are also included for a better comparison and understanding. From this table the following conclusions may be drawn:

1. (*a*) In all the seasons except summer, there is a consistency in the T_2 values of equatorial stations (Bangkok and Ibadan), low latitude (Waltair), and high latitude (Churchill) stations, the T_2 value being around 0000 hrs. When the total four years period is considered, all the stations show that the semidiurnal component maximises around 0000 hrs, except at Ibadan where it shows a deviation of 1·9 hrs.
   (*b*) There is a consistent reversal in the case of semidiurnal component at mid-latitude station, Wakkanai, its value maximising around 0600 hrs for the total four year period and for the solstitial months.
2. There is no consistency observed in the times of occurrence of the maximum amplitude of the diurnal component.
3. Seasonwise, variations in P_2/P_1 do not show any consistency. However as the total data represent much larger sample than those used for individual seasons, the P_2/P_1 values for the total data indicate values of either one or more, suggesting the semidiurnal component is either equal to or greater than that of the diurnal component.
4. The lunar semidiurnal and diurnal components for Waltair show higher valeus than those for other latitudes.

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CRYSTALLOGRAPHIC DATA FOR THE MESOGENIC MATERIAL CHOLESTERYL BENZOATE

CRYSTAL DATA for $C_{34}H_{50}O_2$ are: orthorhombic $P2_12_12_1$ Z = 4; *a* = 10·14, *b* = 10·06 and *c* = 26·00 Å.

The derivatives of cholesterol which generally exhibit cholesterid liquid crystalline phase have acquired importance due to the biological implications and their unique optical properties. A knowledge of the molecular packing in the crystalline state of the materials generally determines the assembly of the molecules in the mesogenic state. A proper understanding of the physical properties requires a knowledge of the molecular structure. As such, we present here the preliminary crystallographic data for cholesterol benzoate, the crystals of which were obtained by successive recrystallization in acetone. The detailed structure analysis has been taken up as a part of a project. The material was obtained from Eastman Kodak Company, USA. The preliminary data have been obtained from oscillation and Weissenberg photographs taken about *a* and *b* axes of the long plate like crystals. The density was measured by floatation technique in a solution of potassium tartra e.

The preliminary data are tabulated below:

Unit cell dimensions	*a* = 10·14, *b* = 10·06, *c* = 26·00 Å
Volume of the unit cell	2652·22 Å³
No. of molecules in the unit cell	4

D_m = 1·231 gm/cc, D_{cal} = 1·228 gm/cc, MW = 490·75

Absent conditions *h*00 *h* = 2n+1, 0*k*0 *k* = 2n+1, 00*l* *ll* = 2n+1.

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THE EINSTEIN-GODEL UNIVERSE WITH AN ELECTROMAGNETIC FIELD

EINSTEIN static model of the universe is the simplest geometrical model for an isotropic and homogeneous universe. Another simple model for a homogeneous static universe is that of Gödel[1] which is not isotropic in the sense that the matter in the cosmos is rotating.

Vaidya[2] has obtained a metric which describes the combined Einstein-Gödel universe. It contains a parameter ϵ which is either 1 or − 1. When $\epsilon = 1$, it reduces to the metric of the Einstein's universe and when $\epsilon = -1$, it reduces to the Gödel's metric. The object of the present note is to study the incorporation of an electromagnetic field in the combined Einstein-Gödel universe.

We shall use the following field equations

$$R_{ik} - \tfrac{1}{2} g_{ik} R = -8\pi \left[(p + \rho)\, v_i v_k - p g_{ik} + E_{ik} \right] + \lambda g_{ik} \tag{1}$$

$$E_{ik} = -g^{lm} F_{il} F_{km} + \tfrac{1}{4} g_{ik} F_{lm} F^{lm} \tag{2}$$

$$F_{ik} = A_{i,k} - A_{k,i} \tag{3}$$

$$F^{ik}_{;k} = J^i \tag{4}$$

where a comma indicates ordinary derivative and a semicolon indicates covariant differentiation. The symbols occurring in the above equations have their usual meanings.

The metric of a solution of the above field equations has been obtained as

$$ds^2 = \epsilon dx^2 - \epsilon dr^2 + 2\epsilon Y dr d\beta = \frac{-Y}{4} \left[(1 + \epsilon)(4 + 8\pi C^2 R^2) - (1 - \epsilon + 8\pi C^2 R^2) Y \right] d\beta^2 - \left[\frac{(1 + 3\epsilon + 8\pi C^2 R^2) Y}{4(1 + \epsilon - Y)} \right] dy^2 \tag{5}$$

where Y is given by

$$Y = \frac{4}{1 + 3\epsilon} \exp \left[(1 + 3\epsilon + 8\pi C^2 R^2) \left(\frac{-y}{2R} \right) \right] \tag{6}$$

Here x, r, y and β are the co-ordinates used by Vaidya[2]. We take $x^1 = u$, $x^2 = y$, $x^3 = \beta$, $x^4 = x$. y and β are space-like co-ordinates. When $\epsilon = 1$, x is time-like and r is space-like. When $\epsilon = -1$, x is space-like and r is time-like. C and R are constants of integration and ϵ is a parameter such that $\epsilon^2 = 1$. The actual calculations for the metric (5) with (6) are straightforward and hence not given here.

For the solution described by (5) we have the following expressions for the pressure, density, the magnitude of the current 4-vector and the non-zero F_{ik} :

$$8\pi p = \lambda - 4\pi C^2 - \frac{\epsilon}{R^2} \tag{7}$$

$$8\pi \rho = -\lambda + 4\pi C^2 + \frac{2 + \epsilon}{R^2} \tag{8}$$

$$J^i J_i = -\frac{4C^2 \epsilon}{R^2}, \quad F_{23} = -\frac{C}{4}(1 + 3\epsilon) Y. \tag{9}$$

If we set $C = 0$ in the metric (5), the electromagnetic field disappears and we get the metric of the combined Einstein-Gödel universe discussed by Vaidya. Thus the metric (5) along with (6) represents the Einstein-Gödel universe with an electromagnetic field. We shall now discuss the two cases ($\epsilon = -1$ and $\epsilon = 1$. When $\epsilon = -1$, it is clear from (9) that the current 4-vector J^i is time-like. In this case if we choose the cosmological constant λ to be $4\pi C^2 - 1/R^2$, we obtain $p = 0$. Taking $J^i = \sigma v^i$ it is easy to see that the ratio σ/ρ of charge and mass densities is given by

$$\frac{\sigma}{\rho} = -8\pi C. \tag{10}$$

If we take $C < 0$, then σ/ρ becomes positive. In this case we obtain the solution discussed by Banerjee and Banerjee[3] describing a rotating charged dust distribution. If we put $C = 0$ in this solution, we get the Gödel's solution.

In the case $\epsilon = 1$, the current 4 vector J^i becomes space-like and hence represents magnetic lines of force. Using Linchnerowicz[4] equations of relativistic magnetohydrodynamics it can be seen without much difficulty that the metric (5) along with (6) and $\epsilon = 1$ represents Einstein's universe filled with perfectly conducting magnetofluid. If we put $C = 0$ in this solution, we get Einstein's universe.

Here it should be noted that the case of space-like 4-current arising in the class of type VIo cosmological models with electromagnetic field is discussed by Dunn and Tuper[5] and by Tuper[6].

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