thus available will go a long way in making the programme a success. Wide publicity is to be a necessary part of the work, since many suggestions may flow from outside for trial. In fact, some enthusiasts may offer to try their ideas with these classes or the experiments. There should be scope of giving them the chance and encouragement. It is to be a national experiment.

We have said that the parameters at class X and +2 level examinations are not to be disturbed. But it is conceivable that this centre may be able to influence the kind of questions asked at these examinations for better evaluation of understanding; also the methods of teaching and the nature of experiments and demonstrations may change at other places as an influence from what are being tried here and propagated.

Unlike the undergraduate level, here we do not propose a "report" preparation. At this level the whole process of imparting education in science is to be seen as a single unit. Of course, the experiences are to be propagated, and we envisage other units/groups of school taking them up, even as this centre goes on with its work.

One may think that this is to be a one-time 3-year work. That is not true. Research in any field is an unending process; so is the improvement in the quality of science education. What I visualise is that in due course there will be one such centre in each state, and the entire system of science education and evaluation in each state may take clues from such a centre. Yet it appears important to stipulate that the academic staff for centres shall not be appointed on a permanent basis. Positions here must not be seen as avenues for promotion for career oriented people; they should be considered as challenging positions for top people on invitation for specific periods.

C. Centres for Science Culture: This is a new concept, designed to accelerate the spread of science culture in the society at large. It is a major challenge to the scientific community. The principle is not under debate; the need is to work out an effective mechanism. Taking out processions would not achieve the results, nor would once-a-while demonstrations, which are seen more by the science people than by the target persons.

Science exhibitions are very useful in this direction. Science museums and Science centres are good too. But the dent they have made is small, particularly relation to the cost involved. Arousing curiosity is not enough; there must be opportunity to discover by doing, and we must arouse the spirit for that.

This is the backdrop against which the building up of Centres for Science Culture (CSC) is being suggested. My basic assumption is that classroom experiments and demonstrations are essentially the simplest ways of developing an understanding of science. Therefore, if we can assemble all such materials for visitors to see and play around with, then it may

form the nucleus of a CSC. There are many associated limitations. We may need to change the scale factor, put some additional control factors, and add many details too. But there are many freedoms: we are not bound by time factor, or sequence consideration, and we may seek assistance from audio and video media. Again, we can make an interesting mix of items from all branches of science, and have units related to explorations in history, geography, culture etc. where science-based techniques are used.

All present day science museums are conceived and executed by people outside the teaching system. Museology is, in fact, considered as a separate specialisation. The CSC's are proposed to be built around the educational system, to give the teacher an opportunity, as also the responsibility, for extending his teaching to the masses. In the process, a two-way interaction is expected to start, bridging the gap which at present keeps science education as somewhat of 'distant' thing far away from the normal life-some kind of a mysterious thing.

Within the educational system, non-science students are presently totally unaware of what is there in science labs. Also students of lower classes have no access to what exists in the labs of higher classes. Knowing that the students have a very wide variety of backgrounds and intellect, we would make of science items available for all (who desire) to see and play with. At the CSC level the very design is to be for that. Then there are numerous persons in the society who did not go through the science path, but from the gadgets they use every day and from what they read in newspapers they will be keen to understand the science behind many things. The CSC should be an exciting place for them. Finally, the laymen and the ignorant, many of them steeped in superstition, who need to see for themselves that things happen a particular way because of specific laws of nature. The once-a-while viewing method would not instil science culture in any of these cases. The CSC must therefore be based on involving in doing experiments. It means that provisions for varying the parameters and taking data must be provided. How much one is involved will vary from case to case; but the essence is to let people know that science is not just seeing, but making a series of measurements, analysing them for some regularity of changes, and then building up laws out of them, which are used for further experiments.

For those experiments at CSC which draw greater attention from the visitors for sustained working, cubicles will have to be provided for, where they can work for some length of time. The number of such cubicles that need to be established will be a good measure of the success of the CSC. For channelizing this act as a place where the regular students from neighbouring institutions can come and have the experience of using them for measurements. The other is the CSC may get itself involved in developmental activities for new experiments, demonstration kits, slides, audio and video items, etc. both for regular educational system and the general public. In this last work it may overlap with programmes A and B suggested earlier.

An outline of CSC has been presented earlier in 1986 [4]. But the scope in the present suggestion extends to all sciences and the anticipated investment now would be merely Rs.2 crores. By itself that is not a large sum looking to the investments in any of the Museums and/or the existing Science Centres. Any one State Government can initiate a

CSC as its own programme. All that is needed is a powerful agency that will sell this idea with conviction. Top scientists alone can do that.

It has been stated that the CSC has to revolve round the teacher as the nucleus, so as to work as bridge between the educational and the public life. It will also be advisable that the running be placed in the hands of an autonomous body, since considerable freedom of action and innovations will be required.

Once one CSC model starts functioning, we would expect many others to grow up all over the country. That is the culture we envisage. These will be the places of "worship" where people should visit very frequently and seek wisdom.

D. Stage Science Shows: All kinds of arts go up to the 'stage' format and thereby develop internal resources for growth and multiplication. Even magic shows have gone to the stage. Why not science shows then? We have innumerable attractive items to show, as we find from the crowds in exhibitions. All we have to do is make a cumulative and comprehensive list of items prepared for such exhibitions. and give them a format in which they can be presented to around 500 spectators in a hall from the stage. I am aware that the format change is not easy. There lies the challenge. But with so much technology now available, it should certainly be quite possible to achieve that. That will be first step in a Stage Science Show (SSS).

Once some good items are prepared, the next step is to weave an exciting programme around some 25 to 30 items to make a 2-2.5 hours show presented from the stage. All help from dance, drama, music and colour may be taken to create interest. But the central theme must be that some knowledge of science has to be communicated to the general public in the show. Obviously, a good mix of items from a wide spectrum has to be there, so that the show does not become dull; the objective could be that at least half of the items interest different viewers each. One would imagine that some 5 units of SSS's to start with will be good. There will be a continuing improvement and restructuring of these based on experiences, and after about 10 trial shows we may have a fairly good set of SSS. At this stage the SSS should be shown in regular hired halls in towns against payment, as for a cinema show. People do pay for circus shows, cinema shows, magic shows, and so on. There is no reason why they would not throng to pay and see the SSS. All the mechanics of publicity and finance should be adopted. The cost of production of items, expenses during the show, (handsome) payments to the “actors” of the SSS, and some provision for future growth must be recovered from the tickets. One benefit could be that Governments are likely to make these collections tax-free. That is how the SSS's are to be envisaged.
It deserves repetition that the central attention must be on communicating science through interesting displays, explaining the innumerable events that occur in nature, the gadgets in wide use and the ways the scientific laws can enrich human life. Teachers should be the "actors" in the shows, and they must use all that a 'magician' in his shows for effect, plus the assistance of music and dance if needed, but keeping explicit science education in mind. The language will have to be the local one, preferably the local dialect too. And with experience the "actors" will improve in communication. The only 'script' for the show will be the chain of items and the basic contents to be communicated.

We visualise that in the bigger towns it should be possible to run at least one Theatre the year round, with 3 shows per day, showing the SSS. Like the cinema, for some cases specific "actors" may develop high reputation for SSS, in other cases people will go with the contents (the counterpart of "story"). Teachers with histrionic talents and with special flavour for demonstrations will find this an excellent avenue.

The next step will be develop travelling counterparts of SSS. These will reach the smaller towns and may become major attractions at the numerous fairs held all over the country. All in all, a new culture is thus sought to be developed-the culture of people paying to get awareness and knowledge of the scientific method and content.

What will be the generating agency for the SSS? Well, any of the existing Science Museums could take it up. The difference between an item seen by individuals and one that can be shown to a large audience from the stage is not small. If they can fill this gap, fine. Another option is that one of the proposed CSC may take it up. The chances of success are larger in that case because they are to be woven around the teachers. Of course, an entirely independent centre may be created just for the development of SSS items, and governing the entire SSS programme. No recurring finances are in any case involved in this. One could even conceive that the recurring expenses on CSC may be met from their SSS wing.

V. Conclusion: It will be seen that from the limited field of Physics I have shifted to the wider field of all sciences. That is because no major work can be taken up in isolation. Physics happens to have a larger content of basic philosophy and many initiatives therefore come from Physics. The different programmes which have been suggested are all interconnected. What is important is that such programmes are strongly propagated and put and into execution. And it is to be seen very clearly that the initiative has to come from Physics alone. The challenge is there for us to take. Fortunately, the right opportunity is now, since the Government is planning for the twenty- first century, the New Education Policy is in the early stages of execution, and we have men of great vision for science at the top. Developing science culture in the society, strengthening the base of science teaching, halting the internal brain drain away from science within India, enhancing the quality of Physics education and research, all come in one chain, and we have to take a comprehensive view of the whole problem and its solution. Let us face the challenge. Let us grab the opportunity when it is before us. Tomorrow may be too late.

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Reminiscences by

Family and friends

He had time for all. … Editing and enriching books and articles written by friends was his favourite hobby. … Service without any expectation of returns was part of his blood.

Anil Khandelwal

Humane side of Dr. Khandelwal was extremely remarkable. His honesty, devotion and dedication to sail our family out of rough times will always remain etched in our hearts.

Mahesh Lal Shah

The two (DPK and the author) embarked on a co-journey to popularise Science for the Man on the street, carrying Science on wheels! … students could witness the wonders of Science Museum - on Bus....one from Bangalore, the other from Birlas, Calcutta.

Shyam Saran Agrawal

Exploring the Roots: Parents of Dr. D.P. Khandelwal

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"To understand and reconnect with our stories, the stories of the ancestors, is to build our identities." - Frank Delaney

Sitting on chair: L→R Daya Prasadji Khandelwal, Sualalji Rawat (Father), Chand Devi (Mother) with Santosh (Nephew), Prem Adharji Rawat (brother)

Sitting on flour: Saran Swaroopji Rawat (Brother)

Standing: L→R Premlata (Sister), Shanti Devi Rawat (Bhabhi), Ratan Devi (Sister)

As we celebrate Dr Daya Prasad Khandelwal's centenary year, we take a journey down the memory lane, preindependence, to understand the social constructs and values shaping his upbringing. The below note on Dr. D P Khandelwal's parents shares a glimpse of their lifestyle, profession and ideals.

Dr D P Khandelwal's father, Shri Sualalji Rawat, was born in Beawar in Rajasthan. He was Custom and Excise Officer at Dungarpur Riyasat Rajasthan.

He was known for his work ethic and discipline. He would start his day at 4:00 am with prayer, follow his planned schedule, and usually continue to work until 10:00 pm. He was known as a visionary social reformer who believed in implementing the reforms through hard work. He solved many issues, like creating a bridge over the river and ensuring the construction of roads to boost the local economy.

Pre-independence, when the norm was to educate only male members of the society, he took a strong stand in favour of women education. He was also against the custom of Pardapratha. He set the example by publically boycotting the dowry system that was prevalent during those times.

A patriot in the true sense, he donated his farm to the congress workers for nation-building. In addition, he was a benefactor for the poor and provided help to the needy at times of natural disaster.

An education evangelist at heart, he felt every student who desires to study irrespective of financial status, should be able to avail facilities. He believed regular study builds a strong foundation. With a focus on holistic development, he also advocated regular exercise and sports along with studies. He was highly influenced by the works of the Hindi author Premchand.

He believed in living with simplicity and keeping high bar for ideals. He always insisted on working honestly. While he had people always willing to help in day-to-day chores, he ensured that everyone in the family has to do their ownwork.

Because of his benevolent nature, he gave away most of his wealth. Thus, when he unexpectedly left for heavenly abode in 1942, his family faced financial hardships. However, education, hard work and strong character instilled in children helped the family ride through the storm.

Smt. Chand Devi, his mother, was also literate. She always started her day by reading Radhaswami's pravachan. Both Shri Sualalji Rawat and Smt. Chand Devi shared the ideals. Even after her husband's demise, she carried forward the values propagated by him. They have 17 grandchildren, all well educated and contributing to society in multiple fields.

The above information has been derived from a write-up by younger brother (Late) Shri Saran Swarooop Rawat and further some facts have been gathered from Smt. Premlata Badhera, younger sister of Dr D P Khandelwal.

Babuji - Dr. D.P. Khandelwal
(Through the eyes of his daughter)

Anita Khandelwal

(Appeared in IAPT Bulletin, October 2021, p. 358)

His dream- IAPT

IAPT today is result of his great vision to bring together entire physics fraternity on one platform and enhance physics research and education under one umbrella. As a college going Girl I have been witness to the period when brain child of my father IAPT was born. I have seen him toiling day in and day out to bring up this child with firm belief and dedication towards its cause. Sometimes we used to feel if his hard work was going to result in fulfilling its goal, but today it is so heartening to see that IAPT has entered its adulthood and is flourishing under the care of dedicated IAPT family. It is a matter of great pride that his dream has come true and our apprehensions have proved wrong.

Babuji's persona was so full of illustrious aspects to it, it is very difficult to describe it in words. His IAPT family is very well aware of his professional and academic accomplishments. I as his daughter would be bringing to light some unknown facets of his social and personal life.

Biodata:

Place of birth: Udaipur, Rajasthan

Father's Name: Shri Sualal ji Rawat

Mother's Nam :Smt Chand Devi Rawat

He had 2 brothers and 3 sisters

He did early schooling at Dungarpur, Rajasthan. There he used to get best student award

High School studies at Udaipur

Graduation from Government College, Ajmer

Post Graduation from Agra College, Agra

Ph.D. in Nainital Degree College, under Dr. D.D. Pant

His Family

Wife: Our mother Lt. Smt. Shakuntala Devi played a great role in his and our lives. While Babuji was always engrossed in his professional, social and academic engagements, she managed and looked after household single-handedly so beautifully. All outside and in-house chores were managed by her. Babuji never commanded or demanded anything at home. Our mother understood his and everybody's needs and fulfilled them with extreme care.

Children

Daughter: Sarita Khandelwal,75, is M.Sc. Physics. Stays in USA with family.

Son: Anil Khandelwal, 72, Electronics Engineer from IIT Kanpur. Retired from PHILIPS INDIA, lives in Pune.

Daughter: Anita Khandelwal, 68, M.Sc. Chemistry. A software professional, retired as Systems Manager from UNIVERSAL CABLES Ltd – Satna. Stays with her family in Gurgaon.

Daughter: Benu (Sunita) Gupta, 66, M.Sc. Physics, lives in Agra with her family.

As Father:

He was very a gentle, affectionate, lenient and liberal father. He believed in free development of children and always appreciated and encouraged us to pursue our interests other than studies. He never put any restrictions on us and did not impose his opinion on us. He admired even small things we did. He believed in all round development and not just academic. He and our mother made sure that we grow up to be independent individuals equipped with all worldly skills. We never faced performance pressure. He allowed us to bloom freely. We had a very happy carefree childhood as a close knit family.

He taught us to be self dependent in all respects. We never took any tuitions or coaching. Only our brother was given tuitions to improve his clumsy handwriting. Today his handwriting is as good as Babuji's. After finishing school he never helped us in getting admissions or reservations. He expected us to find our way through struggle.

His Interests Other than Academic:

Travel: He believed that seeing the outside world was also part of education to develop broader outlook and better understanding of life. On most summer vacations we used to go for a holiday or for a stay with relatives. Wherever we went he used to make sure to take us to all historical or cultural spots along with tourist attractions.

Socialising: Wherever we went he used to make sure to visit close or distant relatives with us. That built a vast social base for us. We are still recognized as Daya Prasad ji's family and given same love that they gave him.

News and Sports: Keen follower of current affairs and politics, used to read news papers thoroughly. Morning and evening news on All India Radio was regular routine. Cricket commentary and Hockey Commentary was also of great interest to him. That's how we also developed interest in politics, current affairs, reading and cricket.

Playing Cards: He was a very good bridge player. At home also during holidays he used to play cards with us and when free he used to play patience all by himself. During family gatherings and festivals he used to play Flash.

Writing Letters: He was a great communicator. He used to write beautiful letters. He stayed connected with all close and distant relatives, friends, colleagues and students through regular

correspondence. He always acknowledged and replied each and every letter he received. Receiving his letters was looked forward to by us. Postman was a daily visitor at our door.

Writing Poetry: In his youth he used to write poems. He wrote patriotic poems during freedom movement, poems of affection for his new born daughter, poems on his struggles and dreams. His poems are still available in his handwriting.

Babuji used to do type writing a lot. Sound of the type writer was part of our household.

Generosity towards Students: He was always very conscious of difficulties faced by his students. In Nainital we had a house with spare room. He would offer needy students to stay there free of cost. Few of those students even after moving out treated Babuji as their guardian and us like their family.

He used to give free tuitions to weak students. Only when he was studying and needed finance he did tuition for money. If any student was short of money, he would pay their fees and ask them to repay when convenient.

In 1965 there was student unrest in Agra. Students raised slogans and took out processions. On one such occasion while he was talking to students trying to pacify them, there was suddenly a police lathi-charge and in the melee he received a blow on his head. He was brought home with bleeding head but he refused to move to hospital so that students remain calm with having him in front of them.

He did two stints at Agra College, as a lecturer during 1948-54 and as a professor during 1964-69. In the Physics department there used to be a student- friendly scheme - Quarter Price Library. Physics books at PG level, mostly by foreign authors, were very costly and many students could not afford to buy them. A student could get issued a book from QPL at quarter price (non refundable) for the whole session, to be returned at the end of the session. If one wished to retain the book, one could by paying the balance. During his second stint, he found that the QPL was in bad shape with only some books in stock. He revived it, in a big way, purchased enough books (some with his own money) and earned the gratitude of students.

His Beliefs: He was an Atheist, in Hindi a Naastik. He believed that there is a Superpower which controls entire Universe. He did not believe in idol worship. In temples he used to admire architecture and gardens but never performed rituals but at home he used to participate in traditional poojas on festivals. His Idea of worship was honesty, integrity, sincerity, morality, and devotion to good causes.

He was honest to the core and expected the same from others. He was a man for principles and fought for his stand.

He never paid bribes and confronted those who asked for it. He used to travel so much for work but never paid bribe to TT for a berth and always got one.

Social Reformist

He was dead against dowry system. He got all three daughters married without dowry. In his son's marriage he did not accept any dowry. Whatever he gave his daughters was out of his

sweet will not on demand. From his in-laws he used to accept only one rupee and Nariyal (coconut). We also follow his ideals.

He was against Parda or Ghoonghat tradition and actively worked to eradicate this custom. He persuaded my mother to allow my Bhabhi (Madhu), his daughterin-law, to wear dresses and saree without parda. He also believed that young widows should be remarried.

Participation in Freedom Movement:

He took part in the freedom movement and due to this, he was sent to jail when he was studying at Agra College, Agra. He had to leave his M.Sc. studies incomplete. As he was under the scrutiny of the British Government, he had to change his surname from Rawat to Khandelwal and had to shift to Karachi. He came back to Agra before the partition. After returning, he joined again and completed his M.Sc.

Services to Khandelwal Community:

For upliftment of young generation of Khandelwals he extensively worked for Khandelwal Mahasabha organization. He believed higher education is the strongest tool for social and financial upliftment of young generation and well being of their families. He used to collect funds for Mahasabha which gave scholarships to deserving financially weak Khandelwal students for higher education. Many such students are today highly placed and have uplifted financial status of their families. Todays's Khandelwal generation is highly educated and prosperous**.**

Advisor and guide to Relatives and Friends

He was a very patient listener and was very fair and balanced in his judgments. He used to help relatives in resolving their family disputes, personal problems to the satisfaction of all concerned. His decisions were highly respected and obeyed by all as everyone had strong faith in his fairness and wise judgment.

He advised many youngsters in the family on their choice of career or education. He never imposed his opinion anyone and encouraged to make their choices freely. He also advised relatives in choosing matches for their children and fixing marriages.

Before his marriage my Nana ji expired. My mother had four brothers. Three of them were unmarried. Babuji played the role of their guardian at that young age. He helped them finish their education, found matches for them and got them married and helped them in settling down**.**

My Tribute:

I thank God for blessing me with a father as virtuous as My Babuji – Dr. D.P. Khandelwal

He was a great human being, a man of high moral values, honest, selfless, generous, caring, patient, compassionate and so much more. His gentle, loving, smiling, inspiring presence will always be missed by all his loved ones forever.

Babuji - outside the academic world as have I seen him.

Anil Khandelwal
(son of Prof. Khandelwal)
31, Malhar Complex, Pune

(Appeared in IAPT Bulletin Feb. 1997, p 48)

Given here are some elements of Babuji's profile outside the world of Physics. This will fill the view of his life other than academics.

Upliftment in the field of education - a relentless pursuit

His pursuit to serve and dedicate himself to the cause of Education dates back to 1951. He entered the movement "Khandelwal Vaishya Mahasabha". His transparent Sincerity and dedication to the cause of social upliftment soon catapulted him to the top position.

From the platform of Mahasabha, he committed "No Student will be deprived of higher education due to non-availability of funds". His zeal and dedication, saw it implemented in letter and spirit. The scholarships were granted in the spirit of society's responsibility and not as a dole (favour). Within 10 years the annual outlay of scholarships rose from Rs. 4000 to Rs. 4 lacs.

The position for the sake of power never sustained his interest. As soon as he smelled some vested interests, he distanced himself and shifted his full attention to the cause of Physics Teaching, dating back to mid 60s. Thereafter he continued to work for the cause of Mahasabha as a philosopher and guide to all office bearers till the end.

A Poet at Heart

He was an authority in Hindi, in his own right. An official translator in the field of scientific terms in physics. He has even written plays and poems in 1940s. A unpublished compilation is treasure to the family. Some of them are reproduced elsewhere in this volume.

Freedom Struggle

Due to his active participation in Quit India movement, he discontinued his studies after MSc Part I. A warrant of arrest made him change his name from Rawat to Khandelwal and shifted to Karachi. Joined as teacher in Marvari Vidyalaya. The trustee, Late Shri Ramprasadji Khandelwal was impressed with his approach to teaching and administrative abilities. He gave him leave with scholarship to complete his MSc.

Ever available for help

Help requested was never denied. He had time for all. Never say "come later". Editing and enriching books and articles written by friends was his favourite hobby. Unofficial guide to many students seeking Ph.D. etc.

Service without any expectation of returns was part of his blood.

Games enjoyed most

Playing Bridge: During the Nainital days, every evening visitor to the NEW CLUB. His intellectual capacities knew no doubts - Bridge was his favourite pastime.

Cricket- In his younger days, member of the Agra College Staff team as Wicket Keeper, Chess was his indoor favourite.

His principles

No tuition classes. Wouldn't write "Readymade" solution books, instead would only write text books in the format of making the learning exciting. No dowry, No show biz, maintained even under most trying circumstances.

1952 he got selected in Income Tax Services. Didn't join as was not prepared to compromise for survival.

How did he manage to get Donations?

Not a pie of gratification. Very conscientious user of donated funds. Quite evident from IAPT working (started with donations!) People gave him with open heart, because they saw sincerity, dedication and complete transparency in his work. Shortage of funds never deferred him from pursuing a big project. He had the courage of conviction to organise a support (e.g., letter to the Prime Minister, CSC Project, IAPT Land acquisition plans).

A Modern Outlook

Continuously learning and adapting to new things was part of his daily diet. Be it society, family traditions or technology. Just when the IAPT organisations was growing, had the vision to computerise its membership records and mailing system.

Capacity to Write

No letter from anyone went un-replied. No individual was small for him. Did his own typing till the last day. On an average wrote about 15 letters a day. Family misses his 'loads' of incoming mail. Rarely saw him making 'draft' generally thought for a while and penned down straight away.

A company to young and old alike

A very patient listener. People sought advice on subjects far removed from Education and Physics as well. Had network of well-wishers all over the world. During his three personal visits abroad, he was not able to oblige all who wanted to have his company, such was the goodwill earned.

