On Engineering and Social Justice
by Dean Chahim

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We are here today to talk about how to make the world a better place with engineering. So let us ask ourselves: how does an engineer do "good" in the world? It is one I get frequently, and to which I have never bothered to down a set of coherent thoughts. These are some rough reflections. If I offer more questions than answers, it is because engineers have for far too long peddled answers without questions.

We must start with the seemingly obvious: what *is* engineering? What do engineers do?

The typical answer goes something like this: "engineering is the art of applying scientific principles to solve problems for humanity." Engineers I know often describe their interest in three ways: 1) they like "solving problems," 2) they are "good at math and science," and 3) they want to "make the world a better place." (Others say they want to make a lot of money, but this is rarely the sole motivation – and I'm sorry to say that there are easier ways to make money – try getting into mortgage-backed securities.)

These reasons for becoming an engineer are in fact three claims (or hopes) for what engineering is supposed to do. Combining them together, we have the following, tentative claim for what engineering ought to be about: **solving problems using math and science to make the world a better place.**

Let's consider each of these terms one at a time.

<u>Solving problems?</u>
The first question we should ask ourselves is this: whose problems are we solving? Who defined the problem this way? What other problems are we *not* solving - and why not?

The second question is more to the point: do engineers really "solve" problems? Or do they merely transform some problems into other problems?

<u>Math and science?</u>
The problems addressed by engineering are never only about math and science. The abstract domain of the blueprint must always be built in living, breathing, *social* world in which we live. By defining problems so narrowly within mathematical and scientific terms, we are often blinded to the roots of the problem we seek to solve - which lie outside the domain of the scientific. Yet when the only tool we have is math and science, we see every problem as one of engineering.

Furthermore, by falling back onto math and science, we stake our claim to be 'objective' even when such objectivity is impossible. We are social creatures and we do not apply…

<u>A better place?</u>
For *whom* do we make the world a better place? Engineering is almost always described as an integral part of the "march of civilization." History for engineers is a linear relation between progress and time. As time marches on, progress unfailingly follows, punctuated by the contributions of engineers.

But this is history viewed from only one vantage point: the prototypical Western white, wealthy, male, able-bodied, cisgendered, heterosexual engineer. Any given technology's impact is equivocal. That which is hailed as "progress" by some is a crushing setback for others, as Langdon Winner once remarked.

Was the automobile progress? It enabled "freedom" for people to travel at their leisure, or so we are told. But what of those whose homes were demolished to build the freeways to the lily-white suburbs made possible by the automobile?

What of those farmers half a world away in India whose crops are still feeling the climate-warming effects of CO_2 emitted in 1950 Detroit - now magnified the world over?

Caveat: I am not saying that everything engineers have ever done is bad, or that many of the things we have designed couldn't be retooled. But wherever you look, you see engineers obligingly putting their heads down to do the master's work, building his tools. We are taught this self-discipline in school.

Nor am I saying engineers actively mean to do harm. To paraphrase Langdon Winner, the process of technological development has been so biased, for so long, that it is no longer a useful question to ask if designers intended to someone harm. This is rarely the case – although it happens. Anthropologist Hugh Gusterson has shown, for instance, how nuclear warhead designers come to genuinely believe in their work – in their mind they were working to keep the world safe. We can safely say they are out of their minds. But that does not make their *belief* any less genuine.

The same goes for the engineers in my own work. They have come to genuinely believe in their work – after all, how else do you keep doing it, day in and day out?

But more than that, it *appears* to work – for them, as I described in the case of Mexico City.

 So what then, can we do?

I was convinced not to drop my engineering major because of a family friend who reminded me that engineers have "undeserved credibility." He was right. We do. So we must use it.

The point is not to design to solve the problems of poor communities other than our own. **The point is to look up the chain of causality, which almost always points back at us, and tackle the problems where they start - *not where they end up.***

We design for the poor because it is uncontroversial. And because we have the *power* to change their lives. We cannot dream of staring down a rich downtown developer demolishing a homeless encampment to build luxury condos and tell them: you're doing this wrong, you have a problem, give us six months and we'll come back with a new idea. We don't have the *power* to do such a thing - alone at least. But there are movements of people willing to put their bodies on the line to stop just such a development. Where are the valiant socially-conscious engineers in that struggle? Nowhere to be found - they are too busy trying to design little portable boxes for the newly-displaced homeless as part of a design competition.

This is what distinguishes our sister professions from engineering. In any social struggle, one will find lawyers parsing the stacks of rules and regulations to find a point of weakness. In any protest, one will find doctors waiting on hand to care for those injured by police brutality. But where are the engineers, quantifying the disproportionate costs of new technologies, parsing through calculations to find the contradictions and alternatives not considered?

We do not design to make the lives of the oppressors less comfortable - such that they might consume less of the sweat and resources of the oppressed. We design the make the oppressed slightly more comfortable in their exploitation. That is the problem.

We cannot design our way out of injustices unless we *challenge the designs* of the rich and powerful that create those very same injustices. It is here that engineers can play a crucial role, in solidarity with movements of people who are struggling for a better world. We have nothing to lose by joining with movements except our arrogance.