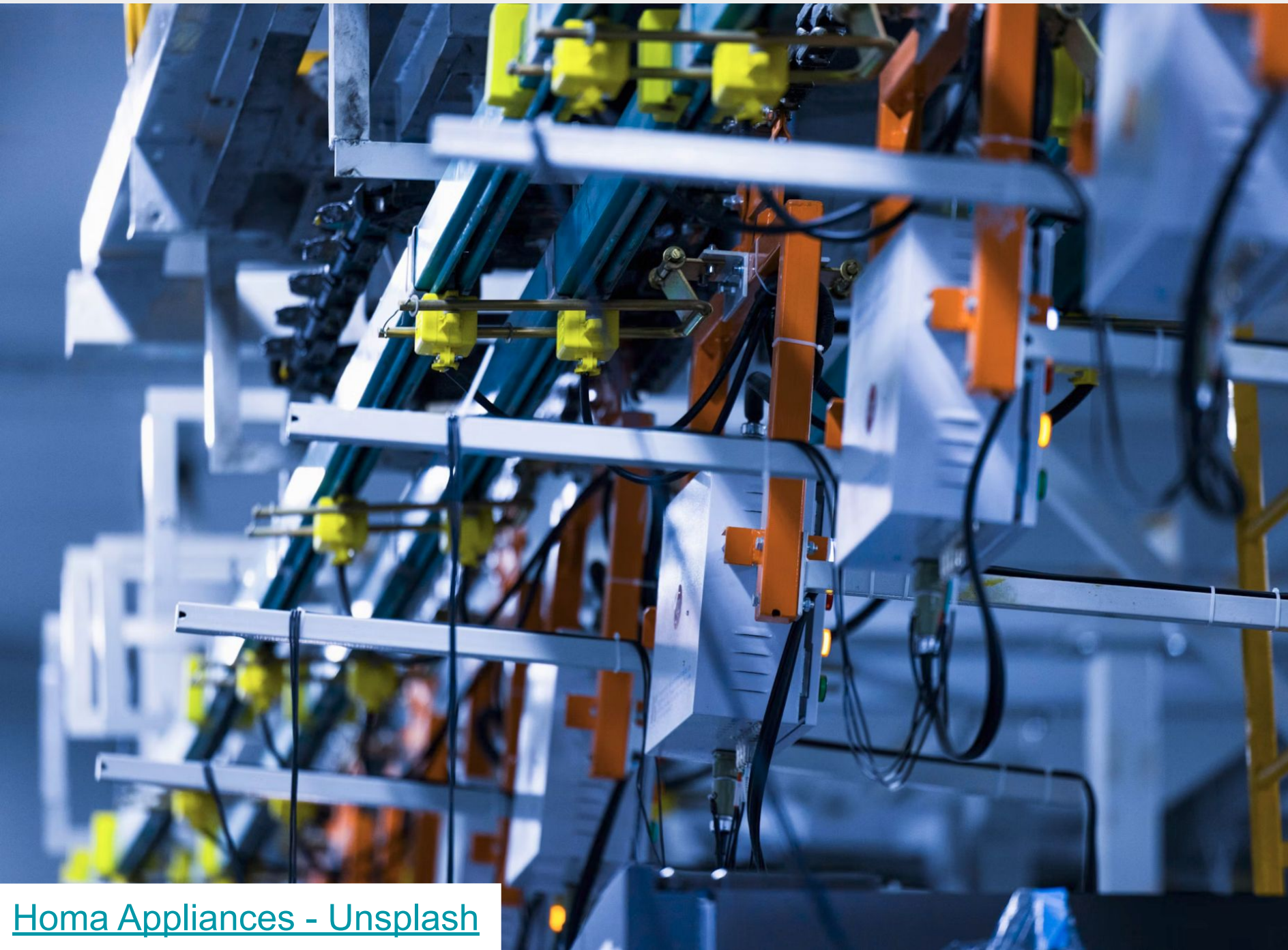
Functions

Adapted from materials by Dr. Carrier



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CIS 162/163 Recap

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What is a function?

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- Blocks of code that can be called from elsewhere
- Usually accomplish one specific task

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Why would we use them?

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What is a function?

- Blocks of code that can be called from elsewhere
- Usually accomplish one specific task

Why would we use them?

