Zeitschrift: Pamphlet
Herausgeber: Professur für Landschaftsarchitektur, Christophe Girot, ETH Zürich
Band: - (2023)
Heft: 27: Terrain vogue

Artikel: Measure and trajectory
Autor: Melsom, James
DOI: https://doi.org/10.5169/seals-1044310

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MEASURE

MEASURE AND TRAJECTORY

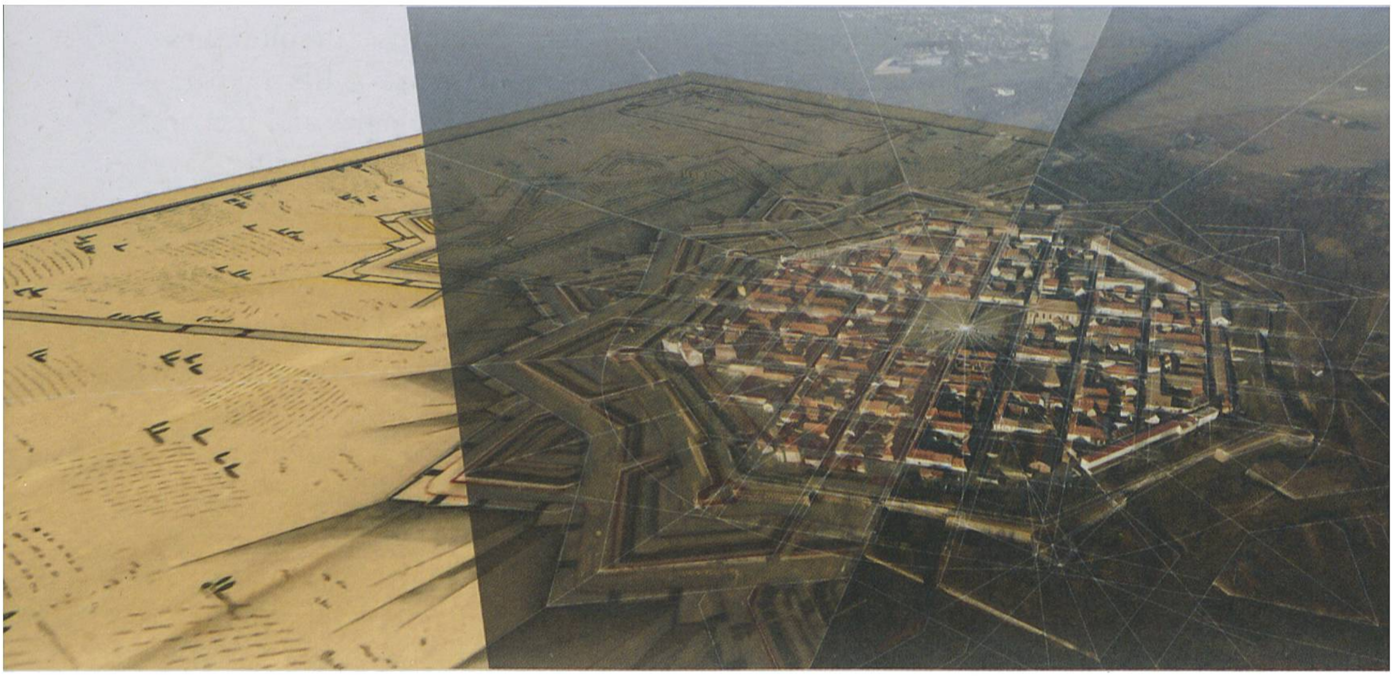
James Melsom

"Straight mine eye hath caught new pleasures, Whilst the landskip round it measures"
John Milton, *L'Allegro*, 1645

Measure

Contemporary landscape interpretation is built on centuries of observation and scientific as well as cultural experimentation. Many methods, metrics, and criteria date back to the earliest use of established tools for landscape measurement as descriptive processes proliferated. The persistence of these modes of working is reinforced by the fact that many of the most recent technologies in the field are simply refinements of the existing methods. The theodolite, for example, is a surveying device developed in the early seventeenth century. It refined previous devices by adding distance to the object being observed. It closely resembles the inner workings of devices whose cartographic lattice tamed European architecture in the 1600s, constructing the logic of its citadels and their territorial surroundings.[1]

