



❖ CSSTE-AP Newsletter ❖

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Valedictory Address : SATMET

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Dr. R.R. Kelkar during the SATMET function

I would like to begin my valedictory address by remembering an old Oriental proverb that is found in many languages, perhaps with some variation. The proverb says : "If you are planning for a year, sow a seed; if you are looking ten years ahead, plant a tree; if you are dreaming of changing the world over the next hundred years, teach people". The wisdom is that investing in people brings the highest long-term returns.

Teaching people cannot be a one-sided affair. The process of teaching implies a parallel process of learning. Also, there are many different ways of 'teaching' and 'learning'. When we talk of 'education', we mean a transfer of knowledge, while knowledge itself is associated with rational thinking. Knowledge is something that has been accumulated over generations and can be acquired only through a process of systematic education. In the olden days, in this country, we had the so-called 'gurus', the wise and learned men who taught their students or 'shishyas' with a highly personalized method of education. We do not have such exclusive systems any more. They have been replaced by open and organized systems of education.

While the word 'education' symbolizes a transfer of knowledge, the term 'training' is more appropriate to a transfer of skills. Skill is related to performance and a skilled person is one who can perform better. Here again, in older societies, skills resided within small groups or families, closely guarded, and they were transferred from one generation to another rather exclusively. This is no longer so. Today one can choose a profession and acquire the skills required for it.

So, education and training can both be acquired independently. A skilled worker may not necessarily be a well-educated person. On the other hand, a highly educated and accomplished individual may not possess any specialised skills at all. But to become an educated as well as a trained person, is certainly a very desirable goal.

Today's life places a high demand on most people. A one-time education, such as that provided by a school, college or university is no longer sufficient, although it still remains a necessary foundation for a successful career. In all fields, knowledge is growing at an extremely rapid rate. The growth of the overall body of knowledge is phenomenal. So, remaining knowledgeable, even after the completion of one's formal education, has become very important in today's life. If our world of fast-changing technology, the training imparted at a given time rapidly loses its usefulness and it could even become totally irrelevant. Thus there is a need for constant re-training, so that people can adapt themselves to new situations and develop new expertise.

In our own lifetime, we have witnessed an unprecedented rate of change in all walks of life. Computers and communications have revolutionized our world and the changes the way we live and work. There are some innovations which have taken the world by storm, like satellite TV and the Internet. Today it is difficult to predict what the world will be like, say twenty years from now.

In the field of meteorology, the developments in the recent past are nothing less than a revolution. Meteorology can be regarded as one of our ancient sciences. Almost all scriptures and historical writings mention

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atmospheric process and their impacts. But scientific meteorology, as we know it today, is at best about four centuries old. Satellite meteorology, which is a totally new branch of the subject, is barely forty years old, having come into existence with the launch of the first meteorological satellite TIROS-1 on April 1, 1960. But, this event changed, almost overnight, the way we looked at our planet, and the way in which meteorologists carried out short-range weather analysis and forecasting. The growth of satellite meteorology has been matched by the proliferation of computers and communications for meteorological data collection and processing, all of which have contributed to the advancement of numerical weather prediction. NWP was thought about as a concept since long, but today it is very much of a reality. It is now agreed that at least in the extra-tropics, the NWP 3 day forecasts are as accurate as the 1 day synoptic forecasts of fifteen years ago, and the NWP 5 day forecasts are now as good as the 3 day synoptic forecasts of that time.

The tropics, however continue to pose their unique problems: deep tropical convection, high rainfall variability, peculiarities of the coastal belts, effects of orography, etc. which are difficult to parameterize in numerical models. We thus have a long way to go before we can say that we have solved the problems of the tropics, in particular the prediction of cyclones, floods, droughts, landslides and other extreme events, which can become natural disasters. The countries of the Asia-Pacific region have a higher density of population that in most other regions of the world. Large sections of these populations are characterized by illiteracy and poverty. At the same time, it must be emphasized that the Asia-Pacific nations have great internal strengths, which they can use for helping each other. While several countries of Europe have joined together to have a common meteorological satellite Meteosat, three countries in Asia-India, Japan and China have their individual meteorological satellite programmes. They also highly developed and well-organised national meteorological services.

