My life has been an romantic escapade often

The first thing that I was exposed to and fell in love with was nature. I remember those romantic moments of my childhood when from the age of about six onwards I used to wander with my grandfather through the many gardens that lined up both sides of the road leading to the Ganga canal that flowed past my hometown about a mile from my hometown.

The winter mornings were somehow specially memorable because perhaps of their crispness and the multitudes of flowers that bloomed in the garden during that season, and because of the various fruits: the guavas, the sheetaf and the aonlas that I picked or plucked and ate.

There were the days of carefreeness that were never to return but which left an indelible mark on my psyche for the rest of my years.

Quite obviously it was grandfather who introduced me to nature when he took me along with him regularly as for morning and evening walks to the Ganga canal. It was he who taught me the many things the writing, the multiplication table and most interestingly the the rule of 9 to check the correctness of a multiplication or a division. His language was rich with the many folk of proverbs and he handed them down to me in a manner of traditions. With him it was a relationship, which was to last of consummate affection which is to last through to day 15 a years after he breathed his last at 93

The contribution he made to my being as what I am to day is immense. Something immeasurable for I absorbed from his personality every piece of his being that I could. He was not highly educated in the conventional sense. But his wisdom transcended all that education could represent at that time He was not ostensibly a very religious person in the conventional sense for I do not remember him ever to have gone to a temple. But he used to sing and recite hymns in the praise of God and only thing that he ever asked God was to take him away while he was still self dependent - as wish that God

lived enough to grant him at age 93.

For the times in which he lived & grew up and which he lived through he was remarkably free from any superstitious beliefs. He never believed in horoscopes. Perhaps it is his profession that made him scientific in his thinking and approach. He was a vaccinator and worked as a part time compounder to a doctor in town and practised his profession with conviction. It was from him that I imbibed a scientific temper and a spirit of scientific enquiry. It was he who sparked my interest in science by describing certain chemical reactions which were magic like to a child - the changing of colours when two chemical solutions were mixed.

For his age, the times and the social status that he lived through and his humble origins, he was a much travelled man by the standards of those times (the last decades of the nineteenth century). As a teenager he studied in Hyderabad where his uncle worked for the Nizam and he lived in Bombay where according to him the trams were drawn by horses and not locomotively.

$$b_\varphi + i\, b_r = \left(A^i_r + i A_\varphi\right) \mathcal{I}_{m+1}(kR)$$

$$b_\varphi - i\, b_r = \left(A^i_r - i A_\varphi\right) \mathcal{I}_{m-1}(kR)$$

$$b_{c\varphi} = \frac{1}{2}$$

May be it was this which led to a widening of his horizons Whatever the reasons I was indeed a lucky child to have been gifted with such a grandfather

Grandfather is dead now for more than 15 years But he lives and will continue to live as long as I do the traditions that he I imbibed from him live. The tradition and concept of grandfatherly love and affection is sadly becoming extinct extinct How sad it is for the children and the society of today that there may no more be a grandfather who will bring up the children in the traditions of the family and impart to them a sense of values which none else can do in this fast moving society

O' Grandfather. I am grateful to you for making me what I am today emotionally culturally and professionally. I have cherished all the values that I have imbibed from you. I hold dear to my heart Even though I occasionally find myself emotionally weak, which weakness

I have temporarily been able to overcome whatsoever regard. But in this weakness I have found a tender spirit which has enabled me to feel for the weak and the underprivileged. Surely, this weakness has many a time caused and sensitivity has caused me many a time caused me mental agony but I have much preferred it to having a hard heart which is insensitive to the feeling of others.

$$\begin{pmatrix} e^{-\frac{1}{2}i\phi} & \\ & e^{\frac{1}{2}i\phi} \end{pmatrix}\begin{pmatrix} \cos\frac{1}{2}\theta & \sin\frac{1}{2}\theta \\ -\sin\frac{1}{2}\theta & +\cos\frac{1}{2}\theta \end{pmatrix} = \begin{pmatrix} e^{-\frac{1}{2}i\phi}\cos\frac{1}{2}\theta & e^{-\frac{1}{2}i\phi}\sin\frac{1}{2}\theta \\ e^{\frac{1}{2}i\phi}\sin\frac{1}{2}\theta & e^{\frac{1}{2}i\phi}\cos\frac{1}{2}\theta \end{pmatrix}$$

$$\begin{pmatrix} \psi_1' \\ \psi_2' \end{pmatrix} = \begin{pmatrix} & \end{pmatrix}\begin{pmatrix} \psi_1 \\ 0 \end{pmatrix}$$

$$\begin{matrix} \cos\theta & \sin\theta \\ \cos^2\frac{1}{2}\theta - \sin^2\frac{1}{2}\theta & 2\sin\frac{1}{2}\theta\cos\frac{1}{2}\theta \end{matrix}$$

$x' = x\cos\theta + y\sin\theta$

$y' = x\sin\theta - y\cos\theta$

$-2\sin\frac{1}{2}\theta\cos\frac{1}{2}\theta \quad \cos^2\frac{1}{2}\theta$

$-\sin\theta \quad \cos\theta$

$$\psi_1' = \left(e^{-\frac{1}{2}i\phi}\cos\tfrac{1}{2}\theta\right)\psi_1$$

$$\psi_2' = -\left(e^{\frac{1}{2}i\phi}\sin\tfrac{1}{2}\theta\right)\psi_1$$

$$\psi_1 = \psi_1'\begin{pmatrix}1\\0\end{pmatrix} + \psi_2'\begin{pmatrix}0\\1\end{pmatrix}$$

If ψ corresponds to spin along (θ,φ), then by rotating by $(+\theta,-\varphi)$, we would get spin along z

$$\begin{cases} \psi\uparrow = e^{\frac{1}{2}i\phi}\cos\frac{1}{2}\theta\ \psi_1 \\ \psi\downarrow = e^{-\frac{1}{2}i\phi}\sin\frac{1}{2}\theta\ \psi_1 \end{cases}$$

$$\begin{aligned} \psi_1' e^{\frac{1}{2}i\phi}\cos\tfrac{1}{2}\theta &= \psi_1\cos^2\tfrac{1}{2}\theta \\ +\psi_2' e^{+\frac{1}{2}i\phi}\sin\tfrac{1}{2}\theta &= \psi_1\sin^2\tfrac{1}{2}\theta \end{aligned}$$

$$\boxed{\psi_1 = \psi_1' e^{-\frac{1}{2}i\phi}\cos\tfrac{1}{2}\theta + \psi_2' e^{+\frac{1}{2}i\phi}\sin\tfrac{1}{2}\theta}$$

Also from above

$$\Psi_1' e^{-\frac{1}{2}i\phi}\sin\frac{\theta}{2} + \Psi_2' e^{\frac{1}{2}i\phi}\cos\tfrac{1}{2}\theta = 0$$

$$\boxed{\psi_1 = \Psi_1 e^{-\frac{1}{2}i\phi}\cos\tfrac{1}{2}\theta + \Psi_2 e^{\frac{1}{2}i\phi}\sin\tfrac{1}{2}\theta}$$

The Need for a Science Culture for India.

It would appear to be very difficult if not impossible to (for reasons of lack of rapid communication of scientific information) to either follow and participate actively in most of the "fashionable" research at any given time, and thus compete in it in a reasonably effective manner. Mere fighting on the sidelines is not good enough and will not bring us no credit more than the "also ran."

Should it then be concluded then scientific community working in India has to reconcile with this handicap and accept the status as a second fiddle? The answer is of course, a resounding no as far as I am concerned. But obviously we must make a radical departure in our approach and attitude to research, and I am here referring

to pure research only.

The problem with our attitude today is that psychologically, emotionally (scientific) and every other way we have so tied ourselves down with the western science that anything done in the West is hailed as a great achievement (no matter what its lasting value) and we instinctively follow it, like the proverbial "moth around the lamp". And I mean literally.

Fashions come and fashions go in the West and we follow them. If fashions were guided by some rare experiment then there is some justification in following them.

Is it high time we in India start fashions too so that others could follow us, or if not others outside India, but at least those working in India?

instinctively
But unfortunately the way we are tuned
to the West, we most of us would
rather follow the "Western fashions" than
our own. I think we are still
subconsciously suffering from the white
man complex.

We thus have to stop following the
West so that we can find time to at
least think different and to
think differently!

