

# Mobile Apps for Chemistry

# Summary

- Current status
- What we've learnt
- The future . . .

# Current status

- Isn't there an app for that already?

# Chemistry apps

- Reading journals
- Drawing structures
- Searching databases
- Calculating properties
- Teaching tools

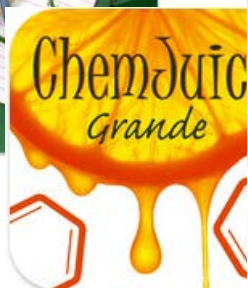
## Reading journals



## Reading journals



## Drawing structures



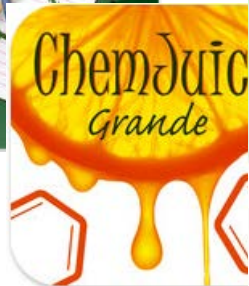
## Reading journals



## Searching databases



## Drawing structures



## Reading journals



## Searching databases



## Drawing structures























## Calculating properties

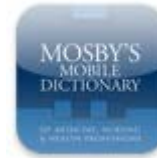
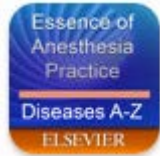




# Teaching tools

|  |  |   |  |
|--|--|---|--|
|  <p>Science Glossary<br/>Education<br/>Updated Sep 26, 2012<br/>+ FREE</p>   |  <p>Organic Chemistry Essenti...<br/>Education<br/>Updated Mar 04, 2012<br/>+ FREE</p>  |  <p>Chemistry Formula Practic...<br/>Education<br/>Updated Jun 08, 2012<br/>+ FREE</p>  |  <p>Chemistry Formulas<br/>Education<br/>Updated Nov 04, 2011<br/>+ \$0.99 BUY</p>                              |
|  <p>Simple 'n Easy<br/>Chemistry,<br/>Organic Chemistry<br/>&amp;<br/>Biochemistry<br/>Chemistry, Organic Chemi...<br/>Education<br/>Updated Sep 30, 2012<br/>+ \$1.99 BUY</p> |  <p>The Elementals<br/>Education<br/>Updated Dec 11, 2010<br/>+ FREE</p>                |  <p>Chemistry Flashcard(s) Lite<br/>Education<br/>Released Mar 15, 2011<br/>+ FREE</p>  |  <p>Physics Chemistry Maths For...<br/>Education<br/>Updated Feb 28, 2012<br/>+ \$0.99 BUY</p>                  |
|  <p>Free Note Cards<br/>Education<br/>Updated Feb 01, 2011<br/>+ FREE</p>  |  <p>Chem Pro: Chemistry Tutor<br/>Education<br/>Updated Sep 27, 2012<br/>FREE</p>       |  <p>iTeach Chemistry<br/>Education<br/>Updated Jul 03, 2012<br/>+ \$0.99 BUY</p>  |  <p>CINCH<br/>learning<br/>McGraw-Hill<br/>CINCH Learning<br/>Education<br/>Updated Jul 19, 2012<br/>+ FREE</p> |
|  <p>WolframAlpha<br/>Reference<br/>Updated Sep 24, 2012<br/>+ \$1.99 BUY</p>  |  <p>The Elements: A Visual Ex...<br/>Books<br/>Updated Jun 01, 2010<br/>\$6.99 BUY</p> |  <p>science<br/>360<br/>FOR iPad<br/>Science360 for iPad<br/>Education<br/>Updated Apr 19, 2012<br/>FREE</p>   |  <p>AP Exam Prep - Calculus AB/B...<br/>Education<br/>Updated Aug 20, 2012<br/>+ FREE</p>                      |
|  <p>NOVA Elements<br/>Education<br/>Updated Jun 27, 2012<br/>FREE</p>  |  <p>Trash The School Lite<br/>Games<br/>Updated May 30, 2012<br/>+ FREE</p>           |  <p>Simple 'n Easy<br/>Medicinal<br/>Chemistry<br/>&amp;<br/>Pharmacology<br/>Simple 'n Easy<br/>Medicinal<br/>Chemistry<br/>&amp;<br/>Pharmacology<br/>Reference<br/>Updated Sep 18, 2012<br/>+ \$1.99 BUY</p> |  <p>Periodic Table of the Elements<br/>Education<br/>Updated Jul 25, 2010<br/>FREE</p>                        |

# Back in 2010 . . .

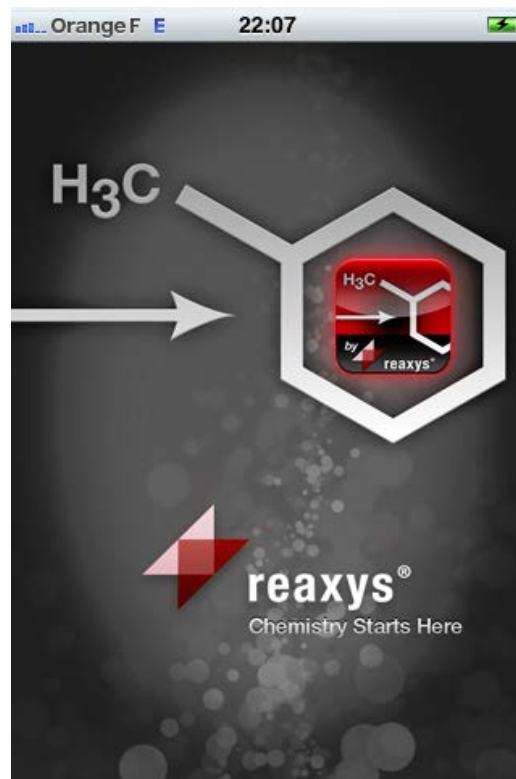


# Back in 2010 . . .

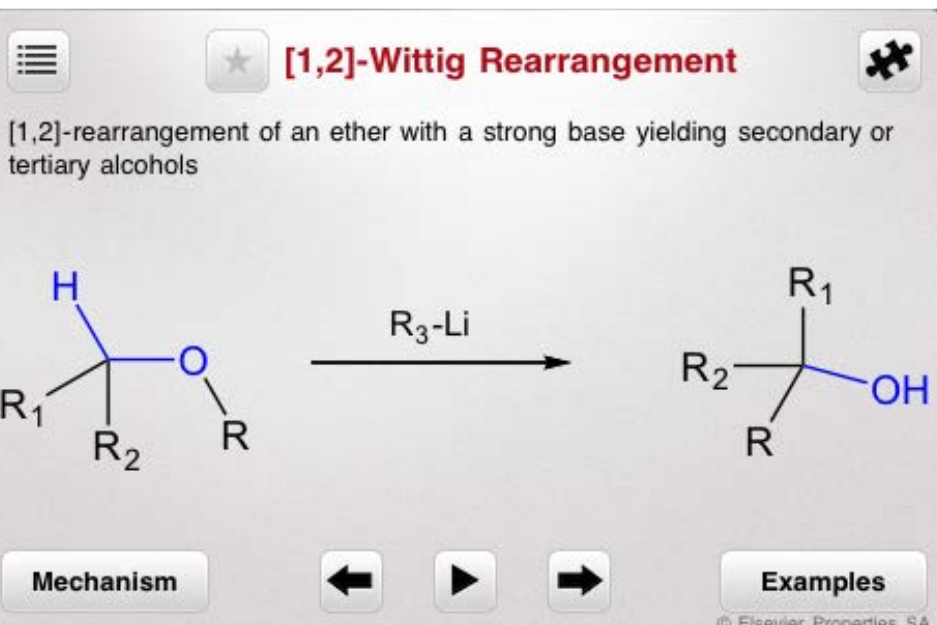
- An experiment
  - Had to have a mobile need
  - Not “connected”
  - Not Reaxys mobile
  - Sales & marketing

# In the end

- ReactionFlash™





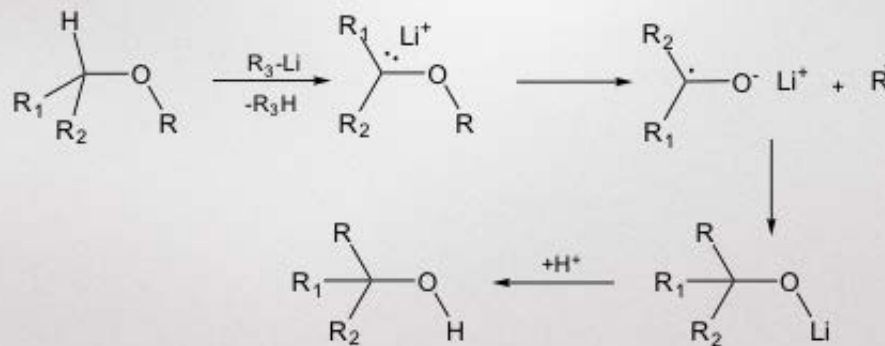




## [1,2]-Wittig Rearrangement



[1,2]-rearrangement of an ether with a strong base yielding secondary or tertiary alcohols






