Foreword

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Biographical notes: Lynn Erbe has been a Professor of Mathematics at the University of Nebraska-Lincoln since 1997. Prior to that he was a Professor at the University of Alberta, Edmonton, Canada from 1968–1996 and a Visiting Professor at Kuwait University from 1995–1997. He has written more than 200 research papers with more than 50 co-authors. According to Math/Sci/Net, his work has been cited more than 1500 times by more than 700 authors. His main interests are in oscillation theory and boundary value problems for differential and dynamic equations.

Allan Peterson has been a Professor of Mathematics at the University of Nebraska-Lincoln since 1968. He has published more than 150 papers with more than 40 co-authors. According to Math/Sci/Net his work has been cited approximately 1300 times by 550 authors. He has had 22 PhD students and has written six books in the areas of differential equations, difference equations, time scales, and discrete Hamiltonian systems.

This special issue of IJDSDE is dedicated to some recent developments in the research area of dynamic equations on time scales. The concept of time-scales analysis is a fairly new idea (originating in Stefan Hilger's 1988 PhD thesis) that combines the traditional areas of continuous and discrete analysis into one theory. After the publication of two textbooks in this area (by Bohner and Peterson, 2001, 2003), more and more researchers are getting involved in this fast-growing field of mathematics, in their own research areas. The study of dynamic equations brings together the traditional research areas of (ordinary and partial) differential and difference equations. It allows one to handle these two research areas at the same time, hence shedding light on the reasons for their seeming discrepancies. In fact, many new results for the continuous and discrete cases have been obtained by studying the more general time-scales case.

E.T. Bell wrote in 1937 ("Men of Mathematics"): "A major task of mathematics today is to harmonise the continuous and the discrete, to include them in one comprehensive mathematics, and to eliminate obscurity from both". Time-scales analysis accomplishes exactly this. This theory can not only unify continuous and discrete analysis, but also is able to extend the study of differential (continuous) and difference (discrete) equations to a more general class of dynamic equations, which includes, e.g., quantum-difference equations. Examples and applications of the theory include insect population models, which are discrete in season (and may follow a difference scheme with variable step size or are often modelled by continuous dynamic systems), die out in say winter, while their eggs are incubating or dormant, and then in season again, hatching gives rise to a non-overlapping population.

Research in the area of dynamic equations on time scales is already well established. Currently, it has been estimated that there are more than 400 researchers worldwide who have contributed about 1800 research articles in the area of time scales. The number of these researchers is steadily growing and the research area is wide open. This area has potential applications in such areas as engineering, biology, economics and finance, physics, chemistry, social sciences, medical sciences, mathematics education, and others.

In view of the potential applications in the study of certain diseases (e.g., West Nile Virus, AIDS, etc.), it is possible that this may lead to some advances in understanding how this occurs (with a combination of discrete and continuous processes including fractional dynamic equations). It is with these thoughts that we present this special issue.