- Save time writing code
- Improves readability
- Modularity

Comparing to Python

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def get_smaller(a, b):
   if a < b:
      return a
   return b;
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   if(a < b) return a;
   return b;
}
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Calling a function:

```
int res = GetSmaller(7, x);
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Terminology

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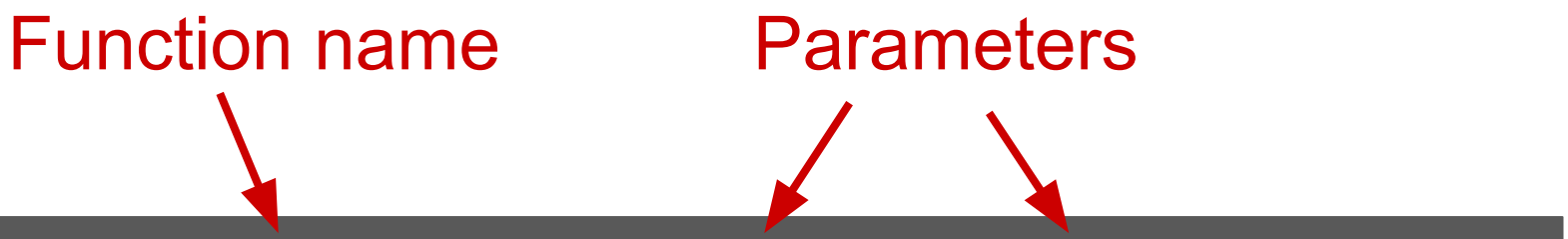