Ever young playing with grandson Akshat

Social Reformer: Dr. Daya Prasad Khandelwal

Er. (Dr.) Narendra Khandelwal
(Son of Dr D.P. Khandelwal's sister)
MBM Engineering College, Jodhpur (Retired)

(Appeared in IAPT Bulletin, October 2021, p. 364)

He was a very active social worker. At societal level, his contributions were no less. He observed that the literacy level in his community was very low. Therefore, around 1960, he joined and actively participated in "Khandelwal Vaishya Mahasabha" (a frontal organisation of our community - Khandelwal's are a business community mostly living in Rajasthan.). He laid the foundation of making the community understand the value of education & gave the slogan that "कोई भी मेधावी छात्र धनाभाव के कारण शिक्षा से वंचित नहीं रहेगा". As its Secretary, introduced innovative schemes to facilitate higher education, by providing financial assistance to students who otherwise could not afford higher education on their own.

He requested all industrialists & businessmen of his community to help him in achieving this goal. Also persuaded and convinced his family members to contribute towards this noble cause. He was personally supervising the work of collecting applications & awarding the scholarships. During that period aspiring students or their guardians had to just send a simple request with details of admission to a professional college & the annual fee of the college was being deposited by Khandelwal Mahasabha. Hundreds of students benefited by this goodwill gesture of Mahasabha and have earned lot of appreciation as Engineers, Doctors, builders, Professors, Administrators, Accountants etc. in India and abroad. Many benefitted from such scholarships and held high positions in their career.

Later a higher education scholarships fund was established in 2003. Till today more than Rs. 5 Crore 25 Lakhs has been distributed to about 700 girls and boys. Rs. 42 Lakhs were distributed as scholarships from this fund to 68 students last year.

Children of his family were influenced by him. They were encouraged to design their future as per their choices. There are seven engineers, six post graduates (one holding double doctorate) in his next generation.

[यह उनकी दूरदर्शिता और दृढ़ विश्वास को दर्शाता है कि शिक्षा ही परिवार की स्थिति को बदल सकती है।]

He was later elected as प्रधान मंत्री of Khandelwal Mahasabha in Nov 1963 for 3 years. But he changed his designation as "प्रधान सेवक" saying that I am here to serve all. He was involved in numerous other activities of Khandelwal Mahasabha. He was deadly against the dowry. He raised a voice against certain traditions involving giving of gifts (as mandatory) on various festive, religious and social occasions – a small step towards social reform, with hopes.

अजमेर खंडेलवाल अधिवेशन (1978) में उन्होंने एक पुस्तिका महिला उत्थान और समाज की कुरीतियां पर प्रिंट करवा कर distribute करवाई थी जो उस समय समाज के लिए अप्रत्याशित थी। उन्होंने विधवा सहायता, विधवा पुनर्विवाह, पर्दाप्रथा, महिला शिक्षा को लेकर मुहिम शुरू की थी।

He always believed in freedom of girls. He was a regular contributor to the magazine published by this body - propagating his ideas on education, पर्दाप्रथा, विधवा विवाह, Child Marriage etc. all throughout his association with this body for long time.

He persuaded the Mahasabha officials and became instrumental to start the financial help scheme for widowed ladies of the community. This scheme is helping many widowed ladies of the community for last few decades. He also pioneered scheme like group marriages of those, belonging to poor families by providing institutional financial support through Khandelwal Mahasabha.

He was a very social person. He used to meet all his close & distant relatives, friends and old colleagues wherever he went.

A Tribute to Tauji[#]

Abha Khandelwal
(D/o Prof. Khandelwal's younger brother Sri Saran Swaroop Rawat)
Department of Computer Science, Hislop College, Nagpur

(Appeared in IAPT Bulletin, June-July 2021, p. 248)

[*]Inspiring a generation of teachers and learners

As I grew up, Tauji became my role model. He has this subtle way of encouraging me to pursue professional goals, consider teaching, explore newer areas like computer science when it was a new field. Tauji used to visit Kamptee and Nagpur for IAPT and academic work. I was really lucky to have opportunities to meet Tauji. His ideology about what it means to be a teacher, how teachers can optimize learning and how sharing fundamental-concepts with clarity is at the heart of a teacher's endeavour had large impact on me. I owe most of my professional success to the ideals he instilled deep inside my heart and mind.

[*]Winning hearts of colleagues across geographies

Tauji had this aura around him. Whenever I would go to Nagpur University - initially as a student and later as a University Board of Studies member, I would usually meet someone from the physics fraternity who knew Tauji and talk about these initiatives fondly.

Some of these colleagues would frequently express their desire to have the opportunity to meet him. Those who had met him would first talk about this down-to earth nature and then bring up his stellar professional accomplishments.

[*]Flag bearer of inter-disciplinary learning

Once during his visit to my place, Tauji said, "No science subject can prosper without having an interdisciplinary approach". This very idea of Tauji resulted in IAPT conducting National Standard Examination for Chemistry, Biology, Astronomy along with Physics leading towards India participating in IPhO, IChO (started in 1997 shortly after his demise and 1999 respectively). When I joined Computer Science Department as Head in 1990, Tauji had an elaborate discussion with me as to how computer-based experiments in Physics could help students grasp the insight of basic concepts. I clearly remember - this was the first time I had gathered the courage, given his stature, to present my views. As I look back, while my views were not as sharp as his, he never made me feel awkward and was such a patient listener!

[#]Elder brother of father

***Love for the nation**

Tauji always thought for society, we all are aware of. Papaji used to share multiple times that Tauji had participated in the freedom movement ... but now I came to know how intensely he was associated with our nation's independence.

It's amazing to see everything Tauji achieved in a single lifetime. This is the Birth Centenary year, and it will be celebrated till 1st Oct 2021 by IAPT. We all are really blessed to be so closely related to Tauji.

***Shat Shat Naman**

Reflecting on the life of my Kakaji (uncle) Dr. D.P. Khandelwal

Dr. Surendra Rawat
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(Appeared in IAPT Bulletin, October 2021, p. 365)

The purpose of my writing this is to reflect on the life of my Kakaji (uncle) Dr. Daya Prasad Khandelwal, my father's younger brother. In a way it is a biographical sketch as well as a memoir, the way I saw him through my eyes during my close contacts as a child and as an adult. When I think of him, a few things about him jump out – an activist (in a positive way), an educator, a social worker, and a very social person, who would not waste even a single minute of his time, always doing something.

An activist:

During British Raj, when he lived in Dungarpur, Rajasthan, he participated in the 'Angrejo Bharat ChhodoAndolan', i.e., Quit India Movement, and wrote slogans to that effect on the walls of his school/college. To avoid repercussions of participating in the movement, he had to hide his identity by changing his last name from Rawat to Khandelwal (Rawat is a 'gotra' of Khandelwals, a business community with roots in Rajasthan).

In 1965, when he was a Professor at Agra College, Agra, while pacifying students, he got hit by a 'lathi' on his forehead during the 'lathi charge' by police to disperse the protesting procession of students; the forehead bled. At that time, I was a student at BITS, Pilani, doing masters in electrical engineering; upon hearing the news on All India Radio, I visited him. It was inspiring to note how much he was revered by his well-wishers who visited him at his home in Agra after the incidence.

An educator and a social worker:
From my parents I heard stories of how in his early days he did his bachelor's and master's education, his teaching at schools in Karachi (during pre-independence days) and in Pilani, and doing Ph.D. in Physics in Nainital under Dr. Pant's supervision, etc. His teaching career involved doing bigger and better things in Agra, Jaipur, and Kanpur, at various Universities and Colleges.

Until 1972, he was the only PhD in our entire Rawat family including our extended families. As a child in 1950's, I was exposed to the meaning of PhD degree through him; and perhaps the environment in our Rawat family, with him as one of the role models, laid the foundation for me and others in the family to aspire for the highest level of education and achievements in STEM (Science, Technology, Engineering and Mathematics); STEM has turned out to be the 'mantra' for every country to develop and prosper in modern times. He being a physicist, in early years of my life he inspired me to be a scientist, which over the time evolved into engineering, with foundations of STEM. As an aside, the next generation, and the generation after that in the Rawat family has had numerous scientists (including Physicists), engineers and doctors with Bachelor's, Master's, and PhD degrees, who at least indirectly, if not directly, have been influenced by the exposure to the value of education by him among others in the family.

As an educator, leaving aside a leading role in the establishment of and activities of IAPT in pursuit of excellence in teaching Physics, he always sought for excellence in teaching. In

early nineties, during his visit to Ottawa, Canada where I worked and lived with my family, I had numerous conversations about improving teaching techniques. His favorite topic was use of latest audiovisual technologies with emphasis on hands on practical aspects; for example, at my home I had some electronic kits to teach electronics to my children in a playful manner, which he took great interest in and thought of using such tools to teach at early stage in schools and universities in India. I gave him those kits to take back to India to explore possibilities – high cost of such tools was one of the barriers in India. He took every opportunity to engage youngsters in educational conversations – I recall during one of his visits to spend some time with my father and family, when I was in grade 9, he asked me, "what will happen to magnetic waves if a linear magnet with two poles was covered with a metallic pot".

He was promoter of Hindi. Back in fifties he wrote a Physics book called "Bhautiki' in Hindi – we had a copy of that in our home. As a school going child, I found it very interesting -- some of the principles of Physics in the book were way beyond my comprehension at my age.

Around 1960, he joined Khandelwal Mahasabha. Khandelwal Mahasabha is a Khandelwal community organization – Khandelwal's are a business community mostly living in Rajasthan. He laid the foundation of making the community understand the value of education and with his efforts a program of scholarships was established for education with financial assistance to needy child in the community – the program has flourished over the years and is continuing with donations.

He was involved in numerous other activities of Khandelwal Mahasabha, such as, instrumental in establishing a program of financial assistance to needy widows in the community, a voice against certain traditions involving giving of gifts (as mandatory) on various festive, religious, and social occasions – a small step towards social reform, with hopes.

A very social person:
Everywhere he visited, he somehow found time to meet with all family members, and friends and acquaintances from the past, living in the town. He always had something to share with them or simply be a good listener. One key observation I made was that they all had great respect for him. During his visit with us in Ottawa, Canada, we took him for site-seeing in Ontario, Canada and New York State, USA, by automobile/car. He expressed the desire to meet with one of his ex-students who lived in a town in central part of New York State, who happened to be ill at that time. During our site seeing tour, we drove in our car four hundred miles each way to meet with his student.

On numerous occasions, during our families' get together at our respective homes, I got to spend some time with him. I never saw him wasting a single minute of his time – always doing something or the other, either teaching related, or social activities, or meeting someone. Frequently he played rummy with my father to spend time with him.

In closing, I learnt life is about what we make of it, what we do with it for ourselves, our family, our friends and people around us in every walk of life, with a sense of making a positive impact

Dr. D.P. Khandelwal - A Quintessential Teacher and a Humanist

Anil K Khandelwal
(Nephew of Prof. Khandelwal)
Former Chairman and Managing director, Bank of Baroda

(Appeared in IAPT Bulletin, October 2021, p. 363)

DPK, was my mother's cousin brother and was very close to our family due to his association with Agra, a city, I was born and studied in. We used to call him DP mamaji. His visit to our home was always a special one when he took stock of our education and related activities. He was passionately committed to education and we experienced it in full measure. My elder brother Krishna Gopal Khandelwal (A resident of London now) tells me that once in early fifties DP Mamaji on his visit to our home found my brother playing marbles on the ground floor that too when high schools exams approached and this disturbed him so much that he told my mother to pack my brother's bags to stay with him to prepare for exams. Till today, my brother remembers this and attributes his success to this critical intervention on the part of DP Mamaji.

He was very affectionate to our family and in all important matters my parents sought his advice. He was a final arbiter in any issue where there was difference of opinion in our family. He always remained neutral in his approaching in resolving conflicts and he always favoured and took sides with ethical values.

I was doubly privileged to be his student first in Agra College in B.Sc and later at HBTI, Kanpur while pursuing my chemical engineering degree. He was one of the finest teachers of physics who could make physics teaching very interesting. He taught with greatest passion and his teaching was student centric. When in class, he moved from one corner to another as if he was in trance of teaching!

He stayed with us for over a month sometime in late 70s at Jaipur when he came to work with Prof Saraf at the University of Rajasthan. During this time, I felt very close to him when after dinner, we would discuss a whole range of subjects from International politics to state of nation. It is at this time that I closely observed him, his daily routine, dedication to work and humane attitude. These have been guiding post to me in my professional career. He was one of the finest family and community man who found time to help/ guide people in their career journeys. Whenever, he visited a town, he visited relatives, professional colleagues and friends. His time management was amazing.

He was no arm chair academic but a realist who understood the problems of a struggling nation in 50s and 60s and had a vision to take science teaching from labs to field. He has been an Institution builder in his own profession of teaching and can be credited with founding IAPT. Although he had to face a number of problems during his career but he faced the same with courage and never made departure from his value system. He was truly an inspirational leader who could inspire people by his commitment to professional values, ethical conduct, social and extension motivation.

One could never see him angry and he was the finest role model for us in the larger family for complete emotional control during crisis times. He never controlled any one but by sheer weight of his personal credibility and authenticity, he inspired one and all, his students,

researchers and others, who came in contact with him. He was a multi-faceted personality- a teacher, researcher, writer and a social reformer.

His personality type is very aptly described by Shakespeare:

“What piece of work is a man, how noble in reason,
how infinite in faculties, in form and moving,
how express and admirable in action, how like an
angel in apprehension,
how like a God!"

From Hamlet by William Shakespeare

Remembering 'Rawat' (aka Prof. D. P. Khandelwal) My Classmate

M. L. Gupta
Retired Principal, MSJ College, Bharatpur

(Appeared in IAPT Bulletin, May 2021, p. 152)

It gives me great pleasure to know that IAPT is celebrating the Birth Centenary Year of Prof. D. P. Khandelwal, Founder of IAPT, in a big way. This occasion is personally special to me and fills me with a sense of immense pride and satisfaction, because at 97, I am probably the only person living, who had the privilege of being his classmate in Agra College, Agra.

To his friends and teachers in college, he was 'Rawat' (Daya Prasad Rawat in full). He was senior to me by 2 years in college initially, but we became classmates in the final year of M.Sc. (Physics) in 1944-45 session. The answer to why and how this happened, is the most inspiring story of patriotism and personal sacrifice of a young student for the cause of country's freedom.

In August, 1942, the 'Quit India Movement' had started. Agra College became the epicentre of this movement in Agra. Rawat was very active in mobilizing student participation in the freedom struggle. British government used a heavy hand to dissuade students from participating in the movement. All the more so in Agra College, because till then the college was always headed by an Englishman. Mr. H. Croll was the Principal during our entire college life. Teaching remained suspended for almost 3 months. Scholarship-holders were asked to give a written undertaking that they would not participate in the movement, if they wanted their scholarships continued. Consequently, we all lost 3 months scholarship. Every night at 9.00 PM, there would be a roll-call in the hostel to ensure that no student was participating in clandestine political activities in night. But all these measures could not stop Rawat and other student leaders from picketing in front of the college gate and delivering fiery speeches in gate-meetings. When the police arrived to arrest them, they would jump in the crowd and disappear. I vividly remember the day 'Rawat' tried to prevent (albeit unsuccessfully) Prof. N.K. Sethi, Head of the Physics Department and his most revered teacher from entering the college premises by prostrating in front of his bicycle. Such was his fearlessness and determination for a cause.

The 'Quit India Movement' was brutally crushed by the British Government. Thousands of freedom-fighters were arrested and sent to jails. A warrant was also issued for the arrest of Rawat and other student leaders in 1943. He had to leave his studies mid-way and take up teaching job in a private Marwari School in Karachi. In order to conceal his identity, he also changed his surname from Rawat to Khandelwal. During this period he also lost his father.

The movement had failed. By early 1944, an uneasy calm had settled in the country. Most of the political prisoners were released. Rawat also returned to Agra seeking re-admission in M.Sc. (Final). This is how we became classmates and passed our M.Sc. (Final) Examination together in 1945. We were only 6 students in our batch. Rawat, Bhatwadekar and I were among the first three in the merit. We were not only classmates in the college, but also hostel mates in the Vaish Hostel, and I had the privilege of talking to him not only about Physics, but also on various other aspects of life. He was very clear about the principles of Physics and got the first prize for a lecture in the Physics Association of the college.

After passing M.Sc. (Final) examination, Rawat went back to Karachi to teach in the same Marwari School out of a sense of gratitude towards his benefactors in Karachi. I joined as a Lecturer at Birla Science College in Pilani (Rajasthan). When Birla College of Engineering started, I was shifted to Engineering College in 1947 and the post of Lecturer in Science College fell vacant. I wrote to him about this vacancy. He came to Pilani and was selected by the Management to fill up the post of Lecturer at Birla Science College. In 1948, both of us went together to appear in interviews for the posts of Lecturer at Agra College and both were selected. That very year, I also got selected as the Head of the Degree Department of Physics at R. R. College, Alwar (Rajasthan). On the advice of my professors, I joined at Alwar.

Rest, as they say, is History. In due course of time, Prof. Khandelwal occupied the prestigious chair of the Head of the Department of Physics at Agra College, Agra. We did not meet very much in the later years of our lives, but I kept listening about his professional achievements and contributions in Physics from my other classmate Prof. M.G. Bhatwadekar, who remained in Jaipur throughout his life.

Unfortunately, Prof. Khandelwal did not live a long life. But, the respect and adulation he earned from thousands of his students and colleagues in this short period is remarkable. I join the Team IAPT in paying my homage to Prof. D. P. Khandelwal.

Born on 30th January 1924, Dr. M. L. Gupta passed his M.Sc. from the Agra University in 1945. As a young lecturer of Physics, his research work won him a Central Overseas Research Scholarship for doing research at the Imperial College of Science and Technology, London, where he worked from 1957 to 1960 under the guidance of Nobel Laureate (1979) Prof. A. Salam in the field of Nuclear and Elementary Particle Physics. He was awarded a Ph.D. degree by the University of London and a D.I.C. by the Imperial College for the high quality of research work done at that institution. He retired from Government Service in 1979 as Principal, MSJ Post Graduate College, Bharatpur (Raj)

The Miracle Man DP

Shyam Saran Agarwal "VIKRAM"
68, Assistant Line, Birla Nagar, Gwalior

(Appeared in IAPT Bulletin, Feb. 1997, p. 66)

A Man of 80 to write about a Man of near 68.....
The Man to write .....is : about a Man who was !
What a pain to the pen !!

> Full thirty years back; the Memory - Tape unwinds....
> DP was Mid-Day-Sun as Head of Physics Deptt.,
> Agra College, Agra - 1968 onwards.

This writer had left that very College even thirty two years earlier there to. The Golden Past met with the Golden Present then. The two embarked on a co-journey to popularise Science for the Man on the street, carrying Science on wheels! The banner was VIGYAN MANDAL, AGRA; with these two as Founder-Members nay, Foundation Pillars- DP as President and this writer as General Secretary.

Full six years rolled by, Vigyan Mandal by then, the Talk of the Town and Centre of Activity for over two dozen Schools, Colleges including Agra University. Through our efforts the students could witness the wonders of Science Museum - on Bus....one from Bangalore, the other from Birlas, Calcutta.

The Giant wheel of Time took downward slope and the last open enjoyable picturesque talk was about two space-ships docked in open Astrospace- our talk entitled (Hindi) ANTRIKSH MEIN SAIJ PlYA KEE. अंतरिक्ष मे सेज पिया की |

A leap of further more Years-
-And the two met again!

DP with his wonder creation IAPT and this writer as humble Early Life Member.

IAPT today, is the Talk of National plus International status, with huge body of the Members, Sponsors, well-wishers etc. The Working Team of its Experts knows much more than what an humble S. S. Agarwal can talk of. They say- "Those whom God loves, die young. Not so young of age but in deeds and dreams, quite young IAPT is Mid-Day-Sun so unsparingly needed the feedback of that wonder Man DP- but less said, the better, as the pen refuses to move an inch now.

If our spoken and silent prayers reach you, Dear DP, may your Sublime Soul rest in peace, with confidence that no stone will be left unturned in fulfilling your dreams, Dear DP."

Dr. D P Khandelwal: A True Human Being

Mahesh Lal Shah
(Family friend of Prof. Khandelwal)
Advocate, Nainital High Court
Ashok Hotel, Nainital

(Appeared in IAPT Bulletin, Oct. 2021, p. 362)

In 1957 when Dr Khandelwal moved to Nainital to join Nainital degree college he took on rent one of our flats in Savitri Niwas property. With time My father Sh. Kishori Lal Shah and Dr. Khandelwal started interacting with each other. Very soon our families started visiting each other and we became very close family friends.

After few years, sadly, my father Kishori Lal ji died in an accident. He fell from the roof of our hotel while supervising some work. I was the eldest child, just 16 years old at that time. I had three younger brothers. Our family was devastated and whole responsibility of looking after everything came on my shoulders. Dr. Khandelwal in that difficult time became a pillar of strength to me and my mother. He guided me in picking up knowledge about my business.

My mother was a simple housewife. Dr. Khandelwal slowly persuaded her to come out and assist me in looking after hotels and guests. His encouragement helped a lot in building her confidence and she started settling down as a working lady. After our business became manageable, he advised me to go back to my studies. I joined college and did my LLB. That education was of great help in building my personality and ability and I could start practicing as a lawyer.

Today my son is a leading practicing lawyer in Nainital High Court. My daughter is also a lawyer and practicing. It has been 60 years since Dr. Khandelwal and family left Nainital, bond between the two families is still alive.

Humane side of Dr. Khandelwal was extremely remarkable. His honesty, devotion and dedication to sail our family out of rough times will always remain etched in our hearts. My tribute to him for what he was as a highly admirable & respectable human.

A tribute:

Y.K. Gupta
J-5, Phase II, Shivalik Nagar, BHEL, Hardwar

(Appeared in IAPT Bulletin, Feb. 1997, p. 60)

"..... A noble soul dedicated to the Physics education in the country rests in peace now. Dr. D.P. Khandelwal devoted his entire life to the cause of physics teaching and this he did even at the cost of his family ties, and his relations with the relatives and friends. Although he was caring and affectionate, but his love for teaching of physics always made others almost a little less than sick. He was a tremendous organiser. He organised a social group of families at Nainital. He organised Khandelwal Education Society in Jaipur and continued his service from Agra for the needy students of the community. Lastly, he instituted Indian Association of Physics teachers which is a living monument of his efforts. How many of us know that he went to Jail in the 1942 freedom movement, but he never capitalised the benefits of a freedom fighter.

I knew him for the last thirty eight years from his journey Nainital-Jaipur-Agra-Kanpur to Pune. Incidentally being in the discipline of Chemistry, we had little academic interaction, but we did understand each other on broad aspect of education. He persuaded me many times to start a similar Institution in the discipline of Chemistry of which he felt a dire necessity. However, I had my own limitations then and I could not carry out his wishes.

I made my journey to Pune only recently, and when he saw me off at Pune on Feb. 1, I never realised that it was our last meeting. The best and the befitting tribute to the memory of the departed soul would be to make the Indian Association of Physics Teachers more than living..."

Reminiscences by

Colleagues and contemporaries

During my stay as D. E. (Director of Education), U.P., he undertook reorienting about 100 teachers of the Intermediate colleges of U.P. knowing fully well that he would get no credit for this job.

D.D. Pant

DPK and DDP (Prof. D.D. Pant) established a library for poor students of Physics Department of the DSB College (Nainital). For this purpose, funds were collected by staging charity programmes.

H.D. Bist

…. for him the development of an innovative undergraduate laboratory was equivalent to the establishment of a first rate research laboratory in some frontier area.

A.W. Joshi and A.D. Tillu

D.P. Khandelwal, as I knew him

Prof. D.D. Pant
Department of Physics, Kumaon University, Nainital

(Appeared in IAPT Bulletin, Feb., 1997, p. 46)

I knew him perhaps better than any one else. He was my life long dear friend, one time colleague and student. A clear headed person with religious temper to duty and devotion to work. Perhaps a bit obstinate and deterministic; it is difficult to give words to the worldless feelings about him. I first heard about him some fifty years back from a class fellow of his at Agra College who told me that Daya Prasad Rawat who a few years back had passed M. Sc. (prev.) (as D. P. Khandelwal) has taken admission in the final class.