There are any number of things in
nature that we are waiting to be
unfolded. Any one of these would be
picked up by anybody in the West
and then we would follow it. Can
we not pick up before it is done
in the West? Not only ~~can it~~ do I
think it can be done, but I am
sure it can be done. One has
only to keep one's eyes and ears

open so to speak., and we can start a fashion from India too! We have of course to be more imaginative and ~~not necessarily~~ also clever but not necessarily. We shall have to bind our research, make it more systimatic and purposeful an approach (I dont mean purposeful as to any goal). We have to develop a diffrent scientific culture - a culture of our own rather than a ~~loved~~ borrowed one. ~~We may actually turn out to be much healthier scientists~~. We should then concentrate on long term scientific perspective than on short term appearing and disappearing fashion.

I think we can do it, We have to give it a try.

* Getting away our energies

I was amused with his manners which smelt of the carefree, unscheduled unsophisticated rural life. I started thinking about the rural life., its boons and its curses. I started feeling how much I missed the ~~village life~~ ~~been~~ carefree, ~~a~~ leisurely village life being away in a crowded busy city. ~~where there is no time to even to notice if there opportunity to notice~~ the. The early morning walk through the fields, the chirping of birds, the blooming of wild flowers & the soft touch of the fresh morning breeze. How soothing it all was. ~~And yet, when~~ I came to reality, I found myself ~~so~~ How fortunate, I thought, was the countryman sitting beside me. And yet, when I came to reality, I asked
517 how on earth can a/man live on so small an earning as an average villager makes. An earning which is not even ~~so~~ guaranteed to be regular. ~~If there is failure of crops he is doomed. The whole village depends~~ Everyone whether or not he owns land depends for his living to a large extent on the succes of crops. If there is failure of crops, he is doomed. He looks around for other odd jobs ~~I threw a glance at my helper~~ He looked as carefree as ever. Perhaps this is the way of life ~~I thought~~.

~~Just~~ As I was ~~busy~~ absorbed reflecting, another countryman joined him, a friend, I thought, the way they started and continued their talk. I

listened to their conversation pretending that I didn't. They ~~done told their tales to each other~~ discussed a variety of topics ranging from the local politics to the failure of crops that year. After some time something else had occupied my mind and I was not quite following what they were discussing. I did, however, see them get up & proceed toward the water pump, to drink water I supposed. The man seemed obviously confident that he would be back in time for the train. So he didn't tell me anything, and I didn't ask him

* My association with this railway station was quite long.

It was a small railway station from where I had to take a train ~~town~~ to go to another town, Muzaffar Nagar in India.* It was ~~it just any~~ the railway station ~~town~~ where I had boarded the train ~~as many times as~~ I whenever I went would go back to college after spending my vacations at home. In those ~~those~~ ~~were no~~ ~~buses~~ days there were ~~to~~ only horse driven tongas running between my small town & the railway station, a distance of about seven miles. ~~Now we had a bus~~. ~~A common anxiety of the traveller used to be~~ Whether the tonga would make it in time for the train used to be the common anxiety of the traveller. The horse/ ~~may~~ might just like to go slow. Now to the relief of many we have a bus.

The train halts at that station for hardly two minutes during which time the passengers have to alight from the train and others have to board it. It becomes hard to get into the train if one is accompanied by heavy luggage, without somebody to help with it the luggage. However, it wasn't one of those days when I couldn't manage my luggage.

I got down from the bus with ~~and got~~ my luggage. ~~from the it was~~ I lifted the two trunks and proceeded toward the railway station which was hardly/ fifty yards away. As I was absorbed thinking about my programs at the other end of my trip, I was distracted by a voice,

"Shall I help you board the train, Babu (Sir)?

I saw standing before me a countryman, with a dark broad face, unevenly grown moustaches, & wearing his usual dhoti & bangi, and carrying a sickle in his hand. I looked at him for a moment with some sort of mixed feelings, and then I said rather reluctantly, I thought, "All right." I didn't really want any

help that day.

"But how much will you charge?" I asked/. 300

"you may pay me four annas, Babu," he answered

"But four annas is too much," I said, as though with a reflex action. But in the next moment my weakness for the villagers got the better of me & I gave a silent acceptance, handing over the luggage to him

. . . . . .

— for the train to come/ +17 400
17
417

I would feel very much hurt. I ~~used~~ would cry in my bed at night.

How funny that old man in Hathras was! I wonder whether he ever had a hair cut. He had grown a long beard, which was not completely grey yet. He didn't seem to have any home, because I always saw him on the streets - even at night. He had a long black warm coat, which he carried with him all the time. That seemed to be his only material possession, which was however full of patches. His pants: they were left only upto knees upwards. And his shoes were just a collection of leather strings randomly tied to getthe to form a cavity for the feet. I remember somebody ~~tried~~ offered him a new pair of trousers. He wouldn't accept. It became impossible for me to refrain from talking to him. He looked an extremely reserved person. So I had to be very careful in my approach. On talking to him, he impressed me as being a very educated man. He didn't turn out to be as reserved a person as I thought. He had, however, a often talk to me. But I never could muster enough courage to ask him about himself. Some people used to say, he was a doctor ~~some time back~~ once.

My school was about ten minutes walk from my home. I thought it was about two miles away. But now I think it would-n't have been that far. A yellow three-winged building. The third wing had not really been completed until I left.

window I saw the man rushing towards the train. But it was too late. He looked around to find me but he couldn't. I could see him though looking around disapponitedly. I wanted to call him and give him the money because he did do a part of the job. But I didn't. I kept standing there with a four anna piece in my hand looking at him, while the train puffed on. Every moment of indecision was taking me farther from him, and making it more and more difficult to call him. Now he was too far from me, looking as though he had missed a great chance of the day, while I stood there wondering I had'nt called him.

It was a small railway station from where I had to take a train to go another town. The train halts there for hardly two minutes during which time the passenger have to alight from the train and others have to board it. It becomes quite difficult to get into the train if one is accompanied by heavy baggage without somebody to help with it. However, it was not one of those days when I could not manage my baggage.

I got off the bus and proceeded towards the railway station with ~~two~~ the two trunks I was having with me. The station was hardly fifty yards away. As I was absorbed thinking about my programme at the other end of my trip, I was distracted by a voice,

"Shall I help you board the train, babu (sir)?"

I saw standing before me a countryman with a dark broad face which looked hardened, unevenly grown moustaches, wearing his usual dhoti and bungi, and carrying a sickle in his hand. I looked at him for a moment, ~~as many thoughts flashed through my mind and then I said~~ rather caught weighing his necessities ~~with~~ against my need. Then finally I said rather reluctantly, I thought, "All right". I didn't really want any help that day.

"But how much will you charge?" I asked.
"Pay me four annas, if you please" he pleaded.
"But four annas is too much" I said as though with a reflex action. But in the next moment my weakness for the villagers got the better of me and I gave a silent acceptance handing over the baggage to him. He carried the baggage to the ~~baggage~~ platform and placed it there. I sat on one of the trunks while he chose to sit on the floor.

It was twenty five minutes past eight then and according to the schedule there were still twenty five minutes for the train to come.

"When does the train come?" I asked somewhat irrelevantly.

"Oh, something like 9, 9-15" he replied carelessly. Time is not something they care about too much.

I was amused with his manners which smelt of the carefree, unscheduled, unsophisticated rural life. I started to think about rural life, its boons and curses. Fresh, clean air, peace and tranquility, green fields, and the wind dancing on the bed of the crops. Birds chirping and producing eternal music. ~~A variety of birds~~, Birds, of thousand

different variety — one gets simply lost. ~~Also~~ ~~reared~~ ~~beautiful~~ ~~setting~~ ~~Unfortunately~~ ~~these are not the only things that characterise a village~~. One also gets lost, in another sense, at other things in a village. Coexisting with those beautiful settings of nature capable of giving endless joy, is endless human misery, caused by utter poverty. One does not know why it exists ~~or not exists~~ — it doesn't really matter since it exists. — I recalled the days when as a boy of ten, I used to sit at the small grocery shop of my grandfather, and would occasionally sell grocery when grandfather was away on some business. There used to be quite a crowd of customers towards the evening. Some people would come every evening to buy the same kind of grocery: two annas worth of wheat flour, one anna worth of dry beans, one anna worth of chillies and salt, and so on. I never tried to question why they have to buy their grocery daily. Why they couldn't buy once a week, say. I took it as a matter of course. Now of course, I could see things clearly: People simply had to earn their living daily. And what if they couldn't earn someday.

