A growing literature in economics considers how to model heuristics that agents use to process information and the resulting biases that emerge in belief updating. In this paper, we link two common approaches used to model inaccurate belief updating: (i) defining an "updating rule" that specifies a mapping from the true Bayesian posterior to the agent's subjective posterior (a heuristic), and (ii) modeling an agent as a Bayesian learner with a misspecified model of the signal process. We first establish conditions under which a heuristic can be represented as a misspecified model and vice versa. In fact, there are often a multiplicity of misspecified models that represent a given heuristic. We then outline two natural restrictions to place on the misspecified model that provide conceptual guidance for which model to select. The first condition---introspection-proofness---imposes structure on how the misspecified model relates to the correctly specified model. The second condition---naive consistent forecasting---is a condition on the agent's forecast about how he will form beliefs in the future. Each condition uniquely selects a misspecified model when such a model exists. We then demonstrate how introspection-proofness places a natural bound on the magnitude of bias that can emerge in an application with motivated reasoning, and how naive consistent forecasting impacts a firm's ability to screen biased consumers in a credit market application.