Khandelwal had taken part in 1942 freedom movement leaving his studies - a fact about which he could have been proud, but it never played any part in his life. I do not remember him ever mentioning about his sacrifice any time. Imet him several times but more intimately about ten years later at Nainital. He had two appointment letters in his pocket -one as assistant professor of physics from U.P.S.C., Allahabad for newly opened Government College, Nainital and the other as Income Tax Officer in the Central Government. He wanted to join the teaching post in preference to I. T.0. 's provided he could work for the Ph. D. degree at Nainital. He was determined not to join the much coveted I.T.0.'s post having discussed with his well wishers the relative merits of the two and keeping in view his resolve to remain honest throughout his life. Nainital had no research facilities. We decided to rig up a fluorimeter. Components were available as disposal materials of second world war. Transformers, condensers, photomultiplier tube were purchased at nominal cost. A small monochromator costing Rs. 2000/- was also purchased and within a year a non-recording fluorimeter was set up. Much of the credit goes to Khandelwal as also to Dr. B.C. Pande whom we employed as a research student. Khandelwal got his Ph. D. in 1958. The amazing thing, however, was that this work which was on deciphering the frozen spectra of uranyl ·ion was extensively quoted with over a dozen spectral curves soon after by Rabinwitch and Belford in their monograph "The Spectra of Uranyl Jon" (Academic Press, 1964). When we were progressing to establish a good laboratory, the U. P. Government in their wisdom downgraded the college. Both Khandelwal and I thought of leaving Nainital and joining Jaipur. The U.G.C., however, was not prepared to allot foreign exchange. I thought it would be difficult to set a new laboratory at Jaipur and changed my mind. Khandelwal, however, joined.

Our associations at Nainital continued lifelong. At Nainital we established a poor boys' library from the funds collected by staging charity programmes etc. where we came in conflict with the district authorities and the principal, but Khandelwal was a true friend to remain with me thought thick and thin. His extreme devotion to teaching brought him back to Agra College but there also he resigned his post and remained perhaps without a job for a few days. Even during these days he organized a Seminar as if nothing had happened. Fortunately, he was appointed Professor at H.B.T.I., Kanpur. I was able to persuade the Chairman, H.B.T.I. that Khandelwal would be an admirable choice. During my stay as D. E., U.P. he undertook reorienting about 100 teachers of the Intermediate colleges of U.P. knowing fully well that he would get no credit for this job.

In Independent India we worked under the spell of Nehru Bhatnagar model of scientific development. External achievements like big labs, equipment, more research papers, prizes, high contacts through international conferences, seminars etc. became important. Khandelwal had none of these and was basically a teacher of unparalleled merit. There was no place for such a person as professor even in Universities. I myself did not select him for a Professor's post at Kumaun University, Nainital, even though I considered him most useful even for my own good. This was cruel and he felt hurt and expressed it. But the matter ended there for he knew why this has happened, as he had not the qualification to attract research grants.

The I.A.P.T. is his later adventure as a contribution to Physics. It was inaugurated by me at Kanpur and gave a talk under the spell of Capra and Talbot - mixture of physics with mysticism. He did not like it and I was not made the president of I.A.P.T. for the first year even though he had himself made the offer earlier. I was hurt but I knew his choice of B.L. Saraf was more appropriate. The big ones in science by now had recognized that failure of science in India was due to the weak training at the undergraduate level! Khandelwal belatedly a member of U.G.C. Physics panel wanted to do his bit by setting up most modern experimental laboratories for B.Sc. in each college. If implemented, it would cost a hundred crore to the exchequer. I disagreed and wrote to him that such ventures cause inflation and jokingly said would "eat away my meagre pension". Let us make use of what exists, now-a-days colleges do about 40 days teaching and lab work is almost fraudulent. The repair work in education has taken place several times, each time stress was in the infra structure resulting in useless expenditure of effort. I once participated in one such but more subtle venture of the U.G.C. - the so called staff colleges. These are supposed to be remedial measure to remove the ill effects of "Two cultures" of C.P. Snow. The operational part consists in orienting young teachers of humanity to science (method) and vice versa. I was invited for a talk. As a general talk on the topic I gave Aristotle's listing of thinkers in order of their honourable status top philosopher then mathematician and so on with engineer at the bottom. So low was engineer as a thinker that Aristotle has even said that inspite of his usefulness "you would not like to give your daughter in marriage to him". I waited for the appreciation of the intended humour but no response. Then stood up a burly young man and shouted at me in Hindi - क्यों साहब इन्जीनियर को लड़की देने मे क्या हर्ज है? For me the orientation was a disaster. Khandelwal shared my view and the joke with his engineer son and was appreciative. He died soon after leaving behind his sweet memory and the edifice of IAPT. This teacher 's organisation for improvement of teaching of physics alone, I believe, can deliver the goods. The gesture of Professor Mande and his colleagues to pay tribute to Dr. Khandelwal gives me hope that his old age Herculian effort will be continued in the right spirit.

Dr. D,P. Khandelwal - A Multifaceted Personality

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

[1]Former Professor, Indian Institute of Technology, Kanpur
[2]Govt. PG College Berinag, Uttarakhand

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Preamble

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

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

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

Period	Institution	Position	Work for students
Jan 1943-47	Marvari Vidyalaya, Karachi	Teacher	High School and Inter
Jan 1947-48	Birla College, Pilani	Lecturer	Intermediate
July 1948-54	Agra College, Agra	Lecturer	BSc & MSc
Oct 1954-61	DSB Govt College, Nanital	Lecturer	BSc, MSc & Research
Oct 1961-63	Rajasthan University, Jaipur	Reader	BSc, MSc & Research
Oct 1963-69	Agra College, Agra	Professor	BSc, MSc & Research
Oct 1969-81	HBTI, Kanpur	Professor	B Tech & Research
1977	Rajasthan University, Jaipur	Visiting Professor	In ULP Program
1981-84	IIT, Kanpur	Visiting Professor	Research

Synopsis of his main assignments

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

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

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

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

In this presentation, we highlight his contributions as:

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

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

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

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

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

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

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

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

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

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

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

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

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

The New Fluorimeter

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

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

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

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

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

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

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

Tits and Bits to remember from association with Prof DDP

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

a) Trait from DDP

"Finishing the job by the end of the day"

(अध्यवसाई का कार्य दिन के अंत तक पूरा किया जाता है)

written on the way of his office in DSB college

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

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

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

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

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

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

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

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

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

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

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

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

At that time his family was settled in Agra. DPK was requested to come and share the living residence allocated to HDB in the campus of IIT Kanpur. DPK accepted the invitation of HDB to stay with him in IIT Kanpur and participate in HDB group's research activities after completing daily duties in HBTI. He spent time in labs and office at IIT Kanpur with HDB group contributing for publications and experimental works. As a senior teacher and colleague for more than a year, DPK's experience was an asset for junior students and researchers in the IIT group of HDB.

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

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

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

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

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

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

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

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

3.1 Books and Research papers from HBTI and IIT Kanpur

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

Papers published –

1. V S Tomar, H D Bist and D P Khandelwal, 'Infrared Spectrum of Potassium Oxalate Monohydrate at Liquid Nitrogen Temperature', Applied Spec. **24**, 598-601 (1970)

2. V N Sarin, M.M Rai, H.D. Bist and D.P. Khandelwal, 'PR Separations and Relative GBranch Intensities in Infrared Band Contours of Monosubstituted Benzenes', Chem. Phys. Letters **6**, 473-475 (1970)

3. M M Rai, H D Bist, D P Khandelwal, 'Infrared Band contours and PR Separations of Fluorinated Aromaties, 1-4 Difluoro- Benzene', Applied Spec **25**, 442-448 (1971)

4. B K Srivastava, D P Khandelwal and H D Bist, 'Anharmonic and coordination effects in the internal modes of water in $CoCl_2.2H_2O$ and $CoCl_2.2D_2O$', Applied Spec **29,** 190 (1975)

5. Bipin K Srivastava, D P Khandelwal and H D Bist, 'Infrared spectra of $BeSO_4.4H_2O$ and its deuterated analogue at 110K in 1200–250 cm^{-1} region', Pramana **7**, 401-406 (1976)

6. B K Srivastava, D P Khandelwal and H D Bist, 'Mechanical and electrical anharmonicities in the bending mode of water in some transition metal dihydrated dichlorides', Solid State Commun **19**, 985-987 (1976)

7. Bipin K Srivastava, D P Khandelwal and H D Bist, 'Infrared spectra of $BeSO_4.4H_2O$ and its deuterated analogue in 4000–1200 cm region', Pramana **7**, 49-55 (1976)

8. B K Srivastava, D P Khandelwal and H D Bist, 'Changes in IR Spectra of Some Hydrates with Different Window Materials, Aging and Pellet Pressure', Ind. J. Pure and Appl. Phys. **14**, 240 (1976)

9. B K Srivastava, D P Khandelwal, and H D Bist, 'Spectroscopic Correlation of OH Stretching Frequency Shifts of Water in Crystal Hydrates', Chem. Phys. Letters **39**, 366-370 (1976)

10. B K Srivastava, D P Khandelwal, Sunita Khandelwal and H D Bist, 'Internal Modes of and Potential Environments Around Water Molecules in $CuSO_4.5H_2O$ and its Deuterate', Chem. Phys. Letters **43**, 557 (1976)

11. Bipin K.Srivastava, D P Khandelwal and H D Bist, 'Intensities of wagging and rocking bands of water in $MnCl_2 \cdot 2H_2O$ and $CoCl_2 \cdot 2H_2O$', Chem Phys Letters, **55**, 391 (1978)

12. V P Tayal, D P Khandelwal and H D Bist, 'Systematics of the Librational Modes of Water in Typical Transition Metal Sulphate Monohydrates $MSO_4.H_2O$ (M = Mn, Co, Ni, Zn)', Chem Phys Letters **55**, 136 (1978)

13. V P Tayal, B K Srivastava, D P Khandelwal and H D Bist, 'Librational modes of crystal water in hydrated solids', Applied Spectroscopy Review, Published online, **16**, 43-134 (1980)

14. G D Tewari, V P Tayal, D P Khandelwal and H D Bist, 'Vibrational Modes of Water in Nickel Formate Dihydrate', J Mol Structure **96**, 45 (1982)

15. G D Tewari, V PTayal, D P Khandelwal and H D Bist, 'Vibrational Modes of Water in Zinc Formate Dihydrate', Appl Spectrosc **36(4)**, 441 (1982)

16. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Phase Transitions in Magnesium Acetate Tetrahydrate', Chem Phys Letters **93**, 371 (1982)

17. O P Lamba, H D Bist and D P Khandelwal, 'Structural investigations on $Sr(NO_3)_2 \cdot X_2O$ (X = H, D): a vibrational analysis', J Mol Structure **101**, 223-231 (1983)

18. Anshu Agarwal, D P Khandelwal and H D Bist, 'Low frequency vibrational spectra of lithium formate monohydrate and its aqueous solutions', Can J Chem **61**, 2282 (1983)

19. M B Patel, S Patel, D P Khandelwal and H D Bist, 'Vibrational Studies and Phase Transitions in $Co(clO_4).6H_2O$ and $Mn(c1O_4).6H_2O$', Chem Phys Letters **101**, 93 (1983)

20. G D Tewari, D P Khandelwal, H D Bist and V P Tayal, 'Evans Holes in the Infrared Spectra of Some Transition Metal Formate Dihydrates', Can J Chem **61**, 2745 (1983)

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22. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Low-Temperature Infrared and Raman Spectra of $Co(CH_3COO)_2 \cdot 4X_2O$ (X = H, D)', Appl Spec **37**, 710 (1984)

23. G D Tewari, G S Raghuvanshi, D P Khandelwal and H D Bist, 'Study of Structural Phase Transition in NH_4SCN from Raman Scattering', Chem Phys Lett **103**, 328 (1984)

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25. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Fermi resonance in $M(CH_3COO)_2.4H_2O/D_2O$ (M = Mg, Co and Ni)', Spectrochim Acta **41A**, 391 (1985)

26. M Pal, D P Khandelwal, V N Sarin and H D Bist, 'Laser Raman Studies of incommensurate Phase in $(CH_3)_4N_2$ $Zncl_4$ in Lasers and Application', J Raman Spectroscopy **17**, 345 (1986).

27. S Ram, D P Khandelwal and H D Bist, 'The Observation of Electronic Raman Effect in Europium Sulphate Octahydrate', Proc. Int. Conf. Raman Spectro **9**, 630 (1984)

28. G S Raghuvanshi, D P Khandelwal and H D Bist, 'Lattice Vibrations in $M(CH_3COO)_2$ (M = Mg, CO and Ni)', J Solid State Chem **57**, 207 (1985)

29. G D Tewari, D P Khandelwal and HD Bist, 'Raman scattering study of phase transitions in NH_4SCN', J Chem Phys **82(2)**, 5624-32 (1985)

30. M Pal, A. Agarwal, D P Khandelwal and H D Bist, 'Incommensurate Phase in Tetramethyl Ammonium Tetrachlorozinate: Evidence from Internal Modes', J Raman Spectros **17**, 345 (1989)

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

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

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

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

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

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

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

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

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

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

J S Goela was Assistant Professor in IIT- Kanpur.

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

4. Indian Association of Physics Teachers (IAPT)

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

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

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

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

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

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

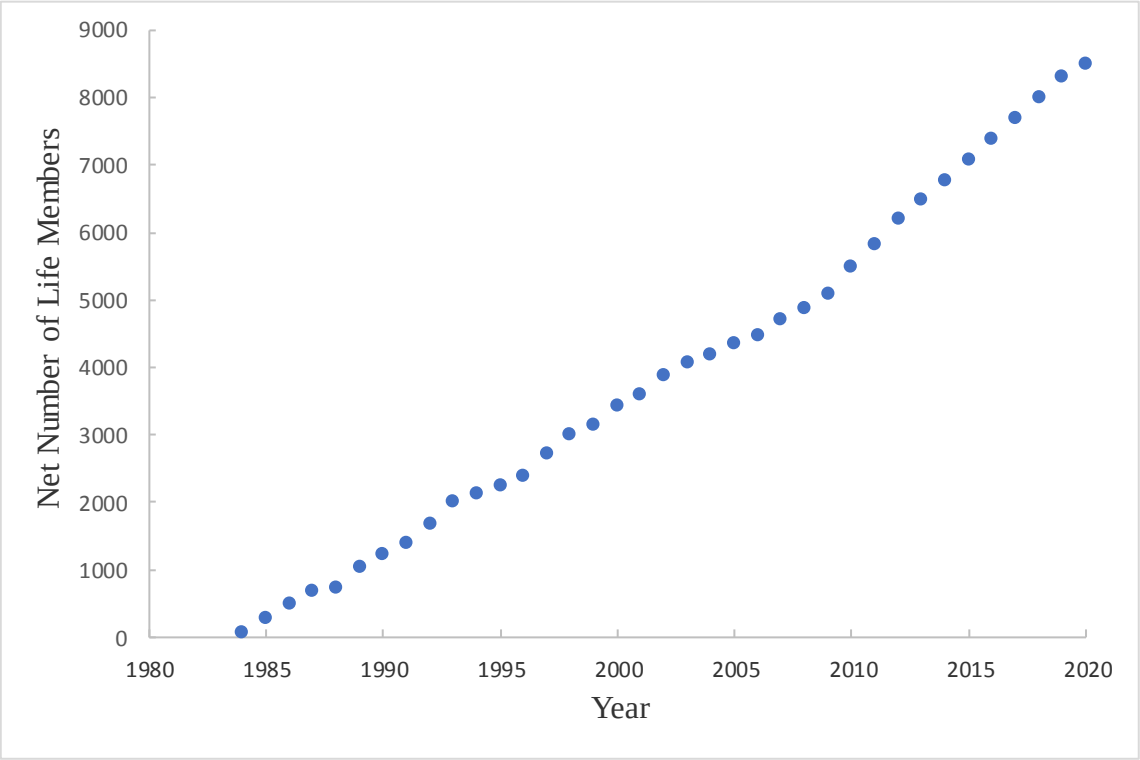
These depict an impressive growth of strength of IAPT founded by Prof. DPK. Starting from April 1984, the number of life members in Dec. 2020 stands at 8499. This is heartening and satisfying.

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

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

Year; Number of Life Members*

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



Graphical representation of Net number of Life members versus years

Dr. D.P. Khandelwal in HBTI - Some Reminiscences

Amar Nath Nigam
Former Professor of Physics, HBTI, Kanpur

(Appeared in IAPT Bulletin Feb. 1997, p 51)

It was the year 1969, when the then Chairman, Board of Governors of HBTI Kanpur announced the appointment of Dr. D.P. Khandelwal as the first Professor of Physics. At that time I myself was the Asst. Professor in the same department. Those were the days when every basic science department was having a faculty eager to go ahead with the research projects. The problem was to get an affiliation to the new Kanpur University for carrying out the Ph.D. programmes. This was not an easy task. However, Prof. Khandelwal succeeded, though it took full three years of hard argumentation with the higher authorities of the university. The affiliation was granted in 1972. We all were happy and gave full credit of obtaining the affiliation to Prof. Khandelwal. It is an admitted fact that pure teaching at the PG level without any research programme or pure research without any teaching assignment are monotonous activities devoid of any thrust for higher knowledge. But this was hardly realised by the higher-ups at the University and also at HBTI.

Prof. Khandelwal's interest for lab-development was confined only to the undergraduate laboratory. For higher research he preferred to have closer ties with the local liT rather than to develop independent research facilities at HBTI. However, I myself sharply differed from him in this regard and still he extended his full support to my development plans. He encouraged the two Lecturers M/s V.P. Tayal and D.N.S. Srivastava to work at IIT for their Ph.D. Every research scholar working with Prof. Khandelwal recorded his data in the IIT labs. This gave a lot of impetus to research work in the department - the atmosphere had totally changed.

Prof. Khandelwal reoriented Physics teaching for the engineering students at HBTI. Besides the Ist year physics, Atomic Physics and Quantum Mechanics were introduced at the B.Tech. IInd yr. level and Solid State Physics at the IIIrd yr. level. New experiments of high educative value not involving any costly equipment gave a lot of thrill to the students of engineering who knew that they were learning Physics for the last time. They became eager to learn more and more and were desirous to peep into the world of higher physics as far as their abilities permitted them.

When Prof. Khandelwal joined HBTI the institution had old traditions of a government organisation. There was no platform for the teachers where they could voice their feelings. Prof. Khandelwal formed a teachers' association. This led to a direct confrontation with the then administration. A mediation by some persons with political status subsided the matters but it took full two years' time. During this time Prof. Khandelwal was under a lot of tension but he never reflected it in his duties. It looked as if nothing has happened! There is common mistake which the government administration makes while running a teaching institution: the administrative rules governing an office are applied as such to the academic faculty however highly qualified it is. This results in a lot of heart burning and the real academic progress is at a stand-still. The progress of an institution of higher learning always depends upon the staff's creative capacity and its free development.

Prof. Khandelwal was a hard-core Gandhian. He was selected as a B.Sc. in the ICS Examination of 1942 but the call of Mahatma Gandhi changed his mind. Much against the wishes of his family he refused to join the ICS. He was involved as a main figure in organising the students strike at Agra and had to go underground when a warrant of arrest was issued against him. He changed his name from D.P. Rawat to D. P. Khandelwal. As soon as the independence movement subsided the joined Agra College Agra to complete his M. Sc. in Physics. The teaching of Prof. N.K. Sethi impressed him and this was reflected in his mode of lecturing. While serving as a lecturer in Nainital he worked with Prof. D. P. Pant for his Ph.D. He became fond of carrying on research without any elaborate equipment.

In 1981 Prof. Khandelwal retired from HBTI Kanpur and conceived a new idea; the formation of Indian Association of Physics Teachers. This was started in 1983 and the first Bulletin came out in 1984. This is being continued since then. It publishes articles pertaining to Physics teaching and very often opens new windows to higher Physics information.

Prof. Khandelwal stressed the objective mode of teaching but sometimes swung the pendulum too far. At such moments I had a lot of lengthy discussion with him and requested him to maintain a balance between objectivity and subjectivity, the latter keeps the system open ended. His capacity to change the curriculum quickly from time to time was indeed marvellous, his ability to introduce new courses was unparalleled in the speed with which he carried out his program. His death has created a gap that is difficult to fill for a long time.

Dr. D.P. Khandelwal: Beyond IAPT

Satya Prakash
Former President IAPT
PU Chandigarh

(Appeared in IAPT Bulletin Dec. 2021, p. 449)

A Conscious Teacher

It was June 1964. After doing M.Sc. from Allahabad University, I had applied for the post of lecturer in Physics in Agra College and was called for the interview. Principal, Agra College, Prof. M. Ray, Head, Physics Department Dr. D.P. Khandelwal and a Subject Expert were committee members. Dr Khandelwal was a man of spectroscopy and he was asking some questions on X-ray spectroscopy. I answered well. Then suddenly Prof. Ray said, I have seen him - he has been my student (I had passed my B.Sc. degree from Agra College and I had few opportunities to meet Prof. Ray). I was selected and joined Agra College. Dr. Khandelwal was a conscious teacher. He called upon me and discussed my teaching priorities and assigned to teach Mathematical Physics to M.Sc., Properties of Matter to B.Sc., and Practical Physics to Class XII.

Pragmatic Personality

It so happened that I got the Junior Fellowship for doing D.Phil. Degree in Allahabad University. I conveyed this message to Dr. Khandelwal. He was happy but showed his concern about me. He advised that you have got permanent job in prestigious Agra College. You can continue your research work here in spectroscopy along with post graduate teaching; you will have a bright carrier. Further he suggested that you also talk to Prof. Ray who is well known for his work in mathematics and he is an authority to accept your resignation letter. While I talked to Prof. Ray, he suggested that you join Allahabad University for your D.Phil. Degree. I talked to Dr. Khandelwal again and finally it was my destiny, I left Agra College after two months. However, by the time I completed my D.Phil. Degree, it was hard to get the permanent position in the same Agra College. Then I realized the words of Dr. Khandelwal. He was very pragmatic person down to earth.

Committed Leadership

I joined Panjab University in 1972. In those days the Indian Physics Association (IPA) had just been constituted. However, most of its physics activities and administration were Mumbai centred - basically in TIFR, BARC and IIT. I was an active member of IPA and Prof. Kushwaha was the Secretary of its Chandigarh Chapter. Over the years, a feeling had started growing that the representation of universities in IPA is minimal and there is no participation of colleges at all. This feeling was going around and during the informal gatherings during a seminar / symposium, this topic was often a subject of discussion. So when Dr Khandelwal started approaching teachers about starting IAPT they welcomed it. Soon, this Indian Association of Physics Teachers (IAPT) was created under the leadership of Dr. Khandelwal and many of my colleagues joined as life member of IAPT. But for sustaining an NGO, the commitment to cause, the zeal to create financial resources and a creditworthy program are most important. Dr Khandelwal had these qualities and IAPT flourished in his committed leadership.

Concern about Under Graduate Physics

After that I had many occasions to meet Dr. Khandelwal but our relations were the same as in Agra College, very informal and caring. An IAPT convention (1994) was held in Ambala. Prof. Kushwaha had requested few of us to give short talks on Frontiers of Physics. We prepared well with a few transparencies for ten minutes presentation. I started my presentation, Dr. Khandelwal came to me on dais and told silently, please complete in five minutes and request others also to do so. I felt differently, but obeyed his words. Later he told me that the aim of convention is to address under graduate physics; he was deeply concerned to under graduate physics. Our view was that physics teaching is comprehensive. The training of subject goes from bottom top and top to bottom. Therefore, post graduate and school teaching should also be the parts of IAPT activities.

Dream of Dr. Khandelwal

It is difficult to fulfil the dreams of a founder. But certainly, the dream must be grand. I personally feel that we must have grown much bigger by now considering the phenomenal increase in the number of colleges, teachers, students, financial resources and communication skills. This needs the vibrant approach, re-examination and review of existing programs, creation of new programs and grooming of young leaders to carry forward IAPT, the most important NGO of the country.

I have profound regard for Dr. Khandelwal as I started my teaching career in Agra College in his supervision and his multiphase contributions to IAPT.

