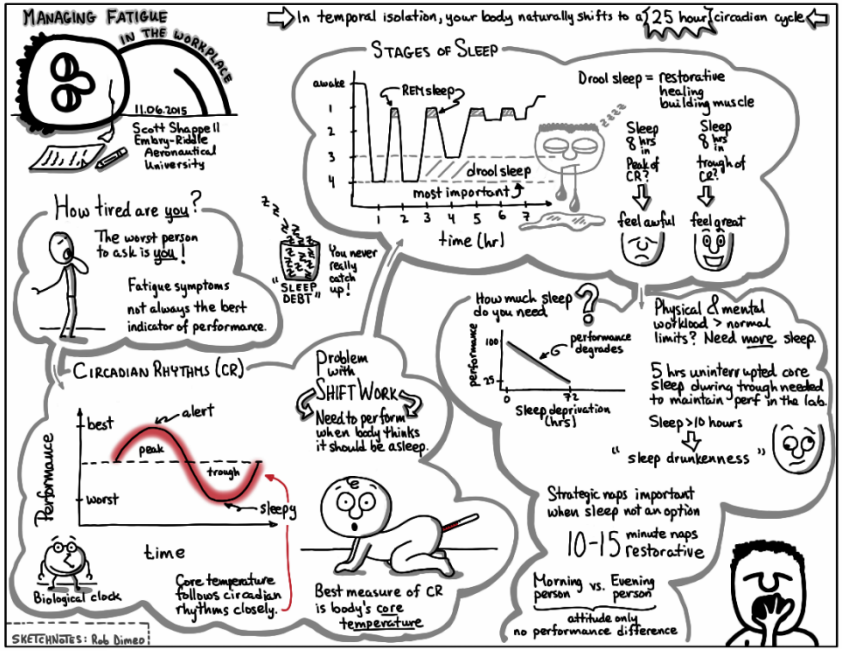
Sketchnotes

a one-page visual summary of just about anything

Rob Dimeo 12.07.2015

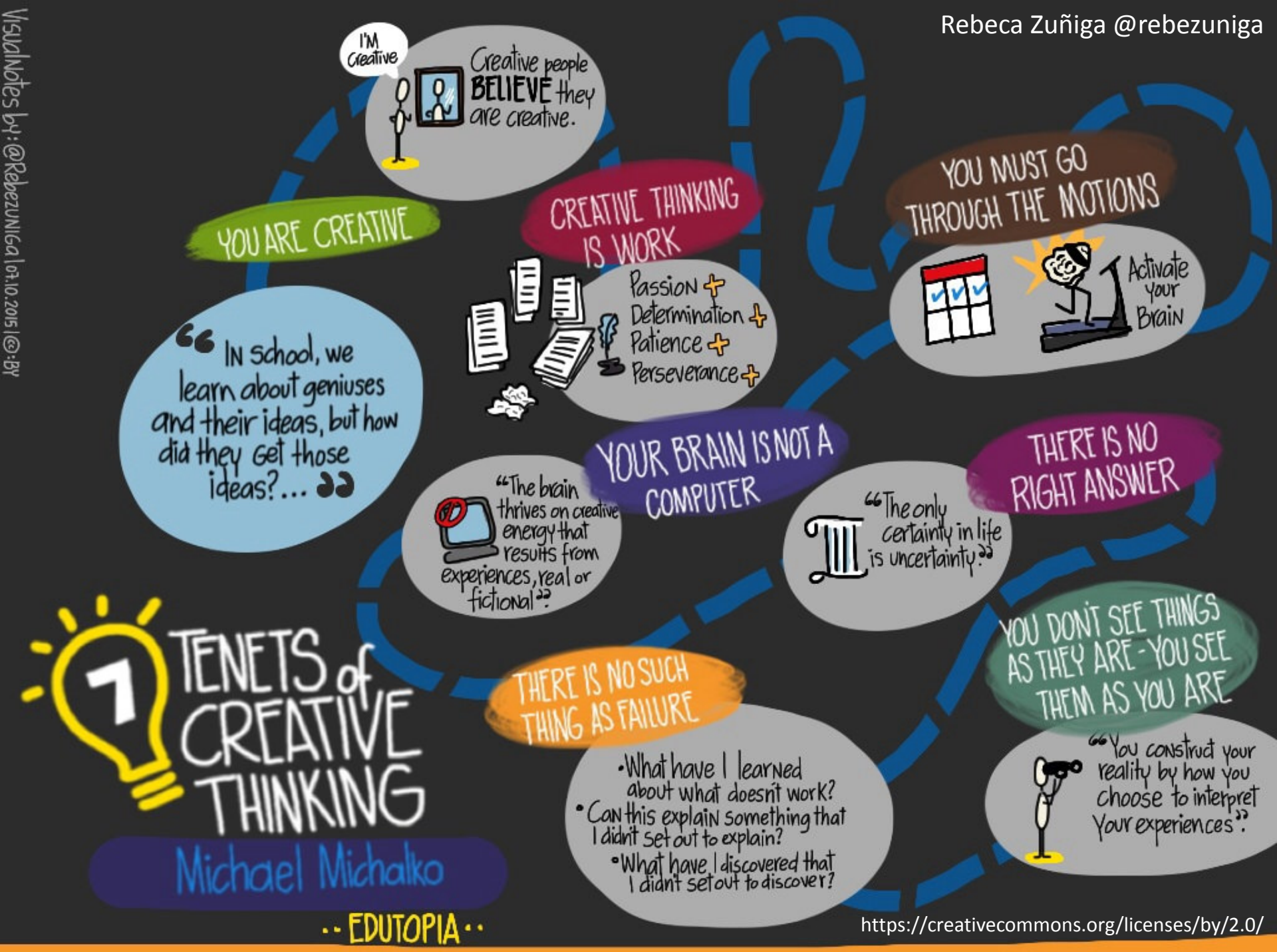


WHAT ARE SKETCHNOTES ?

"... RICH VISUAL NOTES CREATED FROM A MIX OF HANDWRITING, DRAWINGS, HAND-DRAWN