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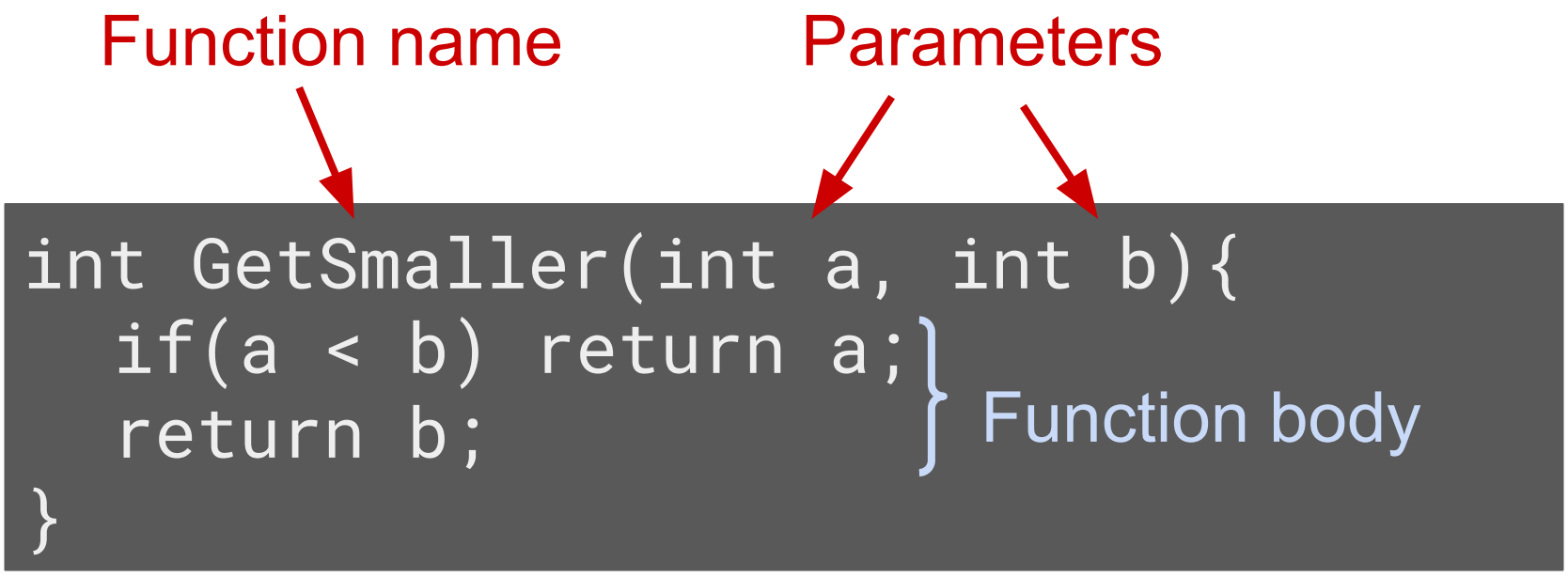

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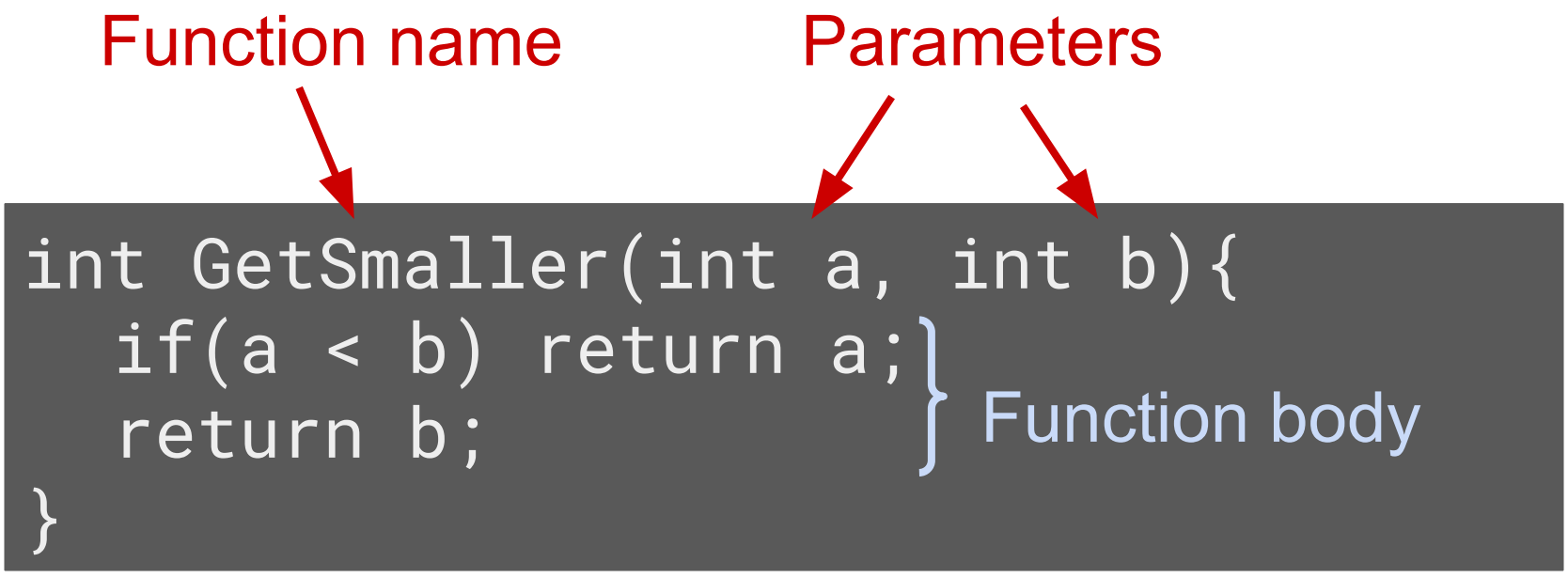

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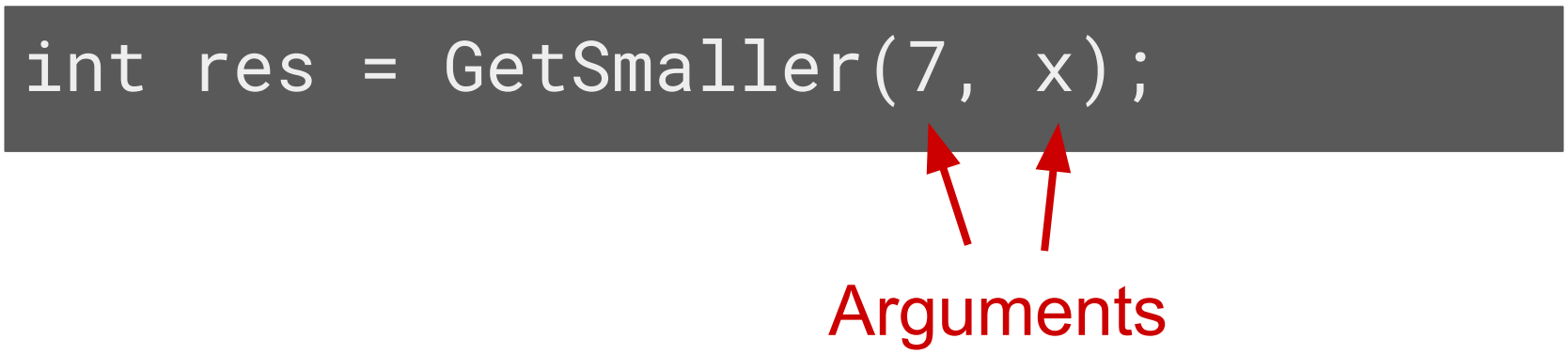

Little more terminology

Function prototype:

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int GetSmaller(int a, int b);
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int GetSmaller(int, int);
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Function definition:

```
int GetSmaller(int a, int b){
   if(a < b) return a;
   return b;
}
```

Key: Definition can come before or after main

If definition is after main, you *must* have prototype before main

Returning

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int GetSmaller(int a, int b){
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   return b;
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All functions must have a return type

Returning


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   if(a < b) return a;
   return b;
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All functions must have a return type

If you don't return anything, return type is `void`

Returning


```
int GetSmaller(int a, int b){
   if(a < b) return a;
   return b;
}
```

All functions must have a return type

If you don't return anything, return type is `void`

```
void Example(int a, int b){
   // Do something
   // No need to return
}
```

Arguments

```
int Increment(int x){
   x++;
   return x;
}

int main(){
   int i = 0;
   printf(“i = %d\n”, i);
   int res = Increment(i);
   printf(“res = %d\n”, res);
   printf(“i = %d\n”, i);
}
```

What does this output?

Arguments

```
int Increment(int x){
   x++;
   return x;
}

int main(){
   int i = 0;
   printf(“i = %d\n”, i);      // 0
   int res = Increment(i);
   printf(“res = %d\n”, res); // 1
   printf(“i = %d\n”, i);      // 0
}
```

What does this output?

Arguments

C is always **pass-by-value**

- Not pass-by-reference

Arguments

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Not pass-by-reference

How can we change arguments?

Arguments

C is always **pass-by-value**

Not pass-by-reference

How can we change arguments?

Pass a pointer!

Arguments

```
int Increment(int* p){
   (*p)++;
   return *p;
}

int main(){
   int i = 0;
   printf(“i = %d\n”, i);
   int res = Increment(&i);
   printf(“res = %d\n”, res);
   printf(“i = %d\n”, i);
}
```

What does this output?

Arguments

```
int Increment(int* p){
   (*p)++;
   return *p;
}

int main(){
   int i = 0;
   printf(“i = %d\n”, i);      // 0
   int res = Increment(&i);
   printf(“res = %d\n”, res); // 1
   printf(“i = %d\n”, i);      // 1
}
```

What does this output?

Arguments

What about passing an array?

How can we write a function to print an array in a nice way?

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What about passing an array?

How can we write a function to print an array in a nice way?

```
void PrintArray(int* arr, int len){
  printf("[");
  int i = 0;
  for(i = 0; i < len; i++){
    printf(" %d", arr[i]);
  }
  printf(" ]\n");
}
```

Arguments

What about passing an array?

How can we write a function to print an array in a nice way?

```
void PrintArray(int* arr, int len){
  printf("[");
  int i = 0;
  for(i = 0; i < len; i++){
    printf(" %d", arr[i]);
  }
  printf(" ]\n");
}
```

Notice we also have to pass the length!

Scope

What is the output of this code?

```
void DoStuff(){
   int x = 10;
   printf("In func: x = %d\n", x);
   ...
}

int main(){
   int x = 0;
   printf("x = %d\n", x);
   DoStuff();
   printf("x = %d\n", x);
}
```

Scope

What is the output of this code?

```
void DoStuff(){
   int x = 10;             //v x = 10
   printf("In func: x = %d\n", x);
   ...
}

int main(){
   int x = 0;
   printf("x = %d\n", x); // x = 0
   DoStuff();
   printf("x = %d\n", x); // x = 0
}
```

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Functions have their own scope

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- Variables in function don’t exist outside it
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Is this code valid?

```
int* MakeInt(){
   int x = 10;
   return &x;
}
```

Scope

Functions have their own scope

- Variables in function don’t exist outside it
- Functions can’t access variables in main

Is this code valid?

```
int* MakeInt(){
  int x = 10;
  return &x;
}
```

Nope! x falls out of scope when we return

- Memory address is then pointing at nothing :(