Dr. D. P. Khandelwal - as I knew him

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(Appeared in IAPT Bulletin, Feb. 1997, p. 53)

It is a sombre occasion as I recall my 45 years association with Late Dr. D. P. Khandelwal who passed away recently. I sincerely appreciate this opportunity provided to me by the President of the Indian Association of Physics Teachers (IAPT). Death is the ultimate reality of life and a new beginning where a person who had lived a productive life and such one worth emulating, continues to live through the contributions made to enrich the lives of others and for the standards left behind to be followed by posterity. Dr. D. P. Khandelwal -a physicist, a great teacher and an inspiration to one and all by his own example was one such person that we miss today while we cherish his memory so very fondly. Let us pray that his soul may rest in peace with our sympathy to the bereaved family. Such luminaries like him never die- they just fade away.

Dr. D.P. Khandelwal and I met for the first time in 1951 when we invited him to come to D.S. College at Aligarh to conduct the Physics Practical examination for B.Sc. students. I happened to be the Internal Examiner which gave me an opportunity to know this fellow physics teacher who at the time was on the staff of Agra College - another constituent college of Agra University, much like ours. He had stayed at my residence on the college campus for four days which further enhanced the level of contact. I was very much impressed by his sincerity, ethics and principles and commitment to excellence in teaching. He was genuinely interested in the welfare of students and encouraged creativity. Finding these attributes within a younger person resonated well with my own philosophy in teaching and upholding the dignity and self-respect of an individual. This led us both to develop a strong and personal bond of friendship which was to last throughout his life and which I very affectionately cherish as we talk of him. My recollections are very personal and not necessarily unique. He was special in so many ways - a great teacher, a trusted and dependable friend, innovative, creative and resourceful and available in times of need.

Dr. Khandelwal moved on to Government Degree College, Nainital as Head of Physics Department. Our association continued and we had long discussions on how to enhance the Physics curricula and enhance the quality of education and create an environment for research. Finding constraints to implement all that positive thinking he left for Jaipur University as a Senior Lecturer to return back to Agra College again - this time as Head of Physics Department. Now firmly in the saddle and in control, he initiated an awareness in teachers about the necessity of improvement in the technique of Physics education. In fact he took upon himself the enormous task of reorienting the syllabus of Physics for B.Sc. and M.Sc. classes and set up a new direction for the standards of Physics in Agra University. This was followed by instituting regular seminars by eminent Physicist of the day, such as Dr. Raja Ramanna and the like. Dr. Khandelwal indeed was a pioneer in enhancing the standards of Physics Research in India.

In 1964 we at D.S. College, Aligarh had applied for permission to institute M.Sc. degree programme in Physics. Dr. D.P. Khandelwal and Prof. Rajendra Singh, Allahabad University (now RSS Chief) were the Government nominee on the UGC panel that visited our college for inspection to review our facilities. Both distinguished professors, I and my staff in the Physics

Department had in-depth discussion and the college got Post-Graduate status. Whereas, Professor Rajendra Singh was to utmost help to us and continues to be widely respected and well known, Dr. Khandelwal was very inspirational by his enthusiasm and provided encouragement and support in our endeavours. Our consultation continued and with the high standards we had established, one of our students topped in the M.Sc. examination in whole of Agra University.

Dr. Khandelwal believed in great team spirit and constantly exhorted and demanded excellence from his staff colleagues in enhancing the quality and content of the physics curricula to make it relevant to the needs of time and beyond. In this effort he would go to any extent to help students no matter from where, to be creative and pursue their research projects under the guidance of any faculty member in a college. I presented him with an opportunity to handle the case of a Lecturer of Physics at D.S. College who had undertaken a research project under a Professor of Physical Chemistry. I had retired by this time and had gone back to my ancestral home in Azamgarh and Dr. Khandelwal had moved to HBTI, Kanpur. I travelled to Kanpur and apprised Dr. Khandelwal of the young Lecturer's case. His support was positive and the person soon got his Ph.D. degree. His criterion was simple, just as I believe in: when someone looks up to you, look after him/her. It is while at Kanpur that he established the Indian Association of Physics Teachers (IAPT) that we all are proud of.

After retirement in 1974, I got busy in preparing a number of books on Physics with the view to provide help to students preparing for the entrance examination for Engineering and Medical Colleges. In this connection also, Dr. Khandelwal gave me valuable suggestions and helped me in this personal venture keeping in view of the greater good of the students.

My involvement in the propagation of Scientific knowledge for the benefit of common man has been a lifelong passion through many books written in Hindi, science magazine articles, radio talks and my well regarded books on Physics "Bhautik Vigyan - Vol. 1 & 2 for Intermediate students". I was intimately connected with Dr. Khandelwal in the "Production of Scientific Literature in Hindi". He was a pioneer in this field as well, having written a number of books in Hindi under the auspices of the Hindi Samiti of Uttar Pradesh at Lucknow.

During the sixtees, I was the Chief Editor of Vigyan Lok (Agra Publication). For this also I received whole hearted cooperation from Dr. Khandelwal. On the occasion of the annual meeting of the Indian Science Congress at Roorkee, I brought out "Indian Science Congress number of Vigyan Lok" and Dr. Khandelwal helped me in making this effort a resounding success. In the field of scientific literature in Hindi Dr. D.P. Khandelwal may as well be classed at par with Late Dr. Gorakh Prasad and Dr. Satya Prakash of Allahabad University.

In 1974 I had translated Peck's "Electricity and Magnetism" under the auspices of Hindi Samiti of Uttar Pradesh in collaboration with Dr. Ashok Chaubey of AMU Aligarh. On my personal request, Dr. Khandelwal took upon himself the task of vetting the Hindi script in spite of a very busy schedule. He made valuable suggestions to improve the script. This book got published in 1975.

It is rather difficult to summarize a lifelong association and multifarious contributions of Dr. D.P. Khandelwal. However, still we must put on record the distinction and the respect he enjoyed by being what he was and what he purported to be. He was a sensitive, decent and a thoughtful human being. His living was simple and he practised truth in all his relationships. He was a great supporter of the dignity of women just as he himself was highly dignified

individual. While he was Head of the Department at Agra College, a lecturer misbehaved with a girl student. He took a very serious note of the incident and reported the matter to the Managing Committee of the college. It failed to take any action since the lecturer was related to someone there. As a protest Dr. Khandelwal forthwith resigned from the services of Agra College. Need we say any more about his respect for people? Respect for the individual was his creed.

As we mourn the loss of a dear friend and a fellow professional - we can also rejoice in the fact that he was among us, as one of us, who walked with us with a head held high, yet humble he was in recounting his achievements far too many. A life well lived and that which enhanced the quality of the lives of others, is a life that never dies and becomes a source of inspiration for all times. This is the life we know, Dr. D.P. Khandelwal lived.

I must conclude with an appeal that let all of us continue with all that made so much sense to late Dr. D.P. Khandelwal and that for which we held him so dear pursuit of truth, imparting high ideals to the younger generation by our own examples, by our own creativity and resourcefulness. This indeed will be a true tribute to him and worthy of us all.

Interaction between Late D.P. Khandelwal and University of Pune

A.W. Joshi and A.D. Tillu
Department of Physics, University of Pune, Pune

(Appeared in IAPT Bulletin Feb. 1997, p. 56)

Much has been said and written about Late Professor D. P. Khandelwal since his sudden demise in February 1996. Several articles in this special issue will say quite a lot about him. We shall therefore focus on some aspects which the others are not likely to touch.

We were working on Curriculum Development during 1988-90 for UGC and Professor Khandelwal was invited to participate in the meetings and deliberations. His involvement in this activity was fairly serious and we had the opportunity of coming in close contact with him. He left an impression on us with his zeal, vigour, ideas and drive to work.

It is well known that Professor Khandelwal spent the last few years of his life in Pune. This is because Professor A.S. Nigavekar had a project sponsored by UNESCO (in which both the present authors were also involved) in the Department of Physics to produce a multicomponent university foundation course in physics which we have called "A World-View of Physics". The project needed a person who could devote a fair amount of time for writing as well as experimental development. Professor Nigavekar thought of Professor Khandelwal and the latter agreed to come to Pune right from the proposal stage. He spent about three months in Pune in 1992 and almost single-handedly drafted the proposal for the above project.

The project was soon sanctioned by UNESCO and naturally Professor Nigavekar invited Late Khandelwal for a longer period to work in this project. Knowing that this project will take a few years, Professor Khandelwal left his house in Kanpur and moved to Pune in May 1993. (This move was facilitated by the fact that his son was living in Pune). From that moment he was working like a train with double engine - he was doing all the work for IAPT as before and coming to this Department everyday like a regular faculty member to work on the UNESCO project.

Although a large team was involved in this project, almost the entire development of the course "A World-View of Physics" (which includes a textbook, a teachers ' guide and quite a few experiments) was due to him. During the development of this course many of us had numerous thread-bare discussions with him on simple-looking but tricky aspects of physics. We also had many discussions on education, curriculum, educational planning etc. (The package of books for the course "A World-View of Physics" will be ready in the early 1997 and will be handed over to UNESCO)

During these academic interactions and discussions, we noticed that he was very respective to new ideas and suggestions. He had definite ideas for the development of undergraduate laboratory. Although he was not averse to an analysis of errors and accuracy of the experiments his stress was always on getting the maximum amount of conceptual output from a given experimental situation and interpreting it in terms of physics starting from the first principles. In fact for him the development of an innovative undergraduate laboratory was equivalent to the establishment of a first rate research laboratory in some frontier area He was also associated with the UGC Journal of Physics Education - he was the member of

the local editorial team of the Journal for about 15 months until his death. He read each and every piece submitted to the journal very critically and made his suggestions and comments.

He did pursue his dream of establishing several centres with nice undergraduate laboratories wherever and whenever opportunities permitted. He could go a part of the way towards this aim in our Department through the UNESCO project. His proposal for a four-week Special Workshop on Experimental Physics at the Undergraduate Level (which was conducted at Jaipur during 30 September- 26 October, 1996) was a natural step towards the fulfilment of this dream. The output of the Jaipur Workshop appears to be commensurate with his expectations. Establishing several innovative centres at the undergraduate level will be a necessity and it will go a long way in the path shown by him.

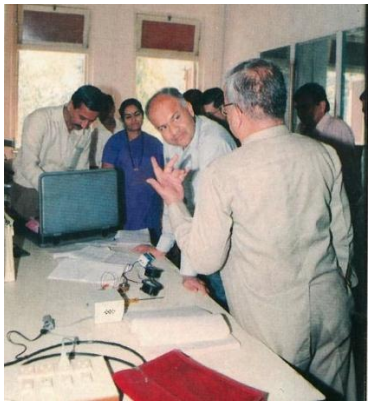
Let us now come straight to the last few days. A UGC Refresher Course was going on in our Department in January-February 1996. We had decided to present the UNESCO course component to the participants of this Refresher Course which involved looking at physics from a new perspective. Our component included about a dozen lectures and some experiments which were also performed with a fresh outlook. Professor Khandelwal delivered his full quota of four lectures in this Refresher Course and set up the experiments for the participants to perform. Professor Jayant V. Narlikar, Director of IUCAA in Pune, and Dr. B.D. Chaure, Pro Vice Chancellor of our university, visited our project laboratory respectively on February 8 and 9, 1996. All of us watched Professor Khandelwal in action along with the participants. Fortunately, we have taken some photographs on these occasions which are probably his last photographs. Some of these photographs are reproduced with this article.

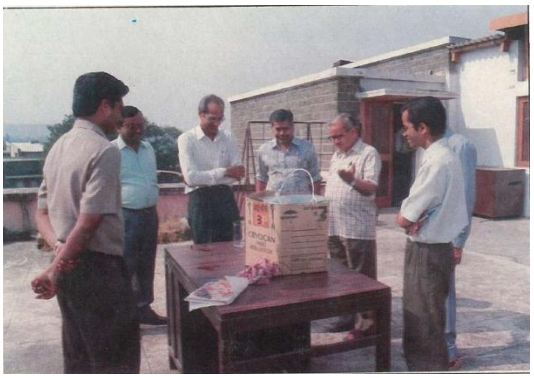
Professor Khandelwal came to this Department for the last time on Saturday, February 10, 1996, for a few hours and went home. During his early morning walk on February11 he collapsed and was admitted to the hospital, never to recover.

We shall always cherish these inspiring memories.

IN ACTION

At the UGC Refresher Course,
Physics Department., Pune University, Pune on 8th & 9th Feb., 1996





With My Master: Some Reminiscences

Dr. R.N. Kapoor
L-117/302, Naveen Nagar, Kanpur

(Appeared in IAPT Bulletin, Feb. 1997, p. 73)

I first met Dr. Khandelwal Ji in 1969 at a meeting of Kanpur Physical Society, an association of Kanpur University Physics teachers. He had recently joined H.B.T.I. Kanpur as professor of Physics. During the summer of 1971 a Summer School was held at D.S.B. College, Nainital for Agra University teachers. Dr. Khandelwal was the Director of the School. It was meant for training Agra University teachers on the newly introduced B. Sc. syllabus. Dr. Khandelwal was the chief architect of this syllabus, while he was professor at Agra College, Agra. Dr. Khandelwal invited me to attend this school as a guest participant from Kanpur University, and to see how the Kanpur University syllabus could be improved in the light of deliberations at the school.

At the Summer school, the conditions changed fast, and soon it was converted into a laboratory development workshop. Working with Dr. Khandelwal in this school, was the most exciting experience of my life. For the first time I got an opportunity to, work in such a free and cordial atmosphere. I realised that even at this level a lot of new things could be done. It was research in education, much different from the research done in big laboratories and Institutes. In this summer school more than a dozen new low-cost experiments for B.Sc. laboratories were developed. The experiments were actually performed, critically examined, discussed at length, observations taken and results drawn. For the first time I had a feeling of open-ended type of experiments. I was highly impressed, and got inspiration from his method of working and approach. This drew me very close to him. I saw in him a Physics teacher with wonderfully clear concepts of the subject, who could apply these concepts to new situations, created by him to examine the approach of his students, and could present difficult concepts of physics in very simple and clear language. He had a command on his language and therefore could do so both in English and Hindi alike. I rarely saw him making a rough draft for any letter or article. He had all those qualities, which I wished to have in me. So in my heart I took him as my master and guide. I always tried to learn from him. He too was always very kind to me. He would shield and cover all my weak points and bring to surface any good idea that I had. He always inspired me with his guidance and help. He could get done things by me, which I had never dreamt to do on my own in my life.

In course of time I became very close to him. He associated me in all his pursuits, be it the curriculum development of High School, and Intermediate, teachers training programme, framing the syllabus for B.Sc. classes of Kanpur University or introducing new experiments in my own laboratory. Even in my own research work, he was always prepared to discuss and give his advice.

In his programme of starting IAPT, he always kept me informed of all developments. The first convention of IAPT held at Kanpur was another great experience I had of working with him. It was another example of his strong will power, and capacity to carry out his decisions against all odds. With very meagre resources and funds at his disposal, he was able to hold a very successful convention with about 100 outstation participants.

IAPT has developed to the present shape due to the courage, farsightedness and leadership of Dr. Khandelwal. In these last thirteen years of his life, he has given to the country, the whole treasure of his earnings, that he had cherished with hard labour and devotion- in the form of IAPT. During all these years he acted as a God-father of the association. People have been criticising him for his dictator type attitude in some situations, but I take it otherwise. He had a little time left at his disposal, and during this time he was to give the whole philosophy, mode of working of IAPT to the coming generation, and he has done it very successfully. Now it is for present leadership to carry out his mission not only according to his wishes but still better, using their own experiences and knowledge.

Financial constraints were always there in running a mission. These constraints never deterred him in taking up new programmes. Once he had to collect donations from EC members, which everyone gave happily. The award function at Delhi in 1994, was also held with a personal loan, which was paid off by him later. I do not know on how many occasions he had to give loan to IAPT from his personal accounts, but I shall mention only the last instance. In June 1995, Part C test was to be held. He was at Pune. I told him that I did not have sufficient funds for this test. He immediately sent to me a draft for Rs. 30,000/- from his personal account, with a covering letter saying, "I would not allow IAPT activities to die on this account. Go ahead with the activities, the money will come." In the first week of February '96, he asked me on phone that now we have received funds from NSEP/NGPE fees, his Rs. 30,000/- should be returned. I got the draft prepared on 12th February, '96, the date of his unfortunate death. Some may call it a coincidence but I feel it as an example of his awareness of his future. His last letter to me (on 10.2.96) speaks of this (published on page 41).

Starting the Part C evaluation of NSEP in 1992 was another feat of his courage and devotion to IAPT. When it was decided to hold the test, we had no money, and the estimated cost was around Rs. 2 Lakh rupees. When he narrated the whole plan to me, I thought it to be too ambitious and impracticable. But he had already started his preparations. Regional College of Education, Bhopal was the venue, NCERT was the co-sponsor, Ambala Scientific Instruments Manufacturing Association ASIMA came forward to help in making the instruments for the test. Four reputed firms of Ambala manufactured all the equipment according to our specification in the required quantity. Their secretary Sri A.D. Batra brought the equipment with him, stayed at Bhopal during the test, and then took all the equipment back. About 35 teachers, principals, University professors, volunteered their services as evaluators, and worked for more than 8 hours at a stretch on that day. It was a very exciting exercise during the hottest days of summer. This test was an eyeopener for those who examine students for engineering and medical entrance, only in theory, thus marring the importance of practical work in the eyes of even the best students.

Later after two years, NCERT withdrew its support, financial problem again came in the way of conducting Part C test. Dr. Khandelwal did not lose courage and innovated new ways. It is true that **'Necessity is the mother of Invention'** and **'God helps those who help themselves.'** Ten colleges all of higher Secondary level were soon located who offered their willingness to conduct the examination. This was a great break through. Since then we are conducting these tests uninterrupted very successfully.

He had a dream of the future shape of IAPT, having its own well equipped building, comprising of Laboratories, Lecture theatres, workshops, hostels and an administrative block etc. With this picture in his mind, in the EC meeting at Birla Vidya Niketan, New Delhi, on

the question of celebrating the Decennial year of IAPT, he suddenly gave the idea of floating the IAPT Buildings fund. The proposal was unanimously accepted and carried out.

Last but not the least important to narrate my reminiscence with him is the following:

Dr. Khandelwal's eldest son-in-law had expired at Indore. This was probably the biggest shock he ever had in his life. I had never seen him so much moved and depressed before. His letters during those days clearly reflected his mental state. He had the responsibility of looking after that family as well. He had to visit Indore very frequently, but with all this, the work of IAPT did not suffer. He gave it top priority. He had returned after cremation at about 6 pm, and wrote me a long letter about the IAPT work at 7 pm. My hats off to such pious soul. Is there any other definition of 'Karmayogi' a true worshiper of God?

To pay my humble tributes and respects to my great master I would only say:

"If I know any physics, If I have any capacity to take up responsibilities in IAPT, it is only due to him and his affection for me and my family. I shall always strive to work for IAPT to the best of my capacity and ability till IAPT needs my humble services."

Tributes:

J. S. Rajput
National Council for Teacher Education, New Delhi

(Appeared in IAPT Bulletin, Feb. 1997, p. 55)

"...What I am specifically proposing is that NCTE chose between being very tough-but considerate and becoming soft and permissive. Let the former be a clear choice." After a well thoughtful analysis of the situation, Prof. D. P. Khandelwal posed this question before the NCTE in his letter of January 15, 1996. While welcoming the establishment of the NCTE and congratulating me on my taking over the Chairmanship of the Council, he pointed out that 'it brings more responsibility than privileges to you'. In a detailed letter he referred to the mushrooming of the teacher education institutions and the down slide of the standards. He expresses his keen desire to see that norms were not lowered while, at the same time, every institution should be given sufficient opportunities to reach these norms within a responsible amount of time. He promised on behalf of the IAPT fullest co-operation and support to NCTE.

The communication from Prof. Khandelwal was discussed by us in the NCTE as it provided us several points to ponder over and help us in visualizing more clearly the tasks ahead of us. We know how committed and dedicated Prof. Khandelwal has been. His untiring efforts have created a band of dedicated and active teachers working at different stages but bound by one thread attempting to achieve quality in teaching and learning of Physics.

I personally had the advantage of having maintained close contact with him over the last three decades. He was so keen to do so much for the teachers. His achievements shall continue to be appreciated for future generations of teachers, particularly the Physics teachers. Whenever a reference comes to the professional Journals, the Bulletin of The Indian Association of Physics Teachers stands out in respect of regularity and quality. Needless to say this was one of the most significant contributions of Prof. Khandelwal.

The NCTE deeply mourns the sad and sudden loss of Prof. Khandelwal. He has guided us in the initial years of the establishment of NCTE. We shall try our best to work for the cause of professional up-gradation of teachers in the country, something which was so dear to him..."

C. Mande
President IAPT
Physics Department, Nagpur University, Nagpur

(Appeared in IAPT Bulletin, Feb. 1997, p. 78)

I have had the good fortune of knowing Dr. D. P. Khandelwal for a fairly long time. I was extremely impressed by his simple life style and his devotion to Physics education. In fact, one rarely comes across these days persons like Dr. Khandelwal: dedicated to a cause.

Dr. Khandelwal was a visionary. He not only worked for improving the quality of Physics education in India, but also dream of tunning up all science education in the country. He very much wanted that like the IAPT similar associations for other science subjects should be started. He worked in this direction but could not get much support from science teachers of other disciplines. This only reflects the general apathy of the scientists and science teachers of our country.

Dr. Khandelwal firmly believed that Physics teachers themselves should take a lead in improving all aspects of Physics education, e. g. curriculum development, laboratory work, demonstration experiments, projects etc. He wanted to promote the culture of science in our country, since he felt that only good science education and scientific temper could lead to overall progress of India.

In the sad demise of Dr. Khandelwal we have lost an eminent educationist and a devoted Physicist. He was in the real sense the moving spirit and the driving force behind the IAPT. The continuation of the work of the I APT with full zeal alone will be a fitting tribute to this memory.

R. Chidambaram
Chairman Atomic Energy Commission & Secretary to the Govt. of India,
Department of Atomic Energy, Mumbai

(Appeared in IAPT Bulletin, Feb. 1997, p. 57)

"....whom I had known for nearly three decades and had greatly admired. The whole of Physics community in the country held him in high esteem for his devotion and deep commitment to the cause of high quality education in general and Physics education in particular..."

J.V. Narlikar
Director, IUCAA, Pune

(Appeared in IAPT Bulletin, Feb. 1997, p. 57)

"....He was a live wire in the Physics teachers community and his passing away is still very hard to get used to..."

S. Lokanathan

Former Professor of Physics, University of Rajasthan, Jaipur
Bangalore

(Appeared in IAPT Bulletin, Feb. 1997, p. 71)

"....He was one of my great friends and I had spent some memorable time with him discussing physics and other matters. Professor Khandelwal was one of those men of great integrity and dedication who are very few in our nation. His work in creating and sustaining IAPT is such a great achievement that I think it will be a lasting monument in his memory..."

Arun S. Nigavekar
Director NAAC, Bangalore

(Appeared in IAPT Bulletin, Feb. 1997, p. 71)

"....There are few people in this country who have done so much for higher education and that too in very unassuming manner…. It is personal loss to me...."

H.S. Hans
Punjab University, Chandigarh

(Appeared in IAPT Bulletin, Feb. 1997, p. 85)

"....His contribution to the world of Indian Physics is very great. By starting the Indian Association of Physics teachers and sustaining it all through by grit of his hard work, he has become immortal. He went on working for it as the President of the association till so to say his last breath The family has a right to feel proud of him..." "....It is a great loss to the nation..."

Reminiscences by

IAPT fellow travellers and flag bearers

He was able to weave a nationwide network of physics educators because of his infectious enthusiasm, perseverance, sheer hard work and uncommon qualities of head and heart. He energised many dormant educators.

H.R. Anand

…. He has shown the path to be followed to integrate physics education with the society at large and through concepts of C.S.C. and model U.G. labs he has left behind a programme of action.

S.C. Samanta

.... the torch (IAPT) kindled by him would not be allowed to die. His all India family of physics teachers is too large to allow that happen....

