Bi-Deniable Public-Key Encryption

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Deniable Encryption [CDNO'97]

$c = \mathrm{Enc}_{pk}(\text{“surpriz prty 4 big bro!”})$

(Images courtesy xkcd.org)

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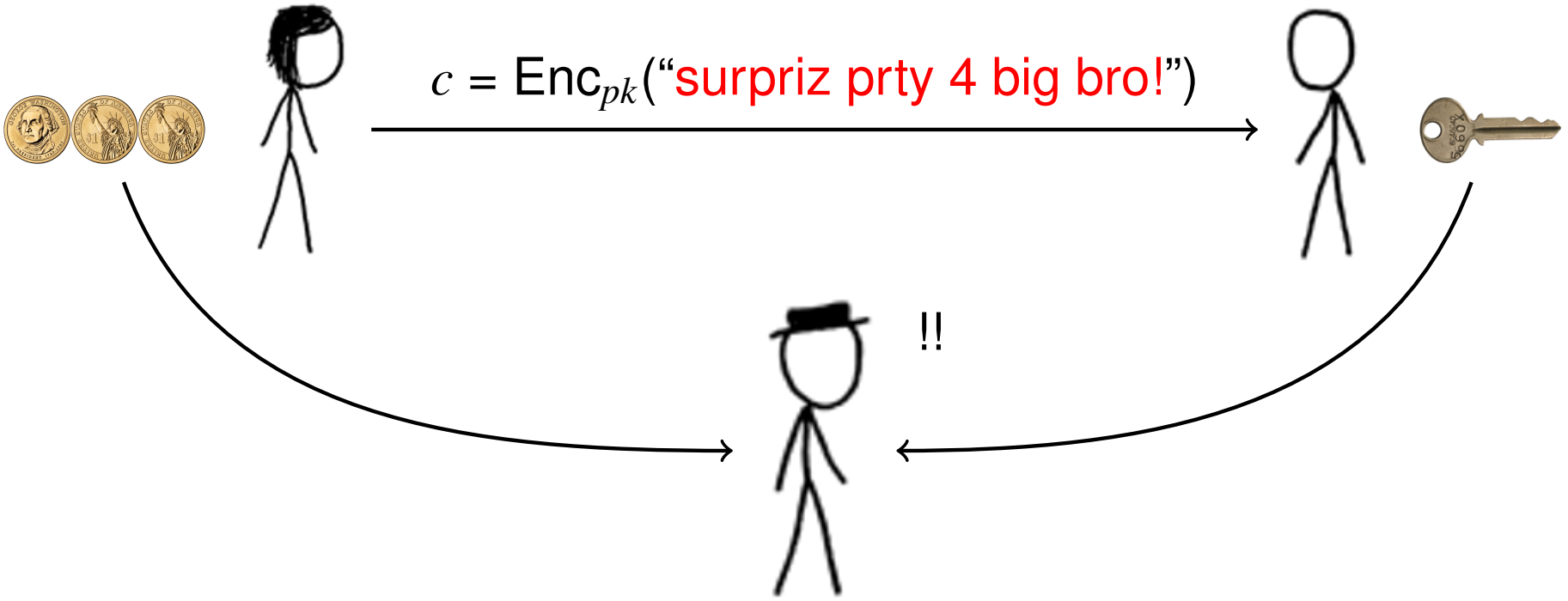

