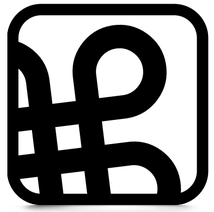

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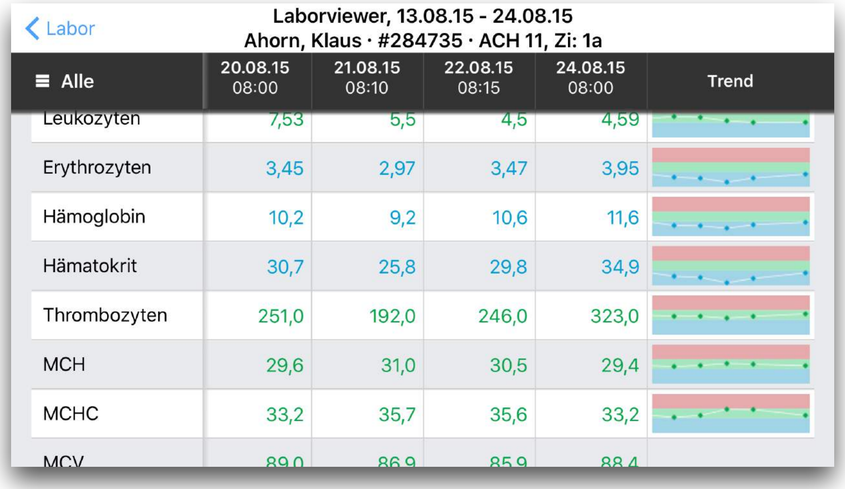
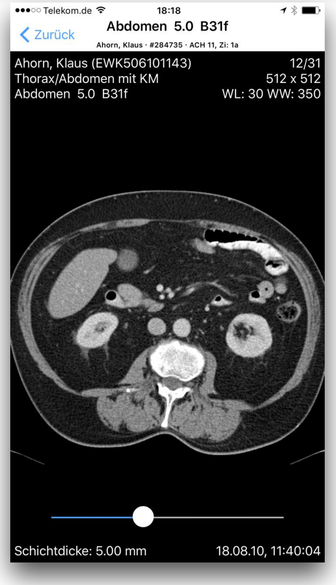
Funktionale Programmierung mit Swift

