Towards the Role of Theory of Mind in Explanation

Maayan Shvo Toryn Q. Klassen Sheila A. McIlraith

Department of Computer Science
University of Toronto
Toronto, Canada

Vector Institute
Toronto, Canada

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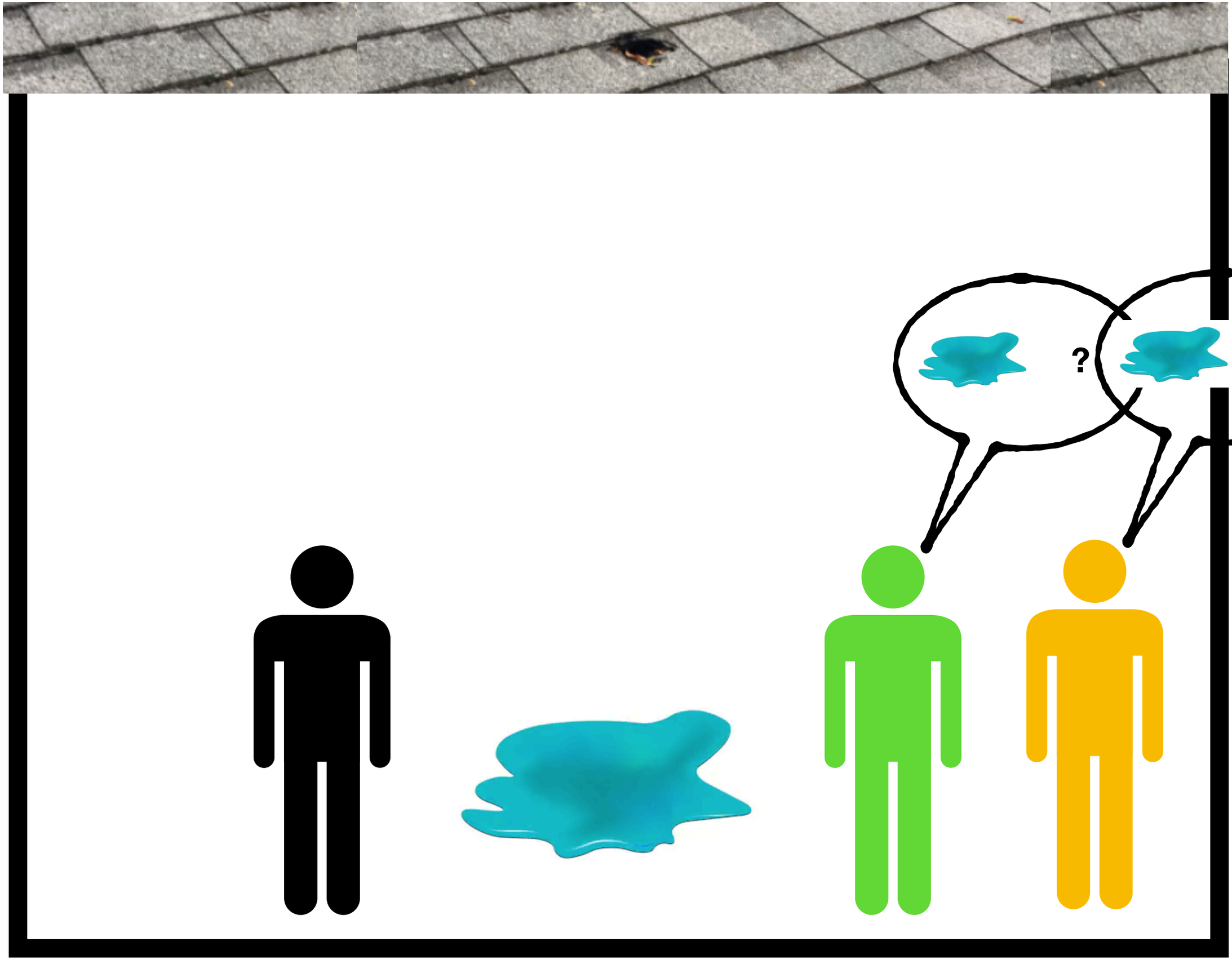

Theory of Mind in Explanation

(Weiner, 1980)
(Gärdenfors, 1988)
(Cawsey, 1991)
(Slugoski et al., 1993)
(Halpern and Pearl, 2005)
(Chakraborti et al., 2017)
(Chandrasekaran et al., 2017)
(Westberg et al., 2019)
(Miller et al., 2019)

Theory of Mind in Explanation - Desiderata

- Multiple explainers and explainees

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- Explainer must reason about how the explainee assimilates explanations

Theory of Mind in Explanation - Building Blocks

Epistemic States

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Our Belief-level Account of Explanation

$$\overrightarrow{e} = e_1, \ldots, e_n$$

e_i is the epistemic state of agent i

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After agent i revises its beliefs with alpha, agent i will believe beta and not have inconsistent beliefs

