# Some quotes about mathematics

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# Albert North Whitehead:

"... to construct a history of thought without profound study of the mathematical ideas of successive epochs ... is certainly analogous to cutting out the part of Ophelia [from the play 'Hamlet'].

The simile is singularly exact. For Ophelia is quite essential to the play, she is very charming – and a little mad.

Let us grant that the pursuit of mathematics is a divine madness of the human spirit ..."

—*Science and the Modern World, 1925*

# God is a mathematician

**Sir James Jeans:**

"...from the intrinsic evidence of his creation, the Great Architect of the universe now begins to appear as a pure mathematician".

—*The Mysterious Universe, 1930*

But on the other hand,

**Sir Arthur Eddington:**

"I cannot accept Jeans view that mathematical conceptions appear in physics because it deals with a universe created by a Pure Mathematician; my opinion of pure mathematicians, though respectful, is not so exalted as all that."

—*The Philosophy of Physical Science, 1939*

# A big number

**A big number:**

"I believe there are exactly
$136 \times 2^{256} =$
15,747,724,136,275,002,577,605,653,961,181,555,468,
044,717,914,527,116,709,366,231,425,076,185,631,031,296
protons in the universe, and the same number of electrons."

*—Sir Arthur Eddington, 1939*

# Einstein

**1921:**

"As far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality."

**1933:**

"Our experience hitherto justifies us in believing that nature is the realization of the simplest conceivable mathematical ideas. . . "

"We can discover by means of purely mathematical constructions . . . the key to understanding natural phenomena. . . "

"Experience remains, of course, the sole criterion of the physical utility of a mathematical construction. But the creative principle resides in mathematics."

# Mathematical Reality

## Hermite

"...the integers have an existence outside ourselves which they impose with the same predetermined necessity as sodium or potassium."

*—Letter to Stieltjes*

## René Thom:

**René Thom:** " ...there are formal structures, in fact geometrical objects, in biology which prescribe the only possible forms capable of having a self-reproducing dynamic in a given environment."

*—Structural Stability and Morphogenesis, 1975*

# Are sets real?

**Gödel:**

- "The assumption of sets is quite as legitimate as the assumption of physical bodies and there is quite as much reason to believe in their existence."

  —*On Russell's Mathematical Logic, 1944*

- "They are in the same sense necessary to obtain a satisfactory system of mathematics as physical bodies are necessary for a satisfactory theory of our sense perceptions."

  —*What is Cantor's Continuum Problem?, 1947*

# Mathematical Existence

**Lebesgue:**

"The question comes down to this, which is hardly new: *Can one prove the existence of a mathematical object without defining it?*... it is impossible to demonstrate the existence of an object without defining it."

**Hadamard**

"The existence... is a fact like any other."

# Truth and proof

"The only verifiable statements which can be made about the world are those which rest on mathematical truths."
G.H. Hardy, in *A Mathematicians's Apology*, (1929):

"There is, strictly, no such thing as mathematical proof: we can, in the last analysis, do nothing but point."

" Proofs are what Littlewood and I call 'gas':
. . . rhetorical flourishes designed to affect psychology,
. . . pictures on board in the lecture,
. . . devices to stimulate the imagination of pupils."

Quoting Hilbert: "When rigour enters, meaning departs."

# Does Mathematics Have a Philosophical Foundation?

**Hilary Putnam:**

"I do not think that the difficulties that philosophy finds with classical mathematics today are genuine difficulties; and I think that the philosophical interpretations of mathematics that we are being offered on every hand are wrong, and that 'philosophical interpretation' is just what mathematics doesn't need."

—*Mathematics Without Foundations, 1972*

# Why do we think Mathematics is real?

**Quine and Putnam's Realism:**

" We are committed to the existence of mathematical objects because they are indispensable to our best theory of the world and we accept that theory."

*—Penelope Maddy, Realism in Mathematics, 1990*

# Further thoughts

**Paul Halmos:**

- "Applied mathematics is bad mathematics"
- "It isn't really . . . but it's different."
- "But usually, applied mathematics is bad mathematics just the same."

'Mathematics Tomorrow', 1981

"Set Theory is a disease from which Mathematics will recover"

*—Attributed to Henri Poincaré*

**Reality is just another model.**

*—Graffito in Berkeley Math Department, 1970*