



# Building the Great Pyramid in a Year: An Engineer's Report

Gerard C. A. Fonte

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Work smarter, not harder? Most archaeologists feel that 25,000 workers spent 20 years building the Great Pyramid in Egypt over 4000 years ago. However, by closely examining the clues and artifacts left behind, and by assuming that the Egyptians were clever and intelligent, it is found that 10,000 workers could have built the Great Pyramid in about 385 days. This book, for high school readers and up, shows how, even at a more realistic, relaxed building schedule, the project could have been completed easily within four to six years by just 4000 workers.

Gerard Fonte presents the construction of the Great Pyramid as a wonder indeed, while challenging our cherished notions of the arduous labor and extreme human costs required for the project. Starting with his knowledge of project management, the properties of basic materials, and common sense, and giving the Egyptians credit as a sophisticated and well-run society, he shows step by step how they may have built great edifices and enhanced social cohesion at the same time. He posits that some of the implements found at archeological sites were clever labor-saving devices, and using experiments, models and tests he illustrates some ingenious techniques that were well within the scope of Egyptians' technical knowledge. Photographs and diagrams support his theory.

This research covers all major aspects of pyramid building: quarrying, moving, placing, lifting, fitting the blocks, finishing the outer casing blocks, placing the top-most blocks, tool specifications, wood requirements and machine design. It examines Egyptian pyramids in general, general pyramid geometry, common pyramid fallacies, available worker population, social effects of large works and scale factors in engineering. It is important to emphasize that everything is based on archaeological remains, forensic evidence, engineering principles, common sense and creativity. Additionally, it presumes that the Egyptian builders were intelligent and innovative and would use the best available techniques.

In particular, two mysterious tools that have been found at the pyramid site are examined and found to instrumental for moving and lifting the blocks. The first is the wooden quarter circle or rocker which is made from imported cedar. The author built replicas of these tools and was able to move a 4200 pound concrete pyramid block 15 feet in less than 10 seconds by himself and from a stationary starting position. (The author was 52 years old and weighed 135 pounds at the time.) A forensic examination of the second tool, a protopulley, reveals that the Egyptians used a particular type of lever to lift the blocks. A time-motion examination showed that three men could lift a block a full course in just three minutes with this lever. The conventional approaches of using ramps to lift blocks and sledges to move blocks are examined are shown to be flawed. The consequences of employing these methods lead to untenable situations, like a quarry that must supply twice as much rock than it can possibly hold.

Fonte is a practicing engineer with a private firm and has some 30 years of varied hands-on experience ranging from commercial products to military designs. He offers a forensic-engineering exploration of the construction of the Egyptian pyramids. Through a close examination of the clues and relics left behind, and working under the assumption that the Egyptians were intelligent and creative, Fonte concludes that the Great Pyramid at Giza could have been constructed in four to six years by 4,000 workers far less time than the estimate of 25,000 workers laboring over 20 years favored by most archaeologists. Illustrated with b&w photographs and diagrams, the text is academic but accessible to the general reader.

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