Indian Society of Remote Sensing
Ahmedabad Chapter

NEWS LETTER

VOL. 2 NO. 3 JULY 1, 1988

FROM THE CHAIRMAN'S DESK

The Newsletter of ISRS-AC was started a year ago in July 1987 and it is a matter of great satisfaction that four issues originally planned have been brought out during the one year period. Due to unforseen circumstances, one of the issues (Vol. 1, No. 2) got considerably delayed and it had to be combined with the subsequent issue (Vol. 2, No. 1).

The Editorial Committee deserves full credit for the success of its untiring efforts in overcoming the initial problems. Collecting sufficient material for the Newsletter particularly related to typical case studies on the application aspects of Remote Sensing carried out by members and member institutions appear to be more difficult than anticipated. More enthusiastic cooperation from members can easily ameliorate this situation. New features like interviews with our senior colleagues not only on technical matters related to Remote Sensing but also on the activities of the Society as a whole and the Chapter in particular are sure to receive acceptance and appreciation from members.

With a creditable performance in the last year, the Chapter looks forward to greater success to the Newsletter in the coming years and we earnestly solicit your support, cooperation and constructive criticism.

Dr. T A Hariharan
Chairman, ISRS-AC

CHAPTER ACTIVITIES

Popular Talks

Two popular scientific talks on the Indian Remote Sensing Satellite System and its utilisation programme were organised on April 9, 1988 at the Tagore Hall, Paldi, Ahmedabad to mark the successful launching of the IRS-1A satellite. Dr. George Joseph, Associate Project Director, IRS Payloads spoke on various technical aspects of the spacecraft and its subsystems and Dr. Baldev Sahai, Asociate Director, IRS Utilisation Programme described various application projects carried out.

Welcoming the audience Dr. T A Hariharan, Chairman of the Ahmedabad Chapter introduced the speakers and expressed how proud this occasion is for not only the Scientific Community but also for the country as a whole. Shri Pramod Kale, Director, Space Applications Centre was the Chief Guest at this function. He mentioned that the next generation of satellites are slated to carry microwave remote sensing payloads envisaging all weather capability. Dr. S R Nayak, Secretary of the Chapter proposed a vote of thanks.

ANNOUNCING

National Symposium on REMOTE SENSING IN RURAL DEVELOPMENT along with the ANNUAL CONVENTION of the Indian Society of Remote Sensing will be held at Haryana Agricultural University, Hisar during November 17-19, 1988.

IMPORTANT DATES:

Receipt of full length papers : August 31, 1988

Intimation regarding acceptance of papers : September 30, 1988

Last date for receipt of Registration fee of Rs. 250/- : October 31, 1988

For details please contact:

Dr. S P S Karwasra
Organising Secretary
National Symposium on Remote Sensing in Rural Development
Department of Soils
Haryana Agricultural University
Hisar 125 004

INTERVIEW

If one talks of sensors it is very difficult not to be talking of Dr. George Joseph and if one talks of Dr. George Joseph and if one talks of Dr. George Joseph it is very difficult not to be talking of sensors. And that is what we decided to do. To talk to Dr. George Joseph about sensors - specially the recently launched IRS-1A sensors. Dr. George Joseph is presently the Deputy Director (Remote Sensing) at the Space Applications Centre and also the Associate Project Director for IRS payloads and the INSAT AVHRR payload. He is also the Director of the IRS Utilisation Programme. The airborne thermal scanner, the airborne multispectral scanner, the Bhaskara TV payloads, the IRS LISS I and LISS II etc. are some of the sensors which he has been instrumental in developing.

IRS-1A

Q. Before we start with the questions we would like to congratulate you on the grand success of IRS-1A. The cameras onboard have performed extremely well and the images being obtained are of very high quality. Would you like to narrate briefly your experiences with the IRS-1A project?