TYPOGRAPHY, SHAPES, AND VISUAL ELEMENTS LIKE ARROWS, BOXES, AND LINES."

– Mike Rohde
The Sketchnote Handbook

Rebeca Zuñiga @rebezuniga



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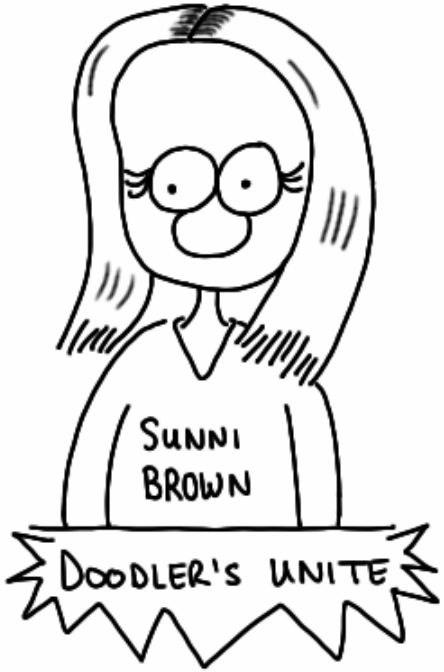
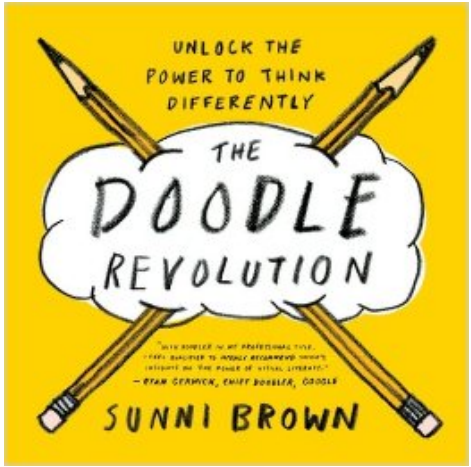
WHY SKETCHNOTE?