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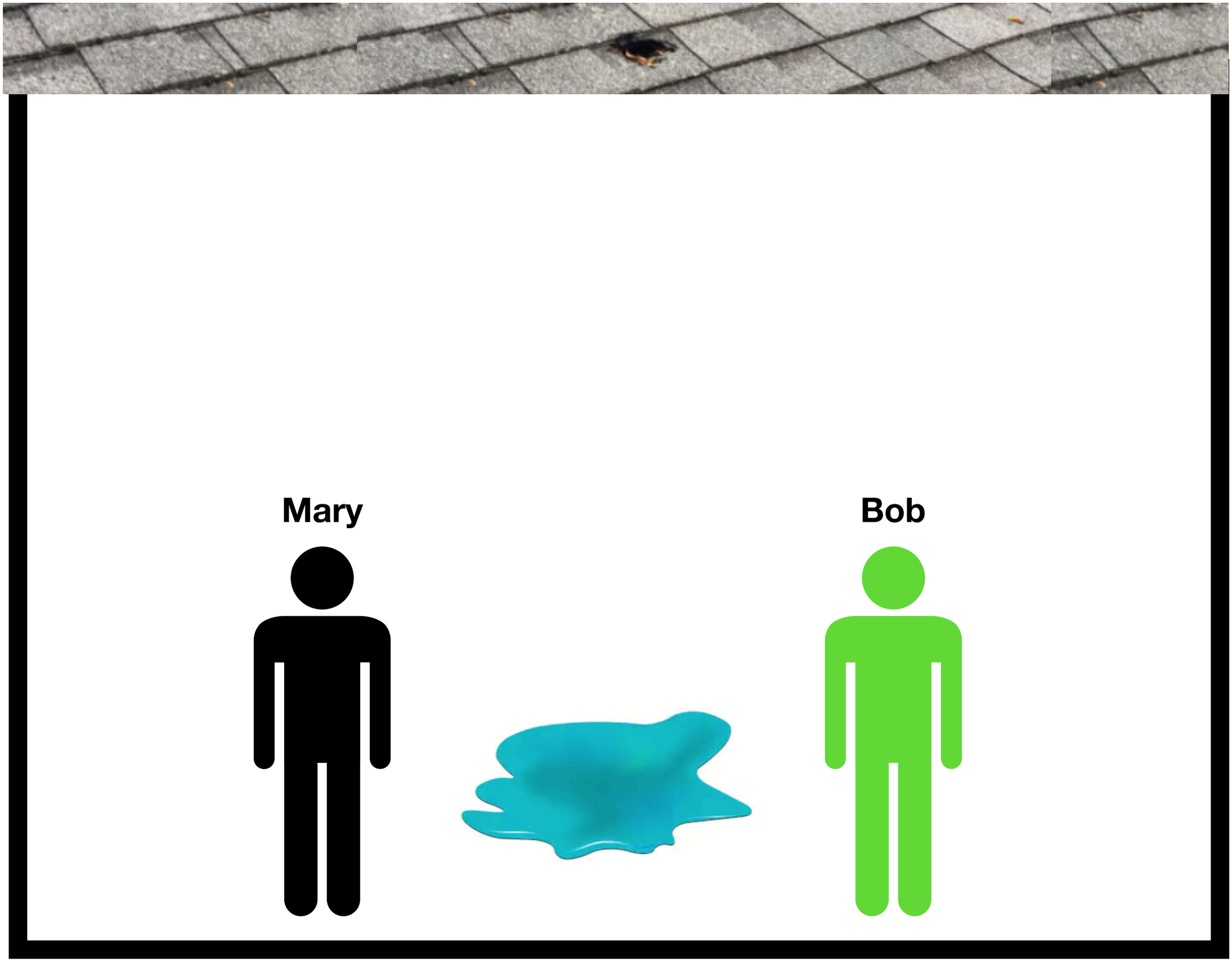
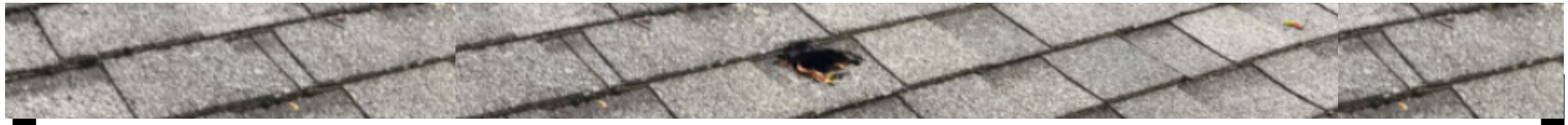