Stefan Wehr
factis research GmbH
factisresearch.com / cpmed.de
wehr@cp-med.com

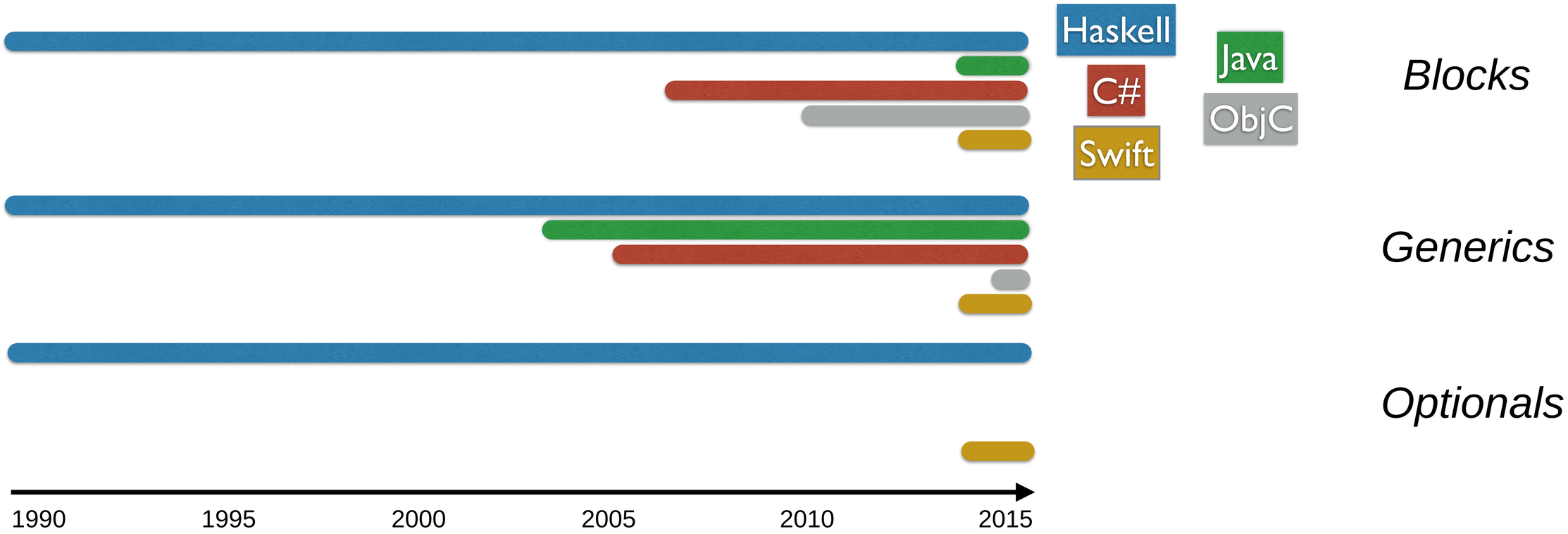
Vorstellung

- Checkpad MED App (seit 2010)
  - mobile Patientenakte
  - Client ~80.000 Zeilen ObjC Code
  - Backend in Haskell
  - http://factisresearch.com / http://cpmed.de
- Funktionaler Programmierer seit 2003
  - Blog: http://funktionale-programmierung.de
  - Konferenz: http://bobkonf.de





Funktionale Programmierung wird Mainstream



Was ist Swift?

~~Objective-C without the C~~

Objective-C with functional programming

Was ist funktionale Programmierung?

unveränderliche Datenstrukturen

statische Typen

Lambda-Kalkül

Generics

formalisierte Semantik

Blocks

Typinferenz

Metaprogrammierung

Mathematik

Automatische Speicherverwaltung

Pattern Matching

interaktive Programmierumgebung

Monaden

Was ist funktionale Programmierung?

unveränderliche Datenstrukturen

statische Typen

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Pattern Matching

interaktive Programmierumgebung

Monaden

Soll ich mich mit funktionaler Programmierung beschäftigen?

Kannst du es dir leisten, dies nicht zu tun??