1. High level of comprehension after the event (e.g. presentation, meeting, etc.)
2. Increased retention & recall (weeks/months later)
3. Increased creativity
4. Enhanced listening skills





WHY I SKETCHNOTE

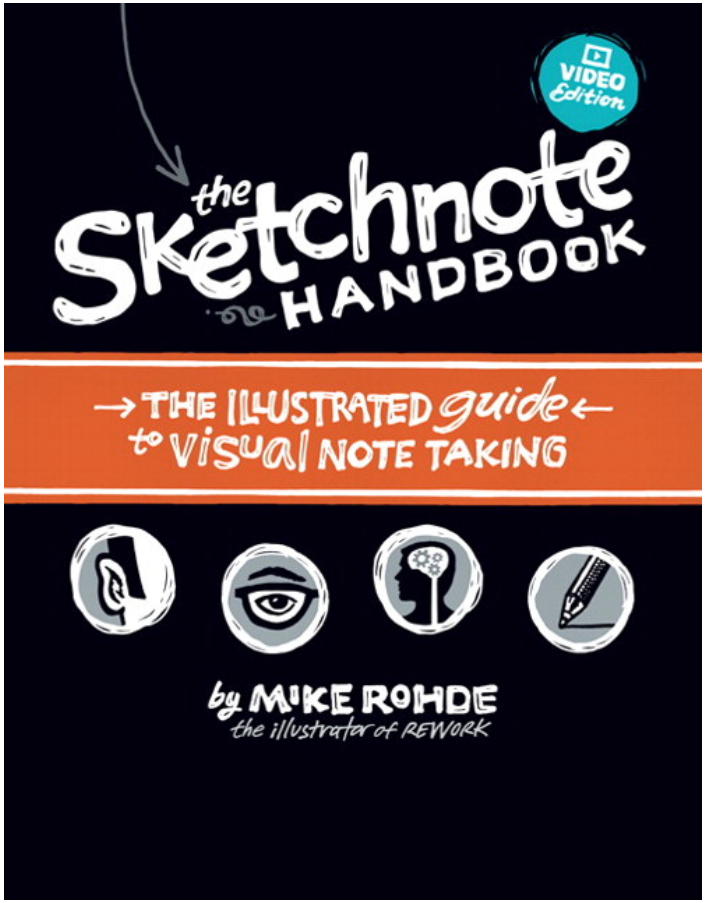
1. Improve scientific understanding via talks and publications.

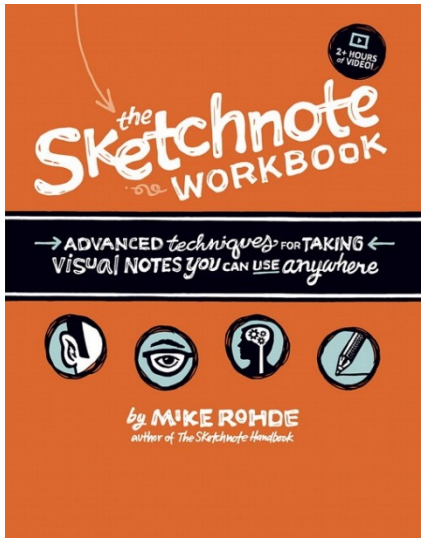
2. I am a visual thinker. Visual appeals to me.

