

Welcome!

If you haven't installed Elixir, follow the instructions on:

<https://elixir-lang.org/install.html>

Drinking the Elixir

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Agenda

- 15:00 - 15:30 Presentation
- 15:30 - 17:30 Challenges
- 17:30 - 18:30 Food!
- 18:30 - 19:00 Announcing winners

Elixir?

- build on top of Erlang
- inspired by Ruby
- immutable
- functional
- dynamically typed

Cases

"The Road to 2 Million Websocket Connections in Phoenix"

"How Discord Scaled Elixir to 5,000,000 Concurrent Users"

"Why Discord, Pinterest, Moz and Bleacher Report use Elixir"

Syntax

```
iex> 1                      # integer
iex> 0x1F                   # integer
iex> 1.0                     # float
iex> true                    # boolean
iex> :hello                  # atom
iex> ?A                      # char
iex> "elixir"                # string|binary
iex> <<0, 255>>             # binary
iex> [1, 2, 3]                # list
iex> {1, 2, 3}                # tuple
iex> %{1 => 2}               # map
```

```
iex> 1 + 2
3
iex> Kernel.+(1, 2)
3
iex> "Hello " <> "there!"
"Hello there!"
iex> is_binary("hellö")
true
iex> String.length("hellö")
5
iex> String.upcase("hellö")
"HELLÖ"
iex> String.graphemes("hellö")
["h", "e", "l", "l", "ö"]
```

Functions

```
iex> greet = fn x -> "Hello " <> x <> "!" end  
iex> greet.("there")  
"Hello there!"
```

Modules

```
# greeting.ex
defmodule Greeting do
  def hello(), do: hello("world")
  def hello(thing) do
    "Hello " <> thing <> "!"
  end
end
```

```
iex> import_file("greeting.ex")
iex> Greeting.hello()
"Hello world!"
iex> Greeting.hello("there")
"Hello there!"
```

Modules

```
# greeting.ex
defmodule Greeting do
  def hello(), do: hello("world")
  def hello(thing) do
    "Hello " <> thing <> "!"
  end
end
```

```
iex> import_file("greeting.ex")
iex> Greeting.hello()
"Hello world!"
iex> Greeting.hello("there")
"Hello there!"
```

Modules

```
# greeting.ex
defmodule Greeting do
  def hello(), do: hello("world")
  def hello(thing) do
    "Hello " <> thing <> "!"
  end
end
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```
iex> import_file("greeting.ex")
iex> Greeting.hello()
"Hello world!"
iex> Greeting.hello("there")
"Hello there!"
```

Modules

```
# greeting.ex
defmodule Greeting do
  def hello(), do: hello("world")
  def hello(thing) do
    "Hello " <> thing <> "!"
  end
end
```

```
iex> import_file("greeting.ex")
iex> Greeting.hello()
"Hello world!"

iex> Greeting.hello("there")
"Hello there!"
```

Pattern matching

Destructuring

```
iex> [1, a] = [1, 2]
iex> a
2
iex> {:ok, {:hello, a}} = {:ok, {:hello, "world"}}
iex> a
"world"
iex> [2, a] = [1, 2]
** (MatchError) no match of right hand side value: [1, 2]
```

Destructuring

```
iex> [1, a] = [1, 2]
iex> a
2
iex> {:ok, {:hello, a}} = {:ok, {:hello, "world"}}
iex> a
"world"
iex> [2, a] = [1, 2]
** (MatchError) no match of right hand side value: [1, 2]
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Destructuring

```
iex> [1, a] = [1, 2]
iex> a
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iex> {:ok, {:hello, a}} = {:ok, {:hello, "world"}}
iex> a
"world"
iex> [2, a] = [1, 2]
** (MatchError) no match of right hand side value: [1, 2]
```

Responses

```
iex> case File.read("path/to/file") do
...>   {:ok, binary_contents} -> IO.puts(contents)
...>   {:error, reason} -> IO.puts("Error: " <> reason)
...> end
```

Responses

```
iex> case File.read("path/to/file") do
...>   {:ok, binary_contents} -> IO.puts(contents)
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```

