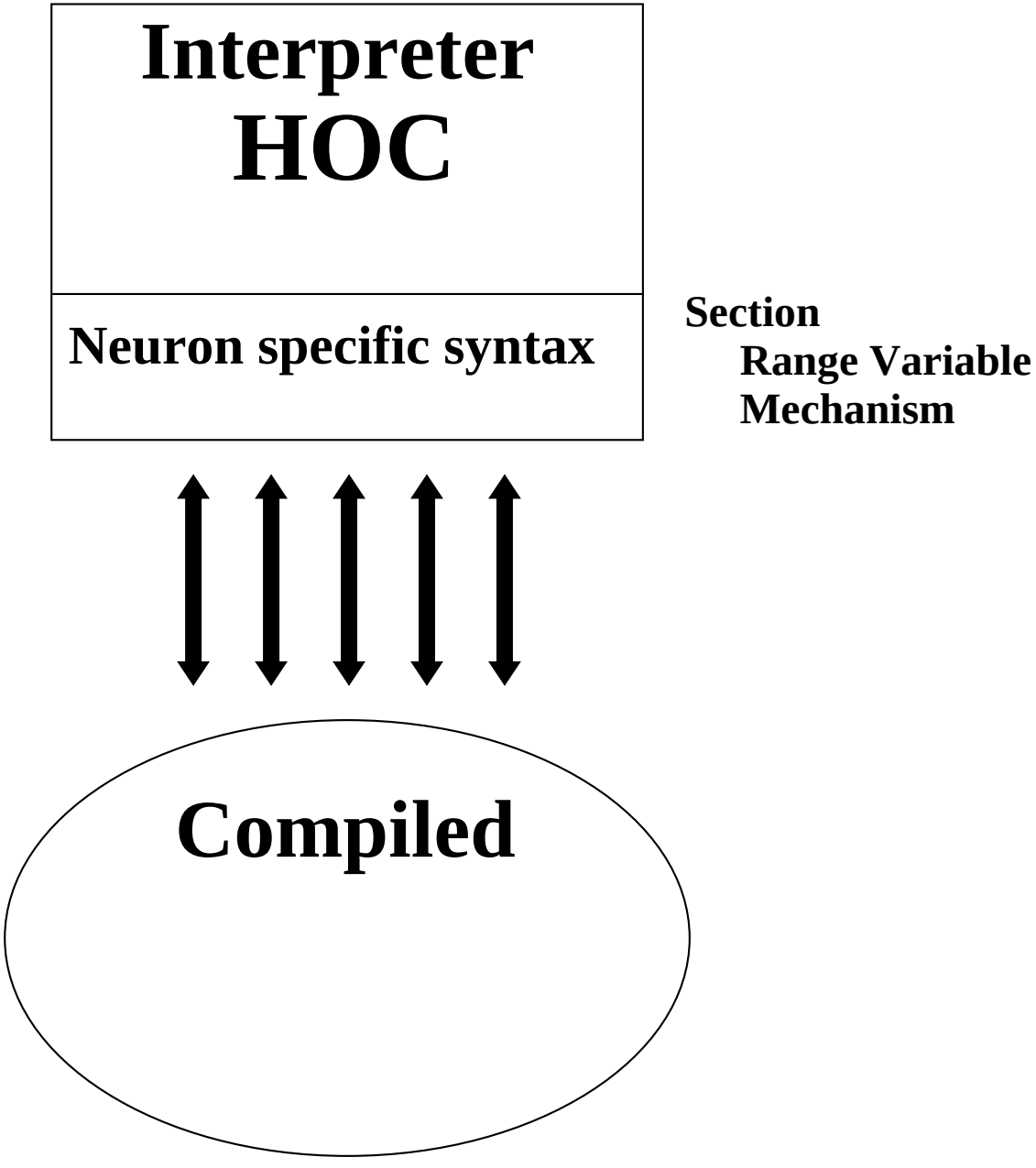
