

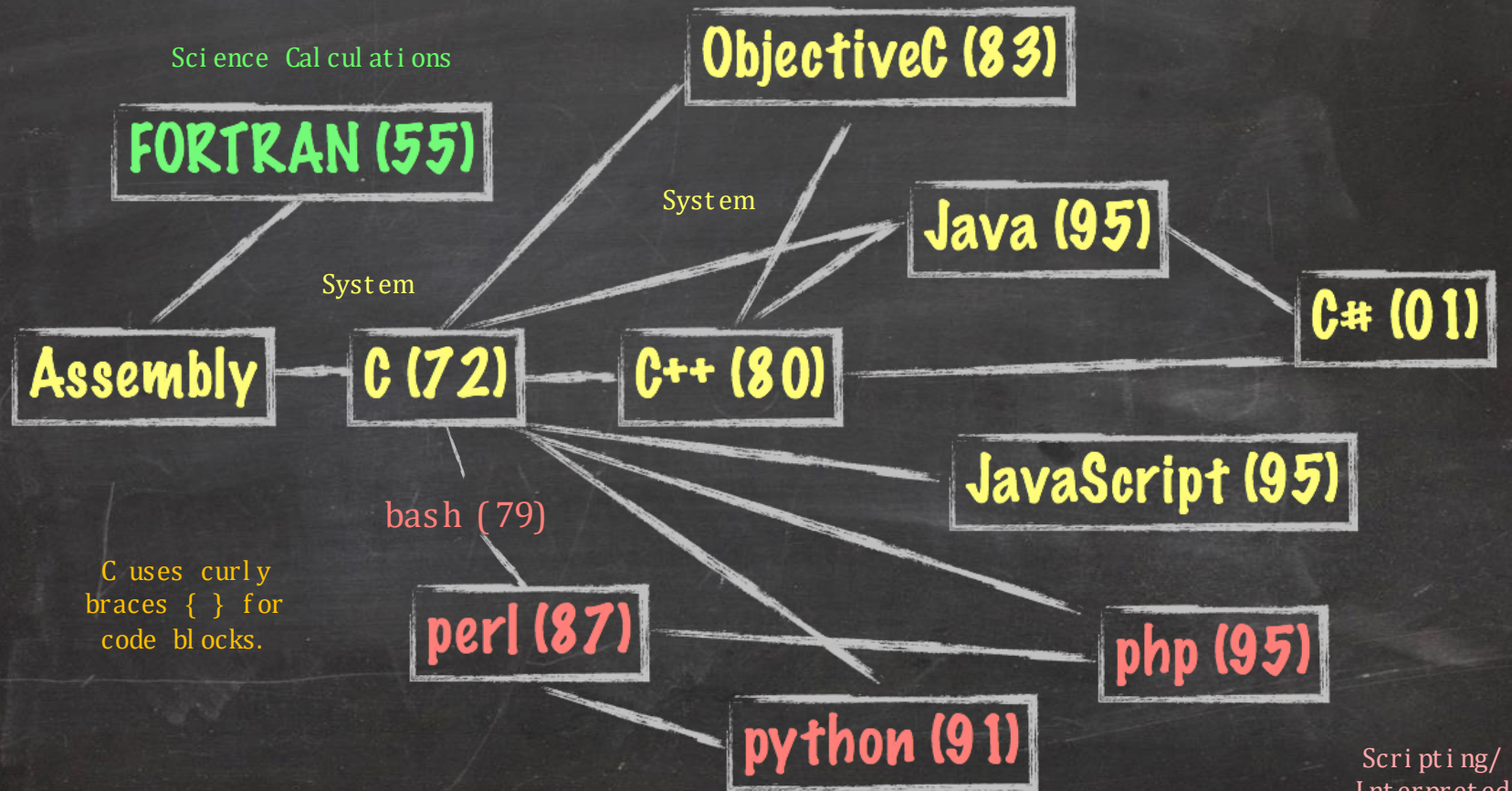
From Python to C

Dr. Charles R. Severance

www.cc4e.com

code.cc4e.com (sample code)

online.dr-chuck.com



Learning Path: online.dr-chuck.com

- History – ihts.pr4e.com
- Python – www.py4e.com
- Django (Python, HTML, CSS, SQL, JavaScript) – www.dj4e.com
- Web Applications (PHP, HTML, CSS, SQL, JavaScript) – www.wa4e.com
- PostgreSQL (SQL) – www.pg4e.com
- C Programming – www.cc4e.com ← We are here 😊
- Computer Architecture
- Java Enterprise Application Development