A. First let me thank you for giving me this opportunity to reach out to the members of the society. And now going on to IRS, the success of this project is very different than those we have had earlier. We started off modestly from the launching of sounding rockets, the first satellite - Aryabhatta, followed by the two Bhaskaras and also the launch vehicles. But now we are in an operational era with the IRS satellite - the capability of which is comparable to any other remote sensing system of the world. We are now having a satellite which is closely comparable to the Thematic Mapper in terms of spatial resolution. The pictures speak for this. Therefore, I feel that we have now entered an operational era in design, development and operation of a state-of-the art remote sensing satellite system. This is certainly an achievement to be proud of, not only for the Department of Space (DOS) but also for the nation, as a whole. And, personally for me, working for the project was a challenge. Even though we had developed some sensors - the airborne thermal sensor, the Bhaskara TV payload, the airborne multispectral scanner etc. the IRS sensors were way ahead in terms of technological capability. Apart from the sensors, even the technology in the satellite in terms of attitude stability, data rate etc. was much advanced than our earlier satellites. Moreover, there was a large amount of indigenisation in the satellite. For example, the gyros; the slippring for the solar array drives; attitude sensors, solar panels and many others were all indigenously made. Of course, the payloads themselves were completely indigenous. All in all, the technology development was truly indigenous even though we had to rely on imported components. And that is why I feel that the work was very challenging. And now that it is all over, it is a matter of satisfaction that everything has gone well.

Q. But there were some reports in the papers that there was some orbit snag just after the launch. What actually happened and how was the problem overcome?

A. It was not actually an orbit snag. May be I should give you the background of the launch to explain this. The satellite had gone through a series of stringent tests and evaluation not only in India but also at the cosmodrome in Baikanour. The hydrazine fuel is loaded and the satellite is mated with the launcher. Just about T-100 minutes the pre-launch operations start and T-35 minutes the umbilical is pulled out and now everything is set for the launch. Once the rocket is launched it takes a pre-determined course so as to launch the spacecraft at a specific height and in a particular inclination orbit. All this takes abot 12 minutes. Once the satellite is "freed" an automatic snap signal deploys the solar panel which is now the power source for the satellite. After this the earth acqusition is done so as to stabilise the spacecraft. Most of the operations, including the LISS-I switch on went off very well and there was no hitch at all. But apparently in one of the orbits there was an earth loss which means that the satellite was not locked-on to the earth as it should have. And once the drift in the attitude is beyond certain tolerable limits then the satellite goes into safe mode. However, the corrections were made and the earth was re-acquired and the satellite was locked-on to the earth. The satellite is now in a very healthy condition and is performing very well.

Q. The two cameras on the IRS-1A are based on the Charge Coupled Device (CCD) technology and are very different than the much proven mechanical scanning systems of the Landsat type. And you have been credited for the idea of going in for a CCD technology way back in 1979-80 when this was still an emerging technology. How did you decide for this as against the mechanical systems at that time?

A. To answer this, I will have to go back to the late seventies when we had already developed the airborne thermal and multipsectral scanner which were mechanical systems. Around this time there were plans for an operational system and various studies were being made. I came across the CCD technology and somehow was fully convinced of their capability for our operational system. I could visualise that the CCD systems would be small and compact and could be designed for a small-end (around 40 kgs) to a high-end (150-200 Kgs) sensor system. So this could fit the bill for a range of satellite systems. The designs would not be complicated and we could achieve better spatial resolution and a higher Signal-to-Noise (S/N) ratio. Apart from all this, I strongly felt that the mechanical systems offered no growth-potential for technological advancement and for that matter I feel that the TM could be considered as ultimate in mechanical systems as far as spatial resolution is concerned. Only a complex detector technology may

provide the type of capability one could have with CCD systems. People were sceptical about the CCD systems and we had to work out many details of design, development etc. to convince. Fortunately, this was accepted and when the IRS project was formulated the Linear Imaging Self Scanning (LISS) system was to be the main sensor for IRS-1A. Incidentally, it might interest you to know that the acronym-LISS - was also coined by me.

Q. How was the 10.30 AM equatorial time chosen for IRS-1A, considering that for the Indian latitutdes this would mean a local time of around 11.15 AM?