As I was absorbed in these and other recollections another countryman joined ~~me~~ my helper, a friend

I thought the way they started and continued their talk. I kept listening to their conversation, pretending that I wasn't. They talked about a variety of topics, ranging from local village topics to the failure of crops that year. After sometime something else had occupied my mind, and I wasn't quite following what they were talking about. May be it wasn't interesting enough. I did, however, see them get up and proceed towards the water pump, to drink water I supposed. The man seemed obviously confident that he would be back in time for the train. So I didn't ask him anything.

Some time had passed since he and his friend left. It was almost time for the train to come. I started feeling uneasy at his not being present. Now the train was coming. I started frantically looking for him. He wasn't at the pump. I was in a fix. I felt obliged to let him do the remaining part of his job. But where was he? Now the train was stopping at the station. I couldn't afford to lose any time. I lifted my baggage and thrust myself into the nearest compartment as quickly as I could, still wishing to find that man.

I had hardly settled down in the train when it started moving. As I glanced through the

A man has died. A daughter lost her father; the two grandsons lost their grandfather. But the millions lost their leader, their friend, their beloved, the only one they had who cared for all of them. But most of all children lost their chacha. November 14 will not be the same for them any more. That day will be a big emptiness for them. They will feel that something gigantic has been taken away from their midst. I have never been a child after independence, but to day I wish I had been, so that I could have had the pleasure of being looked at by him in a special way: the special way he had for children. They will never again see that smiling face of his, and he throwing flowers at them, patting them on their cheeks, talking to them as innocently as they to him.

The grown ups probably understand that a man has to die one day. But only time will be able to heal their feelings. They will no more have him to celebrate Holi with.

I have only one regret. Much of the work he wore himself out for was purely routine work associated with the slow process of democracy. It was at times very disgusting and frustrating, but he stuck to it till his death. He did let his beliefs shaken by the enormous difficulties he had to face.

Roses in the gardens will be missing their lover.

1. Commitment to science and work
   - How ~~spe~~ hotly one pursues one's goal & objective
   - How involved one is with one's work, one's machine other accessories —
     [How much dependent one is on others help]
   - How much work has been done to acquire up to date knowledge of the field?
   - How much initiative one personally takes to generate an activity and an ambience

2. Actual Scientific Competence
   - Experimental capability
   - Capability to propose experiments and ideas
   - Capability to analyse and understand data
   - Ask & answer questions about the experimental results & draw maximal ~~results~~ conclusion.

3. Commitment to the "laboratory" and group
   - ~~Cooperation with others~~
   - Exhibition of corporate spirit

Convective cells in nonuniform dusty plasmas

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Abstract

It is shown that purely damped convective cell modes aquire a real frequency in the presence of static charged dust grains in a nonuniform magnetized dusty plasma. The frequency of the two-dimensional mode is induced by the plasma density gradient and corresponds to charge density waves arising out of the plasma non-neutrality. The dynamics of weakly interacting finite frequency convetive cell modes is governed by the generalized Navier-Stokes equation. The presence of the new term arising from the dust inhomogeneity in the latter provides the possibility of two-dimensional dipolar vortex solution in dusty plasmas.

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Dr Lgr

* ~~good~~ courtesy

Some random "thoughts" and 'definitions'

✓ Communication of information is an art, which calls for clarity, brevity, and establishment of channels of communication with the audience unencumbered by emotions and ostentations.

✓ All information need not be science and certainly science is not all information.

✗ ✗ Audio-visuals are today too much "audio" of the speakers and too much "visuals" of their doings which appear more to impress and overwhelm the audience than to communicate.

Brevity is no more a virtue. It has suffered its demise at the hands of effusive masturbatory articulation meant solely to propagandize oneself.

✓ The word courtesy should be banished from the dictionary because it is now extinct.

✓ Success is if you have got it made regardless.

✓ Progress is if you can forget all these old fashioned inhibitory nuances.

R K Varma

Ode to a "small parameter"

Hail thee O sly spirit
the parameter of "smallness"
They calleth thee small
But great and mightly
art thou indeed:
Thy smallness is thy might
As knoweth all
Great or small.

The mightiest of equations
proud of their
complexity and dimension
crumble
into a rubble
and get reduced to
the puniest of relations
by your sly machinations

And the great physicists
theoreticians and mathematicians
seek thee
with anticipation and expectation
to use thee
to enhance their reputation
with your application
to mathematical equations

So great art thou
not small
O "parameter of smallness"
You should be called
the "parameter of greatness"

So, I bow to thee
O sly spirit
the "parameter of smallness"
Or rather
the "parameter of greatness"

What is life for I sometimes wonder. To go on like a machine because not to do so means you fall. Or is there a positive side where you live and work for a positive pleasure whose absence does not lead to unhappiness but only less of pleasure.

Does life have a purpose superior to than just day to day humdrum which one has to go through because one lives and has to live? Why do I do what I do.? Because I need food to live? Or Because I need to satisfy my ego? Or because I need to satisfy my psychological and sexual needs? Is that all man made for? If so it is a big joke played by the creator on human being for his own fun. If life is only an interplay of the egos of men and women why must such a life perpetuate. If life is meant to be enjoyed freely without worrying about its purpose through the satisfaction of psychological and sexual needs, then let us do that and forget about all inhibitions and constraints that damn life and

destroy the only thing that can make life worth living even if it does not have a purpose

Role of Critics :- A

1. A review of classical mechanics:
   Lagrangian + Hamiltonian mechanics
   Hamilton - Jacobi formalism:
   Relations like: $p = \partial S / \partial q$, etc.

All organisations practise it

There have always been two levels at which things work in any sphere of activity: (i) The external, superficial, level → the facade, + (ii) the real or internal. Or we may describe them as the (i) visible or and (ii) invisible level or if I may want to be more charitable (i) the conscious + (ii) the subconscious.

While it is necessary to keep up a certain amount of facade to delude others and at times to delude ourselves, it is dangerous and suicidal to ignore and be oblivious of the real, the internal, the invisible or the subconscious state.

It is also a fact that nobody in the authority in an organisation likes to be told about the real state of affairs because they are scared of it, and would like to wish it away

We are faced with terrible contradictions:
On the one hand we wish to recruit nothing but the potential leaders on the other hand, we want them to submit to the leadership of an arbitrarily chosen leader

There is Chaos

We have to find either to find order in Chaos
or ~~force order~~ induce (rather than force) chaos into order:

I think this time in the history of PRL is very crucial:

(i) The old groups have almost crumbled while the new groups are emerging

(ii) The earlier faculty is aging. ~~as the new faculty is~~ and there is urgent need to add new faculty, but it ~~has not been easy to encour~~ the growth of the new members has not been very encouraging.

(iii) The norms have undergone a dramatic change. ~~There is while the~~ There is a tendency all over the country (new world) to adopt quicker roads to "success" whatever that word means. The older norms have crumbled with the older generation.

(iv) Success, even in science has is being more and more identified with rise to managerial position which of course, means power and control & past prestige. The scientific achievements have become more a means to this end than the end in itself as it should be

(v) Science has become an industry with its own vested interests and

p. 1.

young scientists - temporary or permanent. ?
Communicate with society ?
project image to society in general

---

p. 3 ~~It is important to recognize that all the scientists that we about need not~~

I think it would be a heresy in the ~~present set of~~ mode midst of the ideas prevalent today that ~~we~~ all the scientists that we about need not have leadership qualities. In fact ~~I do not see~~ today we have very few people in PRL who have leadership qualities. Essentially most people are loners and would merely like to pursue their own ideas and themselves. They rarely like to subject their ideas to the scientific scrutiny of their colleagues let alone their joining. The reason is that they probably think too high of themselves and too low of their other colleagues with whom they are at loggerheads. This is the real malaise that is ~~afflicting~~ severely afflicting PRL today.

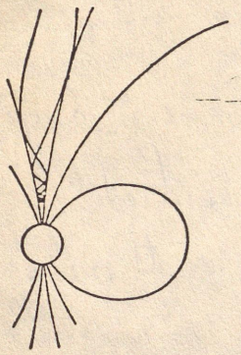
Any further disruptive & reorganisation

of the PRL, and promotions etc must take this into account.

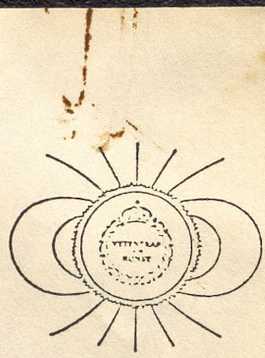
Another point that I have always worried me and is quite crucial to me for the so called ~~science~~ "excellence" that we are hunting for, that we must make a clear distinction between the managerial role of a scientist and his scientific leadership. The way things happen they tend to accentuate the managerial role & often there is ~~no~~ the distinction is not made

The question of assessment of scientists is analogous to the transmitter receiver - system - The scientist being the transmitter and the assessing authority being the receiver.