Python and C

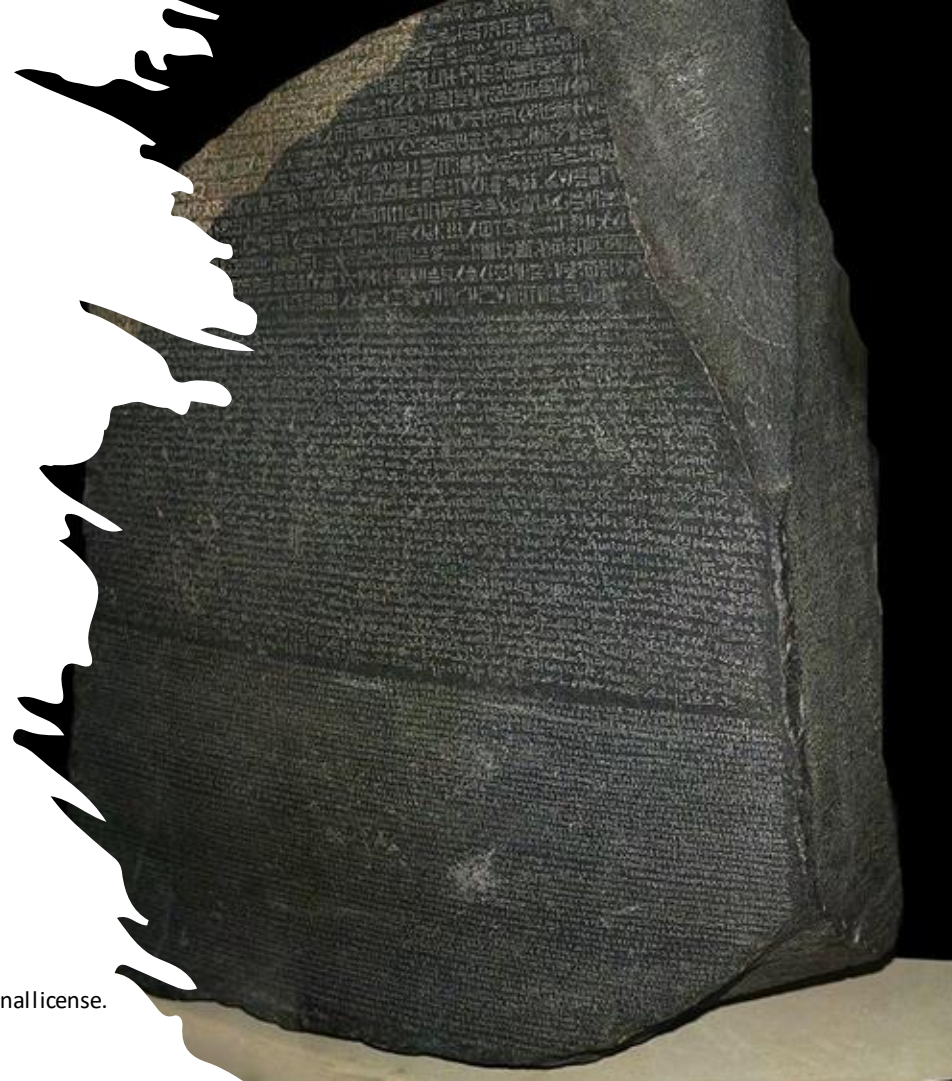
- White space is essential
- Very object oriented
- Convenient data structures
 - list
 - dict
- Auto memory management
- 1980's
- Whitespace ignored
- Not object oriented at all
- Fast efficient powerful
 - struct
 - Pointers
- Manual memory management
- 1970's

In many ways, Python is a convenience layer built on top of C to make it so users could write code without worrying about the complex details.

C Through A Python Lens

Learning by example

Rosetta Stone



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These code examples

- Most of these examples are also programming exercises
- It is my intention that you watch these lectures and work on the exercises at the same time
- These exercises are not trying to assess what you learned
- Watching and listening to the lecture and then typing this code in to make it work *is* the learning objective of this lecture
- After this section – you should do the assignments yourself (i.e. don't search) to gain maximum benefit

Similarities

- Arithmetic Operators: + - * / %
- Comparison Operators: == != < > <= the same
- Variable naming rules – letter/underscore + numbers/letters/underscores – also case matters
- While loops – also break and continue in loops
- Constants similar except for strings and characters and booleans
- Both have int / float, and char / byte
 - C has no str, list, or dict
 - Python has no struct or double

Differences

- Boolean operators
 - and / not / or versus && ! ||
- C for loops are indeterminant (i.e. no for ... in in C)
- C has no pre-defined True or False
- None and NULL are similar concepts but quite different
- Strings and character arrays are similar concepts but **very** different
- C has no list, or dict
- Python has no struct - float in Python is a C double

Output

```
# I am a comment
print('Hello world')
print('Answer', 42)
print('Name', 'Sarah')
print('x', 3.5, 'i', 10)
```

Hello world
Answer 42
Name Sarah
x 3.5 i 100

```
#include <stdio.h>
/* I am a comment */
int main() {
    printf("Hello world\n");
    printf("Answer %d\n", 42);
    printf("Name %s\n", "Sarah");
    printf("x %.1f i %d\n", 3.5, 100);
}
```

Number Input

```
print('Enter US  
Floor')  
usf = int(input())  
euf = usf - 1  
print('EU Floor', euf)
```

Enter US Floor
2
EU Floor 1

```
#include <stdio.h>  
int main() {  
    int usf, euf;  
    printf("Enter US Floor\n");  
    scanf("%d", &usf);  
    euf = usf - 1;  
    printf("EU Floor %d\n", euf);  
}
```

For those of us who learned Python 2, recall the difference between **input()** and **raw_input()**. In Python 3 there is only **input()** which is the same as Python 2's **raw_input()**. In C, **scanf("%d", ...)** is more like Python 2's **input()**.

