was M-1761 of Dow Chemical Co. containing Fe 2·9%, Zn 1·45%, Mn 1·45% and Cu 0·8%.

The treatments along with the data on root growth presented in Table II indicate that inhibitory effect of CCC at 500 ppm on root growth can markedly be minimised by addition of GA (50 ppm) or micronutrient solution containing 10 ppm level of Fe.

TABLE II

Treatment	Root length (mm.)	% over control
Control	22·9	100·0
CCC 500 ppm	13·6	59·3
CCC+GA	21·7	94·8
CCC+Micronutrient	19·4	84·7
GA alone	35·6	155·5
Micronutrient alone	30·8	134·5
C.D. (0·05)	7·9	–

The inhibition of root growth under CCC may presumably be due to destruction of growth-promoting auxin or enzyme. The fact that the promotion of root growth by addition of GA in presence of CCC may be attributed to inactivation of enzyme system but not auxin as the GA cannot act in the absence of auxin.[4,5] The recovery of inhibitory growth of CCC by the addition of micronutrient suggests that the effect of CCC is more on inactivation of heavy metal catalysed enzymic systems than destruction of auxins of the root tissue.

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ROCK ATTENUATION AND INTERNAL FRICTION AS A FUNCTION OF FREQUENCY

IN order not only to perform realistic seismic computations but also to make valid assessments of the elastic moduli of rocks using wave transmission methods, it is necessary to know how wave attenuation varies with frequency. An associated problem concerns the relationship between internal friction and frequency in rocks.

Without citing individual references, earlier conclusions as to these relationships have been based on broad extrapolations from seismic, field and laboratory data *derived over individually limited ranges of frequency.* In order to be able to express these generalised relationships quantitatively with a higher degree of confidence, we have accumulated our own and other published data (recalculated and reconstituted where necessary) and have conducted hitherto unpublished experimental work in order to cover a very wide frequency band extending from the lower limit of recordable seismic frequencies (around 10^{-3} c/s.) and well into the upper ultrasonic range (10^8 c/s.).

The detailed arguments and analytical techniques are being published at length elsewhere. Meanwhile, the main quantitative relationships that have emerged from the statistical analyses are as follows:

(*a*) *Seismic R-wave: 44 coordinates from 14 authors*

$\gamma = 5\cdot835 \times 10^{-3}\ f^{1\cdot005}$ Km^{-1}, $10^{-3} < f < 1$

$\alpha = 5\cdot068 \times 10^{-7}\ f^{1\cdot005}$ dB. cm.$^{-1}$, $10^{-3} < f < 1$

$r = 0\cdot835$ (42 degrees of freedom); condition that $0\cdot296 < r \leqslant 1$ is well satisfied.

(*b*) *'Field' and Ultrasonic (P-wave): 122 coordinates from 12 authors*

$\alpha = 1\cdot012 \times 10^{-5}\ f^{0\cdot911}$ dB. cm.$^{-1}$, $1 < f < 10^8$

$r = 0\cdot943$ (120 degrees of freedom); condition that $0\cdot178 < r \leqslant 1$ is well satisfied.

(c) If we take a statistically composite picture of this data (R and P) we obtain:

$\alpha = 1\cdot99 \times 10^{-6}\ f^{1\cdot0386}$ dB. cm.$^{-1}$, $10^{-3} < f < 10^8$

where:

α = spatial attenuation exponent,
γ = temporal attenuation exponent,
f = frequency,
r = correlation coefficient.

These analyses refer to data on sedimentary rocks only and show that the general assumption of wide-band linearity, frequency/attenuation, is justified. The constants are now being appraised with respect to current seismic records.

Q (reciprocal internal friction) values have been recalculated from published data referred to P,S,R,L, waves, the inherent difficulties (e.g.) dispersion and assumptions in the analysis being outlined in the longer text. Statistically, we are left with the relationship:

$$\bar{Q} = 213\ f^{-0\cdot015},\ 10^{-3} < f < 10^7$$

which of course suggests that, subject to the limits of current data availability, Q is virtually independent of frequency. Quantitatively, this mean figure of 213 for Q is of limited value due to the intrinsic sensitivity of the individual Q's to pressure and temperature. The result of the exercise does, however, support the often-made assumption in seismic analysis that Q is indeed independent of frequency.

This work was conducted as part of the rock mechanics programme at the Post-graduate School in Mining, at the University of Sheffield and our thanks are to Dr. A. Roberts, Director of Post-graduate School in Mining, for facilities and to U.K. Safety in Mines Research Establishment for financial assistance.

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ON UNUSUAL PHOSPHATE-PHOSPHORUS CONCENTRATION IN SURFACE SEA-WATER OFF THE COAST OF VISAKHAPATNAM

THIS note refers to the data on Phosphate-Phosphorus described in our paper 'Studies on diurnal variations in the hydrobiological conditions off the Waltair coast' during the 1958–59 period[5] off the Visakhapatnam coast. In the light of the additional information obtained on the distribution and seasonal changes of Phosphate-Phosphorus during subsequent years and also on board R. V. Anton Bruun of the U.S. Program in Biology under International Indian Ocean Expedition, we wanted to draw special attention to the unusual PO_4-P values observed at an inshore station during a 24 hour period on 24/25 February 1959.[5]

The highest and the lowest values for PO_4-P recorded at the inshore station during this period were 2·25 to 1·25 µg. at/L. These values may be considered rather high and unusual for the surface waters of the Bay of Bengal, for the monthly average values for the inshore waters off the Visakhapatnam coast range between 0·09 and 1·17 µg. at/L. It may also be mentioned that the monthly mean PO_4-P values during October 1958 to May 1959, when more than 30 diurnal cycles of variation were studied, was from 0·23 to 1·19 µg. at/L. It was also generally noticed that high tide brought in high phosphate values and low tide low values.

It is on record that on many occasions, however, the phosphate-phosphorus has shown high concentrations in the inshore waters of the Bay of Bengal. Values as high as 1·5 to 1·8 µg. at/L have been encountered in our work on the hydrography of the region. Ganapati and Ramasarma,[1] Ganapati and Subba Rao,[2] Jayaraman[3] and Ramamurthy[4] have all reported high values like 1·66, 1·37, 3·00 (once recorded) and 1·198 µg. at/L respectively. At the Visakhapatnam harbour one of the possible causes for high and irregular values is the periodical dredging of the harbour area. It may also be due to upwellings off the coast of Waltair.

When such high values are averaged to arrive at monthly mean values, the real picture of the distribution of the PO_4-P in the sea-water gets distorted. In our study we arrived at the monthly mean values by averaging the data collected during 12 observations in a diurnal cycle and 3 to 4 such diurnal cycles in a month. Consequently high values got smoothed out and as such the monthly mean values did not bring out the finer details of the PO_4-P distribution in space and time. This may be true for other factors as well. It is also possible to visualize the existence of 'patchiness' of concentrated phosphate-rich waters here and there in the sea and such waters and their significance will be missed when values are averaged or the data are collected at greater intervals of time and space. In fact the study on chemical and biological fluctuations during diurnal cycles[5] has shown that the daily range of variation of some of the factors was of the same magnitude as the annual range.

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A NEW SPECIES OF *UREDO* ON *HYGROPHILA*

THREE rusts have been previously described on species of *Hygrophila* (*See* Laundon, 1963), these are:

1. *Puccinia cacao* McAlp. is a heteroecious rust with pycnia and æcia on *Hygrophila* and uredia and telia on *Rottbœllia* (Gramineæ).