Same-head functions

```
defmodule Fibonacci do
  def fib(0), do: 0
  def fib(1), do: 1
  def fib(n) when n > 0, do: fib(n-2) + fib(n-1)
  def fib(_), do: raise "Invalid input: need zero or higher"
end
```

Same-head functions

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defmodule Fibonacci do
  def fib(0), do: 0
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Same-head functions

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Same-head functions

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  def fib(_), do: raise "Invalid input: need zero or higher"
end
```

Binary pattern matching

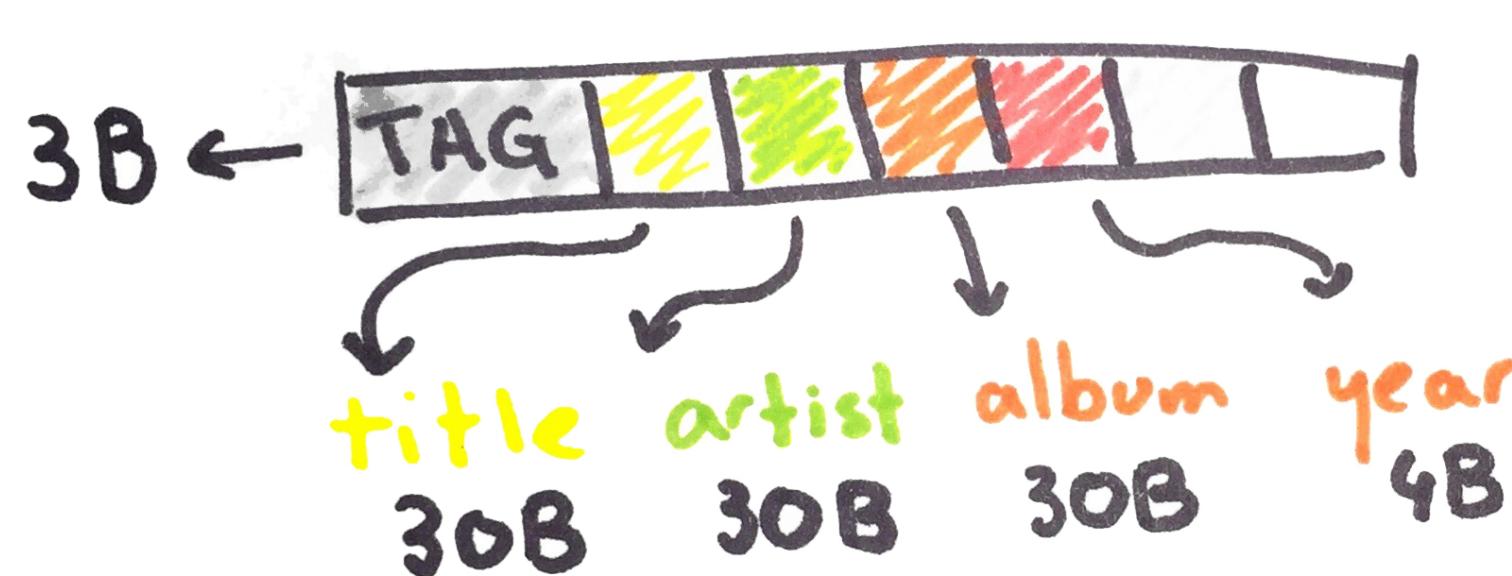
“Get from an MP3 file the title, artist, album, and year”

ID3v1: <https://en.wikipedia.org/wiki/ID3#ID3v1>

MP3



ID3



```
defmodule ID3Parser do
  def parse(file_name) do
    case File.read(file_name) do
      {:ok, contents} ->
        song_byte_size = byte_size(contents) - 128
        << _ :: binary-size(song_byte_size),
          id3_tag :: binary >> = contents