String Input

```
print('Enter name')  
name = input()  
print('Hello', name)
```

Enter name
Sarah
Hello Sarah

```
#include <stdio.h>  
int main() {  
    char name[100];  
    printf("Enter  
name\n");  
    scanf("%100s", name);  
    printf("Hello %s\n",  
name);  
}
```

Line Input

```
print('Enter line')  
line = input()  
print('Line:', line)
```

```
#include <stdio.h>  
int main() {  
    char line[1000];  
    printf("Enter line\n");  
    scanf("%[^\n]1000s", line);  
    printf("Line: %s\n", line);  
}
```

Enter line

Hello world - have a nice day

Line: Hello world - have a nice day

Line Input (safe)

```
print('Enter line')  
line = input()  
print('Line:', line)
```

```
#include <stdio.h>  
int main() {  
    char line[1000];  
    printf("Enter line\n");  
    fgets(line, 1000, stdin);  
    printf("Line: %s\n", line);  
}
```

Enter line

Hello world - have a nice day

Line: Hello world - have a nice day

Read A File

```
hand =  
open('romeo.txt')  
for line in hand:  
    print(line.strip())
```

```
#include <stdio.h>  
int main() {  
    char line[1000];  
    FILE *hand;  
    hand = fopen("romeo.txt", "r");  
    while( fgets(line, 1000, hand) != NULL ) {  
        printf("%s", line);  
    }  
}
```

But soft what light through yonder window breaks
It is the east and Juliet is the sun
Arise fair sun and kill the envious moon
Who is already sick and pale with grief

Counted Loop

```
for i in range(5) :  
    print(i)
```

0
1
2
3
4

```
#include <stdio.h>  
int main() {  
    int i;  
    for(i=0; i<5; i++) {  
        printf("%d\n",i);  
    }  
}
```


Max / Min Python

```
maxval = None
minval = None
while True:
    line = input()
    line = line.strip()
    if line == "done" : break
    ival = int(line)
    if ( maxval is None or ival > maxval)
:
        maxval = ival
    if ( minval is None or ival < minval)
:
        minval = ival

print('Maximum', maxval)
print('Minimum', minval)
```

5

2

9

done

Maximum 9

Minimum 2

Max / Min C

5
2
9
(EOF)
Maximum 9
Minimum 2

5 2 9
(EOF)
Maximum 9
Minimum 2

```
#include <stdio.h>
int main() {
    int first = 1;
    int val, maxval, minval;

    while(scanf("%d",&val) != EOF ) {
        if ( first || val > maxval ) maxval =
val;
        if ( first || val < minval ) minval =
val;
        first = 0;
    }

    printf("Maximum %d\n", maxval);
    printf("Minimum %d\n", minval);
}
```

Guessing

```
while True:
    try:
        line = input()
    except: # If we get EOF
        break
    line = line.strip()
    guess = int(line)
    if guess == 42:
        print('Nice work!')
        break
    elif guess < 42 :
        print('Too low - guess again')
    else :
        print('Too high - guess again')
```

```
#include <stdio.h>
int main() {
    int guess;
    while (scanf("%d", &guess) != EOF ) {
        if ( guess == 42 ) {
            printf("Nice work!\n");
            break;
        }
        else if ( guess < 42 )
            printf("Too low - guess again\n");
        else
            printf("Too high - guess again\n");
    }
}
```

5

Too low - guess again

50

Too high - guess again

42

Nice work!

Functions (call by value)

```
def mymult(a,b):  
    c = a * b  
    return c
```

```
retval = mymult(6, 7)  
print('Answer:',  
      retval)
```

Answer: 42

```
#include <stdio.h>  
int main() {  
    int mymult();  
    int retval;  
  
    retval = mymult(6,7);  
    printf("Answer: %d\n",retval);  
}  
  
int mymult(a, b)  
    int a,b;  
  
    {  
        int c = a * b;  
        return c;  
    }
```

Shouting

```
hand = open('romeo.txt')
for line in hand:

    print(line.strip().upper())
```

```
#include <stdio.h>
#include <string.h>
#include <ctype.h>
int main() {
    char line[1000];
    FILE *hand;
    int i;
    hand = fopen("romeo.txt", "r");
    while( fgets(line, 1000, hand) != NULL
        )
        for(i=0; i<strlen(line); i++)
            putchar(toupper(line[i]));
}
```

BUT SOFT WHAT LIGHT THROUGH YONDER WINDOW
BREAKS
IT IS THE EAST AND JULIET IS THE SUN
ARISE FAIR SUN AND KILL THE ENVIOUS MOON
WHO IS ALREADY SICK AND PALE WITH GRIEF

Summary

- Input/Output
- Looping
- Reading a file
- Strings
- Float
- Way too complex to implement in C (for now)
 - Python str()
 - Python list()
 - Python dict()
- We will revisit these as the end of the course

Acknowledgements / Contributions

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