A. The choice of the equatorial time is a balance between the requirements of illuminiation and the atmospheric conditions. From the illumination point of view, it may be better to go in for as late as possible so that the terrain is well illuminated by the sun. Say around 11.00 AM or 12.00 noon should be very ideal. But around the later times there will be a problem of haze building up. And thus it has to be a compromise between these two. Keeping in mind the global requirements the Landsat and SPOT have a 0930-1000 AM equatorial time. And we have chosen 10.30 AM.

Q. If one looks at the bands of TM and the IRS-1A the first three bands are exactly similar. On the other hand the fourth band is narrow in IRS as compared to TM. What is the reason for this? Is it some technological trade-off or is it due to application needs?

A. When we decided on the bands for IRS we purposely went in for a narrower width for the IR region because of two reasons. One was to avoid the moisture absorption bands around 0.90 um and the other was we were convinced that narrow spectral bands would be more useful rather than broad ones and that too if we can achieve a better S/N ratio it should be very much useful for discriminability of different targets. In addition to improve the contrast transfer function in CCD, it is better to avoid the longer wave length region. So you see this decision was consciously taken. May be in the TM case they had other limitations and thus had to go in for a broad band.

Q. From the spatial resolution point of view, why were a 73 m and a 36 m resolution chosen and that too together for the same sensor?

A. This is an interesting question. We wanted to have a resolution which could match the resolution of the contemporaneous state-of-the art system which was Landsat MSS at that time. Users have a lot of experience on this data and thus we felt that we should have a continuity. So the resolution of around 80 m was chosen which ultimately resulted in 73 m because of the optics etc. We also felt that we should improve on the 73 m and go in for something better too. So we decided to go in for better resolution by factor of two and thus the 36 m resolution for LISS II.

Q. But extending this further, could we not have gone for another factor of two better and have an 18 m resolution too...

A. Theoretically, Yes. We could have done that. But the practical problems of larger data rate, lower S/N ratio, weight and volume of the sensor etc. would have to be tackled. Not only this, but this would mean a stringent requirement of spacecraft attitude so as not to have smear in the images. So, then everything would become complex.

Q. Now that IRS-1A is launched what are the plans for a continued and assured service to the user community. Are there any plans to improve the services - in terms of better spatial, spectral, temporal resolutions in the future?

A. As a follow-on to the IRS-1A, the IRS-1B is planned for an early 1990 launch. This is going to be similar to the IRS-1A and thus the services that are now on from IRS-1A will be continued by IRS-1B. This may go on upto 1992-1993. Later on, in the IRS-1C we are thinking of going for a better spatial resolution - better than LISS-II. Apart from this, there are also plans to have a microwave satellite with a Synthetic Aperture (SAR) and other passive sensors - for which there is a separate programme. However, all this is still in the programme stage and is yet to be projectised but this will be the thrust area in the future.

Sensors Design

Q. From the sensor design point of view, what exactly are the parameters that the design team looks for while arriving at the specifications of a sensor? Could you explain this out.

A. It is a complicated issue and is dependent on many factors. Even if one of them is changed it could have multiplying effects on the other factors. Let me give you an example. If you have a 70 m resolution and want to go in for 35 m resolution, i.e. half of the original one, This would mean that the data rate is increased by four times the original; the integration time has been reduced by a factor of two and so the signal strength is reduced. As a result the S/N ratio is affected. So you see, just by trying to improve the resolution the other factors become problem areas. Therefore, what one has to do is keep the technological feasibility in mind and strike a balance with the requirements. At the same time one must see that the basic requirements are not affected at all. And then there is this misnomer of the resolution. It means different to different people. An application scientist looks at it as the smallest feature that can be seen and to a designer it is the area on ground covered by a projection of the IFOV of the detector on to the ground. But then it is not just the resolution that qualifies the data totally. You see in IRS the resolution is 73 and 36 m but the contrast that one sees in the image is much better than one sees say in MSS or TM. What I am trying to emphasise is that

the resolution alone is not just the parameter based on which the data could be qualified or judged. There are other factors also, like the MTF and the S/N ratio which are very crucial and could well improve the image considerably. For example if there is a 10 m resolution with 20% MTF and a 30 m resolution with 80% MTF I would say that the pictures from the latter would be much better. Similar is the case with S/N ratio. So, you see, there are various parameters one has to consider and the difficult part is to strike a balance amongst all of them.

