because in the west, it is unconformably underlain by Vempalli Formation; towards east, it is unconformably underlain by Pullampet Formation.

3. In the up-dip direction, i.e., southwards, older Gulcheru quartzite can only be expected to be exposed, but not the younger Vempalli Formation.
4. The change in trend is not due to a warp but is due to an angular unconformity between Gulcheru quartzite and Nagari quartzite.

References

KING, W. (1872) On the Cuddapah and Kurnool Formations in the Madras Presidency. Mem. Geol. Surv. India, v.8, pt.3, 346p.

NAGARAJA RAO, B.K., RAJURKAR, T., RAMLINGA SWAMY, G. and RAVINDRA BABU, B. (1987) Stratigraphy, structure and evolution of the Cuddapah basin. *In:* Purana Basins of Peninsular India. Mem. Geol. Soc. India, no.6, pp.33-86.

ASSOCIATION OF MICROBES WITH ARSENIC-BEARING SIDERITE CONCRETIONS FROM SHALLOW AQUIFER SEDIMENTS OF BENGAL DELTA AND ITS IMPLICATIONS by Ravi Shanker, T. Pal, P.K. Mukherjee, S. Shome and S. Sengupta. Jour. Geol. Soc. India, v.58, 2001, pp.269-271.

R.K. Bandyopadhyay, Project Arsenic, Eastern Region, G.S.I., Salt Lake, Sector-2, Kolkata - 700 091 comments:

Ravi Shanker et al. proposed bacteria meditated Fe^{3+} and Fe^{2+} reduction and consequent development of (siderite?) concretions where arsenic was fixed by microbes and its subsequent dissolution owing to marginal lowering of pH in "locally developed acidic condition" which caused the arsenic pollution in groundwater of the study area. Fe^{3+} to Fe^{2+} reduction necessitates anaerobic bacteria that abound in anoxic conditions. These anoxic bacteria are obligate anerobe (survive in the absence of oxygen) and they thrive on electron donated by higher charge ions, viz., Fe^{3+}, SO_4^{2-}, etc. These bacteria types are vast and varied. There are anaerobic bacteria/microbes (MIT-13) which thrives on electron donated by arsenate (ASO_4^{4-}) oxyanion (Ahmann et al. 1994). This follows that these microbes reduce arsenate to aresenite (ASO_3^{4-}). Because these trivalent oxyanions are more soluble and more toxic, hence upon microbe aided reduction of pentavalent arsenate, trivalent arsenate will be generated and dissolved in groundwater. This being the case, it is quite possible that in the reduction reaction of Fe^{3+} to Fe^{2+}, arsenate that occurs as sorbed lode on ferric-hydroxide surface would also be released, reduced, and dissolved in groundwater. Presence of considerable concentration of trivalent arsenic ion in groundwater indicates that above theoretical postulation merits attention. But the authors did not probe any alternative possibility. In scientific investigation one should balance the possibilities and choose the most likely on the basis of best fit data. Moreover, authors have proposed lowering of pH and emergence of acid conditions to explain siderite dissolution. But in acid conditions acidophile aerobic bacteria dominate. These are obligate aerobe. That means they need oxygen for their respiration. In brief, a contradiction is apparent in the theory that has been proposed by the authors.

Whatever explanations they have given for siderite precipitation/dissolution is oversimplified. Occurrence of siderite is indicative of strongly reducing conditions and presence of carbon-di-oxide in more than atmospheric amount ($pCO_2 > 10^{-3.5atms.}$). ".... Fluctuation of pH without a change in oxidation condition can cause alternation of siderite and magnetite in a sediment in a closed system to carbon-di-oxide, but in an open system, where, pCO_2 is constant, the change from siderite to magnetite cannot take place without a change in pO_2" (Garrels and Christ, 1965). Authors have not described whether the system is open or closed. They have not given any pH or Eh data either. The temptation to formulate premature theory upon insufficient data is indicated.