A scientist may have a whole spectrum of capabilities which may not resonate with a particular receiver, and may give a very weak response at the resonant frequency of the receiver. To assess a scientist properly what we therefore need is a sweep frequency receiver.



ELECTRON AND PLASMA PHYSICS
AND
PLASMA PHYSICS AND FUSION RESEARCH



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Rising of the sun & moon
Flowing of rivers
Rains & winds.
Growth of plants
& Existence of life etc.

What is Science ?

- Science is nothing but the nature itself.
- Science is all about what the nature itself does or is doing.
- When we try to understand what the nature does, how it does it, we call it Science

→ - But perhaps the most important things about whatever happens in nature, is that ~~there are always well defined laws~~ nature does not behave in a haphazard way but there are well defined laws according to which nature behaves.

- Perhaps the earliest of laws that man became familiar from his day to day observations is that
  - → Sun rises in the East and sets in the West
  - → That moon completes its cycle in 28 days going through various phases — that there are "Shukla Paksha" and "Krishna Paksha".

- More perceptive "human beings" ~~[illegible]~~ of the early times looked beyond the "sun" and the "moon".
  - They looked at planets and stars
    - They found that planets also moved about but slower than the sun and the moon.
    - But the "stars" in the background remained relatively fixed.

Sun-Centre
↑
Aryabhatta
vs
Brahmagupta
story

These were the early astronomers. In India we have the names of Aryabhatta, Bhaskara, Brahmagupta .ie

- The later astronomers were not satisfied by merely watching their motion and tabulating them, but wanted to determine laws of their motion if there are any.

Thus we had Tycho Brahe
Copernicus
Kepler
+ Newton

~~Having datum~~

Having known the laws of motion, the scientist is very happy that he has solved a mystery of nature.

He knows how precisely the heavenly bodies move

How good and accurate are these laws?

- Applies it to other heavenly bodies and finds that he they are good. & wherever he uses them.

Can he use them to predict what he does not know?

– Reversal of process.

Two uses

(i) application to natural bodies and systems
– discovery of Neptune & Pluto etc
→ Science

(ii) application to
man made situations → Technology
Rocket, Satellites etc

~~Industrial revolution~~

☐ Researches in Heat → ~~Heat engines, Car engines, machines~~
~~Researches in Electricity → domestic electricity~~,

Heat + Mechanics → Heat engines, Car engines
machines

Technology → Industrial Revolution

□ Researches in Electricity and Magnetism
(Faraday & Maxwell)

Science:— How electric currents behave, how they produce magnetic fields.
How electric & magnetic field together can propagate through space ~~and~~ in the form of radio waves & Co

Technology:— Domestic electricity, electric motors, Generators, transformers, and all the applications

→ Radio and television, telephones. telecommunication.

TECHNOLOGY

Betterment of Society:
transportation, Medical, telecommunication, Housing clothing, job opportunities Horticultural research.

Destructive purposes
Guns, planes, bombs
(Even earlier: swords, spears, dynamite.
↓
"Nobel"

☐ Research in Atomic Energy | Unlocked the mystery of nature at atomic dimensions - energy in stars etc

Einstein: $E = mc^2$ changed the future of the mankind completely

- Benefit to mankind (Atomic) Energy for the human consumption
- Atomic & Hydrogen Bombs for Mass destruction (सर्वनाश के साधन)

☐ Research in Quantum Theory & Solid State Physics (Material Science)

↓

A total revolution — the Electronics & the Electronic revolution
Computer Revolution

- The Music revolution
  tape decks music systems
  Computers - Personal Computer
  Safe landing systems
- Electronic & Computerized guidance system for Missiles & autopilots for bombing missions
  Speedy mass destruction

☐ Contribution of India to Science, Astronomy +

Mathematics

↓

Aryabhatta
Brahmagupta

Aryabhatta – Aryabhatiya
Bhaskara – Leelavati
Brahmagupta – Surya siddhanta.
Mahavira.

Ramanujan.

(Physics) Science : Raman, Saha, Bose, Bhabha, Sarabhai ....

Science, Technology & Social Values

How has our thinking changed with the permeation of science & technology in our day to day lives:

- Brought people physically closer together through transportation & communication
- Made lives of people easier — quality of life better.

Has also brought dangerous & ugly distortions because of easier & comfortable life.

- Values have certainly gone down: Money ~~has~~ which is needed to buy articles of comfort & luxury has acquired great importance at the cost of everything else
- Today, ~~nobody~~ few worry about the means of acquiring money.
- We have become more self centred & money-centred. Human relationships have gone down. "Aham" has increased. Sense of duty & responsibility has gone down. ~~Sense of Demand on~~ Sense of rights has increased without the corresponding sense of responsibility

Is Science to Blame? Science cannot be blamed for this. It is of course,

Let $\psi = e^{ikx}$ be the incident wave. On passing through the inhomogeneous magnetic field it gets both backscattered and forward scattered with momenta k'.

~~Now since there is a distribution in p i.e. we have a spectrum of p~~

The scattering is like an inelastic scattering with the $\perp^{ar}$ gyromotion serving as the internal motion into which the energy goes.

We thus have a spectrum of forward scattered momenta k'. The total scattering amplitude is then

$$\psi_s = \sum_{k'} \bar{\psi}_s e^{i\int k' dx}$$

The total probability is then

$$\psi_s^* \psi_s = \sum_{k'} \bar{\psi}_s^* \bar{\psi}_s(k') + \sum_{k' \neq k''} \bar{\psi}^*(k') \psi(k'')$$

$$\exp\left[i \int (k' - k'') dx \right]$$

Introduce $k' - k'' = q$, so $k' + k'' = 2K$

$$\bar{\psi}_s^* \psi_s = \sum_{k} \bar{\psi}_s^*(k) \psi_s(k) + \sum \bar{\psi}_s^*(k') \psi(k'') e^{i\int q dx}.$$

The totality of letters that I got to read about the variety of topics ranging from "disciplining a child" "being an Indian" "rights to do things as an Indian" * "Indian vs U.S culture" "being critical of India and ~~Indian~~ ~~Can~~ ~~a~~ comparing it constantly with U.S. conditions" to ~~read~~ "the rights of NRI to only criticize India", got me thinking about my early days when I was a Ph.D. student in the U.S. By "early days" I mean 1961 - 1965. May be ~~a~~ of the decisions that I made during the course of my career from that time on have some relationship with these various topics. I do not wish to ~~impose~~ ~~my autobio~~ and may provide an example of "one course of ~~decisions~~ ~~Word~~ life". I use these words with a ~~certain~~ ~~definite~~ ~~meaning~~. certain ~~a~~ meaning. Life is nothing but a collection of certain ~~set~~ number of decisions ~~that the~~ that a ~~the~~ person makes and the consequences that follow from it. Life can be lived only once and ~~it~~ there are always certain critical decisions that determine ~~the~~ the course of one's life. Once taken, you can still reverse them provided too much water has not flown down the →

* being patriotic

Y.

the Ganga the Jamuna or the Potomac, whichever whatever you prefer

The decision to live in the U.S. (or any foreign country & for that matter) is one such decision. When one so decides one has to remember what one bargains for: One, of course, bargains for a luxurious life (though with a considerable amount of hard work: one has to become a cog-wheel in the whole American machinery). One is obviously attracted by the shine of the USD, which can be irresistible. My impression is that that is the primary motivation for the desire of most Indians who decide to live in the U.S. Fair enough. Nothing wrong with that. But one also bargains for a whole lot of other things which come later in life: the kind of problems that I read about. But one does not foresee those problem at that time in the excitement of the new found glitter. The first thing that one bargains for is a constant reminder by those around you that you are after all a foreigner.* But that one may argue away by saying that that is the fate of every foreigner. Yes, indeed. But this is precisely

* and particularly welcome except on the terms of the U.S. masters. (May it is to string a phrase. But shorn of all nuances, it is just that).

where one's first trade off comes: ~~You self respect vs~~
~~the luxury~~ ~~A life of pride and self respect vs~~
~~A materialis~~ ~~Luxurious lux life~~ Life of luxury vs
the life of pride and self respect.