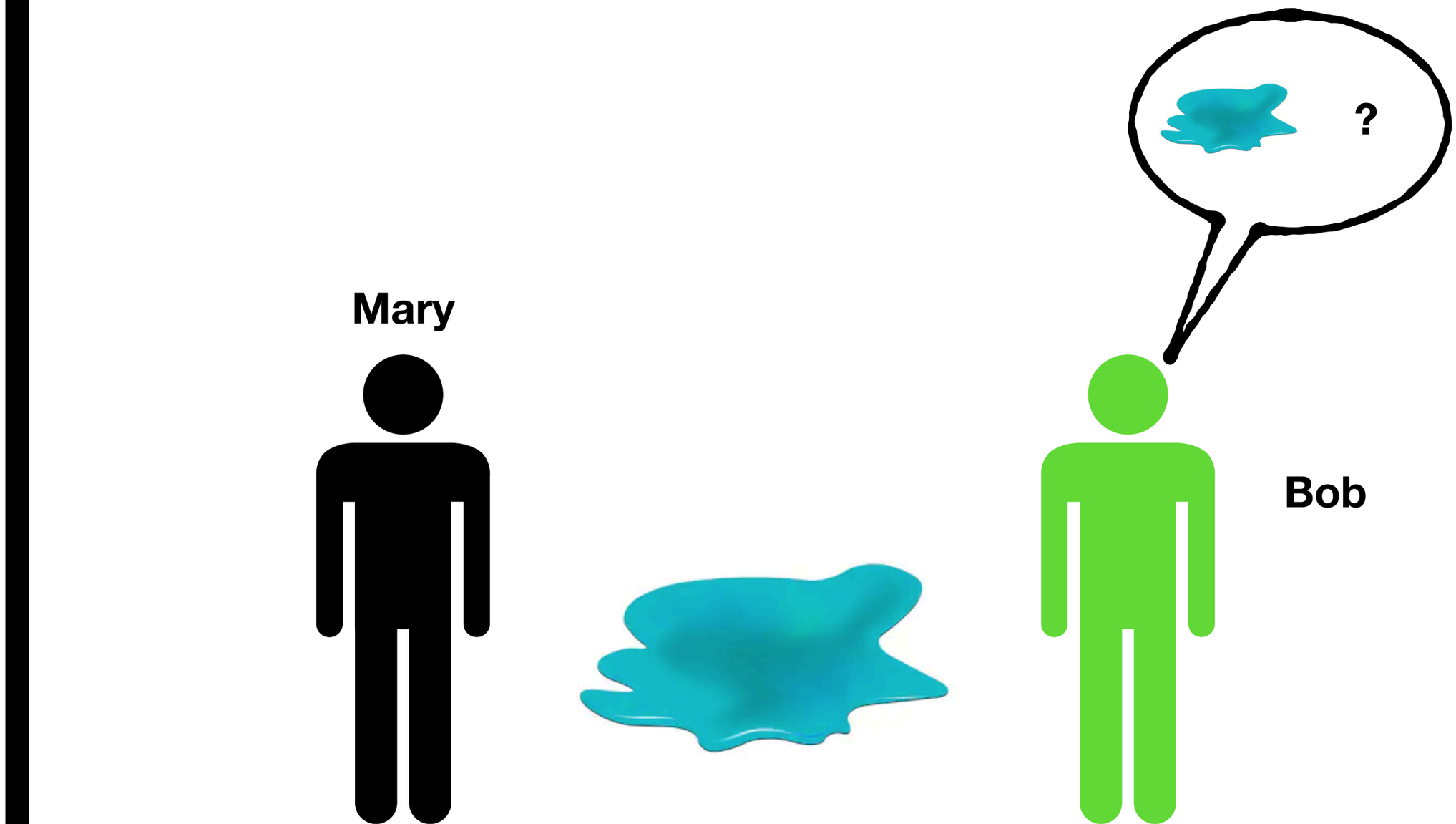
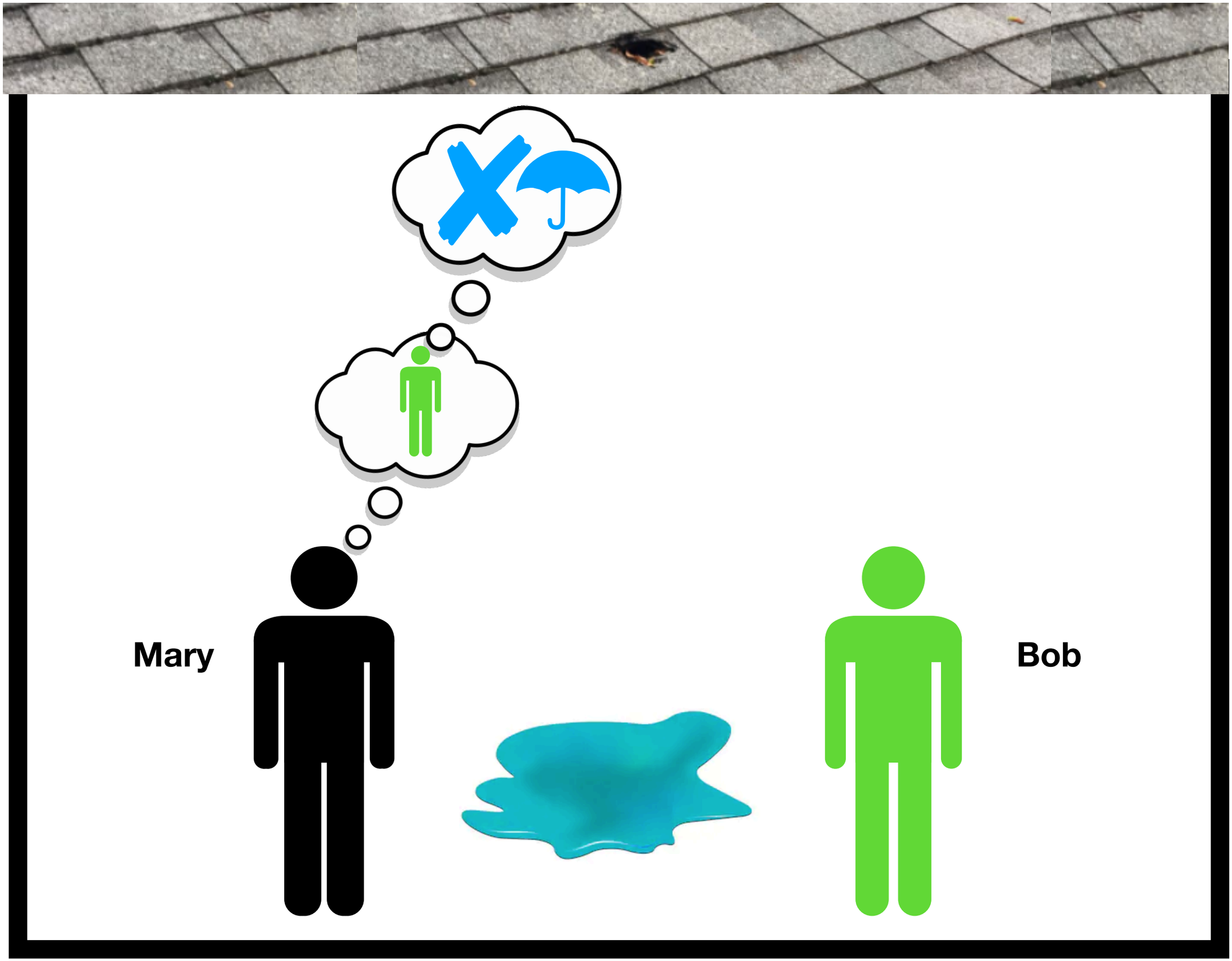
$$\overrightarrow{e} \models B_j Expl(i, \alpha, \beta)$$

