25-1/ A_{TM} & ε_0

all languages that
are described by
a decider

$x \in A_{TM}$

$iff \quad x = <M, w>$

where M is a TM

and $w \in L(m))$

$\searrow$ may LOOP

a TM that
never LOOPs
always Yes or No

<u>25-2/</u> Assume that $A_{TM} \in \Sigma_0$ and

is solved by machine, F.

$\nearrow A_{TM} \notin \Sigma_0$

$F(<M,w>) =$ accept if M accepts w

reject if M rejects w

or M loops in w

$D(<M>) =$ accept if $F(M, <M>)$ returns reject

reject if $F(<M, <M>>$ returns accept

$\nearrow$ must loop

$D(<D>) =$ accept if D rejects $<D>$ X

reject if D accepts $<D>$ X

Liar's Paradox

Quine Paradox ↰

"This statement is
false."

next time . . . .

$$\overline{A_{TM}} \quad \& \quad \mathcal{E}_1$$