Mechanism

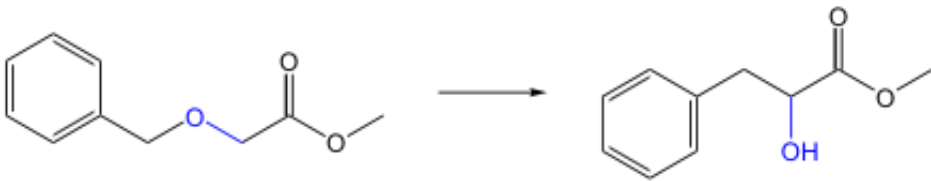
Examples

© Elsevier Properties SA



  **[1,2]-Wittig Rearrangement** 

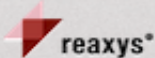
1 of 10



82% With di-n-butylboryl trifluoromethanesulfonate; triethylamine in dichloromethane T=20°C; 0.25 h; <1,2>-Wittig rearrangement

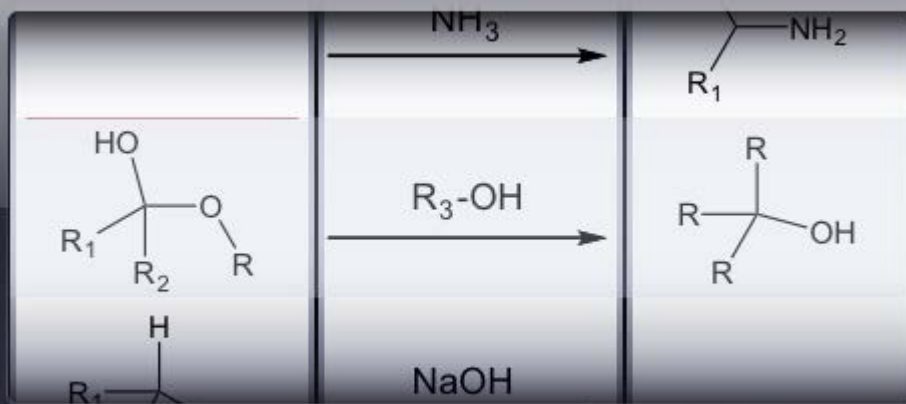
[Organic Letters, 2006 , vol. 8, # 20 p. 4661 - 4663](#)

2 of 10

**Mechanism**  **Examples**

© Elsevier Properties SA

### [1,2]-Wittig Rearrangement



Score

0 POINTS

09:57

Submit

# WHAT WE LEARNT!

- Technology
- Sales & marketing

# Technology

# Structures & images

- Problem
  - iPhone did not represent chemistry drawing files
  - Need to draw them . . .

# Structures & images

- All structures as pictures
  - For “good” zoom 200 reactions was too big
  - Quality not good if compensate for overall size

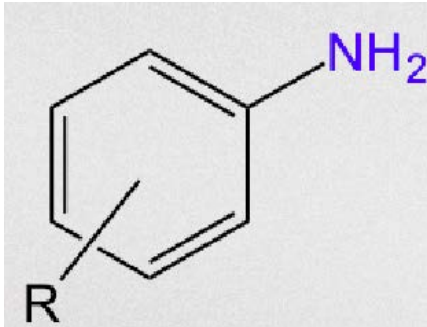
# Structures & images

- All structures vector based
  - Great quality
  - Great speed & interactivity
- But
  - Completely manual
  - “translation” errors from vector based files

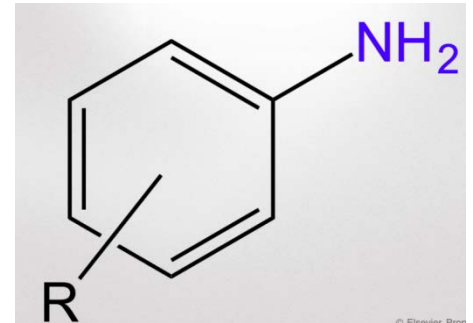


# Structures & images

Picture:  
(zoomed)



Vector based:  
(zoomed)

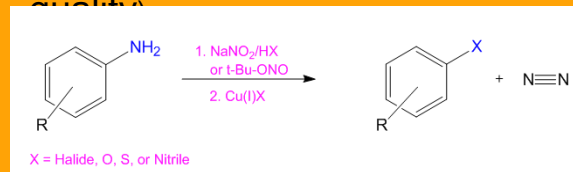


- Vector based worth the effort
- But

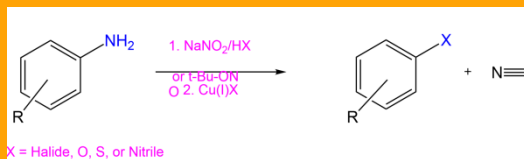
We had to develop a whole  
protocol

# A drawing protocol

Draw Reaction  
(manually-optimize presentation quality)



Create SVG-File (contains errors) and XML File (used to correct errors)



```

<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<chem>Rc1ccc(N)cc1>>Rc1ccc(X)cc1.C#N
1. NaNO2/HX
or t-Bu-ONO
2. Cu(I)X

```

Coordinates and Drawing Instructions  
(in Text Format)

```

Rc1ccc(N)cc1>>Rc1ccc(X)cc1.C#N
1. NaNO2/HX
or t-Bu-ONO
2. Cu(I)X

```

Coordinates and Drawing Instructions  
(encrypted – to protect IP)

```

<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<chem>Rc1ccc(N)cc1>>Rc1ccc(X)cc1.C#N
1. NaNO2/HX
or t-Bu-ONO
2. Cu(I)X

```

Total Size: 11 MB (257 reactions)

# Quality checking . . .

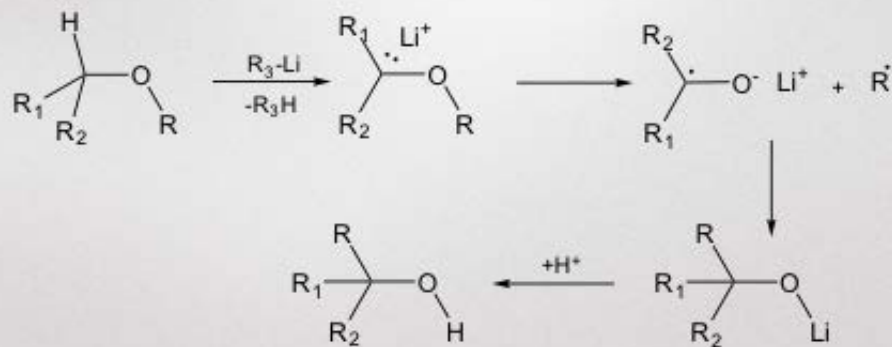
- Reactions
- Mechanisms
- Examples



## [1,2]-Wittig Rearrangement



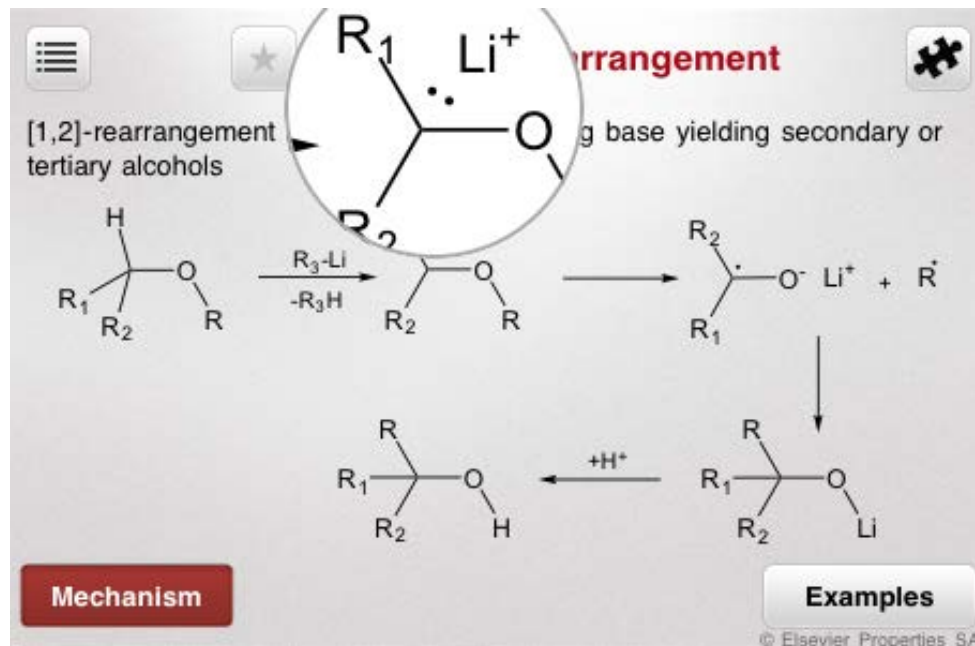
[1,2]-rearrangement of an ether with a strong base yielding secondary or tertiary alcohols



Mechanism

Examples

© Elsevier Properties SA



# Sales & marketing

# iTunes store

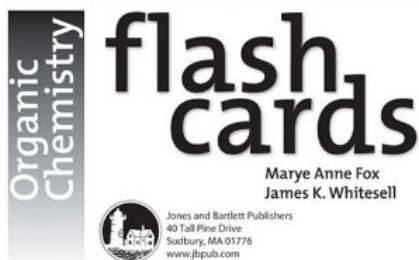
- Contracts
- Time (yours is precious only to you)
- Sales process
- Website info



**BUILD IT AND THEY WILL COME!**

# Sales

- How much to charge?