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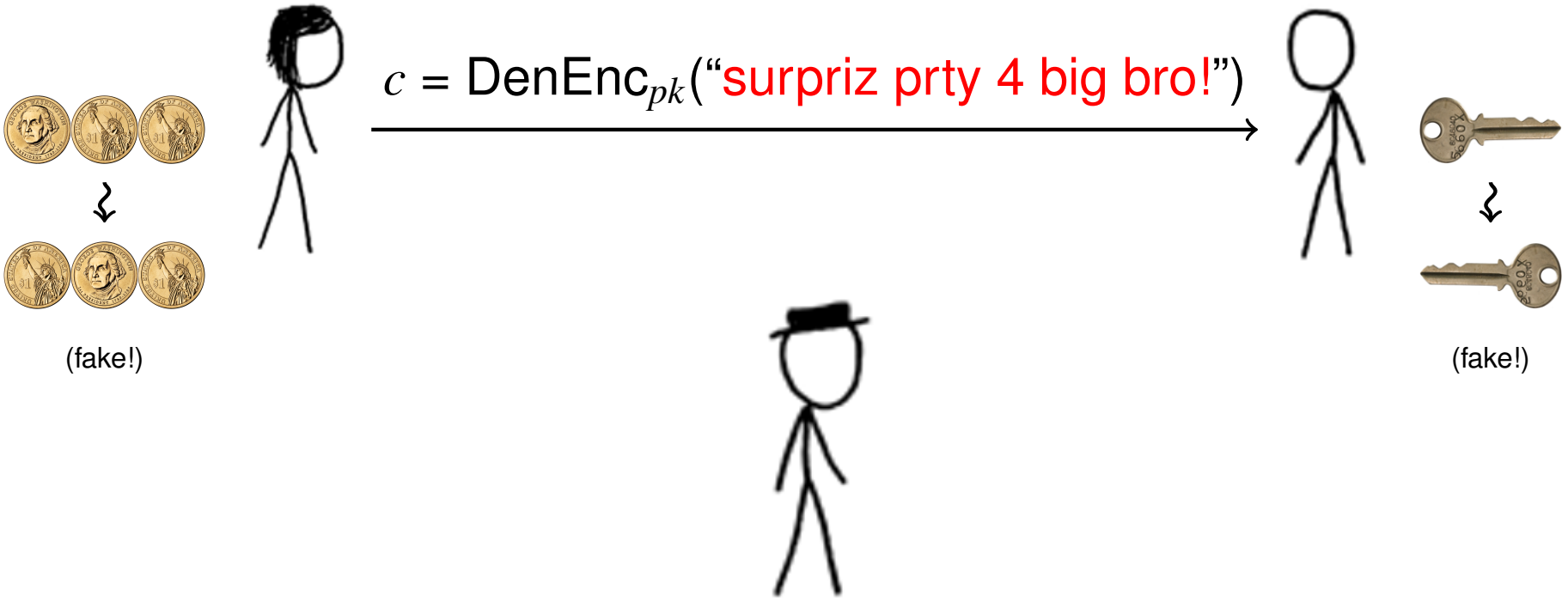

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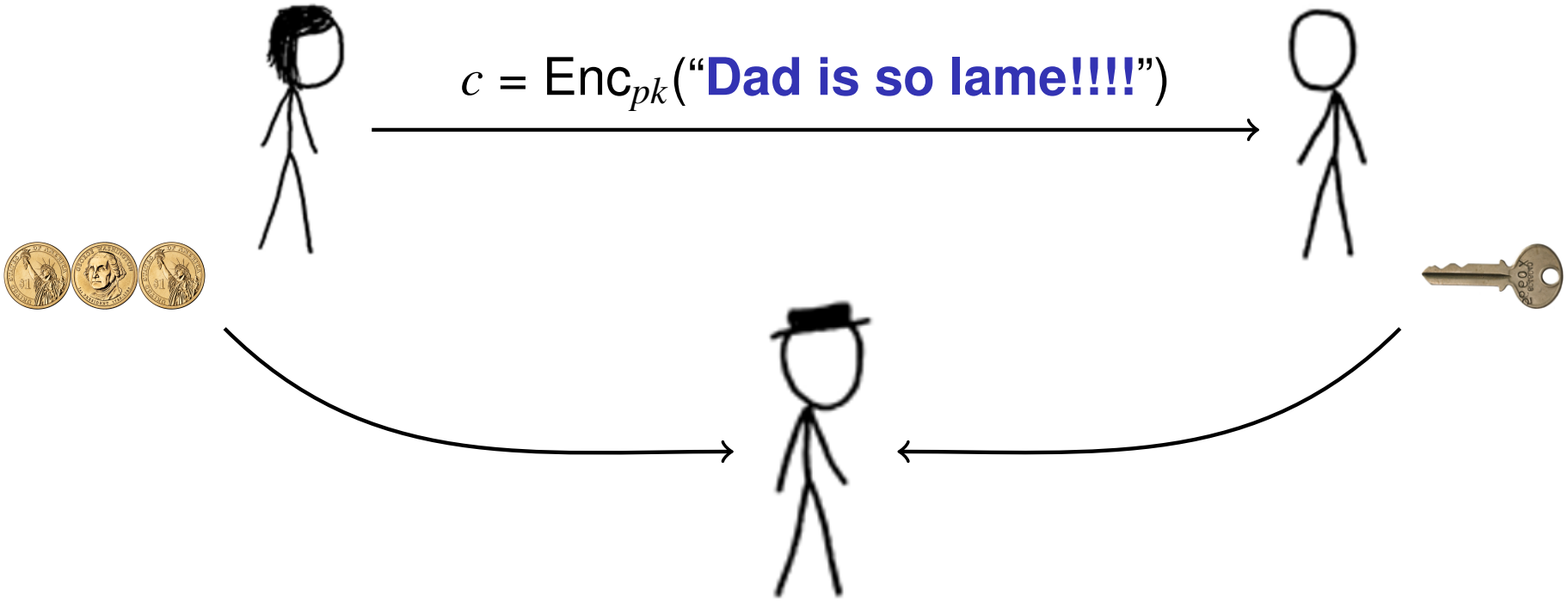