Agent j believes that alpha is an explanation for beta for agent i

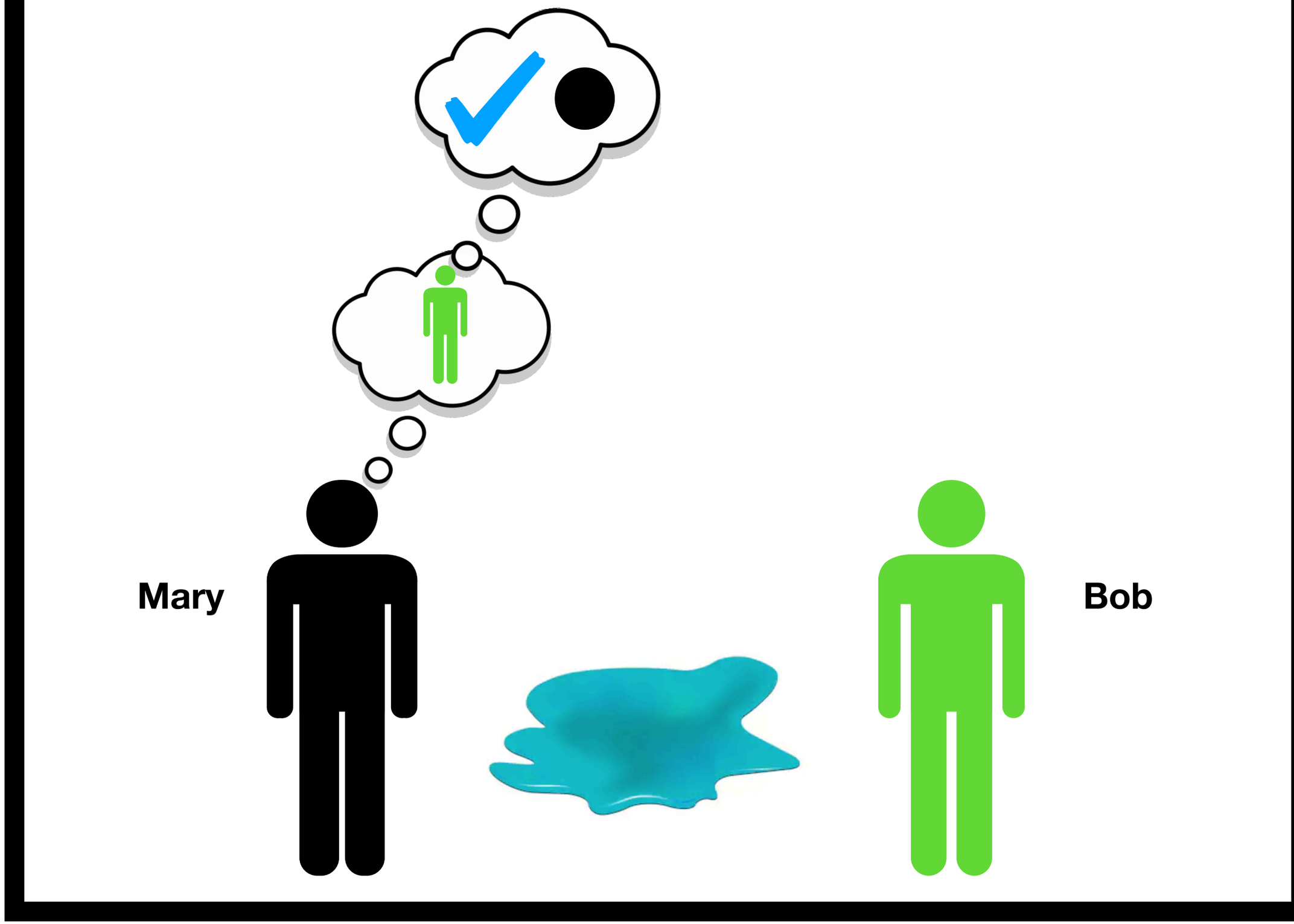

Mary
Bob



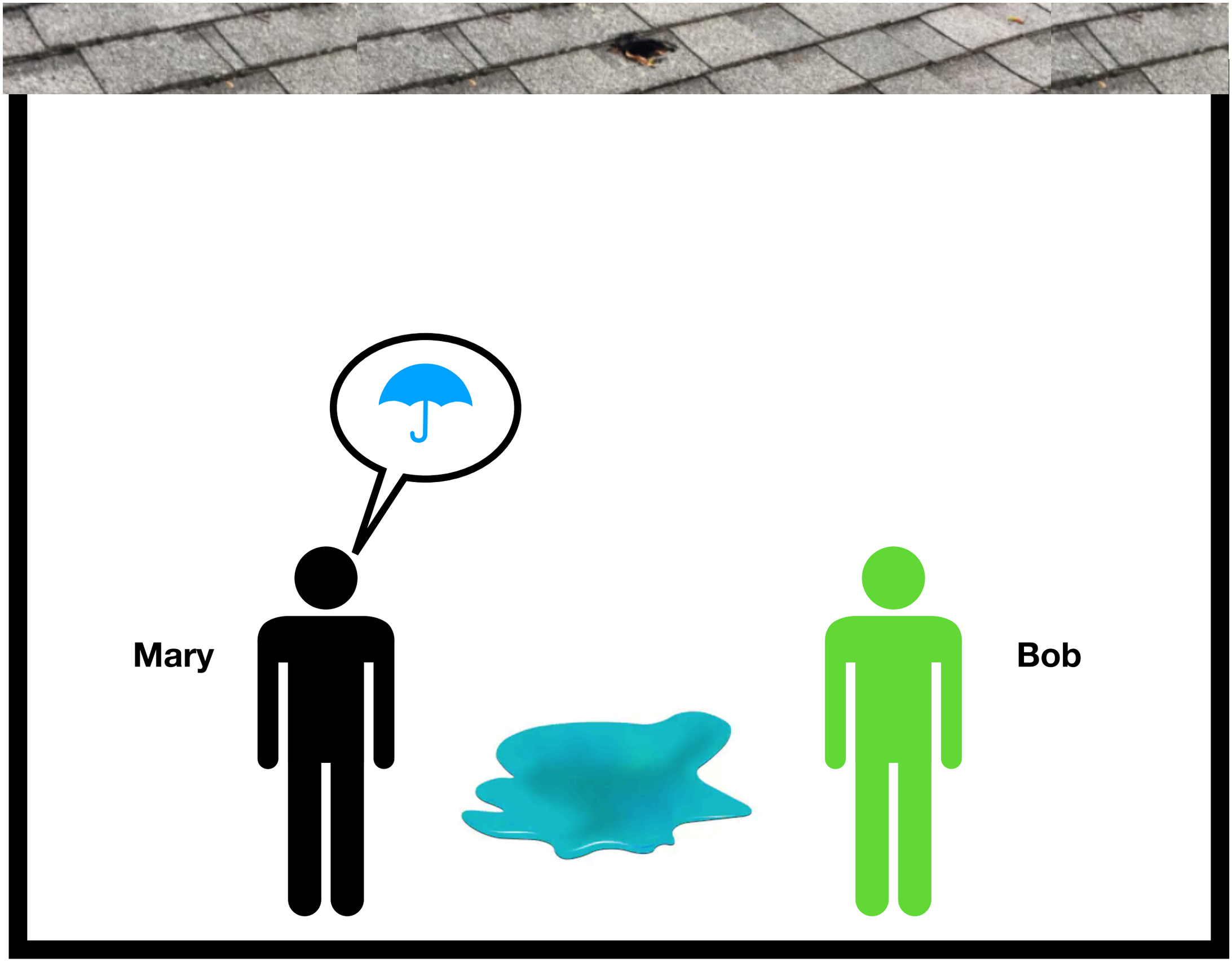

?
Mary
Bob



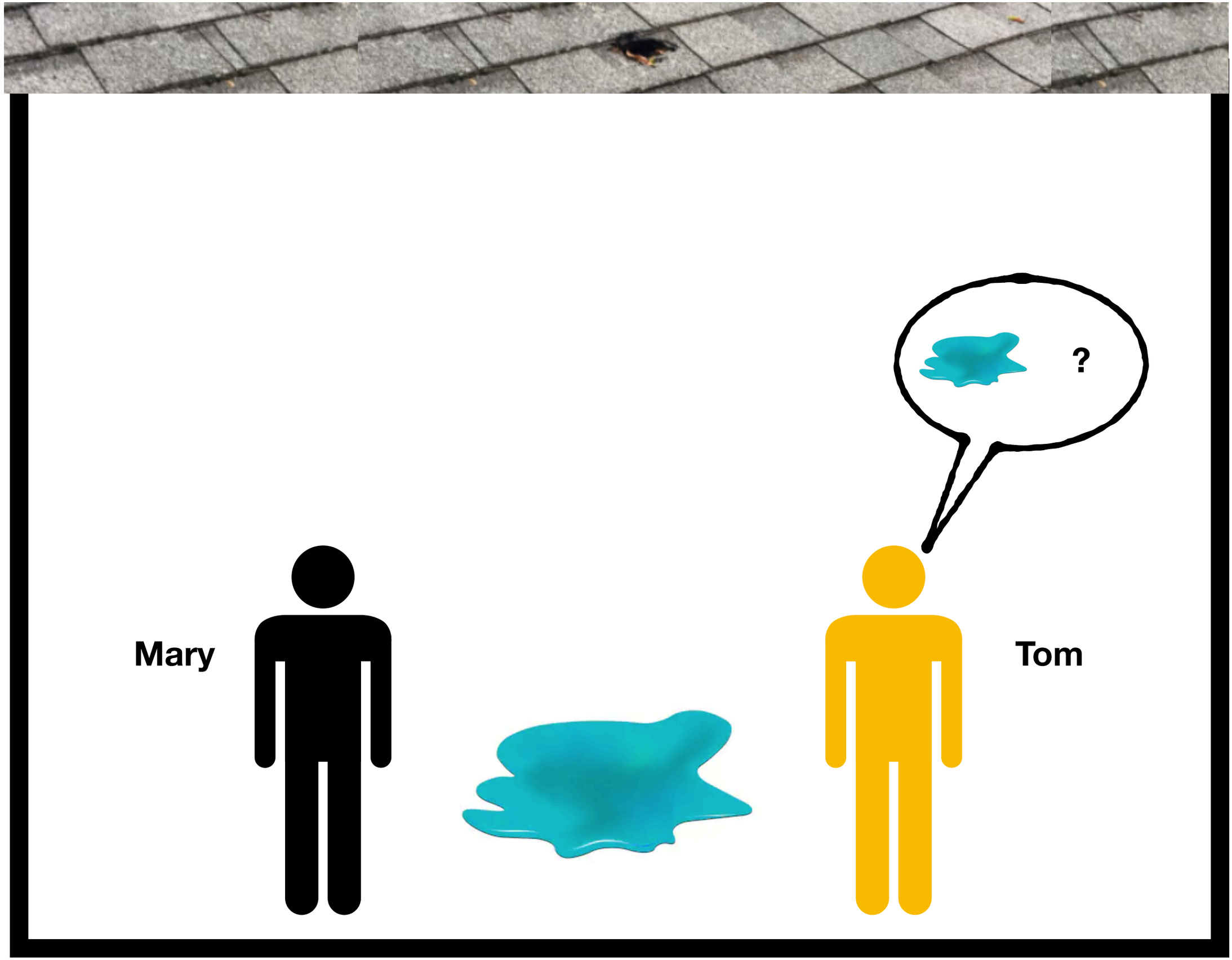
$$\overrightarrow{e} \vDash B_{Mary} B_{Bob} \neg rain$$