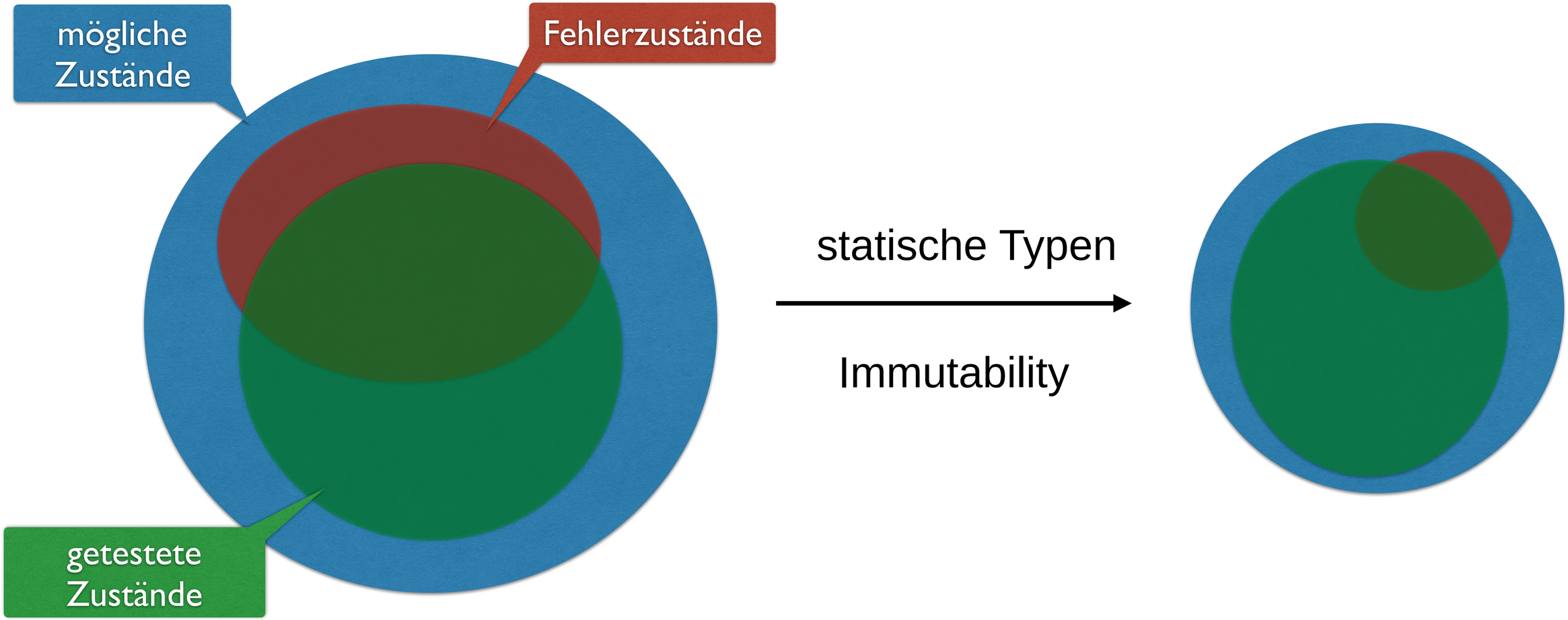
Prominente Benutzer

- Twitter: Scala
- Facebook: Haskell
- Microsoft: F#
- Apple: Swift
- Ericsson: Erlang
- Whatsapp: Erlang

Vorzüge funktionaler Programmierung

- Disziplinierter Umgang mit Seiteneffekten
- Ausdrucksstarkes Typsystem: wenn das Programm kompiliert funktioniert es auch!
- Gute Testbarkeit
- Kurzer, prägnanter und lesbarer Code
- Einfaches Abstrahieren, hoher Wiederverwendungsgrad

Testbarkeit



Statische Typen

```
@interface Registry : NSObject
- (NSInteger)getValue:(NSString *)key;
@end

@implementation Registry {
    @private NSMutableDictionary *dictionary;
}

- (NSInteger)getValue:(NSString *)key
{
    // hey, trust me: the dictionary only contains NSNumbers
    NSNumber *n = [self->dictionary valueForKey:key];
    return [n integerValue];
}

- (instancetype)init
{
    self = [super init];
    if (self) {
        self->dictionary = [NSMutableDictionary dictionary];
        [self->dictionary setObject:@1 forKey:@"one"];
        [self->dictionary setObject:@2 forKey:@"two"];

    return self;
}
@end
```

Statische Typen

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- (NSInteger)getValue:(NSString *)key;
@end

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    @private NSMutableDictionary *dictionary;
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    return [n integerValu
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- (instancetype)init
{
    self = [super init];
    if (self) {
        self->dictionary = [NSMutableDictionary dictionary];
        [self->dictionary setObject:@1 forKey:@"one"];
        [self->dictionary setObject:@2 forKey:@“two"];
        [self->dictionary setObject:@[@3] forKey:@“three"];

    }
    return self;
}
@end
```

Laufzeitfehler: unrecognized selector sent to instance 0x27dc108

Statische Typen

```objc
@interface Registry : NSObject
- (NSInteger)getValue:(NSString *)key;
@end

@implementation Registry {
    @private NSMutableDictionary *dictionary;
}

- (NSInteger)getValue:(NSString *)key
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    // hey, trust me: the dictionary only contains NSNumbers
    NSNumber *n = [self->dictionary valueForKey:key];
    return [n integerValu
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{
    self = [super init];
    if (self) {
        self->dictionary = [NSMutableDictionary dictionary];
        [self->dictionary setObject:@1 forKey:@"one"];
        [self->dictionary setObject:@2 forKey:@“two"];
        [self->dictionary setObject:@[@3] forKey:@“three"];

    }
    return self;
}
@end
```

Laufzeitfehler: unrecognized selector sent to instance 0x27dc108

```swift
class Registry {
    private var dictionary: Dictionary<String, Int>

    func getValue(key: String) -> Int? {
        return self.dictionary[key]
    }

    init() {
        dictionary = Dictionary()
        dictionary["one"] = 1
        dictionary["two"] = 2
        dictionary["three"] = [3]
    }
}
```

Kompilierfehler

Immutability