May be that is not too bad. After a little
while you can begin to feel a part of the

Information
Knowledge
and
Wisdom

are three ~~most important~~ words which have been important for "man" from the earliest of times.
The Our wise men knew clear distinctions between among these words. That is why they were wise men.

Clearly, Knowledge is not just information, and certainly Wisdom is not just Knowledge

In our good old days wisdom was the most respected commodity; while certainly knowledge was ~~certainly~~ ~~very~~ valued

~~In India~~

[While "knowledge" and "wisdom" have been recognized as ~~elements~~ important ~~elements~~

As we have seen how the human being have used his "knowledge" to ~~be~~ engage ~~in engage~~ himself in the mass and foolish acts of ~~the~~ devastating nature and environment for his personal greed.

"Information" on the other hand, is not to be confused with "knowledge", much less with wisdom. Unfortunately, some information enthusiasts in our education system do have such a confusion in their mind where they are confusing transfer of information with transfer of knowledge to our youngsters at schools. The result is for all of us to see and has done incalculable damage to our education system. A vast amount of information is sought to be stuffed into the tender minds of the youngsters in the name of education which is to be even much more than conceptually even more deeper and subtler. the

What we are faced to day is not just an explosion of information but in fact an invasion of "information culture", which is causing much fating ~~an~~ effect. Many of the programs on T.V. for instance, like the Quiz competetion

Wisdom thus calls for a judicious use of knowledge for a harmonious relationship between man, nature and other living beings in this most unique planet in this solar system, if not the whole universe.

In his false sense of superiority, the human being often refused to identified as Ashraf-ul-Makhlukat, has arrogated to himself the role of a creation over than Nature. He has simply ended up digging his own grave.

While "knowledge" and "wisdom" have been universally regarded as highly valued goals for human achievement; information has not. wisdom does not necessarily follows from "knowledge". On the other hand, knowledge does not follow from information. Information on the other hand was not a very current word

Speed quiz competition

tend to glorify the knowledge of disconnected information as something very great. ~~and with emulating~~. This leads to the ~~division~~ of the ~~of~~ free transformation of the psyche of the young and diversion of their energies in unproductive and uncreative pursuits.

It is in this ~~environ~~ ambience and environment that we have to see how we must handle information which keeps pouring in at an ~~exponentially~~ increasing rate. Such a high rate of information naturally poses to challenge to ~~our~~ the libraries which are the repositories of the vast amount of information. The challenges are

1. Ever increasing ~~storage~~ space required to store the information
2. To continually keep prioritizing information on the basis of its relevance and ~~information and then to~~ importance at a given time and discarding
3. To keep sieving out what can be regarded as "dead", or superceded information; and keep updating what may be regarded as live information file.

4. D. But the most challenging of all challenges is the compilation of a connected set of information and retrieve it on command. This requires ~~a~~ defining a network of sets of information sets of chain, which is a very complex task.

I would only like to cite a word of caution: the challenging task should be undertaken with an active involvement of the users, because a compilation of relevance to the ~~users~~ users would be best obtained with their involvement.

I shall take you with me on two of
1. voyages : One ~~is the one~~ would be, which
would give you a ~~view of the~~ "bird's eye
view" of the world around us as has
been discovered by the pioneers of science
over the years :

When I say "world" around us, I ~~don't~~
~~mean~~ should really say "universe" around us,
~~as it has~~ and the manner ~~of it~~ ~~or~~
or in which it displays itself, and
reveals itself to us ~~through~~ not arbitrarily, but
through definite laws ; for if these laws
did not exist, we, as human beings,
or any living beings would not exist,
either. I think it is something to think
about.

Furthermore, it is when we say the world
around us, we do not mean the world
as it exists today but as it existed
even before man arrived on this planet.
Since one believes that the laws that

$k_j(X_1 - X_2)$, with their shapes determined by the weights of l_ν and l_j respectively.

$$\sum_{l_\nu, l_j} \mid \alpha_{\nu'\nu, j'j} \mid^2 \sim F_\nu \left[k_\nu(X_1 - X_2)\right] F_j \left[k_j(X_1 - X_2)\right], \tag{29}$$

Since $k_j \ll k_\nu$ (as $\omega_\nu \gg \omega_j$), the slower variation of the function F_j with $(X_1 - X_2)$ or with v for a fixed $(X_1 - X_2)$ will amplitude modulate the rapid variation of F_ν with $(X_1 - X_2)$, with the maxima of the modulation separated on the X-scale by a distance $L_j = 2\pi/k_j$, while the maximaof the rapid variation will be separated by the distance $L_\nu = 2\pi/k_\nu$. This is what one would expect to observe experimentally.

C. Rydberg states of an atom

One may also consider the Rydberg states of an atom for a similar discussion, which presents a rather interesting case. The energy levels for this case are given by

$$E_n = -\frac{me^4}{2\hbar^2 n^2} .$$

Using the expressions $P = [2M(E - E_n)]^{1/2}$ and $P' = [2M(E - E_{n'})]^{1/2}$, we find $P - P' \approx \frac{2lE_n}{nv}$ where $v = [2(E - E_n)/M]^{1/2}$ is again the magnitude of the centre of mass velocity in the highly excited state n, with the total energy being E, and where $l = \mid n' - n \mid \ll n$ is assumed. Using the foregoing expression for $P' - P$ in the expression corresponding to (18) gives

$$\alpha_{n'n} = A_1 A_1' \, \Delta_{n'n} \exp\left[i\frac{2lE_n}{nv\hbar}(X - X_1)\right] . \tag{30}$$

where $\Delta_{n'n}$ is the scattering (transition) amplitude for a perturbation $\tilde{H}$ between the Rydberg states n' and n. The expression (30), of course, involves $\hbar$ unlike the expressions (18) and (19) for the vibrational degree of freedom, which are independent of $\hbar$. However, $\hbar$ appears in the denominator of the exponent in Eq.(30) in the combination $n\hbar$. Thus when n is large enough, $J_n = n\hbar$ may be regarded as a classical object, namely the angular momentum of the nth Rydberg state in the correspondence limit. We therefore write

$$\frac{2E_n}{v(n\hbar)} = \frac{2E_n}{vJ_n} = \frac{\omega_n}{v}, \tag{31}$$

govern the evolution of nature have been in existence since the birth of the Universe

Let me emphasize that, ~~it is~~ if one thinks about it, it is merely a

BELIEF,

a strong and logical scientific belief, but a "belief" nevertheless. And the only thing that supports this belief, is that if that were not so, there would be no continuity in the evolution of the Universe. [REDUCTIO AD ABSURDUM].

Thus until we see any sign of a discontinuity, we must hold to the belief that the laws of the evolution of the Universe have been unchanged over cosmic times.

where we introduce $\omega_n = 2E_n/J_n$, as a frequency associated with the nth Rydberg state. For large n this frequency may be considered as almost a constant for small variations of n. Eq.(30) is then

$$\alpha_{n',n} = A_1 A_1' exp\,[ik_n(X - X_1)]\,, \tag{32}$$

where $k_n = \omega_n/v$. We notice that $k_n \sim n^{-3}$, and thus decreases rapidly with n, and would correspond to mesoscopic matter waves if n is sufficiently large. For $n = 100$, $\omega_n \approx 6.6\times10^{10}$ rad s^{-1}, and $k_{||} \approx 660\ cm^{-1}$ for $v = 10^8\ cm\ s^{-1}$. This gives $\lambda_n = 2\pi/k_n \approx 10^{-2}\ cm$, which is of macroscopic, or if one prefers, of mesoscopic dimensions.

4. Suggested experimental arrangement

There are follwing four main elements which constitute the basic reqirements of the experiment to check the existence of mesoscopic matter waves proposed here. One could choose either a diatomic molecule or a Rydberg atom depending on the overall convenience. There would of course arise a number of technical problems during the course of carrying out the experiment which will need to be addressed. We shall discuss here only broadly the various essential requirements and a possible experimental arrangement.

1. First, it will be necesary to prepare the molecules/atoms in the appropriate highly excited states. As has been already discussed, because of the special features of the harmonic potential, even low lying vibrational states can be selected for state preparation for the diatomic molecule. For the rotational states, on the other hand it would be desirable to have a highly excited state, for in that case ω_j which equals $2Kj\hbar$ would be nearly constant for small variations of j when j is large. Such states can be prepared with appropriate laser techniques and some ingenuity. A Rydberg atom can also be similary prepared in a highly excited state so that its frequency $\omega_n = 2E_n/n\hbar$ is nearly constant for small variations of n when n is large.

