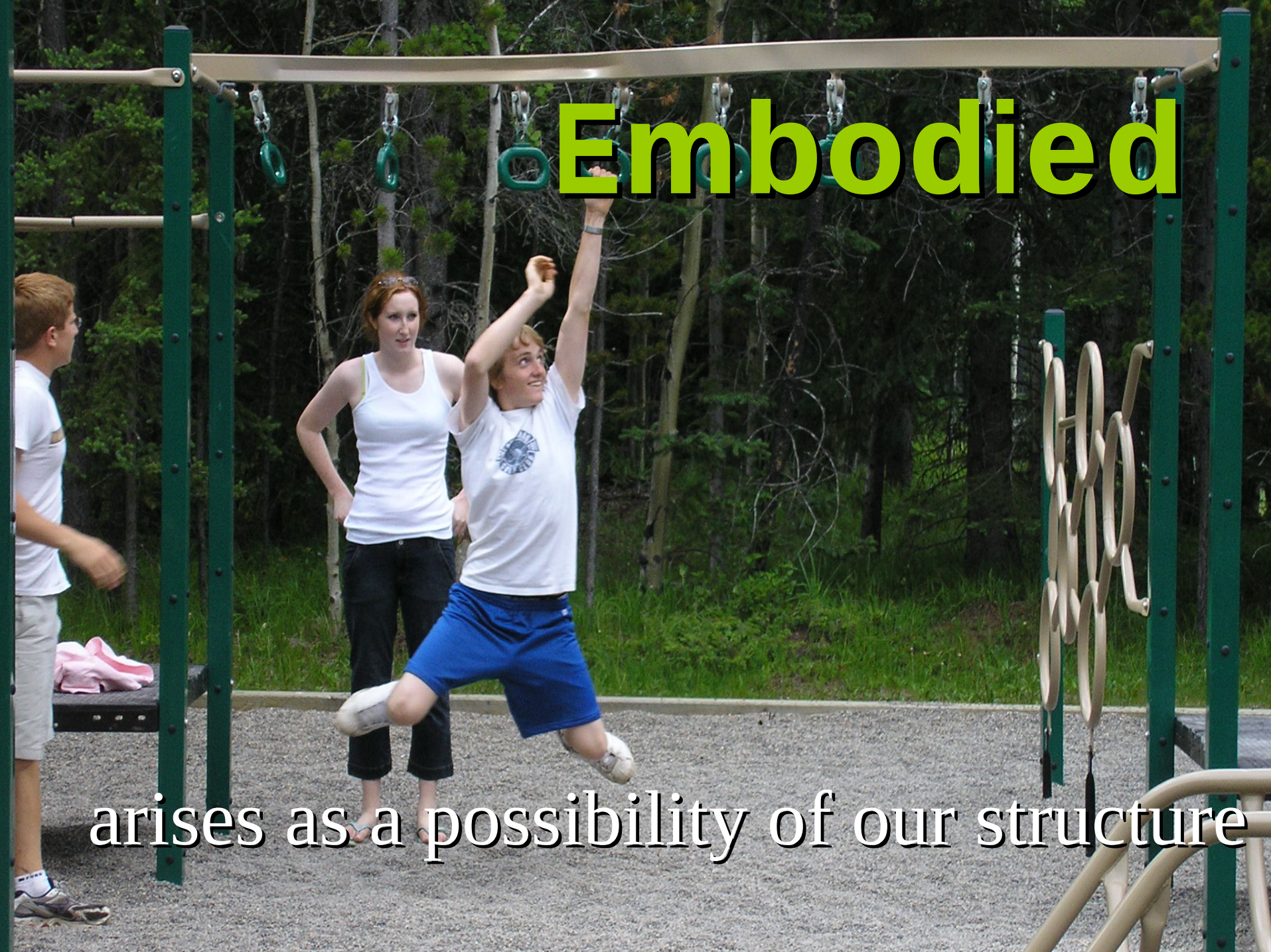
Mathematics-for-Teaching

Algebra, the Darling of Secondary School Mathematics

Lessons from Research

- knower/knowing/knoweldge is
  - embodied, embedded and extended
- collective learning systems emerge that are
  - self-organizing, self-transforming, nested, recursively elaborative and scale independent
- teachers can establish favourable conditions for the emergence of a collective learning system
  - Establishing redundancy, promoting diversity, creating conditions for the possibility of neighbouring interactions, distributing control

