

Abstracts of Australasian Ph D theses

Cosmological models with n fluids

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The aim of the thesis is not to study one particular cosmological problem in depth but rather to look at problems in a couple of areas of cosmology. There is, however, an underlying thread connecting these areas and this is brought out in the title: "Cosmological models with n fluids".

In Part I, an examination is made of general relativistic cosmological models with n fluids, each having an equation of state of the form $p_i = (\nu_i - 1)\epsilon_i$. Here p_i is the pressure of the i -th fluid and ϵ_i is the energy density of this fluid. Basic equations of the models are examined both when there is no conversion and when there is conversion between the fluids. Special emphasis is placed on 2-fluid models containing both radiation ($\nu = 4/3$) and matter ($\nu = 1$).

Part II contains discussion of a particular scalar-tensor theory which is a generalisation of Hoyle's original C -field steady-state model. Part III contains discussion of scalar-tensor theories which can be derived from variational principles, something which is not a property of the C -field theory. The scalar field is also interpreted in terms of a fluid with $\nu = 2$, $p = \epsilon$.

The field equations of Part III are then replaced by the corresponding particle equations, interpreted in terms of the Hoyle-Narlikar particle theory. These are generalised by the inclusion of particles with negative as well as positive inertias. It is then shown how these generalised particle equations play a very important role in

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that all the sets of tensor and scalar-tensor particle and field equations discussed in the thesis are special cases of the equations.

The following papers have arisen from the research for the thesis:

- C.B.G. McIntosh, "C-field cosmological models", *Monthly Not. Roy. Astron. Soc.* **134** (1966), 211-220.
- C.B.G. McIntosh, "A cosmological model with both radiation and matter", *Nature* **215** (1967), 36-37.
- C.B.G. McIntosh, "Cosmological models containing both radiation and matter", *Nature* **216** (1967), 1297-1298.
- C.B.G. McIntosh, "Cosmological models with both radiation and matter", *Monthly Notes. Roy. Astron. Soc.* **138** (1968), 423-436.
- C.B.G. McIntosh, "Relativistic cosmological models with both radiation and matter", *Monthly Notes. Roy. Astron. Soc.* **140** (1968), 461-472.
- C.B.G. McIntosh, "Relativistic analogues of scalar-tensor cosmologies", *J. Mathematical Phys.* **11** (1970), 250-252.
- C.B.G. McIntosh, "A generalised Hoyle-Narlikar particle theory", *Nature* **226** (1970), 339-340.