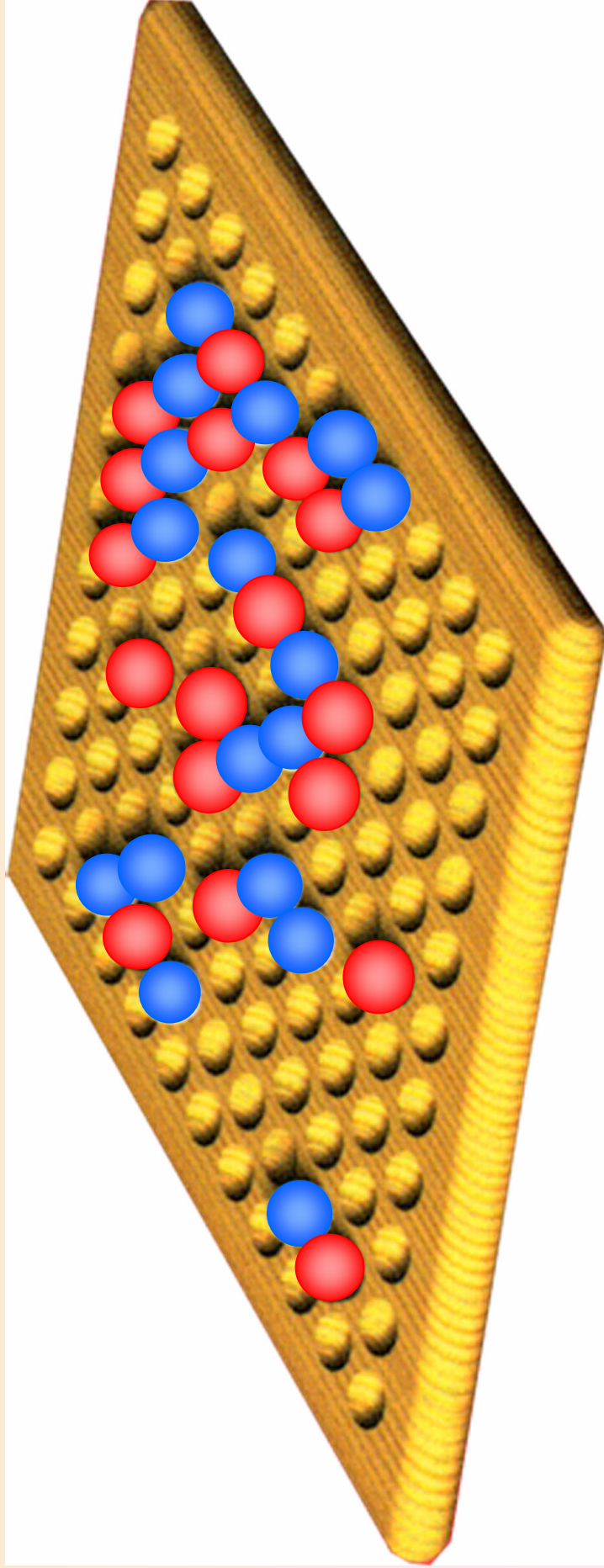