In this context, it is most appropriate that the United Nations Regional Centre for Space Science and Technology Education for Asia and the Pacific is focusing on the areas of satellite meteorology and global climate. Today, the students of the second postgraduate course in these subjects are on their way back home, having completed their task successfully. The organization of training courses by the CSSTE-AP is of great significance in the augmentation of national capabilities in the Asia-Pacific countries. The atmosphere, climate and space which are global entities are being increasingly regarded as valuable resources in the process of national sustainable development. Satellite images and derived products are not only used for day-to-day weather forecasting, and for warnings against extreme events, but also to monitor the parameters responsible for climate change. These technologies must be exploited for the benefit of the Asia-Pacific countries and the world at large. But we must be capable of doing so. Here, the CSSTE-AP is playing a very important role in human resources development and it certainly has a great future.

The students who have passed out today are well-motivated. This is very clear from the way in which they have conducted themselves throughout the duration of the training course lasting several months. Motivated individuals ultimately make up a forward-looking organization, and I am sure that the trainees, after their return to their countries, will form the nucleus for change in the organizations that have nominated them for the training. I hope the trainees will remain in touch with each other, and with the CSSTE-AP, and work towards a networking of the organizations. I also hope that they will carry back with them some of the culture of our country as they have given us a bit of theirs.

Strategic Technologies, Elementary Laws and the Future

Mr. Nihal Kularatna,

Member GB, CSSTE-AP & Director,

Arthur C Clarke Institute for Modern Technologies, Sri Lanka

Invention of the transistor in 1948 had opened several new technology directions & provided a neat miniaturized approach to what we enjoy in our day-to-day electronics. One of the inventors, John Bardeen winning two Nobel prizes in Physics indicates how such people were recognized by the scientific community worldwide. Within a decade from the transistor, high-tech companies such as Texas and Fairchild entered into a long standing law suit for the recognition of the "inventor" of the integrated circuit ultimately agreeing to have the claim on both parties. One of the inventors of the IC, Jack S Kilby of Texas shared the Nobel Prize in physics recently. Robert Noyce, the Fairchild engineer who shared the invention steps in the IC is not with us today. Within 2½ decades from the beginning of *solid state electronics* we are facing the challenge of many products and systems carrying larger amounts of *technology* in terms of larger transistor count inside the ICs; high speed processors with lot of memory; and human expertise translated into software embedded in products.

Most high-tech products with communication interfaces could communicate with rest of world, thanks to the Satellites in orbits while fibre systems giving a competition to satellite. We may see both technologies competing in the new millennium, due to their own advantages and disadvantages.

Scientist and engineers involved in electronics, communications and IT should note and appreciate two new "elementary laws" namely

- Moore's curve predicting the doubling of chip density and clock speeds of digital circuitry every 18 months.
- Theo A M Classen's Logarithmic Law of Usefulness [$Usefulness = \text{Log}(\text{Technology})$]

In 1965, Gordon Moore, chairman emeritus of Intel, foresaw "the doubling of transistor density on a manufactured integrated circuit every year". His prediction was based on the rate at which he believed the IC industry could develop and deploy successive generations of semiconductor processing equipment. Moore later modified his prediction to a doubling every 18 months, which is what we know today as "Moore's Law". (Ref.1)

Theo Classen's (Chief Technical Officer of Phillips Semiconductors) Logarithmic Law of Usefulness, is based on the user friendliness being embedded into modern systems at heavy penalties of hardware and memory contents. Following are few examples he provides as justifications :

- The fact that system performance improves noticeably only if you add memory increments of 10 or 100
- The bandwidth required for video telephony compared with speech.
- The usability improvements in DOS versus Windows or Office 97 versus previous application suites plotted against the greater CPU, memory, and hard-drive capabilities required to support these improvements.
- Digital versatile disks versus video CDs.
- Global Systems for Mobile communications versus Advanced Mobile Phone Service cellular.
- On-Screen TV menus versus *TV Guide*. (Ref. 2)

A team of top scientists and engineers at Battelle, based in Columbus, Ohio, has compiled a list of 10 most strategic technological trends that will shape business and our world over the next 20 years (Ref. 3). Their list of the top 10 strategies technologies for 2020.

- | | |
|--|---|
| 1. Genetic-based Medical & Health Care | 6. Personalized Public Transportation |
| 2. High-power Energy Packages | 7. Designer Foods and Crops |
| 3. Grin Tech (Green Integrated Technology) | 8. Intelligent Goods and Appliances |
| 4. Omnipresent Computing | 9. Worldwide Inexpensive and Safe Water |
| 5. Nanomachines | 10. Super Senses |

It is important for the developing countries in the region to understand the implications of these laws and the future technologies for their own national and regions benefit. CSSTE-AP and its growing range of programmes could take care of at least part of this responsibility to keep pace with the developed world.