[See larger image](#)

[Read the book description](#)

[Share your own customer images](#)

[Publisher: learn how customers can search inside this book.](#)

## Organic Chemistry Flash Cards [Cards]

[Marve Anne Fox](#) (Author), [James K. Whitesell](#) (Author)

★★★★☆ (12 customer reviews) | [Like](#) (1)

List Price: ~~\$26.95~~

Price: **\$23.43** & eligible for **FREE Super Saver Shipping** on orders over \$25. [Details](#)

You Save: **\$3.52 (13%)**

### In Stock.

Ships from and sold by **Amazon.com**. Gift-wrap available.

Only 16 left in stock--order soon (more on the way).

**Want it delivered Friday, August 12?** Order it in the next 14 hours and 17 minutes, and choose **One-Day Shipping** at checkout. [Details](#)

[12 new](#) from \$23.42 | [7 used](#) from \$23.06

| Formats                     | Amazon Price | New from | Used from |
|-----------------------------|--------------|----------|-----------|
| <a href="#">+</a> Hardcover | \$112.95     | \$41.99  | \$0.44    |
| Paperback                   | --           | --       | --        |
| Cards                       | \$23.43      | \$23.42  | \$23.06   |

[Show 5 more formats](#)

# \$9.99?



# Free with in-app purchase



- “No risk” full functionality
- In-app purchase

Category: Education  
Updated: Mar 09, 2012  
Version: 1.2  
Size: 11.2 MB  
Language: English  
Seller: Elsevier Properties SA  
© 2012 Elsevier Properties SA

