

# One More Mathematical Argument in Favor of Interdisciplinary Research and Diversity

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## Abstract

In this paper, we show that mathematical results from the theory of deductive systems, results which have been used to explain the evolutionary advantage of sexual reproduction over asexual one, can be also used to explain potential advantages of interdisciplinary research and of diversity in the workplace.

**Mathematics Subject Classification:** 03B22, 91D99

**Keywords:** deductive systems, speed-up, interdisciplinary research

## 1 Background

A 1987 MIT book [6] by a renowned logician S. Yu. Maslov contains, among other things, a possible mathematical explanation of why sexual reproduction is more efficient than asexual. This explanation is based on the analysis of deductive systems.

When the environment changes, the original DNA – which was adequate for survival in the previous environment – is often no longer adequate. In this case, for the species to survive, they need to modify their DNA so as to make it more adequate for the changed environment.

In general, there are main ways to change individual DNAs:

- via *asexual reproduction*, in which the parent's genes sequence pass to the offspring, usually with a mutation, and
- via *sexual reproduction*, in which the parents' genes are mixed (recombined) and a mutation is added to form the offspring's gene sequence.

The book [6] compares the smallest number of generations that are needed, for both ways, to achieve the desired change. The book proves a mathematical theorem, according to which, under some reasonable assumptions, the possibility of recombination makes the change exponentially faster.

This result explains the evolutionary advantage of sexual reproduction in precise mathematical terms.

*Comment.* The book [6] also gives an interesting explanation of why only two sexes are used and not three or four: namely, it proves that, in general, adding extra sexes will not speed up the process any further.

## 2 Inter-Disciplinary Research vs. Research Within a Discipline

**Idea.**

- When we work within a single discipline, it is more like mutations (while not necessarily a random one).
- On the other hand, inter-disciplinary research provides an opportunity to combine techniques and results from different disciplines.

In view of this analogy, the speed-up result from [6] explains the advantages of inter-disciplinary research.

*Comment.* Similar ideas appeared in [9].

## 3 Diversity in Workplace

**Idea.** A similar idea can explain the advantages of diversity in workplace, where:

- working within a single culture is similar to asexual reproduction, while
- diversity provides us with the possibility to productively combine several different cultural viewpoints.

Thus, the main result from [6] explains potential drastic advantages of diversity.

*Comment.* Similar arguments explaining the benefits of diversity have also been described in [1, 2, 3, 4, 5, 7, 8, 10].

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