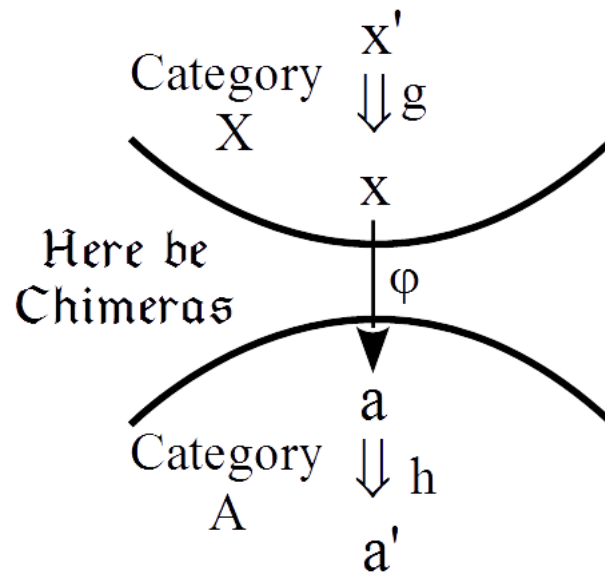


# The Joy of Hets: Heteromorphisms and Category Theory

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Heteromorphisms (hets) are object-to-object morphisms between objects in different categories (like a set-to-group map). The composition of hets is rigorously defined by Het-bifunctors  $\text{Het}: X^{\text{op}} \times A \rightarrow \text{Set}$  (a.k.a. Set-valued profunctors) just as hom-composition is defined by Hom-bifunctors  $\text{Hom}: X^{\text{op}} \times X \rightarrow \text{Set}$ . Hets are chimeras that thrive in the wilds of mathematical practice, but are not "officially" recognized in the ontological zoo of category theory.



This talk will cover:

- the simple and natural definition of adjoints using hets due to Pareigis 1970 (and the similar treatment of other universal mapping properties);
- advantages of the het treatment of adjoints;
- Het-avoidance devices in orthodox homs-only CT texts along side routine use of hets in mathematical practice;
- Tensor products: an example where the UMP requires hets;
- Mac Lane versus Grothendieck: what is more fundamental in CT? Adjoint functors or representable functors.

If hets are routinely used by the "working mathematician" and if one of the points of CT is to reflect mathematical practice (e.g., unlike set theory), then why does orthodox CT only use homs and not hets?