U.S. Kushwaha

BULLETIN OF THE INDIAN ASSOCIATION OF PHYSICS TEACHERS — IAPT

Number 1 — March 19, 1984

IAPT IS LAUNCHED

What started as a probe to form an organization of PHYSICS TEACHERS has evoked such strong responses that we may have a teachers' own movement to upgrade the teaching of physics at all levels. Extracts from circulars 1&2 are reproduced on p.6, and the responses are listed in Table 1.

On March 5 a STEERING COMMITTEE of 10 local members [illegible] approved the draft Statutes (p.2-4) decided to start this BULLETIN. [illegible] to form the Steering body for the FIRST CONVENTION (June 1984).

WE NOW INVITE YOU TO SEND THE FOUNDATION MEMBERSHIP FEE. See p. 5 for the mode. Deadline APRIL 30.

Your special attention is drawn to the note on p.4. IAPT is to [illegible] the energies and talents of teachers. In the 40 days ahead please spread the message widely to enrol members.

CONVENER

TABLE 1 Number of persons desiring to become FOUNDER MEMBERS (as on 19/3)

Andhra	62	Karnataka	68
Assam	16	Kerala	33
Bihar	75	Maharashtra	89
Bengal	39	MP	76
Chandigarh	21	Meghalaya	5
Delhi	24	Orissa	34
Gujarat	49	Punjab	42
Haryana	35	Rajasthan	89
Himachal	6	Tamil Nadu	76
J&K	12	UP	182

1056

About this Bulletin

THIS BULLETIN WILL PUBLISH SHORT ARTICLES, NOTES, AND COMMENTS RE THE TEACHING OF PHYSICS & RELATED AREAS. DETAILED EDITORIAL POLICY IS YET TO BE DEVISED. BUT IT WILL NOT DISCUSS ANY ADMINISTRATIVE PROBLEMS OR LOCAL ISSUES. ANYTHING WHICH HELPS TEACHERS' ACADEMIC GRASP IS WELCOME.

This Bulletin will also invite answers to specific problems, and publish the best answer adjudged by a competent Board.

More later.

The [illegible] for this issue — [illegible] FOR LAYERS. THE AUDIENCE [illegible] GENERAL PUBLIC. Give an outline of your [illegible] in ≤ 300 words, including the first ~100 words in full. [You are to talk PHYSICS, please note]. Last date for reply 30.4.84

INVITATION

There are any number of ways to arouse the teachers' interest and participation. You are invited to suggest some.

We need an EDITOR

for this Bulletin. Honorary work. Bulletin to be printed at the place of the editor. Expenses to be borne by IAPT.

A combination of vision, enthusiasm and physical labour is needed. The person will also need a local team combining different talents.

Please write if you desire to accept this task, giving details of your plans.

THIS ISSUE EDITOR: DPKhandelwal

Many of us have aspirations, dreams of serving causes dear to us but few have the sustained strength and ability to achieve their goals. Prof. Khandelwal was that rare breed who could create an institution

~Prof. S Lokanathan

Homage to an Extraordinary Physics Educator - Dr. D.P. Khandelwal

Dr. H.R. Anand
Thapar Institute of Science & Technology, Patiala
(Appeared in IAPT Bulletin Feb. 1997, p. 50)

The sudden and shocking demise of our President- Dr. D. P. Khandelwal, the prime mover of IAPT has saddened physics teachers all across the country. Dr. Khandelwal had conceived, founded, nurtured and consolidated the pioneering movement of physics teachers in India in a unique way: from grass roots with wide base covering not just the Universities but the entire hinterland of physics education - colleges and schools where most of our students receive their first instructions in physics. Dr. Khandelwal realised this simple Gandhian fact that the change is most needed at this base level and foundation of the physics pyramid would be enduring only if rests on the voluntary participation of the rank and file. Dr. Khandelwal energised the silent majority of physics teachers by his exhortation to work without waiting for structural and societal reforms by other agencies (government, universities etc.) and to work to put the house of physics in order for the love of physics without expectations of monetary returns and remuneration and without funding by government agencies. He was of the firm belief that eventually such good work will earn an appropriate level of support from society and agencies would come forward to sustain and further such endeavours. Professionals must continuously demonstrate their commitment to the upgradation of their profession as a calling rather than as mere mercenaries. The organisation (IAPT) Dr. Khandelwal raised from a scratch along such a line of thought is a living memorial of his convictions.

Dr. Khandelwal had an extraordinary talent to discover talent and to nurture it for public good. He was able to weave a nationwide network of physics educators because of his infectious enthusiasm, perseverance sheer hard work and uncommon qualities of head and heart. He energised many dormant educators. He "discovered" me out of backwaters of physics education and was bold enough to experiment to the extent of offering Chief Editorship of BIAPT way back in 1985. I was lucky to have the benefit of his unstinting support encouragement and guidance during my both terms as Chief Editor of BIAPT.

Dr. Khandelwal was truly an inspiring person - a teacher's teacher. The inspired band of his followers saw him as Karamayogi. Despite bearing the mantle of an organiser and a campaigner in eventually the President of IAPT, he continued to project his leadership essentially through his didactic and pedagogic talents. He continued to project himself primarily as physics communicator through writing on many aspects of physics through BIAPT during last dozen years. His such writing, as also his earlier books on experimental physics, are unique for their innovative content and style and economy of expression. A substantial fraction of articles published in BIAPT during the last 12 years had the benefit of revision, rewriting, representation and compaction through his pen.

We, the members of IAPT in particular and physics teachers across the country in general, owe a debt to the sacred memory of Dr. Khandelwal. Only a realisation of Dr. Khandelwal's vision in full measure would be a true tribute to him. His vision would soon be a reality if the community of physics teachers at all levels dedicate itself to consolidate IAPT to make it a nationwide movement for the upgradation of physics education with wide participation.

Professor D. P. Khandelwal -The Path Finder

Dr. S. C. Samanta
In-Charge, Midnapore College Centre for Scientific Culture, Midnapore

(Appeared in IAPT Bulletin Feb. 1997, p. 58)

To explain philosophical aspect of physical sciences the physicist-philosopher Neil's Bohr remarked:

"Physical sciences, are, in fact, an integral part of our civilization, not only because our ever-increasing mastery of the forces of nature has so completely changed the material conditions of our life, but also because the study of these sciences has contributed so much to clarify the background of our own existence."

As if to complement Bohr's thesis Prof. D. P. Khandelwal added: "Society needs men and women with a scientific temper with broad understanding of the laws of nature to lead life as intelligent and knowledgeable persons."

A freedom-fighter, a true patriot and a great teacher Prof. Khandelwal was very much concerned about the creation of new men and women, the nascent state needed so much. He was convinced, like other thinkers, that only through imparting proper education this could be achieved. As a physics teacher he thought that proper physics education has a significant role in creating the intelligent and knowledgeable persons for the society. He was quite disturbed to realize that the objective of prevalent format of physics education starting from school to university is to supply physics scholars to research centres or to prepare technological experts and the 'real physics, exciting physics in the process becomes subservient to job-oriented physics'. He was at pains to observe that lack of co-ordinated efforts in designing syllabi and managing lab activities, and absence of effective evaluation system had led to the sorry state of affairs in the field of physics education. His entire life was dedicated to the cause of upgrading physics education. He was actively concerned with the search of an alternate path having duly analysed the maladies of the present system.

Professor D.P. Khandelwal was born on 1st Oct., 1921 - the year Gandhiji launched his non-cooperation *movement* to free India from the clutches of British Imperialism. Though nothing concrete is known to me about his early life but what has been gathered from different write-ups and conversations with others that he actively engaged himself in the freedom movement inspired by Gandhiji. As regards his early education he had frequently told us that his science teachers never had gone to the blackboard with chalk and duster to teach science. He taught science through experiments. This particular aspect of his science learning was so indelibly impregnated in his mind and it motivated so much his plan of action regarding physics education, in later life, that he never failed to tell this story to his audience whenever such occasion had arisen. He was undoubtedly a great scholar and he could have gone to the west to earn fortune for himself. But he did not do it. Inspired by Gandhian model of social reconstruction he opted for physics teaching. He taught physics in Colleges and Universities and retired from formal teaching after serving with H.B.T.I. Kanpur. During his teaching career he came across the real problems of physics education. If one scans his works in the maturity years of his teaching life when he was associated with summer institutes and U.L.P. then it is possible to find that he had a definite plan of action in his mind as regards exploring an alternate path for physics education. In this period he, together with his illustrious student Prof. B. Saraf, developed a large number of experiments mostly at the U.G. level. Some of

these experiments were derivatives of the well known ones, available in any U.G. lab and the others particularly, those with compound pendulums and linear air track, were new designs. Each of them also had written excellent manuals covering these experiments. With these, a draft action plan for overhauling lab component of the physics education, particularly at school and college levels, was ready. But how could the action plan he concretised and implemented? Naturally, for this an organisation of teachers was needed. Not that there was dearth of physics Teachers ' Organisation in the country. But these were centred at Universities and research institutes. So he founded along with co-thinkers in 1984 the Indian Association of Physics Teachers which would work for the upgradation of physics education at all levels by involving not only the teachers at different levels but also the common people interested in physics. During its twelve years of existence the I.A.P.T. has engaged itself with the following tasks 1n each of which Prof. Khandelwal invariably occupied the centre stage.

1. Publication of its monthly bulletin that provides information of different I.A.P.T. activities and gives wide coverage to any aspect of physics teaching, evaluation and of interest to physics teachers and students.

2. Conduct of two examinations - one at Senior Secondary level and another at U. G. level Experimental part of these examination is unique in the sense that it is conducted on the basis of an external paper. It is expected, in the long run, these examinations would provide models for the conduct and evaluation of public examinations at these levels.

3. Establishment of Centres for Scientific Culture (C.S.C.): The purpose of these centres is to exhibit working experiments. The people would visit the centres to perform the experiments, take data and find the system in them. As people flock to the public libraries for acquiring knowledge in different fields so they require laboratories also to learn experiment based science subjects. The C.S.C.'s as public laboratories have the potentials to provide unique opportunity to the common people and students who are not exposed to lab activities. At present there are two such C.S.C.'s - one at Midnapore and another at Nagpur.

Apart from these, I.A.P.T. is going to launch two massive teacher re-orientation programmes with the action plans drawn by Prof. Khandelwal himself. In the first programme Senior Secondary teachers are to be involved and willing colleges with the experiment kits and personnel provided by I.A.P.T. with financial assistance from M.H.R.D. will host the orientation camps. The preliminary phase of the second programme of overhauling the U.G. labs and re-orientation of all U.G. physics teachers in a span of two years through the establishment of ten model U.G. labs, has been cleared by the U.G.C. Prof. Khandelwal was given the task of preparatory work for selection of experiments, inviting new experiments and suggestions from a wide section of leaders in the field all over the country.

First time I met Prof. Khandelwal at Nagpur Convention of the I.A.P.T. in 1992 where he had invited us to plead for establishing a C.S.C. at Midnapore College. I saw him delivering his speech at the Inaugural Session with a slinky in hand; - emulating his great teacher, the great disciple was desirous of communicating exciting physics through experiments to the audience of which at least seventy five percent were not technically connected to physics. But in the meeting itself I got the message that the philosophy behind C.S.C. was to make common people aware of the basic scientific concepts through the language of experiments. First time he came to Midnapore College to inaugurate the C.S.C. here in February, 1993. He proclaimed in his inaugural address that he wanted to establish such centres at each and every

corner of the country. Here, he elaborated, the people would *come,* instead of going to the places of worship, to understand how did the nature work. In his words, I find, for the first time, a positive programme for building a secular scientific state in our country. I was also inspired much in understanding that physics teachers had great role in implementing this programme. It may be noted that this was the time when the entire country was burning under the impact of the Babri Masjid demolition on 6th December, 1992. It is true that thousands of miles are to be travelled to achieve this goal but he had shown the path, he had made a beginning.

Afterwards we had met several times. Every time I had found in him an affectionate teacher responding to academic or financial problems of his student in a very sympathetic and appreciative manner. In his death I have lost my most respected teacher and a well wisher.

He breathed his last on 12th Feb., '96 he is no more with us. But he has left behind a legacy - his ideals, his activities that provide us enough inspiration to move along the path charted out by him. He has shown the path to be followed to integrate physics education with the society at large and through concepts of C. S.C. and model U. G. labs he has left behind a programme of action. To remember this great path finder let us "look for" in his own words; 'positive action' and offer we, as members of the society, can offer to the nation. The spirit of humility, combined with courage of conviction and the spirit of dedication is what is needed most."

In Honour of Late Dr. D.P. Khandelwal

Surjeet Singh
87, Phase-7, Mohali

(Appeared in IAPT Bulletin Feb. 1997, p. 63)

The sudden and untimely departure of Dr. D.P. Khandelwal from the world of Physics Education is indeed shocking to everyone who came into his contact.

He founded the IAPT and worked ceaselessly for its growth. The IAPT is the story of the voluntary efforts of Dr. D.P. Khandelwal, without any remuneration, for the improvement of Physics Education in India. He was deeply touched by the deteriorating conditions of teaching of Physics. By his example, he generated an undamped enthusiasm among Indian Physics teachers for doing purely voluntary work. That is the real character of KARMYOGI - par excellence in devotion to self-less work. He was a huge force dislodging the set minds of Physics Teachers at all levels. He promised no pecuniary benefits to the teachers. A word of cheer, encouragement and love - a rare possession - which he gave away profusely to the teachers. He was convinced with the inherent strength of the teachers. And therefore believed that the teachers could raise their own dignity and professional competency only by helping themselves. No external help would do any good to improve physics teaching. And lo ! he was a tremendous success. May his tribe increase!

I can give two instances of my personal experiences working with Dr. D.P. Khandelwal for the upliftment of Physics Education. One, the ability to organise and conduct the Annual Prize Distribution Function and Annual IAPT Conventions. I have known Dr. D.P. Khandelwal since 1986 when the first prize giving IAPT function to honour 20 toppers in NSEP was held at Delhi. Dr. H.S. Hans of the Punjab University (who was the President of the IAPT), Dr. D. P. Khandelwal and the writer requested the President of India, Giani Zail Singh to bless the toppers. When Dr. D.P. Khandelwal explained the concept of voluntary efforts for the improvement of physics education Giani Ji readily accepted the invitation. I compered the function. I remember Dr. D.P. Khandelwal's vivid description of the aims of the IAPT and its contribution, based on purely voluntary efforts without any consideration, to the cause of the Physics Education. The President of India expressed his pleasure and praised in no uncertain words, the voluntary work done by Dr. D.P. Khandelwal and those involved in the IAPT activities. He wished a similar exercise for other science subjects for the development of scientific poise, harmony and peace in the minds of the youth for the social good of mankind at large. Later Dr. D.P. Khandelwal wrote to me in a pleasant surprise about his satisfaction of the successful compering of the function and television coverage.

Second, the concern about the publication of the IAPT Bulletin monthly. The Bulletin contains exclusive articles on different aspects of physics education at all levels. It is meant for private circulation among its Members to share experience and information about the activities of the IAPT. Dr. D.P. Khandelwal considered it life-line for communication of ideas among its Members. Therefore, he worked hard to bring it out on time. It has superbly kept up its tradition of regular publication and distribution. I appeal to my fellow teachers to maintain this tradition in the same spirit as Dr. D.P. Khandelwal had done it.

One aspect of his brilliant coloured personality, I would like unhesitatingly to say that Dr. D.P. Khandelwal had amiable manners, infinite capacity to communicate effectively with fellow teachers and that too affectionately. From the standpoint of physics education, he had enmity with none; he was sincere to one and all. He would make it point always to reply to a letter on time. His last letter to me contained an edited version of my article for re-typing and wished its quick return. Not only that he urged me to continue to write and asked for the second article which was despatched by the end of February 96. But Idid not know that he was no more. That indeed is a great loss to the IAPT family in general and to me in particular. I will miss his guidance in research papers.

Dr. D.P. Khandelwal's greatest contribution to the upliftment of physics education is his innovative idea of introducing an element of practical work in the competitive examination. This indeed is a revolutionary idea aimed at correcting the imbalance between theory and practical examination. The whole teaching work is now oriented towards theory examination. I discussed with him the evaluation techniques of the experimental abilities in the light of the latest known trends in the philosophy of physics education. He accepted most of the ideas on the structure, design and techniques of evaluation of the experimental abilities. Dr. D.P. Khandelwal agreed with me that practical work does provide additional information about the students' maturity of concepts learnt during a course of studies. He believed and rightly so that introduction of practical work in the competition is bound to lead to change in the strategies of teaching and thus considerably improve physics learning.

In order to study the impact of the idea, Dr. D.P. Khandelwal provided me all the relevant material about the NSEP part C for analysis. No less than eight Research Papers including one on Normalisation of the scores were published in the IAPT Bulletin. He showed deep interest in the Research work. I have no words to thank him particularly about his contribution to the article on the Normalisation of the scores. The scores of the students depicted a normal curve. On this assumption, the practical examination is a definite supplement to theory examination. With a view to devising a common rank order for all students appearing at different centres throughout India, I devised a COMMON SCALE with two reference points. The scores of the students were normalised on this scale. This normalisation process controlled only the spread of the frequency of the students' Scores at different Centres, Dr. Khandelwal pointed out as a true physics educationist the need of a factor that would correct the leniency/severity of the evaluators. So he corrected the formula for normalisation. That was a unique contribution to the research paper. The research paper was re-written incorporating his ideas. What I want to say is that the analysis of the Students' Responses indicated overwhelmingly that Practical Examination is equally effective in the assessment of the students' competency attained during a course of studies. Therefore, I wholeheartedly support the introduction of an element of Practical work in the Competitive Examination as was the vision of Dr. D.P. Khandelwal. The idea, I agree with Dr. Khandelwal will help rectify the over emphasis of theory to the neglect of physics practicals in the colleges/schools.

I pay my sincere tributes to the great man of vision. I appeal to fellow teachers to accept the new challenges of physics education and carry forward the torch lit by Dr. D. P. Khandelwal. May his soul rest in peace.

Prof. D.P. Khandelwal - A Priest of Science

A.H. Devadas
A 1-37, Mayuri Apartments, Begumpet, Hyderabad

(Appeared in IAPT Bulletin Feb. 1997, p. 68)

Shall we call him the lord of physics? - or the priest of science-? The eminent thinker is no more. What a shock it is for all of us!

My association with I.A.P.T. started only 1993. Prof. V. S. Murthy, the then general secretary was kind enough to introduce me and made me a member of I.A.P.T. although I was not a teacher.

Based on my science promotion activities, he further invited me to organise a demonstration to the delegates during the VIII National Convention of I.A.P.T. held at Vijayawada in December 1993. On 11.12.93 a well arranged stage, a set of volunteers and more than 300 spectators were all ready for the 2 hour long "Participative Demonstration" on the basics of 'Electro - magnetism". It was only then that I came to know Prof. D. P. Khandelwal, the President of I.A.P.T. was aspiring to organise such a type of science show. At the close of the demonstration he came on the dais and announced his great happiness saying that he was really fascinated by the science show. That was not the end at all. The "STAGE SCIENCE SHOW" was his Dream and he immediately mounted me in it. I was equally surprised to read a detailed report by Prof. D.P.K. in I.A.P.T. Bulletin, January 1994. This reflected his ability to quick decision making and actions taken for the cause. All that he had in his mind can easily be judged by this para in his golden report on January 1994.

"Neither listing of items, not even citing any samples will do justice to the presentation. One has to see it to get the excitement. For us in I.A.P.T. he is a discovery. We had planned for stage science shows as a massive means of propagating science to the masses some 4 years back, but could not find one person who would be one-tenth as effective as Sri Devadas. Now we plan to use him for propagation of his items as a prelude to creating several Devadases even if they are one-tenth as effective to begin with".

Myself and Prof. D.P.K. had a good bond from then onwards. In Feb. '94 a series of phone calls took place between us in connection with his proposed plans to video-record my programmes at Educational Media Research Centre (E.M.R.C.) Pune, for the country-wide class room programmes of U.G.C.

When I landed for this purpose at Pune, it was Prof. D.P.K. who was the first person to welcome me and remained throughout in all my activities with me which was planned for a week. The understanding team, the systematic planning of E.M.R.C., Pune, under the friendly guidance of Prof. D.P.K. and Dr. A.S. Nigavekar, the then Director of E.M.R.C. Pune, the programmes and the recordings took place with a touch of festivity. E.M.R.C., Pune, produced 3 parts of 20 minutes each educative tapes and these programmes were sent to U.G.C. Delhi. They are being periodically telecasted on D.D. I.

Prof. D.P.K.'s messages and suggestions started appearing regularly in I.A.P.T. Bulletins for the use of the interested organisers and institutions. Dozens of invitations started pouring in month after month. The author selected places zone by zone and visited to conduct demonstrations at number of Institutions in various parts of our country. One of the strongest

points to note in the activities of Prof. D.P.K. was his quick decision making, quick response to our letter,s his readiness to solve our why? and how? parts, so aptly and logically. It was all in a humble way, with simple words and totally with a positive approach.

Dr. S. C. Bhargava, the past Chairman of I.E.E.E. sent Prof. D.P.K. a report in July 1994. It was on the recommendations made at the convention of I.E.E.E. with the caption "RECOMMENDATIONS FOR ENGINEERING EDUCATION". A report on this issue appeared in I.A.P.T. Bulletin of Sept. '94. His fast decision and action were admired by all the members of I.E.E.E.

Once on phone I casually told Prof. D.P.K. about my plans to conduct a teachers work-shop at Anandalaya, Anand, *Gujarat.* He immediately told me "Please make it". As a reference book for the teachers who were to attend the work-shop, a 200 pages manual was prepared by me. I sent a copy of this to Prof. D.P.K. for his valuable opinion and suggestions. To my great surprise the book came back to me totally edited on the 1Oth day, along with his views with greater depth. Happy he was with this teachers' training workshop of Anandalaya. A report appeared in I.A.P.T. Bulletin of August 1995.

Prof. D. P. Khandelwal was a simple person, with a lot of plans for the cause of science. He inspired people to do their respective jobs with devotion. From every corner he brought the individuals together, the institutions together. A lovely network of dedicated members was formed for the cause of physics, that is I.A.P.T. He really infused his personality by inducting his ideas amongst the members of I.A.P.T. for its real incorporation. The author is so happy to inform that wherever he visited, he could see a miniature of Prof. D.P.K. both in letter and spirit in all the I.A.P.T. members. The same courtesy, the same enthusiasm and devotion-above all a dedicated service for a good cause.

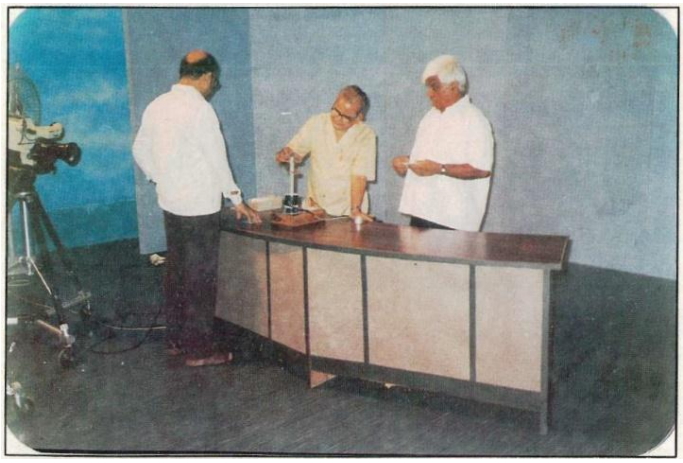
What a great inspiration. What a great contribution.

We learnt from Prof D.PK. that the best way to do good for ourselves, is to do good for others. He went on doing one good after another. To do some good he never waited for any extraordinary circumstances but did the same in the most ordinary, situation too. He clearly made us understand that teaching is not nearly stuffing the facts, but to kindle new methods and ideas. In this world it is not what we take up but what we give up that makes us rich. Prof. D.P.K. in the wisest and the best way lived for both the worlds. He spread tons of love to others and gathered it back in multiples of it.

We have to still find out that invisible book from the pages of which he really digested the essence of human engineering. The almighty, too, is so specific that he always puts his hand upon one whom we love very much. We will promise to move and work on the guidelines set by him. Our guru, philosopher and guide is no more with us but the memories remain. It is never ending, everlasting and eternal. Let his soul live in peace.

