

Bifröst

# Letting Smalltalk Loose

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[www.scg.unibe.ch](http://www.scg.unibe.ch)

**Computer  
revolution has not  
happened yet**

**Computer  
revolution has not  
happened yet**

**Alan Kay**  
Keynote OOPSLA 1997

**improve previous  
ways of thinking**

**create new**  
**ways of thinking**

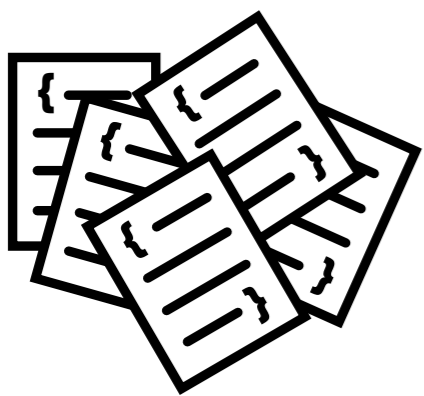
# Object-oriented Programming

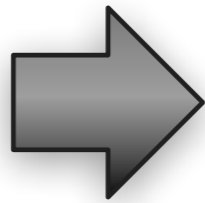
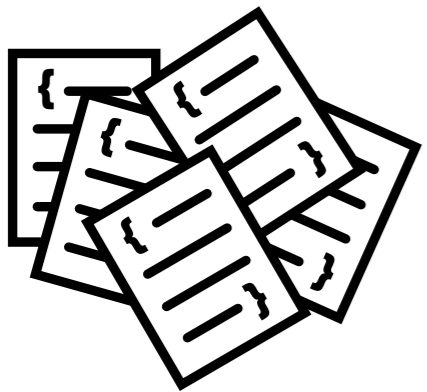
# Dynamic

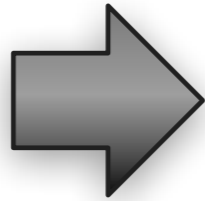
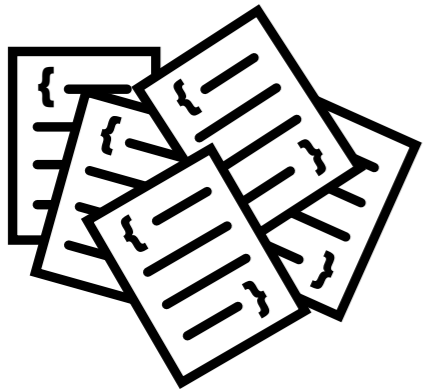
**We still go back to  
the source code**

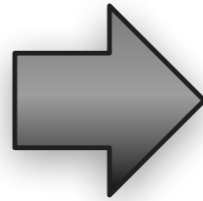
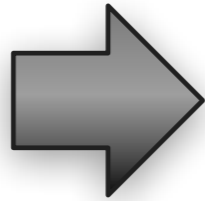
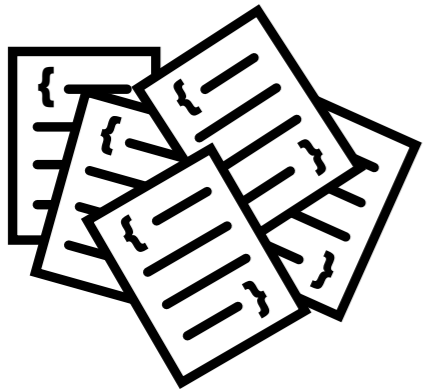


# Debugging











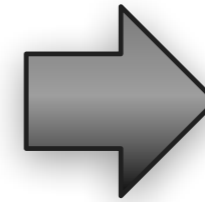
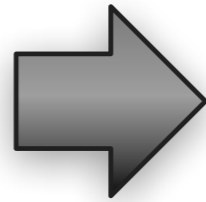
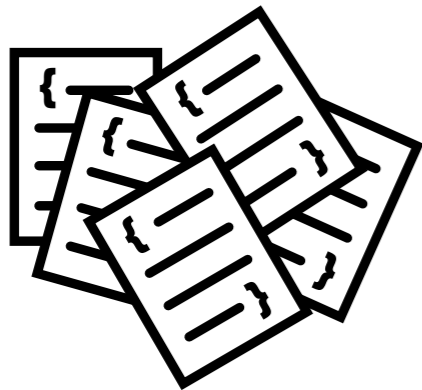






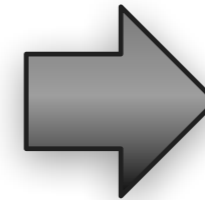
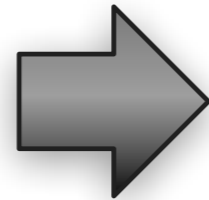
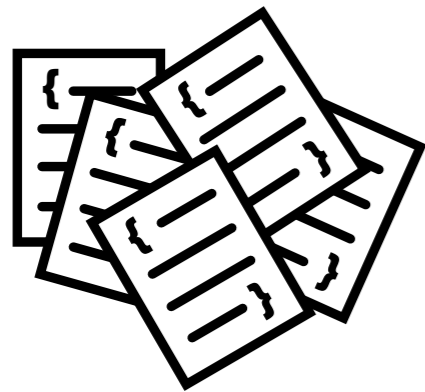
# Profiling

# Profile

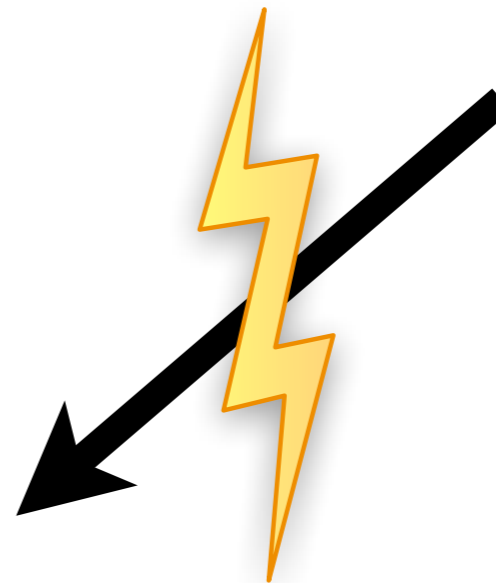


```
54.8% {11501ms} MOCanvas>>drawOn:  
54.8% {11501ms} MORoot(MONode)>>displayOn:  
30.9% {6485ms} MONode>>displayOn:  
  | 18.1% {3799ms} MOEdge>>displayOn:  
  ...  
  | 8.4% {1763ms} MOEdge>>displayOn:  
  | | 8.0% {1679ms} MOStraightLineShape>>display:on:  
  | | 2.6% {546ms} FormCanvas>>line:to:width:color:  
  ...  
23.4% {4911ms} MOEdge>>displayOn:  
...
```

# Profile

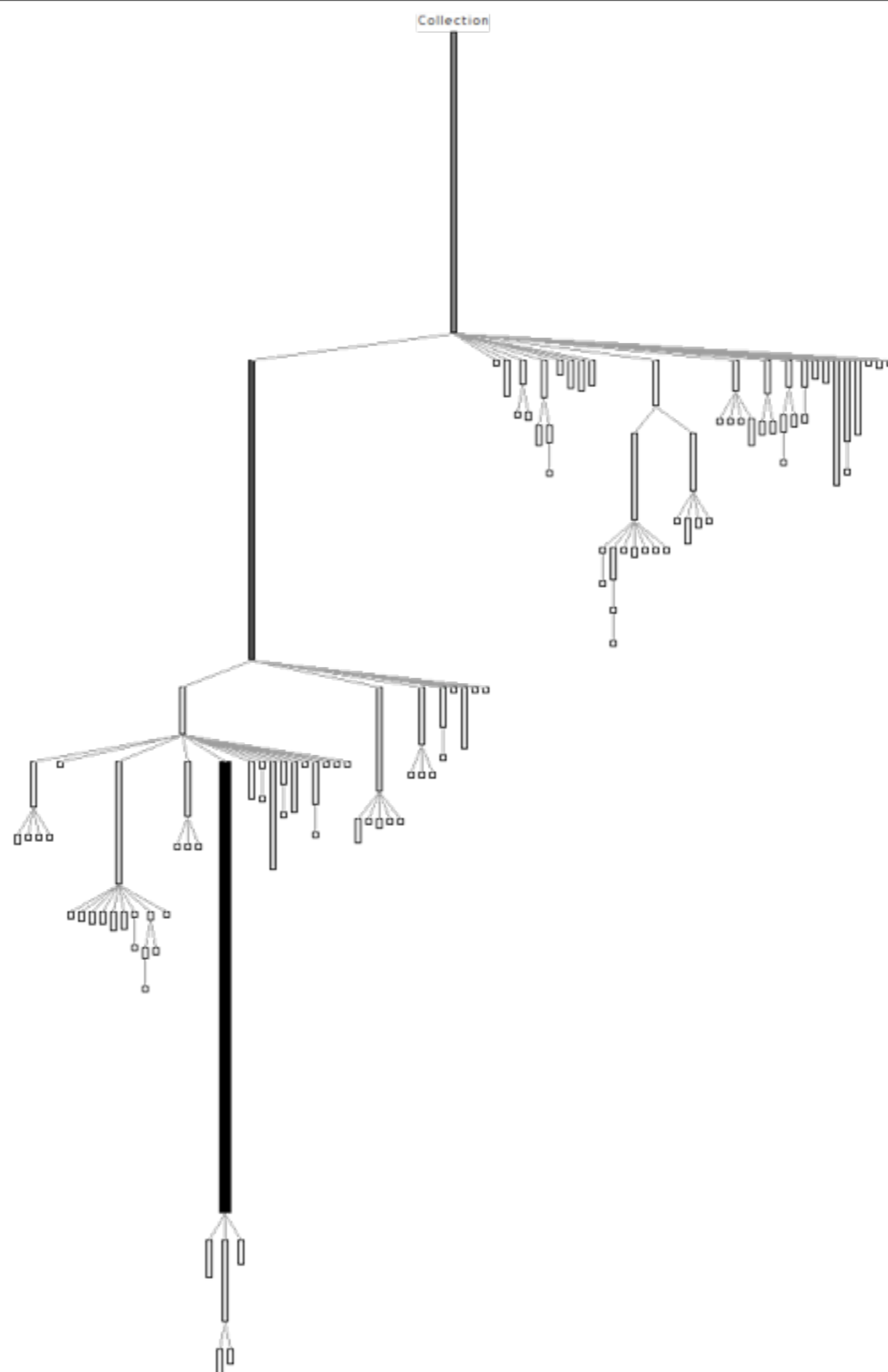


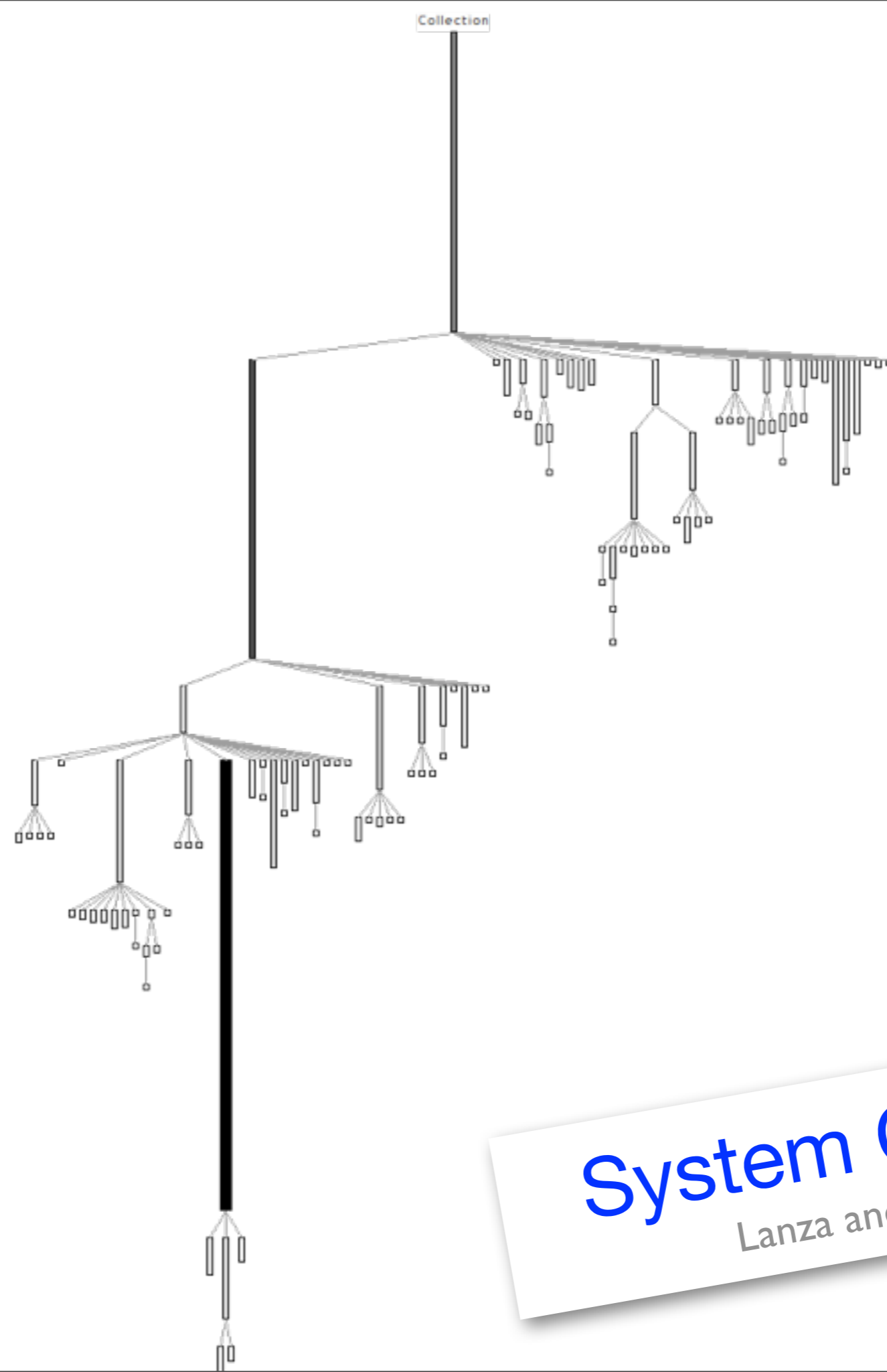
```
54.8% {11501ms} MOCanvas>>drawOn:  
54.8% {11501ms} MORoot(MONode)>>displayOn:  
30.9% {6485ms} MONode>>displayOn:  
  | 18.1% {3799ms} MOEdge>>displayOn:  
  ...  
  | 8.4% {1763ms} MOEdge>>displayOn:  
  | 8.0% {1679ms} MOStraightLineShape>>display:on:  
  | 2.6% {546ms} FormCanvas>>line:to:width:color:  
  ...  
23.4% {4911ms} MOEdge>>displayOn:  
...
```



