The Categorical Relation of Mathematics & Biology

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In [BL25], Liu claims that the difference between applied math (abbreviated AMS) and mathematics is equivalent to "Neuroscience vs biology."

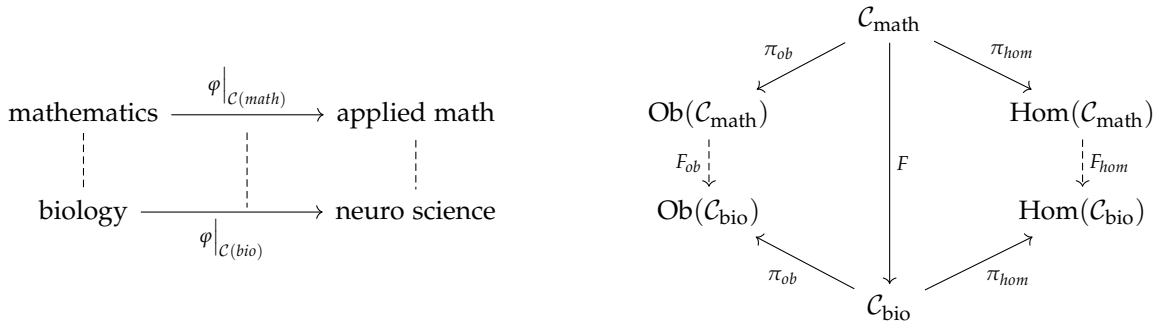We can easily formalize such relationship into a categorical representation:

Figure 1. Commutative diagram over the subjects.

Particularly, $\mathcal{C}_{\mathrm{math}}$ is the category of mathematical subjects, whose objects contains math and AMS, and morphisms between mathematical subjects. Likewise, $\mathcal{C}_{\mathrm{bio}}$ is the category of mathematical subjects, whose objects contains biology and neuroscience, and morphisms between biological subjects.

Hence, the functor $F : \mathcal{C}_{\mathrm{math}} \to \mathcal{C}_{\mathrm{bio}}$ is the functor between the two categories, which induces the functors on objects and homomorphism by the universal property.

References

[BL25]   Brian Liu. Neuroscience vs biology major. *Message*, 2025.