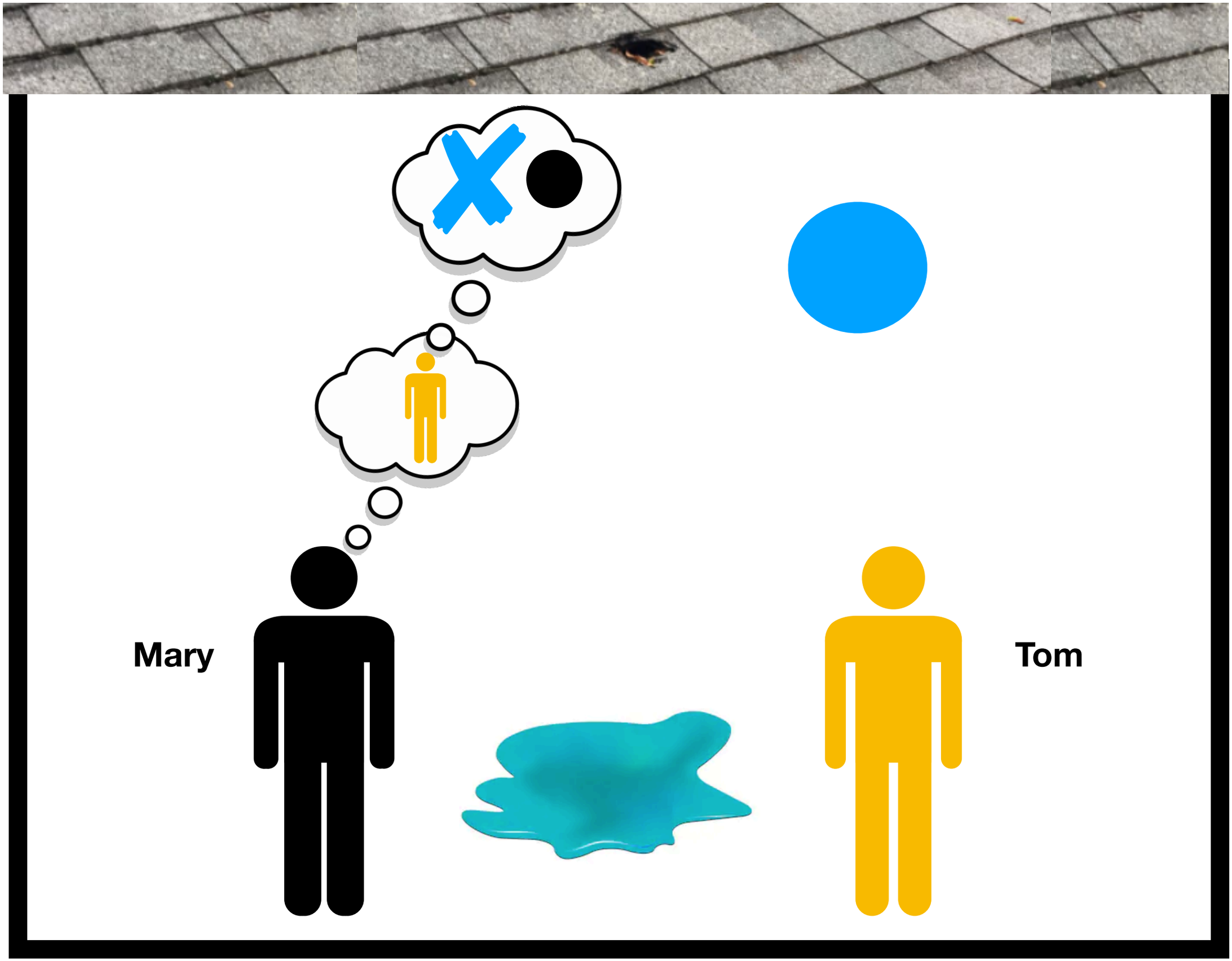


$$\overrightarrow{e} \vDash B_{Mary} B_{Bob} holeInRoof$$

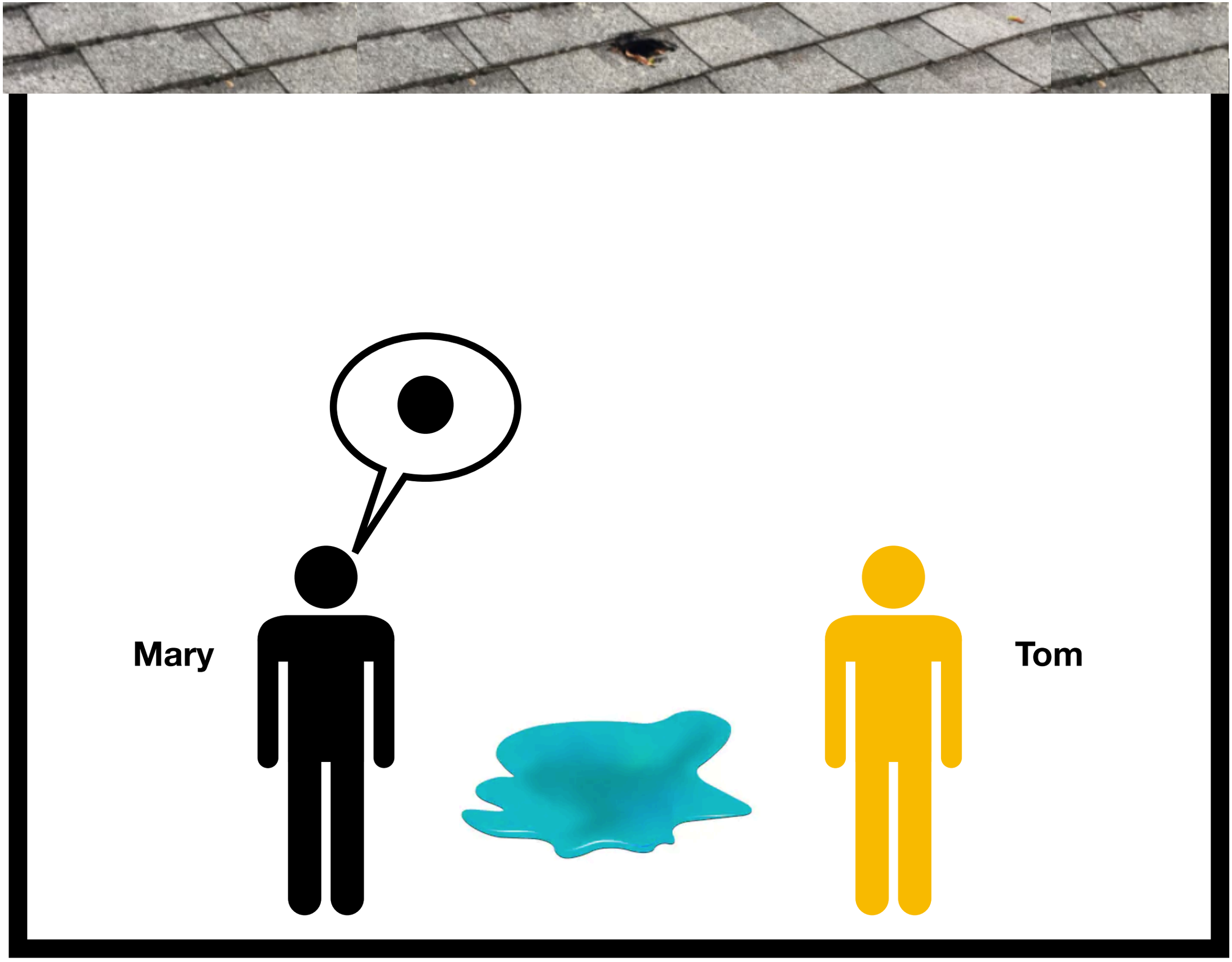


$$\overrightarrow{e} \vDash B_{Mary} Expl(Bob, rain, wetFloor)$$

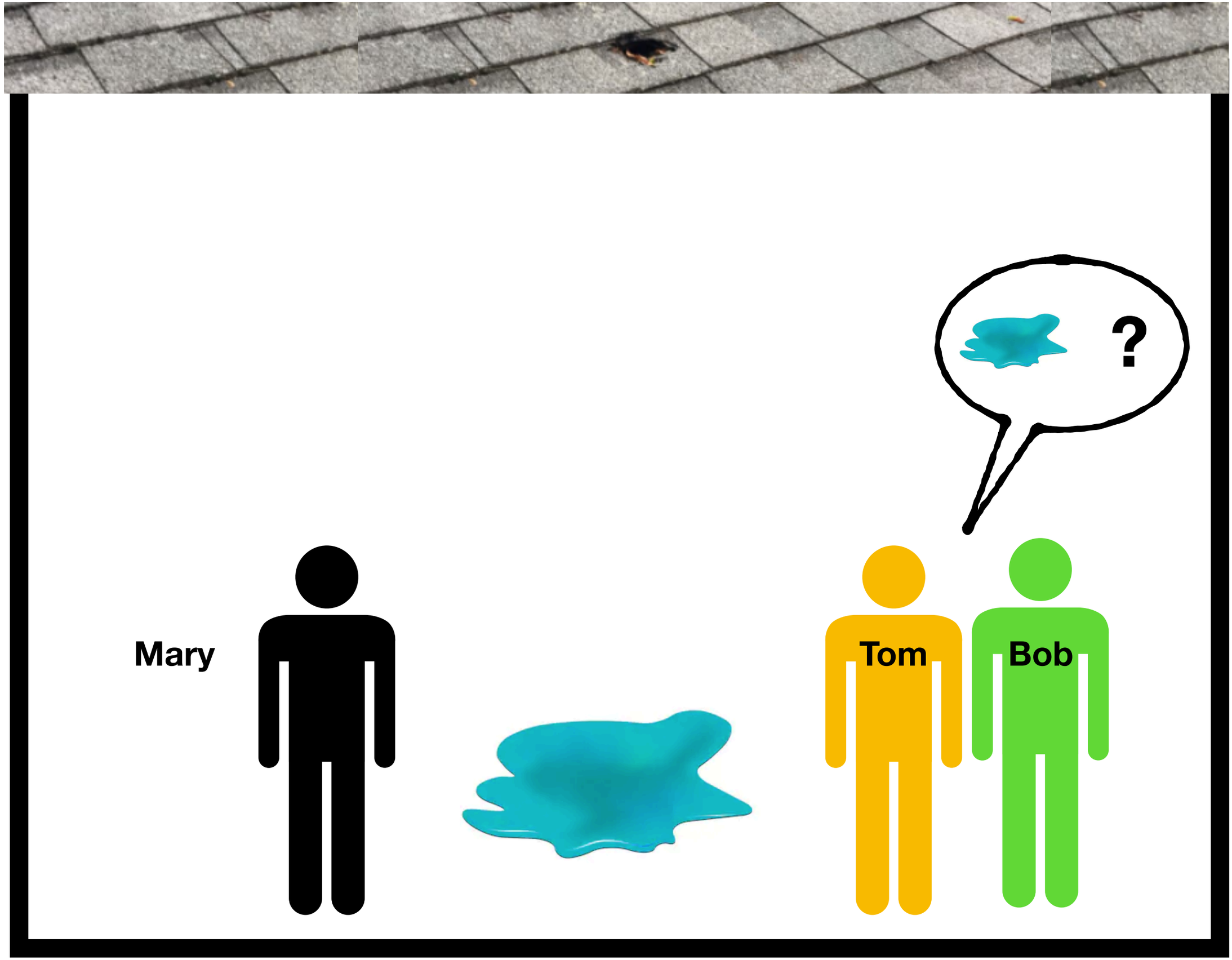

?