References

- Howard Johnson : "Keeping up with Moore" ; *EDN*, 07th May 1998, page 24.
- Brian Dipert : "It's Elementary" ; *EDN*, 15th May 1999, USA, page 52.
- "Battelle Forecasts Strategic Technologies for 2020" ; *PCIM* - April 2000, page 10.

Fifth RS & GIS Course

The fifth (2000-2001) post graduate course on Remote Sensing and Geographic Information System (RS & GIS) which started on October 1, 2000 is in progress at Indian Institute of Remote Sensing (IIRS), Dehra Dun the host institution of CSSTE-AP. 19 officer trainees from 13 countries (including two from India) of the Asia-Pacific region are attending the course. The Module-I ended on December 31, 2000 and the Module-II is closing on March 31, 2001. The Module-II deals with both optional and compulsory streams. The optional stream covers several thematic disciplines of RS & GIS applications such as Agriculture and Soils; Forestry and Ecology; Geoscience; Water Resources; Human Settlement & Urban Analysis and Marine science. The topics covered in compulsory stream are Advance concepts in RS & GIS; satellite meteorology; Sustainable Development & Integrated Resource Management; Earth Processes; Natural Disasters and Environmental Analysis; Monitoring & Management and Global issues. The core faculty of this module consists of experienced faculty of IIRS. Some specialised faculty from several Indian Organisations viz NRSA, Hyderabad; IISc, Bangalore; IARI, New Delhi; ADRIN, Hyderabad; ISRO Hq, etc, were also invited to



deliver guest lectures, on specific topics. International Scientists/experts viz. Dr. Lin Hui, Director, Joint Laboratory for Geoinformation Science, The Chinese University of Hong Kong, Dr. Kiyoshi Honda, Asian Institute of Technology, Thailand and Dr. K. Tempfi, ITC, The Netherlands also delivered number of lectures on specialised topics. The performance of course participants was assessed through written examinations tutorials and practical tests at periodic interval during the entire duration of this module. A number of field excursions of 3-5 days duration were also organised to demonstrate the participants the practical aspect of field data collection for analysis of remote sensing data. As part of educational tour participants undertook a technical visit to National Remote Sensing Agency (NRSA) and Satellite data receiving Earth Station at Hyderabad; ISRO Satellite Centre (ISAC) and Regional Remote Sensing Service Centre (RRSSC) at Bangalore. The participants also had a glimpse of India's diverse rich culture and heritage during their excursions in different Indian cities such as Delhi, Hyderabad, Bangalore and Mysore. The course participants also participated in a cultural function during their visit at NRSA, Hyderabad.

Second Post Graduate Course on Satellite Meteorology and Global Climate

The second post graduate course on "Satellite Meteorology and Global Climate", started on 1st July, 2000. Last three months of the course (January-March 2001) were devoted to the pilot projects and the two technical tours.

The participants in consultation with their organizations and the course management decided the themes of the project. These projects could be listed in the following seven broad topics :

- Applications to tropical cyclone studies using INSAT, GMS, METEOSAT Data
- Soundings from TOVS onboard NOAA
- Monitoring of Climatic parameters like NDVI, Snow cover, agriculture monitoring etc.
- Applications using recent MSMR (onboard IRS-P4) data
- Analysis of GCM results.
- Ocean State Monitoring

The details for one Project work of the participants were finalised after detailed discussions during the Pilot Project presentations taking into account their countries requirements and the facilities available locally with them.

These pilot projects used extensively the data from NCEP analysis and the retrieved parameters available from MSMR onboard IRS-P4 satellite. The majority of the projects were related to application of data from sensors onboard INSAT, METOSAT, GMS, NOAA, TRMM etc. The projects related to agricultural monitoring, used the Geographic Information System available with Space Applications Centre. Each participant was associated with a guide for speedy execution of the project. Each participant was also given a basic research paper related to the theme of his project. Participants gave detailed seminar on the assigned paper. This helped in the execution of the project.

The participants made a detailed presentation to the experts on two occasions :

- i) 15-16 March, 2001 at Space Applications Centre, Ahmedabad
- ii) 23-24 March, 2001 at Department of Meteorology and Oceanography of Andhra University, Visakhapatnam.

The presentations were rated highly by the evaluators. The successful execution of the pilot projects made them ready for the one year project in their home country.