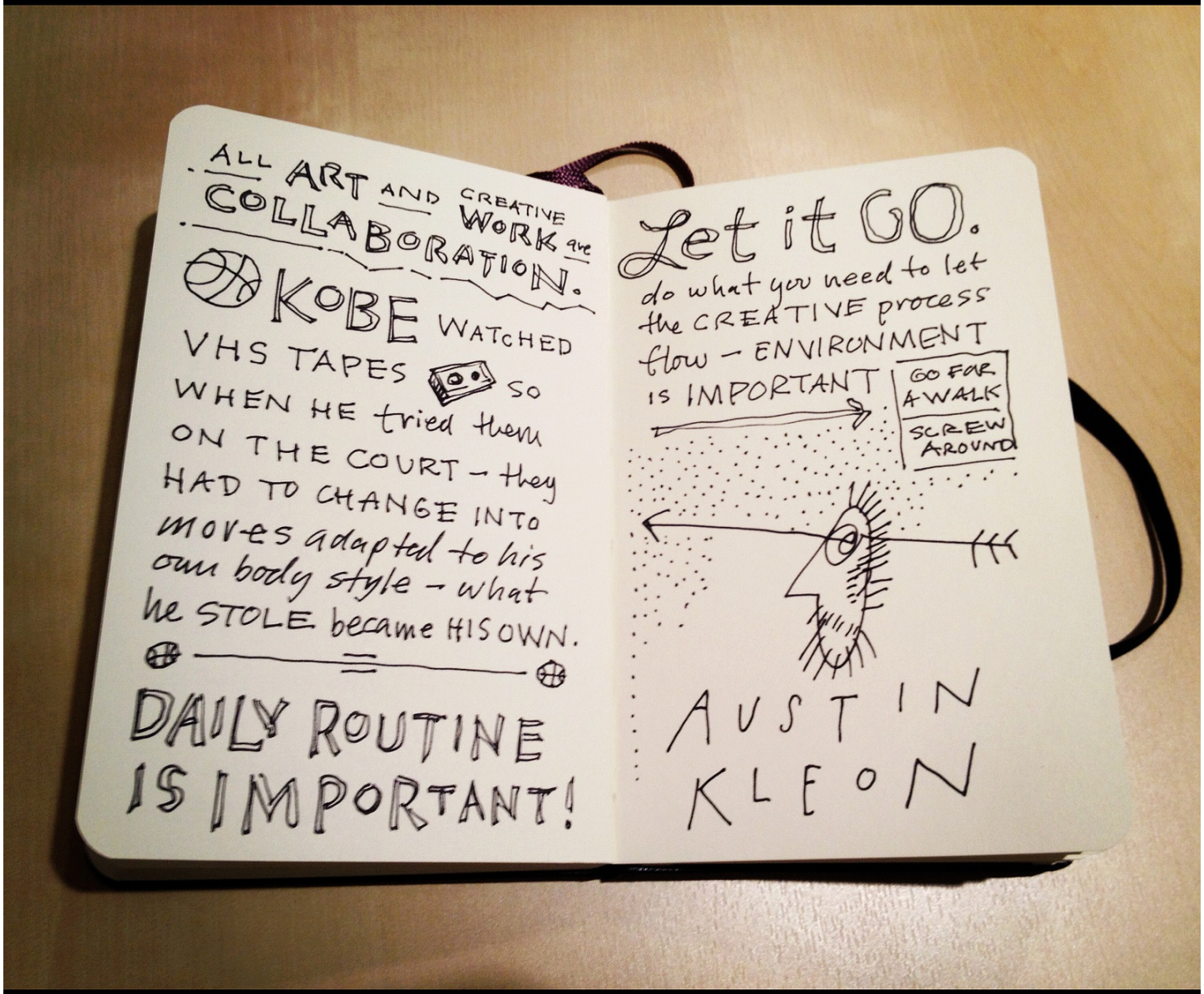
3. Visual notetaking engages mind and body to process verbal and visual information. More so than conventional notes.

4. One-page visual summary can be used later for quick reference. Details recalled easier.

5. SN is a visually appealing artifact. High re-read value.


VIDEO Edition
the Sketchnote HANDBOOK
THE ILLUSTRATED guide to visual NOTE TAKING
by MIKE ROHDE
the illustrator of REWORK


2+ HOURS of VIDEO!
the Sketchnote WORKBOOK
ADVANCED techniques FOR TAKING visual NOTES you CAN USE anywhere
by MIKE ROHDE
author of The Sketchnote Handbook