The form of the terrestrial citadels of the 1600s and their precise geometries were equally conceived within their terrain with an aerial perspective in mind. Theodolites were developed in terms of their accuracy and speed of measurements, but the fundamental nature of the measurements taken and their original militaristic purpose remained largely the same. The trajectories of munitions adhered to principles of gravity and flight discovered at that time, such as Evangelista Torricelli's *parabola di sicurezza*, which formed an aerial logic through which the landscape could be surveilled, controlled, and defended. Sébastien Le Prestre de Vauban's executed topographies of Neuf-Brisach in Alsace, France, are a perfect example of this logic rendered physical, at around the same time Milton's gaze was measuring the English "landskip" in 1645. This logic of control projected its geometries far into the territory, organizing the planning of future infrastructure and governance. Similar surveying instruments would be deployed a century later in the North American dirt to etch distinct, orthogonal



Overlay of the construction plans of Vauban for Neuf-Brisach, France, 1705, with an aerial image from March 2022

lines across the continent in the form of the colonizing logic of the Jefferson Grid.[2]

It was not until the early 1900s that a young Swiss surveyor named Heinrich Wild, dissatisfied with the accuracy of traditional theodolites in the Alps, began to experiment with alternatives. His development by the 1920s of a complex and compact apparatus demonstrated a huge increase in both precision and relative speed of measurement.[3] The Wild Heerbrugg T2 and T3 astronomical theodolites (of 1929 and 1937) were used to plan and transform many of the world's landscapes, facilitating massive infrastructural change, and were to be found on the sites of the world's largest transformative territorial projects over the next half-century, combined with the transformative cartographical advances of Imhof and his contemporaries in Switzerland.[4]

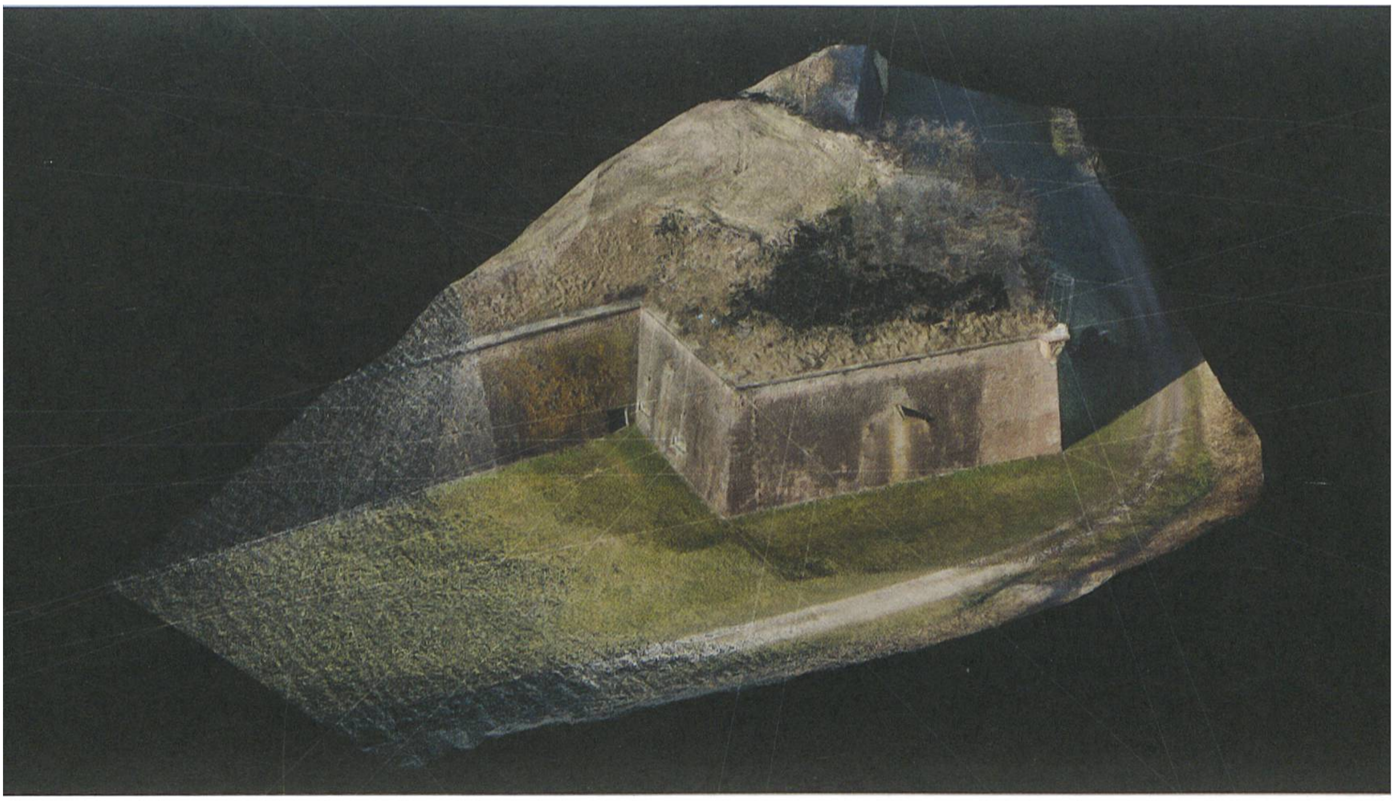
The contemporary laser scanner mimics the base function of the theodolite in many ways, only at an enormous speed and with a much larger number of measurements, together with increased directional flexibility and a new mode of data collection. Its most common incarnation, the terrestrial apparatus, shares the need for unwavering precision through stability and proximity to the ground—simultaneously its strength and weakness, trading accuracy for overview. It is perhaps no coincidence that the Alps, birthplace of Wild's devices, would also produce the early long-range laser scanners from Leica and Riegl. These landscapes, in which the ground rises to meet the probing rays of the device, or the same terrain acts as the promontory that once inspired the painterly sublime, provided the means through which overview and aspect could be attained and refined.