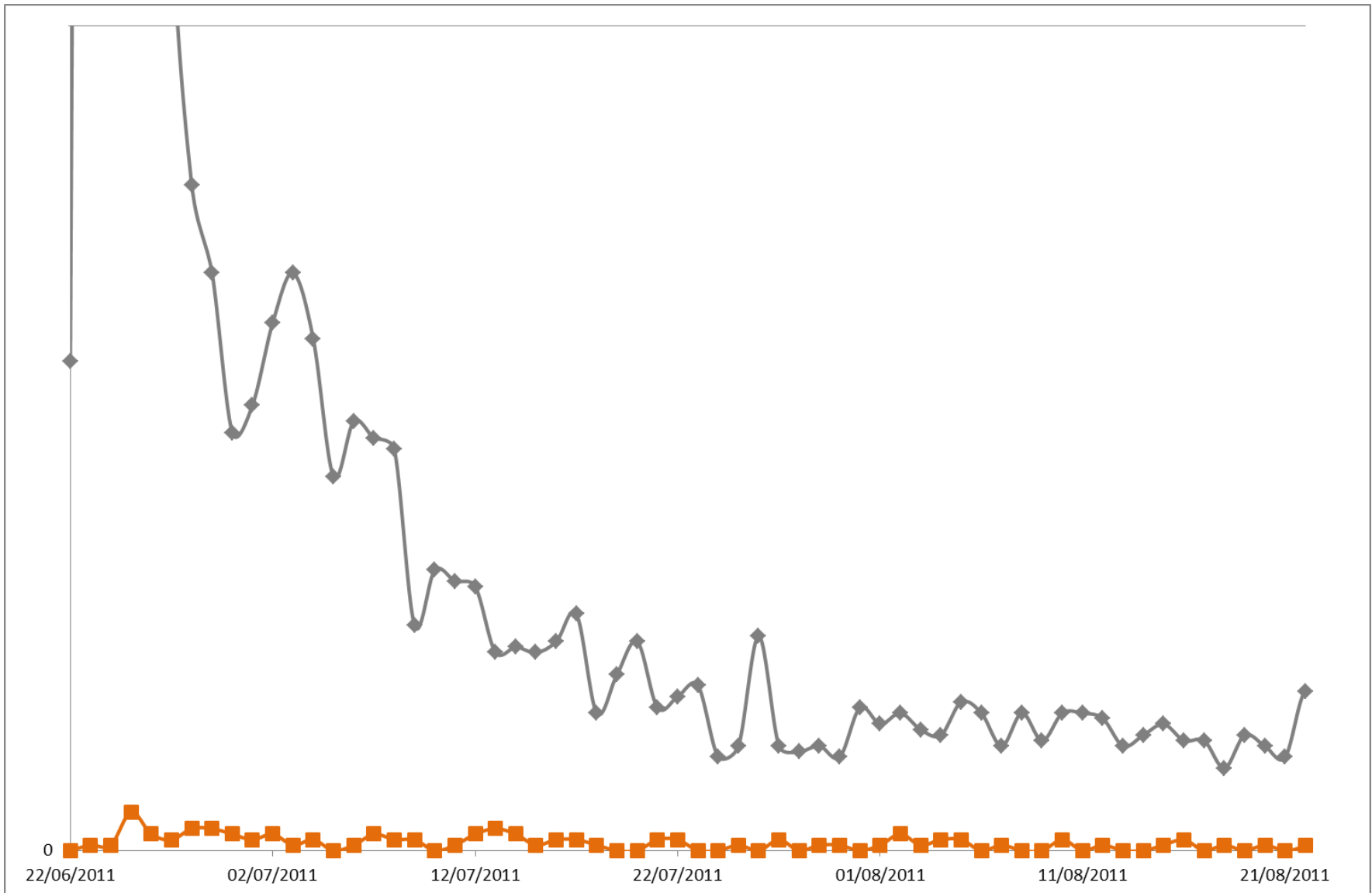
Rated 4+

**Requirements:** Compatible with iPhone, iPod touch, and iPad. Requires iOS 4.1 or later.

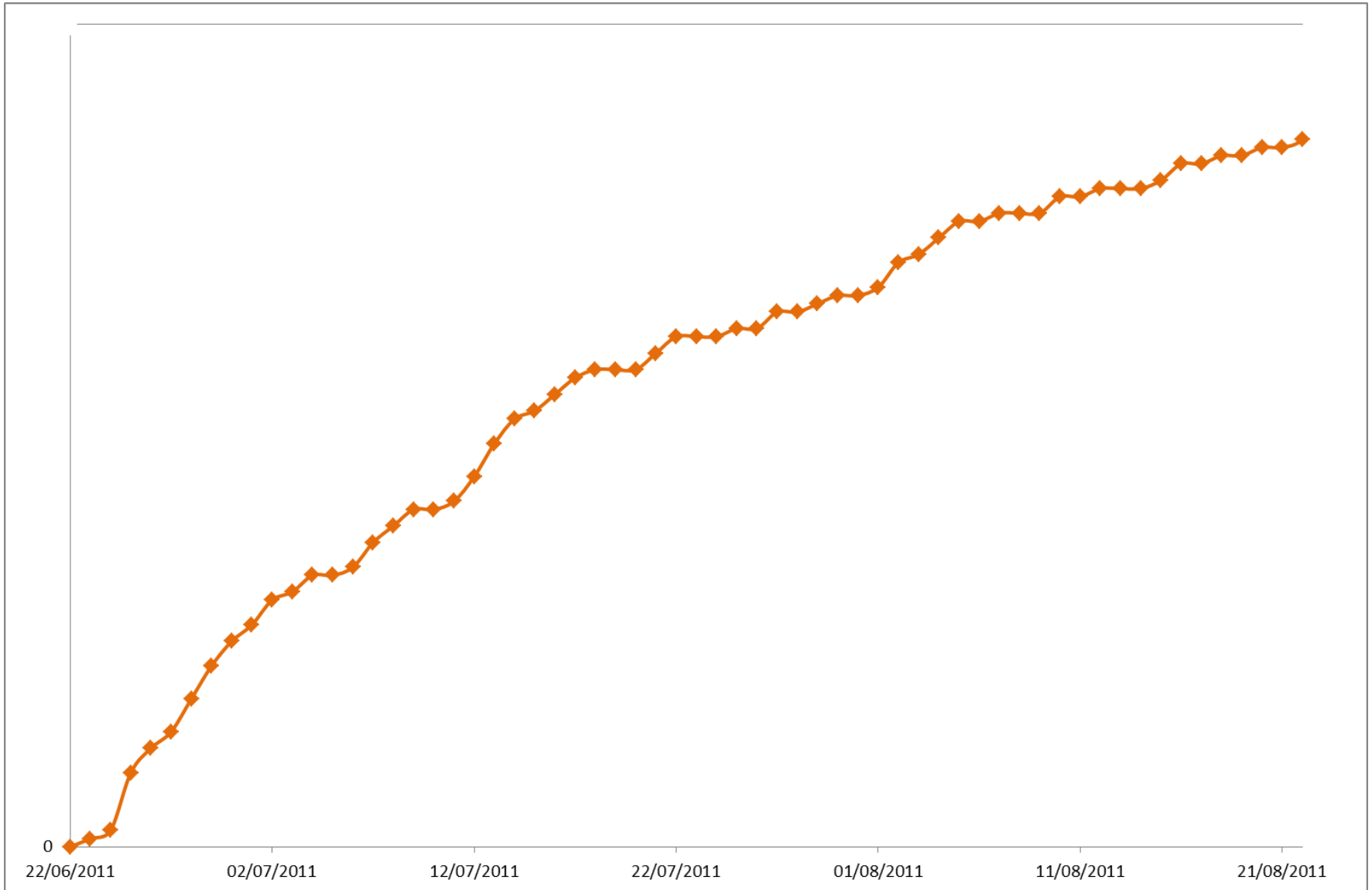
## Top In-App Purchases

1 All reactions \$9.99

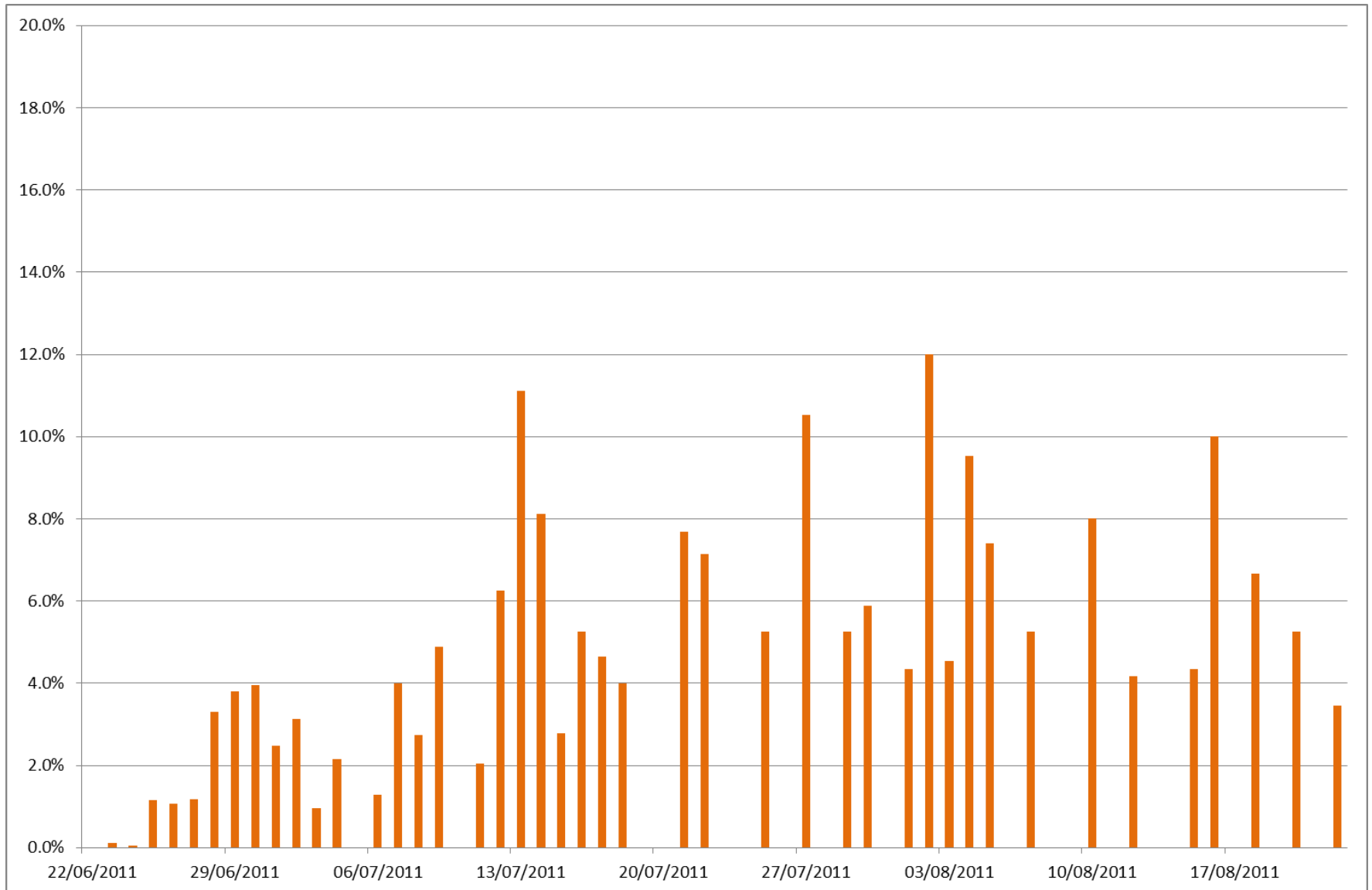
# Downloads & sales



# Total sales



# Conversion rate





# People seemed to like ReactionFlash

## Great tool for all chemists ★★★★★

by ironmike26 - Version 1.2 - Apr 30, 2012

[Report a Concern >](#)

From an undergraduate to a professor, this is a great app with full mechanisms and examples from published work, quizzes are also a great help too. Good for learning and refreshing existing knowledge. I had one app issue and it was resolved quickly, support as very helpful. Worth the money for the full version.

## Great tool for studying Organic Chemistry ★★★★★

by Dustin Bristol - Version 1.0 - Apr 28, 2011

[Report a Concern >](#)

I wish this app was available when I was taking Orgo last semester! This is such a great app and is super simple to use. It includes all the reactions you will need to know for both parts of Organic Chemistry. Looking forward to updates in the future.

## Perfekt ★★★★★

von maximomaxim - Version 1.0 - 11.06.2011

[Ein Problem melden >](#)

Hervorragende App. Nur zu Empfehlen. Eine Unmenge an Namens-Reaktionen mit allem drum und dran. Zu (fast) jeder Reaktion der Ausführliche Mechanismus, sowie einige Beispiele. Dazu gibt es noch ein Quiz mit dem man jede Reaktion üben kann. Karteikarten und aufschreiben werden überflüssig.

Super!

## Just perfect :) ★★★★★

von Benny... - Version 1.1 - 26.06.2011

ich lern grad für meinen organik-masterabschluss und die app ist gold wert ;)

## very good ★★★★★




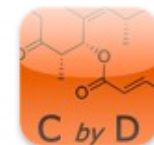






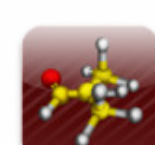



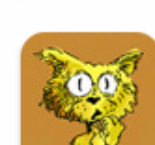

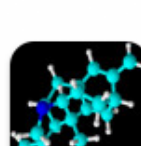



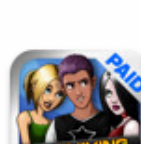

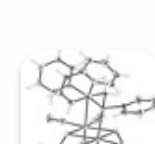

by sukilovely - Version 1.1 - Jun 23, 2011

[Ein Problem melden >](#)

nice app!!  
for organic chemistry  
reaction...  
so simple and easy to use

But compared to the rest of  
iTunes . . .

# Is the price right?

|   |   |  |  |
|---|---|--|--|
|  <p><b>Periodic Table and Chemistry Reference</b><br/>Education<br/>Updated May 29, 2009<br/>+\$0.99 BUY</p>  |  <p><b>Chemistry Formulas Education</b><br/>Education<br/>Updated Aug 05, 2011<br/>+\$0.99 BUY</p>       |  <p><b>Organic Chemistry Essentials Education</b><br/>Education<br/>Updated Jul 31, 2011<br/>+ FREE</p>        |  <p><b>Chemistry By Design: Learn Chemistry</b><br/>Education<br/>Released Aug 13, 2011<br/>+ FREE</p>        |
|  <p><b>CLEP Chemistry 101 Education</b><br/>Education<br/>Updated Mar 18, 2011<br/>+ \$1.99 BUY</p>           |  <p><b>Formul8 - Math, Calculus Reference</b><br/>Reference<br/>Updated Apr 20, 2010<br/>+\$1.99 BUY</p> |  <p><b>Ions-Chemistry Polyatomic Ions Education</b><br/>Education<br/>Updated Jan 31, 2011<br/>+\$0.99 BUY</p> |  <p><b>Chemistry Reference Education</b><br/>Education<br/>Released Apr 14, 2010<br/>+\$0.99 BUY</p>          |
|  <p><b>Khan Academy: Chemistry 1 Education</b><br/>Education<br/>Released Mar 20, 2010<br/>FREE</p>           |  <p><b>MCAT Prep Chemistry Medical</b><br/>Medical<br/>Released Jun 19, 2009<br/>+\$9.99 BUY</p>         |  <p><b>Organic Chemistry No. 1 Education</b><br/>Education<br/>Updated May 26, 2011<br/>FREE</p>               |  <p><b>Chem Pro: Chemistry Tutorials Education</b><br/>Education<br/>Updated Jan 25, 2011<br/>+\$9.99 BUY</p> |
|  <p><b>Chemistry Flashcard(s) Education</b><br/>Education<br/>Released Mar 15, 2011<br/>+ FREE</p>            |  <p><b>ChemApp Lite: Chemistry Education</b><br/>Education<br/>Updated Jan 06, 2011<br/>FREE</p>         |  <p><b>Painless Chemistry Channel Education</b><br/>Education<br/>Released Aug 12, 2011<br/>+ FREE</p>         |  <p><b>Khan Academy: Chemistry 2 Education</b><br/>Education<br/>Released Mar 20, 2010<br/>FREE</p>           |
|  <p><b>Organic Chemistry Flashcards Education</b><br/>Education<br/>Updated Jul 08, 2010<br/>+\$1.99 BUY</p> |  <p><b>WolframAlpha Reference</b><br/>Reference<br/>Updated Jun 23, 2011<br/>+ \$1.99 BUY</p>           |  <p><b>Organic Chemistry Audiotapes Education</b><br/>Education<br/>Released Mar 16, 2010<br/>+\$2.99 BUY</p> |  <p><b>Khan Academy: Chemistry 3 Education</b><br/>Education<br/>Released Mar 20, 2010<br/>FREE</p>          |
|  <p><b>Surviving High School Paid Games</b><br/>Games<br/>Updated Aug 16, 2011<br/>+\$0.99 BUY</p>          |  <p><b>Chemistry Terms Education</b><br/>Education<br/>Updated Oct 15, 2009<br/>+\$2.99 BUY</p>        |  <p><b>Chemistry Total Summary Education</b><br/>Education<br/>Released Sep 03, 2010<br/>+\$9.99 BUY</p>     |  <p><b>Organic Chemistry Express Reference</b><br/>Reference<br/>Updated May 01, 2009<br/>+\$4.99 BUY</p>   |