Mary
Tom



$$\overrightarrow{e} \models B_{Mary} B_{Tom} \neg holeInRoof$$



$$\overrightarrow{e} \vDash B_{Mary}Expl(Tom, holeInRoof, wetFloor)$$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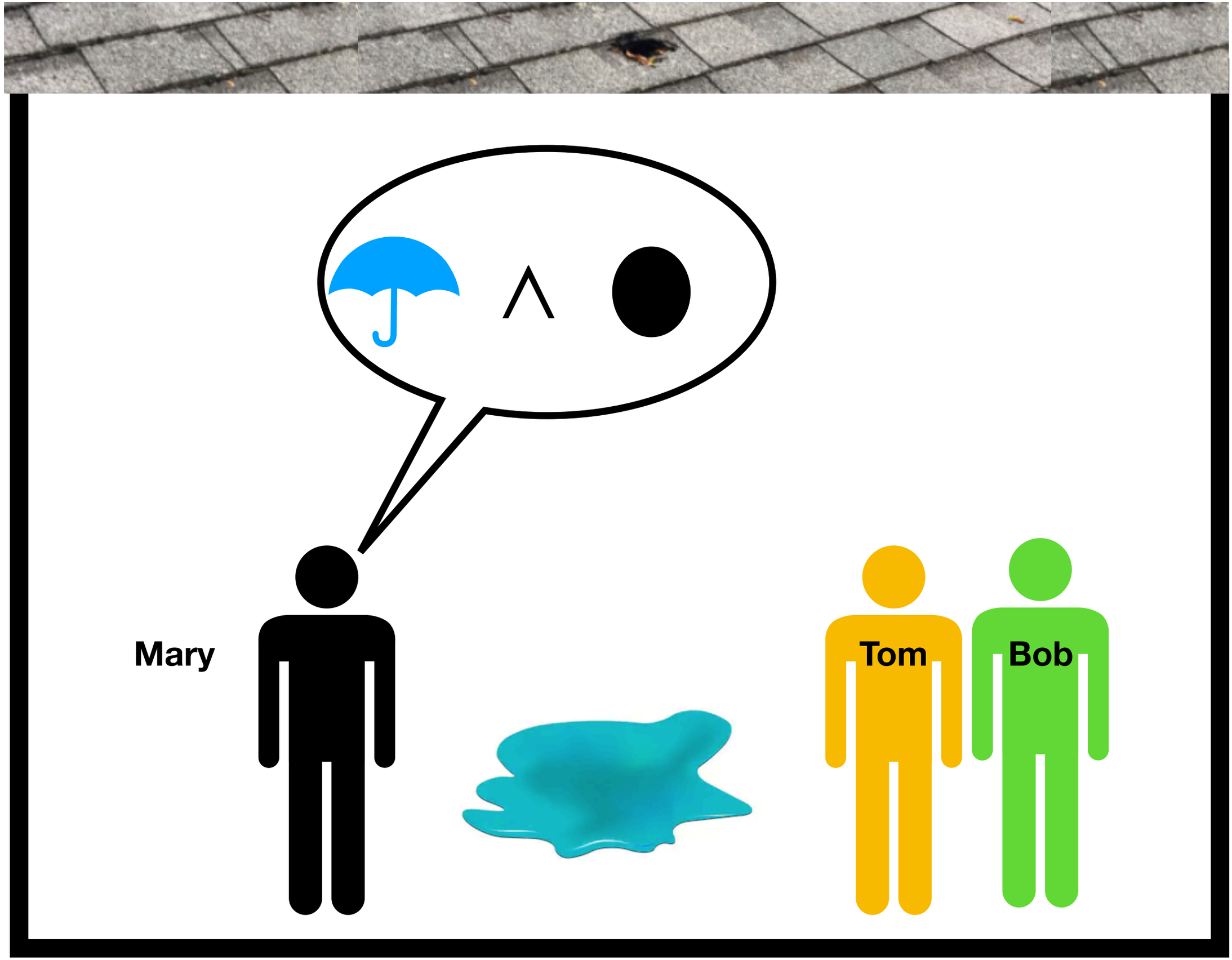
Mary
Tom
Bob