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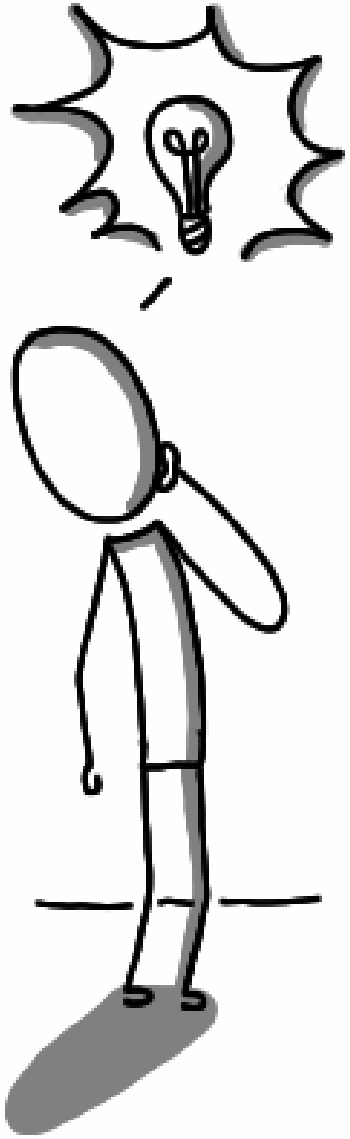
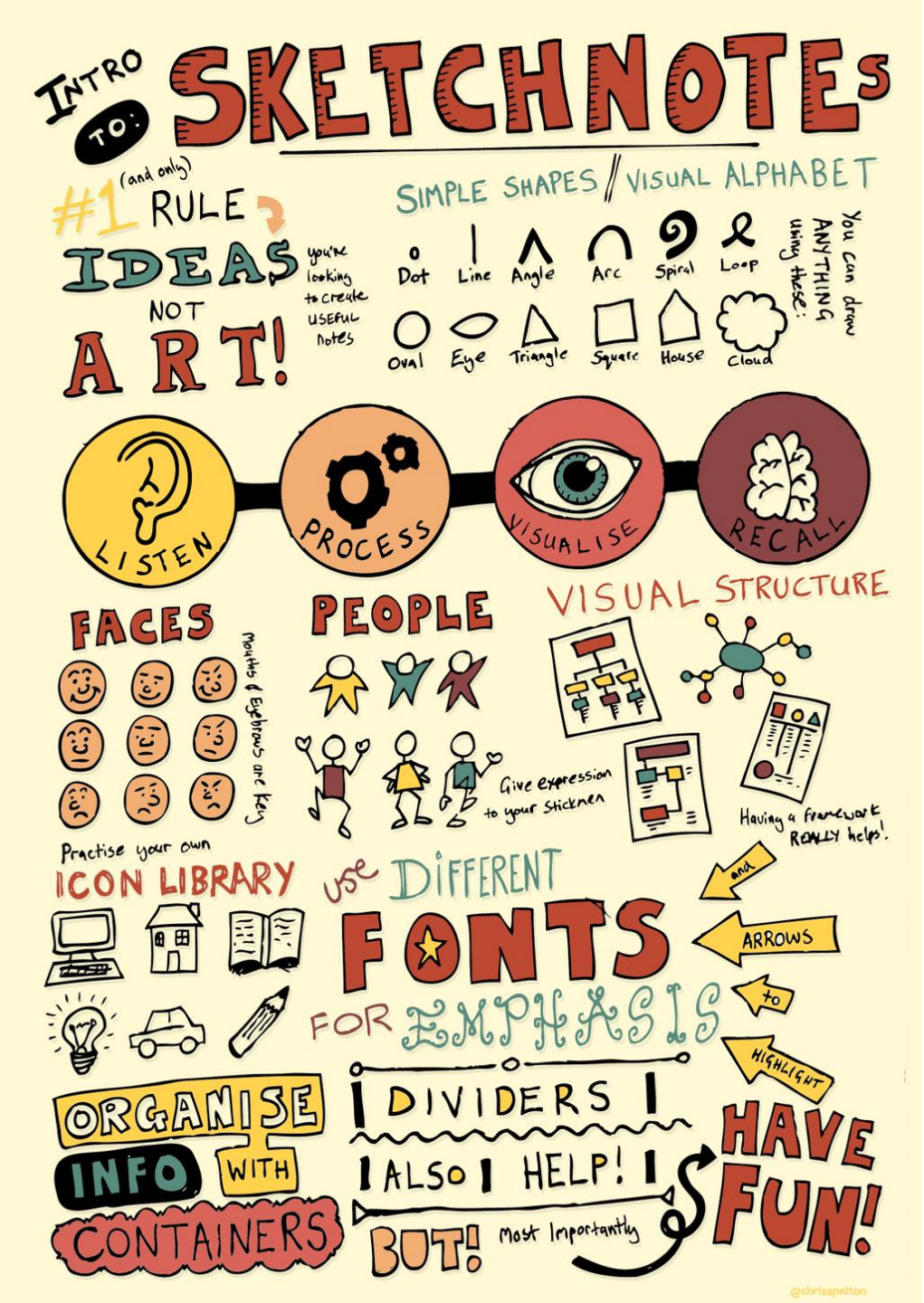