# Domain

# Mondrian





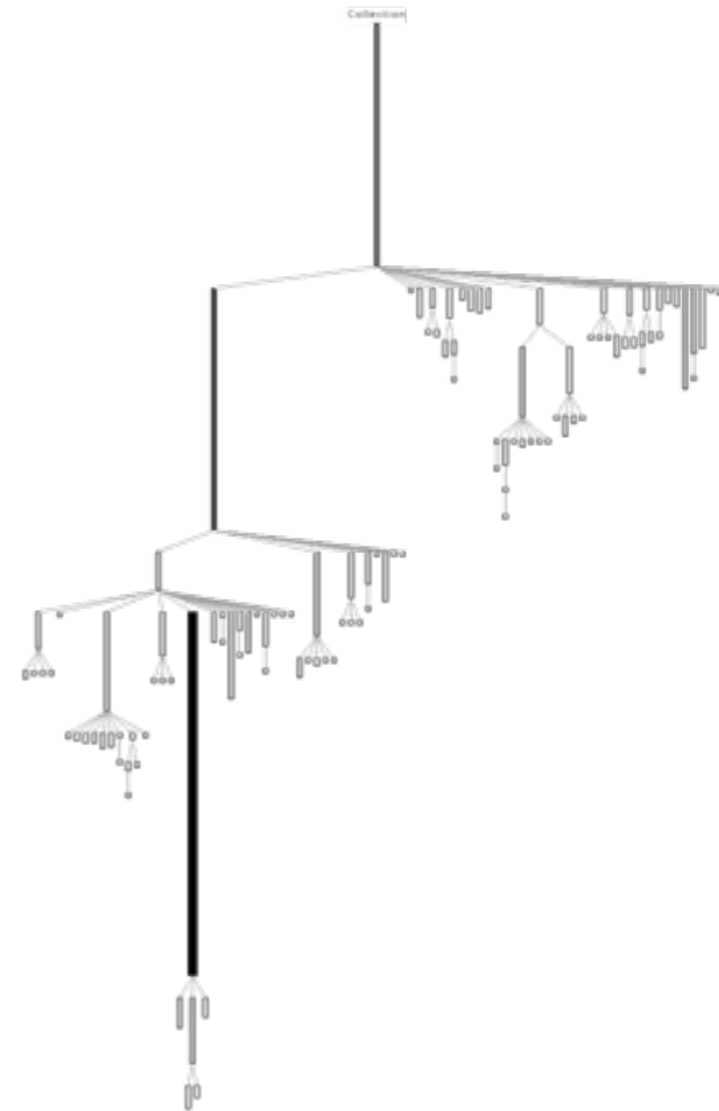
# System Complexity

Lanza and Ducasse 2003

```
54.8% {11501ms} MOCanvas>>drawOn:
  54.8% {11501ms} MORoot(MONode)>>displayOn:
    30.9% {6485ms} MONode>>displayOn:
      | 18.1% {3799ms} MOEdge>>displayOn:
        ...
      | 8.4% {1763ms} MOEdge>>displayOn:
        | 8.0% {1679ms} MOStraightLineShape>>display:on:
          | 2.6% {546ms} FormCanvas>>line:to:width:color:
            ...
    23.4% {4911ms} MOEdge>>displayOn:
      ...
```

# Which is the relationship?

```
54.8% {11501ms} MOCanvas>>drawOn:  
54.8% {11501ms} MORoot(MONode)>>displayOn:  
30.9% {6485ms} MONode>>displayOn:  
  | 18.1% {3799ms} MOEdge>>displayOn:  
  ...  
  | 8.4% {1763ms} MOEdge>>displayOn:  
  | | 8.0% {1679ms} MOStraightLineShape>>display:on:  
  | | 2.6% {546ms} FormCanvas>>line:to:width:color:  
  ...  
23.4% {4911ms} MOEdge>>displayOn:  
...
```