2. It will be necessary next to prepare a beam of such molecules molecules/atoms with a

In the first voyage I would thus take you around (with a bird's eye view) ~~on~~ the evolution of the physical laws since the early times. ~~This will be~~ no

This will necessarily be a qualitative tour, which will help you to have a flavour of the course of evolution of the scientific discoveries and their scope.

2 In the second voyage, I shall try to give you a closer look at the various discoveries which lead one into the "quantum world".

This ~~is~~ would basically discuss the compulsions which ~~made~~ ~~to the physicists~~ literally forced the physicists to enter the new strange world of the quantum which they are still battling to come to terms with.

It is a world which is strange, non intuitive, and which is nevertheless is the real world in the micro-cosm. ~~Its beautiful~~

well defined velocity. A velocity of 10^8 cm s^{-1} corresponds roughly to an energy, $\mathcal{E} \sim \infty 1^{\Delta}]\mathcal{V}$? which should be possible without much difficulty using an ion source.

3.Another requirement is the fabrication of grids for the scattering of molecules/atoms as envisaged above. The distance $(X_1 - X_2) = D$ between the grids would be required to be of the order of a few wave lengths (of the particula matter wave). Hoever, to obtain a higher resolution it would be desirable to have an array of 5-10 grids. While a larger number of grids would yield higher resolution, it will also lead to a decreasing transparency for the transmitted signal. So, the number of grids in the array will have to be optimised. This will be similar to crystal lattice planes in electron diffraction. Here the grid array will have to be properly fabricated. These will be required to be rigid and rigidly fixed to the apparatus so as to ensure the elastic nature of the scattering with respect to the total energy of the molecules/atoms.

4. Finally one has to ensure the quasi-one-dimensionality of the scattering process, which is the most crucial requirement for the manifestation of the mesoscopic matter waves. One way to ensure is to use a beam of particles with a broad wave front parallel to the plane of the grids. This is similar to the Bragg diffraction with the electron beam normal to the plane of the crystal. However, a more definitive way to ensure it in the present case is to use charged molecules/atoms in a given charge state injected along an ambient magnetic field. This will constrain the molecules to move along the one-dimension of its direction. The field may be taken to be at any angle θ to the plane of the grid array, and defines the direction of the one-dimensional scattering. This arrangement has the added advantage that the intergrid spacing along the direction of the magnetic field, which is the direction of the one-dimensional scattering, can be varied by varying the angle θ. Thus the effective intergrid distance $D_{eff} = D/\sin\theta$

It ought to be mentioned, however, that since the thickness of the grid wires would be roughly of micron size or less, much larger than the dimension of the molecules, the forward scattering off the grid wires envisaged above would have to be tangential. An efficient scattering would then require that there be larger number of wires of as small a thickness as possible. If χ be the

(a few hundred nanometer diameter wires are supposed to be available now)

Its beneficial manifestations are there for all of us to see and experience, e.g. Lasers, transistors, nanotechnology, computers, and now we may have quantum computers, in not too distant a future

grazing angle which the incident molecule makes with the tangent to the grid wire then it can be easily shown that even if the grid wire of mass M_G were free, then the energy of recoil acquired by it in such a collision with the molecule of mass m would be $\sim (m/M_G)^2 v^2 \sin^2\chi$, which is negligible in the ratio $(m/M_G)^2$. Thus the elasticity of collisions with the the grid wires with respect to the total energy of the molecule is well satisfied. However, if the grid wires are rigid and rigidly fixed to the apparatus then elasticity is satisfied *a fortiori* .

5. ~~Discussion and summary~~

The concept of macroscopic and mesoscopic matter waves as ~~distinct from~~ the deBroglie matter waves that has been presented above, first arose in relation to the dynamics of charged particles in a magnetic field as described by a probability amplitude theory [represented by a set of Schrödinger- like equations] given by the author[1] in 1985. This was obtained as a Hilbert space representation of the classical Liouville equation for the system, and by virtue of its amplitude character, it predicted the existence of matter wave phenomena with a macroscopic wave length, namely the one-dimensional interference effects. The role of $\hbar$ in these equations is enacted by a macroscopic action $\mu = \nu\hbar, (\nu \gg 1)$.

Recently the author has been able to derive [2] the same set of Schrödinger-like equations starting from the quantum mechanic Schrödinger equation. It is the macroscopic magnitude of μ (which replaces $\hbar$) that is responsible for the macroscopic matter waves in charged particle dynamics along a magnetic field. Indeed the one-dimensional interference effects with macroscopic matter waves with wave length typically in the range $\sim 5cm$ have been reported by the author and his collaborators [3,4,6]

A close examination of the derivation of Ref.[2] gave the author the clue that such macroscopic and mesoscopic matter waves should be possible with, in fact, any composite system, such as atoms and molecules in their highly excited internal states. The discussion presented in this paper is an exposition these concepts as applied to diatomic molecules and Rydberg atoms as illustrative examples.

As already mentioned, the interesting point about these matter waves is that their wave length is not related to the mass of the particle as with the deBroglie waves, but rather to

Everything in this world is transient and temporary; when one is a spectator. Things ~~come and go~~ happen, people come and go. What remains at least for a while, are some moments of happiness which we share with some body. All such moments of happiness are rare coincidences, which are very precious, perhaps, the most precious things.

The world moves on and so has everybody to. We cannot be static. We pass from one scene to another and ~~meet~~ encounter various people in our life track through the world. Mostly we ~~meet~~ encounter indifferent people, busy people who have no time for others. We do not pause and look around for interiting things that are happening around us, We do not pause to meet people. But rarely we do meet nice people, very a nice people who have words of kindness for others. And when we do meet them it is of course, a rare event and a be treasurable event, ~~But~~ which gives you happiness and makes you keep going through this otherwise dreary world. for another shetch of interval

We cannot change the world from its course, It is too stupendous a task. But what we can do some little things in our own way. ~~from~~

as much as we can:

Disturbing thoughts about thinking:

One of the reasons that we are so complacent about thinking is that we mistake fluency & and articulation for thinking. Up to a point language is most useful for thinking. - but beyond that point it restricts muddles, and falsifies thinking. The purpose of language is communication - not thinking. For communication an evolved language is ~~necessary~~. For valuable For thinking there needs to be a designed language. In future we should perhaps design meta-languages that will be much more useful for thinking

In Fig. 5 are plotted all of the Group 1 stars from Paper I and the current paper. Only 2 of the 11 stars (the 2 are circled in Fig. 5) at distances greater than 3 kpc are estimated to be O5-O9. Therefore, according to our discussion in the previous paragraphs, the distance estimates represented in Fig. 4 are probably conservative. The solid lines at galactic longitudes 57° and 80° describe the limits of our survey to date. As Mendoza (1958) found for Be stars within 1.5 kpc of the sun, the emission stars appear not to be confined to the regions of the youngest clusters and O associations. A more detailed study of the galactic distribution will have to await the determination of accurate spectral types for the Vatican Emission Stars and better luminosity calibration for Be stars.

IV. CONCLUSION

Almost 250 new emission stars have been discovered thus far in the survey between ℓ^{II} = 57° and 80° and b^{II} = ±5°. Of these about 50% are most likely classical Be stars. An estimate of the distances of these latter stars indicates that we are surveying up to 6 kpc from the sun in the direction of the Cygnus arm. There are 16 newly discovered emission stars at distances probably greater than 2500 pcs.

I am a dreamer. I have been a dreamer for as long as I can remember. Best most dream usually end up shattered. And I have watched mine too shattered. Best I dreamt other dreams and watched them too shattered and unfulfilled, until I began to believe that the only reality are the dreams themselves and not their fulfilment. So you don't act for any more ~~for~~ for the fulfilment of your dreams but act in anyhow in your daily life because act you must, denying at last some nocturnal force from your dreams. And you end up being schizophranic

VII. Conclusions

We have shown here how starting from the quantum wave function description of a charged particle in a magnetic field we can obtain the wave function description of Ref. 1 as contained in Eqns. (34) - (36). We recall that these equations were obtained in Ref. 1 from rather general probability considerations restricted only by the use of an anstaz for the transition probability. It may be noted that the use of this ansatz, which yielded the Schrodinger-like description of non-adiabatic processes, was made independently and without appeal to the quantum mechanical description. An alternate derivation of the same equations carried out in this paper therefore can be considered to justify this ansatz to the extent of the approximation used in replacing $\overline{\hat{\Psi}}$ by ψ. It is possible that one could use similar ansatz in other analogous situations

It was the magnificance of the rising full moon on the horizon on that poornima day of Holi (Feb 28, 09 to be exact) and my wife that triggered the 'pravachan' = the discourse. We had just come out the movie hall after watching the movie "3 Idiots" around 6:30 p.m. We hailed a rickshaw to go home which headed eastward in the direction of our home on our instruction.