Mary
Tom
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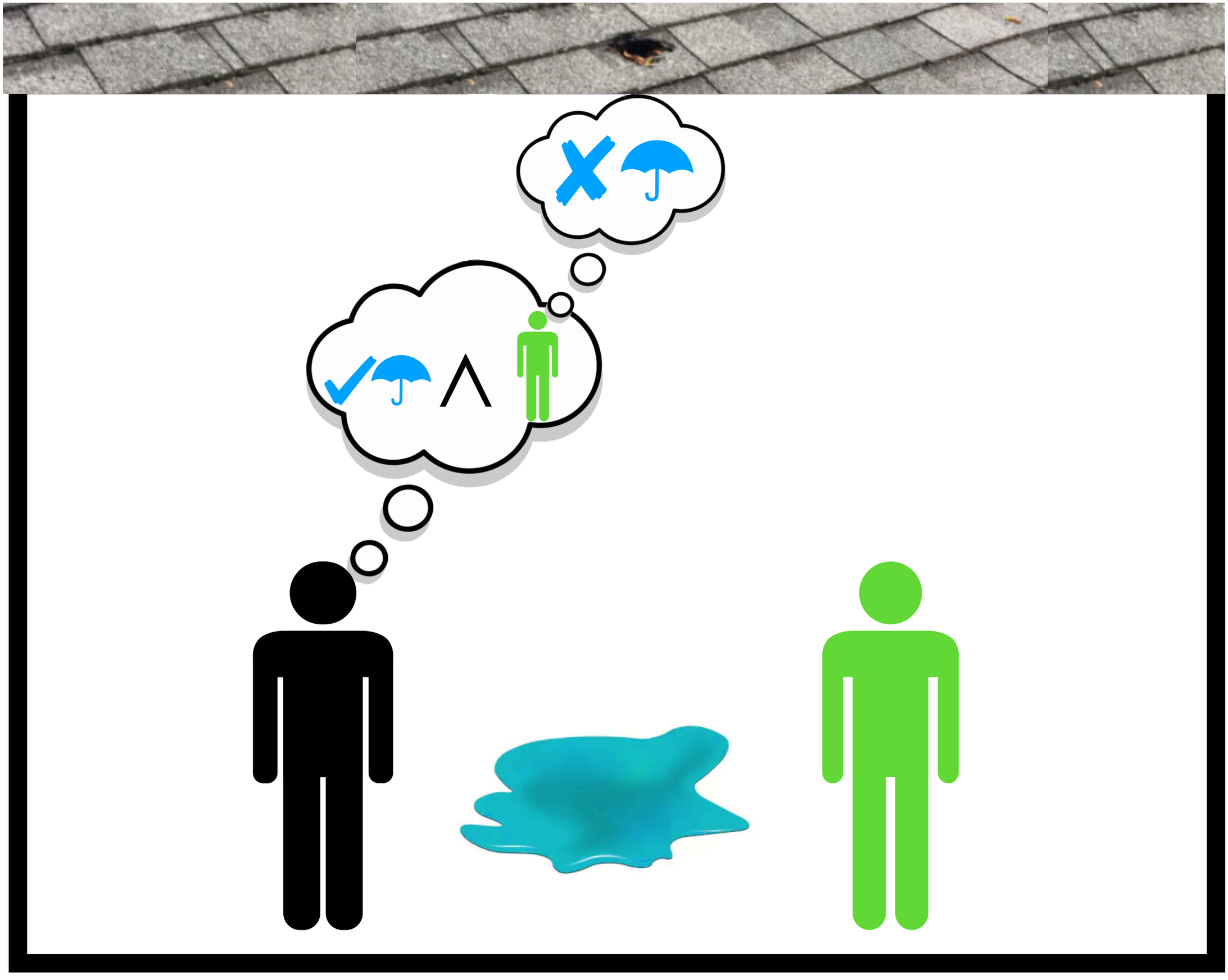
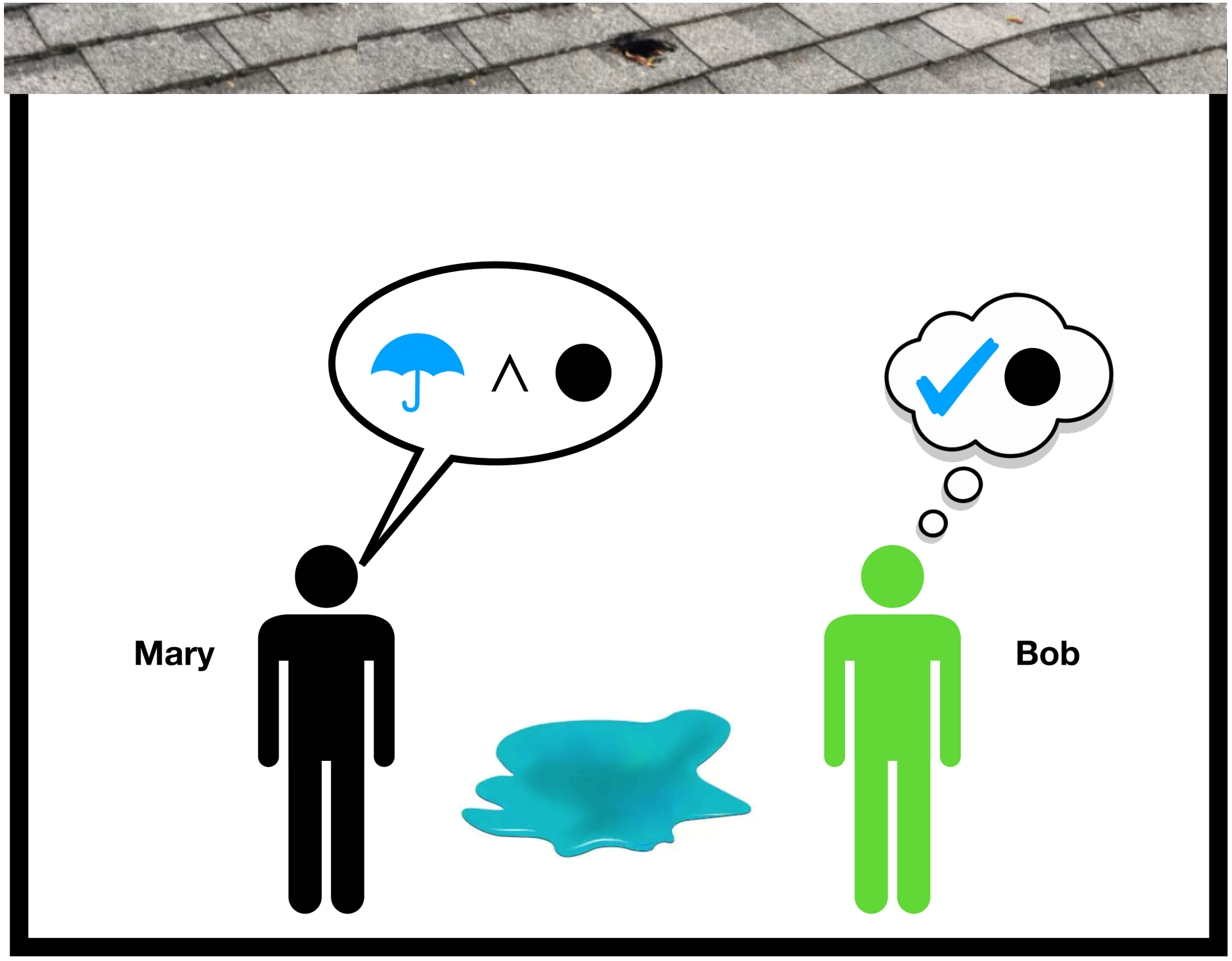
Explainer-Explainee Discrepancies