**What is the  
problem?**

# Fixed Object Model

**Most of the time  
this is good**

**Restricts** what we  
can do

# Time



**Time is a very useful  
concept**

**considering it  
absolute limit us**

**absolute object  
model limit us**



objects that *evolve*

**Why?**

**Debugging**

**Profiling**

**Execution  
Reification**

**Structure  
Evolution**

**Debugging**

**Profiling**

**Execution  
Reification**

**Structure  
Evolution**





**When is the next  
state written?**

**Stop when the next  
message is received**



**Close the gap**

# Object Debugger

Debugging

Profiling

Execution  
Reification

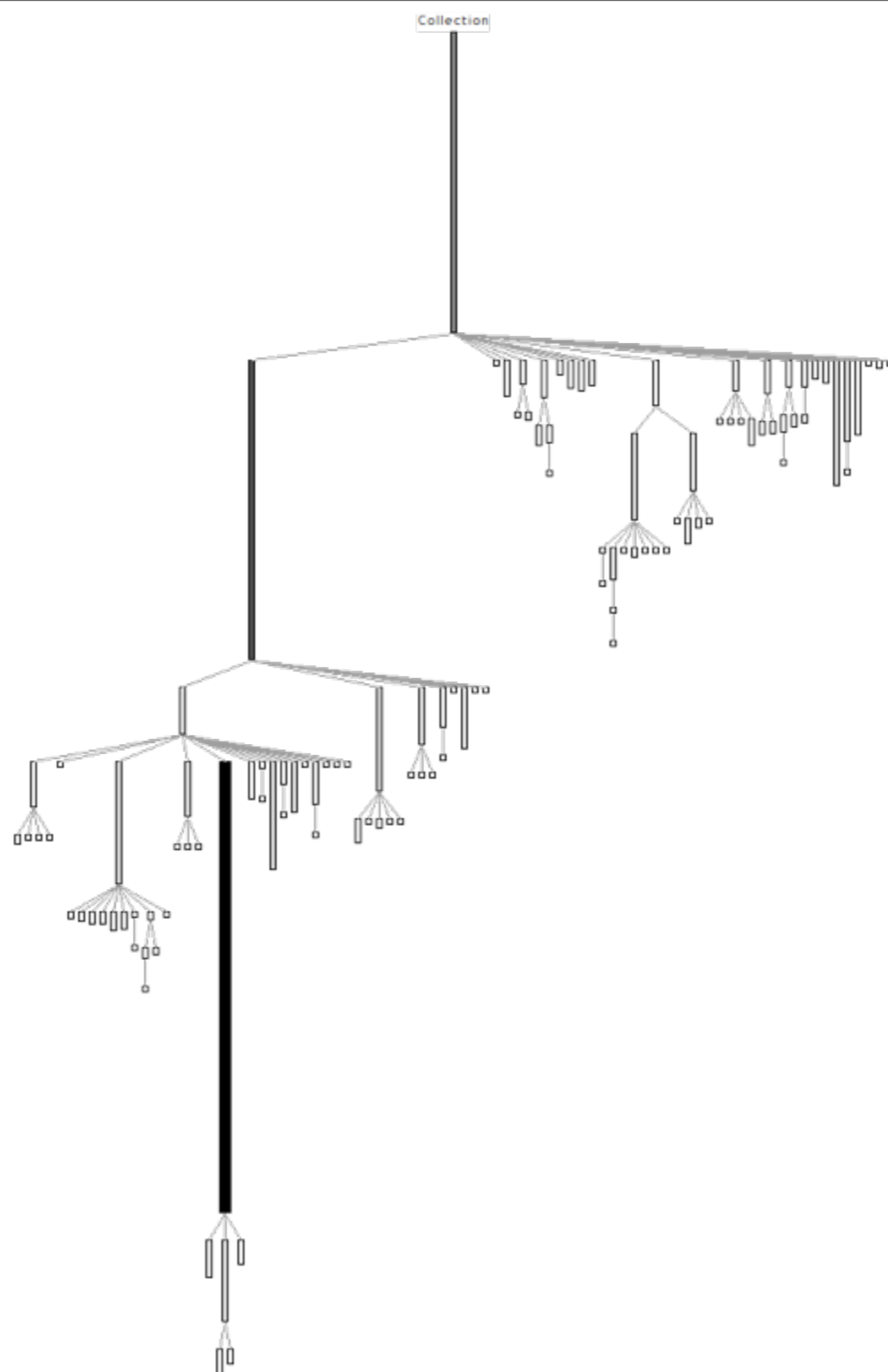
Structure  
Evolution

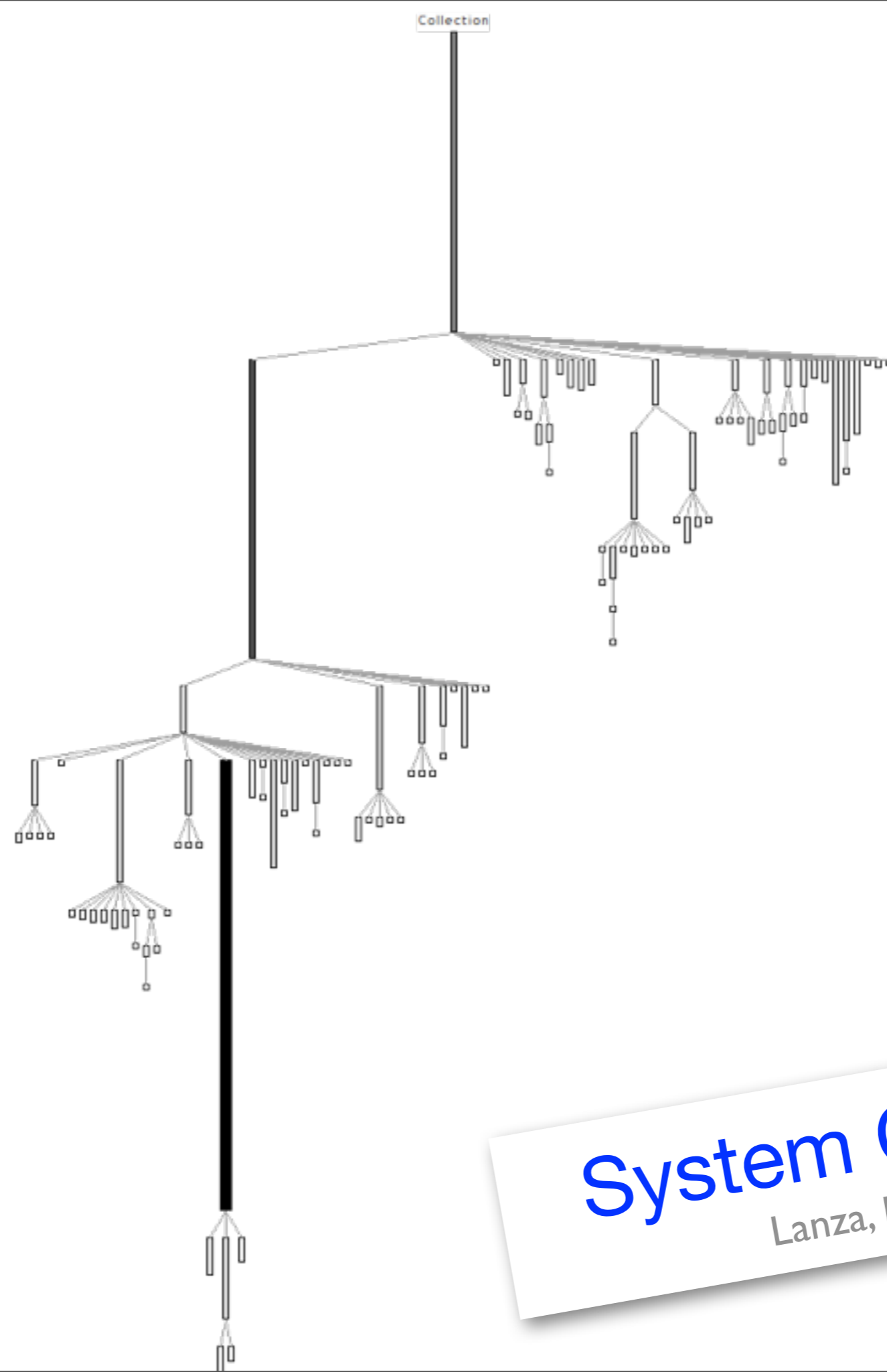
# MetaSpy

# MetaSpy

**TOOLS 2011**  
Bergel et al.

# Mondrian Profiler

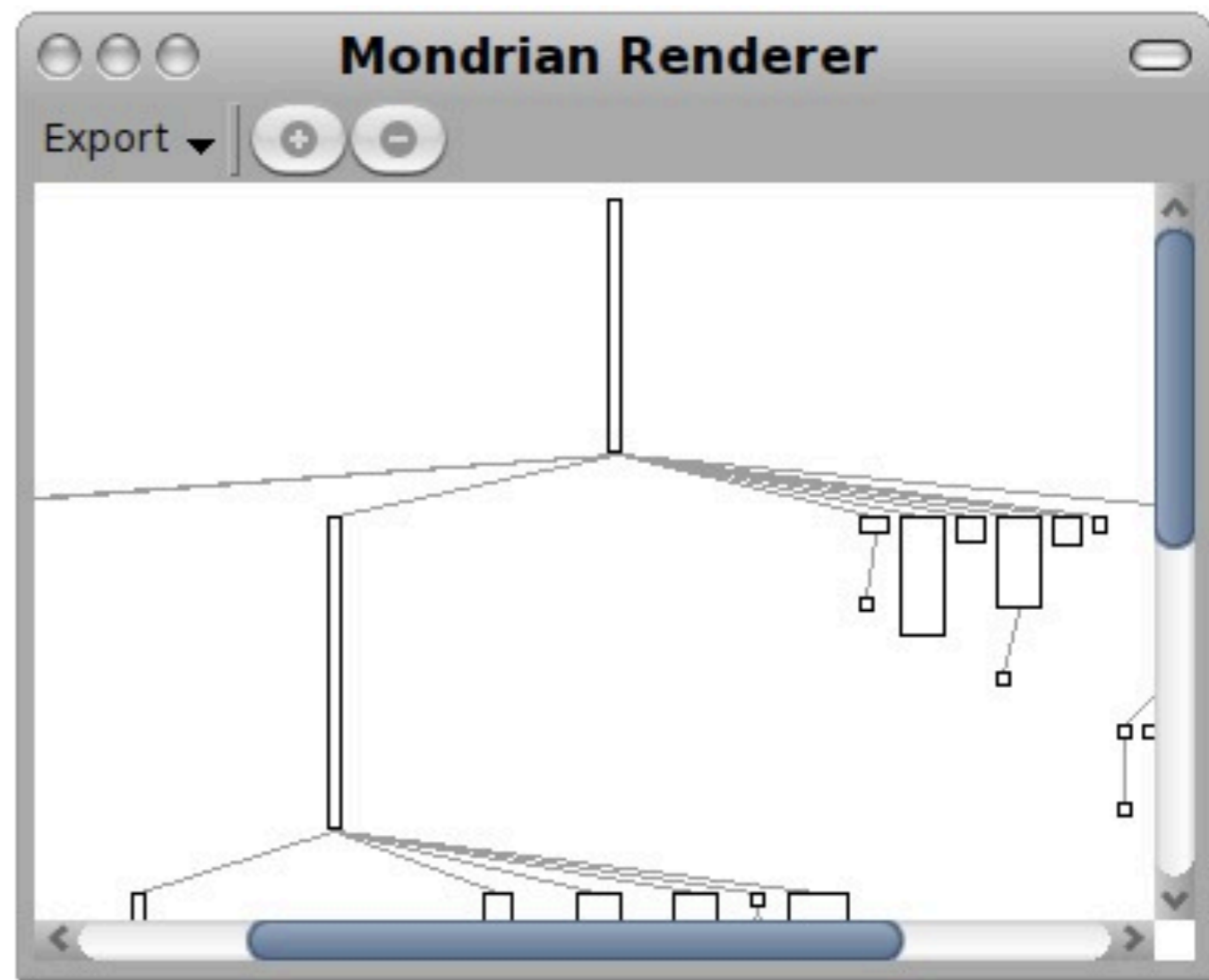
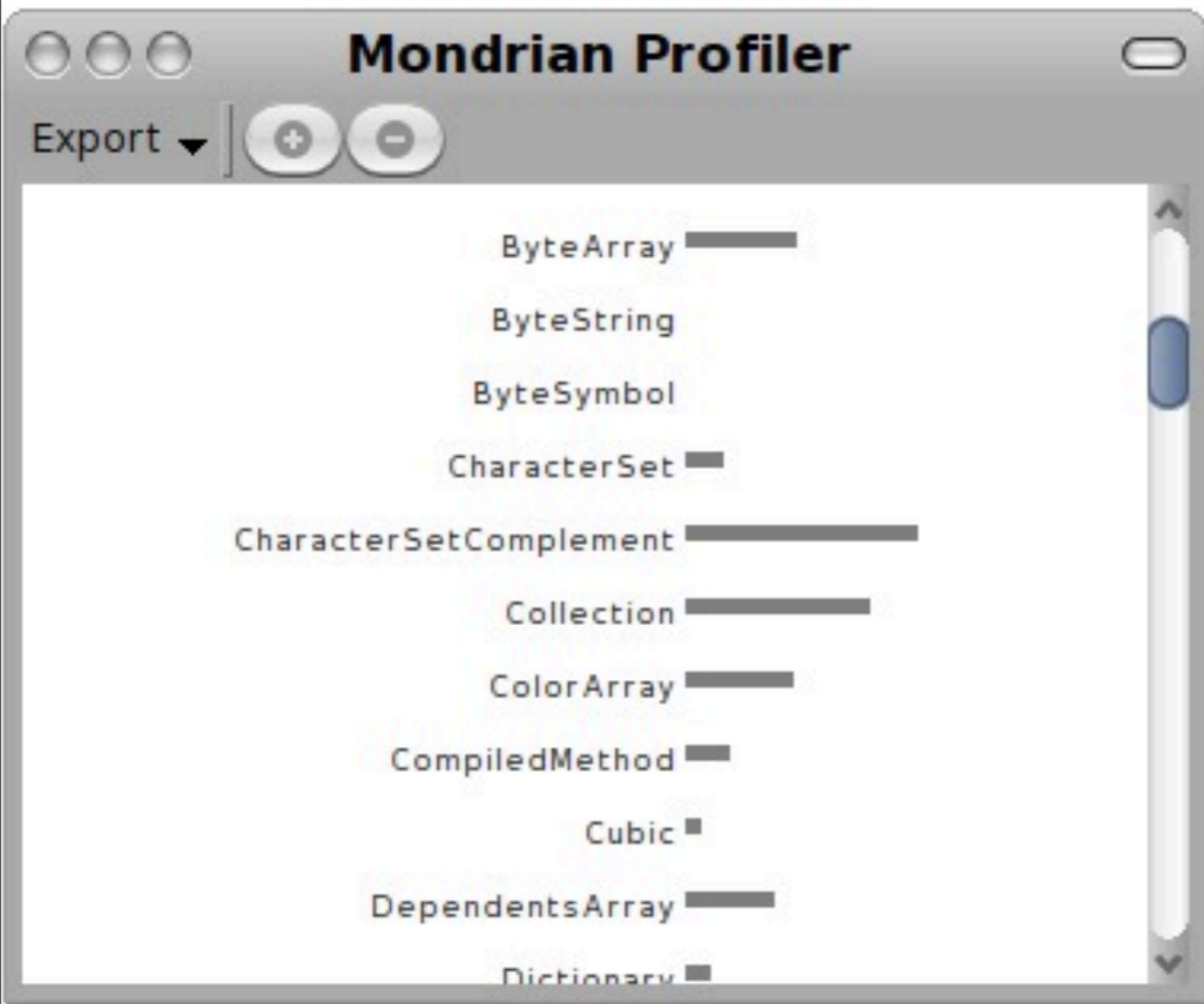