Q. But in the case of IRS is it not that it has been optimised for Indian region by adopting a suitable gain setting whereas the systems like Landsat etc. are optimised for global regions by adopting to different gains. And is this not the reason we are getting better contrast in IRS?

A. The contrast has nothing to do with gain setting. The gain settings are mainly to allow you a flexibility of going in for different saturation radiance because as season changes or you are in some other region so will your reflectance range change and you must allow for such changes to provide good dynamic range. And as rightly pointed out for global systems, they would opt for extreme ranges so that solar illumination, regions, seasons etc. will not have an impact on the data quality, thus not restricting the utility to any particular region of the world.

Q. Actually, from what you have said, it looks like the technology - or technology constraints - mainly defines particular sensor design. You have talked about MTF, IFOV, S/N ratio, saturation radiance, bit-resolution etc. which are all technology parameters. But where does the application user requirement come into the picture, or does it come at all?

A. You see it is not like that, the user requirements are the most important parameters. But at the same time there are some extreme requirements which are difficult to fully satisfy. Let me give you some examples. As far as bands are concerned users have seen that the green, red and IR regions are best as they are used in the FCC for visual analysis. Individually also these bands are seen to be useful for most of the applications. So when we chose the blue, green, red and IR part of regions for the IRS we were fully catering to the needs of most of the users. No doubt we have not got the middle IR or thermal IR but then I don't see many using the MIR and TIR data in TM at all. Over the globe, people have seen its utility for certain applications but from a general viewpoint the users always fall-back on the visible and near IR bands for operational applications. Let us go on to the resolution. Ask any user and he will say he wants the best resolution. When there was MSS there was a "need" for better than 80 m resolution, when the TM came in there was a "need" for better than 30 m resolution and now SPOT is there. But I somehow feel that the resolution requirements of the user cannot be ever satisfied because there is always a "need" for better resolution. At the same time there are certain problems for going in for better and better resolution. There is the problem of data rate and then the scene noise becomes very prominent and this could lead to improper results. So there has to be a trade-off somewhere. Some studies by Markham and others have even quantified this trade-off as a limit beyond it could lead to wrong clarifications. Coming to our own IRS, I feel that a 30 m resolution should be quite optimum for most of our applications.

Sensors of The Future

Q. Nowadays, there is a trend emerging that the future will be an era of very specific sensors - say the spectrometers on application specific sensors etc. what do you think of this emerging trend and are we also thinking in these lines for the future?

A. The trend is in the direction of spectrometers, that is true especially for global earth observations studies. These spectrometers can take data in large number of very narrow spectral bands - say more than 50 bands in the 0.4 - 2.5 um region. Invariably the spatial resolution cannot be very high. I think they are of the order of 30 m and 1 km for two types o spectrometer systems. Also the swath or coverage cannot be very large otherwise the data rates would be extremely high. So these limitations which would make such systems useful in very specific application areas - mainly as a research tool to study the spectral signature of objects. But I have my own doubts of its operational utility.

Q. But cann't we see these systems as a middle level data collection fitting into the scenario of doing an overall or regional level analysis using the IRS type of system and going in for these systems when we want to do specific area detailed analysis. This would not only go well with the concept of the 3-tiered approach of remote sensing but the advantage is we would have the middle-level also on a satellite platform.

A. That would be perfectly alright if we could achieve high spatial resolution so as to completely replace the aerial data which is presently used as base information or as ground truth data. Further, we would not be able to extend the smaller area analysis to a larger area which is very much required. That is why I am not convinced of its utility as a middle-level data in place of the aereal data that we have presently.

Applications

If we look at our programmes in remote sensing, most of them are oriented towards making maps - either visually or digitally. We are not looking at is the prospect of going in for automatic discrimination/delineation techniques - either onboard or on the ground where we get either the thematic information or the

quantified parameters right away. Should we not look at this area?

