

Preface

The word “geometry” can cover many different things. The paths that can be traced from the most ancient concepts to sophisticated modern abstractions form one of the charms of the subject. We can all agree that the study of lines in three dimensional Euclidean space is a part of geometry. It is a wonderful idea that the set of all lines can itself be considered as a ‘space’, which has in turn its own geometry. Of course, this leap into abstraction may seem commonplace now – the set of lines is an example of a four-dimensional manifold and of a homogeneous space, for the group of Euclidean isometries. Modern differential geometry provides the language and tools for doing calculus on such spaces and in particular for *integration*. Then we can talk about the volume of a set of lines with a particular property, the mean value of a function on the space of lines and so on. Likewise if, instead of lines, we take some other distinguished objects, such as spheres, or if we begin with a non-Euclidean space. This is the theory of “Integral Geometry”, to which Luis Santaló contributed so much.

The span of Santaló’s life and career was large: in time, covering nearly all the twentieth century, geographically, and in his phenomenal research output. There is much to gain from a study of his papers. We can see the development and interaction of different themes, points of view and schools; the evolution of the mathematical ideas, language and notation. We see the shift to the modern abstract points of view, involving general theories of Lie groups, homogeneous spaces and differential forms. But we can also find marvellous, and probably little-known, gems of geometry, such as Santaló’s proof of the isoperimetric inequality in surfaces of negative curvature.

Nowadays, if one has access to MathSciNet, it takes only a few moments at a computer to produce a complete list of any mathematicians published work, but a volume such as this *Selecta* goes far beyond that. There is the careful choice of the most significant papers, some of which appeared in journals which are not easy to find, grouped under different themes and with comments from leading experts. There is also a biographical outline, fascinating as a story of an eventful life, as a slice of mathematical history and for the insights it provides into the times. We should heartily thank the Editors for their tremendous labour of love in the production of this volume, which conveys, especially to those of us who did not have the good fortune to know him, such a picture of Santaló, both the mathematician and the man.

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Selected Works

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