

# Using Agent-Based Modelling to Exercise Theoretical Reasoning in Social Psychology

## An Exploration and Tutorial

Bo Yang Tang<sup>a,1,\*</sup>

<sup>a</sup> University of Waterloo, Department of Psychology, 200 University Avenue West, Waterloo, N2L 3G1

---

## Abstract

This is the abstract. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Vestibulum augue turpis, dictum non malesuada a, volutpat eget velit. Nam placerat turpis purus, eu tristique ex tincidunt et. Mauris sed augue eget turpis ultrices tincidunt. Sed et mi in leo porta egestas. Aliquam non laoreet velit. Nunc quis ex vitae eros aliquet auctor nec ac libero. Duis laoreet sapien eu mi luctus, in bibendum leo molestie. Sed hendrerit diam diam, ac dapibus nisl volutpat vitae. Aliquam bibendum varius libero, eu efficitur justo rutrum at. Sed at tempus elit.

*Keywords:* Social Psychology, Complexity, Simulation, Agent-Based Modelling

---

Social psychology has a problem of complexity. This problem is not unique to social psychology or the social sciences ([Macy and Willer](#)), but the approaches that social psychologists use to study social psychology have had limited success ([Grossmann et al.](#); [Open Science Collaboration](#); [Muthukrishna and Henrich](#)). Following the replication crisis, there has been an increased focus in the social sciences on rigour in research process, leading to the creation and adoption of open science practices ([Nosek et al.](#); [Bauer](#)). A survey of psychology researchers found that they perceived the benefits of preregistration most for planning analyses and generating hypotheses ([Sarafoglou et al.](#)). Others argued that a major reason for the replication crisis in psychology is a lack of cohesion in the theoretical foundations guiding research ([Muthukrishna and Henrich](#)). Recently, a large sample of experts in the social sciences participated in a survey to gather their predictions for different domains of societal change following the COVID-19 pandemic ([Grossmann et al.](#)). They found that social scientists did not perform

---

\*Corresponding author

Email address: [bytang@uwaterloo.ca](mailto:bytang@uwaterloo.ca) (Bo Yang Tang)

<sup>1</sup>This is the first author footnote.

better than chance for this task, in contrast to previous studies that found social scientists performed better than laypeople in predicting the outcomes of laboratory experiments of these same domains (Grossmann et al.). This gap in prediction accuracy was attributed to inadequate causal models (Grossmann et al.). Together these findings suggest that social psychologists are lacking theories suitable for the complexity of social phenomena in the real world.

## 1. A Problem of Complexity

Experimental designs allow us to isolate causal relationships between variables, but extending this approach to systematically define multiple aspects of a phenomenon quickly leads to a combinatorial explosion. Overarching theoretical frameworks are the opposite in this regard. Rather than having to test an impractically large space of possible hypotheses to develop comprehensive models, a theoretical framework defines a limited space of possibilities that can be supported or disproven by existing or new data (Muthukrishna and Henrich). The authors argue that dual inheritance theory, an evolutionary theory, is a suitable framework to guide reasoning for social behaviours (Muthukrishna and Henrich). In general, evolutionary theories are bottom-up approaches that can describe complex systems (Miller and Todd).

## References

- Bauer, P.J., . Psychological Science Stepping Up a Level 33, 179–183. URL: <https://doi.org/10.1177/09567976221078527>, doi:[10.1177/09567976221078527](https://doi.org/10.1177/09567976221078527).
- Grossmann, I., Varnum, M.E.W., Hutcherson, C.A., Mandel, D.R., . When expert predictions fail 28, 113–123. URL: <https://www.sciencedirect.com/science/article/pii/S1364661323002632>, doi:[10.1016/j.tics.2023.10.005](https://doi.org/10.1016/j.tics.2023.10.005).
- Macy, M.W., Willer, R., . From factors to actors: Computational sociology and agent-based modeling 28, 143–166. URL: <https://www.proquest.com/docview/199611245/abstract/17CB20A7E5E046B0PQ/1>, doi:[10.1146/annurev.soc.28.110601.141117](https://doi.org/10.1146/annurev.soc.28.110601.141117).
- Miller, G.F., Todd, P.M., . A Bottom-up Approach with a Clear View of the Top: How Human Evolutionary Psychology Can Inform Adaptive Behavior Research 3, 83–95. URL: <https://doi.org/10.1177/105971239400300106>, doi:[10.1177/105971239400300106](https://doi.org/10.1177/105971239400300106).
- Muthukrishna, M., Henrich, J., . A problem in theory 3, 221–229. URL: <https://www.nature.com/articles/s41562-018-0522-1>, doi:[10.1038/s41562-018-0522-1](https://doi.org/10.1038/s41562-018-0522-1).
- Nosek, B.A., Hardwicke, T.E., Moshontz, H., Allard, A., Corker, K.S., Dreber, A., Fidler, F., Hilgard, J., Kline Struhl, M., Nuijten, M.B., Rohrer, J.M., Romero, F., Scheel, A.M., Scherer, L.D., Schönbrodt, F.D., Vazire, S., . Replicability, Robustness, and Reproducibility in Psychological Science 73, 719–748.

URL: [https://journals.scholarsportal.info/details/00664308/v73inone/719\\_rrarips.xml](https://journals.scholarsportal.info/details/00664308/v73inone/719_rrarips.xml), doi:10.1146/annurev-psych-020821-114157.

Open Science Collaboration, . Estimating the reproducibility of psychological science 349, aac4716. URL: <https://www-science-org.proxy.lib.uwaterloo.ca/doi/10.1126/science.aac4716>, doi:10.1126/science.aac4716.

Sarafoglou, A., Kovacs, M., Bakos, B., Wagenmakers, E.J., Aczel, B., . A survey on how preregistration affects the research workflow: Better science but more work 9, 211997. URL: <https://royalsocietypublishing.org/doi/full/10.1098/rsos.211997>, doi:10.1098/rsos.211997.