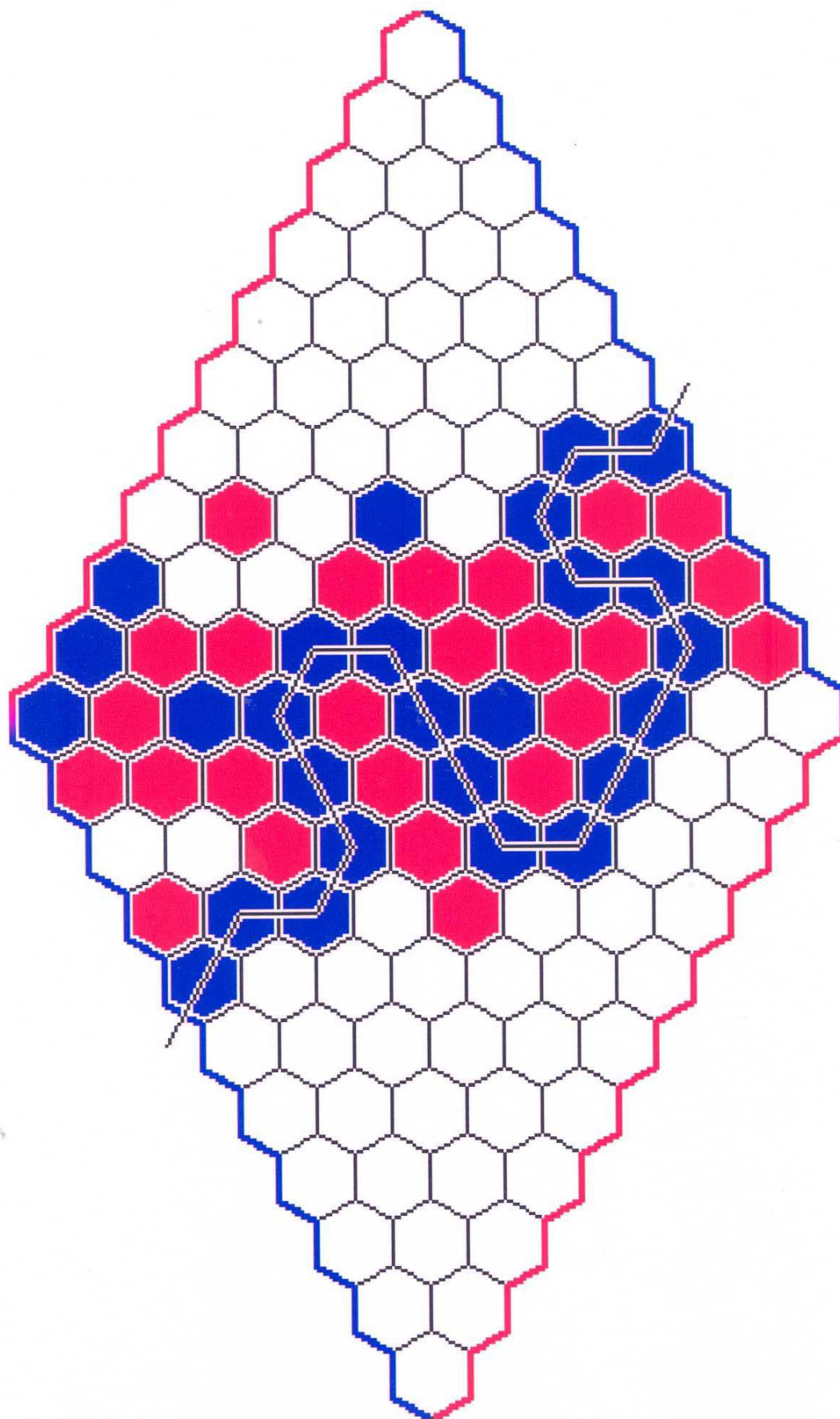