# System Complexity

Lanza, Ducasse 2003





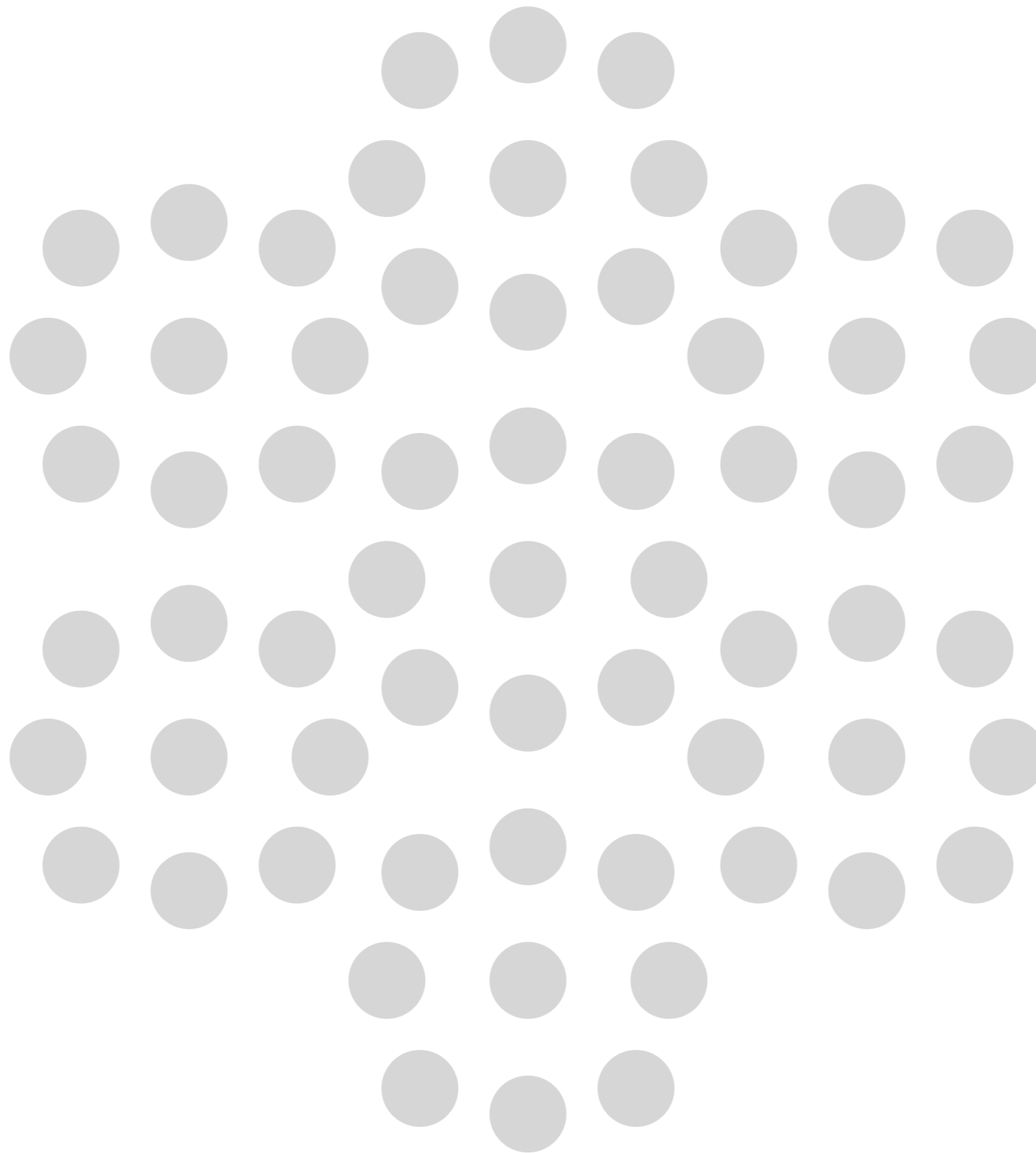
**Debugging**

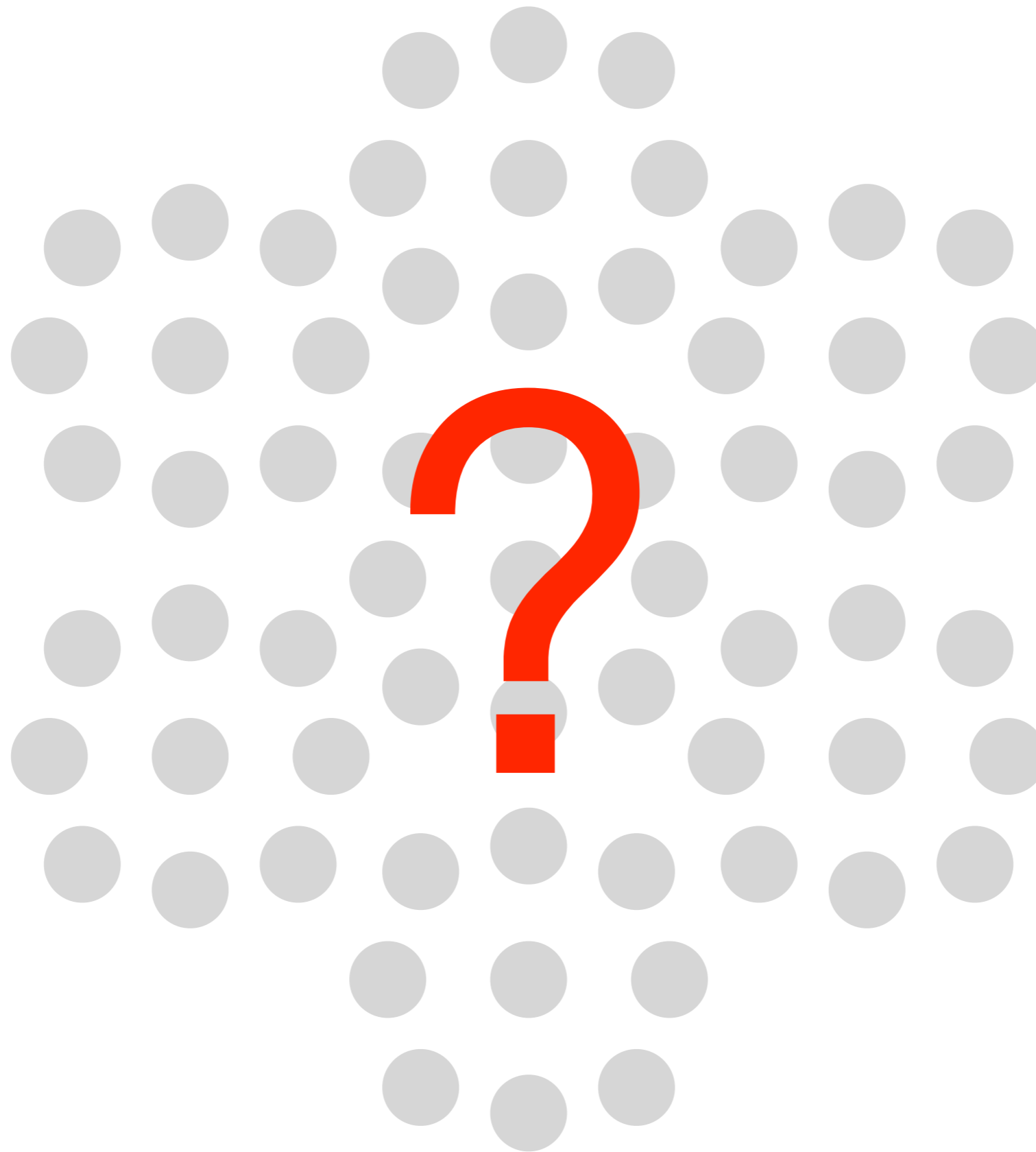
**Profiling**

**Execution  
Reification**

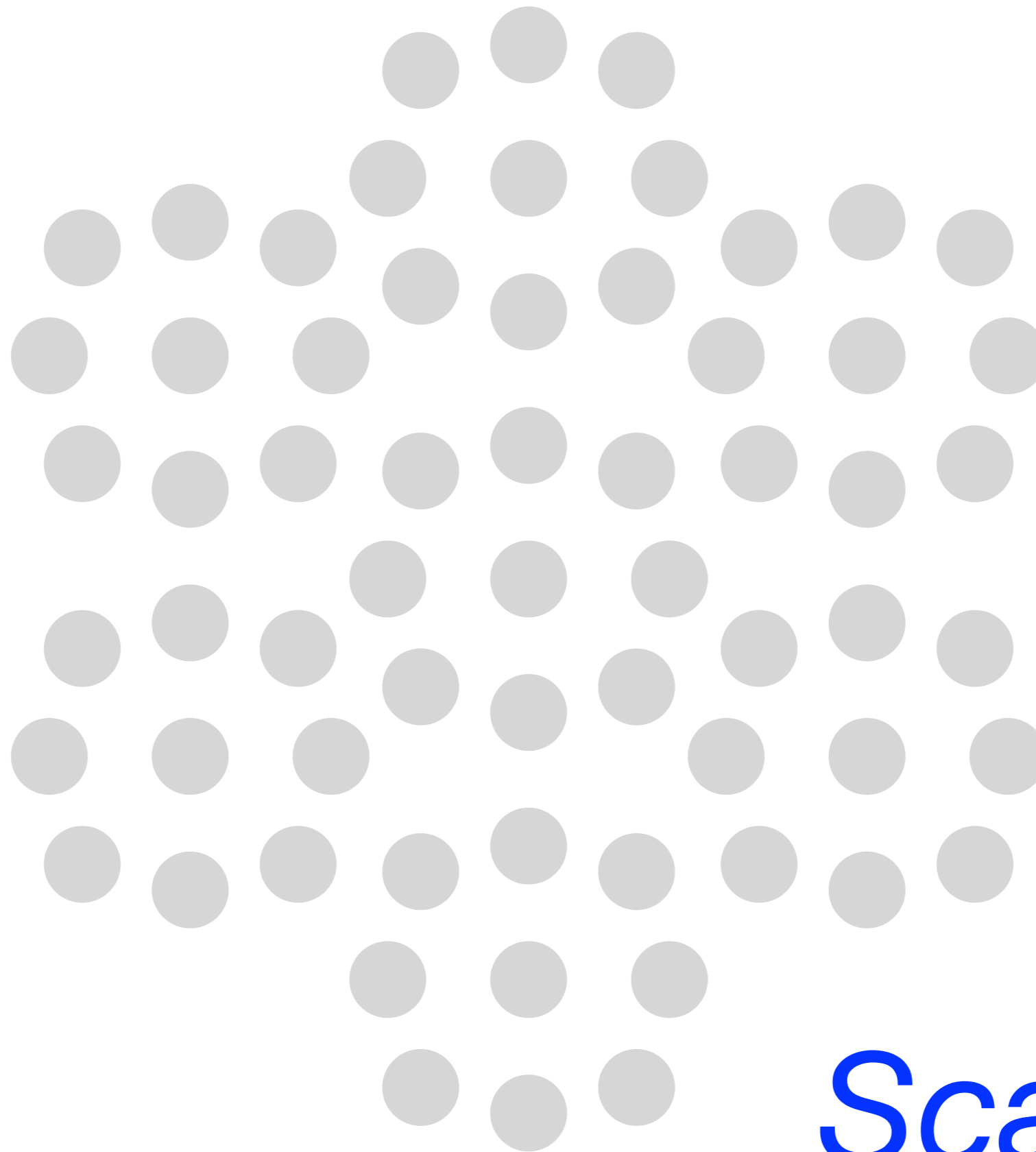
**Structure  
Evolution**

**What if we do not  
know what to evolve?**