Trajectory

Parallel to Wild's early experiments in Switzerland, the first mobile, photographic images were being produced from the air. In preparation for the 1900 Exposition Universelle in Paris, stereoscopic images were generated over Paris, fascinating the public and inspiring a generation of urban designers and planners. Just as laser scanners mimic theodolites, contemporary photogrammetry mimics the simple principle of stereo-image reconstruction used to determine detailed topography from aerial photograph stereo pairs from the 1960s. Here, however, static terrestrial units of landscape measure shift to accommodate units of speed, acceleration, and rotation, describing the constantly shifting position of the camera. The contemporary unmanned aerial vehicle (UAV, or drone) combines the possibilities of the active with the static, a synthesis of measurement apparatus and projectile, and of the promontory with aviation.

The commonalities between these contemporary technologies and the rudimentary tools from which they evolved reflect significant shifts in how we see the world, the frameworks that we use to describe it, and the priorities with which we measure its states and shifts. Despite these advances and entire shifts in paradigm, the terminologies and metrics for describing space and matter have not evolved since the construction of Neuf-Brisach,[5] and certainly not since their further transformation during the Second World War, through the logics of trench warfare, pillboxes, and contemporary projectile delivery systems; additional layers of territorial control and projection.

The resulting structures are an implicit example of a territorial apparatus that measures and projects its influence, analogous to the tools that formed it. The critical application of such devices and the aerial perspective that reveals these territorial projections present a form of visual truth-telling that may redress and unpack these traits that have embedded themselves into language, terminologies, and even folklore and myth. Fundamental to surveying and site-interpretive work is the recognition of the limits of human perception and comprehension to understand and describe its environment, as well as the disconnection from the colonial practices that have influenced its creation. Through an acknowledgment of these factors, and the limits of our tools and metrics, it may be possible to develop methods that measure and reflect a deeper level of site response and transformation. A perspective that recognizes motion, acceleration, and change, that reconciles the engineered with the dynamic, and that rejects colonial tendencies in favor of non-human-centered logics and imperatives.



Photogrammetric model
describing the buttresses of
Neuf-Brisach, March 2022

1 Fritz Deumlich and Rudolf Staiger, *Instrumentenkunde der Vermessungstechnik* (Heidelberg: Wichmann, 1974).

2 James Corner and Alex S. MacLean, *Taking Measures across the American Landscape* (New Haven: Yale University Press, 1996).

3 D. A. Hutchison and A. R. Hinks, "The Photo-Theodolite of Mr. H. Wild," *The Geographical Journal* 67 no. 3, 233–240. https://doi.org/10.2307/1782305.

4 J.B. Harley and David Woodward, eds., *The History of Cartography, Volume 1: Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean*, 1st edition (Chicago: University of Chicago Press, 1987).

5 J.M. Balliet, "La place forte de Neuf-Brisach au XVIIIe: Archétype de la fortification bastionnée contemporaine," *Revue de l'Association des Amis du Musée de l'Infanterie* 60 (2012), 9–15.