to be accepted unquestioningly rather than be understood for their internal contradictions and uncertainties. Teaching takes the same dogmatic route.

8. A subdued version of this same experiment may be carried out using high school students of 14–16 years age without a significant loss of content.
9. This is in spite of the fact that the experiment does involve a lot of effort and tends to be viewed not as biochemistry/biology experiment by fellow teachers. I am yet to come across a statistician who believes that the experimental component of biology is any of their concern in teaching.
10. A disclaimer is perhaps now in order that the problem does not refer to any actual instances and any resemblance to reality is purely a coincidence.
11. Following the well-known aphorism 'a barber is one who shaves every one except himself'.
12. It often comes as a revelation that there is no absolute measurement and even that a measurement need not be far better than what the conclusions warrant.
13. Often one needs to estimate the concentration of protein/glucose in an unknown sample. The standard way to do it is to prepare solutions with known concentration, and measure some property, which is usually the absorbance. The plot of absorbance (*Y* axis) vs concentration (*X* axis) is known as the standard curve.
14. It is interesting that the author never came across a paper that critically tested whether the point of intersection of the reciprocal plots to detect the order of the reaction was actually above or below the line ($1/v = 0$). It is the faith and not the substrate that can reach a concentration of infinity readily.
15. Throughout the text, I deliberately omitted commonplace statistical definitions and equations to emphasize the need for intuitive understanding. Nearly everything here and much more is available in any primer on statistical methodology, except the motivation to open these pages.

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SCIENTIFIC CORRESPONDENCE

Experimental annual forecast of all-India mean summer monsoon rainfall for 1997 using a neural network model

Accurate long-range forecast of rainfall can help in improved planning of agricultural strategies as well as in crisis (e.g. drought) preparedness. However, conventional methods for such forecasts, based on either statistical or dynamical methods, have limited skill in long-range prediction of monsoon rainfall. This is particularly true for prediction for longer than a season in advance. Although some of the statistical models have shown considerable skill in forecasting Indian summer monsoon rainfall (ISMR)[1], their range does not exceed a few months. Besides, most of these statistical (regression) models require a number of observed parameters, many of which are not available until before onset. This has been one of the major obstacles in attempts to generate very long range (VLR, one year or more) forecasts of monsoon rainfall.

In an attempt to develop an alternative successful methodology for generating VLR forecast of ISMR, the technique of neural networks was explored[2]. The usefulness of neural networks for simulating atmospheric process has been emphasized in recent years[3]. However, extensive experimentation and evaluation revealed the conventional neural networks to be inefficient to generate VLR forecasts of ISMR with skill and consistency. However, it was shown in a recent work that a generalization of the structure of a conventional neural networks, termed cognitive network (CN), has the potential for generating VLR forecast of ISMR with good accuracy[2]. Subsequently an extensive statistical evaluation of the performance of CN was carried out by generating 73 hindsets for the period 1821 to 1993 for different test cases. Results of these analyses, presented elsewhere[4], show that the CN can generate annual forecast with average (over 73 cases) error less than half the standard deviation of the data, with absolute error about 36 mm. Encouraged by these results, an experimental annual forecast of ISMR was generated for 1996 using this method as 866 mm.

These forecasts were generated using ISMR data for 50 years prior to 1995 taken from Parthasarathy *et al.*[6]. The forecast for 1996 was 866 mm, which is about 102% of the mean of the 120-year data used in our study. The corresponding observed value is also 102%, indicating an excellent agreement of our experimental forecast with observation. However, it should be mentioned that the (yearly) normal used by the India Meteorological Department is somewhat different from the simple 120-year mean considered by us[7]. The purpose of this note is to record experimental forecasts generated by us for 1997 and 1998, as 846 and 945 mm respectively.

The purpose for generating forecasts for 1997 and 1998 is that it will contribute to an objective evaluation of both the skill and the range of the forecasts.

It should be mentioned that both the forecasts for 1997 and 1998 (and previously for 1996 as well) were generated as an average of an ensemble of forecasts for the respective year. These ensembles were computed by generating a large

Table 1. Experimental annual forecasts for 1997 and 1998 from ensemble forecasts

Configuration	Iteration in 1000	Forecast rainfall in mm 1997	1998
	5	860	946
	10	862	949
	15	861	947
A	20	860	944
	25	863	942
	30	864	943
	35	863	945
Mean (mm)		862	945
Standard deviation (mm)		1.5	2.8
	5	863	946
	10	865	949
	15	859	948
B	20	860	941
	25	863	943
	30	866	945
	35	864	939
Mean (mm)		863	944
Standard deviation (mm)		2.4	3.4
	5	860	944
	10	863	940
	15	864	945
C	20	865	949
	25	865	946
	30	866	943
	35	865	948
Mean (mm)		864	945
Standard deviation (mm)		1.9	2.8
Final mean (mm)		863	945
Final standard deviation (mm)		2.1	2.8

number of forecasts for each year by varying the number of iterations. The network configuration, as well as other network parameters were identical to those used for statistical evaluation of the network for 73 hindcasts. The range of iteration itself was determined as that which provided the best result (minimum absolute error) in case of the 73 hindcasts. For clarity of presentation and to indicate the dispersion (standard deviation) of the forecast with the number of iterations, we present in Table 1 the mean and the standard deviation of the ensemble forecast, for three network configurations. The experimental forecasts quoted here are the final mean of all these ensemble forecasts. The (mean) standard deviation of the forecasts thus provides a measure of precision of our forecasts.

Once again we want to emphasize that this forecast is a purely experimental one, to provide an objective evaluation of the forecast skill of our method; it is thus not meant for any operational use. A general weakness of the method is that it often fails to capture very large (more than twice the standard deviation) departures from the mean, a weakness shared by most statistical methods. It should be noted that 1997 is also predicted to have a normal monsoon, which will be the tenth consecutive normal monsoon. In contrast, 1998 is predicted to have an excess monsoon. It will be interesting to check next year how our forecast compares with observations.

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Temporal variation in gravity field during solar eclipse on 24 October 1995

Solar eclipses provide an unique opportunity for the study of celestial phenomena such as different parts of the sun like corona and chromosphere, its atmosphere and their interaction with the earth and its atmosphere. The solar eclipse on 24 October 1995 starting from sunrise at Iran and ending at sunset at the Pacific Ocean provided a 46 km wide strip for approximately 1800 km in India from Neem Ka Thana (Western Rajasthan) to Diamond Harbour (West Bengal) where total solar eclipse was observed for some time between 7.22 am to 10.30 am (ref. 1). This solar eclipse was unique in several ways due to social consciousness and several scientific experiments were conducted which provided several interesting results[2].

During this period of solar eclipse, we happened to be at Dhoraji (21°44′; 70°27′;