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Seismic activity in Indian region

One of the objectives of seismological research is to help in earthquake disaster mitigation. This is done by (a) understanding the nature of earthquakes and the causes of seismicity (b) study of propagation of the seismic waves in Earth's heterogeneous media and (c) study of the characteristics of ground motions. Such studies provide inputs to improve earthquake-resistant engineering designs.

As far as study of seismic waves is concerned, one is generally familiar with the P and S body waves as well as surface waves. Seismic coda refers to the long time tail visible in the record of seismic waves due to regional earthquakes. It has been known empirically that this tail decays exponentially with a rather large time scale, than the travel time of 'direct' waves from the epicenter to the detection point, reaching levels of seismic noise ultimately. The coda contains frequencies from 1 to 20 Hz.

Studies by Aki and Chouet, by Sato and by Herrinz *et al.* led to the concept that seismic coda are waves scattered singly from inhomogeneities in Earth's crust. However, recent numerical studies and quantitative seismology suggest multiple scattering. Multiply-scattered waves are sensitive to changes in media through which the waves pass. Efforts are underway to develop suitable theories to infer these changes from the change in the coda waves.

'The decay coefficient of the energy contained in the coda, referred to as coda Q-factor is a regional constant dependent on frequency but independent of distance, depth and magnitude of the seismic source'. An estimate of Q (= Q_c, called, the quality factor also), is determined from coda waves which are less sensitive to local path effects than direct waves.

S. C. Gupta and Ashwani Kumar (**page 407**) report results of their studies of seismic wave attenuation in Garhwal Himalaya, Koyna and Northeast India. The coda associated with local earthquakes and an earthquake of August 1988 have been used to estimate Q_c, using the single back-scattering model of Aki and Chouet. They have discussed the nature of attenuation of the coda in the three regions and made a comparative study of the same in different parts of the Earth. Results are discussed taking into account frequency dependence of Q_c. Spatial variations in attenuation of seismic waves have potential impact on spatial distribution of ground shaking and such information are essential for construction of seismic hazard maps. Digital data recorded on closely-spaced stations are still not substantial in India. Thus, we may end up having some idea of regional attenuation (as reported here), but only through more data, these models can be fine tuned for use in seismic hazard maps.

K. R. Rao

Traditional knowledge and bio-piracy

Any society is based on values and norms built over generations. It is accumulated knowledge that comes to be known as tradition. Thus, 'bio-piracy' in the form of a patent on turmeric powder accorded to a company outside India by the United States Patent and Trademark Office is akin to desecrating a temple of its main idol.

Ethnobotany was practised by several ancient societies and was need-based. Common cures for ailments were required on a day-to-day basis. The need was so acute that some of these were adopted as part of food in the form of spices.

India suitably thwarting the grant of a patent to turmeric has lent a much desired respect that an 'ancient science' deserved from a 'modern science'. This will hopefully go a long way and the scientific society of the 21st century will record the traditional knowledge of India and perhaps other countries.

The turmeric case began with an application for a patent on the 'use of turmeric in wound healing' and was successfully challenged by the Council of Scientific and Industrial Research (CSIR), Government of India. This challenge has benefited in protecting Indian traditional knowledge on the world stage. It has also led to questioning and highlighting the recording of traditional knowledge in India.

Sangeeta Udgaonkar (**page 413**) has scrutinized the recording of traditional knowledge in the existing patent system. In light of the turmeric case, an analysis of the required changes in the law has been discussed to prevent recurrence of 'bio-piracy' in the future. The author discusses the legal framework involved and the conditions that need to be fulfilled while granting a patent such as novelty, an inventive step and industrial application.

The article also discusses the best ways to incorporate within the present patent system, the preservation of the intellectual property rights of local people from 'bio-piracy' while transferring to them the economic benefits. Also, there are legal obstacles with the insufficiency in the patent system arising from the vast strides made in new areas such as biotechnology. Problems that these pose *vis-a-vis* 'knowledge obtained from traditional sources' according to the authors fail in the condition of 'novelty' as the knowledge is in the public domain. The other problem that exists is the unavailability of a database and detailed documentation on traditional knowledge. This has been initiated in the form of the 'Traditional Knowledge Digital Library' and also the 'Peoples Biodiversity Register' according to the author. These when they become available in the future to patent offices worldwide would help eliminate the possibility of 'bio-piracy'.

The author also brings into focus the utility and limitations of such a database while cautioning that it should incorporate certain conditions 'regarding access and benefit-sharing within the database structure'.

However the article deals only with traditional knowledge concerning plants, animals and microorganisms. Other forms of knowledge that could come under the purview of 'traditional' such as arts, crafts, etc. are not taken up by the author as these require consideration under a separate legal framework.

Nirupa Sen