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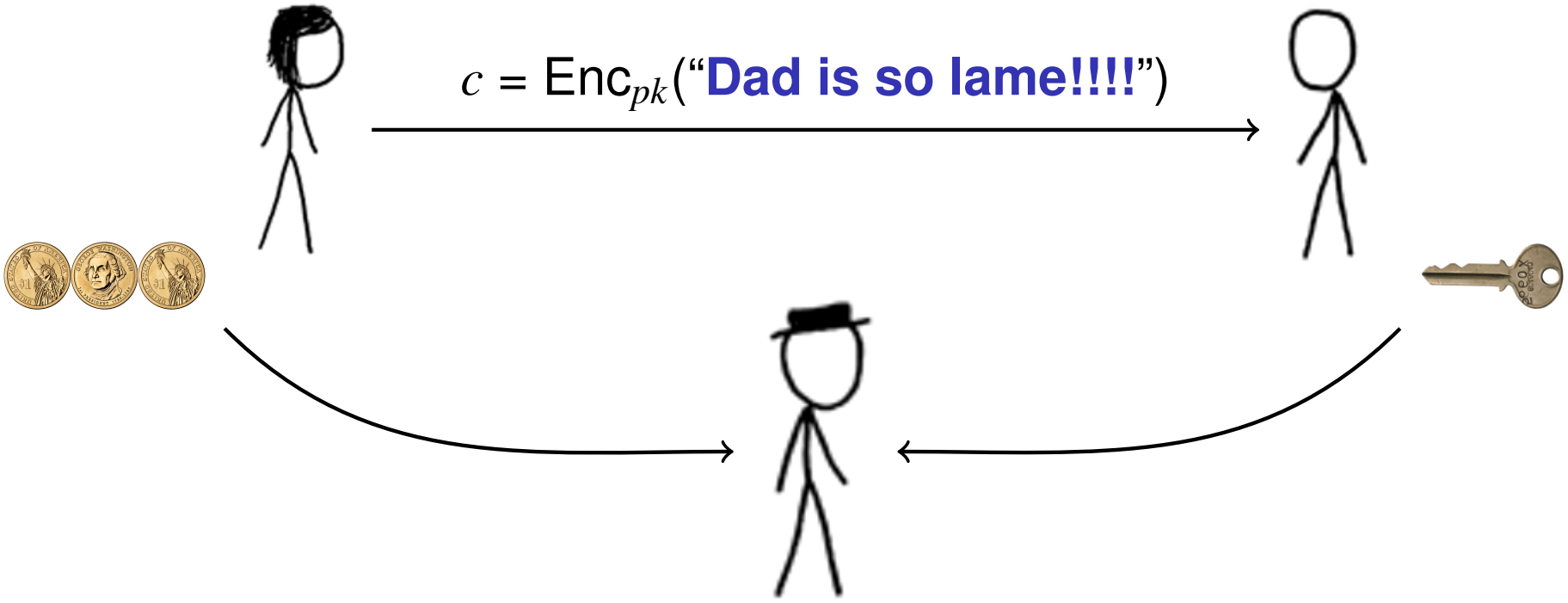