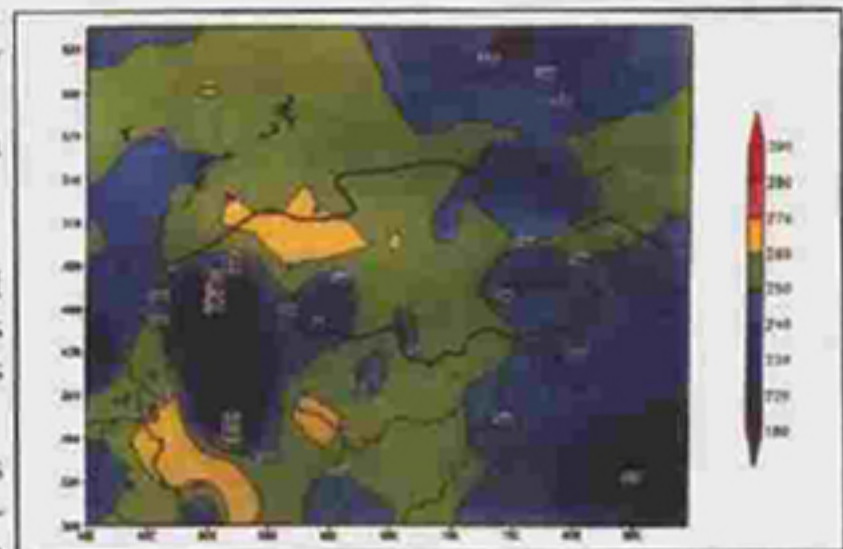
Dr. John Le Marshall of Bureau of Meteorology, Australia and a well known expert in atmospheric sounding gave a series of lectures to the participants. Participants also had the privilege of listening a guest lecture from Prof. Trevor Platt, Chairman, International working Group on Ocean Colour Monitoring, Canada. He described the Carbon Cycle and its relevance to climate studies.



The first technical tour during the last three months was to Mount Abu and Udaipur. The participants had the opportunity to see the LIDAR sounding of the atmosphere, the infrared astronomical observatory, Gamma ray astronomical observatory, and the solar observatory.

The second tour included the various facilities at Andhra University, Cyclone warning Radar of India Meteorological Department at Visakhapatnam and also the remote sensing activities at National Remote Sensing Agency, Hyderabad.

The Valedictory function of the course was held on 31st March 2001 at SAC, Ahmedabad. Dr. R.R. Kelkar, Director General, India



Brightness Temperature over Kazakhstan
6 GHz 1-7 August 1999

Meteorological Department was Chief Guest of the function. Dr. A.K.S. Gopalan, Director, SAC presided over the function. Mr. N. Pant, Member Space Commission, Prof B.L. Deekshatulu, Director, CSSTE-AP, Prof G.S. Agarwal, Director PRL, Senior functionaries of SAC, Faculty for the course and other guests attended the function.

Seven participants passed with Distinction and the rest fourteen passed in first class. Chief Guest distributed the Diploma certificates. In his address Dr. Kelkar stressed the need of training in satellite meteorology for the development of the Asia Pacific region. A CD containing the lecture notes of the course and variety of the other activities of the course were brought out. The CD was released by Director, SAC. Director CSSTE-AP gave away the rank certificates and the prizes to the participants securing first, second and third rank. A printed "memoirs" was also released during the function. The Memoirs also contained messages from the dignitaries from different parts of the world. An exhibition of the posters containing the highlights of the results of the pilot projects was also arranged.

Second Space Science Course at PRL, Ahmedabad

The 2nd Space Science Course of the CSSTE-AP, which started at the Physical Research Laboratory (PRL), Ahmedabad, India on August 1, 2000, is nearing its completion. The course is made up of four module (two dealing with the theory and two dealing with experiments) and a pilot project. The assessment of the participants in these four modules is made through class tests, seminars, written examinations, viva-voce and practical examinations. The assessment of all the four modules of the 2nd course has been completed recently. Participants are currently involved in the conduct of a two-month's pilot project. The pilot project is the forerunner of the one year research project, which is to be done in their respective home countries. During the pilot project, a clear cut definition of the one year home project is evolved, in consultation with the supervisor in the home country, procedure for experimental design and/or data analysis is firmed up and the availability of required data and literature is ensured. Participants are currently busy in their pilot project after which they would compile their work and make formal presentation for its evaluation.

After the completion of four modules, all participants were taken to a number of the state of the art space research facilities developed in India. The facilities which were visited included Alibagh and Colaba Geomagnetic Observatories of the Indian Institute of Geomagnetism (IIG) Mumbai, ISRO Satellite Centre (ISAC), ISRO Satellite Tracking and Telecommand Network (ISTRACK), and Raman Research Institute (RRI), Bangalore, National MST Radar Facility (NMRF), Tirupati, Vikram Sarabhai Space Centre (VSSC), Trivandrum, National Centre for Radio Astrophysics (NCRA) and Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune. Some of the activities which excited the participants most were the fabrication of a real satellite at SAC, the launch pad at VSSC, the space museum, which showed the evolution of launch vehicle programme from a tiny rocket, which was carried on a bicycle, to the giant geo stationary launch vehicle and totally steerable dishes of the Giant Meter Wave Radio Telescope (GMRT) at Narayangaon near Pune. The participants are in the process of procuring the books needed for their research work through the book grant provided by CSSTE-AP and a lot of other literature supplied by faculty members. A Valedictory function is planned during the end of April, 2001, wherein the participants would be awarded a Post-Graduate Diploma in Space Science.