A. The remote sensing applications, as it stands now, can be categorised into two groups the first one is related to the mapping based on tonal, textural, shape etc. difference. These techniques are fairly well established and give sufficiently accurate results. The second relates to the quantitative estimation of a particular parameter based on the correlation of the spectral reflectance, with that parameter. Say for example the estimation of a crop yield or turbidity in water. This would necessarily mean establishing correlation between spectral reflectance and yield or turbidity. These are more complex than the first category applications and are still at experiment level. So, when these models are yet to be operationalised it is very difficult to conceive of a black-box processing where you can directly get the quantified information. I don't think we will in the near future get into that sort of a situation because the human experience has a very important role to play.

Chapter Activities

Q. What have you to say about the Ahmedabad Chapter? Do you have any suggestions vis-a-vis the activities of the Chapter?

A. I don't know how often we meet as a Chapter. Apart from the larger gatherings - like the seminar, workshops etc. what is more important for the Chapter is to have more informal meetings and adopt a more personal approach towards the activities. We must have a get-together atleast once a month and have a discussion on a particular topic - say problems in agriculture, geology etc. and more so the problems related to Gujarat. This would also put the problem in the right perspective as we would get different view-points. The thing is the more informal gatherings we have the better would be the interaction of the members. The film shows that are being organised is also a good activity. We must also have public lectures so as to see that remote sensing reaches the common man and the impact of the technology is felt by everybody. We may have formal activities say once or twice a year.

Lastly

Q. One last question. Suppose one was able to put the clock back to say 1979-80 and you were again given the responsibility of making the IRS sensors. With all this exprience with you, how would you go about it? The same way as you did now or any different?

A. Well, if I had all this experience with me I would have done and delivered the sensors just as I did now. No difference at all. I have an excellent team-the best designers and the best engineers and we don't lack in these aspects at all. The same is true for the satellite technology as well and for the whole of ISRO.

PROCEEDINGS OF THE EXTRA ORDINARY GENERAL BODY MEETING OF THE SOCIETY

An extra ordinary General Body Meeting of the Society was called on 5.2.1988 at Hyderabad to ratify the decisions of Executive Council to revise the rates of subscription for various categories of the membership (R. 16.1 of Constitution). The following rates were approved with effective from 1st April, 1988.

Category of Members	Within India		Outside India	
	Admission Fee(Rs.)	Annual Sub(Rs.)	Admission Fee ($)	Annual Sub($)
Members	10.00	50.00	5.00	35.00
Life Members				
- Admitted before 45 years of age	500.00	-	250.00	-
- Admitted after 45 years of age	375.00	-	175.00	-
Sustaining Members	-	500.00	-	175.00
Patron Members	5000.00	-	2500.00	-

Note: Any Member or Life Member of the Society who is temporarily residing outside India shall have to pay extra mail charges as decided by the Secretary apart from normal subscription.

R.16. 2 A member who has been continuously on rolls of the Society for 5 years or more shall have the right to compound for further payments by a single payment of Rs. 375/- only and become a life member.

Under clause R. 9.10 the Chapter's share will continue to be 50% of the annual subscription or 5% of the interest on Life membership.

R.16.3 The entire fee shall be payable in one instalment unless otherwise permitted by the Secretary. In no case it shall be paid in more than three instalments (as before).

R.16. 4 The last known address of a member shall be considered as a valid mailing address for correspondence by the Society. Members should ensure that their addresses are kept uptodate (as before).

PHOTONIRVACHAK NEWS

Shri V K Jha, Scientist SE, Geo-Sciences Division, IIRS, Dehradun has been nominated as Associate Editor of "Photonirvachak", Journal, Indian Society of Remote Sensing.

REMOTE SENSING OF URBAN SPRAWL OF AHMEDABAD

This study was carried out by Space Applications Centre (SAC) in collaboration with the Ahmedabad Urban Development Authority (AUDA), Town Planning and Valuation Department and Ahmedabad Municipal Corporation.

