Alice - Called
Bob - Chicago
Charlie - AP Princeton
good student who did all the work.

need an exp. for 3

to help Charlie.

go to p. 49.
WOW: always add # of black balls
always

0, 0.8c, 0.10c, 10c, 48c
never one of those: 110, 101, 011, 000.

so, after opening 2 boxes, can predict third one
perfectly: it always works.

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So, if you get curious about box X & Y,
just do this: we'll open the Y doors.
Then you'll know what's behind the X
doors for sure. So just open Y and you
find out both.
Charlie: Let's open all three in X!

Greenberger, Horne, Zeilinger, Mermin

Suppose we know $Y_A Y_B Y_C = 000$ then: For sure $Y_A = Y_B = 0$

$\Rightarrow X_C = 1$

Similarly $X_B = 1$, $X_C = 1$

So $Y_A Y_B Y_C = 000 \Rightarrow X_A X_B X_C = 111$

only 8 possibilities

\[ \begin{array}{c|c|c|c|c|c|c|c} 
Y_A & Y_B & Y_C & X_A & X_B & X_C \\
\hline
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\
0 & 1 & 0 & 0 & 1 & 0 & 1 & 1 \\
0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 \\
1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\
1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \\
1 & 1 & 0 & 1 & 1 & 0 & 1 & 0 \\
1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
\end{array} \]

\[ \text{not all odd!} \]
A & B&C do the experiment.

what do they see?

3 white balls. every time. ???

every time - opposite prediction of Einstein locality.

even # of black balls every time.

A quantum description:

\[ \frac{1}{\sqrt{2}} (1000_{ABC} + 1111_{ABC}) \]

Simultaneous eigenshape of:

\[ Z_A \otimes Z_B \otimes Z_c \]

\[ 1_{IA} \otimes Z_a \otimes Z_c \]

\[ X_A \otimes X_b \otimes X_c \]

[Show +1 eigenshate.]

Since \[ N \cdot V \leq 0 \]
Deterministic
violation of
Einstein locality

Irreconcilable
incompatibility
of complementary observables

\[ X_+ = \frac{1}{\sqrt{2}} (|0\rangle + |1\rangle) \]
\[ X_- = \frac{1}{\sqrt{2}} (|0\rangle - |1\rangle) \]
\[ Y_+ = \frac{1}{\sqrt{2}} (|0\rangle + i|1\rangle) \]
\[ Y_- = \frac{1}{\sqrt{2}} (|0\rangle - i|1\rangle) \]
\[ Z_+ = |0\rangle \]
\[ Z_- = |1\rangle \]