# Top Paid iPhone Apps

Sort By: **Bestsellers** ▾

- |   |  |   |  |
|---|--|---|--|
| 1.  <b>Angry Birds</b><br>Games<br>Updated Jul 25, 2011<br>Game Center<br>\$0.99 BUY ▾            | 2.  <b>Fruit Ninja</b><br>Games<br>Updated Jun 25, 2011<br>Game Center<br>\$0.99 BUY ▾      | 3.  <b>Cover Orange</b><br>Games<br>Updated Aug 02, 2011<br>Game Center<br>\$0.99 BUY ▾         | 4.  <b>Camera+</b><br>Photography<br>Updated Aug 13, 2011<br>\$0.99 BUY ▾                             |
| 5.  <b>Cut the Rope: Expe...</b><br>Games<br>Released Aug 04, 2011<br>Game Center<br>\$0.99 BUY ▾ | 6.  <b>Lock My Phone - S...</b><br>Entertainment<br>Released Aug 06, 2011<br>\$0.99 BUY ▾   | 7.  <b>Angry Birds Rio</b><br>Games<br>Updated Jul 14, 2011<br>Game Center<br>\$0.99 BUY ▾      | 8.  <b>Zombie Gunship</b><br>Games<br>Updated Aug 06, 2011<br>Game Center<br>+ \$0.99 BUY ▾           |
| 9.  <b>Pimp Your Screen ...</b><br>Lifestyle<br>Updated Jun 20, 2011<br>+ \$0.99 BUY ▾            | 10.  <b>Tiny Wings</b><br>Games<br>Updated Mar 25, 2011<br>Game Center<br>\$0.99 BUY ▾      | 11.  <b>Angry Birds Seasons</b><br>Games<br>Updated Jun 24, 2011<br>Game Center<br>\$0.99 BUY ▾ | 12.  <b>Words With Friends</b><br>Games<br>Updated Aug 05, 2011<br>\$1.99 BUY ▾                       |
| 13.  <b>Cut the Rope</b><br>Games<br>Updated Jul 22, 2011<br>Game Center<br>\$0.99 BUY ▾          | 14.  <b>"Free Music Downl...</b><br>Music<br>Released Aug 09, 2011<br>\$0.99 BUY ▾          | 15.  <b>WhatsApp Messen...</b><br>Social Networking<br>Updated Apr 21, 2011<br>\$0.99 BUY ▾     | 16.  <b>Flick Soccer!</b><br>Games<br>Released Aug 11, 2011<br>Game Center<br>\$0.99 BUY ▾            |
| 17.  <b>THE GAME OF LIFE ...</b><br>Games<br>Updated Dec 09, 2010<br>\$0.99 BUY ▾               | 18.  <b>Stickman BMX</b><br>Games<br>Released Jul 18, 2011<br>Game Center<br>\$0.99 BUY ▾ | 19.  <b>MONOPOLY</b><br>Games<br>Updated Mar 18, 2011<br>\$0.99 BUY ▾                         | 20.  <b>Doodle Jump - BE WAR...</b><br>Games<br>Updated Aug 02, 2011<br>Game Center<br>\$0.99 BUY ▾ |

# ReactionFlash™

NAMED REACTIONS ON THE GO

For further information see  
[reaxys.com/info/reactionflash](http://reaxys.com/info/reactionflash)