Ravi Shanker, B-5, Section-K, Aliganj, Lucknow - 226 024 replies:

1. We are happy that our short communication has aroused the interest of Shri Bandyopadhyay in the subject.
2. He has completely missed the objective and the main purpose of our communication, which was to focus the attention of all those involved on the problem of arsenic pollution in the groundwater of Bengal,

towards the presence of highly arseniferous microbes enclosed within siderite globules/concretions, whose shell was non-arseniferous.

3. This finding gives completely new dimension to the problem's understanding, which is a pre-requisite to finding a solution.
4. Further studies are on to identify and culture these 'microbes' in collaboration with experts in that field.
5. Shri Bandyopadhyay has correctly understood only a part of our statement that lowering of pH causes dissolution of siderite concretions containing areseniferous microbes, leading to contamination of groundwater.
6. We have not suggested that formation of concretions and their dissolution happens simultaneously and under the same conditions. The contradiction, which Shri Bandyopadhyay finds apparent in our findings, is as a result of his assuming something we have never implied, suggested and/or wrote. We have described certain observed facts and substantiated them with few photographs up to one micron magnification.

References

AHMANN, DIANNE, ROBERTS, LYNN, A., KRUMHOLZ, R. LEE and MOREL, M.M. FRANCOIS (1994) Microbe grows by reducing arsenic. Nature, v.371, pp.

GARRELS, ROBERT, M. and CHARLES, L. CHRIST (1965) Solutions, Minerals and Equilibria. Harper and Row, pp.201-206.

PATTERN OF OCCURRENCE OF KIMBERLITE PIPES BASED ON GRAVITY AND MAGNETIC ANOMALIES IN WAJRAKARUR-LATTAVARAM REGION, ANDHRA PRADESH by A. Vasanthi and K. Mallick. Jour. Geol. Soc. India, v.58, 2001, pp.251-259.

(1)

K.R.P. Rao, Geological Survey of India Training Institute, Hyderabad - 500 068 comments:

1. The effort of the authors is really appreciated for discussing comprehensively the geophysical signatures, both gravity and magnetics on a regional scale, over the known kimberlites in the Wajrakarur area and prognostication of areas for further prospecting. I thank the authors for educating many a geologist in this field.
2. The statement that "*except the pipes 10, 11 and 12 which occur at the contact of the intrusive granite and Peninsular Gneiss, other pipes do not show clear association with any other geological structure*" is not true and the ground reality is as follows:

   The authors refer to the map published in the Geological Survey of India Misc. Publ. no.130, Part V, p.32, Plate-1 wherein the pipe nos. 1, 2, 6 and 11 occur at the contact of TTG and TGA suite of rocks (Peninsular Gneiss and granites). The Lattavaram group of pipes (p-3,4,8 and 9) occur close to the NE-SW trending fault that passes through the closure of the Marutla domal structure and these bodies occur at the contact of the TGA (Peninsular Gneiss) and the younger intrusive granite (Kandamalakunta diapir). Without any reservation one can say that all the kimberlites exhibit clear structural and geological controls of emplacemet.
3. The statement that "*Kohinoor, Regent, Hope and Orloff and many more diamonds had their origin in Wajrakarur-Lattavaram region*" perhaps lacks conviction, though the truth is still a mystery. Many workers are obliged to agree that the source of these famous diamonds (recovered from the Krishna river gravels in Guntur and Krishna Districts) has to be other than the Wajrakarur kimberlites. The new discovery of lamproites in the Jaggayyapeta lamproite field of Krishna, Nalgonda and Khammam Districts substantiates this contention and is the first strong geological evidence in favour of this opinion.
4. It is bit intriguing to see the statement made at p.258 under residual vertical magnetic map (v) that "*two small kimberlite piper nearer Guntakal have been found in May 2000* (D.V. Subba Rao, Pers. Commn.)".

   Discovery of kimberlite/lamproites is indeed a great achievement and contribution by any geologist or geophysicist in this exciting field of diamond exploration. If one has discovered a kimberlite, more details are to be published for the benefit of the enthusiastic scientific community. The area under question – north of Guntakal as stated by the authors, is Peravali-Jonnagiri area where geologists and geophysicists of GSI and NGRI have worked