        << "TAG",
          title :: binary-size(30),
          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

```
defmodule ID3Parser do
  def parse(file_name) do
    case File.read(file_name) do
      {:ok, contents} ->
        song_byte_size = byte_size(contents) - 128
        << _ :: binary-size(song_byte_size),
          id3_tag :: binary >> = contents

        << "TAG",
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          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

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    case File.read(file_name) do
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        song_byte_size = byte_size(contents) - 128
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          id3_tag :: binary >> = contents

        << "TAG",
          title :: binary-size(30),
          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

```
defmodule ID3Parser do
  def parse(file_name) do
    case File.read(file_name) do
      {:ok, contents} ->
        song_byte_size = byte_size(contents) - 128
        << _ :: binary-size(song_byte_size),
          id3_tag :: binary >> = contents

        << "TAG",
          title :: binary-size(30),
          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

```
defmodule ID3Parser do
  def parse(file_name) do
    case File.read(file_name) do
      {:ok, contents} ->
        song_byte_size = byte_size(contents) - 128
        << _ :: binary-size(song_byte_size),
          id3_tag :: binary >> = contents

        << "TAG",
          title :: binary-size(30),
          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

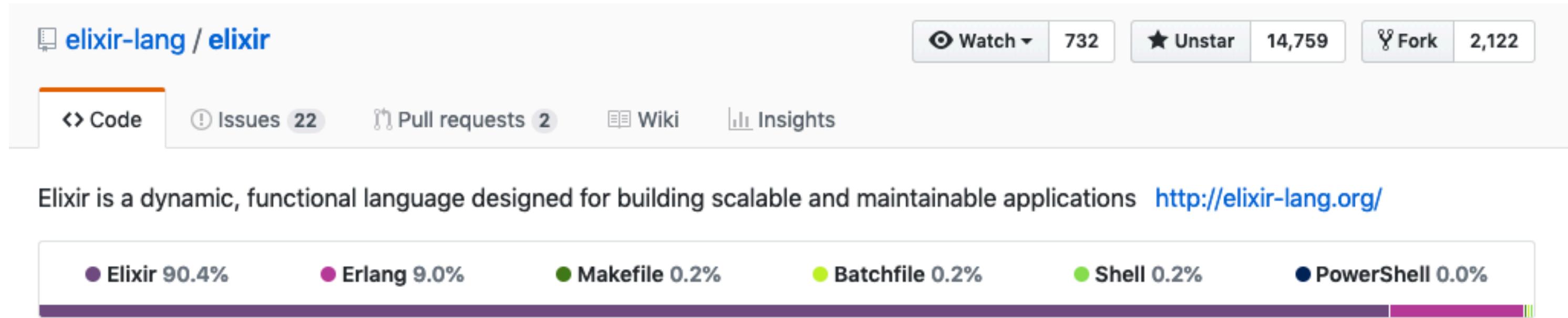
```
defmodule ID3Parser do
  def parse(file_name) do
    case File.read(file_name) do
      {:ok, contents} ->
        song_byte_size = byte_size(contents) - 128
        << _ :: binary-size(song_byte_size),
          id3_tag :: binary >> = contents

        << "TAG",
          title :: binary-size(30),
          artist :: binary-size(30),
          album :: binary-size(30),
          year :: binary-size(4),
          _ :: binary >> = id3_tag

      _ ->
        IO.puts "Couldn't open " <> file_name
    end
  end
end
```

Meta-programming

Most of Elixir is written in Elixir!



```
if is_thruthy() do
  do_something()
else
  do_something_else()
end

# becomes:
# https://github.com/elixir-lang/elixir/blob/master/lib/elixir/lib/kernel.ex#L3054

case is_thruthy() do
  x when x in [false, nil] ->
    do_something_else()
  _ ->
    do_something()
end
```

```
if is_thruthy() do
  do_something()
else
  do_something_else()
end

# becomes:
# https://github.com/elixir-lang/elixir/blob/master/lib/elixir/lib/kernel.ex#L3054

case is_thruthy() do
  x when x in [false, nil] ->
    do_something_else()
  _ ->
    do_something()
end
```

Unquoted expressions

