SAT Reduces to 3-Coloring

Is there an assignment of T's and F's to the inputs that yields output T?

Circuit SAT

Create graph whose 3-colorings simulate circuit behavior

Truth Colors

force P to be truth-colored
.simulate NOT

.simulate OR

.simulate OR

.simulate OR
Circuit SAT

replace gates by gadgets

graph is 3-colorable iff circuit is in SAT

force output T
SAT vs 3-Color

SAT reduces to 3-Color: any fast procedure for 3-Color would yield a fast SAT procedure.

SAT vs 3-Color

Theorists -- and world institutions -- are betting there isn’t any fast SAT procedure, so we can safely bet there isn’t any fast 3-Coloring procedure either.