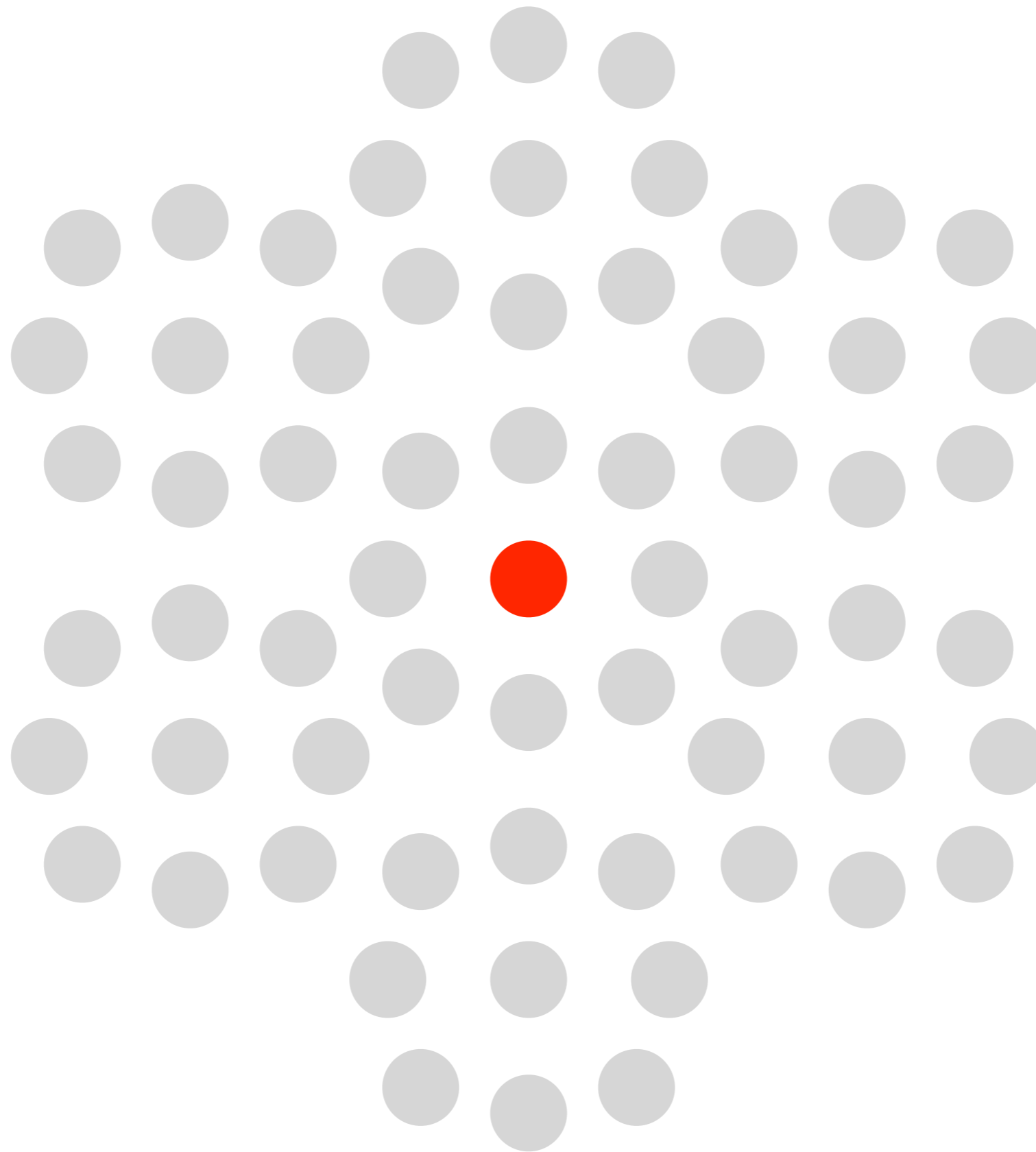




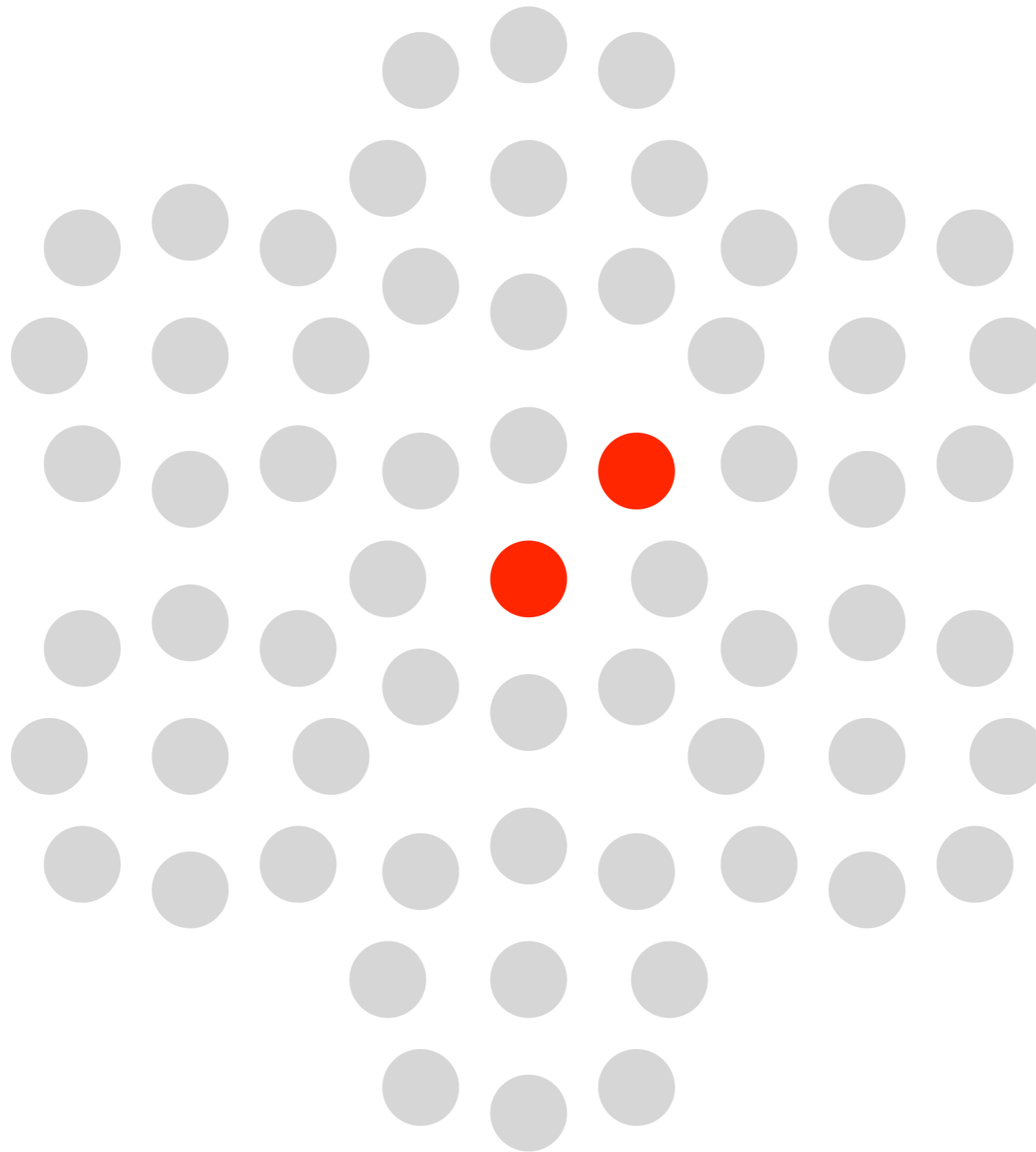
# Prisma

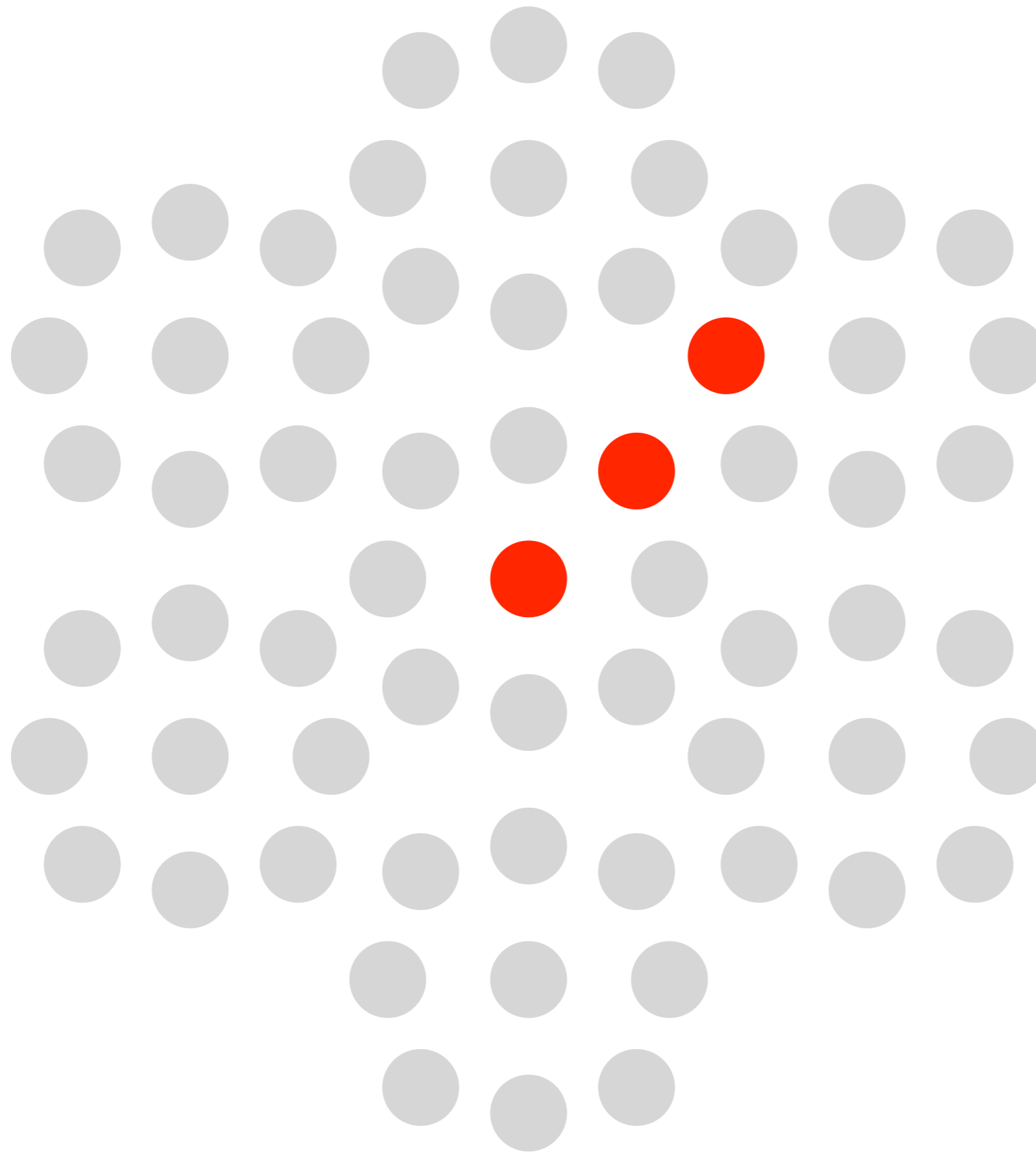


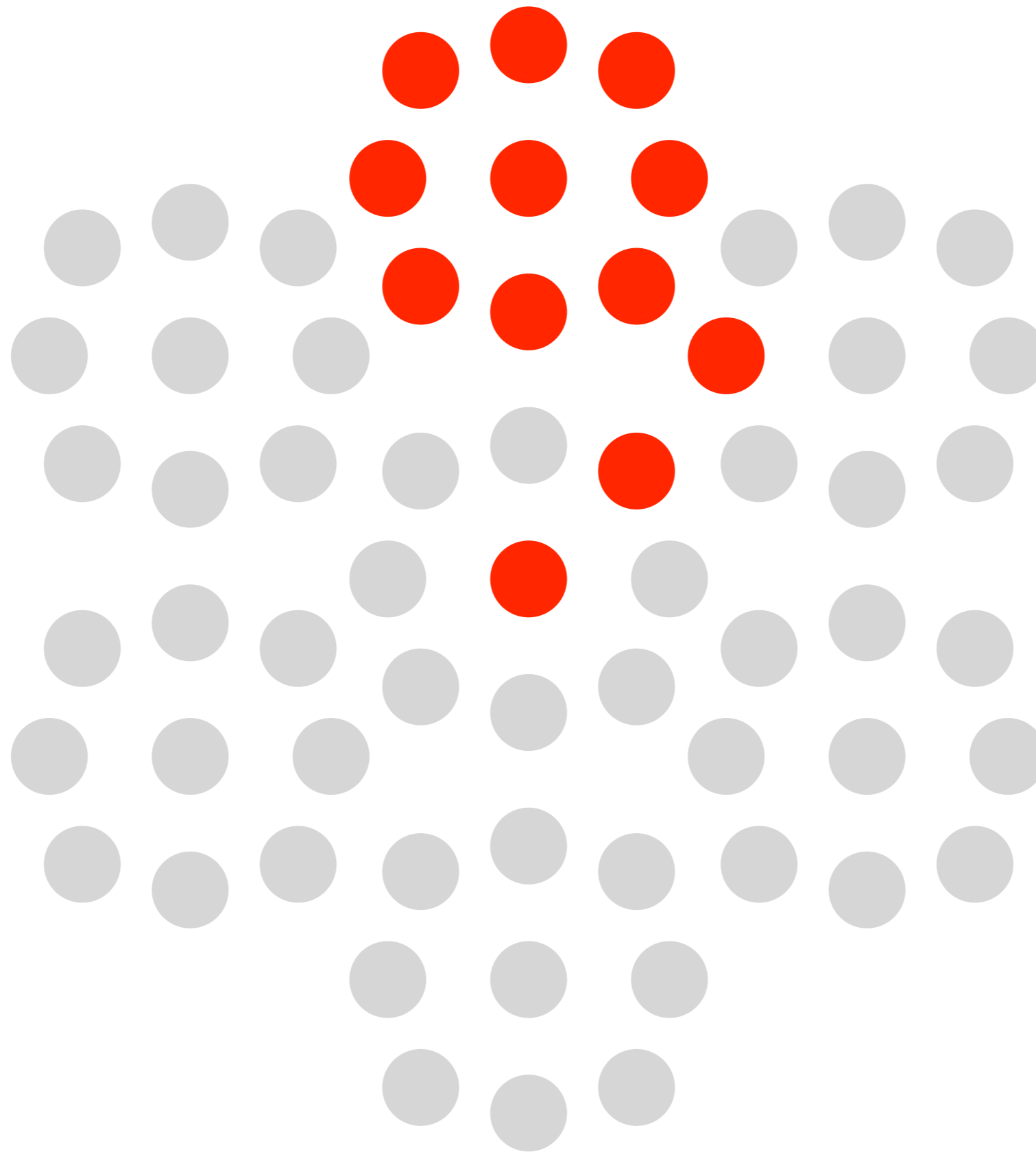
*Scarring*

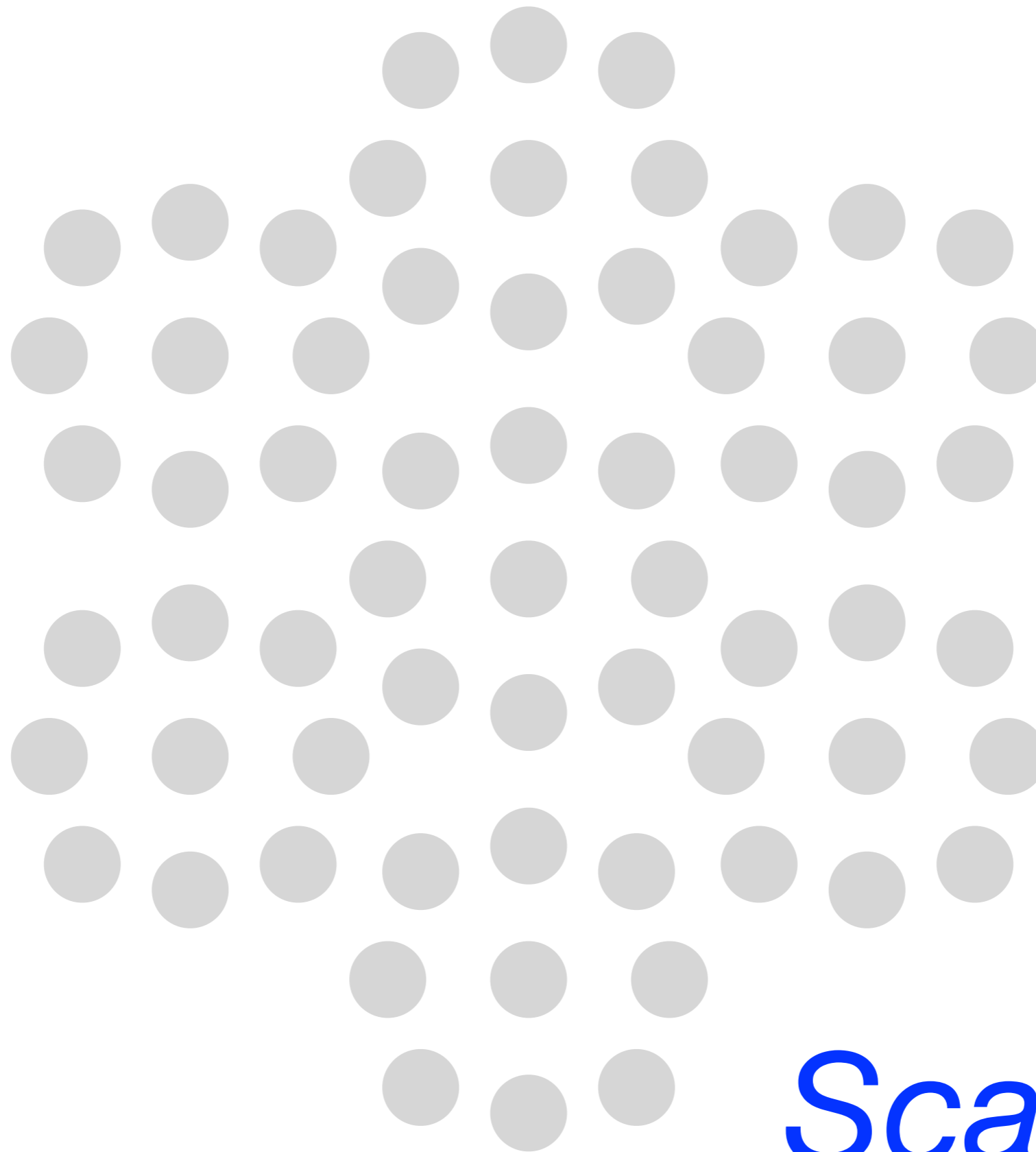




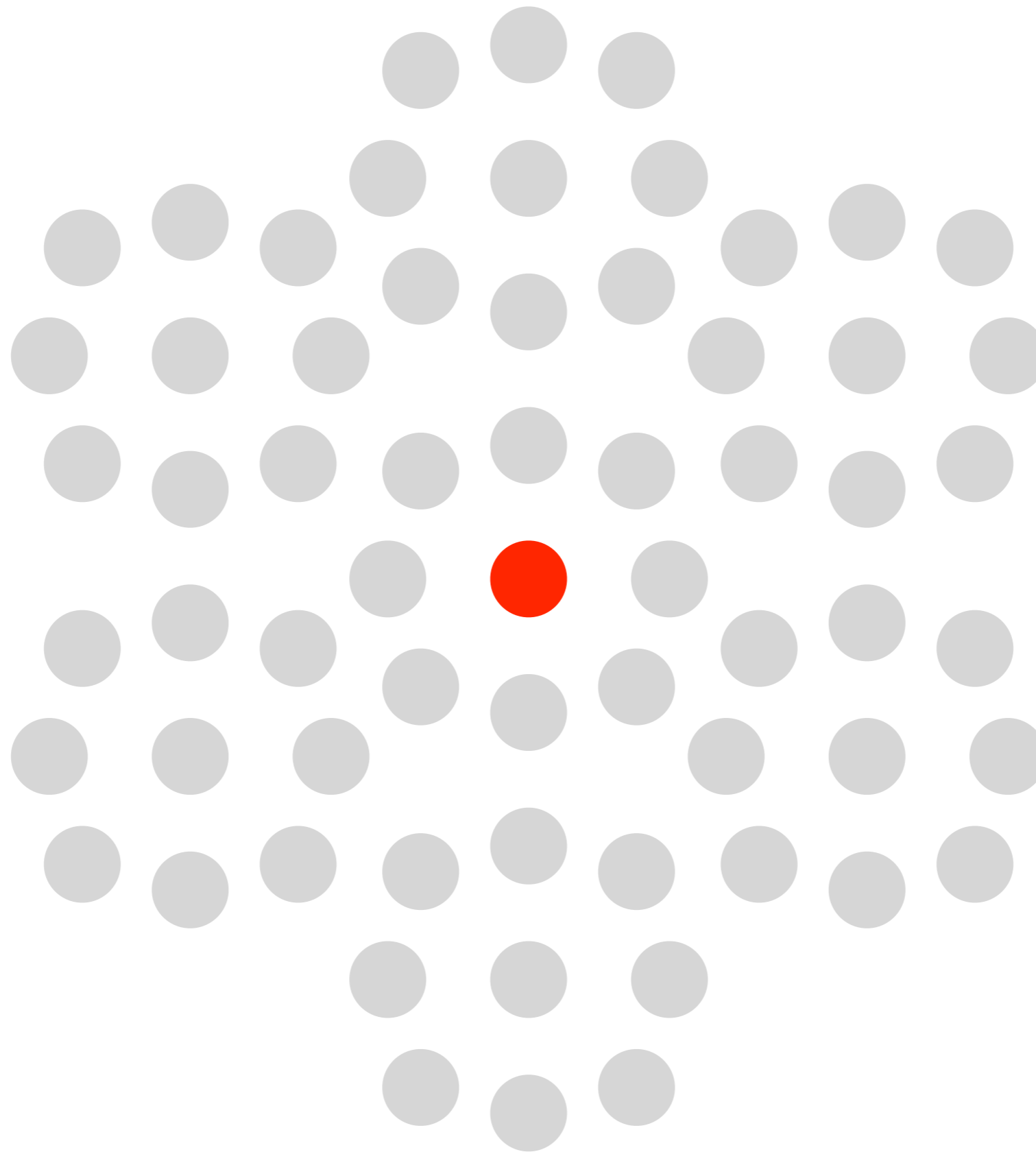


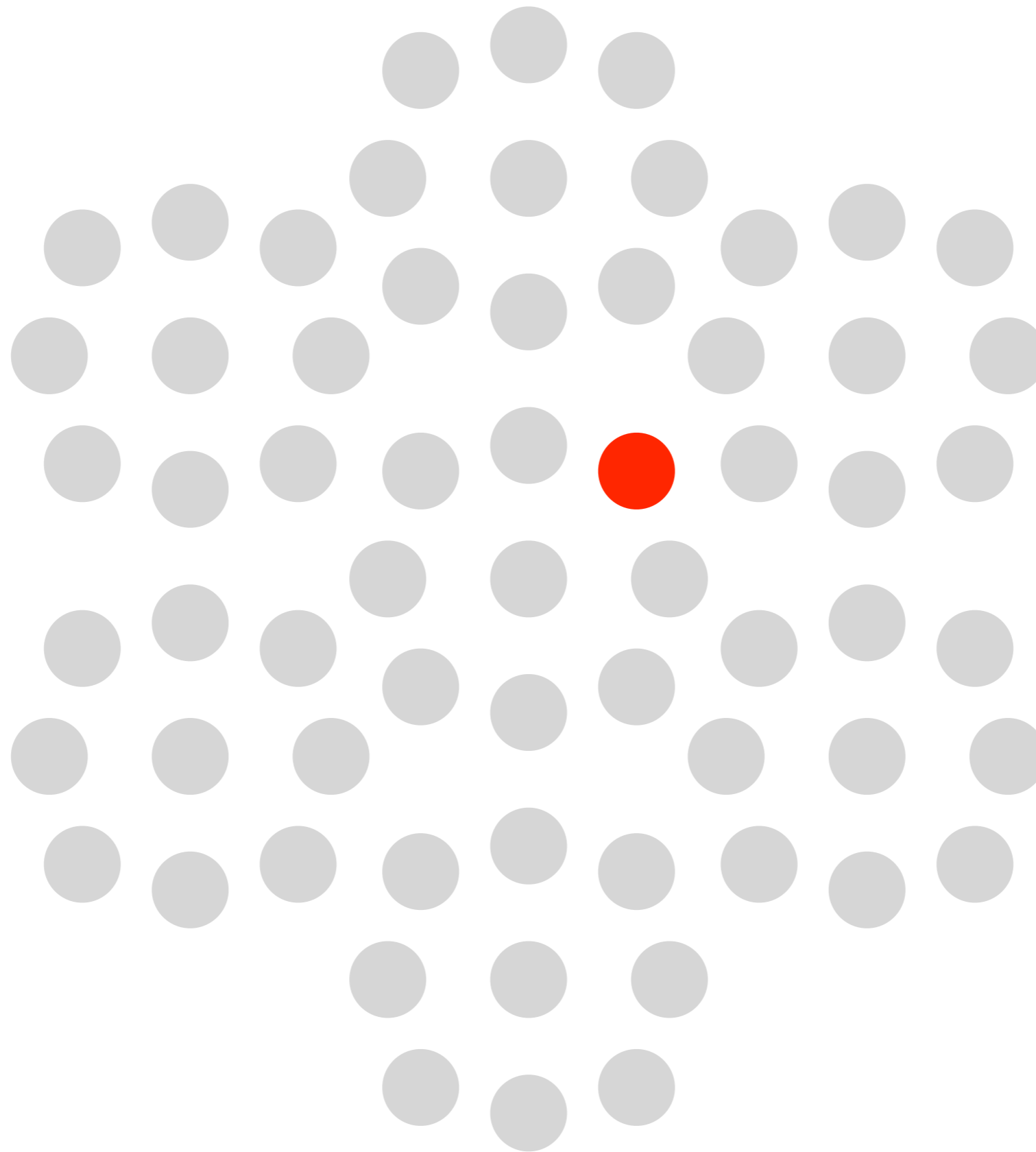