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⋆⋆ Coercion is after the fact (cf. "uncoercible communication" [BT'94])

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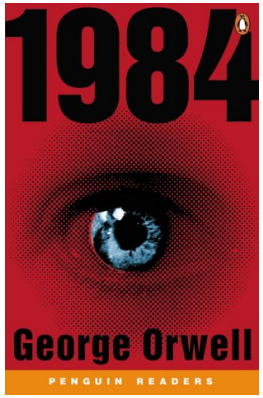

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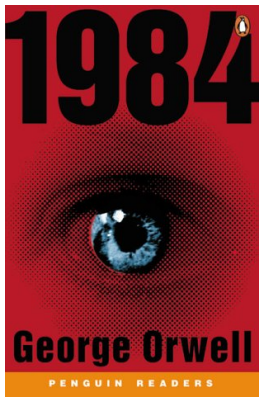

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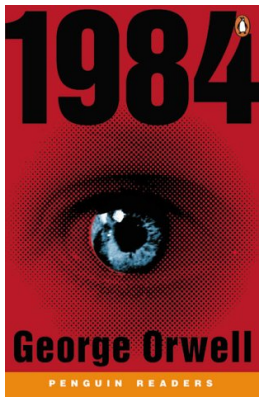

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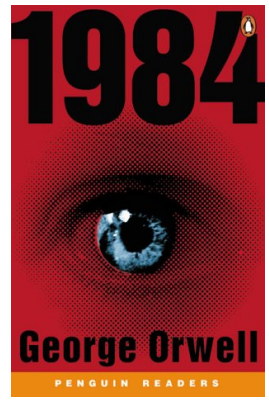

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4. Implies noncommitting encryption for adaptive corruption [CFGN'96]

Prior Work

Theory [CDNO'97]

- Sender-deniable public-key encryption
- Receiver-deniability with interaction
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Practice: TrueCrypt, Rubberhose FS, . . .

- "Plausible deniability:" *move along, no message here. . .*

  Maybe OK for *storage*, but not so much for *communication*.

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   (analogue of "somewhat non-committing" encryption [GWZ'09])

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3. Analogous solutions in the ID-based setting.

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2. "Fully receiver-/bi-deniable PKE is impossible" [BNNO'11]
   - ⋆ Formally: σ-bit secret key $\Rightarrow$ $(1/\sigma)$-distinguishable real vs. fake
   - ⋆ Don't deny the impossibility — instead, be "flexible."

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- "Full" deniability requires equivocable Gen and Enc algs.

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The purpose is not to 'convince' the coercer, but just to *preempt coercion in the first place*.

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   - ⋆ (Also calls into question the applicability to voting.)

A Tool for Deniability: Translucent Sets [CDNO'97]

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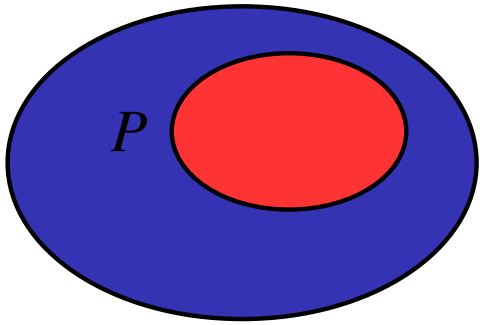

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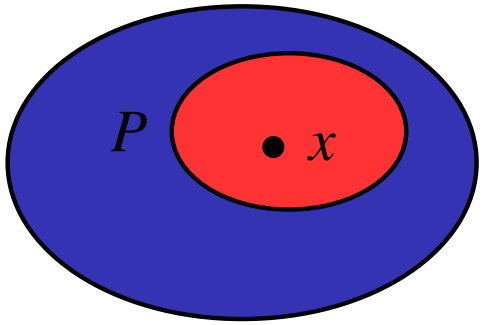

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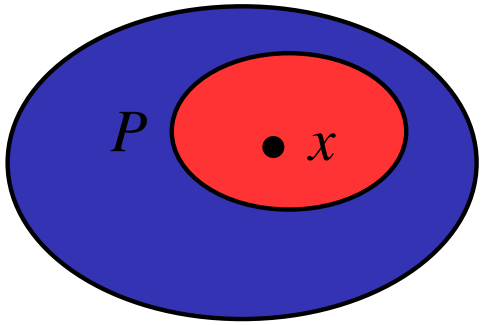

