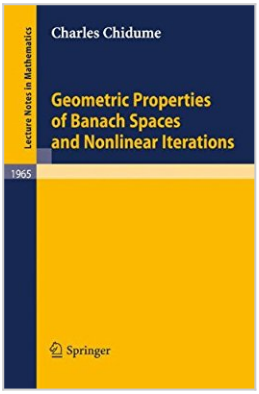


# Geometric Properties of Banach Spaces and Nonlinear Iterations (Lecture Notes in Mathematics)

*By Charles Chidume*



**Geometric Properties of Banach Spaces and Nonlinear Iterations (Lecture Notes in Mathematics)** By Charles Chidume

The contents of this monograph fall within the general area of nonlinear functional analysis and applications. We focus on an important topic within this area: geometric properties of Banach spaces and nonlinear iterations, a topic of intensive research e?orts, especially within the past 30 years, or so. In this theory, some geometric properties of Banach spaces play a crucial role. In the ?rst part of the monograph, we expose these geometric properties most of which are well known. As is well known, among all in?nite dim- sional Banach spaces, Hilbert spaces have the nicest geometric properties. The availability of the inner product, the fact that the proximity map or nearest point map of a real Hilbert space H onto a closed convex subset K of H is Lipschitzian with constant 1, and the following two identities 2 2 2 ||x+y|| =||x|| +2 x,y +||y|| , (?) 2 2 2 2 ||?x+(1??)y|| = ?||x|| +(1??)||y|| ??(1??)||x?y|| , (??) which hold for all x,y? H, are some of the geometric properties that char- terize inner product spaces and also make certain problems posed in Hilbert spaces more manageable than those in general Banach spaces. However, as has been rightly observed by M. Hazewinkel, "... many, and probably most, mathematical objects and models do not naturally live in Hilbert spaces". Consequently,toextendsomeoftheHilbertspacetechniquestomoregeneral Banach spaces, analogues of the identities (?) and (??) have to be developed.

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## Editorial Review

Review
From the reviews: “The aim of the present book is to give an introduction to this very active area of investigation. … the book is of great help for graduate and postgraduate students, as well as for researchers interested in fixed point theory, geometry of Banach spaces and numerical solution of various kinds of equations - operator differential equations, differential inclusions, variational inequalities.” (S. Cobza?, Studia Universitatis Babe?-Bolyai. Mathematica, Vol. LIV (4), December, 2009) “The topic of this monograph falls within the area of nonlinear functional analysis. … The main purpose of this book is to expose in depth the most important results on iterative algorithms for approximation of fixed points or zeroes of the mappings mentioned above. … this book picks up the most important results in the area, its explanations are comprehensive and interesting and I think that this book will be useful for mathematicians interested in iterations for nonlinear operators defined in Banach spaces.” (Jesus Garcia-Falset, Mathematical Reviews, Issue 2010 f)

From the Back Cover

Nonlinear functional analysis and applications is an area of study that has provided fascination for many mathematicians across the world. This monograph delves specifically into the topic of the geometric properties of Banach spaces and nonlinear iterations, a subject of extensive research over the past thirty years.

Chapters 1 to 5 develop materials on convexity and smoothness of Banach spaces, associated moduli and connections with duality maps. Key results obtained are summarized at the end of each chapter for easy reference. Chapters 6 to 23 deal with an in-depth, comprehensive and up-to-date coverage of the main ideas, concepts and results on iterative algorithms for the approximation of fixed points of nonlinear nonexpansive and pseudo-contractive-type mappings. This includes detailed workings on solutions of variational inequality problems, solutions of Hammerstein integral equations, and common fixed points (and common zeros) of families of nonlinear mappings.

Carefully referenced and full of recent, incisive findings and interesting open-questions, this volume will prove useful for graduate students of mathematical analysis and will be a key-read for mathematicians with an interest in applications of geometric properties of Banach spaces, as well as specialists in nonlinear operator theory.

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