FOR A LIMITED TIME ONLY:  
**BACK TO SCHOOL  
OFFER \$1.99**

> 250 reactions

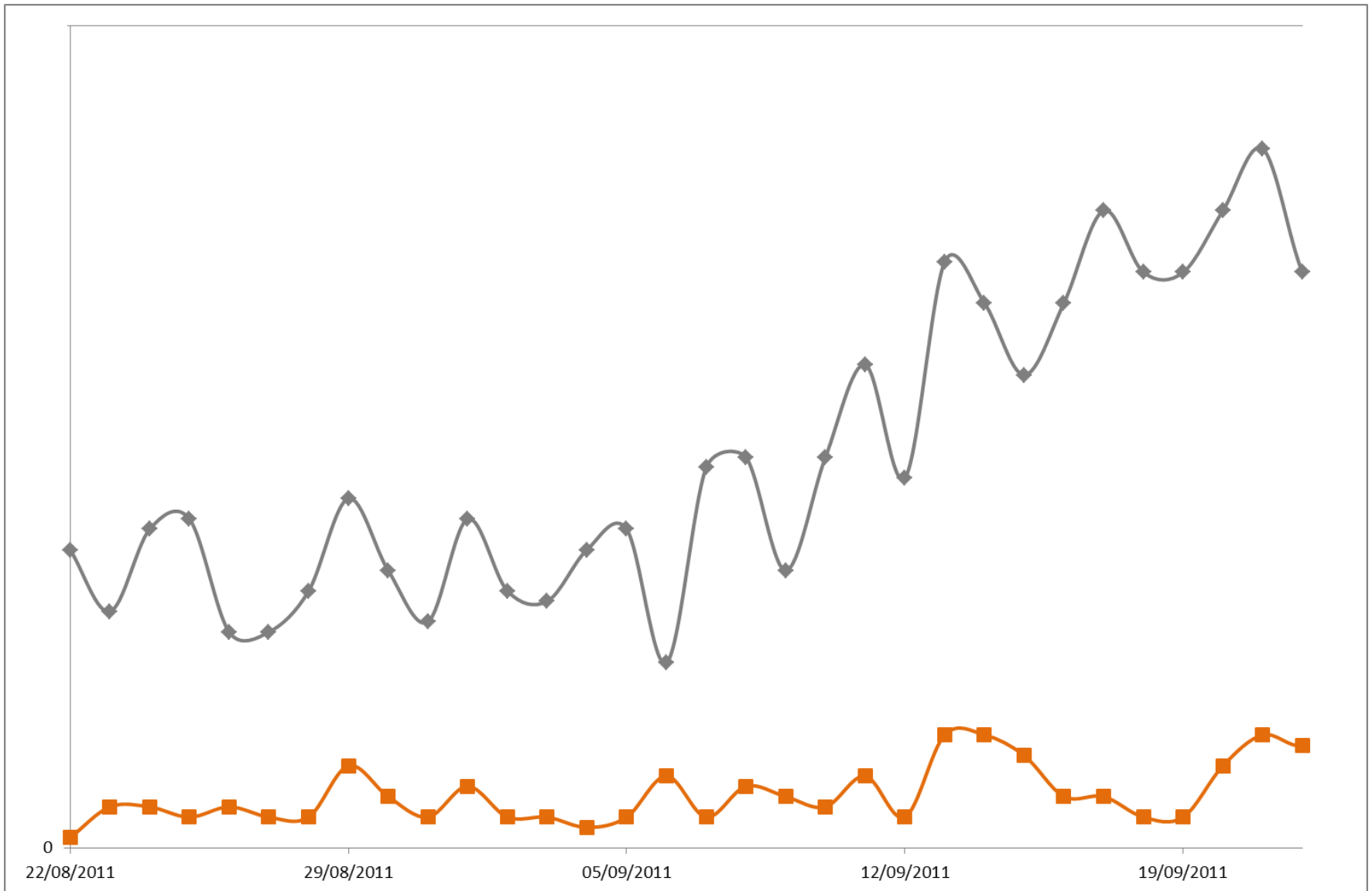
> 250 mechanisms

> 2000 examples

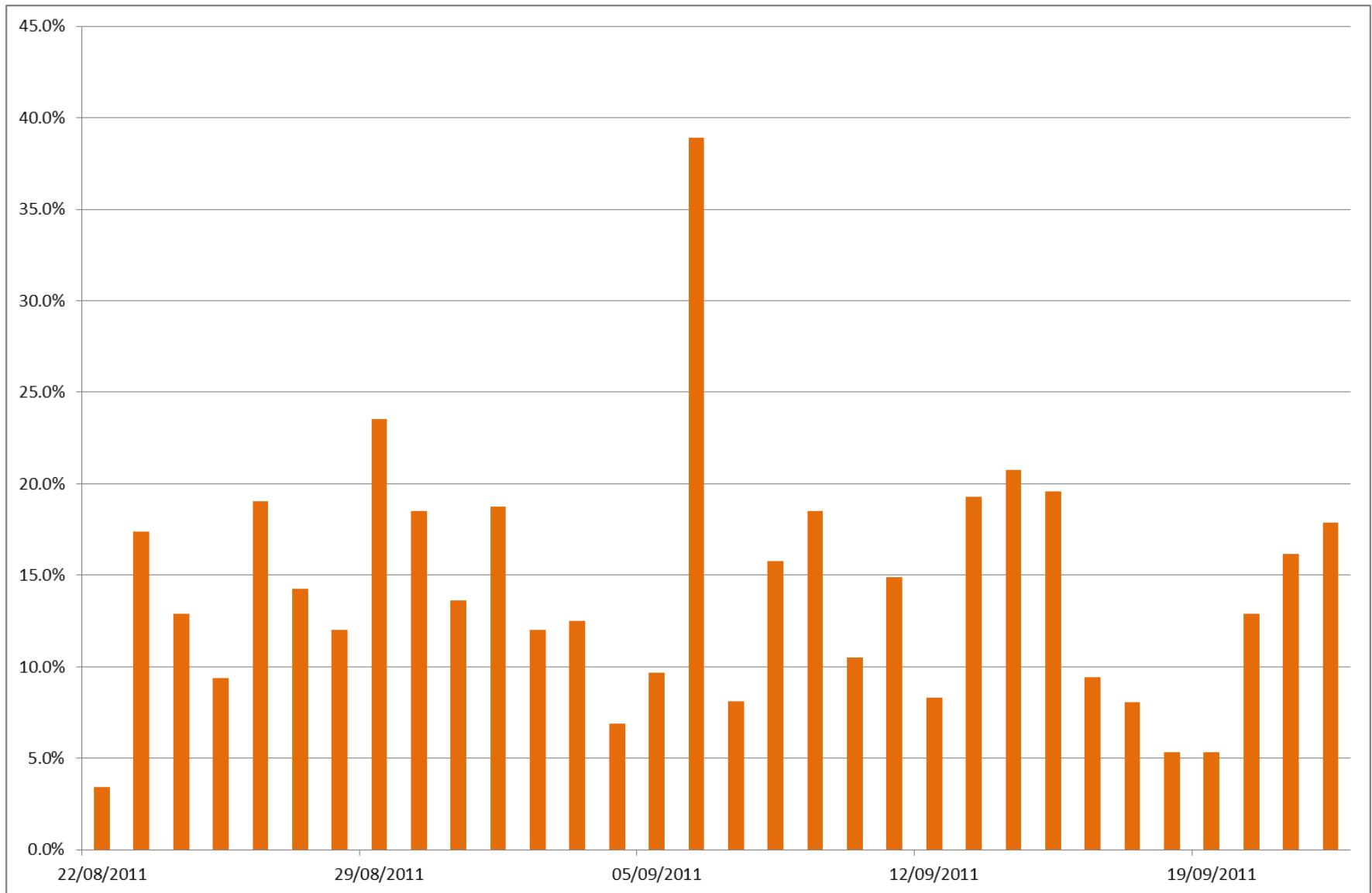


The App has been developed by Elsevier Properties SA with help and input from Prof. Erick M. Carreira and his group at ETH Zürich

# Back to school!

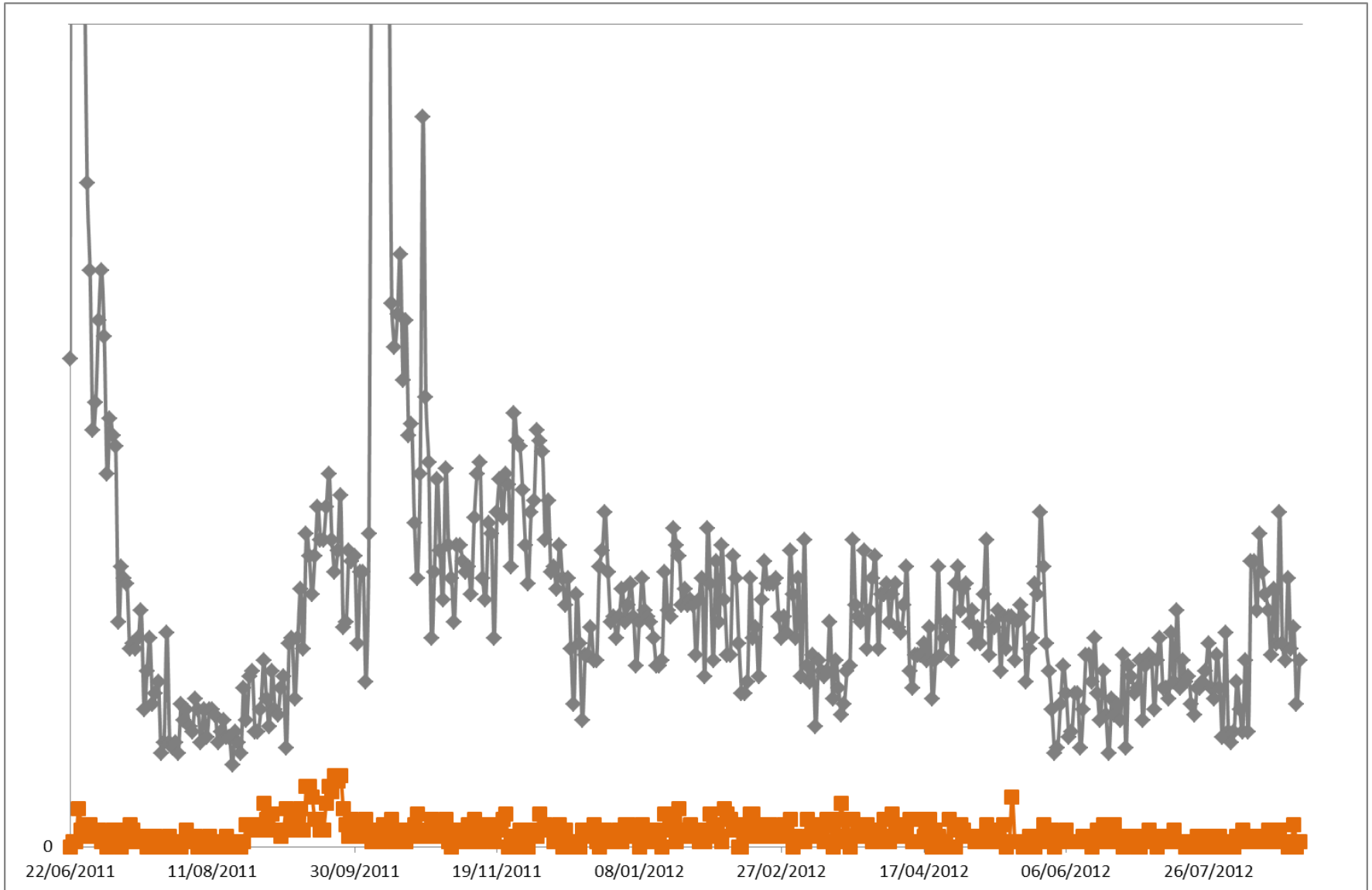


# Back to school!

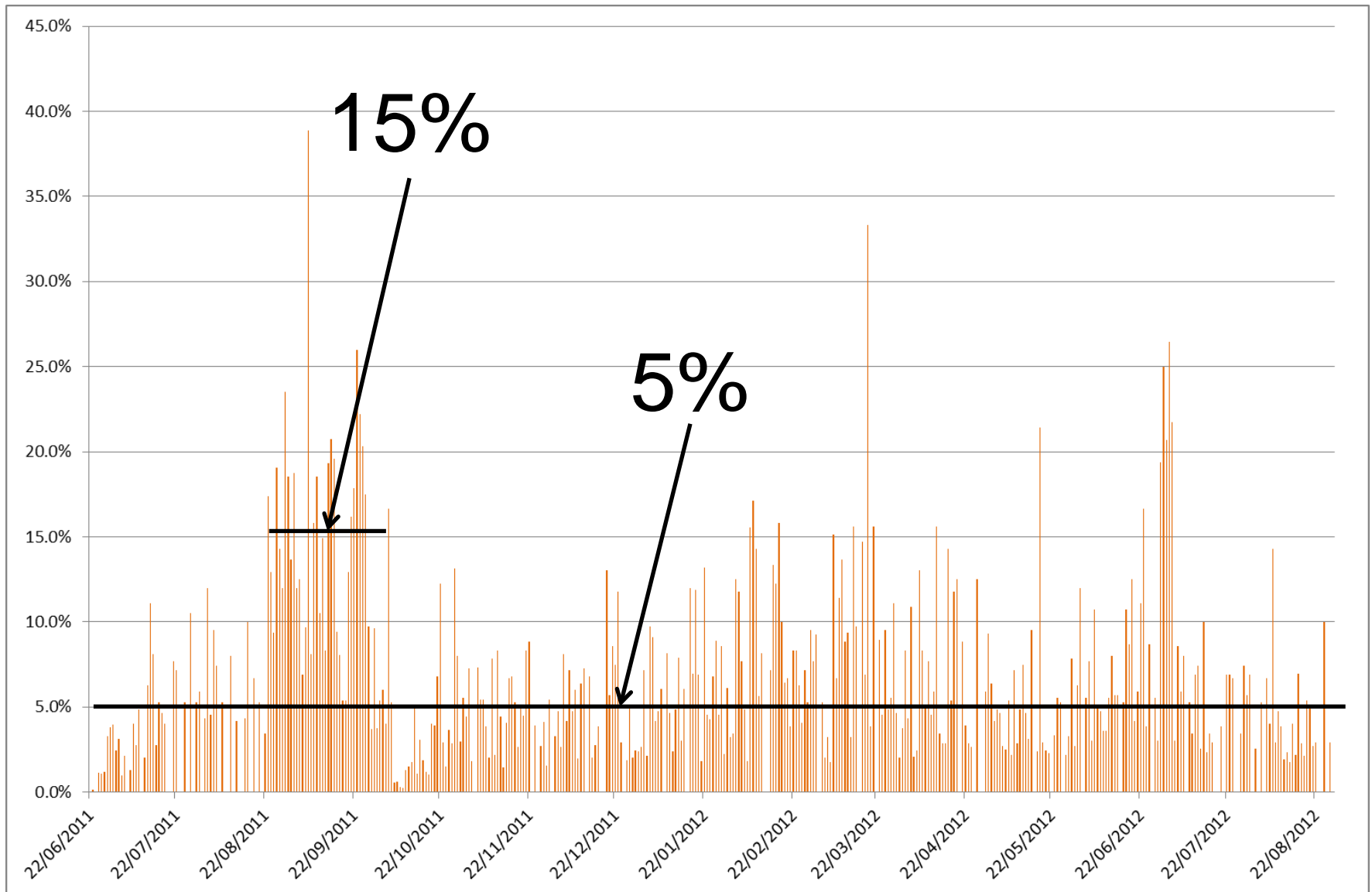




# What happened afterwards?



# Back to school!



# Is \$1.99 sustainable?

- What is the market size for chemistry students interested in named reactions
- Is this bigger or smaller than the audience for Angry Birds??