By now he must have decorated a special chair reserved for him in the palace of eternity. Will he really sit and take rest there-? l doubt- He must be too busy in formulating a lab or in rigging up an apparatus to show to the other world too, what is science? Inspired by his association 1 shall conclude saying **.. "A TRUE TEACHER LIVES FOR THE SUBJECT, AND THE REST LIVE ON IT**".

At Rawge Hills Secondary School, Pune giving concluding remarks



Child like interest !
Experimenting with Dr. A S. Nigavekar and A.H. Devadas at EMRC Pune

Relax1ng with Dr. A.S. Nlgavekar in between Video recording at EMRC, Pune

Prof. D. P. Khandelwal: A unique example of receptivity

Dileep V. Sathe
Dadawala Jr. College, 1433 Kasba Peth, Pune

(Appeared in IAPT Bulletin Feb. 1997, p. 76)

I had the good fortune of working with him in the Physics Education group here in Pune. It also gave me the opportunity of discussing my own work, which finally led to my note on the implications of Jupiter-comet collision - see the Bulletin p. 20, Jan. 1995. My acknowledgement of his suggestions is a traditional one and it does nothing out the rare receptivity he had even when he was 70+. Therefore, I would like to narrate story behind that note to illustrate his receptivity to even controversial ideas.

For many years I am working on the difficulties in teaching and learning of circular motion and related topics. In October 1993, I had prepared a note on difficulties arising from bodies moving anticlockwise and clockwise. That time I had used a hypothetical solar system, having two planets - one moving anticlockwise and the other moving in the opposite manner. My views were different from the established ones and so he rejected which was not at all surprising to me. However, my views did remain in his mind somewhere - as I realised it in 1994.

In July 1994, the comet Shoemaker-Levy collided with the Jupiter and this event caught the attention of the public all over the world. This situation stimulated me to use the J-P-R system (i.e., the Jupiter, one prograde moon and one retrograde moon) instead of the earlier hypothetical solar system. So I rediscussed my views with Prof. Khandelwal in October 1994. The J-P-A system proved to be more effective in communicating the views. Prof. Khandelwal not only changed his decision but made some useful suggestions for revising the note. Finally, it appeared in the Jan. 1985 issue of our Bulletin.

In those discussions, I could get the first-hand experience of his attitude slowly changing from an unfavourable one in the pre-collision era to a favourable one in the post-collision era. What a remarkable receptivity he had at age past 70. I will always cherish those happy and fruitful discussions with ·him.

Prof. D. P. Khandelwal - A Tribute

Dr. K.N. Thomas
Former Principal & Head, Physics Department, Baring Union Christian College, Batala, Punjab

(Appeared in IAPT Bulletin Feb. 1997, p. 81)

I do remember with great joy my first acquaintance with Prof. Khandelwal during the First International Conference on Physics Practical held at Jaipur (in...). His love for physics education, commitment to promotion of physics teaching in schools and colleges, his abundant resourcefulness and above all his simplicity impressed me very much.

I had been in the USA for five years and quite impressed by the work having done by the American Association of Physics Teachers for the promotion of Physics education in that country. Having returned to India after my Ph.D., to teach in an undergraduate college, I was quite enthused by Prof. Khandelwal's initiative to founding the Indian Association of Physics Teachers and happily volunteered to be one of its founding life member and senders of its executive committee. Even though he had the approach of many physics enthusiasts from all over India, I think, the credit of lion share of the great test of founding IAPT and building it up to become a vast and fruitful organisation, goes to Prof. Khandelwal. The physics community in India owes a great debt of gratitude to great physicist of India.

It has been no ordinary task to keep the Bulletin of IAPT regularly published every month its inceptors. Various other features introduced by Prof. Khandelwal the NSEP, NGEP contest for Teachers in Paper Setting etc one all praise worthy and bear the imprint of a great pioneer. To honour his legacy we ought to continue and improve their features with full cooperation and genuine commitment.

Tributes:

Sanjay M. Wagh
Director, Central India Research Institute, Nagpur

(Appeared in IAPT Bulletin Feb. 1997, p. 52)

"...How much can a person influence others in a short acquaintance of a day or two? That too, positively and constructively? There is no doubt that a person capable of imprinting a great deal of such influence must himself be a positive, constructive worker of extra-ordinary capacities, dedication, clear thinking and a self-less judge of wider perception himself. In short, he must be a true missionary of the cause. Prof. D. P. Khandelwal was, I am deeply sorry to have use this tense, more than just one amongst such missionaries. He had become entirely indistinguishable from the cause - to associate oneself with him had, for anyone, become synonymous to working for the cause of enhancing the standards of physics education, in particular, and science education in general. It is someone like him who can have the highest influence on others. This is clearly evident in the formation, membership and activities of his brain-child - the Indian Association of Physics Teachers (IAPT) - for whose healthy growth, Prof. Khandelwal had been busy day-in and day-out.

He was the motivation of, the mentor of, the centre point of IAPT. In his sad demise in February 1996 at Pune not only IAPT but the physics and science communities have suffered an irreparable loss. All the members of Central India Research Institute (CIRI), Nagpur, while deeply regretting the sad demise of Prof. D. P. Khandelwal, appeal to the society to pay homage to his memory by striving hard to work for the cause that he was - the continued enhancement of the standards of education in our country. The members of CIRI hereby pledge themselves to this cause as a tribute to the ever-fond memories of Prof. D.P. Khandelwal ..."

Simon George
California State University, Long Beach USA

(Appeared in IAPT Bulletin Feb. 1997, p. 76)

"....Very few people have such enthusiasm, determination and energy as he brought to support the growth of Physics Education everywhere in the world. Professor Herbert Gottlieb of the city college of New York and I met him once in Lucknow and after our meeting, Professor Gottlieb turned to me and said, "India needs more people like him. He is extremely dedicated to his profession. He has inspired me to join IAPT as a foreign member." Indeed many educators in India and abroad share Prof. Gottlieb's sentiments. I had many fruitful discussions with him in India and I served as the IAPT representative in the U.S. and Canada at his request. I urge Physics educators in India to carry on his legacy - a legacy that each and everyone of us in Physics education can be proud of ..."

Dr. Gururaj
Karajagi, Bangalore

(Appeared in IAPT Bulletin Feb. 1997, p. 71)

".... was a towering source of inspiration to many science teachers. He was a leader by example and a teacher par excellence ..."

V. Srinivasan
Madurai

(Appeared in IAPT Bulletin Feb. 1997, p. 85)

"..the Physics community has lost an eminent, enthusiastic and very hardworking physics educator/organiser. The IAPT his brain child cannot be what it used to be, without him. Personally I have lost a good friend...."

M. ES. Abasaheb
Garware College, Pune

(Appeared in IAPT Bulletin Feb. 1997, p. 85)

"...He was a veracious reader in Physics. The Physics community has lost in him a very dedicated teacher of Physics. He was truly noble and pious gentleman, whose life was an example to all Physics teacher. He gave us great inspiration and every guidance in organising the X Annual Convention of IAPT in this college in the month of November 1995. Due to this it became memorable grand function..."

Dr. S.K. Nataraju
Shimoga

(Appeared in IAPT Bulletin Feb. 1997, p. 86)

"... His enthusiasm, dedication and valuable suggestions could sustain the activities of IAPT. He is largely responsible for the reputation our association has established in the academic field of our country..."

U.S. Kushwaha
Chandigarh

(Appeared in IAPT Bulletin Feb. 1997, p. 87)

"...In fact from IAPT point of view, most of us were in a complacent state of mind that Dr. Khandelwal was there to look after it and so there is no cause for worry and so nobody ever gave a serious thought to the possibility that after all one day he will be snatched away from us...To me it is a personal loss. He had been my teacher. I had been in contact with him ever since 1972...As far as IAPT in concerned, believe me, the torch kindled my him would not be allowed to die. His all India family of physics teachers is too large to allow that happen...."

Lest we forget

A Birth Centenary Tribute

Values Which Prof. DP Khandelwal Inculcated in IAPT

- **Science as Service to Society**
- **Society Above Self**
- **Reaching Out**
- **Scientific Temper**
- **Spirit of enquiry**
- **Volunteerism**
- **Team Work**
- **Team Building**

- **Networking Among Institutions at All Levels**
  Schools, Colleges, Universities and
  Research Institutions
- **Empathy Towards Students**
- **Mentor-Mentee Relationship**
- **Passion for Lab Work and Use it as a Cradle of Talent**
- **Open Ended Approach to Do Experiments**
- **Culture of Quality**
- **Above All NEVER SAY DIE ATTITUDE**

Curated by Prof. P,K Ahluwalia, Former Prof. Himachal Pradesh University Shimla, 26.11.2021

Reminiscences by

Students – formal and otherwise

Any student who wanted to stay in the (Departmental) library after the (Agra) college is over … was allowed. … Last student (if leaving) before 11 p.m., was supposed to return the keys (at Prof. Khandelwal's residence). But in case it was late, he had to return the keys before the college reopened next day.

Prabhat Kumar

Prof Khandelwal was the first to start summer school for Physics lecturers from colleges for improvement of Physics Teaching. … He also managed to get Physics teachers (resource persons) from USA … This programme was a great hit with the physics teachers who used to look forward to join the summer schools at Agra College.

S.D. Saxena

Prof. Khandelwal always felt that due credits must be given to all involved regardless of their designations … this leadership quality … led him to successfully create the large workforce of selfless teachers in schools, colleges and Universities ….

Vijay Raybagkar

Dr. D.P. Khandelwal – A Tribute

Dr. S.P. Tripathi
Former HoD Physics, St John's College, Agra

(Appeared in IAPT Bulletin October 2021, p. 361)

I feel myself honoured to get an opportunity to express my deep regards to my teacher Prof. D.P. Khandelwal. I had the privilege of being his student during my post graduate studies (1965-67) at Agra college Agra. As a student we felt little scared of the person, heading the physics teaching faculty of nearly 30 brilliant teachers, but our fear soon disappeared when he started taking our classes. Since then, till his death, I found in him a sincere guardian of myself.

Dr. Khandelwal relentlessly worked throughout his life for upgrading physics education at all levels, be it school or university. He was instrumental in bringing a quantum change in physics syllabus of Agra University by introducing syllabus based on Berkeley Physics Course at undergraduate level. Same year a new paper 'Solid State Physics' was inducted at post graduate level in the university and he took the responsibility of teaching same to our batch of six students who offered this paper in that year. As a teacher, he went deep in the subject and made it crystal clear to his students. He always emphasised more on the physical aspects of the concept rather than its mathematics, so as to create interest in the subject.

This motivated the students of our batch so much that all of us started our career as physics teacher (1. Mr. S D Saxena at Rajasthan University, 2. Mr. V P Tripathi at I I T Delhi, 3. Mr. Y S Jain at NEHU Shillong, 4. Mr. S C Goyal at Agra College Agra, 5. Mr V K Goyal at Allahabad and myself at St. John's College, Agra). While teaching he deeply involved himself with mind and body to explain the subject. I can visualise him even now going along the length of the black board from one end to other end of the class with hand extended and whole body going up and down to explain SHM and oscillatory motion at one of his lectures.

Dr Khandelwal had equal command on English and Hindi languages. I heard him at several occasions teaching physics in fluent Hindi. I have not come across many science teachers with this talent.

He was convinced that to improve physics education there is need to brush up quality of teachers involved in physics teaching at college levels where majority of students get their education. With this objective in mind, soon after the change of syllabus he got organised several summer institutes (in 1967 at Agra College, Agra, in1968 at St. John's college Agra and in1969 at D.S.B. College Nainital). In the same year (1969) in Nainital Dr. Khandelwal was busy with Dr. JK Ghose, Prof. GM Ram and other colleagues from St John's College and DSB College Nainital to device new experiments for physics teaching. During my short stay at this workshop, I remember him saying 'there is nothing like seeing'. He believed that students can be motivated to physics study at higher levels if they are taught through demonstrative experiments at lower levels.

Dr. Khandelwal was a man of principle and never compromised on issues of moral and integrity of a teacher. It was the talk of the town when he resigned from his post, without a second thought, on the inaction of College managing committee against the teacher of his Department for behaving inappropriately with a girl student in college laboratory. He remained jobless for some time before joining as Professor and Head of the Department at

HBTI Kanpur. For Dr Khandelwal the high moral values of a teacher and justice to students were more important than his personal benefits and gains.

Prof. D. P. Khandelwal - My Physics Dronacharya

S.D. Saxena
Fmr Lecturer Physics, Rajasthan University
Retired Civil Servant

(Appeared in IAPT Bulletin October 2021, p. 362)

Prof Khandelwal my mentor and guru changed my life completely after I came in contact with him. I had just completed my graduation from St. Johns College in Agra and was interested in studying Physics for postgraduation. In those days St. Johnians did not like to go to Agra College as it was a very large group of students and some activism and Unionism used to creep in, this was completely absent in St. Johns in those days. I had no option as the M.Sc. physics was available in Agra College only and so I got admitted to Agra college with fears and apprehensions. Soon I discovered that Physics Department was a totally academic island in the large ocean of Agra College. The man responsible was Prof. D.P. Khandelwal Head of the Physics Department.

I vividly remember my first meeting with him, he encouraged us to think out of box and also to learn from the great theories developed by great physicists. Prof Khandelwal went out of the way to help and guide his students, even helping them financially. His lectures used to be a never miss event, I still remember his lectures on Optics and the concepts imparted by him in our impressionable mind. His interest in developing laboratory was supreme. I specially remember one experiment – the Michelson Morley experiment for measuring the speed of light. It was a difficult one and in the dark room I used to sweat in the intense heat of sodium lamp and was not able to observe the fringes. One day I felt the presence of Prof Khandelwal behind me. He helped me to complete the experiment which I always remember.

Prof Khandelwal used to deliver special lectures on various topics one topic dear to his heart was “Photoluminescence”. This lecture, well illuminated with Luminescent crystals demonstration, was very interesting as it introduced us to the world of Crystal and Solid-State Physics. In fact, due to his pioneering effort a specialization in M.Sc. was started in Agra College, the first in the whole of Agra University. I along with four others were the first batch of Students who specialized in Solid State Physics in the year 1967.

Prof Khandelwal was the first to start summer school for Physics lecturers from colleges for improvement of Physics Teaching. A number of physics teachers benefitted from this programme. He also managed to get Physics teachers from USA under the PSSC programme a joint effort of Indian and US Govt. This programme was a great hit with the physics teachers who used to look forward to join the summer schools at Agra College.

After my M.Sc. I was appointed lecturer at Rajasthan University, I was privileged to work under Prof. B.L. Saraf who was associated with Prof. Khandelwal in a project on Book writing and developing laboratory experiments for Schools through a project funded by NCERT. In this project many renowned Physicists of India including Dr. D.S. Kothari had evinced a keen interest. Prof Khandelwal was the main force behind this project and he used to work tirelessly for the project sometimes continuously for 10 hours at a stretch. He used to come to Jaipur by train and work continuously for hours and then will catch the train back to Agra. It was due to the pioneering efforts of Prof. Saraf and Prof. Khandelwal that very useful books were launched by NCERT changing the very concept of learning.

Prof Khandelwal was committed to bringing in a movement of science and Physics learning in India. With that in view he founded the Indian Association of Physics teachers (IAPT) – his biggest contribution to the country. IAPT has now blossomed into a big vibrant organization of over 8000 physics teachers (at all levels) spread all over the country. The activities of IAPT are multifarious; all aimed at doing what Prof Khandelwal wanted to do."

I always respected him for his principled approach to life. He resigned from the cozy position of Agra college on matter of principles. He finally took over as Head of the Physics Department at HBTI, Kanpur. Agra college's loss was the gain of HBTI, as he set up excellent labs and teaching facilities at the Institute. I always remember him with reverence and regard he was committed to physics education and for creating excellence in the field of Physics learning in India. When I think of him I am always reminded of the lines by William Shakespeare: -

"His life was gentle; and
the element so mixed in him
that nature might stand up
and say to all the world,
THIS WAS THE MAN"

Dr. D.P. Khandelwal in USA 1988

Dr. Shyam N. Bajpai
Maryland, USA

(Appeared in IAPT Bulletin Nov. 2021, p. 418)

Dr D. P. Khandelwal, the founder of IAPT, was a great visionary, who connected people from all over India. The entire community is beneficiary of his hard work and vision. This idea of celebrating his 100th birth anniversary made by IAPT is laudable. On this occasion I would like to share my own experience in association with him.

I took admission in M.Sc. at Agra College, Agra in 1968. I applied for tuition fee waiver. Dr Khandelwal was the Head of the department. He called me for an interview in his office. I explained to him that my father just retired and our family cannot afford to pay the tuition fees. He listened to me and approved tuition waiver. This was my first impression about his kindness, leadership and visionary qualities. In 1969, He joined HBTI, Kanpur. After completing my degree, he helped me getting a teaching job at Kanpur, where I spent next few years. This is where, I became close to him and his family. I left Kanpur for Ph.D. at IIT Delhi. I completed Ph.D. in Magnetostatic/Microwave Excitation and Propagation and came to USA in 1981.

Initially, I joined Westinghouse Research and Development Center, Pittsburg. Clarence Zener, inventor of Zener Breakdown/Diode, was once Director of Research at Westinghouse (1951-65). In 1983, I joined the Faculty of Electrical Engineering, at State University of New York at Stony Brook University. Around this time, Dr. Khandelwal, founded the IAPT and asked me to become life member and I did. In 1988, Dr Khandelwal wrote to me that they will be travelling to London, USA and Canada in July/August. I wrote to him that we will be honored to welcome at our place and take you around. Dr Sahab and Aunti ji arrived from London and stayed with us at Stony Brook, Long Inland, New York, for a week. …*

… I have met so many people in my life, but only few have inspired me to the extent that it stays so long and fresh; Dr Khandelwal is one of them. His creation of IAPT, is incredible effort and he did it with dedicated leadership for the good of subject and students. It was a most difficult undertaking. It is almost impossible to recreate. As time moves, Dr. Khandelwal's, creation of IAPT will be more and more admired.

In 1991, I got an opportunity and joined National Oceanic and Atmospheric Administration (NOAA) to Lead the Future Weather Satellite Systems Development. So, we moved to the State of Maryland and retired in 2014. Below is the memory in photo. I feel that I am talking to them.

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*Details of Prof. Khandelwal's one week stay described here (available in full Article in IAPT Bulletin Nov. 2021).

L–R: Mira Bajpai, Mrs. Khandelwal, Dr. Khandelwal, Shyam Bajpai, son Vipul. Our older son Vivek is taking photo, August 1988

My teacher – Dr. D.P. Khandelwal

Dr. Prabhat Kumar
(retd.) Associate Professor, St. John's College Agra, Agra

(Appeared in IAPT Bulletin Nov. 2021, p. 419)

I had the good fortune to be a student of Prof. D.P. Khandelwal when I joined Agra College for my Masters Degree (1969- 1971). He was held in high regard as a professor of Physics by the staff and students. But I could sense something extraordinary in his attitude. His passion for the subject came across vibrantly. Here I want to tell you about his love for books and his concern for those who might not be so privileged as to bear the high cost of books.

A very special feature of his concern for the students was a special scheme. Quality books were costly for the student like us who came from ordinary middle class family. He provided one open shelf in the departmental library for M.Sc. students. Our Physics Departmental library had an independent access in the college campus. He ordered that all teachers have to give the list of books referred to by them in M.Sc. Previous and final classes on that very day to the library clerk. He would put at least one copy of each in the open shelf. Any student of Physics who wanted to stay in the library after the college is over to consult books and make notes was allowed to stay and was supposed to sign on the card attached to the keys of the open shelf and the door of the library. This was given to the student himself. When he wanted to leave he would have to find that student who was going to stay longest and get his signature on the card before handing over the keys to him. If the last student left the library before 11 p.m., he was supposed to go to nearby Raja Mandi crossing to Prof Khandelwal's official residence to return the keys. But in case it was late, he might keep them but had to return the keys before the college reopened next day. The only guarantee taken was that in case of any misbehavior or if any book was found lost, the facility would be discontinued. During my two years stay in the college, I prepared all my notes in the library sitting every day after my dinner from my hostel, Bhargava Hostel or Old boys hostel as now it is called. Such was the concern and trust of my Guru.

After my M.Sc. I joined St. John's College Agra for Ph.D. under Dr J.K. Ghose. Agra College was better equipped with research journals, so Dr. Ghose wrote a letter requesting Dr. Khandelwal to allow me to use his library. When I produced that letter before him, Prof. Khandelwal immediately wrote "permitted" and said '00you are my student too' and there was no need for any recommendations.

Dr. D.P. Khandelwal was the teacher of teachers. As he mentioned in several seminars and summer institutes, he wanted to improve the quality and dedication of the teachers for their profession. It is mentioned by several other authors in earlier IAPT bulletin.

Post graduate classes in St. John's College started in 1966. Dr J.K. Ghose and Prof G.M. Ram were instrumental in making the post graduate laboratory almost from scratch. Dr Khandelwal along with Dr Ghose designed some innovative experiments for undergraduate classes. Dr Khandelwal redesigned the syllabi of Agra university. In June 1971 a summer institute was organized for this purpose at D.S.B. College Nainital. We carried all the laboratory material from our college to Nainital. Based on the work done there, Dr Khandelwal later wrote a book " A Laboratory Manual of Physics, Vani Educational Books (1985).

In 1971, I joined the Physics department of St. John's College as a Lecturer. I was also one of the founder members of IAPT. After few years I was made the Joint Secretary and given the responsibility of ELCB (Extra Low Cost Books) scheme. He taught me that in order to

convince the publishers to agree to supply their books at reduced cost of 40% of the printed price, I should tell them that this programme is to help them to give free sample copies. Here the interested teacher was paying at least 40% and is sure to go through these books. This logic served the purpose of the publishers too.

Prof. Khandelwal was a person of high internal strength, would continue to work untiringly even when he was not well. I bow my head to such a wonderful personality.

Prof. D.P. Khandelwal – a visionary teacher

B.K. Srivastava
(did Ph.D. under Prof. Khandelwal at HBTI, Kanpur)
(retd.) Professor of Physics, University of Rajasthan, Jaipur

(Appeared in IAPT Bulletin Feb. 2021, p. 40)

It is now quarter of a century since Prof. Khandelwal left for his heavenly abode. His trend setting contributions to upgradation of Physics syllabi and laboratories continue to be relevant and inspiring. For those who had the privilege of working/interacting with him, his passionate zeal for the cause of physics education continues to be infectious. Indian Association of Physics Teachers (IAPT), founded by him in 1984, is providing platform to Physics Teachers to share ideas and is abuzz with activities aimed at popularizing physics and science.

1. The person

A down to earth simple man sensitive to the calls of the society and uncompromising on principles, a true 'karmayogi', he touched and influenced innumerable lives. Participation in freedom movement, association with Khandelwal Mahasabha with focus on helping the needy children avail education, his clear headed and incessant working for upgrading science/physics education, launching and nurturing of IAPT and tireless working till his very last, all emanate from one eternal desire, viz., to affect change for better.

What were the inspirations? Surely parents would have imparted the basic values and the character. A brilliant student, after his B.Sc., he got selected for Indian Civil Service but his conscience did not permit to join it under the foreign rule. The importance that Prof. Khandelwal attached to experiments should owe in part to the impact created by his school teacher who primarily invoked demonstration experiments for conveying science concepts. Prof. Khandelwal would fondly recollect this. In the context of his work on development of experiments, he reminisced that Prof. D.D. Pant had been a source of inspiration and dynamic support for him. These apart, two factors seem to stand out which played role in shaping his persona, viz., (i) the call of freedom struggle and (ii) the benevolence of the owner of the school in which Prof. Khandelwal had his first teaching appointment.