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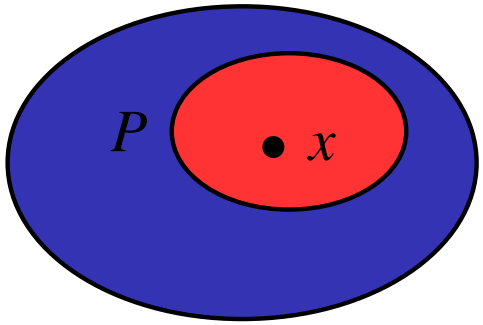

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- Many instantiations: trapdoor perms (RSA), DDH, lattices, ...

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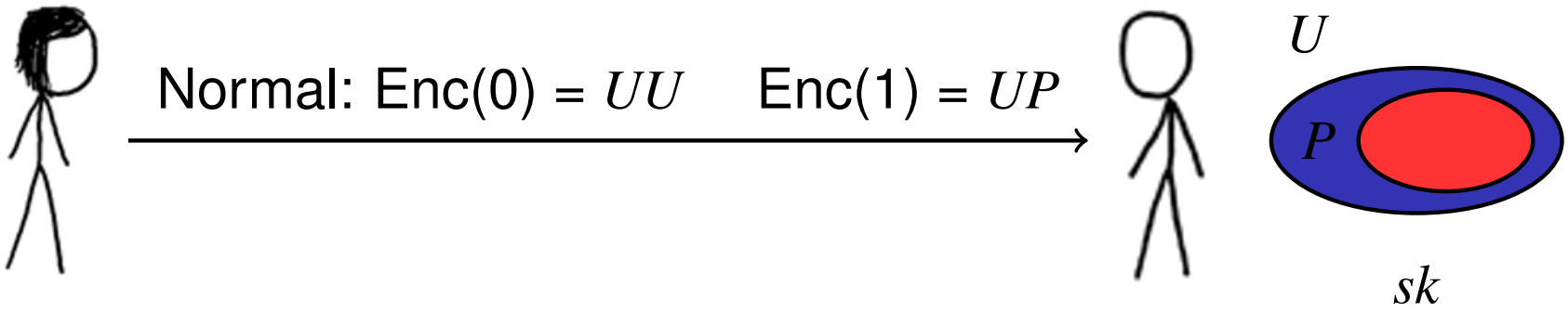

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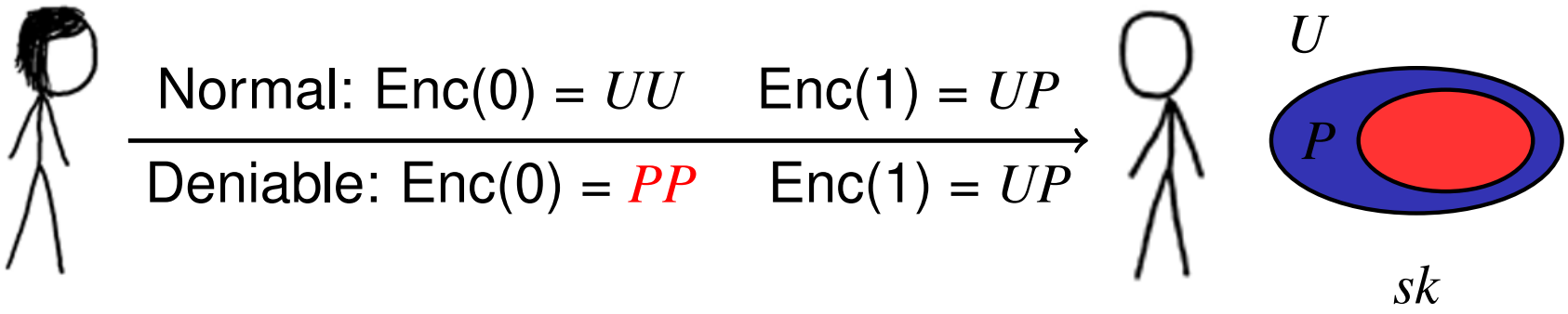