$$B_{Mary} rain \wedge B_{Mary} B_{Bob} \neg rain$$

The (In)Adequacy of the Explainer's Beliefs


Mary
Bob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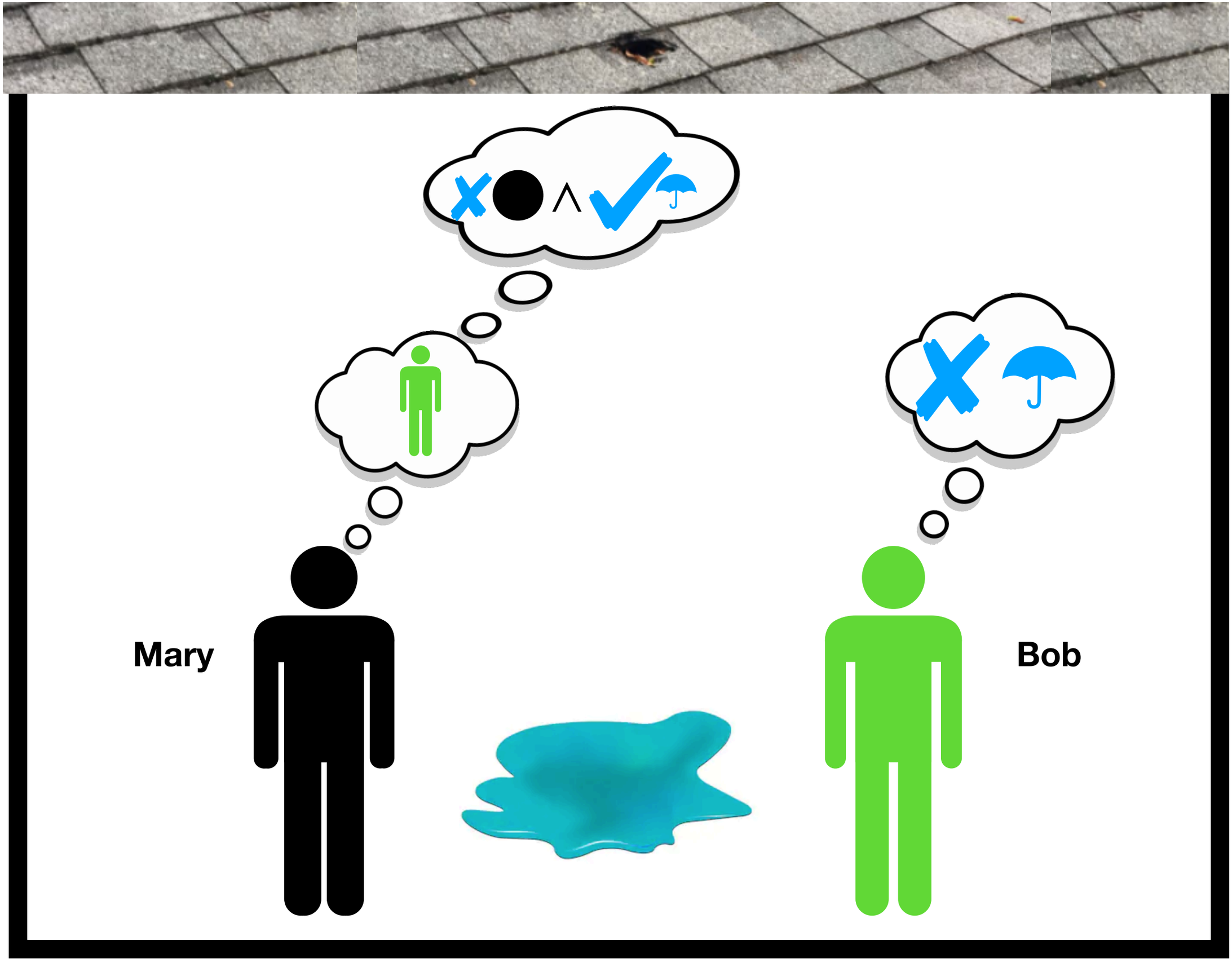
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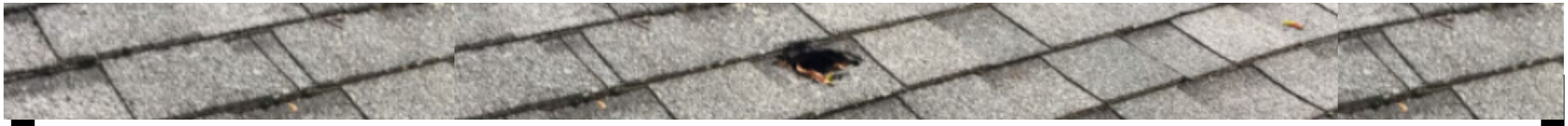

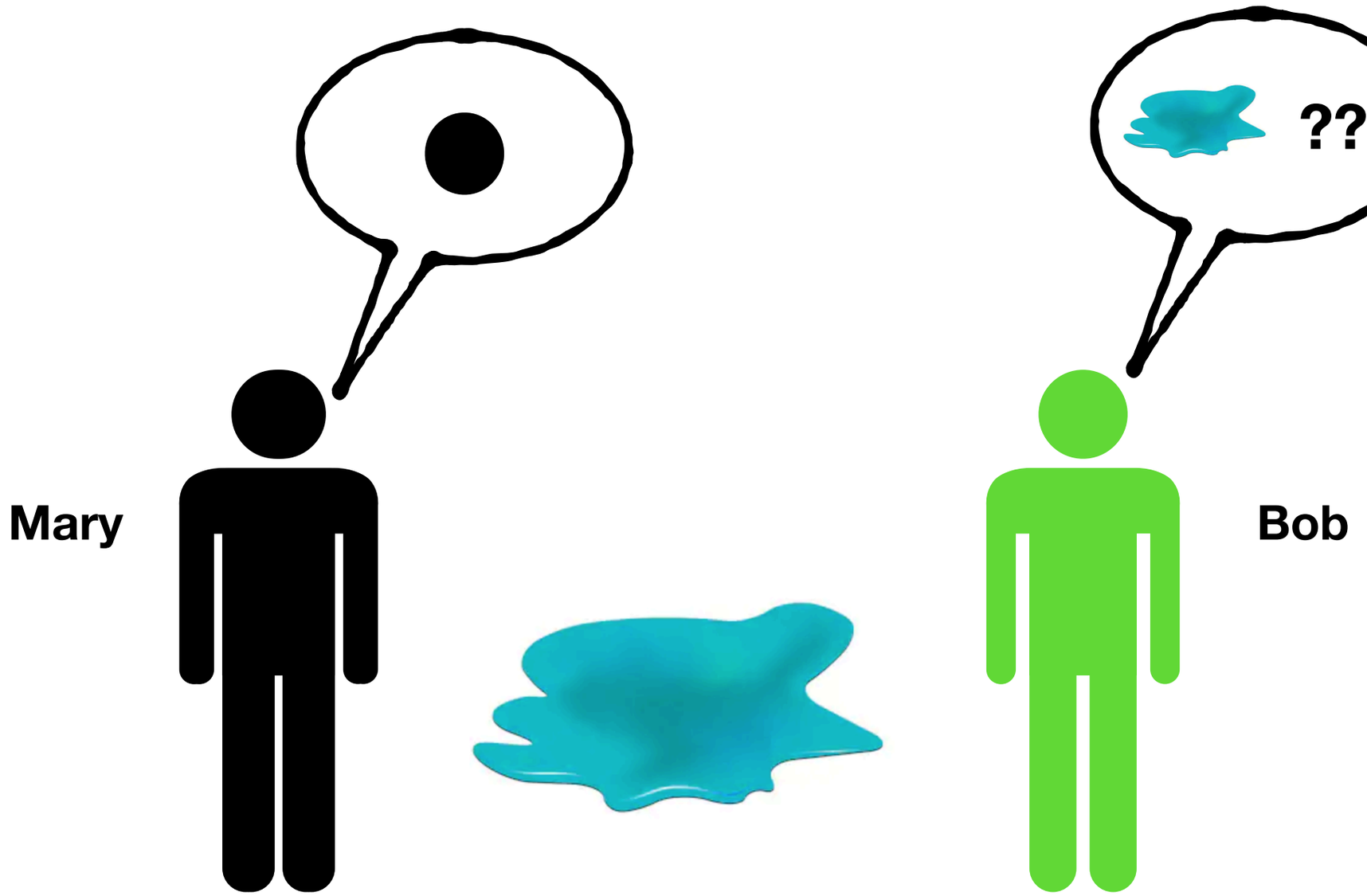
??
Mary
Bob

Summary (and Why You Should Read the Paper)

- We propose a belief-level account of explanation
- We appeal to generic epistemic states
- We appeal to a generic revision operator

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- Explainer-Explainee Discrepancies
- The (In)Adequacy of the Explainer's Beliefs

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