UN/ESA/COSPAR Workshop on Satellite Data Reduction & Analysis Techniques

An International Workshop on "Satellite Data Reduction and Analysis techniques", sponsored by UN/ESA/COSPAR was conducted in India, Dehradun organized by Indian Space Research Organization (ISRO), Dept. of Space, co-hosted by Indian Institute of Remote Sensing (IIRS) and Centre for Space Science Technology & Education in Asia-Pacific (CSSTE-AP), during November 27-30, 2000.

Satellite data reduction and analysis techniques were applied covering broad topics of Space Science, Astronomy, Metrology, Remote Sensing and Spatial Information System. The details of topics covered are :

- Satellite data reception
- Fundamentals of Satellite data, pre-processing, geometric corrections and image analysis for land resources.
- Retrieval and analysis of UV spectra of stars
- Fourier and Wavelet analysis techniques
- Natural resources management and ocean applications based on optical, thermal and microwave data



- Integrated approaches of Spatial Information System

Majority of the experts drawn from India, UN/ESA and other organizations contributed in successful organization of the workshop.

Director Speaks

CSSTE-AP had been established with the objective for capacity building in the region in different areas of space science & technology that can provide advancement in social & economic development. The education/course curricula model developed by United Nations in the area of RS & GIS, SATMET, SATCOM,

and Space & Atmospheric Science was adopted in early 1995. Similar other UN Regional Centre's (CSSTE's)- two in Africa, one each in Latin America and the Caribbean, Western Asia and East-Europe Network have also come up during this time. The curricula provides each Centre (CSSTE) with a bench mark of the academic level, necessary to maintain the international standard and character of the program as well as the centre. However, in the dynamic and ever changing world of Space Science and technology, new application and research areas are always emerging. No progressive educational organization or institute can afford to remain oblivious of these changes. Now that the CSSTE-AP has completed more than 5 years and also that other CSSTE centres are in the run, it is time for the centre to review the course curricula under each of the four disciplines in the light of new developments in the respective fields, their practical applications and utility for the developing countries, new challenges/problems of the region, new concepts, different methods of teaching and technical tools of educational standard, feedback and the suggestions from the outgoing participants, views of experts, etc. Minor changes are being incorporated regularly in the curriculum on yearly basis. While the above is being done to maintain high academic standards of the programmes and their ensured utilization for the developing countries, we are always open to new constructive suggestions for revision/upgradation of our programmes and curricula. I urge/call upon all our widely spread readers consisting of academicians, sponsoring scientific/technical organizations, Universities and past participants of the CSSTE-AP programmes and experts to come out with specific suggestions/proposals which may help us in further improving our education curricula and programmes. We solicit quick response from our readers.

- Prof B.L. Deekshatulu

COURSES IN PROGRESS

- Second 9 months Post Graduate Course on Space & Atmospheric Sciences at Physical Research Laboratory, Ahmedabad from August 1, 2000 (9 participants from 5 countries).
- Fifth 9 months Post Graduate Course on Remote Sensing & GIS at IIRS, Dehradun from October 1, 2000 (19 participants from 13 countries)

FORTHCOMING COURSES

- Third 9 months PG Course in Satellite Communications commencing from August 1, 2001 at Satellite Application Centre, Ahmedabad.
- International short course on Application of Space Science & Technology for Social scientists of Asia-Pacific region during 9-21 July, 2001 (first week at NRSA, Hyderabad and second week at SAC, Ahmedabad).
- International short course on Remote Sensing & Geographic Information System - Technology & Applications in Natural Resources & Environmental Management during August 27 to September 21, 2001 at IIRS, Dehradun.
- Sixth 9 months PG course in Remote Sensing & Geographic Information System during October 1, 2001 to June 30, 2002 at IIRS, Dehradun

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CSSTE-AP welcomes the views and opinions of the readers of the newsletter. Short Communications on space science and technology education which may be relevant to Asia Pacific Region are also welcome. Views expressed in the articles of the newsletter are those of the authors and do not necessarily reflect the official views of the Centre