# What did we learn

- Building apps is a lot of fun!
- Technology & QA is no less important than on any other platform!!
  - There is a lot of great default technology but outside of that toolbox it is difficult
- The best apps are specific (single use / objectives)
- Small market sizes / target audiences will influence the objective for an app

So what do people really  
want?

# Innovation explorers

- 2010, 2011, 2012
- ~100 respondents each year
- Researchers in biochemistry, genetics, molecular biology, chemistry engineering, chemistry, immunology, pharmacology, toxicology, microbiology, & medicine
- 60/40 split academic vs. corporate

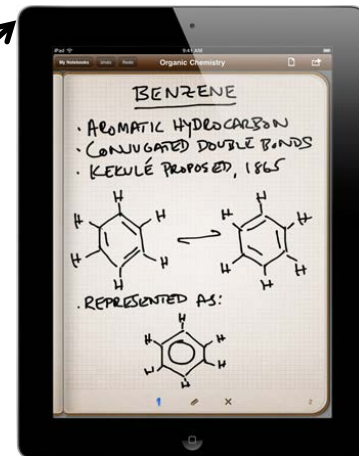
# Smartphones in academia & industry



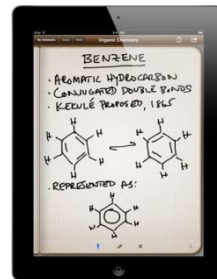
69% → 79%



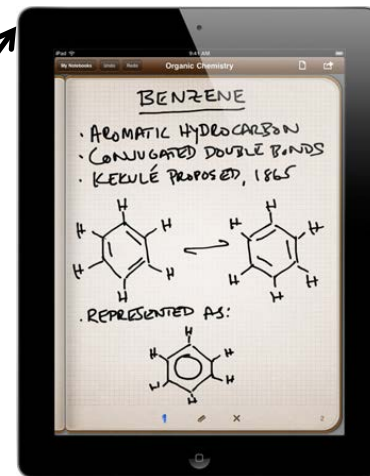
11% → 50%



67% → 89%



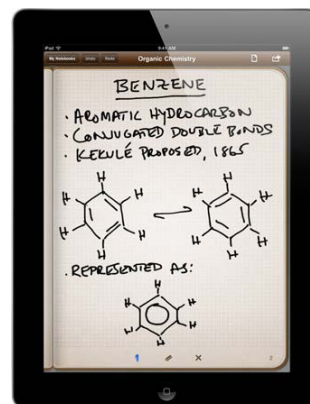
35% → 53%



# Smartphone / tablets



25%



48%



20%



31%



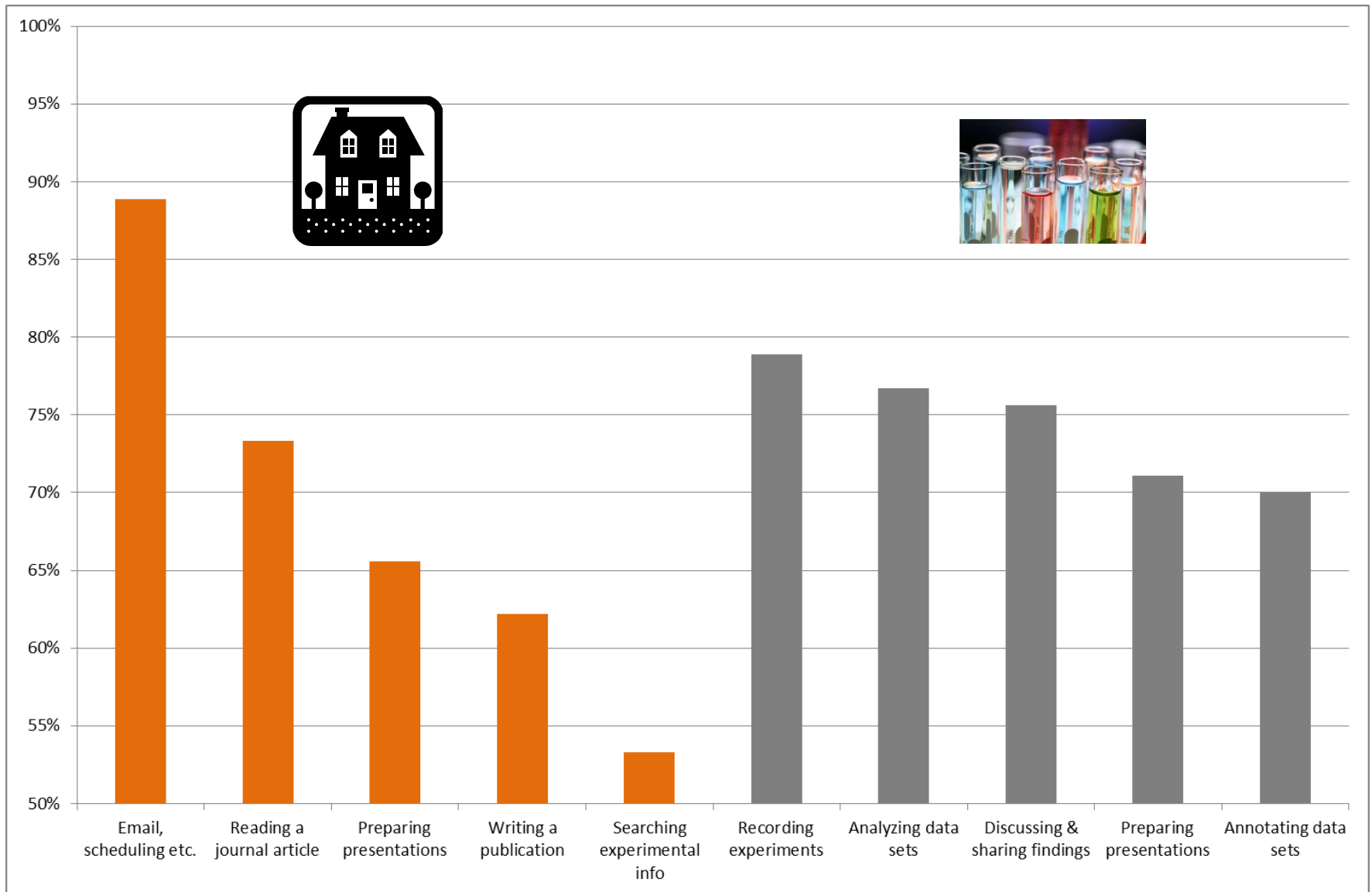
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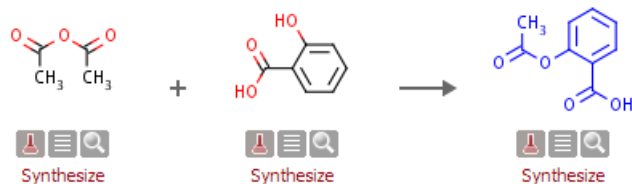


# Work @



# What about chemistry?

# Finding information



| eMolecules |               |               |  |
|------------|---------------|---------------|--|
| MoWT       | Supplier      | Supplier's ID |  |
| 102.089    | Sigma Aldrich | 175641        |  |
|            | Sigma Aldrich | 242845        |  |
|            | Sigma Aldrich | 320102        |  |
|            | Sigma Aldrich | 539996        |  |
|            | Sigma Aldrich | 45830         |  |
|            | Sigma Aldrich | 33214         |  |
|            | Sigma Aldrich | 91204         |  |

| Product Name                              | Supplier       | Quantity |
|---|----------------|----------|
| 1. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 2. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 3. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 4. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 5. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 6. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 7. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |
| 8. Methyl Salicylate (CAS 102-089-1) 100g | Acros Organics | 100g     |



| Melting Point | Solvent         | Reference  |
|---------------|-----------------|--|
| 133 °C        | dichloromethane | <b>Bag, Partha Pratim; Reddy, C. Malla</b><br>Crystal Growth and Design, <b>2012</b> , vol. 12, # 6 p. 2740 - 2743<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">Show Details</a>  |
| 137 °C        | acetone         | <b>Bag, Partha Pratim; Reddy, C. Malla</b><br>Crystal Growth and Design, <b>2012</b> , vol. 12, # 6 p. 2740 - 2743<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">Show Details</a>  |
| 132 - 136 °C  |                 | <b>Chandrasekhar, Sosale; Kumar, Honnaiah Vijay</b><br>Tetrahedron Letters, <b>2011</b> , vol. 52, # 28 p. 3561 - 3564<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">View citing articles</a> <a href="#">Show Details</a>                             |
| 135 °C        | ethanol         | <b>Tyagi, Beena; Mishra, Manish Kumar; Jasra, Raksh Vr</b><br>Journal of Molecular Catalysis A: Chemical, <b>2010</b> , vol. 317, # 1-2 p. 41 - 45<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">View citing articles</a> <a href="#">Show Details</a> |