```
class Temperature {
    var celsius: Double
    var fahrenheit: Double {
        get { return (celsius * 9 / 5  + 32) }
        set { celsius = (newValue - 32) * 5 / 9 }
    }
    init(celsius: Double) {
        self.celsius = celsius
    }
}

let house = House()
let temp = Temperature(celsius:21)
house.thermostat.temperature = temp
```

Immutability

```
class Temperature {
    var celsius: Double
    var fahrenheit: Double {
        get { return (celsius * 9 / 5  + 32) }
        set { celsius = (newValue - 32) * 5 / 9 }
    }
    init(celsius: Double) {
        self.celsius = celsius
    }
}

let house = House()
let temp = Temperature(celsius:21)
house.thermostat.temperature = temp

temp.celsius = 250
house.oven.temperature = temp
```

Jetzt wird's heiß!

```
class Temperature {
    let celsius: Double
    let fahrenheit: Double {
        get { return (celsius * 9 / 5  + 32) }
    }
    init(celsius: Double) {
        self.celsius = celsius
    }
}

let house = House()
house.thermostat.temperature = Temperature(celsius:21)
house.oven.temperature = Temperature(celsius:250)
```

Immutability

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class Temperature {
    var celsius: Double
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Jetzt wird's heiß!

```
class Temperature {
    let celsius: Double
    let fahrenheit: Double {
        get { return (celsius * 9 / 5  + 32) }
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    init(celsius: Double) {
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    }
}

let house = House()
house.thermostat.temperature = Temperature(celsius:21)
house.oven.temperature = Temperature(celsius:250)
```
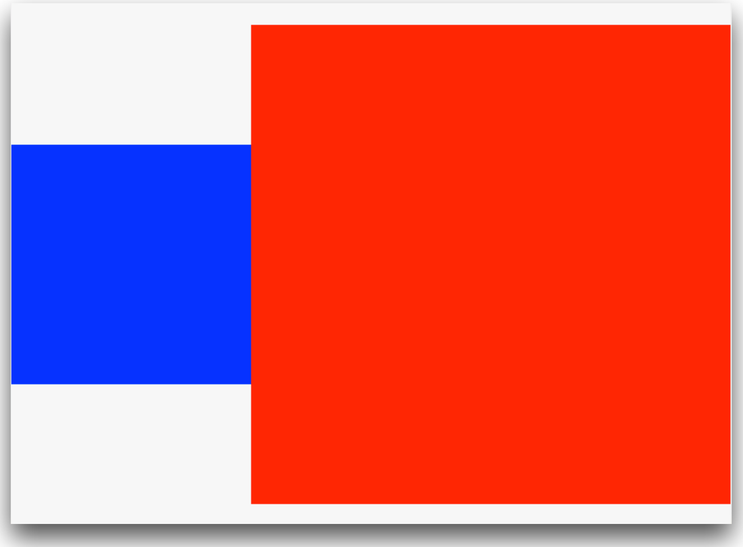

- WWDC 2015: Building Better Apps with Value Types in Swift
  "Swift supports rich first-class **value types** in the form of powerful structs, which provide new ways to architect your apps. Learn about the differences between reference and value types, how **value types help you elegantly solve common problems around mutability and thread safety**, and discover how Swift's unique capabilities might change the way you think about abstraction."
- WWDC 2014: Advanced iOS Application Architecture and Patterns
  "Learn how to manage complexity in large codebases by clearly defining where truth resides, by **controlling state with Swift's powerful value types and immutability**, and by **thinking in terms of composition**."

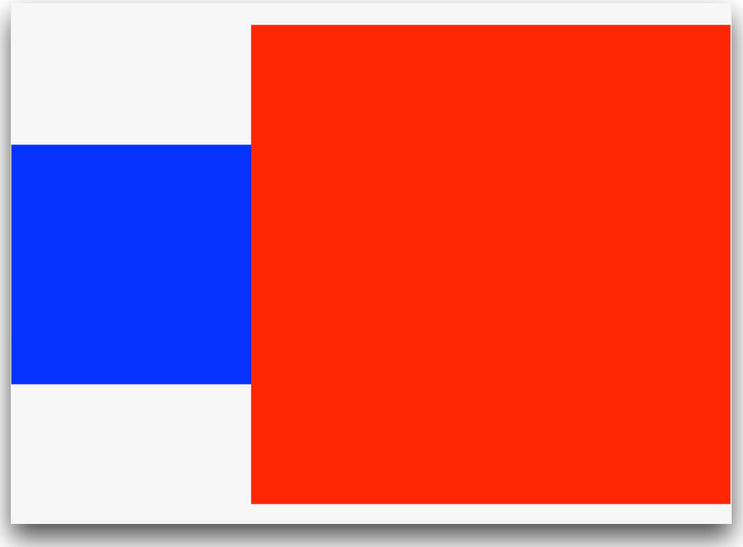
Demo Time!

Diagramme



