

Craig Larson's Email to Jeremy Avigad (Feb. 15, 2022)

Dear Professor Avigad,

I read your article in the current Bulletin with great interest.

For many people the "goal" of mathematical research is (or should be) to advance the predictive sciences. While the Fermats of the world may pursue mathematics for their own personal reasons, the interest of society in advancing mathematics **is** that mathematical advances have proven useful.

Whether all (or any) mathematicians themselves care about practical utility is a sociological question (of course Hardy and many others don't). But it seems unlikely to me though that we'd teach kids math, require it in college, etc, if all we had was "conceptual understanding" of mathematical creations which weren't useful for advancing the predictive sciences. It would be like forcing kids to learn chess endgame strategy - totally unmotivated.

It might even be argued that the most important mathematics of the 20th century (the "calculus" of the 20th century) is linear programming. Every big company uses it. Are there any questions there that interest the people working on the Langlands program? That question is sociological - but whether it interests them or not, people will still want answers.

And many people might wonder: will all the "conceptual understanding" being developed by people working on Langland's, etc, ever contribute to the (mathematics of the) predictive sciences? I don't know. Every description I've ever seen of the mathematics of these poobahs of conceptual understanding only seems to apply to problems they created in the first place. Will Langlands math, etc, lead to faster algorithms, etc?

It may be just a sociological phenomenon that some very smart people have done something akin to locking themselves in a room, convinced themselves they were doing the most "important" mathematics, make up problems, congratulate each other for advancing research on those questions, and give each other rewards. Then there are other mathematicians that are developing algorithms and making direct contributions to predictive science. Whether or not the ones locked in a room think this is "important" is in some sense irrelevant.

The algorithms (among other useful math) are forever - regardless of fashions. Who did more "important" mathematics, Dantzig or Grothendieck? I don't know. But I do know

that the simplex method is as widely used now as calculus was in Newton's day. Will any of Grothendieck's "conceptual understanding" trickle-down to the math that touches applications? I don't know. (And am interested to know). If it doesn't I suspect that all the people with "conceptual understanding" will disappear. But the rest of us will still have to move forward without them.

I don't personally care much about applications, and enjoy trying to prove theorems about obscure questions as much as the next person, but don't personally get sucked in to issues like which axiom system for the reals is the "best" or "true" - as I don't see that there's an practical consequence. It seems very distant from "possibly practical" mathematics. But that's fine. To each their own.

But equating the "goal" of mathematics to what these very smart people locked in their metaphorical room congratulating each other about their "conceptual understanding" seems to be missing the most important fact - ultimately math *is* useful.

Cheers, best,

Craig Larson

Back to [Opinion 182 of Doron Zeilberger](#)