INSPIRATION



@ChrisSpalton

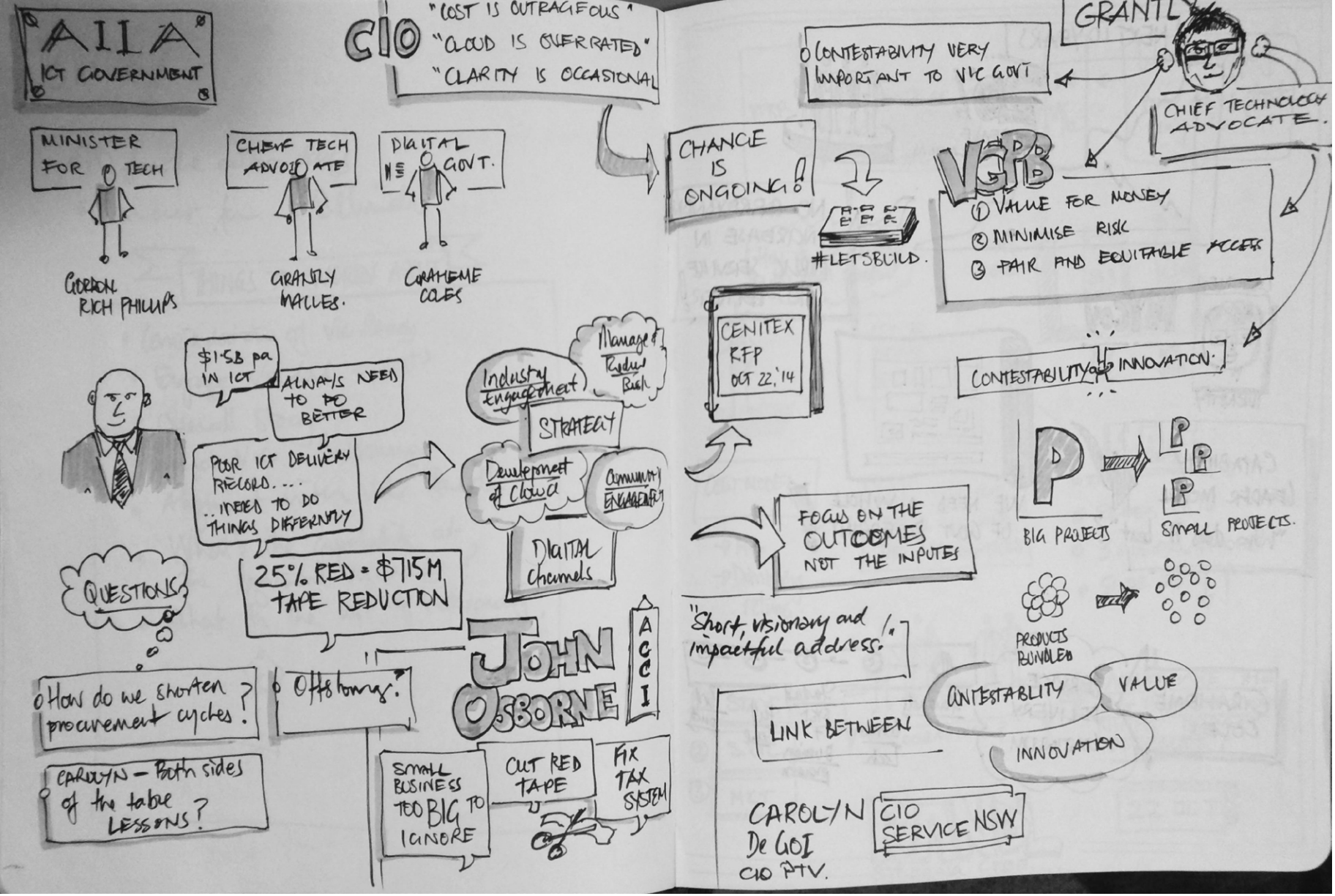
Chris Spalton, UX Designer

