The years between 1818 and 1832 were dominated by the vast project of surveying the Kingdom of Hanover. Gauss himself directed the initial stages of this venture which took nearly 20 years to complete.

The contemporary interest in geodesy was essentially of a practical nature though it was also of a certain theoretical interest to determine by mensuration the true shape of the Earth. This question had already been taken up in the 18th century when extensive measurements had led to the universal acceptance of Newton's theory of gravitation. In Gauss's time, additional quantitative results were still sought but there were also practical concerns. Geodetic work enjoyed official benevolence and liberal funding because the military and economic benefits of good maps were obvious.

The principal techniques for the various surveys were simple. Starting from a baseline of very precisely determined length, the area to be measured had to be covered by a grid of triangles whose vertices were visually connected. The actual work of surveying consisted of the establishment of such a grid and the precise determination of the angles. It is obvious that each "trigonometric point" had to be visible from a minimum of two directions. It was advantageous to exceed this minimum and to have, besides the regular rather small triangles, larger control triangles. This experimental work was time-consuming; even more so were, in the absence of any computing machines, the necessary calculations.

A certain part of Hanover had already been measured during the Napoleonic era and had been connected with the triangulation of the Netherlands. But the work had not been completed, its results were not sufficiently accurate, and many of the triangulation points were not even known any longer. After 1815, all the major states of central Europe commissioned geodetic surveys. In the case of Hanover (and Gauss) the initiative came from Schumacher, who organized a similar survey for the Kingdom of Denmark. In 1818, Schumacher inquired whether Gauss would be interested in cooperation and the southern continuation of the Danish grid. * Gauss, W. K. Bühler, *Gauss*
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who had performed some minor geodetic measurements during his second Brunswick period, was immediately attracted by the idea. He drew up a memorandum for his government, complete with a description of the project, the personnel needed, etc. A positive answer was secured quickly, and Gauss himself was made director of the project. The government gave the requested subsidies, and a few soldiers were detached to work as Gauss's assistants. At this point, Gauss certainly did not suspect that this operation would be the central task of the next ten years of his life, but the measurements were time-consuming and the ensuing difficulties much greater than anticipated.

The original plan foresaw only the connection of the Danish survey with the already existing results for Hanover, but that was soon dropped in favor of a completely original survey of Hanover, later to be expanded to include the territory of the independent city of Bremen. This last assignment presented its own difficulties because the coastal countryside was completely flat and practically on sea level.

The difficulties which had led to a premature end of the French survey stemmed from the peculiar topography of the kingdom. The country, especially in its western and coastal parts, is flat and covered* by large forests. It does not permit many of the essential long vistas, the establishment of trigonometric markers is difficult and in many directions impossible. The most problematic area is the so-called Lüneburger Heide, a sparsely populated stretch of land to the south of Hamburg, directly between Göttingen, where Gauss's base was, and the Danish triangles.

Gauss was not a merely nominal director of the project, he personally took charge of it. During the summer months of these years he rarely spent a night in his own bed and was often only a few nights in any one place, rushing from village to village, a victim of the inconveniences of the rural countryside (from which only two generations separated him) and of the heat of the summer. We see Gauss in his formal and proper attire, the indispensable velvet cap on his head, perspiring and directing his military assistants, bartering with farmers about the costs of the removal of a few trees which were supposed to obstruct the direct line of vision between two trigonometric points, organizing the distribution of instruments, etc. The evenings brought nearly daily correspondence with Schumacher (with complicated instructions where the mail should be sent and how it should be addressed), and endless computations. The measurements were made with the help of a small number of heliotropes, devices that had been invented by Gauss himself. Heliotropes were instruments with movable mirrors for reflecting the (dispersed) sunlight; with some minor improvements, they developed into a very efficient tool, allowing Gauss to connect much longer distances than his predecessors and to observe in less propitious weather, under cloudy skies and without direct sunlight. The correspondence with Schumacher, Olbers, and Bessel projects a vivid picture of the difficulties with which Gauss had to contend,

* Or, at least, was during the time of Gauss.