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Impact of Advancing Space Technology in Improving Quality of Human Life.

Transcribed Aug 14¹⁵ Saturday
& edited 5 pm - 6 pm

Version completed on 29/8/2021 → In YOGA.
Dean Dr. Murthy Director IIT Hyd,
Dean, Faculty and the student organisers

of EML lectures and dear students
in the audience, Namaste. It is
a great honour to share my thoughts
with you all. IIT Hyd, in its short
span of existence has created for
itself a great name. That is due to
its management, faculty, staff and

~~above~~ all the students. It is the synchronised actions and commitment by all of you that has made it possible.

You all have before you many more ~~sea~~ peaks to be won ~~within~~ during your studies and research here (you students) and later as alumni. ~~as~~ ably assisted by the faculty and later in the outside world as alumni. Your achievements outside IIT Hyd after you finish your studies will truly bring out the IMPACT of IIT Hyderabad on INDIA and

the world. Not just academia
in many fields of science, engineering,
medicine, ~~arts~~ ^{business}, arts, law, commerce,
banking, security systems including
defence, literary world and in
many more fields.

Yes it will be well beyond
the usual world ranking, citation
indexes, patents filed, ^{corpus, funds} etc which
do not capture the impact.

I should specially thank
IIT Hyd Director Dr. Murthy, who,
(as a rare event within IIT's as
I have experienced) emailed me
welcoming me and gently hinting

at the role of extra-mural lectures. I was looking at the word MURAL. It is a painting on the wall. What you get regularly all around you in the campus from dedicated teachers and staff.

~~What we have to~~

What is expected of extra-MURAL, that is outside or in-addition - to MURAL?

I take it that ~~it is~~ my attempt as an extra-mural lecturer ~~has~~ to make a deep IMPRINT

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in your heart and brains.
Whether I succeed I don't
know. It is a formidable
task if I see the illustrious
list of earlier speakers in
the EML series.

Or in short I have
to make an IMPACT on you.
Yes I like the word IMPACT
you have suggested in the title of
the talk. Normally I change
title. But it is a great
title: IMPACT and QUALITY-OF-
LIFE. Space Technology is a vis

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these two. You remove
the word Space Technology and
put any other thing. Biotechnology,
Security Systems, Governance
Systems etc. • IMPACT is much
~~more~~ ~~lasting~~ ~~than~~ the BENEFITS -
it is long term. Some irreversible
changes.

I will give illustrations
from Space and give you the GENERIC
clues for IMPACT MAKING INNOVATIONS.
Think of this talk,
interactions we make - something
which had saved us from
isolation from COVID restrictions
and which was of course

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used effectively earlier too -
without the advent of Satellite
Communications, it would have
been impossible. Yes there
are ~~a~~ many other supplementary
and complimentary systems
which make it possible: fibres,
local towns, computers, mobiles,
satellite terminals, ... many
many more. It is the CLUSTER
OF, CONFLUENCE ~~me~~ of many
different domains of technologies,
some of which were even,
considered competitive; This versus
That. They have joined to

make it possible. ~~The~~ The fillip
came from SATCOM in the 1980's
which made distances ~~at~~
almost irrelevant ~~to~~ ~~in~~
for instant communication
and also high speed deployment.
It competed, lost some ground
to fibre optics, thought it
will replace all towers, but
what we ^{now} have a beautiful
mix of all of them!

~~It has~~
The impact is so
much that it is a ~~stt~~ situation
of DILMANGHEY MORE!

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We don't like this mode of "mute your audio", video" etc due to constraints of bandwidth.

We want 5G, even 6, 7, 8G's which are under discussion!

Again possible by a large number of LEO (Low Earth Orbit satellite)

Space fellows used to have fight between GEO & LEO' - Now they have to co-exist to give such a large (huge) bandwidth.

You have ~~one-way~~ One-Web, Starlinks etc. May be a

decade from now even then r-f links, ~~microwave~~ microwave K, Ka etc are not enough.

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It may be laser-links
(fibre in the space so to say)
I am not telling science fiction;
experiments with laser links
are going ~~to~~ on, in space.

