and programmes are implemented appropriately, especially in fields like bioinformatics where women can do research by using computers at home. Fora where women can express themselves without any hindrance should be motivated. We all have to understand that it is not the lack of interest or ambition that causes a woman to withdraw right when she is at the prime of her scientific career. If that were the case we will not see women pursuing science by choice at college and university levels. It is high time that we all join together to work towards the development of woman and in turn towards the welfare of mankind. We would like to share an interview given by Michelle Bachelet on role of women in development[6]. We conclude by citing a quote from Erica Jong, 'Everyone has talent. What is rare is the courage to follow the talent to the dark place where it leads'. Women have that extraordinary courage; so dare to dream and live that dream.

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Legal aspects of earthquake forecasting

Dimri[1] has raised two significant questions. The first is about the directivity of tsunamis and the other about legal aspects of forecasting earthquakes and tsunamis. As far as directivity of tsunami waves is concerned, the matter is quite simple for seismologists. In general, it may be remembered that the occurrence of tsunamis is a result of a large-magnitude earthquake. The large geological or tectonic faults in the Sumatran and Andaman regions are quite well known. These faults have generated a number of moderate to large magnitude earthquakes during the last 100 years or so. If we know the fault plane solutions of these past historical seismic events, then the potential direction of tsunami waves could be easily determined. As a thumb rule it may be remembered that amplitude and energy of tsunami waves are minimum in the direction of rupture, whereas they are highest at right angles to the direction of rupture. This is explained with the example from the 26 December 2004 earthquake and related tsunami.

On 26 December 2004, the rupture started at 00 h 58 min 47 sec UTC and continued for at least 7 min, as reported by Park *et al.*[2]. The rupture extended towards northwest along the Sunda trench for 1200 km to the Andaman Islands. The energy associated in two directions can be seen in Figure 1. The city of Galle in Sri Lanka was severely damaged by the tsunami, while Cocos Island, which is roughly on the same great circle distance (1754 km) from the epicentre, recorded only a maximum tsunami amplitude of 42 cm. This also explains the reason why Kolkata, Sundarbans and Bangladesh did not suffer from any tsunami attack. Nagapattinam area on the east coast of India was almost at right angles to the NW end of the rupture. Similarly, the Thailand coast was at right angles to the direction of rupture. Both the locations have suffered heavy damages. The Indian National Centre for Ocean Information Services (INCOIS), Hyderabad has records of several moderate to large magnitude earthquakes with fault plane solutions for $M > 7.0$ in Indonesia, Andaman and neighbouring region. Once the epicentral location of an earthquake is known, it would be easy to find the likely direction of propagation or directivity if the fault plane solutions of historical seismic events and the latest earthquake are known. It will take about 120–140 min for the tsunami waves from Indonesian region to reach east coast of India. This time is sufficient to organize suitable mitigation and administrative measures.

The second point discussed by Dimri[1] is about the verdict of an Italian court with respect to the L'Aquila earthquake. The L'Aquila region was experiencing small magnitude earthquakes before the event. Local population was apprehensive and was expecting an earthquake to strike. The Italian Government sent a committee to assess the seismic situation. The committee examined the site and then announced that there is no possibility of earthquake occurrence. Within one week of this announcement an earthquake occurred and killed about 300 people. Local people filed a criminal case of manslaughter on the scientists and the court convicted them to six years imprisonment[3]. The Italian case is presently being lodged in higher court. As discussed by Balaram[4], the interaction between science and law would increase in future. The medical profession has been experiencing legal battles and tangles for long. Failure of any engineering system or machine had also attracted legal provisions and some legal cases against engineers.

An example from 2006 about Dibrugarh earthquake prediction would illustrate

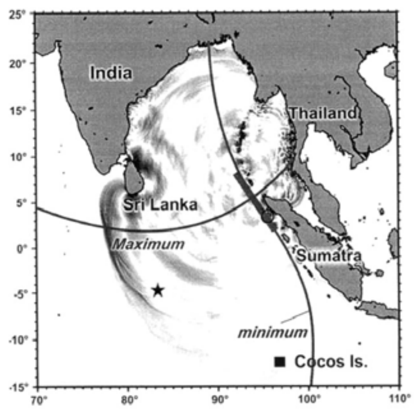

Figure 1. Total rupture (thick line) during 26 December 2004 earthquake. The location of Nagapattinam is almost at right angles to the northwestern end of the rupture.

