the real help came hours later. Why did we not learn from this?

Like at Malpa, the residents of the neighbouring Asane village had sensed the incoming mud avalanche at Malin by the loud noise heard at about 03:00 a.m. There were evidences of howling wind as well, similar to the experience at Malpa. There being no early warning system in place, Malin too did not receive attention until a bus driver encountered the devastated landscape at 07:30 a.m. and the Manchar city authorities got the news thereafter. NDRF personnel could reach the site only by the afternoon. The district collector reportedly came to know about the incident at 09:00 a.m.

Why no attempts were made to prevent abuse of land, educate people on the perceived threat and on the do's and don'ts, restore ecological stability of the area and disallow non-engineered dressing of the slopes for agriculture? Was it difficult for the Government to keep a tight check on the felling of trees, abuse of land and stone quarrying in the area, especially when landslides have been a common occurrence in this part of the district? Only last year, the neighbouring village of Kolthawadi was hit by a landslide.

Whenever landslide disasters strike, we rush to lean on fixed ideas in our minds. It has almost become ritualistic to name rainfall to explain away cataclysmic floods and devastating landslide events, without even attempting to understand the slope dynamics. We can understand landslides only by systematic geotechnical, geomorphologic, hydrogeological and seismic characterization of slopes, and study of the environmental impact of urbanization. The question to ask is: Why are scientific investigations in our landslide-prone areas exceptions rather than a rule? The earlier we insist on prevention by taking recourse to scientific investigations, the better.

R. K. Bhandari
e-mail: rajmee@yahoo.com

Discovery of the most distant lensing galaxy

In yet another example of serendipity, Tran and her team of scientists in Texas A&M University, USA, have discovered the most distant strong lensing galaxy[1]. While studying star formation in distant galaxy clusters, they spotted hot hydrogen [Lyman α] lines that appeared to come from a massive elliptical galaxy in the cluster IRC 0218. Lyα spectral lines were unexpected, because the elliptical galaxy being the brightest in the cluster was established to be old and dormant, with no star-formation activity. However, hot hydrogen [Lyα] lines strongly indicate the presence of active star formation[2]. To add to the surprise, the spectral lines suggested that the source is 10.7 billion years ago, while the elliptical galaxy was only 9.6 billion years ago[3].

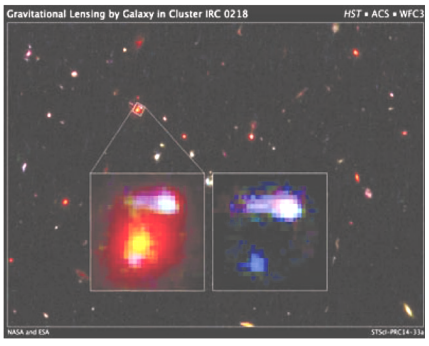

Figure 1. False colour image showing the arcs and smudged dot next to the elliptical, depicting distortion of the spiral galaxy due to lensing. Image credit: NASA, ESA, K-V Tran (Texas A&M University), and K. Wong (Academia Sinica Institute of Astronomy and Astrophysics).

This observation prompted Tran and her associates to propose that the elliptical galaxy was in fact lensing a smaller active spiral galaxy hiding behind. Further analyses of the images by Hubble's Advanced Camera for Surveys and the Wide field Camera 3, confirmed their claim by revealing arcs from a smudged dot next to the elliptical galaxy in the spatially resolved images. These arcs or distorted images are characteristic of strong gravitational lensing, thus corroborating their hypothesis. In other words, the team proved that the Lyα spectral lines are emerging from the spiral galaxy hidden behind, and is lensed by, the massive elliptical galaxy.

The lensing elliptical galaxy, at a red shift $z = 1.62$, beats the previously held record of the most distant lensing galaxy by 200 million years, which is at a red shift $z = 1.53$ (ref. 4). While lensing galaxies are frequent in the recent past, it is indeed fortuitous to have found one so distant in time, given that early galaxies were not massive enough to cause strong lensing.

In addition to establishing that the giant elliptical is the most distant lensing galaxy, the team has also been able to explore the evolution of dark matter content in early galaxies. Kenneth Wong and Sherry Suyu of Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) in Taiwan[1], have reconstructed mass enclosed in the giant galaxy based on the lensing effect it exhibits and have deduced that, dark matter content is less than what is expected. In most recent galaxies of similar size, dark matter constitutes 70 to 90 per cent of the total mass, while it is a mere 30 per cent in the elliptical, implying that in the next 9 billion years it would accumulate more dark matter than normal matter. Such unusually less dark matter content in the early galaxy, has dispelled the long held hypothesis, that galaxies accumulate normal and dark matter in equal proportions over time, because galaxies were thought to grow purely by merging of smaller galaxies. Instead, the current study reveals that the ratio of dark matter to normal matter evolves with time as the galaxy grows. This finding might throw more light on the evolution of galaxies and their dark matter content.

Investigation of Hubble images of the spiral galaxy behind the elliptical has further uncovered a bright region with hot hydrogen close to its centre, which perhaps suggests an outburst of star formation in this zone. Tran and her team are now looking for more such lensing galaxies, which provide glimpses into the early universe.

1. Wong, K. C. *et al.*, *ApJ*, 2014, **789**, L31.
2. http://en.wikipedia.org/wiki/Lyman-alpha_emitter
3. http://hubblesite.org/newscenter/archive/releases/2014/33/full/
4. van der Wel, A. *et al.*, *ApJ*, 2013, **777**, L17.

G. V. Punyakoti, S. Ramaseshan Fellow.
e-mail: punyakoti.gv@gmail.com