

WEIRS IN TURRIANO'S CODEX

[by John H. Lienhard](#)

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Today, we read a 400-year-old book on dams. The University of Houston's College of Engineering presents this series about the machines that make our civilization run, and the people whose ingenuity created them.

Historian Garcia-Diego tells about a remarkable book in the Madrid Library. It's called the Turriano Codex, although Juanelo Turriano -- who's name is on it -- wasn't the real author. Whoever the author was, it's a magnificent treatise on hydraulics, written in the 1560s. Book IX of the Codex describes weirs, or river dams, and it's a surprise.

But first let's locate the year 1560. In Spain, Miguel de Cervantes -- the man who wrote Don Quixote -- was a teenager. In England, Queen Elizabeth had just been made queen. And in Italy, Leonardo Da Vinci had died 40 years earlier. The period we call the Renaissance was a century old.

The book and its illustrations are remarkably detailed, and it displays an astonishing command of civil engineering. In fact, the next large treatise that really extended the subject was written by the U.S. Bureau of Reclamation in 1938. And there the kinship with the Turriano Codex is clear.

Book IX of the Codex shows scores of ways to accumulate water, to divert it to other locations, and to control flooding. Here are several kinds of structural wooden frameworks for shaping both stone and earthen weirs. There's a quick-and-dirty forest weir made of local vegetation -- meant to handle only one flood. We see masonry gravity weirs -- single-arch, double-arch, and joined-arch weirs. Every kind of dam or weir imaginable.

This is not a Da Vinci sketchbook -- it doesn't represent the author's flights of fancy. What we see isn't invention, but a report on technologies that were solidly in place. Da Vinci made analytical sketches to show how he thought whirlpools worked. This author reports what whirlpools and eddies are known to do to dams and how to combat that damage. A serious practical engineer is relating the accumulated ingenuity of his age. He shows us a kind of technocratic innocence when he furrows his brow and tells us:

Weirs must need be built in all sincerity of mind; nor should those who have the charge of building them be burdened with a concern for gain, lest they [do not] do what they should; for such works demand great lavishness in materials ...

I suppose we all might be warned to work with a "sincerity of mind." Yet there's a dreamlike quality in his advice that we utterly abandon any "concern for gain" when we do it. But those views aside, it's a delicious surprise to learn how complete the

technologies of water management had become by the time Queen Elizabeth was taking the throne of England.

I'm John Lienhard, at the University of Houston, where we're interested in the way inventive minds work.

(Theme music)

Garcia-Diego, J.A., The Chapter on Weirs in the Codex of Juanelo Turriano. *Technology and Culture*, Vol. 17, No. 2, 1976.

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