In particular for the commutative C^*-algebra $C(X)$ the dual symmetric manifold is the universal covering manifold of $F_X(\overline{C})$. We then show that the dual symmetric manifold of $C(X)$ displays the compact-type property of admitting only constant complex-valued holomorphic mappings. We conclude this section of the thesis by examining the concrete example $C(X)$ for X a compact subset of $\mathbb{R}$ and showing that the dual manifold in this case is given by $C(X, \overline{C})$.

The last chapter of the thesis examines the holomorphic curvature of the tangent norm of an arbitrary dual symmetric manifold (the tangent norm is a Finsler metric and holomorphic curvature is therefore different than in the Riemannian sense). We find that the dual manifolds have constant positive holomorphic curvature.

Pauline Mellon,
Department of Mathematics,
St Patrick's College,
Maynooth,
Co. Kildare.

Abstract of Doctoral Thesis

A NUMERICAL STUDY OF THE NON-LINEAR BAROTROPIC INSTABILITY OF FREE ROSSBY WAVES AND TOPOGRAPHICALLY FORCED PLANETARY WAVES

William M. O'Brien

This thesis was prepared in the NIHE, Limerick (University of Limerick) under the direction of Professor P. F. Hodnett and was submitted for the award of Ph.D. to the University of Limerick, July 1990.

The stability of free and forced planetary waves on a β-plane is investigated by integrating numerically the nonlinear quasi-geostrophic, barotropic vorticity equation on a grid-point model. It is shown that the exponential growth rate predicted by the linear model of Lorenz (1972) is accurate. However it is also shown that instability can occur for wave amplitudes $A < A_c$ in the nonlinear case where A_c is calculated using the linear model. When stability occurs for large A the perturbation undergoes exponential growth followed by a bounded oscillating behaviour. For small A the perturbation follows an oscillating pattern of growing and subsiding slowly over a long time period. This appears to confirm the analysis of Deininger (1982) and Deininger and Loesch (1982).

The effect of boundary conditions on stability is investigated by comparing the instability for a Rossby wave on a doubly periodic domain with the instability of exactly the same wave in channel. It is found that there is no significant effect on Rossby wave stability. The effect of changing the y dependence on the stability of a Rossby-Haurvitz in a channel is also investigated.

The nonlinear instability of topographic planetary waves on a doubly periodic *beta*-plane as well as in a channel is examined. In the former case an example of a system going form one equilibrium

state to another is found. Instability is studied as a function of various parameters. For a certain perturbation behaviour similar to that predicted by Deininger (1981) was found.

William M. O'Brien,
University of Limerick,
Limerick.

DERIVATIONS AND COMPLETELY BOUNDED MAPS ON C*-ALGEBRAS

A Survey

Martin Mathieu

The present paper summarises a series of lectures delivered at the Department of Mathematics of University College Cork in early spring 1990 which were supported by the ERASMUS programme. Aimed at the non-specialist, we intend to provide a general survey of the theory of completely bounded linear operators on C^*-algebras with a closer view of their relations to derivations. Most of the details we have omitted can be found in Paulsen's fine treatise [26], in fact the reader may use this paper as a guide to [26] under the particular aspect of applications to derivations on C^*-algebras. A more comprehensive state-of-the-art overview on completely bounded operators is given in the recent paper by Christensen and Sinclair [7], while Effros' address to the ICM 86 [11] emphasises the connections with cohomology theory of operator algebras.

Since the mid 1970's it emerged that the classes of completely bounded and completely positive operators are among the most important classes of (multi-)linear mappings on C^*-algebras, as they are intimately related to a number of structural properties, and several open questions can be phrased in terms of these operators. Here, we shall mainly concentrate on how the problem of innerness of derivations naturally leads to consider completely bounded maps. On the way we will also add some remarks on the role these operators play in the operator algebraic approach to quantum theory. Occasionally, proofs are outlined in order to illustrate the typical techniques.