## Cultures of *Bacterium brunneum*

In connexion with some fundamental investigations on the removal of wool from sheepskins being carried out by the Council for Scientific and Industrial Research in Melbourne, we have made several endeavours to obtain a culture of *Bacterium brunneum*.

So far, we have been unable to locate a culture in any of the normal repositories such as the National Collection of Type Cultures, the American Type Culture Collection, the Pasteur Institute in Paris and the Bacteriology Department of the University of Pisa, and would like to ask the help of any of the readers of *Nature* who may know of or have a culture of the organism.

According to Bergey's "Manual", the organism was first isolated by Copeland[1] who called it *Bacillus brunneus*. Bergey *et al.* have transferred it to the genus *Flavobacterium* as *Flavobacterium brunneum* Bergey *et al.*

Assistance in this search will be greatly appreciated.

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[1] Copeland, Rept. Filtration Commission, Pittsburgh, U.S.A., 348 (1899).

## Unusual State at Birth of a Bat

During some recent observations on bats in Trinidad, B.W.I., an interesting variation from the normal state of young bats at birth was noticed. A pregnant specimen of *Artibeus planirostris trinitatis* K. And. (Phyllostomidæ) was under observation. Parturition occurred in the afternoon of March 9, 1945, and the young bat was closely examined within two hours and found to have its eyes open. As this seemed unusual, several further specimens of the same species were captured. These were all within a few days of parturition. The fœti were dissected out and examined, and it was found that these also had their eyes open.

This occurrence does not appear to have been recorded before for any family of bats. Dr. G. M. Allen[1], in his book on bats, summarized most of the published work on parturition and post-natal development of bats, but no mention of the above occurrence has been noted. Dr. H. B. Sherman, of the University of Florida, in a private communication, stated he knew of only one other case, which he observed recently occurring in *Tadarida cynocephala* (Molossidæ).

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[1] Allen, G. M., "Bats" (Harvard Univ. Press, 1939).

## The Two-body Problem in Milne's Theory of Gravitation

In a recent communication[1], Dr. Camm has answered Schild's contention[2], that Milne's theory of the gravitational interaction of two massive particles in the field of the substratum is not Lorentz invariant and hence either invalid or else dependent on an arbitrary additional principle. Camm has shown that: (1) the consequences of Milne's theory are independent of any particular simultaneity convention, Lorentz-invariant or otherwise; and (2) the choice of such a convention, if Lorentz-invariant, is much more restricted than Schild supposes. While the particular convention, arbitrarily chosen by Schild, is shown to be invalid, Camm gives plausible reasons for adopting the convention,

$$t_1^2 - \mathbf{P}_1^2/c^2 = t_2^2 - \mathbf{P}_2^2/c^2,$$

linking the event $(t_1,\mathbf{P}_1)$ at the particle $m_1$ with the event $(t_2,\mathbf{P}_2)$ at the particle $m_2$. A conclusive reason, however, can be given for imposing this condition uniquely, as the following argument shows.

Using the $t$-scale, according to which the substratum is described as expanding uniformly from a point source, Milne[3] discovered a Lorentz-invariant form for the mutual gravitational potential of two superposed particles, $m_1$ and $m_2$, namely,

$$\chi = -\frac{m_1 m_2 c^2 (t_1 t_2 - \mathbf{P}_1.\mathbf{P}_2/c^2)}{M_0\{(t_1t_2 - \mathbf{P}_1.\mathbf{P}_2/c^2)^2 - (t_1^2 - \mathbf{P}_1^2/c^2)(t_2^2 - \mathbf{P}_2^2/c^2)\}^{1/2}},$$

where $M_0$ is the 'fictitious mass of the universe'[4], the numerical value of which is taken to be (in the present state of our knowledge) about $2 \cdot 4 \times 10^{55}$ gm. As $\chi$ is invariant for each fundamental observer of the quasi-continuous substratum, it follows that

$$\chi = -\frac{m_1 m_2 c^3 t_1}{M_0 |\mathbf{P}_1|},$$

where $(t_1,\mathbf{P}_1)$ are the co-ordinates assigned to an event at $m_1$ by the fundamental observer with whom $m_2$ coincides at the (local) epoch $t_2$; for this observer, of course, $\mathbf{P}_2 = 0$. Hence,

$$\chi = -\frac{m_1 m_2 c^3}{M_0 |\mathbf{P}_1/t_1|} = -\frac{m_1 m_2 c^2}{M_0 |\mathbf{V}_{12}/c|},$$

where $\mathbf{V}_{12}$ is the uniform velocity of relative recession of the fundamental observers with whom $m_1$ and $m_2$ are (momentarily) coincident, respectively.

Using the $\tau$-scale, given by the clock-regraduation formula,

$$\tau = t_0 \log(t/t_0) + t_0,$$

it is easy to show[5] that the constant distance apart of $m_1$ and $m_2$ is $\lambda_{12}$, where

$$\tanh(\lambda_{12}/ct_0) = |\mathbf{V}_{12}/c|.$$

Hence,

$$\chi = -\frac{m_1 m_2 c^2}{M_0 \tanh(\lambda_{12}/ct_0)}.$$

This formula was first given by Milne[6], but the present derivation appears to be more direct.

The outstanding feature of this form of the gravitational potential is its apparent independence of the local epochs, $\tau_1$ (at $m_1$) and $\tau_2$ (at $m_2$), and hence of any explicit relation between them.

The characteristic property of the substratum, in $\tau$-time, is the co-existence of a public space and a public time, as in Newtonian physics. In examining any gravitational situation in the latter, it is usual to dissect the history of the system into a continuous set of maps recording 'world-wide' instants. In this way a meaning is given to the idea of conservation, for example, of energy. Similarly, in the gravitational situation considered here, the appropriate 'simultaneity condition' to impose, at least implicitly, is $\tau_2 = \tau_1$. This criterion is chosen freely, but the choice is unique and is not arbitrary. Reverting to $t$-time, it is easily seen[7] that, if $(t_1,\mathbf{P}_1)$ are the $t$-scale co-ordinates of the event $\tau_1$ at $m_1$, and $(t_2,\mathbf{P}_2)$ those of the event $\tau_2$ at $m_2$,

$$\tau_1 = \tfrac{1}{2} t_0 \log\left(\frac{t_1^2 - \mathbf{P}_1^2/c^2}{t_0^2}\right) + t_0,$$