# THE HEX GAME





*Good News*

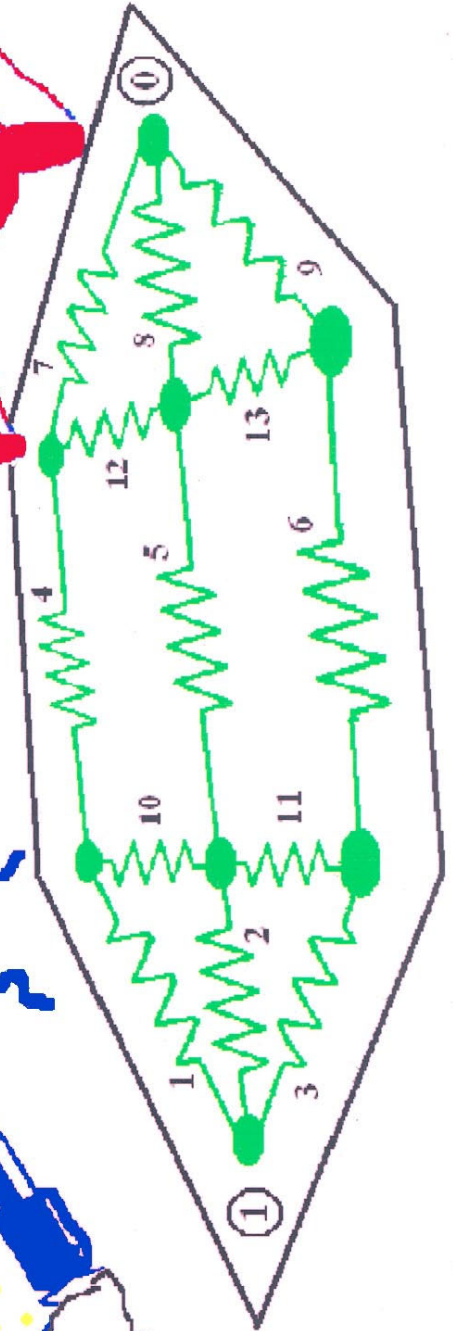
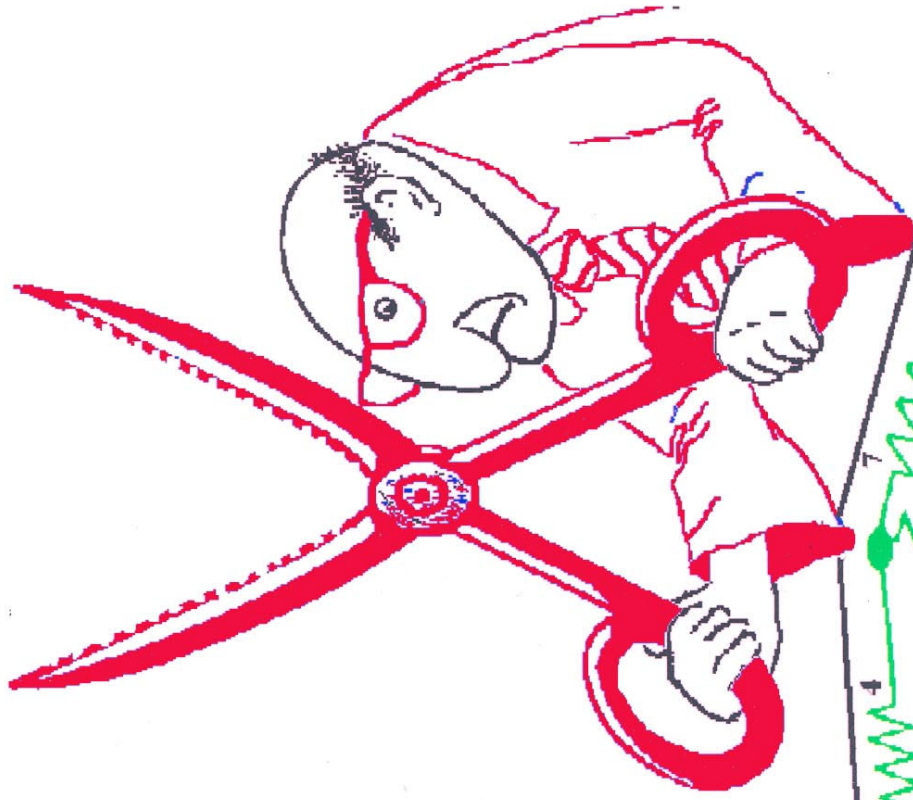
# Existence Theorem

There exists a **winning strategy** such that **if you begin**, you will always win.

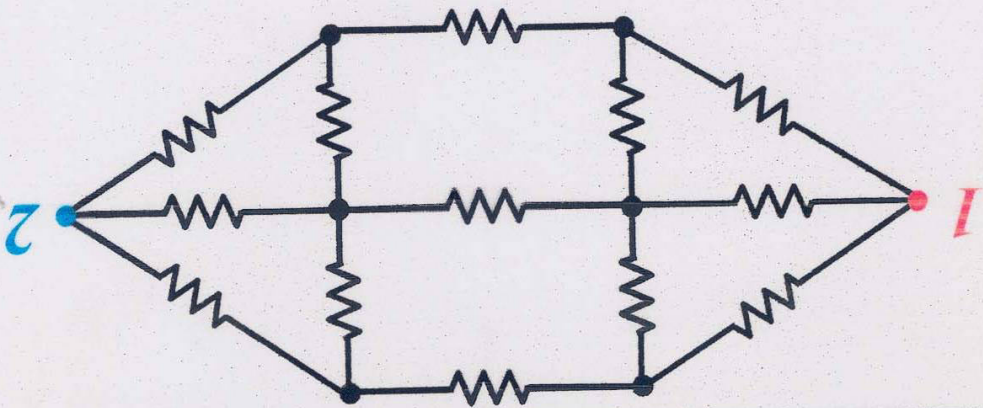
*Proved by : John Nash  
Nobel Laureate  
in Economics*

# *Bad News*

There is no known general winning strategy for Hex boards of size larger than  $9 \times 9$ .



# Shannon's Hex Circuit Game



## Goal of the Game :

Player 1 : open the  $1-\Omega$  resistor circuit between the red and blue nodes by removing a cut set.

Player 2 : create a short circuited path between the red and blue nodes.

## Rules of the Game :

Player 1 : Remove one branch at a time.

Player 2 : Short one branch at a time.

The player who accomplishes his goal first wins the game.

