It is expected that the use of polarized infra-red radiation will be of service in identifying absorption frequencies with particular modes of vibration of the molecule, and in correlating the direction of valence links with the external surfaces of oriented materials.

A. ELLIOTT
E. J. AMBROSE
Fundamental Research Laboratory,
Courtaulds, Ltd.,
Maidenhead,
Berks.
Feb. 28.

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A Spherically Symmetrical Non-Static Electromagnetic Field

WE have recently found the most general non-static solution of spherical symmetry satisfying the relativistic equations of electromagnetism, namely,

$$G_{\mu\nu} - \tfrac{1}{2}GJ_{\mu\nu} = -8\pi T_\mu^\nu, \quad . \quad . \quad (1)$$

where
$$T_\mu^\nu = -F^{\nu\sigma}F_{\mu\sigma} + \tfrac{1}{4}\delta_\mu^\nu F^{\alpha\beta}F_{\alpha\beta}, \quad (2)$$

$$F_{\mu\nu} = k_{\mu,\nu} - k_{\nu\cdot\mu}, \quad (3)$$

$$F^{\mu\nu}{}_{,\nu} = J^\mu, \quad (4)$$

in the usual notation[1]. The line element is

$$ds^2 = -(1 - 2m/r)^{-1}dr^2 - r^2(d\theta^2 + \sin^2\theta\, d\varphi^2) + \dot{m}^2(1 - 2m/r)/f^2.dt^2, \quad (5)$$

where

$$f \equiv f(m) = m'(1 - 2m/r), \dot{m} \equiv \partial m/\partial t, m' \equiv \partial m/\partial r. \quad (6)$$

The surviving components of the tensor T_μ^ν are four:

$$-T_1^1 = T_4^4 = m'/4\pi r^2,\ T_1^4 = m'^2/4\pi\dot{m}r^2,\ T_4^1 = -\dot{m}/4\pi r^2. \quad (7)$$

If we interpret T_μ^ν as

$$T_\mu^\nu = \rho v_\mu v^\nu,\ v^\mu{}_{,\nu}v^\nu = 0, \quad (8)$$

and define

$$\frac{d}{d\tau} \equiv v^1\frac{\partial}{\partial r} + v^4\frac{\partial}{\partial t}, \quad (9)$$

$$v^1 = \sqrt{f(m)/4\pi\rho r^2}, v^2 = 0, v^3 = 0, v^4 = -m'v^1/\dot{m}, \quad (10)$$

$$dm/d\tau = 0,\ dv^1/d\tau = 0,\ d(4\pi r^2\rho)/d\tau = 0. \quad (11)$$

Both ρ and $f(m)$ are arbitrary. We note that m is conserved along a line of flow.

It is interesting to note that there are several solutions of (3) and (4) consistent with (5). One solution is given by

$$k_1 = -\frac{m'}{\sqrt{(4\pi f)}}\cos^{-1}(\sin\theta\sin\varphi),$$
$$k_2 = 0,\quad k_3 = 0, \quad (12)$$
$$k_4 = -\frac{\dot{m}}{\sqrt{(4\pi f)}}\cos^{-1}(\sin\theta\sin\varphi).$$

$F_{\mu\nu}$ and J^μ can be readily calculated. Results corresponding to (10) and (11) follow for this interpretation of T_μ^ν. All such solutions and their details will be published elsewhere.

The line element (5) was first published by one of us[2] some years ago. A line element equivalent to (5) but not obviously so was obtained by Mineur[3] several years earlier. No attempt, however, seems to have been made to obtain the electromagnetic interpretation of the line element in terms of k_μ and J^μ.

V. V. NARLIKAR
P. C. VAIDYA
Benares Hindu University,
and
M.T.B. College,
Surat.
Feb. 13.

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Existence of New Types of Wakes Behind a Moving Body

A QUESTION which to me seems very interesting was posed by Dr. Christopherson in *Nature* of March 8, p. 345 : Can an approximate (numerical) computation establish either the existence or non-existence of a mathematical solution ? He was describing a recent use of relaxation methods to find new types of wake behind a moving body, and expressed himself as satisfied that these exist. But the paper which recorded these computations also recorded failure to discover behind a 'planing surface' a motion of the fluid involving waves. This failure had not been expected, and Dr. Christopherson concludes (as I think, rightly) that it should be regarded as a null result from an ideal experiment.

For my own part, though I believe in the existence of finite wakes, I should do so with less confidence if the only evidence were the solutions which Miss Vaisey obtained on the basis of finite differences; for if the down-stream junction had been one of two streams impinging at a small angle, then (as was remarked to us by Sir Geoffrey Taylor) a small 'splash' would have been directed upstream from the junction, and this might have been so small as to escape detection (its thickness might have been smaller than our mesh-length). On that account, in the paper, an argument for the existence of finite wakes was based on the 'membrane analogue' of inviscid motion. I think that a case was made; but what I should consider a more convincing argument would be some *exact* solution for a finite wake—and I am hopeful of finding one.

As regards the motion behind a planing surface, while agreeing with the view expressed by Dr. Christopherson I should, perhaps, correct his statement that what appears to be non-existent is a motion in which the depth is the same far upstream and far downstream of the plane. What we have sought without success is a motion involving waves downstream but not upstream. I do not think it would have been difficult to find a solution involving stagnation on both sides of the plane, and the same depth far away from it ; but this would have little importance, for it would also entail an infinite velocity at the trailing edge. It must be emphasized that our paper dealt with an *inviscid* fluid, in which results of this kind are acceptable mathematically, with other conclusions still less in accord with experience. All our solutions, for example, would *in theory* hold with the velocities reversed.

Our paper, being concerned with computation, did not seem to be the place for physical speculation ; but for my own part I suspect that friction plays an essential part in the production of waves