The dissertation entitled "*Design, Synthesis and Properties of Dendritic Macromolecules*" embodies in detail the design and synthesis of a variety of finely engineered polyamidoamine (PAMAM) dendritic systems having different properties ranging photoresponsive, chiral, fluorescent as well as biocompatible characteristics. Additional synthesis of totally different dendritic structures i.e, hyperbranched polyesteramines (PEA) has been incorporated. The content of the thesis has been divided into nine chapters. Chapter-1 presents a general introduction to dendritic macromolecules including the concept, their interdisciplinary nature, applications universe, recent advances on different types of interest, valuable, and aesthetically pleasing dendritic structures as well as a brief discussion on the necessary criteria for the design of suitable dendritic macromolecules etc. This chapter also outlines the rocketing utility of polyamidoamine (PAMAM) dendrimers that ultimately directed our preferences and prejudices to develop various novel PAMAM dendritic structures. Chapter-2 is devoted to the synthesis of azobenzene based PAMAM dendritic scaffolds of up to 2.5 generations displaying the photochromic *cis/trans* isomerization of azobenzene units. To our knowledge these are the first photoresponsive PAMAM dendrimers reported so far. Chapter-3 discusses the logical extension of our approach as described in chapter-2, to develop PAMAM side chain dendritic polyester (SCDPE) architecture with a number of azobenzene units in the main chain of the polymer. Photoresponsive study has been carried out and described in detail. Chapter-4 addresses the synthesis of a series of novel PAMAM side chain dendritic polyurethanes (SCDPU) and study of their cytotoxicity. This chapter also illustrates the logical approach of generating PAMAM side chain dendritic polyurethanes embedded with sebasic acid or polyethylene glycol unit in order to increase the biocompatibility to some extent. Chapter-5 deals with the potential development of chiral tartaric acid centered

PAMAM dendrimers having some advantageous characteristics compared to classical PAMAM dendrimers. Chaper-6 switches to an exploration of novel azobenzene-based chiral PAMAM side chain dendritic polyester architectural photoswitch. Extensive study on photoresponsive behavior has also been addressed in this chapter. Chapter-7 aims at the development of new naphthalene centered PAMAM dendrimers displaying fluorescence chemosensing behavior towards carboxylic acids. Chapter-8 demonstrates the design of a totally new class of dendritic systems i.e, hyperbranched polymers which are the imperfect cousin of dendrimers. This chapter deals with the facile one pot synthesis of fluorescent hyperbranched polyesteramine (PEA) architectures of up to 4th generation. Details of fluorescence study along with signal amplification towards various metal ions have also been included in this chapter. Chapter-9 presents in brief the overall summary of the major achievements in the present investigation and further scopes.