



# Differential Geometry, Lie Groups, and Symmetric Spaces (Graduate Studies in Mathematics)

*Sigurdur Helgason*

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The study of homogeneous spaces provides excellent insights into both differential geometry and Lie groups. In geometry, for instance, general theorems and properties will also hold for homogeneous spaces, and will usually be easier to understand and to prove in this setting. For Lie groups, a significant amount of analysis either begins with or reduces to analysis on homogeneous spaces, frequently on symmetric spaces. For many years and for many mathematicians, Sigurdur Helgason's classic *Differential Geometry, Lie Groups, and Symmetric Spaces* has been--and continues to be--the standard source for this material.

Helgason begins with a concise, self-contained introduction to differential geometry. He then introduces Lie groups and Lie algebras, including important results on their structure. This sets the stage for the introduction and study of symmetric spaces, which form the central part of the book. The text concludes with the classification of symmetric spaces by means of the Killing-Cartan classification of simple Lie algebras over  $\mathbf{C}$  and Cartan's classification of simple Lie algebras over  $\mathbf{R}$ .

The excellent exposition is supplemented by extensive collections of useful exercises at the end of each chapter. All the problems have either solutions or substantial hints, found at the back of the book.

For this latest edition, Helgason has made corrections and added helpful notes and useful references. The sequels to the present book are published in the AMS's *Mathematical Surveys and Monographs Series*: *Groups and Geometric Analysis*, Volume 83, and *Geometric Analysis on Symmetric Spaces*, Volume 39.

Sigurdur Helgason was awarded the Steele Prize for *Differential Geometry, Lie Groups, and Symmetric Spaces* and *Groups and Geometric Analysis*.

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