Part 2.2:
Python: Loops, Lists, Files and Modules

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Python Development Environment: ATOM text editor

- Development environments provide tools to make writing code easier
  - Syntax highlighting
  - Automatic syntax enforcement
  - Intelligent autocomplete
  - Debugging
- ATOM text editor
  - Open source
  - Free
  - Easy to use and extend

Running Python Scripts

- Python is an interpreted language
  - Code is not compiled prior to executed
  - Code is read and executed by the Python interpreter
- Example:

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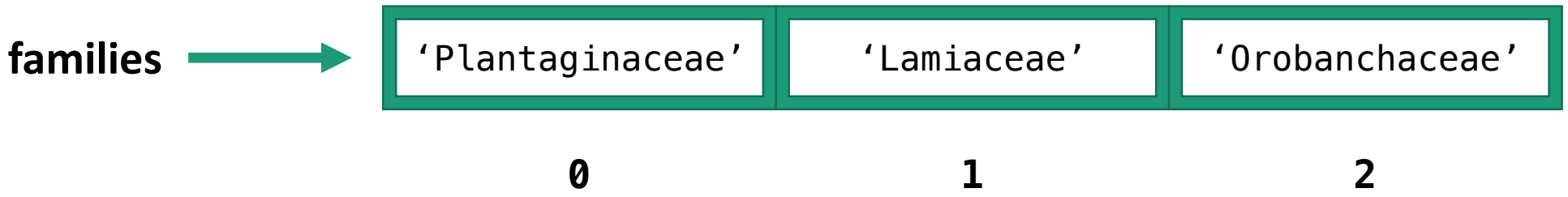

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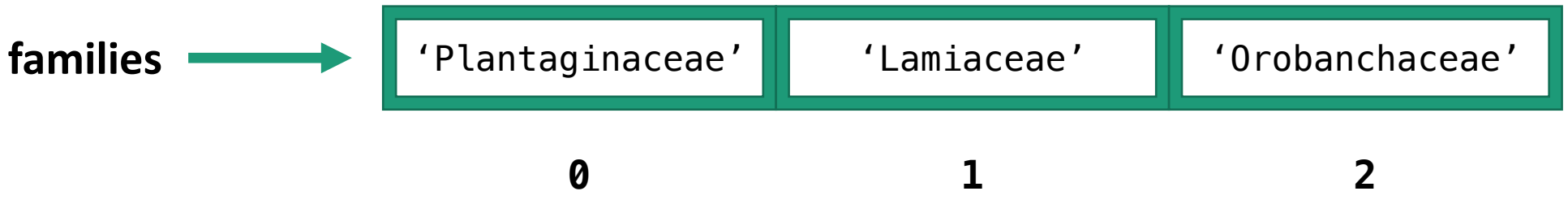

- List values are separated by commas and surrounded by square brackets
- Lists are zero indexed

```
families = ['Plantaginaceae', 'Lamiaceae', 'Orobanchaceae']
print(families[0])   # Plantaginaceae
print(families[2])   # Lamiaceae
print(len(families)) # 3
```

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- Python uses the open function to access files

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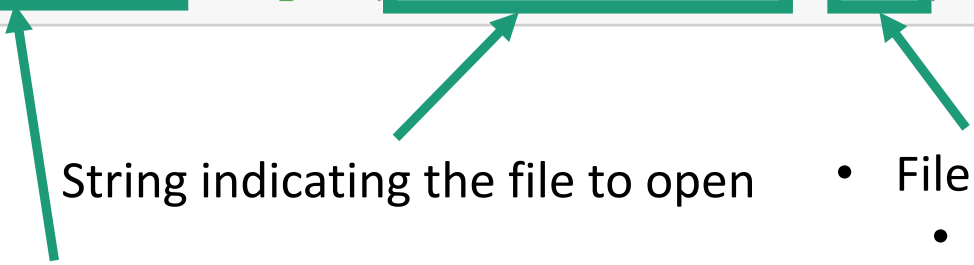

