OBITUARY

Janardan Ganapatirao Negi
(1936-2016)

Dr. Janardan Ganapatirao Negi has been extraordinary researcher of post-independence Indian geophysics. Through his own and his students' work, he pioneered development of theoretical geophysics in India, using established physical laws. His contributions have been numerous and multidimensional and with his sad demise, India lost its foremost proponent of hard core geophysical studies in India.

Dr. Negi, a promoter of quantitative geosciences in the country, established theoretical geophysics division at the CSIR-National Geophysical Research Institute, Hyderabad, on the lines of theoretical and mathematical physics. Till then, theoretical geophysics has been an identified branch of geoscience at only a few places like, University of Cambridge. To start with, he chose areas like theoretical geo-electromagnetism and geomagnetism, theoretical body and surface wave seismology and theoretical geothermics, followed by geodynamics. He was very keenly involved in the development of negative screening effect due to overburden in electromagnetism. This problem has great relevance to our country even today, where most of ore bodies are concealed below by a thick overburden at many places. He used theoretical model to show that in certain frequency band, the ore body will show itself better than when overburden is absent. This work was later on substantiated through experimental model studies, developed at CSIR-NGRI, which produced many important results in geophysical exploration in years that followed. Overburden can have uneven topography and for this, innovative perturbation methods in electromagnetism were also developed. Later on his studies in time domain electromagnetism, electromagnetic anisotropy and analogue modeling of response of ore bodies led to several interesting findings. This work was followed by seismological studies, where a new concept of non-linear transparency was developed using inhomogeneous transition layer model of earth's crust. Besides, in the field of elastic surface waves, mode equivalence concept was developed for anisotropic media. He was also keen in studying geothermics where new matrix methods were advanced to determine the distribution of deep-seated temperatures in the stratified earth's model. This included study of the role of fluid movement on thermal structure in stratified oceanic crust. Apart from this, when heat flow and heat generation data become available in India, he proceeded to model those using physics based models and advanced a new exponential model of radiogenic heat in the crust, by reinterpretation of linear heat flow and heat generation data. It was theoretically shown that this relationship also varied with the uplift and erosion and that Moho temperature was hotter and lithosphere is very thin beneath Indian shield, compared to elsewhere in the world. Implications of these results on seismicity, magnetization and possibilities of partial melting at shallow depths, were also predicted. Application of information theory in geophysical interpretation particularly quantification of ambiguity in gravity interpretation, as well as methods for interpreting non-

stationary time series, were also developed around this time.

During the early growth of CSIR-NGRI, Dr. Negi focused on physics based equation-driven researches as described above. Soon after, several geoscientific data sets became available worldwide and he paid attention to data-driven research. Initially, he collaborated with Dr. N. Krishna Brahmam, and proposed presence of rift valleys under Deccan traps, utilizing gravity data and with Dr Harsh Gupta, he studied lateral variation in seismic wave velocities at plate boundaries. He then used his enormous theoretical skills in developing data processing tools and their applications to both local and global problems. At first, he was attracted by geomagnetic reversal data, which is made of square pulses. He used a novel method of Walsh transform to find periodicities in the data, whereas the earlier researches focused on fitting Poisson renewal model. This resulted in the discovery of several long periods, which went unnoticed earlier. He related all these long periodicities to many geological, astronomic and astrophysical processes. He went ahead in using nonlinear dynamical method to understand and predict several geophysical time series. His keen interest in geodynamical studies, also resulted in the discovery of a K-T asteroidal impact site near offshore Mumbai region, which led to Deccan volcanic eruption and ultimately demise of dinosaurs.

Dr Negi was one of the main builders of NGRI, having joined in 1963 when it had very few scientists.. He supervised about 20 Ph.D. theses. He headed various other organizations in the country such as Madhya Pradesh Council of Science and Technology, Institute of Seismological Research, Gandhinagar. He was also scientific advisor to government of Madhya Pradesh. He also served several organization abroad such as CIRES (Cooperative Institute of Research in Environmental Sciences), Federal University of Bahia and Pará as visiting professor.

He won several distinguished awards such as Shanti Swarup Bhatnagar Prize (CSIR), Krishnan Medal (Indian Geophysical Union), National lectureship (UGC) and Life time achievement award of Association of Exploration Geophysicist, India. He was elected to the fellowship of national Academy of Sciences and Royal Astronomical Society. For his research and societal contribution he was awarded Holkar Science College Centenary Award and Vigyan Ratna award.

He co-authored with P.D. Saraf a book on "Anisotropy in geo-electro-magnetism" published by Elsevier. He also edited for several years NGRI's home journal "Geophysical Journal Bulletin". He has over two hundred and fifty publications in reputed national and international journals. He will be greatly missed by numerous students and colleagues for his guidance and inspiration.

CSIR-NGRI, Hyderabad
E: rnsingh@iitgn.ac.in

R.N. SINGH, V.P. DIMRI
and O. P. PANDEY