isolated. We can hardly conceive of any political topic the material of which does not prejudice social interpretation, and what is most obvious is that social progress depends in a large measure upon the political acts and policies of statesmen, while both are sustained by the inventions and discoveries of science. Our inability to determine the future trends of human affairs is mostly due to our lack of faith that the progress of social science must be a solvent of most of the economic maladjustments and because we do not maintain the courage and spirit of adventure, so successfully employed in the realms of science, in the political and administrative fields, we are confronted with widespread social and political disappointments.

It seems to us that the Indian Science Congress which enjoys a high prestige in the country should convene a conference of scientists in India for inaugurating a department with the ostensible object of exploring the possibilities of extending scientific methods to the study of social problems. Science has too long been divorced from society, because of the idea that the province of science is matter, and the human sciences like biology, sociology and economics had not acquired the status and importance of the physical sciences. The consequence has led to a dreadful state of affairs where the physical and the moral are indistinguishably mixed up in the social conditions. It becomes increasingly clear how hopeless it is to disentangle them and establish new trends in society whose development has been permitted to grow ever more confused and chaotic. The new age of liberalism which has emerged from that of traditionalism must obviously create dynamic changes in the whole social framework, but the impulse of expansion is restricted to special groups which discovered the inadequacy of the traditional mode of moulding character and mind. The changes have now overtaken the masses without being prepared to profit by their results. This unbalance in the social structure must account for all its ills. Have the scientists any technique or formula for their solution? While the social legislator should possess a clear and far-sighted vision of the kind of society he would bring into being, the social scientist should have knowledge to control and direct its tendencies. Science ought to be able to offer answers to questions which governments might ask for their solution and unless a symbiotic relationship is established between social sciences and statecraft, society must drift perhaps on a down-hill course. The infusion of a scientific temper into governance might remove the fanaticism and arrogance of injudicious zealots, "transforming the blaze of passionate propaganda into a cool grotto where people would humbly investigate economic facts and social conditions – which would render the politician sufficiently uncertain about his own conclusions to respect the honest convictions of those with whom he differs".

The Congress is most favourably endowed for bringing to bear upon society the broadening and stimulating effects of science, and its realization that the immediate purpose of science is the ordered progress of society, ought to lead to a revision of the Congress programme of functions so as to bring it into intimate touch with the social thoughts and reactions of the body politic.

SCIENTIFIC CORRESPONDENCE

Experimental forecasts of all-India summer monsoon rainfall for 2002 and 2003 using neural network

Alternative modelling and forecast methodology can complement/improve forecasts of complex atmospheric and oceanic processes by conventional method through enhancement of the range, scope and quality of forecasts. A very relevant example is long-range forecasting of monsoon rainfall; accurate long-range forecasting of monsoon rainfall can have manifold benefits for the country, from crop planning to power generation to policy planning[1]. However, conventional techniques still do not have adequate skill at long-range forecasting, especially at longer than a season. It was to address this issue that an alternative forecasting technique using neural networks[2] (NN) was explored by the author and his collaborator. However, the skill of conventional NN for forecasting rainfall was found to be inadequate; a generalized NN, termed cognitive network (CN) was designed and evaluated[3] for forecasting all-India summer monsoon rainfall (ISMR). The principle and the design of cognitive network (CN) were adopted from a generalization of conventional NN; in particular, a CN also carries out a cognitive summation in addition to conventional neuronal summation. Cognitive networks have proved to be a successful tool for generating long-range forecasts of all-India summer rainfall (ISMR). Hindcast experiments for more than 70 years of ISMR showed CN to have significant hindcast skill[3,4].

Using a 3-layer (input layer, hidden layer, output layer) CN configuration, the author and his collaborators have generated experimental forecasts of ISMR for the past seven years. It is noteworthy that all these experimental forecasts, generated well ahead of the season and several of them two seasons in advance, have been fairly accurate[4,5]. This is all the more remarkable since years like 1997, characterized by the presence of a warming event over the Pacific, were expected to be deficit monsoon years. Table 1 compares the observed and the predicted values of ISMR for the years 1995–2000. The basic data for ISMR used in these experiments have been received from the rainfall data published by Parthasarathy *et al.*[6].