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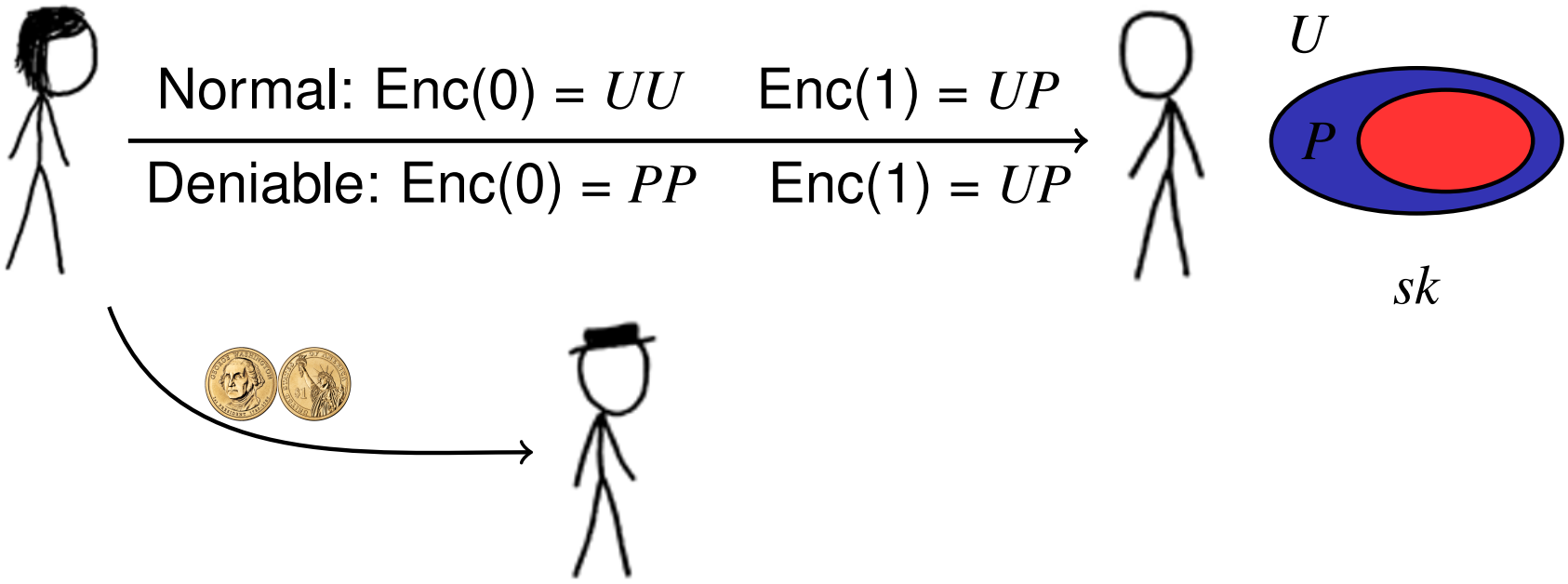

