‹GEORGE BOOLE›

ENGLAND

George Boole, a professor at Queen's College, Cork, developed Boolean algebra, laying the foundation for modern computing and the technology around us. Largely self-taught, he connected algebra and logic, shaping mathematical reasoning. Before his professorship, he taught and founded his own school at the age of 19.

Lincolnshire, England

November 2, 1815 – December 8, 1864

FIRST GOLD PRIZE FOR MATHEMATICS, ROYAL SOCIETY

‹CONTRIBUTION›

Developed **BOOLEAN ALGEBRA**

- Defined boolean variables, variables that may be 1 or 0
- Developed an algebraic system based on logical values instead of numerical values.
- Introduced boolean operations: AND ($\wedge$), OR ($\vee$), NOT ($\neg$)
- Created boolean equations, which represent logical statements mathematically

example:

$$Y = (A \vee B) \wedge \neg C$$

Formalized via published "The Laws of Thought" (1854)

Logisticized **BOOLEAN FUNCTIONS**

- Defined boolean functions as expressions combining boolean variables using logical operations
- Showed that any logical condition can be expressed as a boolean function
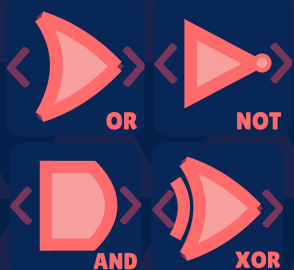- Touched on simplification methods, important for efficiency

examples:

$$\text{let } OR(A,B) = \begin{cases} 1, & A = 1 \\ 1, & B = 1 \\ 0, & A = B = 0 \end{cases}$$
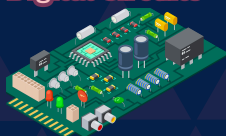
$$\text{let } AND(A,B) = \begin{cases} 0, & A = 0 \\ 0, & B = 0 \\ 1, & A = B = 1 \end{cases}$$

Boolean algebra underpins digital logic, enabling computers to process binary. Logic gates execute equations, powering CPU operations, memory storage, circuit design, and software decision-making.

‹IMPACT›

OR **NOT** **AND** **XOR**

Computer Processors Digital Circuits

Every operation is broken down into logic gate operations

Data Storage Communication Systems

Compression methods use Boolean operations to increase size to information efficiency

Artificial Intelligence Search Algorithms

Machine learning use boolean functions to process inputs and make automated decisions

CHECK OUT http://emera1d3x.github.io/boolean-algebra for interactive logic gate simulation!