The Urban Sprawl map of Ahmedabad city was prepared on 1:50,000 scale using Landsat MSS (March 1975, January 1982) and Landsat TM (March 1986) data in conjunction with the Survey of India topographic maps. The boundary jurisdiction of the AUDA was incorporated into this map in order to assess the gorwth pattern and trends.

The map shows the physical growth pattern, built up area, its encroachment into the agricultural lands in the villages located in the pheripery of the city. Salient findings are:

(a) The city has extended well beyond the municipal limits and even crossed AUDA limits on the western side, i.e. Near Ambli.

(b) The general trend of growth within a decade (1972-82) were observed mainly along the transportation network.

(c) After 1982, the growth pattern was observed as encroachment into the agricultural lands located between the transportation routes, i.e. Near Chiloda, Chinubhainagar, Ratanpur, Ramol, Vinjhol, Sahijpur, Piplaj, Sarkhej, Fatewadi, Makarba, Vejalpur, Jodhpur, Mamadpur, Ambli, Shilaj, Bhardaj, Ognaj and Khodiar villages.

(d) The rate of the growth as observed is tabulated as follows:-

Sr. No.	Data used for Analysis	Area in Sq. Kms	Phy-sical Growth Sq Kms	Growth Rate in %	Overall Growth Rate
1.	Oct 1972 SOI map	96	-	-	-
2.	14.3.1975 Landsat MSS	124	28	29.1	-
3.	26.1.1982 Landsat MSS	175	51	48.4	82.3
4.	30.3.1986 Landsat TM	256	81	46.3	166.6

It is evident from the above table that the growth rates observed during 1972 to 75, to that of 1982-86 is quite high and overall growth rate from 1972-86 is 166.6 per cent which is a staggering figure.

For further details please contact :

Shri S K Pathan
SAC, RSA
Ahmedabad 380 053.

SATELLITE UPDATE

Landsat Update

Landsat-4 has started collection of TM data from October 1987 through TDRSS. Presently it is collecting approximately 50-60 scenes/day.

Landsat-5 continues to operate nominally providing both TM and MSS data. Landsat data to be available on floppy diskettes.

(Source : Photogrametric Engineering and Remote Sensing (PERS), April 1988.

Landsat to carry on

The US Department of Commerce has got a US $ 62.5 m. release from the Congress for the continued development of Landsat-6 satellite and associated systems. This follow-on Landsat-6 is tentatively scheduled for a March 1991 launch. Consequently, EOSAT is making all efforts to conserve the life of Landsat-5 so as to minimise (not avoid) the data interruption between satellites. The TM on Landsat-4 has been put into use to take some of the workload of Landsat-5.

What will Landsat-6 offer? It will have a wide array of sensing and off-nadir viewing capabilities (just like that in SPOT). An Enchanced Thematic Mapper (ETM) having the present seven bands of TM and also a panchromatic hand with 15 m resolution; a Thermal Infrared sensor and an ocean colour imager form the payload for the proposed Landsat-6.

(Source : Remote Sensing Society's News and Letters, April 1988).

And one from the Russians

The USSR recently put into space the largest civilian survey satellite ever. This remote sensing satellite weighing nearly ten times heavier than the present Landsat is envisaged to provide data on "hydrology, cartography, geology, agriculture, oceans and the environment" say the Russians. While details on the sensors and payloads are not available, there is no doubt that the system would be unique in its own way.

(Source : Remote Sensing Society's News and Letters, April 1988).

APPEAL

Now that we have brought out interviews with two eminent persons, we expect the members to react on the views expressed on different topics in the interviews.

We visualise that these responses/reactions will throw open a "debate" on various topics through the media of this newsletter. Our aim is to make this newsletter a forum for free and frank exchange of views and ideas on any topic of interst to the society. For this the participation from each and every member is very essential. We appeal to all the members for their fullest cooperation.