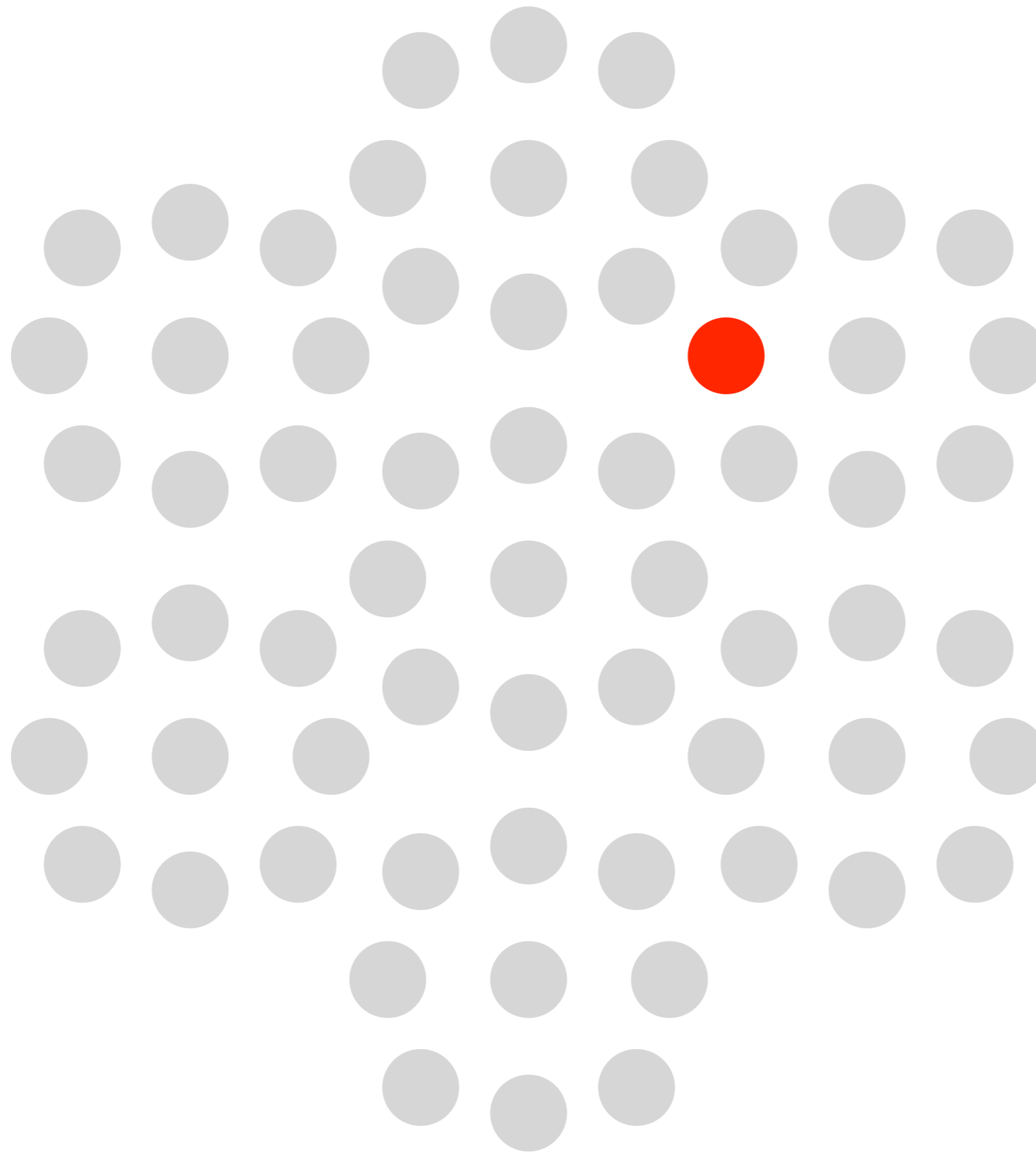


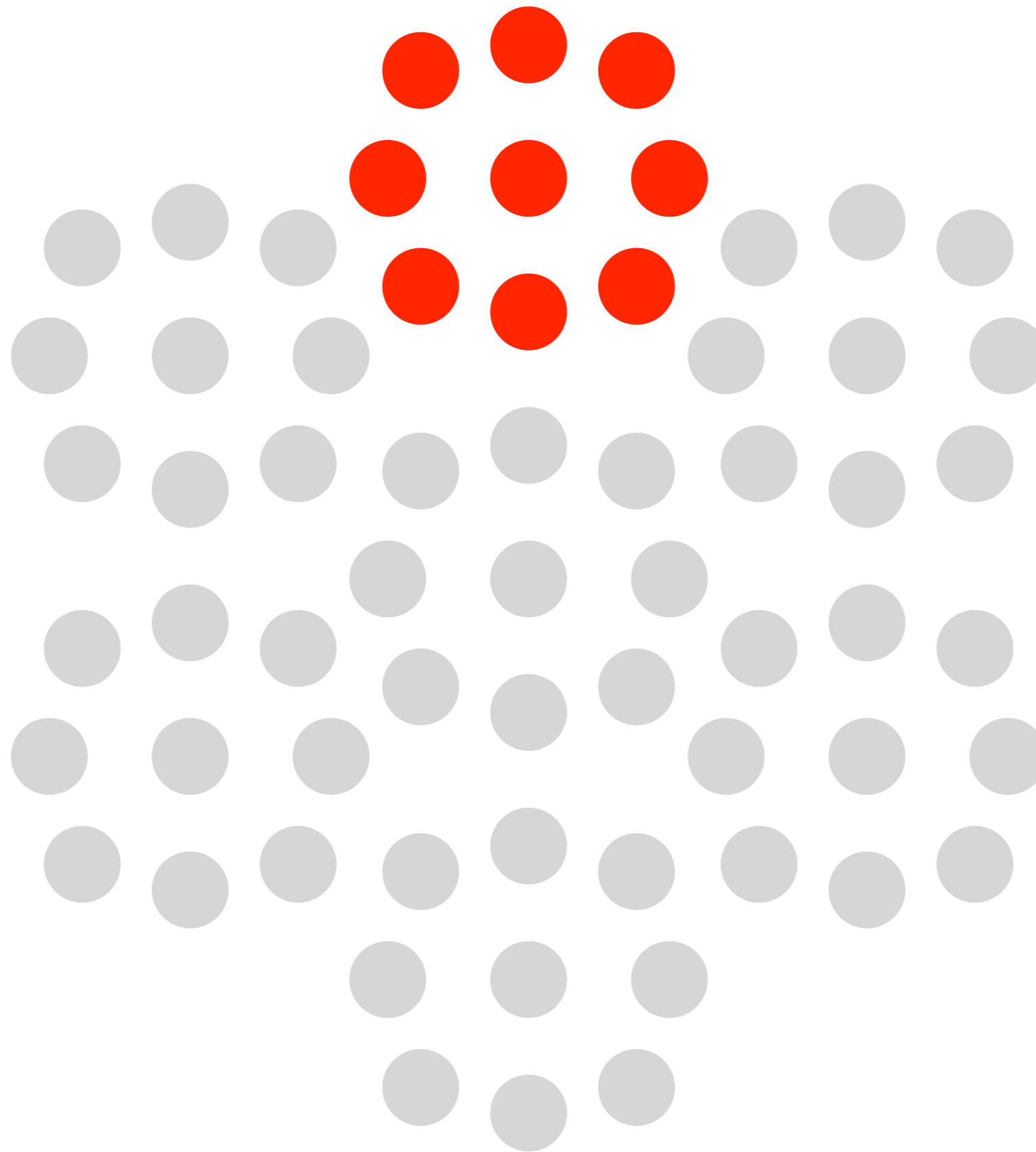


*Scanning*

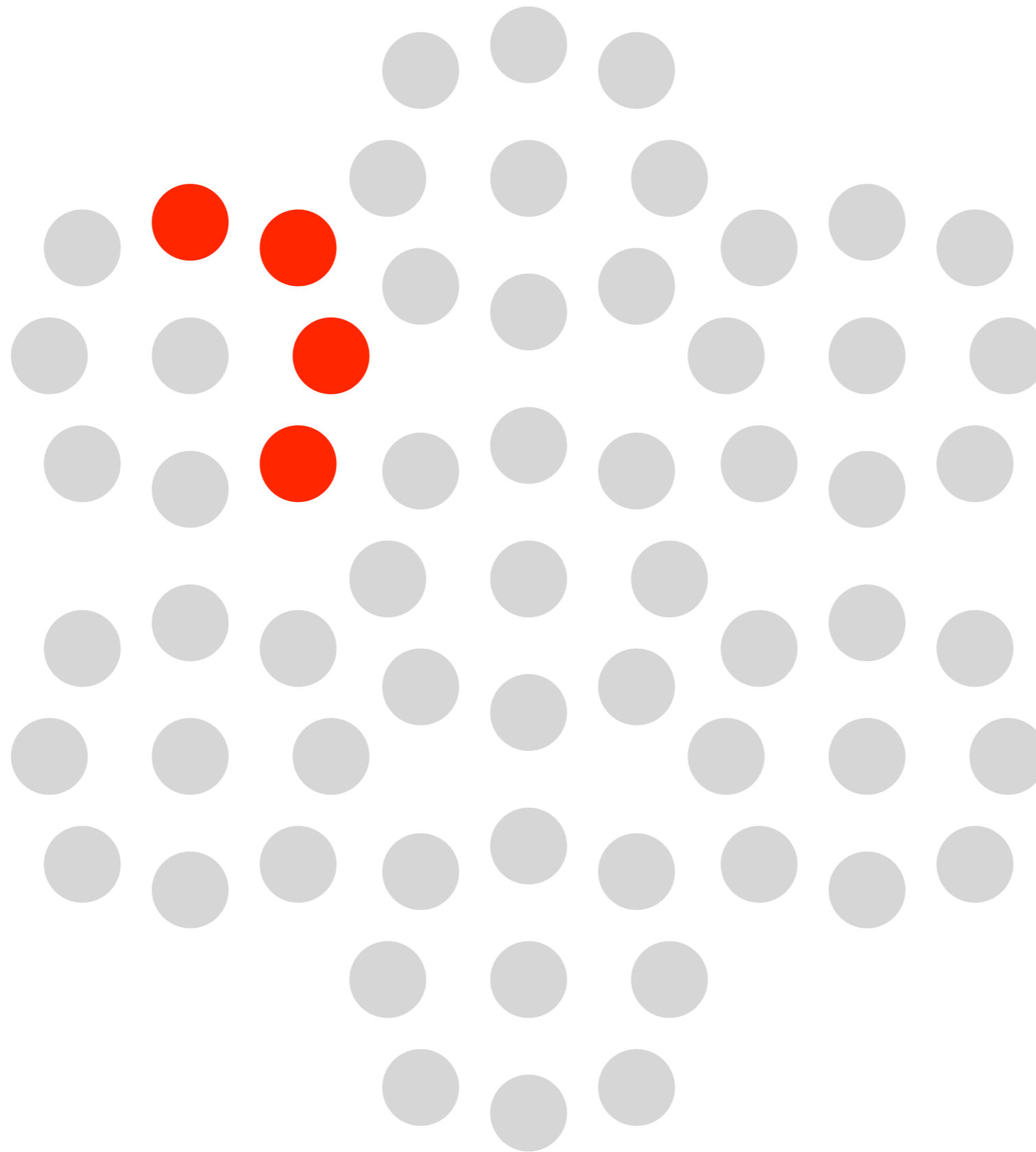


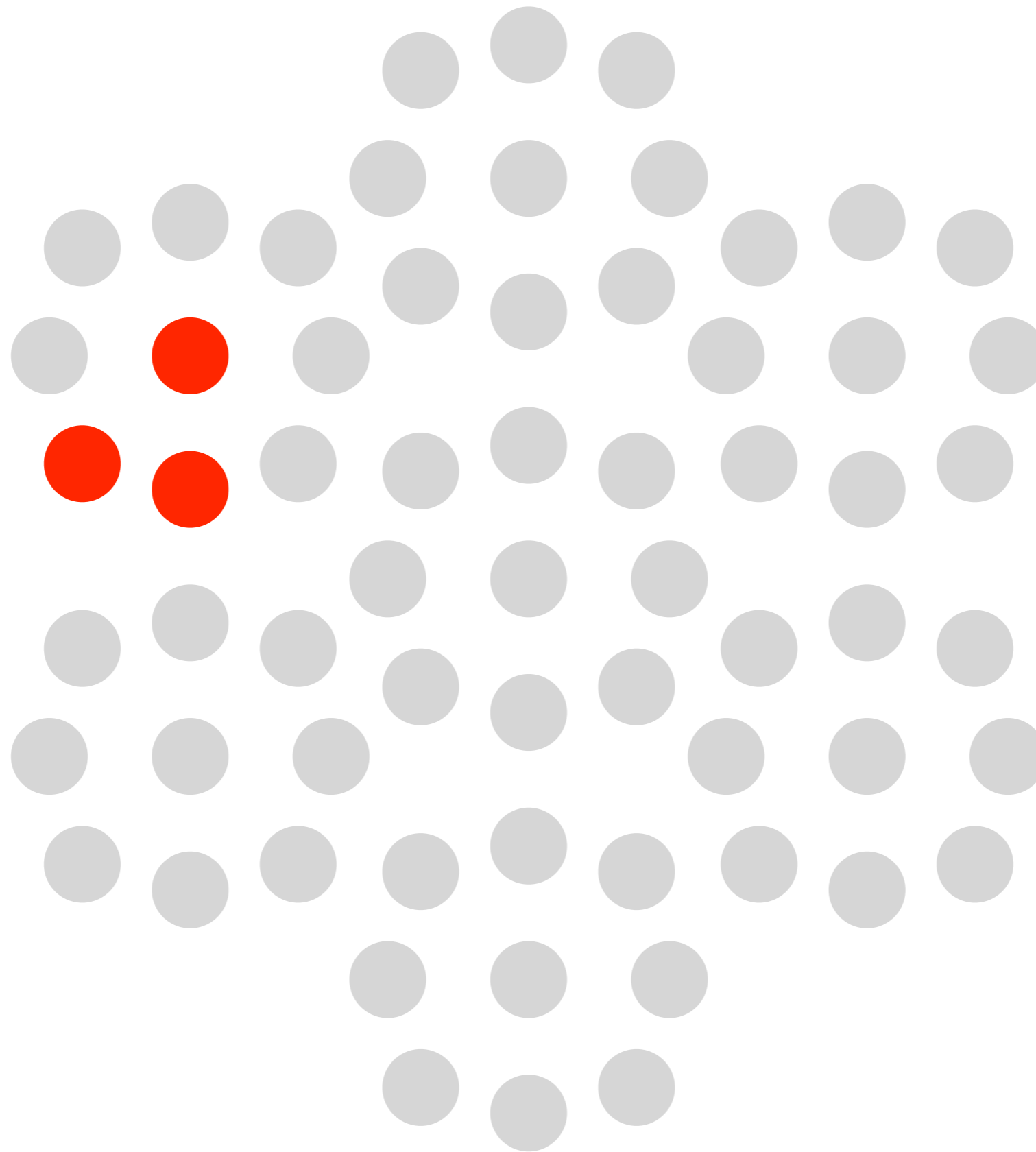


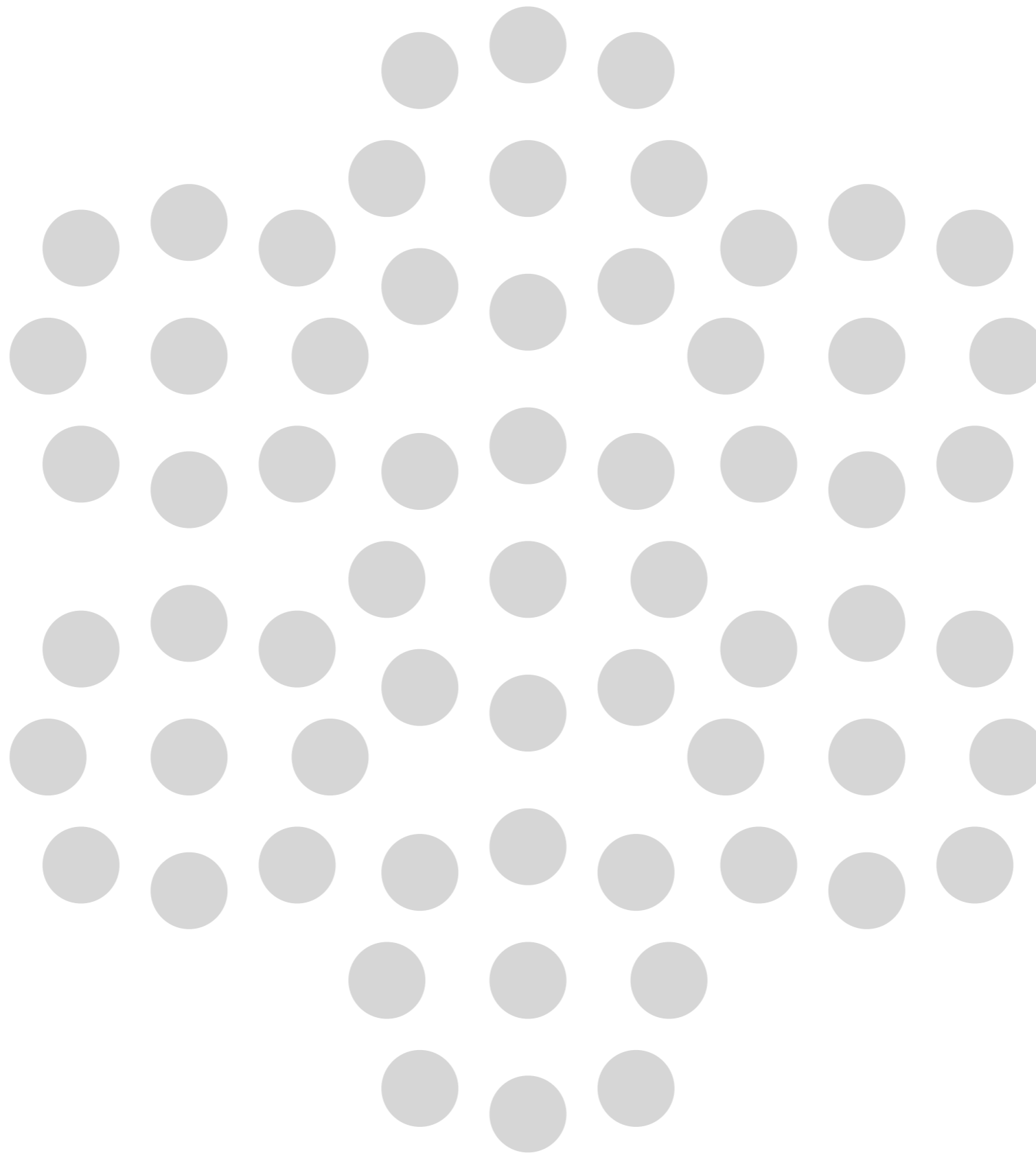










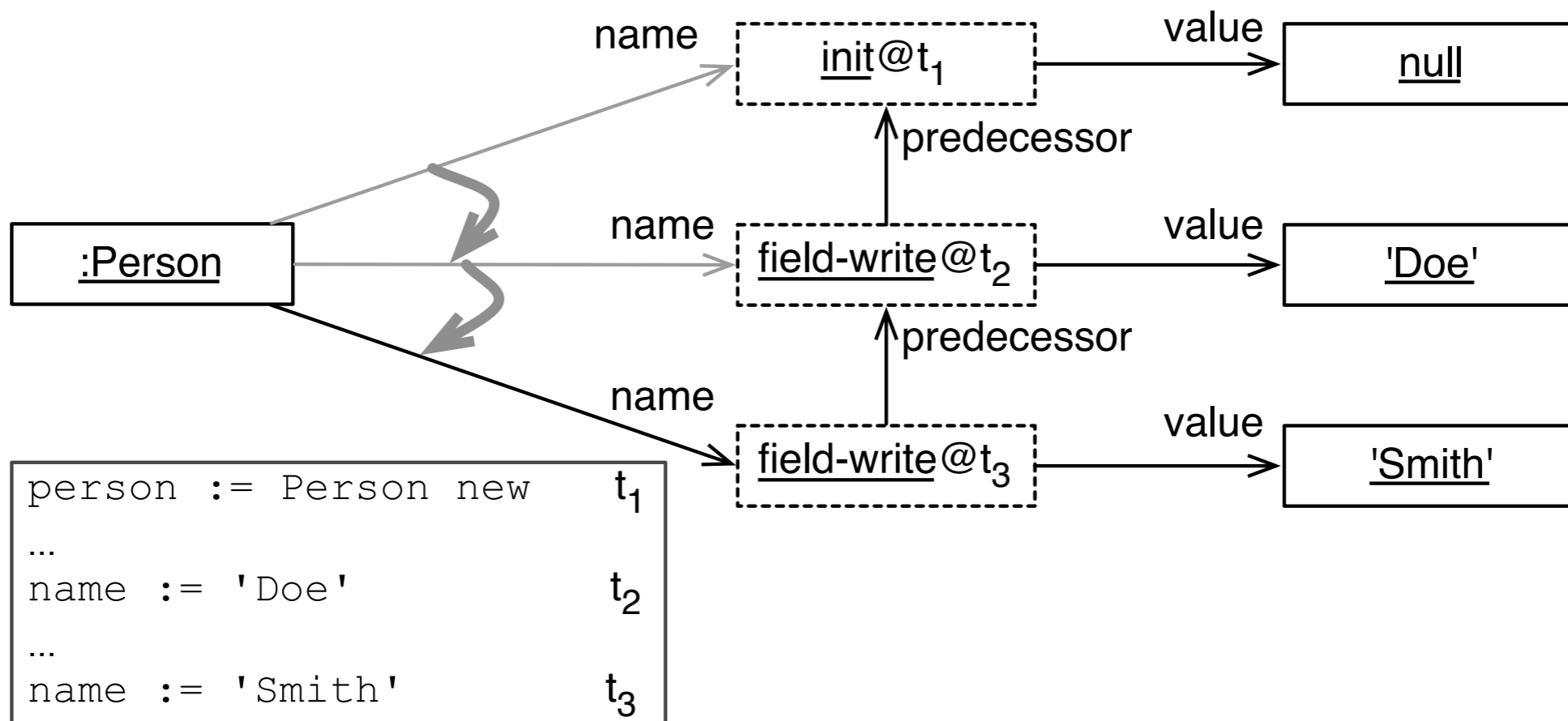


# Back in time Debugger

# Back in time Debugger

**Object Flow Debugger**  
Lienhard et al. ECOOP 2008

# Instance variable history



**Debugging**

**Profiling**

**Execution  
Reification**

**Structure  
Evolution**



# Talents

[scg.unibe.ch/research/talents](http://scg.unibe.ch/research/talents)