```
NSColor.blueColor().setFill()
CGContextFillRect(ctx,
    CGRectMake(0.0, 37.5, 75.0, 75.0)
NSColor.redColor().setFill()
CGContextFillRect(ctx,
    CGRectMake(75.0, 0.0, 150.0, 150.0))
```

Diagramme



```
NSColor.blueColor().setFill()
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```

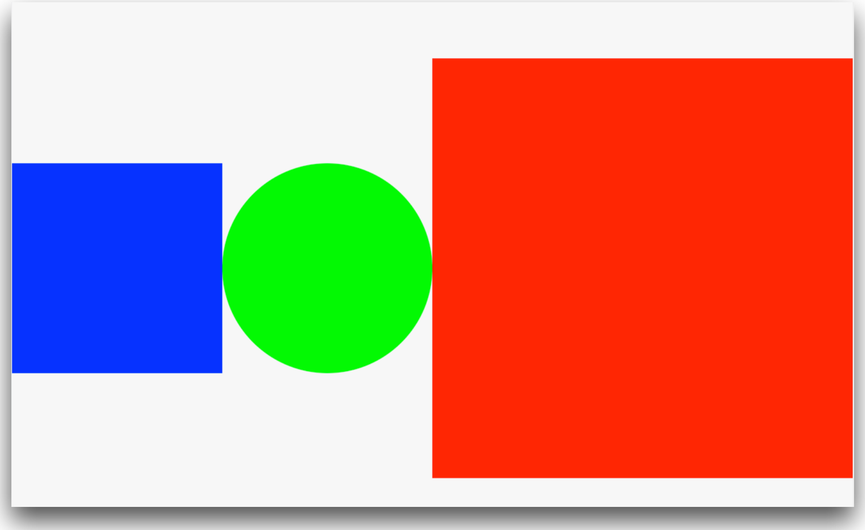

```
NSColor.blueColor().setFill()
CGContextFillRect(ctx, CGRectMake(0.0, 37.5, 75.0, 75.0))
NSColor.greenColor().setFill()
CGContextFillEllipseInRect(ctx,
    CGRectMake(75.0, 37.5, 75.0, 75.0))
NSColor.redColor().setFill()
CGContextFillRect(ctx, CGRectMake(150.0, 0.0, 150.0, 150.0))
```

Demo 1

Funktionale Diagramme (siehe Xcode Playground)

Buch: Functional Programming in Swift (2014)
Chris Eidhof, Florian Kugler, Wouter Swierstra

Zusammenfassung

- Die Zukunft ist funktional
- Statische Typen sind deine Freunde
- Immutability ist dein Freund
- Warum warten? Die Zukunft ist jetzt!

Funktionale Programmierung mit Swift

Fragen?

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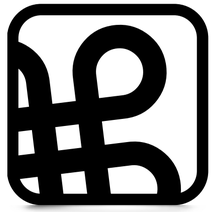

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Quellen

- Folie 3; Screenshots “Checkpad MED, iOS App”; factis research GmbH; Genemigung zur Verwendung der Screenshots im Rahmen dieses Vortrags liegt vor.

- Folie 4; Diagramme; Stefan Wehr; public domain.