```
iex> number = 2
iex> ast = quote do
...>   1 + unquote(number)
...> end
{:+, [context: Elixir, import: Kernel], [1, 2]}
iex> Macro.to_string(ast)
"1 + 2"
```

Unquoted expressions

```
iex> number = 2
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...>   1 + unquote(number)
...> end
{:+, [context: Elixir, import: Kernel], [1, 2]}
iex> Macro.to_string(ast)
"1 + 2"
```

Unquoted expressions

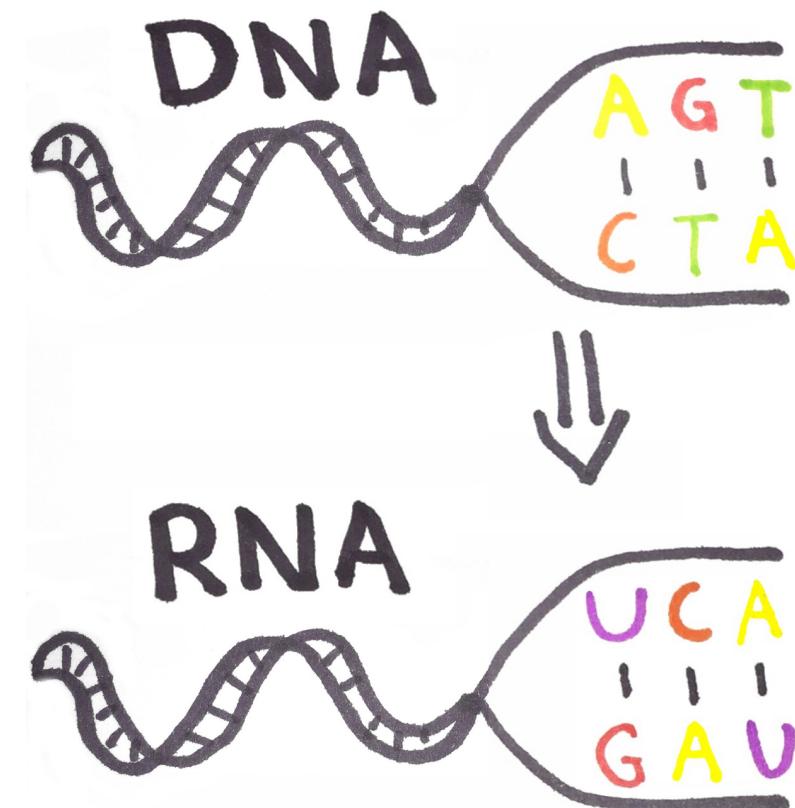
```
iex> number = 2
iex> ast = quote do
...>   1 + unquote(number)
...> end
{:+, [context: Elixir, import: Kernel], [1, 2]}
iex> Macro.to_string(ast)
"1 + 2"
```

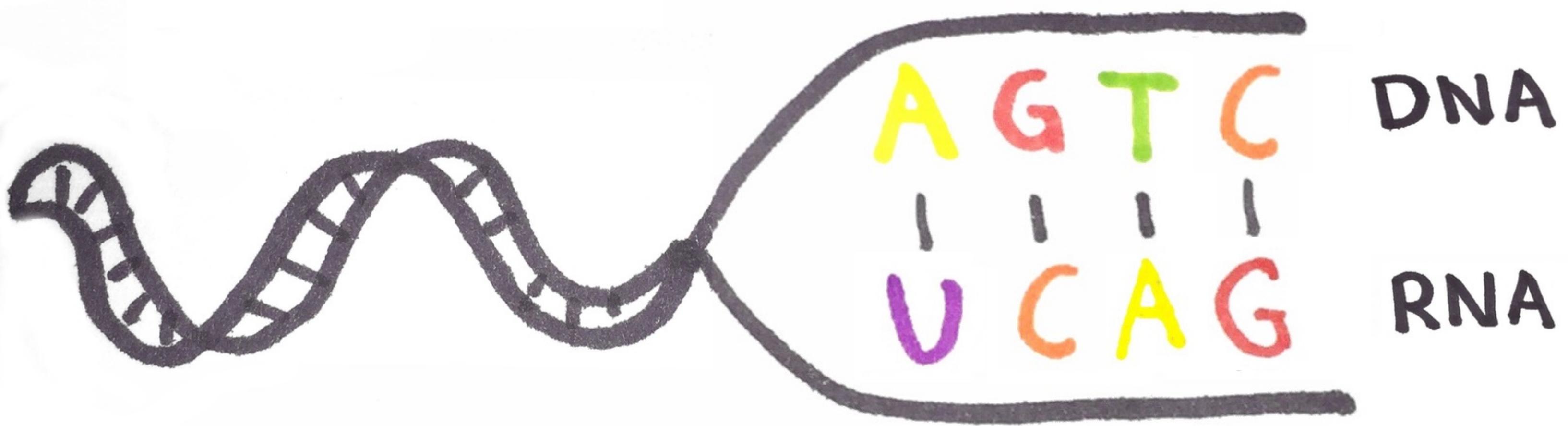
Unquoted expressions