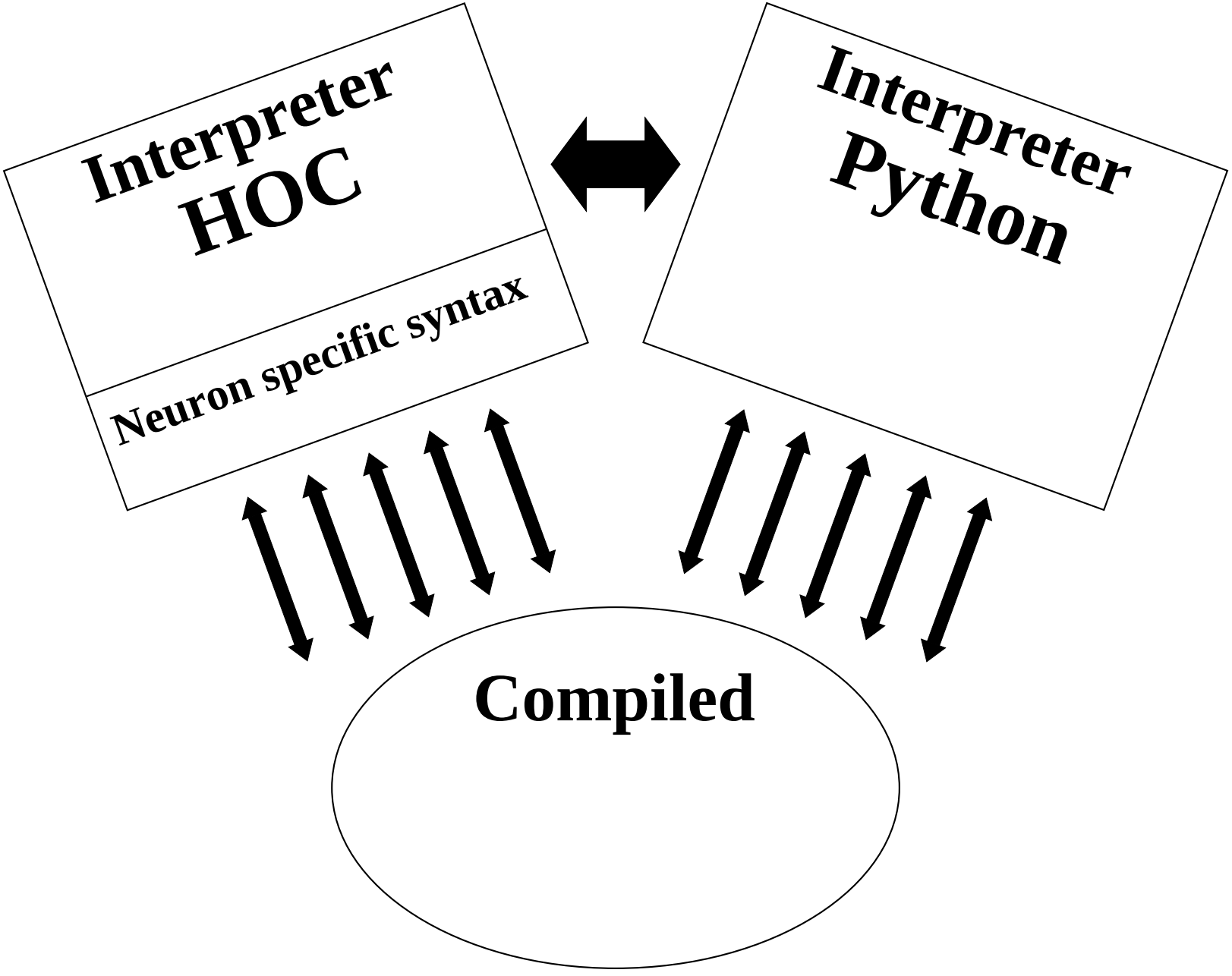
Python + NEURON


