

Alex Groce (agroce@gmail.com), Northern Arizona University

John Ruskin's *The Elements of Drawing* is the last book I mentioned the other semester when I sent out a final email to my software engineering class; a few students had asked for a list of books I thought were worth reading, if you really wanted to learn how to be a great software engineer. Most of the books I suggested were obvious choices (Brooks, Kernighan and Pike, Ousterhout, Kidder, Butler Lampson, Jon Bentley, etc.) and some "CS adjacent" general-engineering works (Petroski, Florman, etc.), but Ruskin probably struck students who thought about it as a bit strange. This column is my defense of that choice. As with my claim, long ago in this space, that Confucius' ideas are still relevant to good work in software engineering, I shall primarily state my case in the form of quotations from the supposedly relevant work.

Confucius wrote in (perhaps) 500 BC (Confucius probably did not write); John Ruskin certainly wrote in 1857 (Ruskin did a great many things, but he certainly wrote and wrote and wrote; an electronic edition of his collected works that I own runs to an almost ludicrous 15,000 pages; there's some bloat there but a great deal of sheer text). Neither knew anything of software, though more than ten years before Ruskin's book, Ada Lovelace had published notes that included what might be thought of as the first computer program, and Ruskin was aware of Mr. Babbage, if not particularly interested in his computing machines. General principles underlying the construction of well-made thought-things (and software, unlike the architectural constructs Ruskin wrote about at such length, is first and foremost a thought-thing) however, have not changed in the last 150 or 2500 years.

1. *On the myth of shortcuts*

"It is much easier to learn to draw well, than it is to learn to play well on any musical instrument; but you know that it takes three or four years of practice, giving three or four hours a day, to acquire even ordinary command over the keys of a piano; and you must not think that a masterly command of your pencil... can be acquired without painstaking, or in a very short time." (Letter I, §2)

2. *On cargo-culting a master's style*

"You will never produce a great drawing by imitating the execution of a great master. Acquire his knowledge and share his feelings, and the easy execution will fall from your hand as it did from his: but if you merely scrawl because he scrawled, or blot because he blotted, you will not only never advance in power, but every able draughtsman... will know you for a cheat, and despise you accordingly." (§95)

3. *On economy, not speed, as the mark of skill*

"In a great man's work, at its fastest, no line is thrown away, and it is not by the rapidity, but the economy of the execution that you know him to be great." (§94)

4. On reducing a hard problem to its essential subproblem

"Now if you can draw that stone, you can draw anything... for all drawing depends, primarily, on your power of representing Roundness. If you can once do that, all the rest is easy and straightforward; if you cannot do that, nothing else that you may be able to do will be of any use." (§42)

5. Against universal recipes

"There is no general way of doing any thing; no recipe can be given you for so much as the drawing of a cluster of grass... look at it, and try to draw it as it is, and don't think how somebody 'told you to do grass.'" (§108)

6. On refusing to let habit run the show

"No touch or form is ever added to another by a good painter without a mental determination and affirmation... You must stop that hand of yours, however painfully; make it understand that it is not to have its own way any more... otherwise it is not you who are the master, but your fingers." (§137)

7. On modeling systems as processes, not snapshots

"Nothing distinguishes great men from inferior men more than their always... knowing the way things are going. Your dunce thinks they are standing still, and draws them all fixed; your wise man sees the change or changing in them." (§104)

8. Definition of composition as interdependence

"It is the essence of composition that everything should be in a determined place, perform an intended part, and act, in that part, advantageously for everything that is connected with it... In a well-composed air, no note, however short or low, can be spared, but the least is as necessary as the greatest." (§189, §193)

9. On fitting structure to the actual shape of the problem, not imposed uniformity

"All endeavours to do the thing in a grand engineer's manner, with a level roadway and equal arches, are barbarous; not only because all monotonous forms are ugly in themselves, but because the mind perceives at once that there has been cost uselessly thrown away for the sake of formality." (§203–204, on why Turner's bridges fit the river's actual currents instead of forcing symmetrical spans)

10. On necessary, engineered variation

"If there be no change at all in the shape or size of the objects, there is no continuity; there is only repetition—monotony... no series of any kind was ever introduced by a great composer in a

painting without a snap somewhere." (§200, §223)

I add a bonus eleventh bit, on the great value of differential testing with a true reference, a topic dear to my own heart:

"In order to ascertain what the shades of it really are, cut a round hole, about half the size of a pea, in a piece of white paper the colour of that you use to draw on. Hold this bit of paper with the hole in it, between you and your stone; and pass the paper backwards and forwards, so as to see the different portions of the stone (or other subject) through the hole... You will be able thus actually to match the colour of the stone at any part of it, by tinting the paper beside the circular opening." (§48)