```
iex> number = 2
iex> ast = quote do
...>   1 + unquote(number)
...> end
{:+, [context: Elixir, import: Kernel], [1, 2]}
iex> Macro.to_string(ast)
"1 + 2"
```

Compile-time functions

"Convert a given DNA strand to its RNA complement."





```
# rna.ex

defmodule RNATranscription do
  def to_rna("A"), do: "U"
  def to_rna("G"), do: "C"
  def to_rna("T"), do: "A"
  def to_rna("C"), do: "G"

end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex

defmodule RNATranscription do
  def to_rna("A"), do: "U"
  def to_rna("G"), do: "C"
  def to_rna("T"), do: "A"
  def to_rna("C"), do: "G"
end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex

defmodule RNATranscription do
  mapping = %{
    "G" => "C",
    "C" => "G",
    "T" => "A",
    "A" => "U"
  }
  for { dna, rna } <- mapping do
    def to_rna(unquote(dna)), do: unquote(rna)
  end
end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex
defmodule RNATranscription do
  mapping = %{
    "G" => "C",
    "C" => "G",
    "T" => "A",
    "A" => "U"
  }
  for { dna, rna } <- mapping do
    def to_rna(unquote(dna)), do: unquote(rna)
  end
end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex
defmodule RNATranscription do
  mapping = %{
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  }
  for { dna, rna } <- mapping do
    def to_rna(unquote(dna)), do: unquote(rna)
  end
end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex
defmodule RNATranscription do
  mapping = %{
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    "T" => "A",
    "A" => "U"
  }
  for { dna, rna } <- mapping do
    def to_rna(unquote(dna)), do: unquote(rna)
  end
end
```

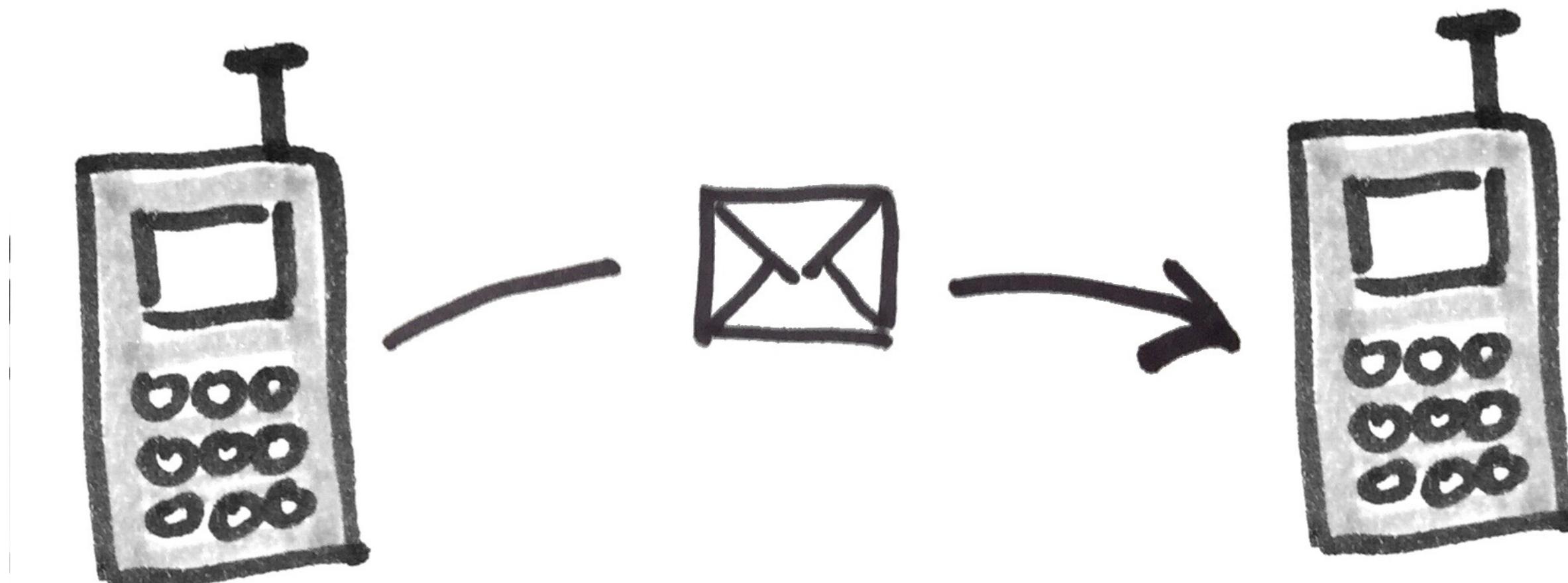
```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

```
# rna.ex
defmodule RNATranscription do
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    "G" => "C",
    "C" => "G",
    "T" => "A",
    "A" => "U"
  }
  for { dna, rna } <- mapping do
    def to_rna(unquote(dna)), do: unquote(rna)
  end
end
```

```
iex> import_file("rna.ex")
iex> RNATranscription.to_rna("T")
"A"
```