# Finding information

40%

Synthesize Synthesize Synthesize

45%

| MoWT  | Supplier      | Supplier's ID |
|-------|---------------|---------------|
| 102.0 | Sigma Aldrich | 175641        |
|       | Sigma Aldrich | 242845        |
|       | Sigma Aldrich | 320102        |
|       | Sigma Aldrich | 539996        |
|       | Sigma Aldrich | 45830         |
|       | Sigma Aldrich | 33214         |
|       | Sigma Aldrich | 91204         |

55%

| Title/Abstract   | Full Text | Show Details               |
|--|-----------|----------------------------|
| 1. <a href="#">Pharmacokinetic Review 88(3)(3), S. 2185, S. 2188 Part 88</a> |           | ICH expert panel page 1987 |
| 2. <a href="#">Non-Standard Acid-Base Equilibria in Aqueous Solution</a>     |           | 2006                       |
| 3. <a href="#">Pharmacokinetic Review 88(3)(3), S. 2185, S. 2188 Part 88</a> |           | ICH expert panel page 1987 |
| 4. <a href="#">Pharmacokinetic Review 88(3)(3), S. 2185, S. 2188 Part 88</a> |           | ICH expert panel page 1987 |
| 5. <a href="#">Pharmacokinetic Review 88(3)(3), S. 2185, S. 2188 Part 88</a> |           | ICH expert panel page 1987 |
| 6. <a href="#">Pharmacokinetic Review 88(3)(3), S. 2185, S. 2188 Part 88</a> |           | ICH expert panel page 1987 |

61%

| Melting Point | Solvent         | Reference  |
|---------------|-----------------|--|
| 133 °C        | dichloromethane | <b>Bag, Partha Pratim; Reddy, C. Malla</b><br>Crystal Growth and Design, <b>2012</b> , vol. 12, # 6 p. 2740 - 2743<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">Show Details</a>  |
| 132-136 °C    | acetone         | <b>Bag, Partha Pratim; Reddy, C. Malla</b><br>Crystal Growth and Design, <b>2012</b> , vol. 12, # 6 p. 2740 - 2743<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">Show Details</a>  |
| 132-136 °C    |                 | <b>Chandrasekhar, Sosale; Kumar, Honnaiah Vijay</b><br>Tetrahedron Letters, <b>2011</b> , vol. 52, # 28 p. 3561 - 3564<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">View citing articles</a> <a href="#">Show Details</a>                             |
| 135 °C        | ethanol         | <b>Tyagi, Beena; Mishra, Manish Kumar; Jasra, Raksh Vr</b><br>Journal of Molecular Catalysis A: Chemical, <b>2010</b> , vol. 317, # 1-2 p. 41 - 45<br><a href="#">Title/Abstract</a> <a href="#">Full Text</a> <a href="#">View citing articles</a> <a href="#">Show Details</a> |

# The future

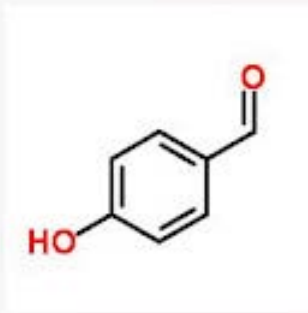


<http://www.virgingalactic.com>

# Additional functions



Recognized structure



Continue Try Again

The image shows a software interface for identifying chemical structures. At the top, the text "Recognized structure" is displayed in a light blue font. Below this, a chemical structure is shown within a white box. The structure is 4-hydroxybenzaldehyde, consisting of a benzene ring with a hydroxyl group (-OH) at the para position and an aldehyde group (-CHO) at the other para position. The "HO" and "O" atoms are highlighted in red. At the bottom of the interface, there are two buttons: "Continue" and "Try Again", both in a grey font on a light grey background.

RSC -- <https://play.google.com/store/apps/details?id=org.rsc.chemgoggles&hl=en>

# Changing attitudes

- Some things just don't currently / yet work on mobile:
  - Analysing data sets
  - Searching for experimental information
  - Writing papers / reports

# What is mobile?

| Category   | Shipments | Growth 2010 / 2011 |
|------------|-----------|--------------------|
| Smartphone | 488M      | 63%                |
| Pads       | 63M       | 274%               |
| Netbooks   | 30M       | -25%               |
| Notebooks  | 210M      | 7.5%               |
| Desktops   | 112M      | 2.5%               |

Canalys 2012



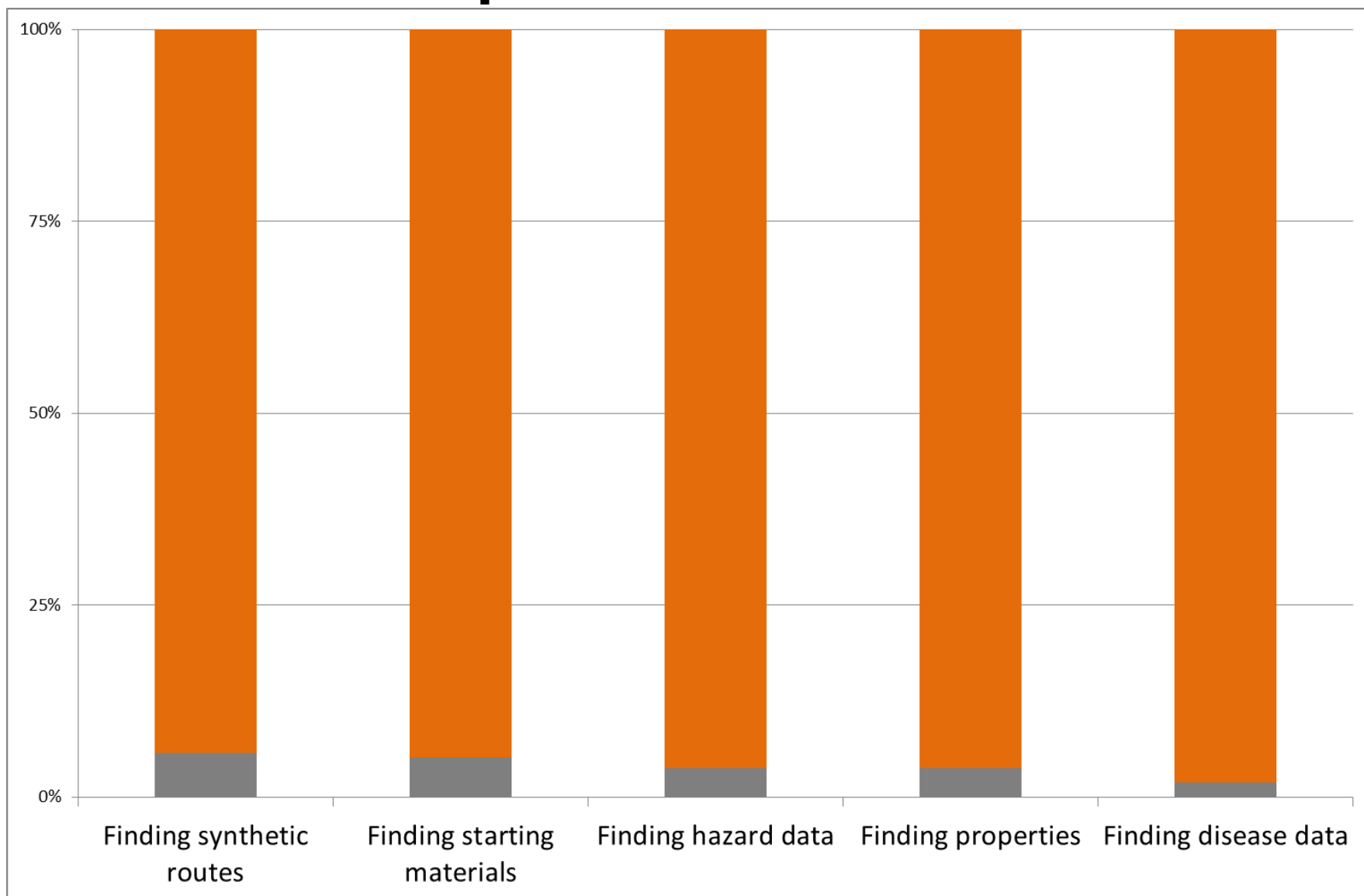
# Is everything equal?

- Surely a smartphone is not a tablet?

# Size is important . . .



# Smartphone vs. tablet



# Is mobile important?

"The term 'mobile' will become an anachronism. Remember 'desktop computing'? All computing will be considered mobile"

**Peter Semmelhack, founder of Bug Labs**

"The future of mobile is all about how gestural interfaces will permeate our every day lives"

**Rana June Sobhany, iPad DJ, author, and mobile entrepreneur**

Read more: <http://www.businessinsider.com/future-of-mobile-experts-2011-6?op=1>

# Thanks!



[http://www.youtube.com/watch?feature=player\\_embedded&v=z1magCv4LtM](http://www.youtube.com/watch?feature=player_embedded&v=z1magCv4LtM)

# Questions??