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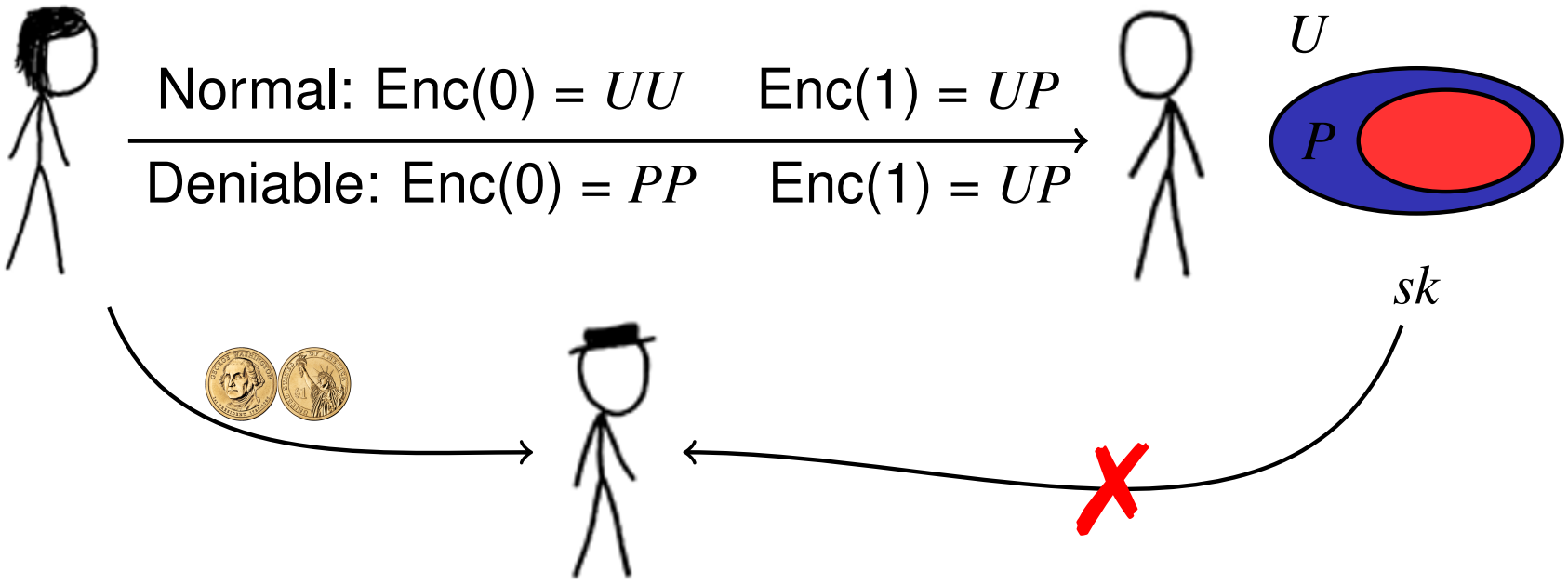

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- ✔ Alice can fake: $PP \to UP \to UU$
- ✗ What about Bob?? His sk reveals the true message bits!

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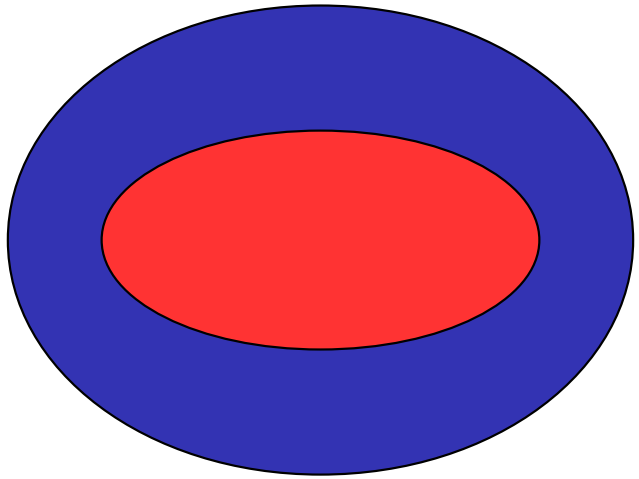

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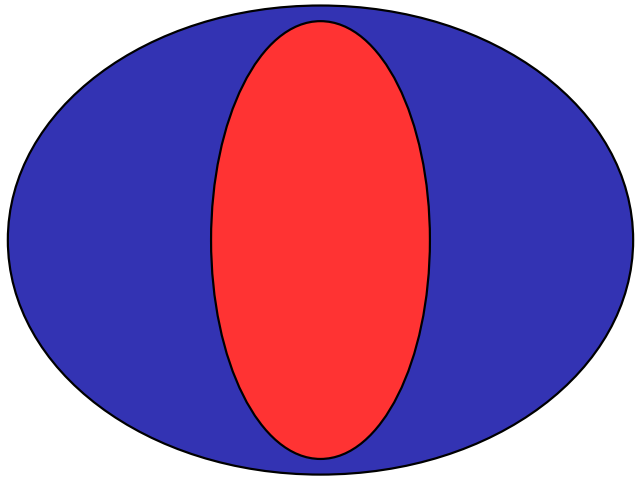

