matters arising

February–June weather relationships in Norway

GREEN[1] claims that the empirical prediction technique can be useful in the development of long range weather forecasting. Empirical methods of long range forecasting sometimes follow the discovery of relationships between observations made at different times and places. Though I agree with Green that there seems to be no reason not to use the relationships in prediction, even though the physical mechanism behind them is not fully understood, some precautions must, nonetheless, be taken. If empirical correlations are to be of any value in weather forecasting, correlation coefficients ought to be considerably larger than the significance levels.

Green illustrated his idea using as an example the correlation between February and June temperatures at Dalen in Norway, between 1940 and 1974. He claims that a cold February will be followed by a warm June. Figure 1, however, shows that points are quite scattered.

An analysis of observed winter and summer temperatures in Scandinavia indicates that no correlation exists that can be useful for a forecast model. Fairbridge[2] has given differences between July and preceding January temperatures in Stockholm from about 1750. The data indicate a decline in amplitude during the nineteenth century, but a marked increase in recent years.

Table 1 shows the results of a correlation analysis of monthly temperatures at Dalen in Norway. The significance limit is based on a confidence level equal to 95% in the Student's t distribution, and the coefficient is given only when it exceeds the significance limit. For the complete series, 1890–1972, there is no significant correlation between the February–June temperatures. Only by considering a shorter period back from 1972, can a significant correlation be found. Nor is the correlation between the lowest and the highest monthly temperature in the year significant. Similar results have been found in Oslo and Hellisøy.

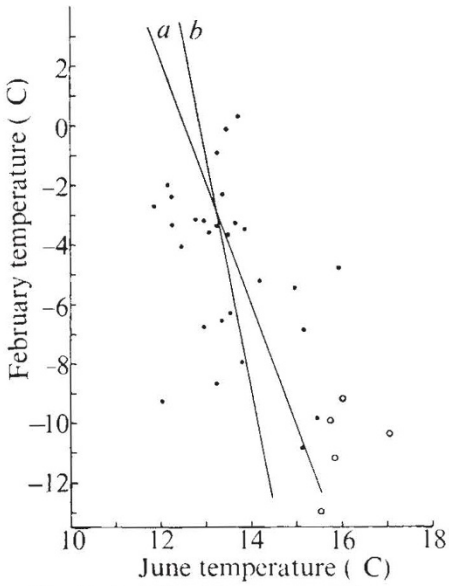

Fig. 1 Relationship between February and June temperatures at Dalen, Norway between 1940 and 1972. *a*, Computed from February–June temperatures for the period 1940–72; *b*, based on the same temperatures except those indicated by circles, showing that the negative correlation depends strongly on a few extreme temperature conditions.

Table 1 Empirical correlation coefficients for monthly temperatures at Dalen, Norway, between 1890 and 1972

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
January	1.00	0.52	+	+	—	—	+	+	+	+	—	—
February		1.00	0.30	0.30	—	—	+	—	+	+	+	—
March			1.00	0.48	+	+	+	—	+	+	+	+
April				1.00	0.39	—	+	+	+	+	—	+
May					1.00	+	+	+	+	—	—	+
June						1.00	+	+	0.23	+	—	+
July							1.00	0.42	0.22	+	+	—
August								1.00	0.36	+	+	+
September									1.00	0.29	+	—
October										1.00	+	—
November											1.00	0.37
December												1.00

* Significance limit r_s 0.22.

In Britain[3] and Norway, the monthly rainfall and temperature are correlated positively in winter and negatively in summer. If a negative correlation between February and June temperatures exists, a positive correlation between February temperature and June rainfall can be expected. An analysis of June rainfall and the temperature of the preceding months for three different places, Oslo, Dalen and Bergen reveals no significant correlation except for February temperatures in Bergen, in which the empirical correlation coefficient is just on the significance level.

I conclude that there is no statistical evidence that the winter temperature is a useful element in forecasting the summer temperature and rainfall for the same domain.

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1 Green, F. H. W., *Nature*, **253**, 522–523 (1975).
2 Fairbridge, R. W., *Encyclopedia of Atmospheric Sciences and Astrogeology*, 205–211 (1967).
3 Murray, R., *Met. Mag., Lond.*, **96**, 141–145 (1968).

Development of visual acuity and the sensitive period

WE have read with interest the article, by Freeman and Marg[1]. Their observations that there is a significant change in the response of the visual system of the kitten to spatial gratings with age are not unexpected from the results of our study of the optical properties of kitten's eyes. We question, however, their contention that, on the basis of their ophthalmoscopic observations, "it is unlikely that optical factors limit the acuity determined for younger animals." As evidence to the contrary, we submit the following.

Photographs of the fundus of the same kitten 11, 18, 25 and 32 d after birth are shown in Fig. 1. These photographs were made with a Zeiss fundus camera and accurately demonstrate the hazy media one encounters in kittens for the first 5 weeks of life. This haziness results from the scattering of light by the cornea which is not optically clear in the first 3–4 weeks of life, the tunica vasculosa lentis and by particulate material in the vitreous, much as is seen in premature infants (A. McCormack, personal communication). The tunica vasculosa lentis disappears between days 30 and 35 of life and not before day 23 as contended by Freeman and Marg. To quantify the