

**Geometry and Mechanics of  
Historic Structures**  
Collected Studies

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## Introduction

A volume called *Arches, Vaults and Buttresses* was published in England in 1996, and contained some 26 of my articles written between 1966 and 1995. These articles were mostly on masonry construction, but my increasing involvement with the repair of old buildings gave rise to three articles on timber roofs. The present second volume contains 25 further articles, published between 1993 and 2014, mainly on masonry, but again some are concerned with design in timber. There are other articles which involve on the one hand more general problems of structural analysis, and on the other wider contributions to the study of construction history, a field which Professor Huerta may be said to have originated, and which he has made very much his own. There is also a non-technical account of the way Government regulations are applied to cathedrals in England.

The aim in the earlier papers was to convince the reader that so-called plastic theory could be applied to masonry. I myself had come to the study of masonry from a background of work on steel structures. In 1946 I started as the last research student of Professor John Baker, whose name is always associated with the development of plastic theory for the design of steelwork (and there is a paper in the present volume discussing the adoption of plastic methods in the UK). My research publications in the next 20 years were almost all on the use of plastic methods for steel. However, in 1949 I spent the first of two post-doctoral years at Brown University, where Professor Prager introduced me to the fundamental theorems which lay behind the work I had been

doing. In particular, I learned that masonry could be examined by these theorems, of which the most important is the “lower-bound” theorem, now often called the “safe” theorem. It states that if it is possible to find any state of equilibrium for a structure in which it is “comfortable”, then this is assurance that the structure will always be stable. For this reason it would be more descriptive, as Professor Huerta has suggested, that “equilibrium theory” should replace “plastic theory” as a name for this fundamental tool for the analysis of structures. What has emerged clearly is that “elastic theory”, with which structural engineers have been preoccupied for two centuries, and which is needed for the estimation of deflexions and for the prediction of buckling, does not give meaningful information about the strength of a structure, whether it be made from steel, reinforced concrete, timber or masonry.

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Jacques Heyman 2016