Just then we noticed the full moon rising right in our line of sight with all its magnificance and with a huge size. The sight was entirely captivating which no one could have missed being enthralled with.

All three of us – the two of us and the rikshawala felt entirely mesmerized by that sight. Here it was daring us to produce anything more beautiful and majestic than itself (that is at that moment).

And then the 'pravachan' ensued. "Look at that beautiful moon!" – the rikshawala said. "Yes I said. "It is poornima today." "Nature is so wonderful" He said, and continued. "I am muslim and it is told to us that a star that looks so tiny is actually is many times bigger than the whole world" – a perfectly scientific fact I mused to myself. But rather than interrupt him and try to explain why the moon is looking bigger at moonrise time or to tell him that a star is indeed many many times bigger than the earth, as I was tempted to do, I just continued to listen to him. And he continued.

ration. The excellent agreement shown in Fig.4 B, on the other hand, constitutes the most definitive validation of the premised mechanism for the generation of the TAW, namely through the scattering by the grid wires in the present case, which is in fact crucial for the one-dimensionality of the effect, and thereby of the physical reality of the TAW itself.

The results presented here on the vector potential observation are obviously quite unexpected and unusual. Being on the macro-scale and in one dimension they run counter to the well known Aharonov-Bohm effect on both counts. However, they do by no means negate the latter. On the contrary, they help establish the physical reality of a new kind of matter wave (on the macro-scale) which is associated with a new quantum object–the "transition amplitude wave"– generated as a "quantum modulation" of the plane wave state of the guiding center motion in consequence of transition across Landau states. This is the importance of the investigation reported here and the related ones reported earlier [1, 2, 4, 5]which would open up new possibilities. Interestingly, the experiment is extremely simple, easily repreatable, and the results obtained are robust.

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[5] Varma, R. K. and Banerjee S. B. 2007 Phys. Scripta **75**, 19.

"Look at the beauty of our earth. It gives you everything. It has a universal "galla", unlike our galla. In our galla if you put a 10 rupees, ~~you~~ e in it, you can draw only the same 10 rupees out of it. If we put in some gold there you get only the same gold out of it. But in with the earths' gala, you put in some seeds and water you get ~~one~~ onion, potatoes, etc gold ~~and~~ ~~almost anything you want~~. It has everything you want. But we don't appreciate it.

"People say this house is mine, this car is mine. They don't understand.." ~~I nod in agreement silently~~ Nothing belongs really to anybody. A day comes when everybody has to go leaving behind everything." I nod in agreement ~~.~~ sit silently. I ~~am~~ was overtaken by the depth of this ~~o~~ man's - the humble rikshwala's awareness of the "world" around him, understanding and his "thinking" attitude. ~~The look of his spiritual~~ ~~I was almost stupefied~~, ~~I was rudely~~ ~~The stupor was rudely by the realization~~ that our destination had arrived ~~this~~. ~~He is no extraordinary~~ What was striking about him was his ~~a~~ meditative spirit ~~even~~ even as he carries ~~on~~ on his job to earn his living. He ~~is~~ is not an oldish man ~~but a r~~ when one is so supposed to be inclined to such a mode of thinking, but a rather young man of around forty ish.. ~~I was a almost as mesmerise~~ Not that I learnt from him what I am not aware of and ~~practis~~ given to such musings. So what I so special ~~strking~~ distinct about him ~~is~~ was about the manner of his perception

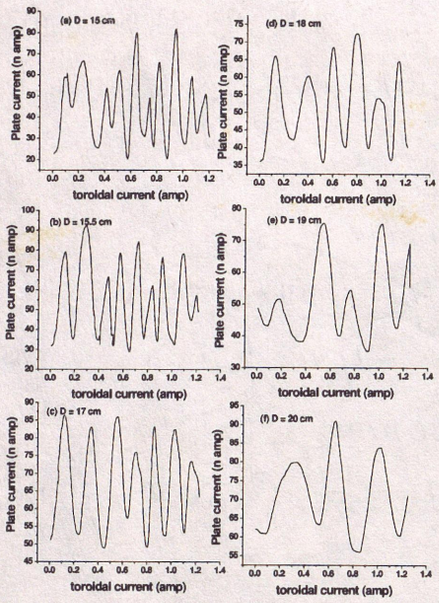

FIG. 3: **Detector plate current against the toroidal solenoidal current for different plate-gun distances but same electron energy** These plots are those chosen as the best well defined of the sets obtained with a range of external magnetic field values, and corrected for core saturation. The plots $(a), (b), (c) \cdots (f)$ of the figure denote detector plate current in nA against the solenoidal current in amperes (A) for various plate-grid distances $L_p - L_g$ = D(cm) = 15, 15.5, 17, 18, 19, 20. for the same electron energy 830 eV.

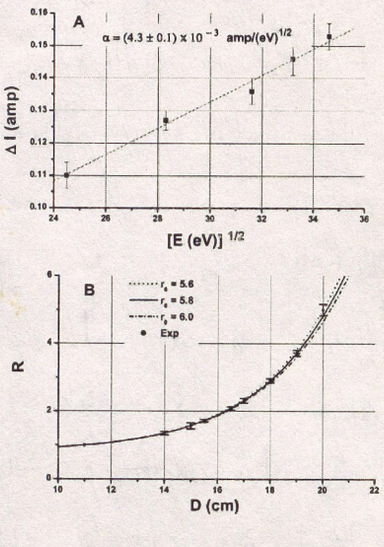

Figure 4

FIG. 4: **A. Inter-peak solenoidal current interval ΔI against the different electron energies** The inter peak separations ΔI depicted here, expected to be equally spaced with respect to the toroidal current, are actually corrected for core saturation of the original plots which had dilating inter-peak separation. The error bars in the plot are obtained using several different runs for a given electron energy with different external magnetic field values differing by 0.1 G on either side of the best value The figure gives the plot of ΔI against the square root of electron energy $\mathcal{E}^{1/2}$, confirming the theoretically expected linear dependence.
B. The ΔI_D for the various distances D(cm)for the same energy $\mathcal{E}$ =830 eV

and the gauge invariance follows.

The geometrical factor G carries within it the crucial information regarding the mechanism and the point of generation of the TAW. To explore this dependence, a particular electron energy $\mathcal{E}$ = 830 eV is chosen and the experimental procedure carried out, as described earlier, for the various grid positions x_g, with the plate remaining fixed at x_p for all the cases. Define $L_g = |x_g - x_o|$ and $L_p = |x_p - x_o|$. The increasing values of D(cm) = $(L_p - L_g)$ =11, 14, 15, 15.5, 16.5, 17, 18, 19 and 20 , are chosen which correspond to the grid being moved towards the gun. All other parameters in the relation (6) remaining fixed, the detector plate current response will reflect only the dependence on G.

The observed plate current profile as a function of the toroidal current for the various D values is depicted in Fig.3 (choosing only D(cm) = 15, 15.5, 17, 18, 19 and 20 to save space) The various plots in the figure show a clear dilation of the inter-peak separation as the grid gets closer to the electron source.

The detector response is obviously a reflection of the shrinking value $G\Phi$, as x_g gets closer to x_o, which corresponds to decreasing value of G. To give a quantitative check with respect to the expression for G, the quantity G^{-1}, evaluated over a range of distances D (as given in Ref. [3] and normalized with respect to its value ($G^{-1}_{(11)}$) for D=11 cm is plotted as a function of D. Since everything else has been kept fixed in Eq.(6) as D is varied, $R \equiv (\Delta I)_D/(\Delta I)_{(11)} = G_{(11)}/G_D$. The ratio R is then plotted in Fig. 4 B against D with the parameters of the toroid ℓ_o =5.8 cm and three values of the mean radius r_o(cm) = 5.6, 5.8, and 6.0. as shown in the figure.

The experimentally determined values of $R^{\rm exp}$ = $(\Delta I)^{\rm exp}_D/(\Delta I)^{\rm exp}_{(11)}$ from the plots of Fig.3) are then inserted in Fig. 4 B for the respective distances indicated as "dots". They are seen to fall very closely around the theoretically expected curve for r_o= 5.8 cm. The agreement with the predicted curve is remarkable!!