@diehauteculture

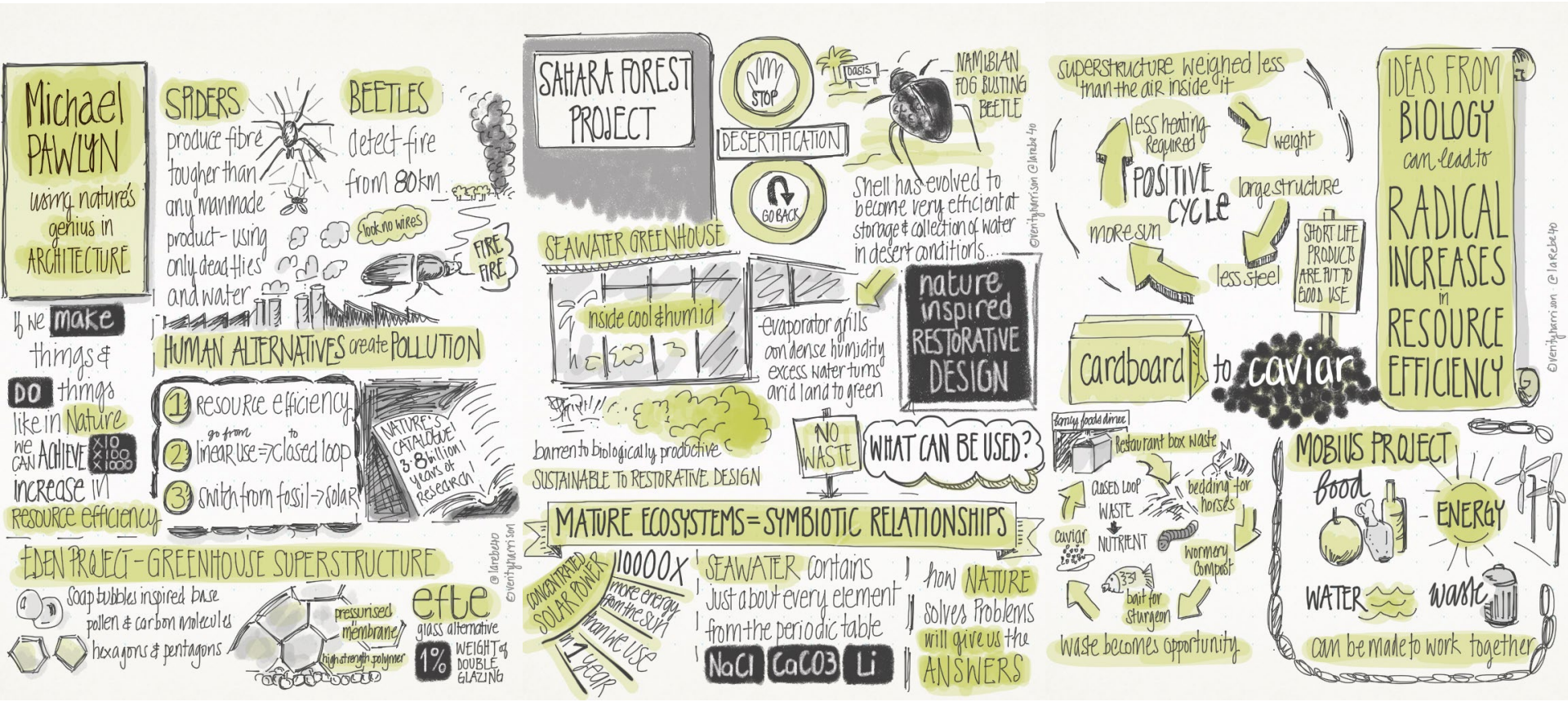
Andrea Brücken, Trainer New Media & Visual Communication

