

Should mathematicians care about applications?

Final Essay in the seminar "Ethics in Mathematics"

Leopold Karl

June 2023

1 Introduction

Since mathematical discoveries seem to be some of the main ingredients to both beneficial and (potentially) harmful tools (e.g. in telecommunications, nuclear weapons, ...), questions of ethical responsibility for applications of a published mathematical result arise. In particular, out of a mathematician's point of view the question "Should mathematicians care about applications?" urges for an answer. In this essay I will give pro- and contra-arguments for a mathematician to care about possible applications of their work, genuinely focusing on the mathematicians themselves: The arguments are given in a way that they should convince a mathematician to care/not care about the applications of his work and not to establish a public opinion on this topic.

2 Why should mathematicians care about applications?

One of the most straight-forward arguments for a mathematician to care about applications of his work comes back to a mathematician's funding: Since they are mostly funded by the society itself, they should care to give something back or at least to not harm their society, not only for moral reasons (you should not harm someone who does you good), but out of two kinds of personal interest: Firstly, if their results are used in a way harmful to their community, they are affected themselves and, secondly, if mathematicians or at least the ones working in a similar field produce results with (immediate) harmful applications, society might decide not to fund them anymore, which would most likely force the mathematician to search for a new job or at least change field (given that they aren't willing and able to fund themselves or receive some funding by a company interested in these harmful applications, but this is a topic on its own).

However, mathematicians should not only care about their work's applications due to a feeling of obligation, but also because they might have a personal interest in the existence of application and might want to influence the direction the field of applications of their theory takes:

Of course, mathematical findings are ranked according to their importance as in any other field of study, and the author receives more credit for impactful papers. Therefore, a mathematician might want to promote powerful applications since they are to some extent part of the judgement of whether or not their finding has been important. Also, if mathematicians engaged with possible applications, they might be able to lead the field of applications of their work into the most promising (and least harmful) direction, to promote the forthcoming of these applications and, thereby, potentially their own recognition.

Last, but not least, writing about their thoughts on possible application to their work (at the end of a paper, as discussed in class), does not only make their papers more interesting to non-mathematicians by already giving them directions for applications, but does also encourage a dialogue between the mathematician himself and scientists in other fields by signaling interest and, thereby, making other scientists feel more welcomed to get in touch and discuss their thoughts on how to apply the mathematicians work, which, as mentioned earlier, might not only result in a useful tool, but just as well in promoting the mathematicians recognition and, hence, potentially his career.

3 Why shouldn't mathematicians care about applications?

First of all, one might want to counter the argument on a mathematicians obligations given in the previous section by noting that a mathematician already gives back to society, namely, by producing new mathematical results - exactly what is actually asked from him. In particular, if he did spend time on applications of his mathematical work, he would actually engage in something, not asked from him and, as a result, potentially harm his mathematical productivity due to having less time to spend on mathematics itself.

Secondly, a mathematician might argue that there are enough specialists in the various fields who are far more likely to find a use for his results in their field, since they have far more experience in their field. Also, a mathematician might not even know where to start searching for applications or overlook a certain field of possible application. If their statements on how to apply their work are then seen as (strict) guideline or if their work was categorised (e.g. by editors of journals) in such a way, that it is marked as unimportant for that overlooked field, then this might prevent certain useful applications from developing.

Lastly, a mathematician will most likely not be able to predict the most harmful (or useful) application of his work due to his lack of knowledge of all the potential fields of application and, therefore, the argument of wanting mathematicians to consider applications of their work to prevent harmful applications from developing, falls apart.

4 Conclusion

In my opinion, both positions (caring and not caring about applications) are valid ones to take as a mathematician since I couldn't find an argument so striking that it outweighed all the other side's points and, therefore, believe that the mathematical community should not give itself rules for how to deal with this issue, but rather leave this question up to every mathematician himself.

However, I do want to share what I would consider a healthy path to solving this issue: Since writing some lines on possible applications and informing oneself only perfunctorily should not take too much time and might even be quite interesting to the mathematician himself, I would encourage to write a paragraph at the end of a paper dealing with the usage of the proven theorem (including its potential usage in and implications for further mathematical research, as well as possible applications) to show interest in the further development and usage of the result and, thereby, encouraging future collaborations.