$$\frac{dk}{dp} = \frac{4k_0 + 4p/9}{k_0 + p/3}, \quad (4)$$

$$k = k_0 + 4p/3 + 8k_0 \log (1 + p/3k_0). \quad (5)$$

With equations (4) and (5) and the assumed values for the earth's interior, we can now construct the accompanying table, where the units of p and k are 10^{12} dynes/cm.

p	dk/dp	k	Depth
0	4	2	0
1	3·62	5·8	2,200 km.
2	3·33	9·3	3,500 km.
3	3·11	12·5	4,800 km.
4	2·93	15·5	centre

In the construction of this table, the assumption of Bullen's compressibility pressure hypothesis is implicit, and his values giving the variation of pressure with depth have been used to estimate the approximate depth. It will be noticed that there is a very good correspondence between the values of k obtained from equation (5) and Bullen's[3] values.

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An Extended Smith–Lagrange Invariant

It is well known in optics that, if μ_r is the refractive index of the rth medium of a co-axial system, h_r is the height of the image of a given object from the axis in the same medium, and α_r is the angle a selected ray makes with the axis at the image plane, then

$$\mu_r h_r \left\{ \begin{array}{l} \sin \alpha_r \\ \tan \alpha_r \end{array} \right. \quad (1)$$

is invariant (Smith–Lagrange invariant). The choice of $\sin \alpha_r$ or $\tan \alpha_r$ varies with different authors. The relation holds in all systems where $\sin \alpha$ and $\tan \alpha$ are indistinguishable.

The development of various two-stage processes of image formation[1], in which the wave-length may be altered between object and image, makes it profitable to consider whether the wave-length can be introduced. Since wave-length is inversely proportional to refractive index, the form :

$$\frac{\mu_r h_r \sin \alpha}{\lambda_r} \quad (2)$$

as invariant suggests itself. It is readily verified in the case of diffraction microscopy that this is correct.

Hopkins[2] has recently published a coherence criterion for a beam of circular cross-section :

$$\frac{\mu h \sin \alpha}{\lambda} = \frac{z}{2\pi} \ngtr 0{\cdot}16, \quad (3)$$

in which h and $\sin \alpha$ are capable of two alternative interpretations, one of which agrees with that of (1) and (2). Comparison with (2) shows at once that, if a beam is coherent in one image plane of a Gaussian co-axial system, it will be coherent in all other image planes. Thus coherence is conserved in such systems. Moreover, if the invariant (2) exceeds 0·16 in numerical magnitude, the degree of partial coherence has been shown by Hopkins to be $2J_1(z)/z$, and is still invariant down the system, though now imperfect.

The Smith–Lagrange invariant thus corresponds to the physical law that the degree of coherence is conserved from image plane to image plane in Gaussian systems.

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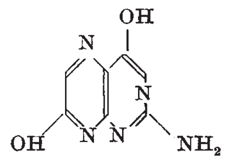
*Iso*xanthopterin

We have recently prepared *iso*xanthopterin (2-amino-4 : 7-dihydroxypteridine) by a new synthesis, namely, the condensation of triamino-4-hydroxypyrimidine with ethyl glyoxylate hemiacetal. The synthesis, purification and analysis will be reported in detail elsewhere. The ultra-violet spectrum of the product consisted of three peaks at the $\lambda_{max.}$ values previously reported[1,2], but the extinction coefficients were so much higher as to suggest that the samples previously examined contained no more than 80 per cent of *iso*xanthopterin. Our results are as follows (material dried at 150°, analysing as anhydrous, dissolved in 0·1 N potassium hydroxide).

$\lambda_{max.}$ (mμ)	ε	log ε
339	14,200	4·15
254	11,550	4·06
223	(38,000)	(4·58)



The ε at 223 mμ may be subject to a small error from stray light.

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