The single scientific motivation behind generating and publishing these experimental forecasts has been to carry out an objective field evaluation of the proposed method. One of the major drawbacks of NN (or, specifically CN) simulation is the absence of an (obvious and conventional) causal (dynamical) picture. The chief merit of the methodology therefore has to be derived from its forecast skill. The experimental forecasts, generated and published well ahead of the season, can help to build up a (statistically) acceptable estimate of the reliability and the skill of the method.

With this philosophy, we record here our experimental forecasts of ISMR for the years 2002 and 2003 (Table 2).

The experimental forecasts recorded here is an ensemble average; the ensemble forecasts are generated by changing certain configurational parameters of the CN. The error bars in Table 2 thus represent ensemble standard deviations. The long-period mean ISMR adopted here is 887 mm.

Thus, as per criteria of India Meteorological Department, both the years 2002 and 2003 are likely to be normal monsoon years. A peculiarity of the forecasts presented here is worth noting: observationally (over the past hundred years or so), the longest spell of consecutive normal monsoon years is 13; we are thus at the edge of a shift to draught/excess year. However, our forecasts for both 2002 and 2003 are quite close to the long-term mean. It is worth emphasizing, however, that our forecasts are precise numbers with error bars as indicated. In other words, if the monsoon is normal, our forecasts may still be erroneous if the difference between the observed and the predicted values differed significantly from the indicated error bars.

We want to re-emphasize that the sole purpose of these experimental forecasts is to develop an objective and robust estimate of the skill of the CN forecast; they are not meant for any operational or commercial use. The CN model employed here uses only past ISMR as a predictor and, in that sense, is quite simple. However, the goodness of such a model has to be judged from its forecast skill, and not necessarily from its complexity. On the other hand, however, none of the years of experimental forecasts has a departure of more than one standard deviation of the observed data. Thus the skill of CN for large departures is yet to be proved in field evaluation.

Table 1. A summary of performance of CN forecast

Year	CN forecast†	Observation†
1995	98	110
1996	95*	103
1997	98	102
1998	107*	106
1999	98	96
2000	91*	92
2001	95–97%	91

*Forecast made 2 – seasons in advance, i.e. 1996 forecast made before 1995 monsoon.
†Percentage of mean: Mean ISMR adopted in this table = 887 mm.

Table 2. Experimental CN forecasts of ISMR for 2002 and 2003

Year	Rainfall (mm)	Percentage of long-period mean (%)	Error limit (%)
2002	869	99	3
2003	919	104	4.5

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A new record of a pterosaur from the Early Cretaceous of Korea

Pterosaurs are unsuitable for fossilization and are very rare in fossil records because their skeletons are fragile and are not preserved well[1–3]. The record of pterosaurs is represented by generally isolated, disarticulated and incomplete bones, but they have been discovered on all major land masses[4]. The Upper Triassic and Jurassic rocks have yielded a number of well-preserved pterosaurs, including *Dimorphodon*, *Rhamphorhynchus* and *Pterodactylus*, while the Cretaceous period has produced poorly preserved species such as *Dsungaripterus*, *Pteranodon* and *Quetzalcoatlus*[3].

South Korea reported the first pterosaur tracks in Asia and the largest tracks on record[5]. More than 4000 pterosaur tracks and the fragmentary remains of a pterosaur were discovered from the Uhangri Formation (Campanian) of the Late Cretaceous in South Korea[6]. However, the major portion of the fragmentary skeleton is still buried and not described as yet[7].

An isolated pterosaur bone was collected from the lacustrine Early Cretaceous Hasandong Formation (Hauterivian–Barremian) in the Gyeongsang Supergroup of South Korea. The