- Editorial committee

ADDENDUM TO THE LIST OF MEMBERS

The following members of the Ahmedabad Chapter have now become Life Members:-

1. Shri Bhaskar Das
2. Dr. M C Gupta
3. Dr. M B Potdar
4. Dr. V K Dadhwal
5. Shri Rajeev Sharma
6. Smt Tara Sharma
7. Shri M G Shaikh
8. Ms Anjali Pandeya
9. Shri H B Chauhan
10. Dr. K V G Murthy
11. Dr. S S Thakur
12. Dr. S S Pokharna
13. Dr. V N Sridhar
14. Shri E S Murthy
15. Shri T J Majumdar
16. Shri S K Pathan
17. Dr. Manab Chakraborty
18. Shri A Narayana
19. Dr. R Ramani
20. Dr. S Palria
21. Shri T V R Murthy
22. Dr. M M Kimothi
23. Dr. V K Srivastava
24. Shri K N Padia
25. Shri Ramlal Mehta
26. Shri H I Andharia
27. Shri S P Vyas
28. Miss Beenakumari
29. Dr. P N Pathak
30. Shri H U Solanki
31. Dr. G V Saratbabu
32. Shri H P Bhatt
33. Smt K S Sudha
34. Ms Yogini Vanikar
35. Shri T T Medhavy
36. Ms Kavita Dwivedi
37. Dr. N K Vyas
38. Dr. A Sarkar
39. Shri P Jothimani
40. Shri A S Rajawat
41. Shri D M Pancholi
42. Shri S K Sharma

NEW MEMBERS

Life Members

A. Space Applications Centre, Ahmedabad 380 053

1. Shri Pramod Kale
2. Shri R M Patel

Annual Members

A. Space Applications Centre, Ahmedabad 380 053

3. Shri U G Desai
4. Shri G P Sharma
5. Shri S A Sharma
6. Shri S S Manjul
7. Shri Sandip Oza
8. Dr. M P Oza
9. Shri J K Thesia

B. L D College of Engineering, Ahmedabad 380 009

10. Shri J N Patel

Patron Members

11. Gujarat Co-operative Oil Seeds Grower's Federation Limited, Ahmedabad 380 009
12. Gujarat Council on Science and Technology, Gandhinagar 382 010

OTHER MEMBERS FROM GUJARAT

Life Members

1. Shri V B Patel, Gujarat Engineering Research Institute, Vadodara 390 007
2. Shri P S Dwivedi, Gujarat Engineering Research Institute, Vadodara 390 007
3. Shri Kamlesh Patel, Vadodara 390 005
4. Shri G B Dalwadi, Gujarat Engineering Research Institute, Vadodara 390 007

Annual Members

5. Shri Tarun J Patel, Directorate of Geology and Miing, Vadodara 390 001
6. Shri U S Buch, Kevadia Colony 393 151

THE SECRETARY SAYS.....

Our chapter has grown considerably.

Total membership of the Ahmedabad Chapter is 159.

Other members from Gujarat is about 23.

Details of the membership are as follows:

Membership category	Ahmedabad Chapter	Others from Gujarat
Life members	103	13
Annual members	45	8
Sustaining members	7	2
Patron members	3	-
Honorary member	1	-
Total	159	23

LIGNITE BASIN INVESTIGATION USING AERIAL PHOTOS

Recently, the remote sensing laboratory of the Directorate of Geology and Mining (DGM) has carried out the investigation of the lignite basin around the Kharsalia village in Bhavnagar district usin aerial photographs. About 100 sq. kms. area has been mapped at 1:50,000 scale using black-and-white aerial photographs. Lithologically the area is made of tertiary sediments which are exposed above the Deccan traps and sporadically covered by ferruginous conglomerate - which in turn is embedded with wood fossils.

Aerial photo-interpretation techniques, aided by ground data, have given a new dimension to the problem of locating such basins. Lineaments trending NW-SE and NE-SW could be easily delineated on the aerial photos. The study has revealed that the area is affected by step faulting, is highly jointed and is severely intruded by trap dykes. It was observed that the fractures have given rise to narrow valleys and escarpments.

Thus, the study has enabled the quick investigation of the geology and the structural features. These have helped in the better understanding of the Kharsalia lignite basin.

For details please contact: Director, Directorate of Geology and Mining, Ahmedabad - 380 016.

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