Processes

- Erlang virtual machine processes
- follows the actor model



```
iex> for num <- 1..1000 do  
...>   spawn(fn -> IO.puts(num * 2) end)  
...> end
```

2

4

6

8

10

12

...

```
iex> self()
#PID<0.103.0>
iex> send(self(), "Hello!")
"Hello!"
iex> flush()
"Hello!"
:ok
```

```
iex> pid = spawn(fn ->  
...>   IO.puts("Waiting for messages")  
...>   receive do  
...>     msg -> IO.puts("Received: " <> msg)  
...>   end  
...>   IO.puts("Done!")  
...> end)
```

Waiting for messages

#PID<0.1134.0>

```
iex> send(pid, "Hello world!")
```

Received "Hello world!"

Done!

```
iex> send(pid, "Hello world!")
```

iex>

```
iex> pid = spawn(fn ->
...>   IO.puts("Waiting for messages")
...>   receive do
...>     msg -> IO.puts("Received: " <> msg)
...>   end
...>   IO.puts("Done!")
...> end)
```

```
Waiting for messages
#PID<0.1134.0>
```

```
iex> send(pid, "Hello world!")
Received "Hello world!"
Done!
iex> send(pid, "Hello world!")
iex>
```

```
# my_process.ex
defmodule MyProcess do

  def loop(), do: loop(0)
  def loop(counter) do
    receive do
      msg -> IO.puts("#{counter} - #{inspect msg}")
    end
    loop(counter + 1)
  end
end

iex> import_file("my_process.ex")
iex> pid = spawn(MyProcess, :loop, [])
iex> send(pid, "Hello world!")
0 - "Hello world!"
iex> send(pid, "Hello there!")
1 - "Hello there!"
```

```
# my_process.ex
defmodule MyProcess do

  def loop(), do: loop(0)
  def loop(counter) do
    receive do
      msg -> IO.puts("#{counter} - #{inspect msg}")
    end
    loop(counter + 1)
  end
end

iex> import_file("my_process.ex")
iex> pid = spawn(MyProcess, :loop, [])
iex> send(pid, "Hello world!")
0 - "Hello world!"
iex> send(pid, "Hello there!")
1 - "Hello there!"
```