# Talents

**IWST 2011**

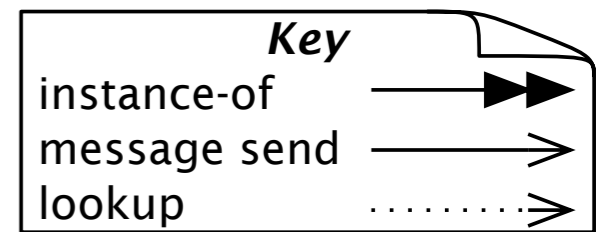
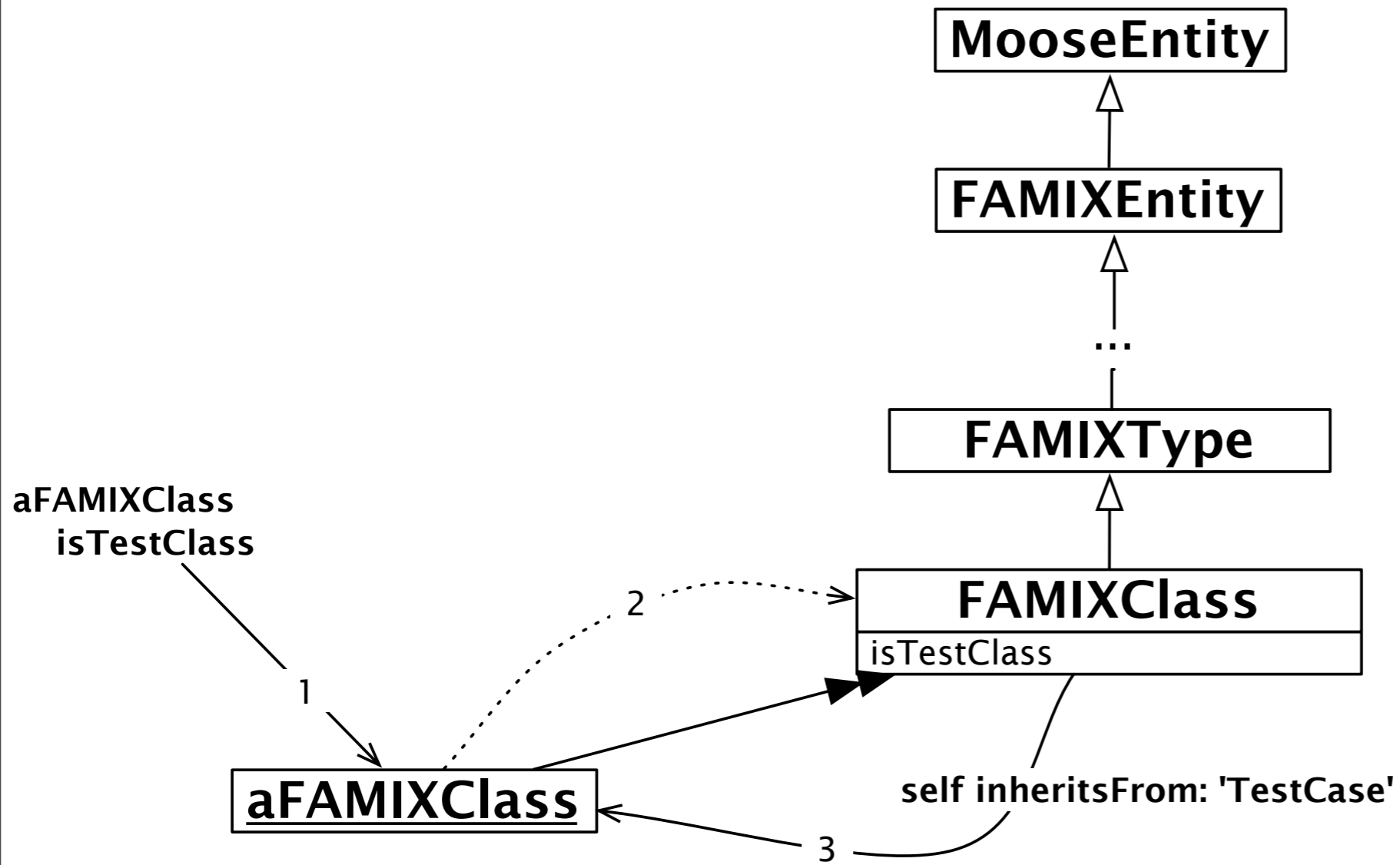
J. Ressia, T. Gîrba, O. Nierstrasz, F. Perin and  
L. Renggli

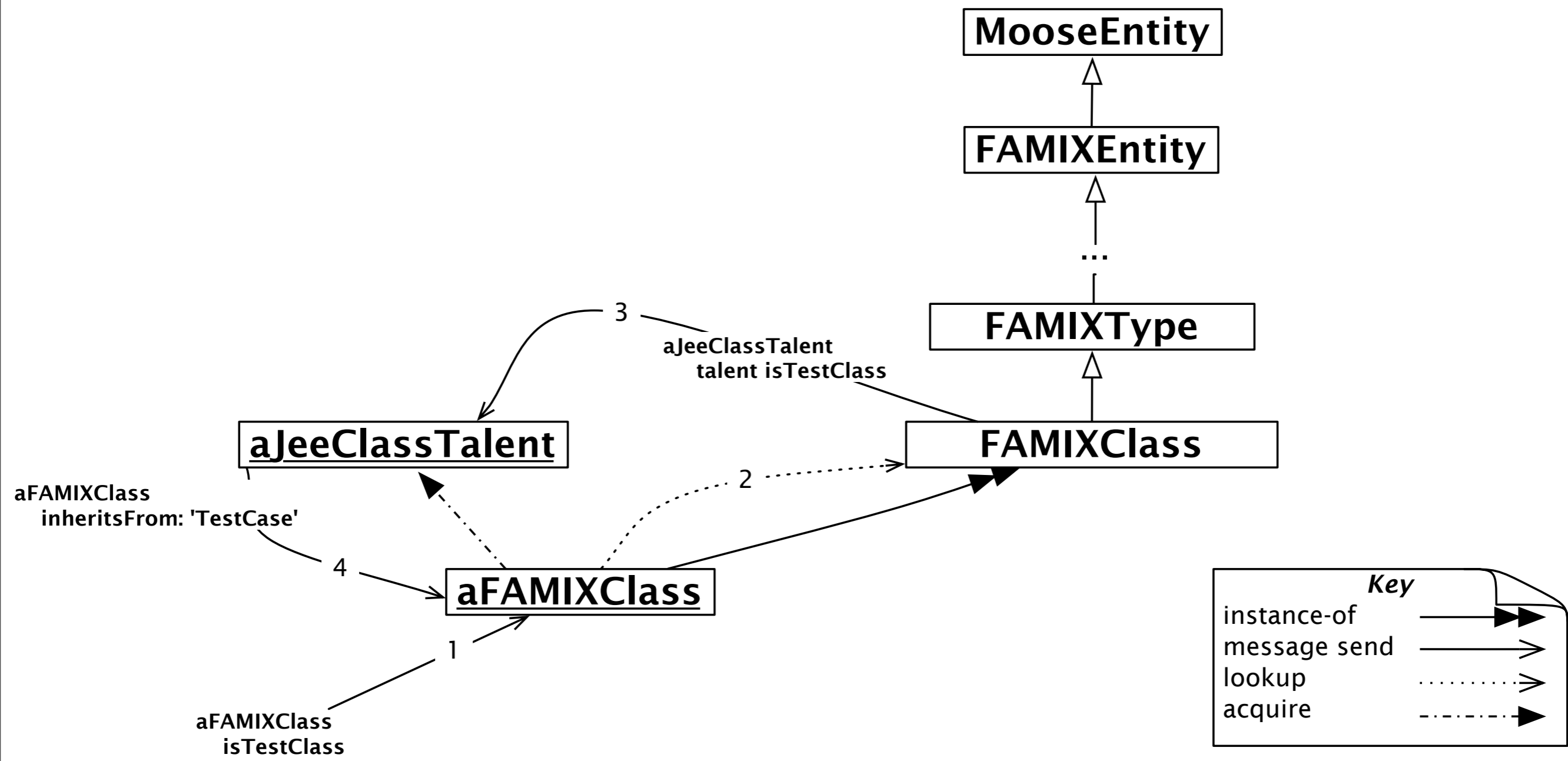
[scg.unibe.ch/research/talents](http://scg.unibe.ch/research/talents)

# **Dynamically composable units of reuse**



[moosetechnology.org](http://moosetechnology.org)





# Operators

- @ alias
- - exclusion
- , composition

# Flattening



# Scoping

# Evolution friendly Object Model

Bisfröst



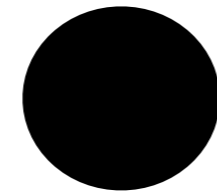
# Organize the Meta-level

# Explicit Meta-objects

Class



Meta-object



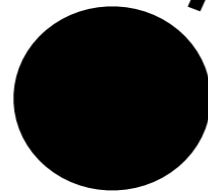
Object



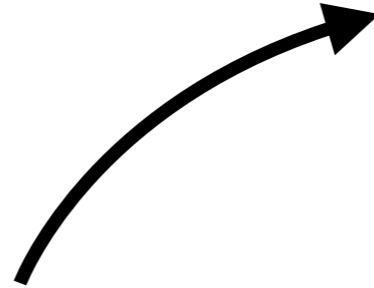
Class



Meta-object



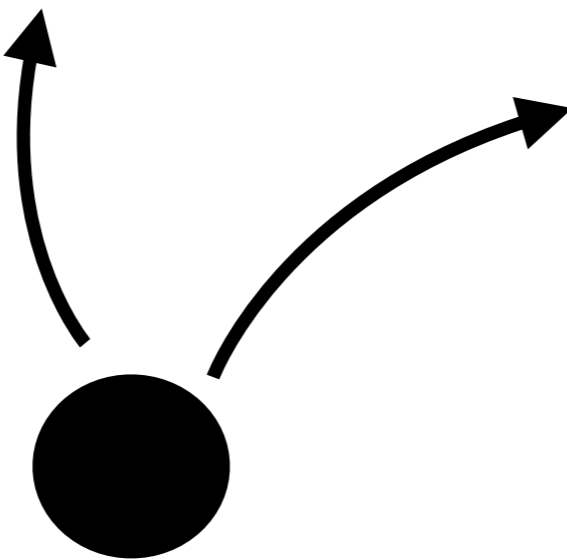
Object



Class



Meta-object



Evolved Object



## **Object>>haltAtNextMessage**

| aMetaObject |

aMetaObject := BFBehavioralMetaObject new.

aMetaObject

**when:** (BFMessageReceiveEvent new)

**do:** [ self metaObject **unbindFrom:** self.

TransparentBreakpoint signal ].

aMetaObject **bindTo:** self

**We let Smalltalk  
loose**

# Bifröst

Object  
Debugger

Prisma

Subjectopia

MetaSpy

Talents

Chameleon

Jenkins

[People](#)

[Build History](#)

### Build Queue

No builds in the queue.

### Build Executor Status

#	Status
1	Idle
2	Idle



S	W	Job ↓	Last Success	Last Failure	Last Duration
		<a href="#">Bifrost</a>	17 hr ( <a href="#">#209</a> )	N/A	1 min 21 sec
		<a href="#">Bifrost-Unstable</a>	17 hr ( <a href="#">#45</a> )	N/A	1 min 5 sec
		<a href="#">Chameleon</a>	17 hr ( <a href="#">#195</a> )	N/A	21 sec
		<a href="#">Development</a>	1 day 6 hr ( <a href="#">#34</a> )	1 day 6 hr ( <a href="#">#33</a> )	2 min 53 sec
		<a href="#">Development-Unstable</a>	1 day 6 hr ( <a href="#">#26</a> )	1 day 6 hr ( <a href="#">#25</a> )	2 min 41 sec
		<a href="#">ObjectDebugger</a>	17 hr ( <a href="#">#35</a> )	N/A	5.8 sec
		<a href="#">Pharo</a>	1 day 22 hr ( <a href="#">#38</a> )	1 mo 1 day ( <a href="#">#33</a> )	37 sec
		<a href="#">Pharo-Unstable</a>	1 day 6 hr ( <a href="#">#14</a> )	23 days ( <a href="#">#9</a> )	6.6 sec
		<a href="#">Pharogenesis</a>	4 mo 29 days ( <a href="#">#7</a> )	N/A	2 min 24 sec
		<a href="#">Prisma</a>	1 day 23 hr ( <a href="#">#51</a> )	N/A	4.6 sec
		<a href="#">Seaside3</a>	1 day 6 hr ( <a href="#">#5</a> )	N/A	3 min 8 sec
		<a href="#">Talents</a>	17 hr ( <a href="#">#25</a> )	N/A	18 sec
		<a href="#">Talents-UI</a>	17 hr ( <a href="#">#17</a> )	19 hr ( <a href="#">#13</a> )	3 min 4 sec
		<a href="#">TextLint</a>	1 day 6 hr ( <a href="#">#10</a> )	23 days ( <a href="#">#2</a> )	3 min 50 sec

Icon: [S](#) [M](#) [L](#)

[Legend](#)
[RSS for all](#)
[RSS for failures](#)
[RSS for just latest builds](#)

[scg.unibe.ch/jenkins/](http://scg.unibe.ch/jenkins/)

Bifrost

[scg.unibe.ch/research/bifrost](http://scg.unibe.ch/research/bifrost)