So the CLUSTERS are
not static — continuously adapting
and evolving. More you succeed
and give, more will be the demands.

I need not tell after
this, the mind boggling number
of TV channels, thanks to Satellites,
Before ISRO had launched INSAT
in 1980's, one channel in some
metros. These ^{TV} channels ^{now} give ~~you~~
the consumer what they can

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Choose. Here again FIBRE replaced the cable TV, four wire telephones with modems. With many in addition direct TV's directed from Satellites.

Impact of these is so much that people born after ~~1995~~ 1990's won't even imagine that Indians struggled for telephone lines, no TV at all in most places before INSAT. We launched ~~SLV-3~~ with Aryabhata⁽¹⁹⁷⁵⁾, SLV-3^(1979, 80) etc

without good telephone link to outside tracking stations! Horrible days!

When INSAT came, the telephone lines ~~to~~ laid on laid on

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growth for 15 years was done
in just 18 months. TV channels
can reach anywhere in India
with a small TV dish!

~~I was~~ Now Indians
cannot be without so many
TV's, continuous high data
transfer, continuous telephone calls!
Banks, governments, transport, police,
and now even doctors for telemedicine.
Even military, are dependent on
such high bandwidth, high data
rate communications. People will
riot if they are stopped!

Look at another ~~at~~ situation.
If Autodriver, or taxi you
call to your house or a delivery
person tells you "Sir ~~se~~ pl."

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Send Google location map "by mobile". That depends on

GPS (Satellite Navigation), High Resolution Satellite Remote Sensing and various image processing GIS niches.

Part of life of ordinary persons.

Impact on so many sectors

very deep. They ^{people} also consume

~~TV's~~ TV shows in mobile.

~~Complex~~ Cluster of many technologies / skills. You work it

out.

One more

You may think that

I am listing only economic,

commerce & entertainment to

illustrate impact. I will now

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tell you about another set of information. Eastern Coast of India esp. AP, Odisha, West Bengal have ~~at~~ annual visitations of devastating cyclones.

~~In~~ The 1977 AP cyclone Nov 1977 killed 10,000 people.

1996 AP cyclone 1077 deaths
225,000 families evacuated

Recent ^{oct} 2014 in AP, 61 deaths

Deaths from cyclones which used to be in ~~hundreds~~ thousands have come down. (~~It don't put economic value to human lives~~). Why deaths are down. Due to INSAT satellites Cyclone tracking started mid 1980's

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~~Satellites alone~~ It can predict ^{several days} ~~well~~ in advance. Again ~~with~~ clustering it with ground radars and other ~~to~~ ground logistics, local training ~~example~~. — a long chain of different SKILLS & technologies has made DISASTER MANAGEMENT ~~very~~ much easier. SATCOM ~~for~~ helps in rescue operations when local communication infrastructures are devastated.

— One more, you hear about DOKLAM — anti — terror operations. Confluence of many techs from high resolution Remote Sensing,

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Gps, different air force & army innovations make it possible. Intelligence, Surveillance etc. Space technology has a major uniting role. No modern military can be without Space force. So USA has opened a new Force than Army, Navy, Airforce — India is also building it. Read more ~~in a talk by~~ an

Eaker Lecture: Successful Deterrence in the 21st Century by Gen John E. Hyten (vayreant)

(2021)

Also Space, War & Security by S. Chandrasekhar - Download on Scribd

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So ~~of~~ Space Technology
born in mid 20th Century has
now impacted most of life
in the world and in India too.

Now let me turn to
Quality of Life. For some of you
~~and~~ it may mean, more income,
a good 3 BHK Apt ~~then~~ before
you turn 30 years, ability to
travel abroad, and many more
goodies of modern life. Note
Indian Realities. For details
read my articles/books. Of
the 135 Crore Indians now
than ~~70-80%~~ 70% Indians have

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uncertain lives. You all
come inside a lucky 15%
of Indians. You may want to rise up!

No harm. You should aspire.