The call of freedom struggle invigorated him to participate. Pricking his fingers to inscribe in blood on paper slips and sliding them in hostel rooms in Agra, he would exhort other students to join the movement. This was 1943 during his second year of M.Sc. A warrant was issued for his arrest which forced him to leave studies mid-way. For concealing identity, he had to change his surname from Rawat to Khandelwal. He took up teaching in a private Marwari Vidyalaya in Karachi. When the upheaval subsided, he returned to Agra seeking re-admission in M.Sc. (second year). He lost time but earned determination to firmly stand against injustice, something that was to reflect again in his future actions. Years down the line in 1969 when he was Head of the Department of Physics at the prestigious Agra College, an unfortunate incident of a teacher behaving inappropriately with a girl student and the College Administration, inspite of his recommendation, not coming forth with appropriate action, made his inner rebel resign the job. He remained without job for some days before appointment as Professor and Head of Physics Department at Harcourt Butler Technological Institute (HBTI), Kanpur. The spirit of standing up for a cause comes through again when he vehemently resisted certain administrative policies at HBTI. It would have its obvious share of tense times but Prof. Khandelwal with his calm persona would carry on the normal routine of teaching and Head-ship. Prof. A.N. Nigam, his colleague in the Department, recollects this in his memoirs of Prof. Khandelwal [1].

The second factor that would leave a mark on him relates to the Marwari Vidyalaya, Karachi, D.P. Khandelwal had joined in as teacher after dropping out of M.Sc. in midway of second year. The owner of the school was impressed with his interest and dedication in teaching and gave him (financial) freedom for setting up a good laboratory for the students. Further, he sponsored his discontinued M.Sc. education at Agra College. The kind gestures, from a person who himself was perhaps not highly 'educated', added to his innate desire of devoting to education of youth in general and to science education in particular.

Prof. Khandelwal was a strict disciplinarian in sticking to a planned schedule and to this end he was very tough on himself. During the course of one summer Institute under his Director-ship at Nainital, he received the tragic news of passing away of his mother. That day he left for his native place but only to return the next day. … Personal comfort was the last thing he would care if he had to meet some commitment. Two instances come to mind. Prof. S. Lokanathan (who had joined University of Rajasthan as Professor in 1969) recalls the following from around 1975. Prof. Khandelwal, at that time with HBTI, Kanpur, was on a visit to Jaipur in connection with ULP programme in the University Physics Department. After couple of days, after finishing day's work, he asked Prof. Lokanathan to drop him at the bus station for a night bus as he had to get back to Kanpur. Prof. Lokanathan's suggestion that he should get some rest overnight and next morning he would put him on a fast train to go in some comfort in I class, was not heeded to. … Some 15 years later, in early 1990s he was in Jaipur on a short visit. Next day he was to leave for Pune, where he had convened an IAPT meeting. I accompanied him to the railway station. His train reservation did not get confirmed till the last. I suggested that he could postpone the Pune meeting for a couple of days but it would not fit in with his self discipline of sticking to a schedule. He just boarded the train. I thought that at the age of 70+ this should have been avoided. ….. Prof. Lokanathan reminisces "Although he was years older (than him), his stamina seemed of a higher level."

Prof. Khandelwal loved work and hard work at that but he was not workaholic. He enjoyed games, played cricket and bridge, and enjoyed humour too. While at Agra College he was a regular wicket keeper player in the faculty team. Even on a busy day he would love to keep updated of scores in an ongoing India cricket match. At home he could be seen enjoying solitaire. Prof. Lokanathan has following interesting recollection from his visit to a workshop which Prof. Khandelwal organised at Agra College. Prof. Khandelwal would be sitting through all the Lectures and still in the evening would find out an hour to play bridge and then plan for next day's proceedings before retiring for the night. Come to humour, in a lighter mood, he would talk about three classmates in High School passing out in I, II and III Divisions respectively; in the long run the first one became a teacher, the second a bureaucrat and the third one eventually became a Chief Minister. The first one was he himself; two others shall like to remain nameless.

2. Professional career

As mentioned earlier, in 1943 leaving his M.Sc. (second year) studies mid-way, Prof. Khandelwal joined as teacher in Marwari Vidyalaya, Karachi. In the turmoil of partition in 1947, he moved to Birla College, Pilani, to take up teaching Physics to Intermediate students. In 1948 he was appointed as Lecturer in the prestigious Agra College, Agra, where he would engage UG and PG classes. In 1954 he got selected for Lecturer-ship in Government PG College, Nainital, where he also pursued his Ph.D. work under the supervision of Prof. D.D. Pant. Served there till 1961 when he moved to Rajasthan University, Jaipur, as Reader in Physics. In the year 1963 he went back to Agra College, this time to Head the Department of Physics, a position which provided him space to pro-actively pursue his passion of working

for upgradation of Physics syllabi and laboratories. In 1965 he went on short visits to USA and UK, under the USAID Programme of the Government of India, for studying development of teaching programmes and organisation of teacher orientation courses. In 1969, from Agra College, he went to Kanpur as Professor and Head of the Department of Physics at HBTI. In 1977 for one year he went on deputation as Visiting Professor to work in the University Leadership Programme (ULP) at University of Rajasthan, Jaipur. Prof. Khandelwal retired from HBTI in 1981.

Post retirement, during 1981 - 84, Prof. Khandelwal associated as Research Scientist with Prof. H.D. Bist's group at IIT/K. He launched IAPT in 1984 and its functioning became his singular devotion. In 1993 he joined Poona University as Emeritus Fellow in a UNESCO Project "University Foundation Course in Modern Physics" with Prof. A.S. Nigavekar. Sharing his time between IAPT activities and the UNESCO Project, Prof. Khandelwal kept working for long hours till his very last.

3. Works on upgradation of Physics education and on research

Prof. Khandelwal was passionate working for upgradation of syllabi and designing/renovation of experiments. In relation to these, he also devoted his time on preparation of course content/teaching material and training/orientation of teachers. The first ever seminar held at Jaipur for the teachers of Rajasthan for discussing syllabi and laboratory development was convened by him in 1963. He was also the Convener of the first ever Seminar, with similar objectives, held in Agra College for Agra University teachers in 1964. He worked for lower classes, VI onwards to Intermediate, with as much vigor and enthusiasm as for UG classes. Some twenty summer Institutes/Seminars/experimental workshops/teacher orientation courses were organized over the years.

Two of his trend setting works of far reaching consequence are introduction of Berkeley Physics based B.Sc. syllabi in Agra University in 1967 and renovation of Laboratory experiments with open ended approach. In due course, the syllabi were adopted by Universities across the country. Prior to this, UG Physics syllabi were so to say compartmentalised into "General Properties of Matter, Sound, Heat, Light, Electricity & Magnetism and Electronics". The carried out upgradation brought in the much needed and thitherto missing perspective in Physics teaching in the country.

His love for experiments and student like zeal for performing experiments was striking. He put emphasis on an open ended approach for experiments with an objective of studying a system or a phenomenon instead of determining a constant. Large number of experiments was designed by Prof. Khandelwal and his colleagues/fellow teacher participants in number of Summer Institutes/workshops organized in his Director-ship, and in his places of work, viz., Agra College, DSB College at Nainital and HBTI, Kanpur. The 1971 Summer Institute at Nainital needs special mention. 15 new B.Sc. level experiments were designed in this workshop. The report of the Summer Institute got wide acclaim and several of the experiments became part of the laboratories of different colleges. The experiments developed over the years are rich in their depth as also in coverage of the range of phenomena. His book "A Laboratory Manual of Physics" [2] gives a vivid description of these experiments. It also includes experiments developed under University Leadership Project at University of Rajasthan, Jaipur, with which Prof. Khandelwal was closely associated right from its inception. The experiments include adaptations of old and established experiments to open ended approach, new low cost experiments effectively conveying concept with freedom to play and new experiments with relatively costly equipment but adding to student's excitement and precision of the data.

In his last few years' association with Poona University, Prof. Khandelwal was involved with the UNESCO Project right from the stage of drafting of the proposal. Professors A.W. Joshi and A.D. Tillu [3] thus recount his contribution 'Although a large team was involved in this Project, almost the entire development of the course "A World-View of Physics" (which includes a textbook, a teacher's guide and quite a few experiments) was due to him'.

His research interests were in fluorescence spectroscopy, molecular and solid state spectroscopy using infrared and Raman techniques, and in theoretical lattice dynamics. Six students obtained Ph.D. degree under his supervision. His own Ph.D. work carried on a home built fluorimeter was extensively quoted in a monograph by Rabinwitch and Belford (Academic Press, 1964). Results of experimental work on molecular and solid state spectroscopy were published in reputed Journals like Chemical Physics Letters and Journal of Molecular Structure. An invited Review article came out in Applied Spectroscopy Review. Results of the work carried out in theoretical lattice dynamics brought out publications in Journals like Physical Review and Journal of Chemical Physics.

4. Long time associations

In his over three decades of teaching career spread over at Agra, Nainital, Jaipur and Kanpur, Prof. Khandelwal enjoyed close cooperation of many fellow teachers/colleagues. Also he had been closely associated with ULP Programmes at University of Rajasthan, Jaipur and at Punjab University, Chandigarh and with Physics Education Programmes at Poona University. Long time associations with three Professors, namely, Prof. D.D. Pant, Prof. B.L. Saraf and Prof. H.D. Bist, stand out.

Prof. Pant has narrated [4] that when D.P. Khandelwal was selected as Lecturer in Physics for the Government College, Nainital, he went to meet him (Prof. Pant) who was then Head of the Physics Department there. D.P. Khandelwal also had an offer of appointment as Income Tax Officer. He, however, expressed his desire, to Prof. Pant, of joining as Lecturer but he would also like to have the possibility of doing Ph.D. there. That was in 1954. Prof. Pant made him join the Department. The College did not have facilities for research. It was decided to ab-initio set up a fluorimeter for undertaking a research programme on fluorescence spectroscopy. Basic units like photomultiplier tube and transformers were collected and a non-recording fluorimeter was assembled around a student's spectrometer. D.P. Khandelwal carried out his Ph.D. work on this laboratory assembled fluorimeter. In 1961, Dr. Khandelwal moved to Rajasthan University, Jaipur. Association with Prof. Pant continued over the years. In 1970s Dr. Khandelwal conducted Summer Institutes at Nainital and when Prof. Pant was Director of Education in UP, did extensive work on training of teachers for organizing Summer Institutes of teachers of Intermediate classes.

Prof. Khandelwal had the longest association with Prof. B.L. Saraf. Their first acquaintance was in 1948 - 49 in Agra College where Dr. Khandelwal had recently joined the Department as Lecturer and B.L. Saraf was a M.Sc. student. Their long time association commenced when in 1965 Dr. Saraf, after his stint in BARC, joined teaching faculty at University of Rajasthan. Dr. Khandelwal, having earlier served as Lecturer in University of Rajasthan (1961 - 63), had moved to Agra College in 1963 and was actively involved with programmes relating to upgradation of Science/Physics education at various levels. First collaborative venture of Prof. Khandelwal and Prof. Saraf was during 1966 - 69 on a NCERT Project for producing teaching material/experiments for classes VI – VIII. A novel "Question Book" approach was developed under the Project for teaching of science at the lowest level. In 1971, University Leadership Project (ULP), aiming at design/development of experiments, was

taken up under the Coordinator-ship of Prof. Saraf with a strong team including Prof. S. Lokanathan and others, at University of Rajasthan. Prof. Khandelwal was actively associated with this Project right from the stage of its inception and was a regular visitor to the Department interacting with the team. This association resulted in development of very novel experiments. As mentioned earlier, in 1977 Prof. Khandelwal went to Jaipur for a year as visiting Professor for working for development under the ULP. One would vividly recollect the images of Prof. Khandelwal performing, like a student, the experiments in great details in the University Science Instrumentation Centre Building in the extreme summer time of May - June, 1978. The sustained efforts resulted in rich observations on the newly developed concept-wise rich experiments. The experimental development work carried out under ULP was presented in two books, "Physics through Experiments, Vol. I and Vol. II". Prof. Khandelwal was associated in various stages of the work compiled in both the volumes. His spending one year at Jaipur particularly enriched Vol. II; it also brought out a more detailed second edition of Vol. I.

Association between the two Professors continued. Prof. Khandelwal launched IAPT in March 1984; in October 1984 Prof. Saraf took over as President and continued till Dec. 1986. He returned back to undertake this responsibility for the period Jan. 1998 - Dec. 1999.

Since Prof. Khandelwal moved to HBTI, Kanpur in 1969, he initiated research collaboration with Dr. H.D. Bist at IIT/K in the field of Molecular and Solid State Spectroscopy using Infrared and Raman techniques. They had acquaintance during their overlapping times at DSB College, Nainital. Dr. Khandelwal had joined the faculty in 1954. Both, Dr. Khandelwal and Dr. Bist did their Ph.D.s under Prof. D.D. Pant, Dr. Khandelwal during 1954 - 58 and Dr. Bist during 1958 - 62. They collaborated on some research problems in Nainital. When Prof. Khandelwal moved to Kanpur, for some months he stayed on IIT Campus. This enabled commencement of an extensive collaboration between them. Several research students (one being myself) benefited. After his retirement from HBTI, the collaboration continued and Prof. Khandelwal associated as Research Scientist with Prof. Bist's group during the period 1981 - 84. Over all they co-authored more than 30 research papers and co-edited a book "Lasers and their applications in Indian context" (Tata McGraw Hill, 1985).

5. Prolific writer

Prof. Khandelwal loved to write. As reminisced by his son Sri Anil Khandelwal, no letter addressed to him went unanswered. Come to writing articles/ research papers, one remark which captures his style is worth recalling. I was doing my Ph.D. under the supervision of Prof. Khandelwal. Infrared spectroscopy experiments for the Ph.D. work were carried out in the research Laboratory of Dr. Bist at IIT/K. In the course of writing a research paper, first draft would be written by the Ph.D. student, it would be critically examined/corrected/re-written by Prof. Khandelwal and then taken to Dr. Bist for opinion/corrections. Once, first draft of a research paper, prepared by me, was with Prof. Khandelwal for some time. And one fine day when I took the corrected draft to Dr. Bist in IIT/K, a pleased Dr. Bist's spontaneous remark was 'Doctor Sahib nay aaj ek hee sitting may likh diya hoga'. That was the style. It would take a while for ideas to get concretised and then he would write them down generally in one go.

Prof. Khandelwal had equally good command in Hindi and English. He was a poet at heart. A few of his Hindi poems printed in Feb. 97 issue of IAPT Bulletin reflect his sensitive side. In his early teaching career, he wrote books in Hindi for High School and Intermediate classes. He also translated two well known Physics books into Hindi – Beaching's 'Electron Diffraction' and Saha and Srivastava's 'Heat'. His two books – 'Optics and Atomic Physics' and 'Elements of Thermodynamics and Statistical Physics' (this one with Prof. S.

Lokanathan) – have been reference material for generation of teachers and B.Sc. students. His book 'Laboratory Manual of Physics', as mentioned earlier, is an authentic resource of selected new experiments. ULP's two books 'Physics through Experiments, Vol. I (second edition) and Vol. II' have distinctive imprints of his efforts. Each of the umpteen number of summer Institutes/workshops/orientation courses coordinated by him was followed with a detailed report/write-up.

6. Man with a purpose and team builder

Prof. Lokanathan recalls [5], from his first meeting with Prof. Khandelwal when in1965 he and Prof. Saraf visited IIT/D where Prof. Lokanathan was on the faculty, "He immediately struck me as a person with a purpose. He wanted information about some laboratory equipment he needed and came straight to the point". Everyone meeting Prof. Khandelwal carried that impression. The focused approach was a characteristic all through…. S.A. Agte and Nitin Bhamare [6], who worked with Prof. Khandelwal for the Pune UNESCO Project, in his last few years (1993 - 96), recall in the following words "He used to start working just right after entering the room and will leave the room just after he has finished……He used to preplan what should be completed today".

Prof. Khandelwal had a belief that everyone has got his own strength and the job of a team head/leader is to spot it and get out the best. With this belief, with his unassuming nature and with his so apparent sincerity of purpose, he was able to win support. This stood strong in his long time academic associations/collaborations and ultimately in the building up of strong team of IAPT flag bearers.

7. The teacher - always there to help

The spark in Prof. Khandelwal's eyes while emphasizing on a point would keep the students spellbound. During my B.Sc. days in Kanpur in 1970, he visited the College to deliver a lecture under the auspices of Kanpur Physical Society. We students were thoroughly charmed. After my M.Sc. from DAV College, Kanpur, I was fortunate to get selected for Junior Research Fellowship under his guidance. Students had an important place for him and he was always there to help. Even when busy in discussions with colleagues or attending to some administrative work, if a student approaches with either a study related or an office related problem, he would be attended to without having to wait. Teachers and the teaching Institutes exist for and because of the students, was always put into practice. One worth mentioning instance relates to the then M.Sc. student Babu Lal Saraf at Agra College. Prof. Khandelwal was on the teaching faculty and B.L. Saraf had taken admission in M.Sc. One day as the student Saraf was looking for some book, teacher Khandelwal accompanied him to the Central Library to help him find the appropriate book. That bond of sincerity of a teacher would have played role in their nearly four decade long friendship which resulted in illustrious collaborative efforts in the cause of Physics education.

Prof. Khandelwal encouraged students to engage in research/Ph.D. work which essentially provides some five years of hands on experience of rigorous analytic thinking/work. In his characteristic style he would sum it up in the words 'dhai aakhar prem ka padhey so pandit hoye'. Y.S. Jain who in second half of 1960s was working as Lecturer in a Private College at Agra fondly remembers Prof. Khandelwal encouraging him to join as research student in a Project with Dr. H.D. Bist at IIT/K. That changed his course. He did his Ph.D. from IIT/K and went on to make substantial contributions in the fields of Molecular/Solid State Spectroscopy and Condensed Matter Physics and served as Professor at North Eastern Hill University, Shillong. At HBTI, Prof. Khandelwal encouraged and helped the Faculty and

research students, for undertaking quality research work in collaboration with research groups at IIT/K and Universities. This created a lively atmosphere for research in the Department.

Alok Kumar who was a Ph.D. student (of Prof. A.N. Nigam) at HBTI, and presently Distinguished Teaching Professor at State University of New York, Oswego, cherishes memories of seeking Prof. Khandelwal's advice on different occasions starting from his HBTI days. One specific instance he mentions is from 1989 when Alok Kumar was teaching in California State University, Long Beach. He was working on writing a book titled "Science of the Ancient Hindus". He requested Prof. Khandelwal for his comments on the manuscript. Alok Kumar says that Prof. Khandelwal critically read the book and gave his comments. He wanted Alok to publish the book as it should encourage others to work in the field. Based on Prof. Khandelwal's comments/suggestions, he worked on improving the text and finally published it in 2005.

I myself owe my professional career to Prof. Khandelwal. I had the privilege of being his research student during 1972 - 77 at HBTI, Kanpur. In 1977, he was to go to Jaipur as Visiting Professor under the ULP Programme with Prof. B.L. Saraf. My Ph.D. had just got completed. Prof. Khandelwal advised that it should be explored if I could have an opportunity of being part of the research programmes at Physics Department of University of Rajasthan which was abuzz with research activities with Prof. B.L. Saraf and Prof. S. Lokanathan at the helm. Prof. Khandelwal asked me to accompany him to Jaipur. For couple of initial days I stayed with him in the University Guest House. Subsequently when he moved to regular Professor's residential quarter, he offered and allowed me to stay with him. This was not with slightest hint of obliging but it was part of his moral/human value system as a teacher. When L.C. Joshi, who had been his student in Nainital, went to Jaipur to be part of ULP team, he also stayed with Prof. Khandelwal along with me.

On Prof. Khandelwal's recommendation, Prof. Lokanathan accepted me in his research group on Mossbauer Spectroscopy. I was fortunate to get an opportunity of working as Research Associate in a major Research Project under Prof. Lokanathan and in due course got opportunity to join the teaching Faculty in the Department.

8. His concerns/ views

Not many youngsters opting for physics/science (he termed it internal brain drain) - particularly for fun of it and not just for jobs, quality of M.Sc.'s and Ph.D.'s, disconnect of Universities and more so of big Institutes with problems at lower level, college/school level teachers not having a platform to share their teaching related problems, the gap between Universities and colleges in terms of research environment and the big science facilities largely not being in reach/under control of Universities, all worried him [7].

He suggests [7] a common test for M.Sc. pass outs not only for teaching and research but for any job openings for M.Sc.'s. For popularising physics/science he prescribed multi-pronged approach including (i) science stage shows, (ii) setting up of Centres for Science Culture where common public could visit, just as to a public library, and do experiments of their choice, (iii) setting up of model school and UG level Laboratories with continuous renovation where teachers would visit, interact, work on and choose experiments for their own school/college and (iv) making experimental evaluation, along with theory evaluation, mandatory be it for admissions in higher classes or for jobs. He attached great importance to student Laboratories and advocated for teachers to devote, and being duly recognized for it, more serious attention to Laboratory work. Alike the more heard dictum of the class teacher to be accorded flexibility in choosing say 20% of the course content, Prof. Khandelwal

advocated for teacher to be given freedom to choose a laboratory programme as per his taste and available facilities.

With the view of establishing primacy of Universities as the seats of education and research, he suggests that any big science facility should be set up only with a proper University link/control. Establishing of Inter University Consortium for DAE Facilities and Nuclear Science Centre are welcome. Still this is a work in progress.

9. Launching and nurturing of IAPT

There was no forum in the country to which physics/science teachers of all levels could truly relate to. Through his experience of extensive interactions with teachers in Summer Institutes/orientation courses/experimental workshops and of academic collaborations in Universities/Institutes, Prof. Khandelwal had a clear realization of importance of teachers – and teachers of all levels – coming together for the cause of popularization of science and for upgradation of Physics/science teaching/education. This lead him conceptualise an Association of Physics Teachers. His discussions with Prof. D.D. Pant, Prof. B.L. Saraf and Prof. S. Lokanathan at Jaipur during "International Conference on the Role of Laboratory in Physics Education" (Dec. 29, 1983 – Jan. 2, 1984), firmed up the idea.

Prof. Khandelwal's work place Kanpur became the head quarter. He had a belief in collective wisdom. On a couple of occasions when he needed to have opinion on effectiveness of some experiments, he resorted to survey among large number of teachers. On the issue of launching of physics teachers association too, he decided to go for a survey. Two circulars, first on Feb. 1, 1984 and second on Feb. 20, 1984, were posted to outstation teachers asking if they would like to be founding member of a proposed Indian Association of Physics Teachers. First one fetched a positive response from about 600 teachers and the second one from 1056 teachers. Convinced of the sufficiency of the number for sustainability of the association, Prof. Khandelwal took the plunge. A local steering committee of 10 eminent Physics teachers, from IIT/K, HBTI and different colleges of Kanpur, did drafting of the statutes and took decision on qualification and membership etc. It was decided to bring out a monthly Bulletin of the Association. IAPT got formed. Story of the formation of IAPT has been described in some details by Prof. R.N. Kapur [8].

Its first bulletin of March 19, 1984, was partly written in hand and partly typed and 1400 cyclostyled copies were posted. Receiving the hand written Bulletin, one was reminded of Prof. Khandelwal's participation in another revolution little over four decades ago when he would inscribe in blood on paper slips exhorting students to join the freedom movement. His unabated conviction in a well thought out cause and his inner strength for taking a plunge for such a cause, belief in the power of collective thought pooling of teachers, his organisational capacity, ability of identifying talent and winning support, all blended together in launching and sustaining of IAPT. Prof. Lokanathan's words [5] "Many of us have aspirations, dreams of serving causes dear to us but few have the sustained strength and ability to achieve their goals. Prof. Khandelwal was that rare breed who could create an Institution" catch this the best.

In its first convention held in October 1984 at Kanpur, an executive committee was formed. Prof. B.L. Saraf was chosen as the President. Prof. Khandelwal took up the responsibility of General Secretary continuing till Dec. 1990. From Jan. 1991 onwards he was elected President for three successive terms and continued in this role till his last. During those first twelve years of IAPT, one by one several activities were taken up. The monthly Bulletin which has been getting published without a break and the annual conventions provide platforms for exchange of ideas among the teachers. Articles appearing in the Bulletin deal in

aspects/problems of teaching, relate to innovation in experiments and latest developments in different areas. Palpable enthusiasm of teachers of all levels including school level is heartening. The examination programmes – National Standard Examination in Physics (NSEP) and National Graduate Physics Examination (NGPE) – have caught the imagination of students. Evaluation of experimental skills, aside the (objective type) theory papers, is a loud statement on the need of attaching, otherwise missing, greater seriousness to experiments. Schemes of IAPT scholarships based on these exams aided to these goals. Later developments of their linking up with International/Asian Physics Olympiad and admission in PG course of SN Bose Centre for Basic Sciences symbolize their accredited authenticity. That IAPT is also conducting National Standard Examinations in Biology, Chemistry and Mathematics which become the base for selecting participants for Olympiads in the respective subjects, is gratifying. Centre for Science Culture Programme (Midnapore) came up as catalyst for popularsing science among public at large. Other important activities which were taken up are National Competition for Innovative Experiments in Physics, and Orientation Programmes, Seminars and Workshops conducted by the Regional Centres of IAPT.