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defmodule MyProcess do

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end

iex> import_file("my_process.ex")
iex> pid = spawn(MyProcess, :loop, [])
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iex> pid = spawn(MyProcess, :loop, [])
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```

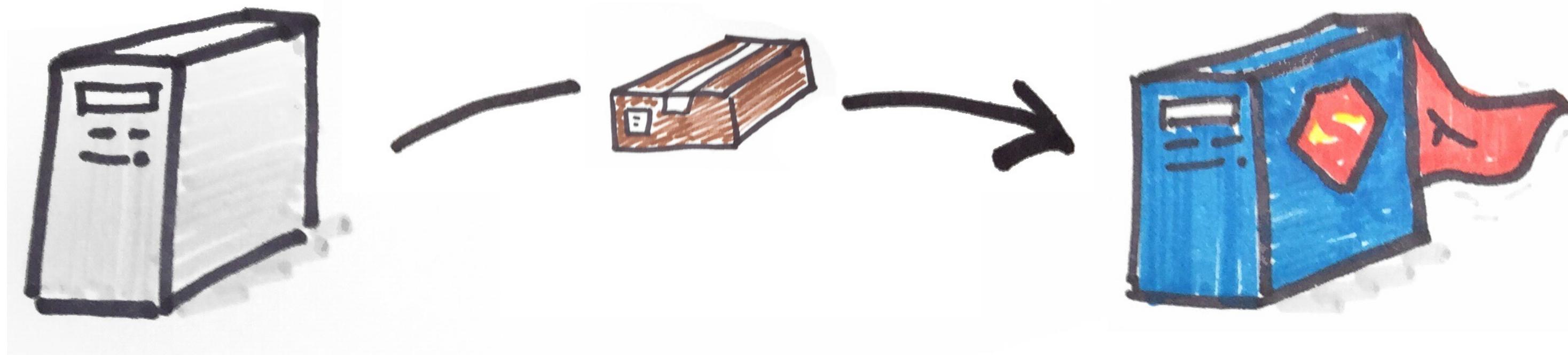
```
# my_process.ex
defmodule MyProcess do

  def loop(), do: loop(0)
  def loop(counter) do
    receive do
      msg → IO.puts("#{counter} - #{inspect msg}")
    end
    loop(counter + 1)
  end

end
```

```
iex> import_file("my_process.ex")
iex> pid = spawn(MyProcess, :loop, [])
iex> send(pid, "Hello world!")
0 - "Hello world!"
iex> send(pid, "Hello there!")
1 - "Hello there!"
```

Remote nodes



```
$ iex --name normal@10.1.0.1 --cookie secret
```

```
$ iex --name super@10.1.0.2 --cookie secret
```

```
iex(normal@10.1.0.1)> Node.list()
[]
iex(normal@10.1.0.1)> Node.connect(:"super@10.1.0.2")
true
iex(normal@10.1.0.1)> Node.list()
[:"super@10.1.0.2"]
```

```
iex(normal@10.1.0.1)> Node.spawn(:"super@10.1.0.2", fn ->
...> IO.puts("Hello from " <> Node.self())
...> end)
#PID<9071.68.0>
Hello from super@10.1.0.2
```

```
iex(normal@10.1.0.1)> pid = Node.spawn(:"super@10.1.0.2", fn ->
...>   receive do
...>     {:ping, client} -> send(client, :pong)
...>   end
...> end)
#PID<9014.59.0>
iex(normal@10.1.0.1)> send(pid, {:ping, self})
{:ping, #PID<0.73.0>}
iex(normal@10.1.0.1)> flush()
:pong
:ok
```

Challenges!

Challenges (max. 3 persoon):

Slides:

[github.com/brianvanburken/
knowledge-sharing/
presentations](https://github.com/brianvanburken/knowledge-sharing/presentations)

[2019-03-28-
drinking-the-elixir](https://github.com/brianvanburken/knowledge-sharing/presentations/2019-03-28-drinking-the-elixir)