I should hasten to add that

the lives of ~~the~~ the lucky base
of Indians about 20% ~~80%~~ is an

many times more better than
what we were in our childhood.

Though population has grown

five times more, there is no

mass starvation. People wear better.

Better places to live. More goodies

of life. Many of them see TV's

even huts thanks to SATCOM.

And here mobiles.

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Quality of Life of people is
a changing concept: more you ~~have~~ ^{can have,}
~~more~~ much more will be ~~required~~.

It is the rising of aspirations also
increased by the TV channels, mobile
adverts, availability in ~~shops~~ ^{shops} ~~commerce~~ etc

No point therefore to define GDP per capita,
or income or slogans like ROTI KAPDA MAKAN
once prevalent in India — now calls
for free subsidies. ^{Subsidies} ~~They~~ are not

~~needed~~ sustainable. I have

analysed after lot of search & research
five generic areas for improving quality of life:

(1) Need for employment at

Various levels of demographic distribution:

White, gray, blue and rust — and continuous

skilling for changes which occur

every 6-7 years.

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(2) ~~to~~ Cluster of essential needs being met and feeling of security (without uncertainties of tomorrow or a year after ~~an~~ or later life): Food security, nutrition, shelter, water including safe drinking water, sanitation & health, alleviating drudgery (which can happen only with selective ~~an~~ automation at various levels)

(3) Vitality of economy: possible only with continual innovation and value addition. Higher education such as what you have in IIT's, Engineering colleges, MBA's etc play a great role.

(4) National Security; ~~you~~ Internal Security too.

(5) Human Resources of S & T and other clustering skills ~~for~~ needed

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for actual operations as I have illustrated a little bit before.

This is not just the traditional education expanded — but continual adaptation as the world of technology & business change very fast.

For all these ^{above (5)} Space Technology has helped. More in employment because the downstream industries of SATCOM, TV, GPS based systems have ~~and~~ create millions of job — not directly with space but ~~is~~ it being in a CLUSTER of right ~~of~~ systems as illustrated before.

National Security: very much.

For (2) ~~that~~ essential needs only limited

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Contribution now as the govt. policies and systems to deliver them are very slow. Remote sensing based ^{Natural} Resource Management have been demonstrated in ~~small~~ ^{sizeably}

Operational scales. But the

corresponding ~~govt~~ 'Growth Programs'

as it was done for Cyclone management need to be put in all areas

(water pollution monitoring etc)

If I talk on it, it may take several ~~hour~~ hours. The only

thing I want to assert here

that Space Tech. Remote sensing, Satcom, GPS

together if CLUSTERED well

with Govt systems in districts,

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States, Centre — lots of new
sustainable
economic activities can emerge

meeting the essential needs of people.
Satellite to mobile is possible to directly

~~HRD~~ → Great deal is possible
connect
~~connect~~ people as Digital India
calls for.

HR → Yes satellites can
be used ^{very} well. But academic
system needs to be reformed and
commercial entities be allowed to
deliver education/skills without
uncessary unnecessary Ruts & Regs

In summary, Space Technology
has impacted Indian lives fully
in most spheres as they have

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got rightly CLUSTER^{ed} with ~~policy~~
Other systems with ^{govt} policies (which
do not interfere or micromanage)
~~Not so~~ In Security a lot more
has to be done. Private sector needs
to be brought in massively as
in USA, Europe, ~~the~~ Japan, & etc.

For Quality of Life which
is more complex: Yes Space has
contributed in down stream industries
But a ~~time~~ lot more has
to be done not by space technologists
but by policy makers & administrative
system to fully realise the

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potentials demonstrated very well in different parts of India in a major way. But we

need CLUSTERING &

confluencing can be done only with Govt initiatives — initial push in a sustained way.

✓ Note I have emphasized the need for CLUSTER & confluence in chains. That is crucial for

any Technology to make impact and improve Quality of Life. That is the MANTRA to Succeed.

~~Just~~ You can do so with any technology: Energy, Biotech,

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Agriculture, Chemical, etc. When you are ~~out~~ ^{the} in homside world ~~try these~~ remember these principles: as employees, or inventors or investors or policy makers or business persons or even academics.