# Shannon's Hex Circuit Game

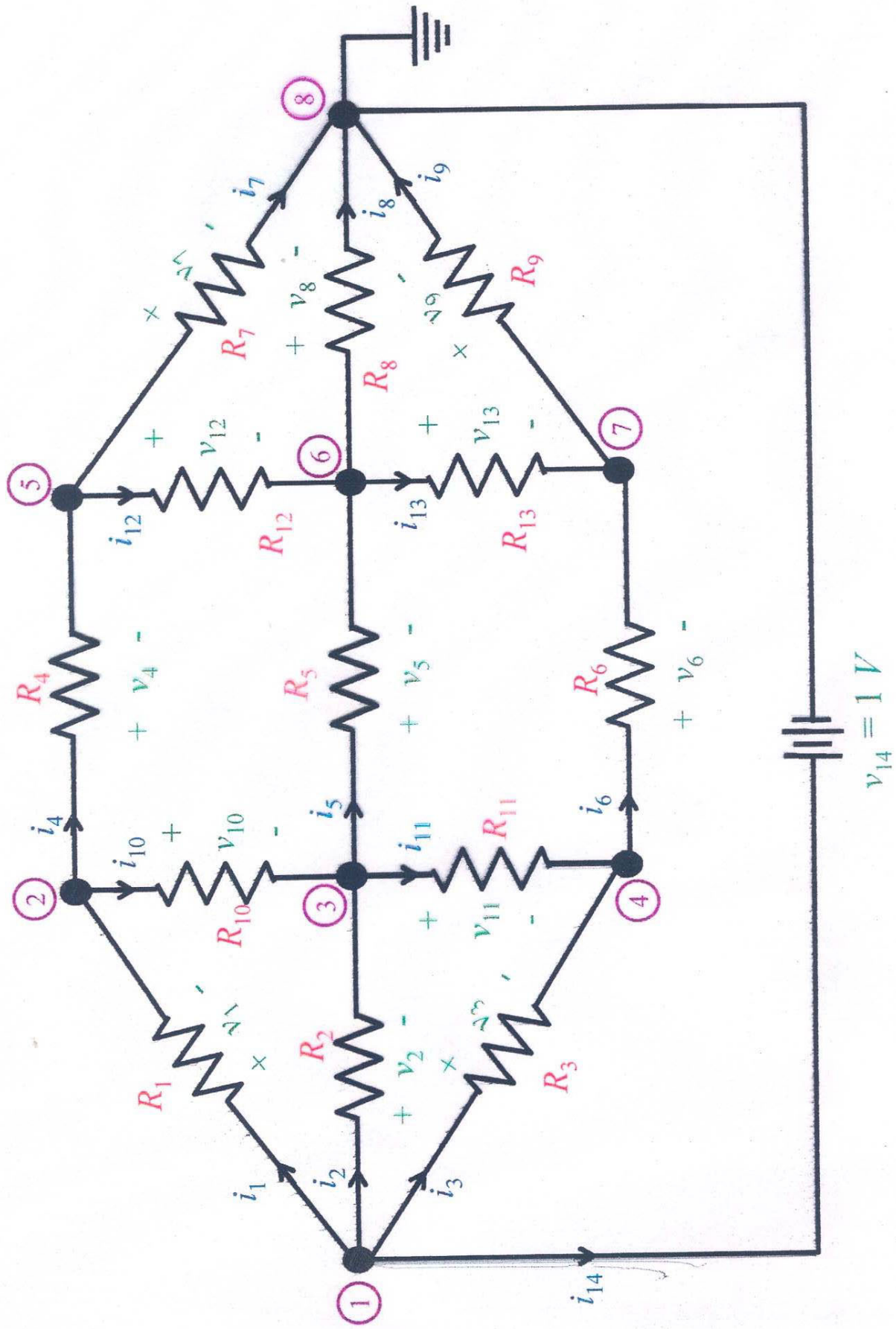
## Winning Strategy

**Player 1** : *Cut* the resistor with the largest current magnitude.

**Player 2** : *Short* the resistor with the largest current magnitude.



All resistors are  $1\ \Omega$  resistors :  $R_k = 1\ \Omega$



# Shannon's Hex Circuit Game Winning Theorem

If both players follow  
Shannon's winning strategy,  
then the player who begins wins.

# A<sup>+</sup> Project

Write a computer program to exhaust all possible outcomes of the Shannon *Hex* circuit-game winning strategy and prove or disprove Shannon's conjecture. If false, propose your winning strategy.