Variable containing the file object

String indicating the file to open

- File mode
  - r – read
  - w – write

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- To read lines from the opened file use the `readline()` method on the file object

```
open("filename.txt", "r") as file_handle
line = file_handle.readline() #'First line\n'
line = file_handle.readline() #'Second line\n'
file_handle.close
```

Loops

- We often need to repeat a block of code several times
  - Reading lines from a file
  - Calculating values for each item of a list
  - Running simulations
- Programming languages have loop statements to introduce repetitions
- Python has two types of loops
  - for loops
  - while loops

Loops: for

- Python for loops are iterator based loops that step through sequences, such as, lists
- Syntax:

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    statment1
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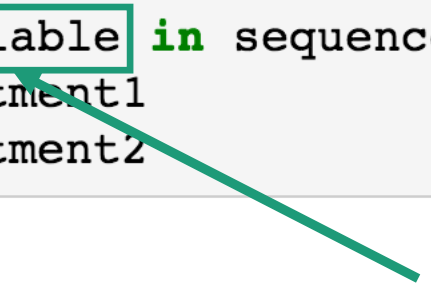

Variable that holds the current step of the sequence object

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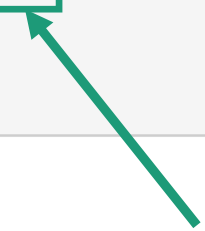

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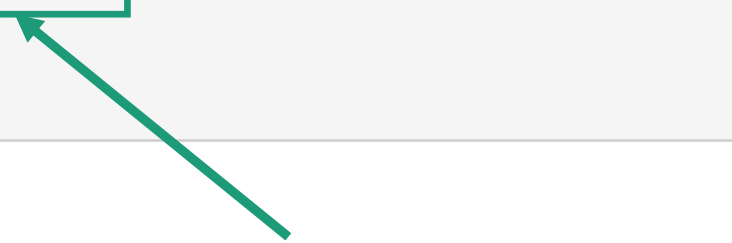

Sequence object (e.g. list) to step through

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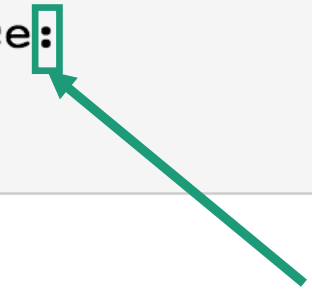

The colon indicates the start of a indented code block.

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Indented code block that is executed each iteration of the loop
(four spaces are used to indent the block)

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- Example: printing every line of a file:

```
open("filename.txt", "r") as file_handle
for line in file_handle:
    print(line)
```

Loops: While

- Syntax

```
while (condition is true):
    statement1
    statement2
```

- Commonly used for simulations.
- We will be simulating genetic drift using a Moran process

Methods and Functions

- Functions
  - Take variables as arguments and perform a task
  - Functions are not associated with particular variable type

```
print("Hi")
len([1,2,3,4,5,6])
range(5)
```

- Methods
  - Perform a task
  - Methods are associated with a variable type and used directly on the variable

```
"Hello World".split() #["Hello", "World"]
[0,1,2,3,4].append(5) #[0,1,2,3,4,5]
```

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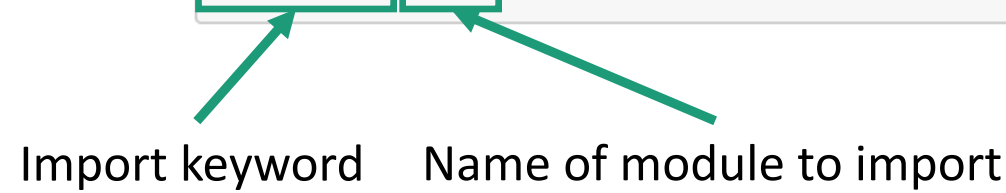

Modules: sys

- Gives access to command-line arguments through sys.argv
  - sys.argv is a list of command-line arguments including the script name
- Syntax

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```

```
import sys
print(sys.argv[0]) #script_name
print(sys.argv[1]) #argument1
print(sys.argv[2]) #argument2
```

- Arguments are commonly used to specify files