I will end it with a quote on what is Science, Technology & Innovation. ^(STI) In India the eminent ~~no~~ leaders of SET & in academia ^{or neglected} have forgotten the need for a continual chain between S, T, I and above all clustering. Each push their own ~~silo~~ narrow silos & sink deeper into it! And sink India down to dependence!!

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Tomorrow is the day of completion
of 74 years of Independence. Still
we are not fully Atmanirbhar
(independent) because of the
fact we have not used
the principle of chaining of S, T, I
and ~~Q~~ CLUST that in real life
not one technology but ^a cluster
of several technologies & competence
~~A~~ many other systems ^(which are not S, T, I) also
are crucial for success and
~~their~~ impact & improve quality
of ^{lives} ~~life~~ of people.

~~Now the for~~
~~Now the note:~~

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Impact of Space Technology
in Indian lives makes me happy / proud.
But still so much which can be
done for Quality of Life is yet ~~an~~ a
work in progress — too slow for Indians
cannot wait more. Achievements ^{are more} ~~are~~ inside ISRO.

In other areas of Technology
though a few capable persons existed (exist)
all over ~~the~~ India, mainly due to ~~the~~
neglect of principles of CLUSTERING TO
do end-delivery and the total neglect
of links in S, T, I by ^{many} ~~the~~ S&T leaders
and of course Indira & Govt, India's reports
is still import dependent on many
crucial sectors of Defence, Manufacturing, Energy,
Biomedical; ^{agriculture} ~~and~~ many more. That
makes me sad, sometimes angry.

~~So I will remind you of the~~
~~crucial linkage of S, T, I in the~~
~~words of great achiever!~~

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When we talk about ~~the~~ such CLUSTERING AND CONFLUENCE OF CHAINS, remember that in the modern world of business, or technologies or finance ~~etc~~ ^{or academia} or defence, very large sets of data (ranging to several terabytes or more in total) will have to ^{be} exchanged in real - or near - real time ~~etc~~ on 24x7 basis. ~~It is~~ But it AI, Deep ~~the~~ learning chains, IOT or anything else, will thus require a "Information Backbone" to serve this need. That can come only through a large cluster of satellites, several thousands. For example Elon Musk already has 1141 satellites in operation some 27% of all satellites in USA and more than all other countries put together! That shows the level of business opportunities in the future. near future. Imagine the HUA E clusters it will form. and Chains

Now I quote from a great achiever to tell about STI:

" "S" (Science) does not equal "T" (Technology) and "T" does not equal "I" (Innovation). To translate my

lecture little into layman's terms

would be: Science alone is not technology, Technology alone is

not Innovation. I believe that

technology comes from employing and manipulating science into concepts, processes and devices.

As an outgrowth of science, technology fuels industrial engine. "Technologists" are those

rare individuals who have a wide understanding of science and engineering, as well as

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a broad vision and true commitment to the needs of society. People with this ~~vision~~ depth of understanding can adapt and apply technology with imagination, wisdom and humanity.

Just having an innovative technology is not enough to claim innovation. I see true innovation to be made up of three key elements which I call the "three creatives".

Creativity in technology

Creativity in product planning

Creativity in marketing

— Akio Morita, Chairman of the Board of Sony Corp, while delivering the FIRST (Inaugural) UK

Who said it?

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SONY CHAIRMAN QUTE

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Innovation Lecture to an invited audience at the Royal Society London 6th Feb 1992.

What he said is true even now, and will be so all through 21st Century too.

Under the main title of Three Creativities are embedded many important details.

→ They are like Brahma Sutras. One has to learn more. For example: under product plan & markets are embedded many crucial items like Quality Certifications, ~~St~~ Compliance to standards, legal issues of IP etc. Each will take several hours to explain.

Remember these words. That of Akio Morita.

Resolve to make India ~~not~~ really

Independent and Atmanirbhar.

CLUSTER CORRECTLY ^{CREATIVELY} AND WIN

THE WORLD. God bless.