It is a tribute to Prof. Khandelwal that the support he received and the larger team that got built up has strengthened the movement and it is adding more and more innovative programmes. Prayas - the bi-monthly Students' Journal, the series 'Horizons of Physics', setting up of as of now more than 20 Anveshikas beginning with the first one in 2001 at Kanpur, setting up of more than 20 innovative hubs starting with the first one in 2013 at Vivekananda Global University, Jaipur, National Anveshika experimental skill test, competitions in essay writing and computer based innovative experiments, Deenbandhu Saha award for UG teaching, the list is only adding up. Prof. Khandelwal should be proud.

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DPK Blessings to me

Y.K. Vijay
(Retd.) Professor of Physics, University of Rajasthan, Jaipur
President IAPT RC-6

(Appeared in IAPT Bulletin March 2022, p. 113)

I had opportunity to learn basic concepts of physics during golden time, 1977- 78, when Prof. D.P. Khandelwal (DPK), was at the University of Rajasthan, Jaipur, as a visiting professor on invitation of Prof. Babulal Saraf (BLS), to optimise the contents of the book, Physics Through Experiments Vol. II, Mechanical Systems.

I passed M.Sc. from Kota (1975) and joined Ph.D. program in the group of Prof. Saraf at University of Rajasthan. During that time a museum was set up in Vigyan Bhawan, main building where several mechanical models were displayed on Oscillations, waves, Air Track, Mechanical Transmission line etc. While moving in the corridor of the building, we students used to watch a very sincere, dedicated person, taking data on these setups and plotting graph and writing comments. We learnt that he was Prof. DPK from Kanpur. Many times, we enjoyed discussions amongst DPK, BLS and Prof S. Lokanathan, in the staff room on tea table. A few things, I still remember and like to share here.

1. A mechanical resonance setup, in which DPK used to adjust the time period of a bar pendulum by sliding mass up and down. Another similar bar pendulum, was coupled with a string and mass system. The response of energy transfer was observable on Lissajous figure. I had a notion that the energy transfer is maximum when time periods of both are equal and they move in same phase, but it was wrong. It was only during that time that I learnt that the energy transfer is maximum when the phase difference between driver and driven systems is 90 degrees. DPK justified and explained this using the Lissajous figure, as illustrated in Fig. 1.

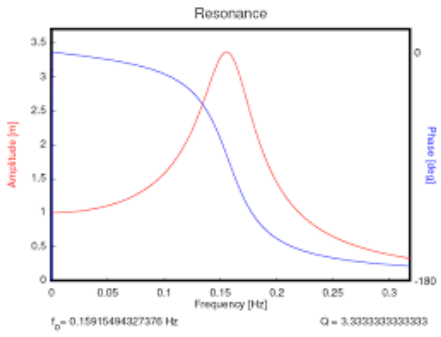
(a)  (b) 

Fig. 1: DPK typical data of bar pendulum, time period 1.6 sec. At resonance, one gets circle

2. Coupled Oscillator system always fascinated every one due to energy transfer time and coupling strength. DPK suggested for connecting a driver to a coupled oscillator system to get independent resonance peaks, corresponding to two steady states. It was difficult to setup such a system using simple pendulum or bar pendulum. Later a system using two

strip oscillators, mounted on one pillar, was developed and it was coupled to another maintained strip oscillator. It demonstrated the same idea that was given by DPK and he was very happy to see it; I share a relevant picture (Fig. 2) of 1991.

Fig. 2: Coupled strip oscillator system demonstrated at IAPT Teaching Aid Contest 1991 (in picture YKV with Prof. DPK)

3. Potential Energy diagram: DPK explained and demonstrated different potential energy diagrams on a linear Air Track, which was developed at Centre for Development of Physics Education (CDPE), University of Rajasthan, Jaipur. He verified most of the data reported in the book 'Lab Manual of Physics'. He explained combination of gravitational and magnetic potentials. In another teaching aid contest organized by IAPT, DPK appreciated the importance of anharmonic oscillations through modified bar pendulum (Fig. 3).

Fig. 3: Anharmonic Oscillator displayed at Teaching aid contest, 1990, Ruparel College, Mumbai; seen in the middle is Chief Guest Dr. V.C. Sahni of BARC, Mumbai

Fig. 4: Teaching Aid Contest at Ruparel College, Mumbai, 1990

DPK encouraged several IAPT members to develop innovative experiments and emphasized on quality teaching and confidence building amongst teachers. WE at the IAPT RC-6 developed an Innovation Hub Science Gallery, with the theme *Science for Everyone, Play Enjoy and Learn*, with over 50 working models as aid for learning fundamental science principles. During last five years, twenty five such innovation hubs have been established all over the country. The 25th one has been established recently at Midnapore Science College, Midnapore, which has also been running a Centre of Science Culture, initiated by DPK in 1992-93.

An Year with Prof. D. P. Khandelwal

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It was really a heart breaking news on that unlucky Monday, 12th Feb. that Prof. Khandelwal was admitted to the hospital following a massive heart attack. On Saturday 10th only the UNESCO project laboratory component for teachers Refresher Course was completed and we had parted with his usual "Thank you so much" which I always felt ashamed to accept when I reached him till University gate. The month of January was full of hectic activities involving developments of experiments for IInd Refresher Course for college and university teachers. This time order of working was reversed as apparatus for the experiments was not in our hands. He wrote the manuscript for the laboratory experiments first without any actual experimental results in his hands. After that only we could perform the experiment and see whether we are anywhere near expectations. But the task was over, we had met the challenges as he used to say and successfully had gone through whole of the process. But it was not in his blood to rest, he had already started to think about the next set of experiments. Here we cite few occasions which impressed our minds.

He always had positive outlook, guiding always encouraging, ever ready to discuss anything. In UNESCO project laboratory he was always busy with his typewriter first and for last three or four months with his computer. He mastered the computer within a few days. He found great joy in learning new things about computer which were expressed on his face like a child.

He used to start working just right after entering the room and will leave the room just after he has finished, many a times he forgot his lunch. He used to pre-plan what should be completed today. At this age he used to devote almost 14-15 hours for physics daily. Discussions with him were not long, mostly one sided but giving way to the problem. Even so he used to grab any moment to enlighten the persons present by talking about the physics the situation presented and express his views about many aspects of physics. He felt that now a days more stress is on mathematics than on physical concepts. Students can write a derivation of three-four pages but cannot explain simple physical significance. He strongly emphasized that the demonstration experiments in lectures will be more impressive for the students and also will save the time. We learnt a lot from him during this year.

He used to talk about his school teacher with gratitude, who never went to the board but used to call the student near his table and teach physics through experiments like "prepare a concave mirror by connecting pieces of glass" etc. That is the way he learned science in school, which he never forgot.

Many a times he mentioned about the hundred years old beam used in colleges (for the measurement of Young's modulus) very sceptically. He was very much for development of undergraduate laboratory and never felt that experimenting is below dignity. The new experiment should be developed on the basis of day-to-day experience and using the material easily available. He stressed that teacher should be innovative and should manage with whatever is available. Once there was a need of pointer to read a circular scale, he asked for a

piece of paper, folded it properly and used it as a pointer. At another time a slit was needed to obtain a Lithro-spectrum. He immediately cut it from a thick envelope.

We shared the development of some 12 to 15 experiments with him. He was very conscious about the wrong message that may be conveyed. When there was a question of a least count of a stop watch he insisted that a stop watch of appropriate least count should be used, no less no more and where wrist watch suffices don't go for stop watch.

He was very polite and always encouraging though he believed in a tough training for students. He used to give complete responsibility of the work and had enough patience till it was fulfilled. We shared a moment of joy when quite unsuspected magnet oscillation in gravitational and magnetic field were observed after many trials. He was with us in every difficulty and found the way out, till something very nice came out.

He used to say that experience with physics gives more lasting effect e. g. to explain free fall under gravitational field, drop an object on the table or floor. His explanations used to be unique, unmatched and very enlightening.

He said that research people should be given a free hand, whatever promotes learning is not a waste. He used to say, "I never keep notes of the lectures, but prepare them afresh every time."

He used to keep good health and was against taking medicines frequently. He advised "Don't run to the doctor, wait for three or four days, fever will naturally vanish."

It was really God's bless that we had a privilege of working with Prof. D. P. Khandelwal for about one year.

Physics as a whole and specially Physics laboratories will suffer a lot because of his untimely death.

The Master, as I See Him

Rabindranath Chattopadhyay
Haripal G. D. Institution, Khamarchandi, Hooghly, WB

(Appeared in IAPT Bulletin, Feb. 1997, p. 72)

"Alas I am guardian less in the community of Physics Teachers" That was the immediate feeling after hearing about Prof. Khandelwal's demise. It was about 1988. I completed my M.Sc. from Calcutta University and entered into the community of physics learners and teachers at National level following the guidelines of Prof. A. W. Joshi which he kindly gave me in connection with publishing papers in "PHYSICS EDUCATION". Then it was only Prof. Joshi at National level whom I thought myself as a pen-student of. Then Dr. J.N. Chakraborti, the then Head of the Department of physics, R.K.M.R. College, Narendrapur, West Bengal and also my teacher, made me a life-member of IAPT. I am grateful for that to Dr. Chakraborti. My article appeared for the first time in IAPT Bull in the year 1990. And from then on I was in a very close connection, although only through letters, with Prof. Khandelwal. He praised me for some of my articles and I have kept those appraisals intact as certificates from such a giant personality. Thence after too many correspondences took place between us. As I think Prof. Khandelwal studentiotiated (a term, coined by myself to mean the act of making one student of) me. Then I could think with real confidence that there is at least one person in the world to whom I can tell, without any hesitation, about any problem either purely academic or semi-academic in nature. In all of such cases I got realistic solutions over quickest possible communication along with letters full of love and affection from him.

There is no doubt that in our country there are a large number of great scientists in various fields of study. But the real crisis, as I personally think, is that there persists a very very large gap in the level of thinking, either formally or informally between the community of school teachers and the university professors or scientists. Although I must admit that the fault is not totally from the part of the more learned persons I must say that it is mostly so. If the levels of thinking of teachers in broad sense are discrete, discontinued and disconnected although the realm of the total education system, the education, the teachers impart can never be demanded to be a perfect one. And that kind of indulgence may result in a sum total equal to vast nothingness. Too many scientists have the capability of performing good research works but a few of them have real power of appreciation. This is the picture conformal with stern reality and unhappy truth. The power of intelligentsia is the root of producing good research works and the power of appreciation is the root of producing good students or scholars. Therefore, the latter is multiply higher than the former.

In regard of all the above discussion I strongly believe that the first ideal person to feel or to realise the above-mentioned crisis is Prof. D.P. Khandelwal. He was the first person, as I would not expect the only person, to bridge the gap between layman like us and many gigantic personalities in the world of science.

However, Prof. Khandelwal is no more with us.

May his soul leave out into space
for an eternal rest in peace;

May his spirit promote within us, the physics teachers ' race
a zeal that we should never miss;

A zeal for love of science and conscience
with a genuine love for truth;

A teacher like him, a truth-preacher thence
to whom should we follow in sooth.

A Tribute to Professor Khandelwal

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(Appeared in IAPT Bulletin June-July 2021, p. 249)

It was probably the third week of August or the first week of September 1993. This was the time when I stayed in Lonavla (about 65 km away from Pune) and worked as a lecturer in the Nowrosjee Wadia College of Pune. I received a message from Dr. Mrs. Varsha Joshi, my senior colleague and later the Head of the Department of Physics in my college, that I should meet her.

When I met her, she told me that there was a group of eminent persons working in the Pune University (now SPPU) in the area of my interest namely, physics education. She asked me if I had an inclination to be associated with the group since they required someone with a good hand at practical work in physics. Since I always loved working in physics laboratories much more than reading theory books, I nodded. Later when I was introduced to the group by her, I learnt that it was an international UNESCO project on which several veterans including Prof. A.S. Nigavekar who had taught me while I did my M.Sc. in the same department. Gradually I got acquainted with other members of the group too.

Prof. D.P. Khandelwal and Prof. A.W. Joshi were the most active members of the group and both had a vast treasure of knowledge in the field of physics. They had already established a tiny laboratory in one corner on the ground floor of the University physics department. It did not take much time for me to be a confidant of Prof Khandelwal since I often had good conversation with him while dropping him close to his residence in Pune (quite near my college) in the evening. He was such a down-to-earth simple person that I never felt hesitant to take him as a pillion rider on my M-50 moped. This would usually be my evening schedule twice or sometimes thrice a week. I could then leave the city for Lonavla by Indrayani Express. It was much later that I learnt about his bright contributions with Prof BL Saraf in the past.

I still do not know what exactly impressed Prof. Khandelwal but it was probably my volley of questions particularly about activities and experiments in physics that created affection. He would speak not only about activities but also about the people involved in the group and sometimes even beyond; to assess the depth as well as quality of the final outcome of the UNESCO project in the form of books. When he asked me about my background and interests and I told him about late Prof. M.R. Bhide and Prof. R.N. Karekar's unimaginable support to promote the spirit of inquiry in us while doing MSc in Pune University. I told him about our schedule of experimentation spread over several nights during emergency days in order to complete all experiments successfully. This was when I could see the glitter in his eyes very clear. It was the kind of glitter that one would often see when he would himself be able to accomplish something with complete satisfaction.

There are many great teachers who are impressive orators and have an excellent style of communicating physics to students but I found a distinctly different great teacher in Prof. D.P. Khandelwal. He did not offer a complete explanation at one go. He would instead, ask me to do something in the laboratory or think about it as a thought experiment and investigate. This, as I soon learnt, ensured my deepest mental involvement 'in solving the problems' myself for enhanced pace of learning.

On some occasions, we could work on several experiments and he would leave the task of verifying the outcome of some novel deviations from the normal procedures to me. I think I should have passed his informal assessment, as he strongly recommended my name to the departmental authorities as a resource person in the forthcoming refresher courses in physics at the department. I must also mention that prior to this honour, I had also received a remark "one thing at a time!" on my write-up of one of the experiments formally assessed by him. Thus, it was always more through his actions that Prof Khandelwal delivered a strong message to his students and associates that for attaining deeper understanding, one must narrow down the scatter in thinking as well.

I recall his passion and dedication towards self-reliance ('atmanirbharata') when he used to ask me or other younger generation associates how to add omit or shift a part of text somewhere in his file on a computer. Today it might sound trivial to youngsters but this was both commendable and memorable since it was much difficult compared to that today after WINDOWS OS came in. After watching the zealous student in him working for several hours even after completing seventy years of age, everyone in the group felt inspired to perform better with each passing day. I remember that we had Mr Nitin Bhamare as our assistant in the group who would help us set up experiments.

Whether it was Prof Pandit Vidyasagar or Prof A.W. Joshi or Prof Tillu, Prof Khandelwal would always be extremely attentive to what they said and gave immediate response to their views or suggestions. Perhaps he never believed in keeping the matters pending which could be immediately sorted even in a minute. This, needless to say enhanced the pace of physics learning for many, including myself. Only such matters that needed to be tested experimentally would sometimes linger beyond a day or two. I could see him working silently all alone with some mathematical equations in order to arrive at some concrete conclusions while he was scripting the major book "The World View of Physics". Prof AW Joshi who later took over the mission to completion after the sudden and sad demise of Babuji in Feb 1996 (and with whom I remained very closely associated till he passed away in July 2010) had mentioned on at least three occasions that Prof Khandelwal had done almost 85-90% of the work in terms of the series of booklets in the project and he could provide the finishing touches in time only because of it.

Prof. Khandelwal being a pre-independence freedom fighter, had a strong sense of justice and always felt that due credits must be given to all involved team members in a mission regardless of their designations or even limited roles if the contributions were significant. In my opinion, this was the highest and essential leadership quality that led him to successfully create the large workforce of selfless teachers in schools, colleges and Universities in our country. Today, when we see what IAPT is and compare it with many other organizations which have a large funding but severe shortage of workforce in the field, the importance of being one Prof Khandelwal in thousands of teachers becomes very evident.

I was pursuing my M.Phil. degree while I was working with Prof Khandelwal and the group in Pune. In February 1996 there was a refresher course arranged for physics faculty in the University department of physics. Prof. Khandelwal was of course the senior most resource person and for reason unknown he preferred to deliver his lectures right in the first week of the course. Some experiments that our group had set-up were later demonstrated to the participants and faculty members. Prof B.D. Chaure from Nashik region who was then the Pro-Vice Chancellor of Pune University and Prof. Jayant Narlikar were invited as special

guests to see our experiments. They both honoured the invitation and had very meaningful interaction with our group members on two consecutive days. Prof. Narlikar visited us probably on Saturday. Some photos were clicked. I returned home that night with great satisfaction.

On Monday, I came to Pune by train as usual and received a message note in my department. It mentioned that Prof Khandelwal had suffered from an attack and he was admitted to Jehangir nursing home, a reputed hospital quite near my college. I rushed to the hospital to see him but since he was in ICU and I was not his blood relative, I had to be content only watching him through a glass window. I could just pray for his recuperation distantly. I returned to my college and discharged my duties almost as a ritual –my mind was restless from within. The next day when I landed in Pune, I heard the sad news that he had breathed his last. It was a rude shock for me. Even the fresh photographs clicked with Profs. Chaure and Narlikar were received the next day and cruelly stared at me.

Babuji's demise shook me so heavily from within that I could not even write an obituary article on him in the special issue of the IAPT Bulletin published soon after his demise though it included our last photograph together. His sudden departure could be compared only with that of my father some years earlier. However, my association with the University group continued, Prof AW Joshi successfully led the group to finish the incomplete work on books and the work consolidated my resolve to pay my tribute to Prof Khandelwal through my experimental work rather than words.

I was fortunate to be allowed to convert my registration for the M.Phil. degree to Ph.D. by the YCMOU, Nashik authorities (although it was not a hassles-free passage due to formalities involved and took more than an year) and I could obtain a doctorate degree from them in 'subject communication' aka Physics Education with the distinction of working on designing, developing, testing, implementing and pedagogically assessing a set of a dozen simple low-cost experiments suitable for undergraduates. Further, my experimental work completed successfully through a University that was 'Open' (and consequently had no laboratories of its own) aroused much curiosity among IGNOU authorities who invited me to be a Ph.D. guide and it was surely due to the silent blessings of late Prof. Khandelwal that my friend Umpatai Pattar from Karnataka did much similar work to acquire his doctorate under my guidance through IGNOU later.

Thus, I have the life-time contentment of having paid my rich tribute to the noble soul who had illuminated my life like an angel in less than three years of his divine personal presence. I would prefer to summarise my emotions in the following lines:

"*There was a squirrel in the Ramayana they say,*

Who shed some grains of gravel on Rama's way;

Some people still think it's just another story,

While I just followed faithfully, I must say."

Tributes:

Alok Kumar
(did Ph.D. with Prof. A.N. Nigam at HBTI, Kanpur)
Oswego, New York, USA

(Appeared in IAPT Bulletin, Feb. 1997, p. 71)

".....It is not only a personal loss to me and you, it is a national loss. The revolution he started by founding the IAPT, to promote a culture of science and technology among citizens will greatly suffer. He dedicated his life to the academics and made valuable contributions. He touched thousands of lives for betterment; I am one of them. He was like a good father to me. He was always there to support whenever I was in need. I will miss a great teacher, a well wisher, and the nation will miss a person who loved his country dearly ..."

Dr. S. V. Subramanyam
Indian Institute of Science, Bangalore

(Appeared in IAPT Bulletin, Feb. 1997, p. 71)

"....He had been a gentleman to the core, a dedicated teacher and a committed president of IAPT. His guidance was keenly sought after. I am deeply pained that I have lost a fatherly figure ..."

L.C. Joshi
Almora (U. P.)

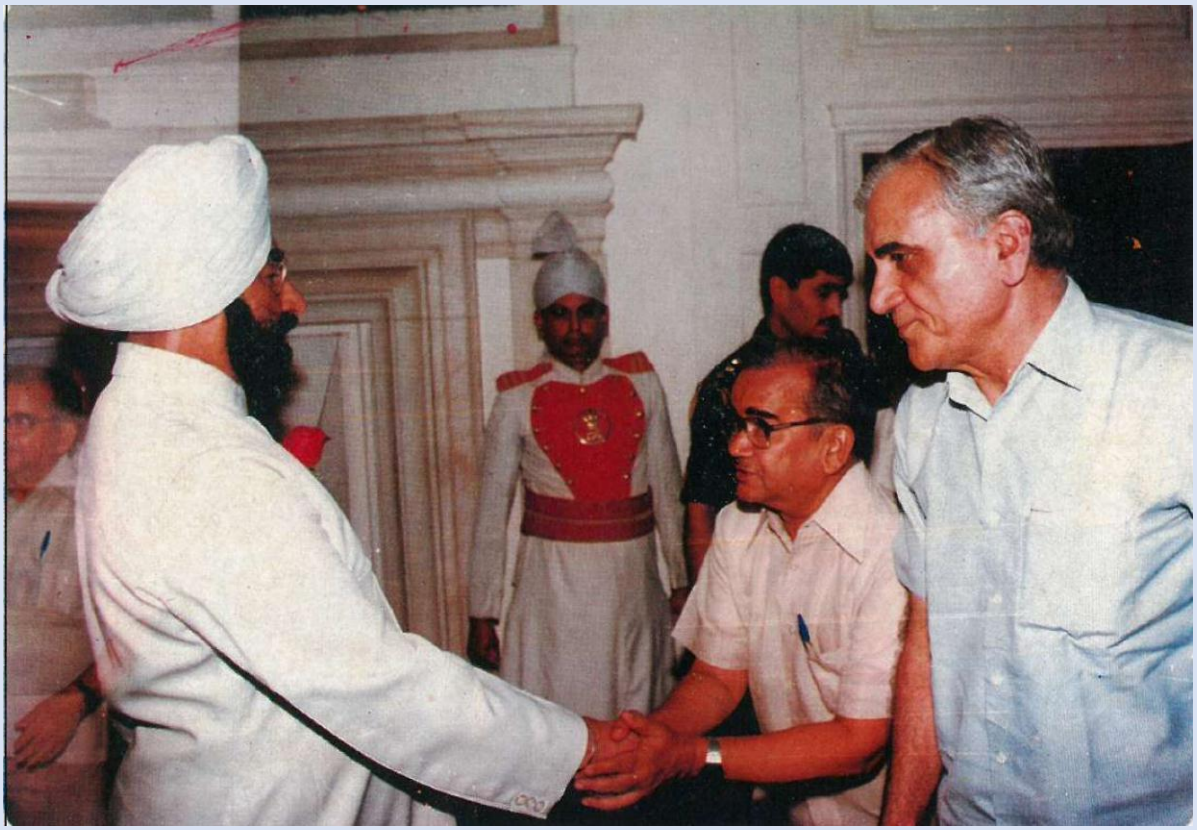
(Appeared in IAPT Bulletin, Feb. 1997, p. 86)

"....He was a man of convictions and actions. He setup rare standards for himself. A number of people shall ever remember him as a matchless teacher."

Dr. Y.C. Bhatt
Jaipur

(Appeared in IAPT Bulletin, Feb. 1997, p. 86)

"...Prof. Khandelwal was a great teacher. I learned physics from him in 1963. His clarity of Thought of Physics involved in the phenomena was great. As a person also he embodied compassion, gentle humour and affection of all his students..."



With Giani Zail Singh Ji, President of India, on the first Award Function of IAPT (14.6.1987). Along with is Prof. H.S. Hans.