Recent contributions to the philosophical literature on scientific modeling are largely predicated on a twofold representationalist assumption, according to which (i) models are representations of a target, and (ii) the representational relationship between model and target is what secures the epistemic value of modeling. Philosophers increasingly recognize the importance of idealizations, abstractions and purposeful deviations from "veridical representation[s] of real-world phenomena". Many emphasize, for example, that false models can be useful for the development of better theories, and that in many cases models explain not in spite of idealizations but because of them. Yet, even while forgoing the requirement of veridicality and acknowledging the productive role of misrepresentations, most still endorse some form of representationalism and accordingly assume that models contribute to scientific explanation and understanding of real-world targets only insofar as models describe their target, more or less accurately.

Despite its popularity, representationalism is riddled with problems that render the twofold assumption inconsistent. One key problem concerns the role of misrepresentation in model-based research, which raises the question: if what makes X a model of Y is that X represents Y, then how can it be that at least sometimes, as some suggest, what makes X a good model of Y is that the X-Y relationship is faulty and X misrepresents Y? The problem of misrepresentation has been at the forefront of philosophers' attention and has motivated developments that reveal an even more embarrassing difficulty, namely that of explaining successful representation. Traditional accounts that

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assumed a purely dyadic model- target relationship have largely shifted toward accounting for the pragmatic aspects of representation, thus adding scientists as a third component responsible for establishing the "representational mapping" between model and target. This is the case of the updated versions of isomorphism and similarity views, as well as of novel approaches like the inferential, interpretational, and semiotic accounts. Triadic or agential views strengthen the first component of the twofold representational assumption, circumventing criticisms such as that "anything is similar to anything else in various ways." Yet, that is at the cost of weakening the second component of the assumption: if representation is a matter of stipulation, then the representational relationship between model and target cannot be what secures the epistemic value of modeling, for anything can represent anything else if someone is willing to establish a representational mapping.

Some representationalists have proposed to treat models as "instruments of investigation" and "epistemic tools". Based on these insights, I articulate an alternative anti-representational view of models, arguing that representationalism is not necessary for making sense of scientific modeling. Drawing the concept of "affordance" or "action possibility" from ecological psychology, I argue that, as tools, models are epistemically useful for what they present rather than what they re-present. And drawing from complexity science, I highlight the non-linear dynamics of modeling as resulting from evolution over multiple time-scales.

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