Knowing is


Embodied
arises as a possibility of our structure


Embedded
occurs in our collective activity


Extended
at once uses and produces
culture/cultural artefacts
04.22.2005


Complex
self-organizing, self transforming,
recursively elaborative, nested

Collective Learning Systems are—

Self-Organizing

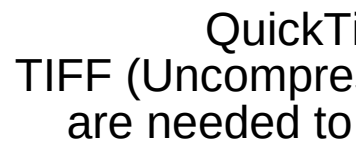
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Self-Transforming

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Nested

Complex forms unfold from and are enfolded in one another.

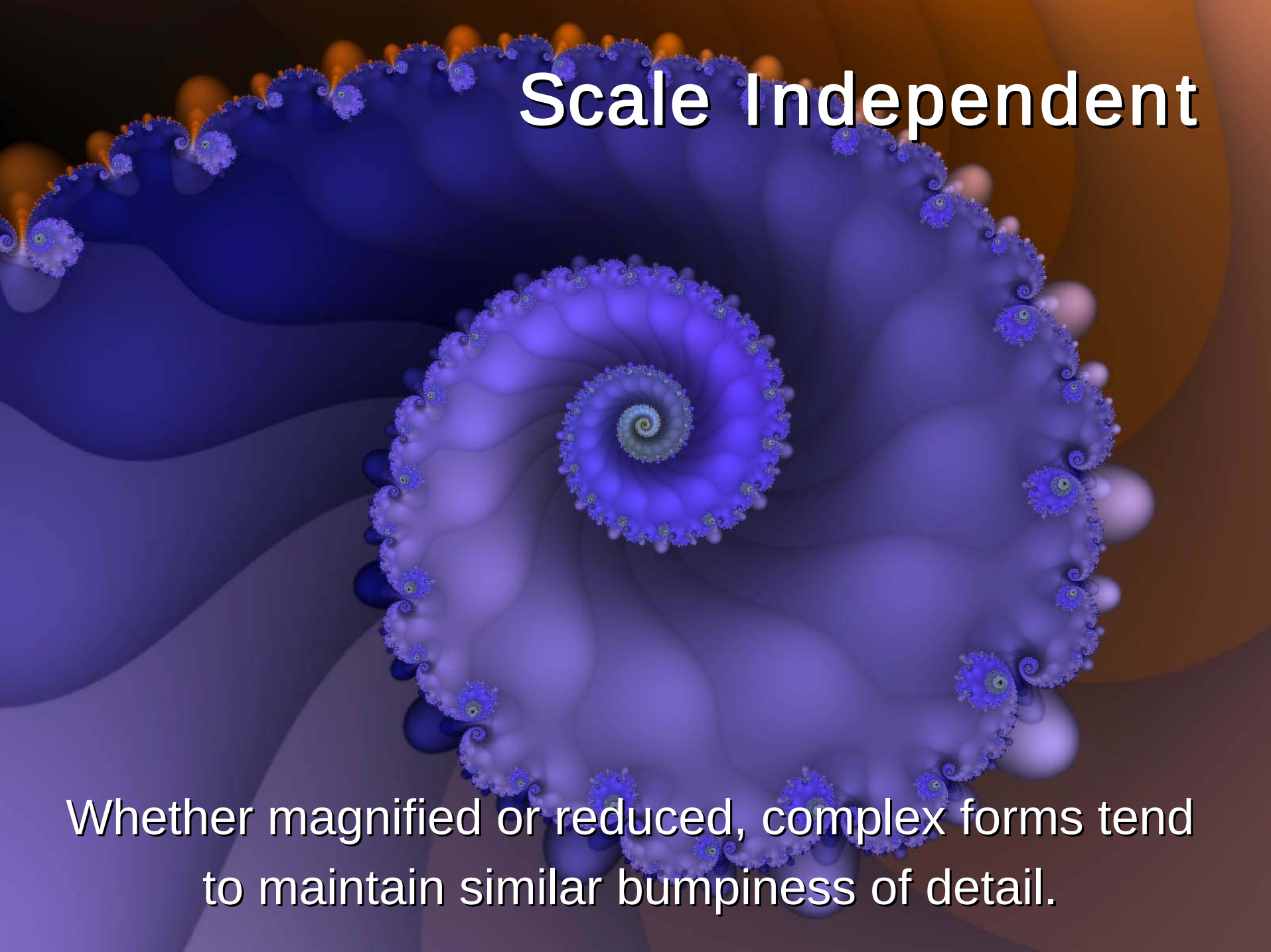


Recursively Elaborative



Rather than simply additive, complex systems are elaborated and transformed through experience.

Scale Independent



Whether magnified or reduced, complex forms tend to maintain similar bumpiness of detail.