the prediction fiasco. On 8 September 2006 at 0822 h, the Assam Government in particular and the entire nation in general was comforting in a tension-free zone. A geologist from Madras University had predicted the occurrence of magnitude 7.0–8.0 earthquakes near Dibrugarh. In haste to perfection, the scientist had observed that the epicentre of the earthquake would be at a distance of 15 km SW of Dibrugarh. Earthquake occurrence time was given as 0821 h. This observation triggered a wave of fear psychosis and resulted in panic. The Assam State Disaster Management Authority (ASDMA) was on its toes. Schools, colleges, departments, police and other administrative machinery were busy in planning action for any seismic contingency. The electronic media, as usual, gave extensive, unwanted and disproportionately amplified coverage to the so-called scientific prediction. But the earthquake did not occur and the situation turned to normal. At that time some scientists had advocated legal action against the scientist. But no action was initiated or taken.

Whether the prediction of earthquakes attracts any legal provision or whether some legal provision is required to be introduced in the present administrative system needs to be examined. Should this be limited to earthquakes alone or should it cover other natural calamities such as floods, tsunamis, cyclones and cloud bursts? The recent case of devastation in Uttarakhand gives some latent meaning to forecasting. India Meteorological Department (IMD) issues weather forecasts about heavy rainfall one or two days before the event. But till that time (even at present to some extent) the IMD weather forecasts are grotesque and somewhat vague, e.g.. '…there could be heavy rainfall at few places in Himachal Pradesh, Uttarakhand and parts of J&K, Punjab and Haryana…'. Most of the forecasts are primarily based on statistical probability. The predictions are always probabilistic and never deterministic. Bringing the element of precision in forecasting is difficult. One of the major reasons is that the number of observational points is limited over an extensive large area. The length of the fault or of a river is of the order of hundred kilometres, whereas the observational points are of the order of few metres.

India has several institutes, universities and researchers in the field of earthquake. Various funding agencies should come forward to provide grants for earthquake prediction research. Another obstacle is that a number of administrators, engineers and scientists feel that earthquakes cannot be predicted. This ad hoc assumption needs to be wiped out totally if we want to save the lives of people.

Considering the legalities of the L'Aquila earthquake and the Uttarakhand tragedy, and keeping in view the high seismic status of Himalayan states, scientists, academicians, legal experts and administrators must jointly discuss the issue of natural disaster forecasting and also about legal provisions required to be made for forecasting. The ultimate and final aim of such deliberations should be to save human lives during earthquakes and other disasters.

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Genetic diversity of taro (*Colocasia esculenta* L.) in Mon district, Nagaland, needs attention for its conservation

Mon district in Nagaland, the 'Land of Anghs' is recognized by the Planning Commission of India as one of the most backward districts of the Indian subcontinent. It lies between 26°34′–26°45′N lat. and 94°45′–95°15′E long. It is inhabited by the Konyak tribe occupying a geographical area of about 1786 sq. km and having a population of 250,671 (ref. 1). More than 90% of the population depends on agriculture for its livelihood and jhum (shifting) cultivation is the principal agricultural practice. The district situated in the Indo-Burma region, is the centre of origin of many plant species, of which, taro (*Colocasia esculenta* L.) is one of the important aroids that ranks as the 14th staple vegetable in the world[2]. It is one of the important staple foods of the Konyaks, next to rice. The leaves, petioles, corms and cormels are edible[3], which are rich in carbohydrates, starch, dry matter, minerals and vitamins[4].

Taro belongs to the family Araceae, called as 'tang' by Konyaks, and is cultivated in an area of about 860 ha with an average annual production of 8140 MT (ref. 1). There exists a rich genetic diversity of taro in Mon district that includes edible landraces (*antiquorum* and *esculenta* types), viz. Baishi, Nalon, Tungmei, Pakthung, Yaupe, Pungmantung, Kungnyak, Tuncho, etc. and wild types. In this region, the diversity in taro has evolved through natural process and the available genetic resources have been maintained by the farmers, generation after generation. Over the years, the farmers have identified many landraces or varieties suitable to different land-use systems. Apart from homestead cultivation, taro is cultivated in large scale in jhum fields (Figure 1 *a*) as a mixed crop along with paddy/maize. Normally sowing of the crops is done during January–February. All the landraces of taro are mixed together during planting and the farmers have knowledge that they have inherited to identify a particular landrace amongst the population. The harvesting of taro is carried out during August–December depending upon the maturity of the landraces and thereby meets the food and nutritional requirement of the locals.

The landraces available in the farmers' field, homestead gardens and forest areas vary in their yield (50–650 g/plant), moisture content (60.21–87.14%), dry matter (12.86–39.79%), starch (17.30–32.14 g/100 g) and total sugars (3.3–8.9 g/100 g). All the plant parts