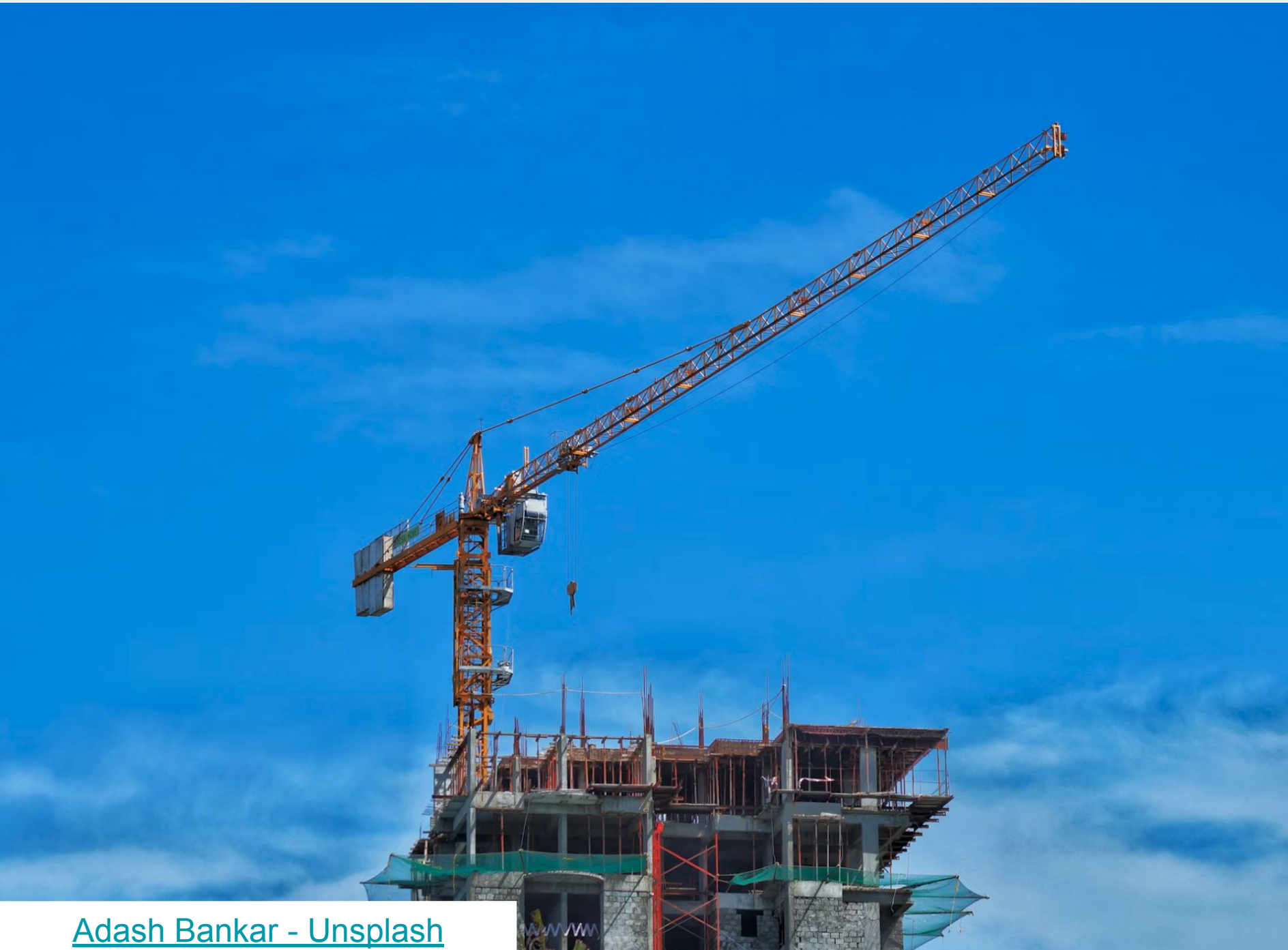
make

Adapted from materials by Dr. Carrier



Adash Bankar - Unsplash

Compiling

How do we compile this program?

Contents of main.c:

```c
#include <stdio.h>

#include "vector.h"
#include "cool_math.h"

int main(){
```

Result of ls:

```
class/c/make_files/example_project$ ls
cool_math.c  cool_math.h  main.c  vector.c  vector.h
```

```
gcc main.c cool_math.c vector.c
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gcc main.c cool_math.c vector.c
```

Or

```
gcc -c vector.c -o vector.o
gcc -c cool_math.c -o cool_math.o
gcc main.c vector.o cool_math.o
```

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We are using GNU make

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2. Run `make` (just that one word)
    a. Alternatively you can run `make rule` to run that specific rule

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Note, recipes line start with a tab, not spaces!
Ctrl + V then Tab in Vim (if you use spaces via expandtab)

Example (simple)

To compile our example from earlier

```
default: main.c vector.c cool_math.c
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Note that running `make` will run the “default” rule, or the first in the file if default doesn’t exist

Example (advanced)

To compile our example from earlier

```
default: program
program: main.c vector.o cool_math.o
   gcc -o program main.c vector.o cool_math.o
vector.o: vector.c
   gcc -o vector.o -c vector.c
cool_math.o: cool_math.c
   gcc -o cool_math.o -c cool_math.c
```

Future compilation will only recompile what's needed! (uses file modified dates/times)

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```
CC = gcc
CFLAGS = -Wall
program: main.c vector.o
   $(CC) $(CLFLAGS) -o program main.c vector.o
```

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We can use variables!

```
CC = gcc
CFLAGS = -Wall
program: main.c vector.o
   $(CC) $(CLFLAGS) -o program main.c vector.o
```

Note we access variables with $(var)

This is different from bash scripts!

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```
%.o: %.c
   gcc -o $@ -c $<
```

This generalizes our vector.o and cool_math.o from our example!

Comments

Comments start with #, just like in bash!

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Another common example is the `install` rule

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Why use make over a bash script?

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Allows us (and others who use our code) to easily compile

Why use make over a bash script?

- The recursive prereq lookup
- The date-checking to prevent us from recompiling files that haven't changed