

Work on the Ugliest Part

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The Nobel Prize-winning ethologist Konrad Lorenz said that the best exercise for a research scientist is to get up every morning and throw away three favourite ideas before breakfast. An important lesson that I learned as a scientist, and one of the most important that I shared with my research students, is that the best way to support an idea (we call it a hypothesis) is to try to break it; to make it fail. That's what experimentation does when it's done well, and it's a big part of what science is about. Rather than trying to prove our own ideas (this common idea is dead wrong), we set up situations that will prove them wrong, if they are. When we publish the results of our experiments, we are in effect saying to our peers "I tried my best to break this idea, but it survived the test. So at least until someone else proves it wrong, I suggest we take the idea seriously".

But even before experimentation, there is a lot we can do to break our ideas. They might embody unrealistic assumptions, for example, or apply only in such special cases that they are not worth bothering with. They might contain internal inconsistencies or contradictions that doom them from the start, and in each of these cases it is much better for us to discover the problems ourselves before someone else does. If there is a problem with a good idea, someone will surely find it at some point. It is good to find them before publication, and cheaper to do it, if possible, before experimentation.

While I was learning to apply these principles in my research group, I was also deeply involved in sculpting. Probably for that reason, "*work on the ugliest part*" became a powerful metaphor in our lab culture for sniffing out the weak parts of our ideas as early as possible in the game. As a team, we became good at finding the flaws in our teammates' hypotheses, and good at inventing experiments to discover flaws that survived early scrutiny. And because it is embarrassing to watch a favourite idea crumble, even in a highly supportive team atmosphere that runs on trust, each of us as individuals became good at breaking our own ideas before our teammates did it for us. Our interactions were a filter to prevent bad ideas from escaping the lab, and "work on the ugliest part" was our rallying cry.

In sculpting, it is always tempting to work on the parts we like best, the parts that satisfy us and invite us to feel competent, and to ignore or postpone working on the parts that push us past the present limits of our capability or threaten to take more time than we think we have to complete the work. I feel that temptation on each new piece, just as I felt it in the thrill of hot new scientific ideas. More often than I like to admit, I succumb to the temptation until the ugliest part is so ugly in relation to the rest that I can't stand it any longer. That's a bad way to do things, even if it protects my ego for a while.

It is even worse than it sounds. Just as complex scientific hypotheses are more than the sum of their individual components, so are sculptures. Sculptures are three dimensional forms, and for sculptors like myself, form is about geometric relationships among the parts - - all of them. Ignoring the ugly parts makes it impossible to integrate the form (often this is called "resolving" form). At least for the kinds of forms that most turn **me** on, to fail to integrate is to fail to sculpt; it is as simple as that.

When the great Canadian sculptor Bill Reid talked about “the well-made object”, and he talked about it a lot, I think this is a big part of what he was talking about. He just wasn’t interested in art that retained the ugly parts, and neither am I. And don’t think that the best work doesn’t have ugly parts in its early stages. It does, and a big part of our challenge as sculptors is to detect those bugs and work them out (the term “bug” is from computer programming, where it refers to problems in programs; programmers spend a lot of time “debugging” their work). The novelist and poet Michael Ondaatje made this point very clearly in relation to editing text and editing film in his book *Conversations with Walter Murch*.

The point here is that a lot of editing is required in sculpting, and just as with novels and movies, a lot of the editing has to do with purging problems and developing coherence and integrity. We simply can’t do that without developing a practiced eye for ugliness in our own work.

Here is an example. In the original stone version of my sculpture *Listening to the Wind* (URL), I was severely constrained in what I could do by the shape of the rock I began with. And in subtractive sculpting we are always constrained by the fact that we can only take away and never add material; the sculpture always gets smaller, and there is no way around that. In the original, in my opinion, I took away more stone than I should have in a particular region that is difficult to describe because the anatomy of the sculpture maps only abstractly into the anatomy of real people. The point I want to make here relates to the $\frac{3}{4}$ scale bronze reproduction of the “same” sculpture (URL pattern).

Here is the process I followed in producing the scale model pattern for bronze casting. I first had the stone version scanned by a laser-based measuring system that produces a very precise computer model, in this case consisting of about a million measurements connected by a web of triangles on the virtual surface that represents the real object (www.3dtechnics.com). This virtual sculpture was sent to another company (www.3dcustomfoam.com), where it was milled in dense polyurethane foam at the reduced scale and shipped to me. In my studio, I spent a month modifying and tuning the form, adapting it to a stone base that will also be cast in bronze, and preparing the surface, ultimately using the tools and techniques of auto body repair.

Now remember my sense that I had removed more material than I should have in the stone original. That error was reproduced accurately in the model and I tried to ignore it until the final stages, where it leaped out at me as so ugly that I couldn’t let the pattern go like that. The better the rest of the pattern got, the worse that part of it appeared to me; it stuck out like a sore thumb. Fortunately, the final stages of auto body repair are additive as well as subtractive, so while it would have been a good idea for me to add material at the beginning, it was still possible at the end. Conservatively, I estimate that ignoring that ugly part cost me almost a week of very long days.

Why did adding a relatively small amount of material (maybe 10 cc’s of volume in total) cost so much time and effort? Fundamentally, the reason is what I said above about the integration of form. When surfaces are as smoothly integrated as they are on this sculpture changing any little thing requires changing every little thing on the entire surface. Not only that, but it requires changing them together. While ignoring the ugliness for several weeks, I integrated three separate surfaces as if the problem did not

exist in the landscape I was developing. When I finally bit the bullet and began to fix the problem, I had to change every part of all three surfaces, and in all three cases I had also to change other surfaces with which they intersected.

Ignore ugliness at your peril! I've learned the lesson a thousand times that when we keep working on the worst parts of whatever we are making, after a while we can't find any more ugliness and we declare the project finished.

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I have had many useful discussions about these things with former graduate students Ken Lertzman and GI Sutherland in the context of science and writing, with my wife Lucretia Schanfarber in the context of writing and with Georg Schmerholz, my "professore", in the context of sculpting.