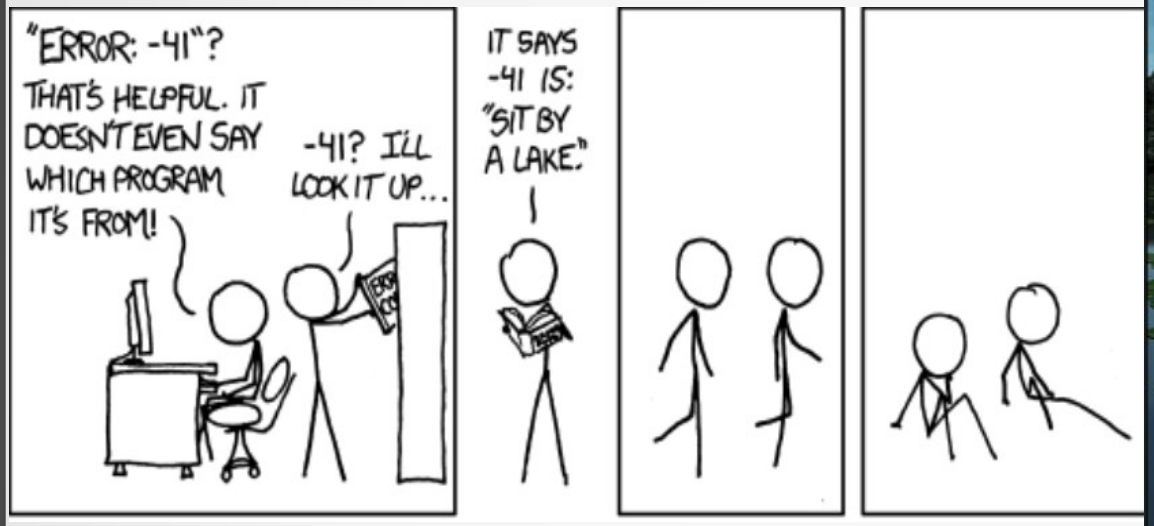
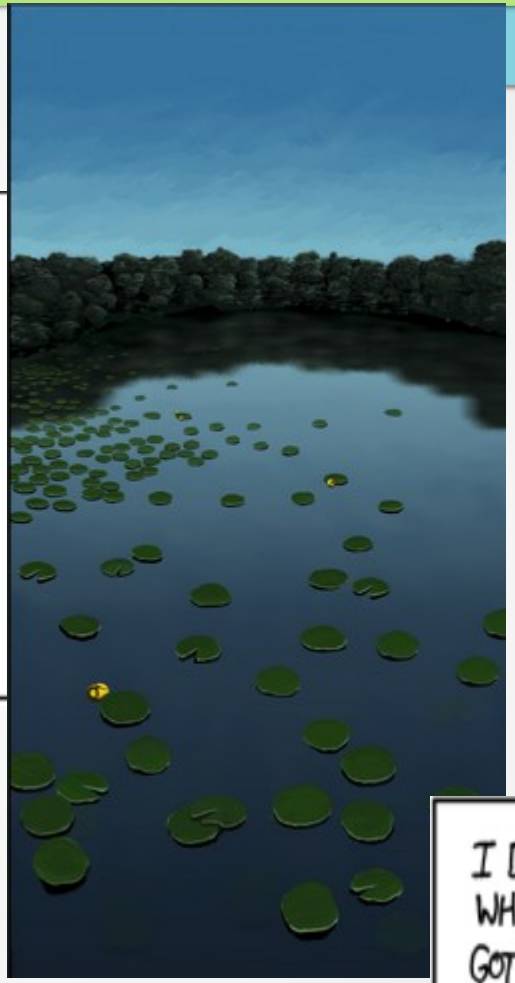
C++ Exception Handling (Part II)





http://xkcd.com/1024/

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Exceptions: They are not errors!

"some part of the system couldn't do what it was asked to do"

- Catching Exception:
- void f() {

```
    try {
        throw E {};
    }
    catch(H) {
        // when do we get here?
    }
}
```

Object lifetimes

```
// Example code
{
    Parrot& perch = Parrot();
}
```

- When does an object's lifetime begin?
  - When its constructor completes successfully and returns normally. That is, when control reaches the end of the constructor body or completes an earlier *return* statement
- When does an object's lifetime end?
  - When its destructor begins. That is, when control reaches the beginning of the destructor body

Constructor exception

```
{    Parrot& perch = Parrot();  }
```

- The state of the object before its lifetime begins is exactly the same as after its lifetime ends: There is no object.
- What does emitting an exception from a constructor mean?
  - It means that construction has failed, the object never existed, its lifetime never began. Indeed, the only way to report the failure of construction—namely, the inability to correctly build a functioning object of the given type—is to throw an exception. Incidentally, this is why a destructor will never be called if the constructor didn't succeed—there's nothing to destroy

What exactly happens when a constructor emits an exception?

```
class C : private A
{
    B b_;
};
```

In the **C** constructor, how can you catch an exception thrown from the constructor of a base subobject (such as **A**) or a member object (such as **b_**)?

Function try blocks

```
C::C()
try
    : A ( /*...*/ ), b_( /*...*/ ) {}
catch( ... )
{
// We get here if either A::A() or B::B() throws.
}
```

- If A::A() succeeds and then B::B() throws, the language guarantees that A::~A() will be called to destroy the already-created A base subobject before control reaches this catch block
- **Is this needed at all? In C++, if construction of any base or member subobject fails, the whole object's construction must fail.**

Morals about function try blocks

- **Moral #1:** Constructor function try block handlers are only good for translating an exception thrown from a base or member subobject constructor. They are not useful for any other purpose.
- **Moral #2:** Destructor function try blocks have little or no practical use. Destructor should NEVER emit an exception.
- **Moral #3:** All other function try blocks have no practical use.
- **Moral #4:** Always perform unmanaged resource acquisition in the constructor body, never in initializer lists, i.e., Resource Allocation Is Initialisation (RAII).