The results contained in Fig. 4A and Fig.4 B thus demonstrate different features of the rather unfamiliar curl-free vector potential observation on the macro-scale which had been predicted by the formalism of [1]. Thus apart from exhibiting a non-flat undulatory response which itself signals the detection of the vector potential, Fig. 4 A also provides a quantitative confirmation of the predicted $\mathcal{E}^{(1/2)}$ dependence of the inter-peak sepa-

It was the month of March of that fateful year. Perhaps the end of March. I had returned to my department after a bout of typhoid which had confined me to my bed for about two weeks. But I was quite energetic, jumping around as usual and generally in a happy state of mind. I must have regained my strength. A few decades back when there were no antibiotic cure for typhoid, it would be very debilitating with all the dietary restrictions that the doctors insisted on, and which would have to continue until the disease took its course. But now with the antibiotics, the disease could be controlled within a week, and the restrictions need not be continued for a longer period.

I was happy to be back at my desk and with my teaching responsibilities*. I was happy to be back with my colleagues with some of whom I had a rather close friendship.** One of them, Sachin, who had joined the department along with me do roughly a decade back. The other with whom I shared the office, Anil Biswas, had a great wit and a sense of humour, and we both

* which I enjoyed a great deal only
** all the more as it happened, Jane was a visitor to the department, namely Jane Austen, who was not married, nor even female, but terribly social.

The Anguish of the Golden Jubilee

I belong to that generation of my countrymen whose childhood saw the ~~yoke of imperialism~~ fellow countrymen being crushed under the yoke of imperialism and had heard of the heroic deeds of ~~the~~ ... and sacrifices of Sukh Dev ~~Bhagat~~ Bhagat Singh and Rajguru with a tremendous sense of pride. I also subsequently witnessed the dawn of freedom and had felt a tremendous sense of euphoria. ~~I had heard~~ I Being in Delhi during that period as a high school student. I had also heard the mesmeric speeches of Jawaharlal Nehru from the ramparts of Red Fort a couple of times. In my early childhood as a student of class IV in 1946 I had also walked to a ~~nearby~~ village near my hometown in U.P. to ~~listen~~ listen to Jawaharlal Nehru who was visiting there in connection with the death of a freedom fighter in police firing

~~It was~~ I can't say ~~that I intellectually~~ whether I grasped intellectually the full significance of the dawn of freedom. ~~But I felt~~ and instinctively at that young age; ~~But I had felt instinctively~~

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because I had not personally experienced the trauma that the foreign imperialist domination meant. I had not even heard of the Jalianwala Bagh massacre.* But I had felt instinctively, ~~the~~ a sense of freedom though in a rather ephemeral way. In 1942 during the Quit India Movement, I was ~~this~~ instructed by my grandmother ~~not~~ "not to go out". Now I felt that ~~I would not have to be instructed~~ there would be no occasion for me to be so instructed.

Even though the freedom was born in ~~a~~ the trauma of partition, nevertheless ~~there~~ one looked forward to happy days ahead.** ~~The~~ the people had instinctive faith in the then leadership to ~~deliver~~ deliver ~~Jawahar Lal Nehru~~ happy days: Mahatma Gandhi, Jawahar Lal Nehru, Sardar Vallabhbhai Patel, Maulana Azad, Acharya Kripalani, C. Rajagopalachari, ~~they~~ may Rajendra Prasad and Jai Prakash Narayan. They may had ~~faith in the~~ their ~~differences~~ ideological differences, and differences in approach to a problem, but there was never any doubt about their sense of commitment and integrity. ~~There were healthy debates in and outside parliament~~. This is the impression that I had gathered

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*though
I had heard from my father the account of atrocities committed by the British Raj as described in the book "Bharat mein Angrezi Raj" by Sunder Lal. (The book was not surprisingly banned by the British Government) →

**One did not exactly define what the happy days were to be like. But it seemed clear that one could now plan one's own destiny and plan one's own dreams. And many a young and old people did dream of an India where one could really claim that "Saarey Jahan se achchha Hindostan hamara", that such a dream could be fulfilled That such a dream could be fulfilled seemed assured by the quality really than of the leadership, who were all tempered by the fire of nationalism and rigours of freedom struggle →

even as a boy in school. To be sure, the public was not as politically conscious then, as they are today. But in some sense, they were politically naive, and had the attitude of "father knows best". But on the other hand the leaders did not also betray the trust of the people by and large. This is the background of the immediate post independence period.

Concerns about the various sections of society. One of the first things to be done was the type land reforms carried out in some states, in the form of Zamindari abolition, for example. There were many developmental programmes which were initiated the most notable amongst them were the ... construction of dams for the twin objectives of irrigation and the generation of hydroelectric power, installation of various steel plants at Bhilai, Rourkela and ..... for example.

Ironically, it was also the period when the seeds of corruptions were sown. The concepts of integrity honesty and integrity began to be compromised in favour of expediency and in the development process.

a position occupied by such illustrious predecessors as Jawahar Lal Nehru and Lal Bahadur Shastri, ~~independence could have been the starting point~~

Now fifty years later in the Golden Jubilee year of Independence we have ~~a leadership where a~~ a sample of leadership, a who have for whom the commitment to self is paramount and who has forsaken all sense of shame in the quest for self-aggrandizement. Imagine a former prime minister facing criminal charges for in as many as three cases. St Kitts forgery case, J.M.M. bribery case and Lakhubhai Pathak cheating case. Even if one were to accept the argument that he acting acted only as a lieutenant in the St Kitts case under the orders of the then Prime Minister, his culpability in the other two cases cannot be so defended. Then there is the case of a former lady Governor and a minister of Housing and Urban affairs Sheila Kaul, who ~~thought it fit to disown her kin~~ had no felt no compunction and a sense of shame in disowning her own kin folks in an attempt to wriggle out of the unenviable position that she found herself in the Shah Nehmat scandal. My fond hypothesis and belief that

~~Not to be outdone in the race~~ women are less corruptible than men, and would thus serve as more honest administrators thus standing shattered ... the further example of Jayalaltha has not helped to provide much solace and relief to my fond hypothesis. What seems remarkable in both the cases is the ~~sheer audacity with which~~ they exhibition of sheer audacity in their part in the face of the charges against them; the former clinging to her Governs position until ordered to quit and the latter not giving a damn to the charges against her.

It may appear boring to mention other well known cases. But one must be fair to them ~~others~~ as well for they have also worked overtime to deserve the "honourable mention". The case of Pt. Sukh Ram is specially interesting as for its innovativeness. I have wondered since listening to his pleas of innocence as to how come no one has ever cared to leave even a few hundreds in my home. ~~For me~~ And not to be left behind ~~yet the last one~~ is the case of Capt Satish Sharma who pleads that he is

a victim of misinterpretation of the phrase "discretionary quota". Poor Capt Satish Sharma! Somebody ought to own responsibility for not clarifying to him the meaning of "discretionary quota".

~~Against this background present~~

by ~~Were received by~~ the

It may appear remarkable that all the cases mentioned above belong to the ~~Great Indian National~~ members of the once great Indian National Congress, the historical organisation which played a seminal role in the independence movement of India. What a fall then of the standards of ethics and character which the present members of this ~~an~~ once august organization represent. I have always wondered how this has been allowed to happen. What has happened to the sense of pride in the organization which ~~ex~~ ought to have exhorted its members to maintain the high standards of character.?

As an Indian, I, who ~~can~~ was witness to the dawn of freedom as a boy and who shared the dream of our great ~~India~~ and prosperous India, of an India which ~~in continuation~~ I had helped, ~~would continue the great~~ great would continue

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the great past / traditions ~~of India~~ in the footsteps of Ashoka, whose chakra we have so solemnly adopted as the symbol of our Nation, ~~I had~~ I feel a great sense of anguish at having been betrayed by these bands of politicians who have not only denigrated the parent organization to which they belong, but have put the nation on a reunion path, rather than the path of glory that we had dreamt of. I feel a great sense of anguish,* that they have betrayed the great sacrifices of the freedom fighters such as Bhagat Singh, Rajguru and Sukh Dev, and so many others.

~~To expect that the present day politicians~~

Of course ~~to expect that~~ it is totally unrealistic ~~that the present day politi~~ to expect that the present day politicians ~~would~~ have obsessed, should have the capacity to even dream, mired as they are in the unbridled quest for power and power alone. But one ~~does expect that~~ did not expect that they would be so brazen in their ~~desire~~ hunger for power and money that they would

* In this Golden Jubilee year of independence