Conditions for the emergence of a collective learning system ...

Redundancy

Diversity

Specialization

Neighbor Interactions

Decentralized Control

Enabling Constraints

Algebra in School Curricula

- Generalized arithmetic
- Patterning
- Symbolic manipulation
- Relations
- Functions
- Analytic geometry

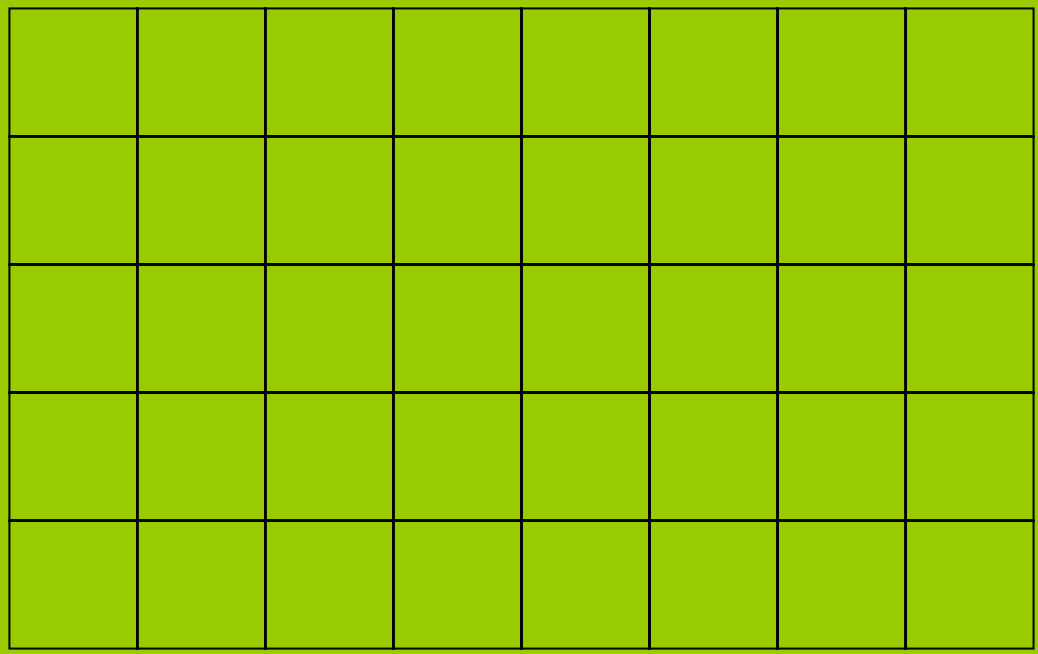
Tunja Sequences

John Mason

How was this activity informed by complexity?

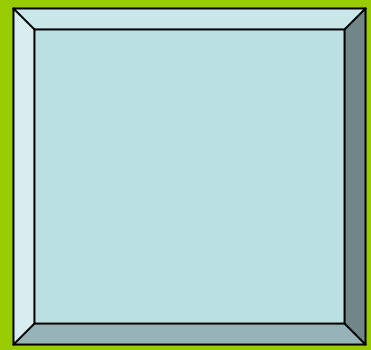
- Relied on redundancy
- Made room for diversity
- Created conditions for the possibility of neighbouring interactions
- Distributed control

Toothpick Problem



How many toothpicks?
Pay attention to how you count.

Informal Approach to Polynomial Algebra



How is knowing

- embodied,
- embedded,
- extended

in the polynomial engineering task?