Interpreter
HOC
Neuron specific syntax
Section
Range Variable
Mechanism
Compiled


Interpreter
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Installation

```
>>> import neuron
```

Linux: i686, x86_64

Mac: OS X 10.4, 10.5, 10.6

MSWin: Cygwin, MinGW

Launch: NEURON, Python

Python: 2.3, 2.4, 2.5, 2.6, 3.0

NumPy

```
$ nrniv -python
NEURON -- VERSION 7.1 ...
```

```
$ nrniv -python
NEURON -- VERSION 7.1 ...

>>> from neuron import h
>>> print h
TopLevelHocInterpreter
```

```
>>> h(’’’
... x = 5
... strdef s
... s = "hello"
... func square() { return $1*$1 }
... ’’’)
1
```

```
>>> h('''
... x = 5
... strdef s
... s = "hello"
... func square() { return $1*$1 }
... ''')
1
>>> print h.x, h.s, h.square(4)
5.0 hello 16.0
```

```
>>> v = h.Vector(4).indgen().add(10)
>>> print v, len(v), v.size(), v.x[2], v[2]
Vector[1] 4 4.0 12.0 12.0
```

```
>>> v = h.Vector(4).indgen().add(10)
>>> print v, len(v), v.size(), v.x[2], v[2]
Vector[1] 4 4.0 12.0 12.0
>>> v.printf()
10      11      12      13
4.0
>>> for x in v: print x
...
10.0
11.0
12.0
13.0
>>>
```

```
>>> import numpy
>>> na = numpy.arange(0, 10, 0.00001) # 0.0131
>>> v = h.Vector(na)                  # 0.0197
>>> v.size()
1000000.0
>>> nb = numpy.array(v)               # 0.0125
>>> nb[999999]
9.9999900000000004
>>> b = list(v)                       # 0.0717
>>> for i in xrange(0, len(nb)):
...   v.x[i] = na[i]
...                                   # 3.7497
```

```
>>> def callback(a = 1, b = 2):
...   print "callback: a=%d b=%d" % (a, b)
...
>>> fih = h.FInitializeHandler(callback)
>>> h.finitialize()
callback: a=1 b=2
1.0
```

```
>>> def callback(a = 1, b = 2):
...   print "callback: a=%d b=%d" % (a, b)
...
>>> fih = h.FInitializeHandler(callback)
>>> h.finitialize()
callback: a=1 b=2
1.0
>>> fih = h.FInitializeHandler((callback,\
... (4, 5)))
>>> h.finitialize()
callback: a=4 b=5
1.0
>>>
```

```
# assume hh soma model

vvec = h.Vector()
vvec.record(soma(.5)._ref_v, sec=soma)
```

```
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vvec = h.Vector()
vvec.record(soma(.5)._ref_v, sec=soma)

tvec = h.Vector()
tvec.record(h._ref_t, sec=soma)

h.run()
```

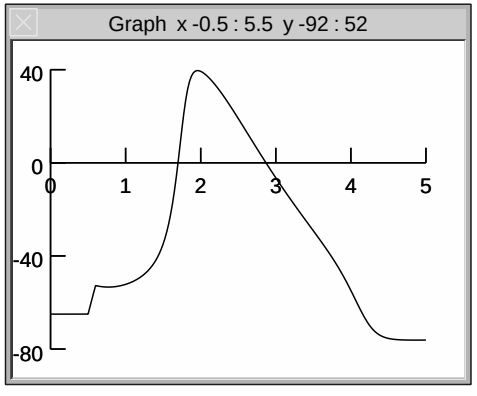
```
# assume hh soma model

vvec = h.Vector()
vvec.record(soma(.5)._ref_v, sec=soma)

tvec = h.Vector()
tvec.record(h._ref_t, sec=soma)

h.run()

g = h.Graph()
g.size(0, 5, −80, 40)
vvec.line(g, tvec)
```



```
>>> from neuron import h
>>> soma = h.Section(name = 'soma')
>>> axon = h.Section()
>>> axon.connect(soma, 1)
>>> axon.nseg = 5
>>> h.topology()

|-|       soma(0-1)
   `----|       PySec_2b371cd17190(0-1)

1.0
```

```
>>> axon.L = 1000
>>> axon.diam = 1

>>> for sec in h.allsec():
...   sec.cm = 1
...   sec.Ra = 100
...   sec.insert('hh')
...
```

```
>>> axon.gnabar_hh = .1
>>> axon(.5).hh.gnabar = .09
>>> for seg in axon:
...   print seg.x, seg.hh.gnabar
...
0.1 0.1
0.3 0.1
0.5 0.09
0.7 0.1
0.9 0.1
```

```
>>> stim = h.IClamp(.5, sec=soma)
>>> stim.delay = .5
>>> stim.dur = .1
>>> stim.amp = .4
```

```
class Cell(object):
  def __init__(self):
    self.topology()
    self.subsets()
    ...
```

```
class Cell(object):
  def __init__(self):
    self.topology()
    self.subsets()
    ...
  def topology(self):
    self.soma = h.Section(cell = self)
    self.dend = h.Section(cell = self)
    self.dend.connect(self.soma)
    ...
```

```
class Cell(object):
  def __init__(self):
    self.topology()
    self.subsets()
    ...
  def topology(self):
    self.soma = h.Section(cell = self)
    self.dend = h.Section(cell = self)
    self.dend.connect(self.soma)
    ...
  def subsets(self):
    self.all = h.SectionList()
    self.all.wholetree(sec=self.soma)
```