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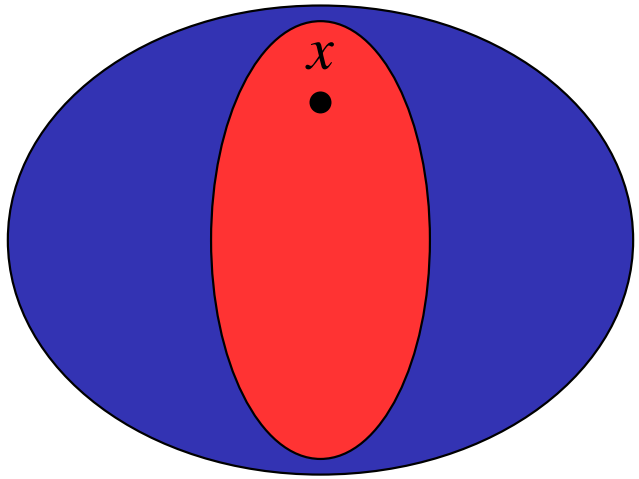

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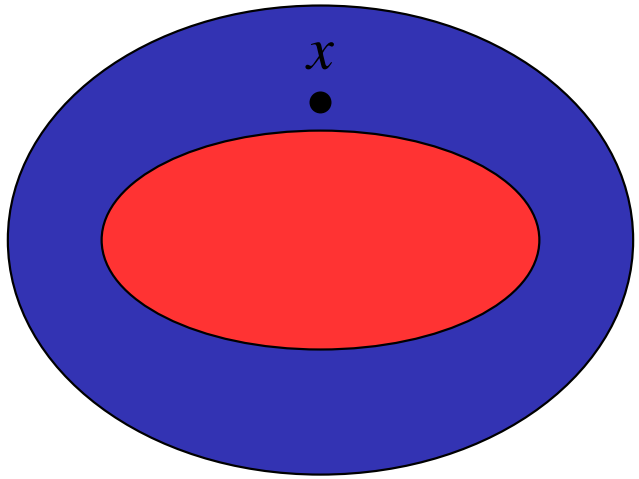

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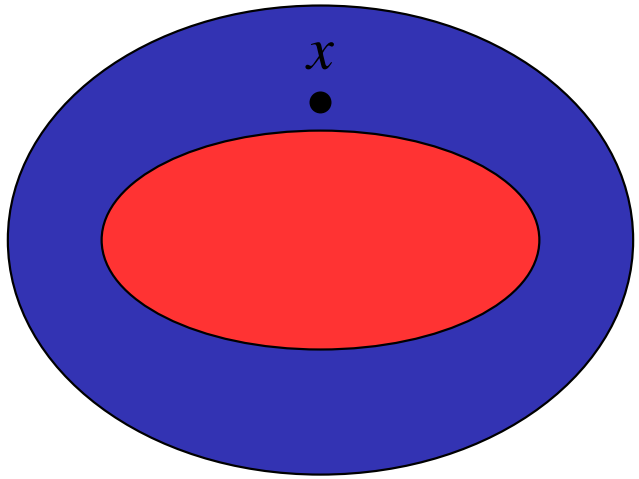

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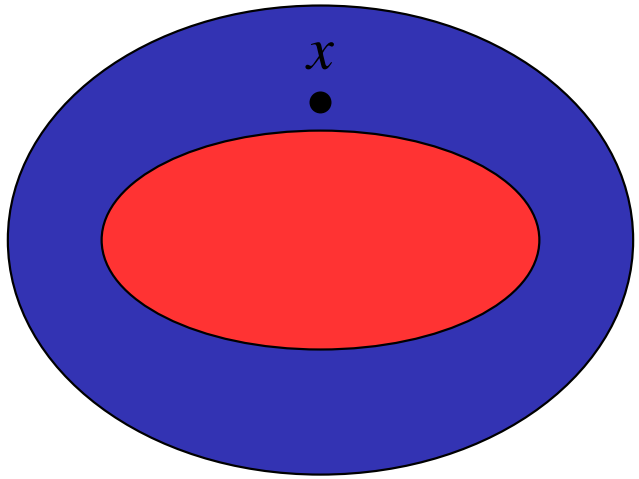

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$\star\star$ Instantiation idea: in [GPV'08] IBE, authority can induce an "oblivious decryption error" via carefully chosen sk_{id}

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Thanks!

Full version: ePrint #2011/352