@xlontrax

Mauro Toselli, Chief Operating Sketchnoter at sketchnotearmy.com



James Saretta
Management Consultant
@JamesSaretta



Verity Harrison
Visual Storyteller

@larebe40

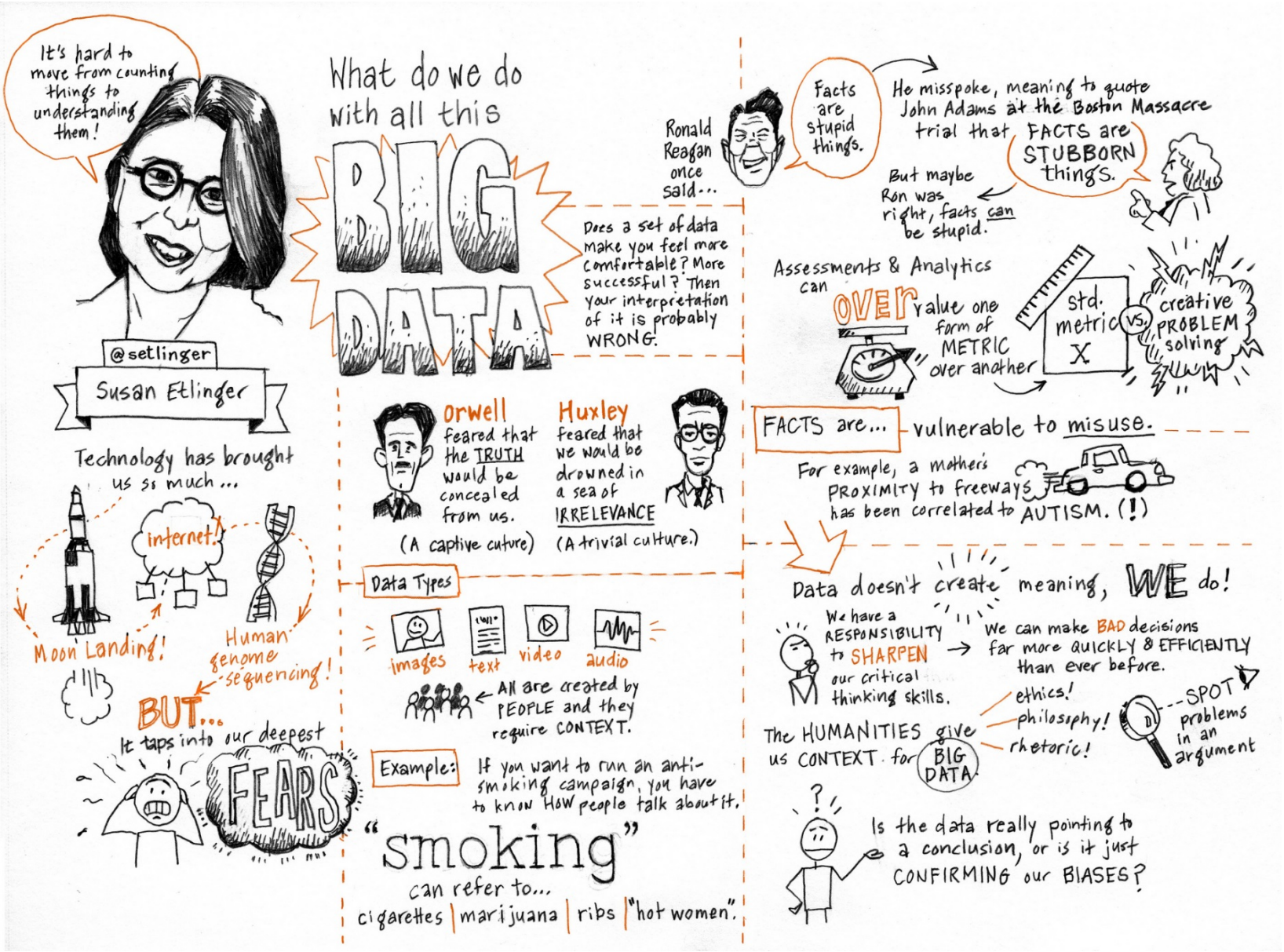
@itsLilpeanut

Marichiel Boudwin, Illustrator

@itsLilpeanut

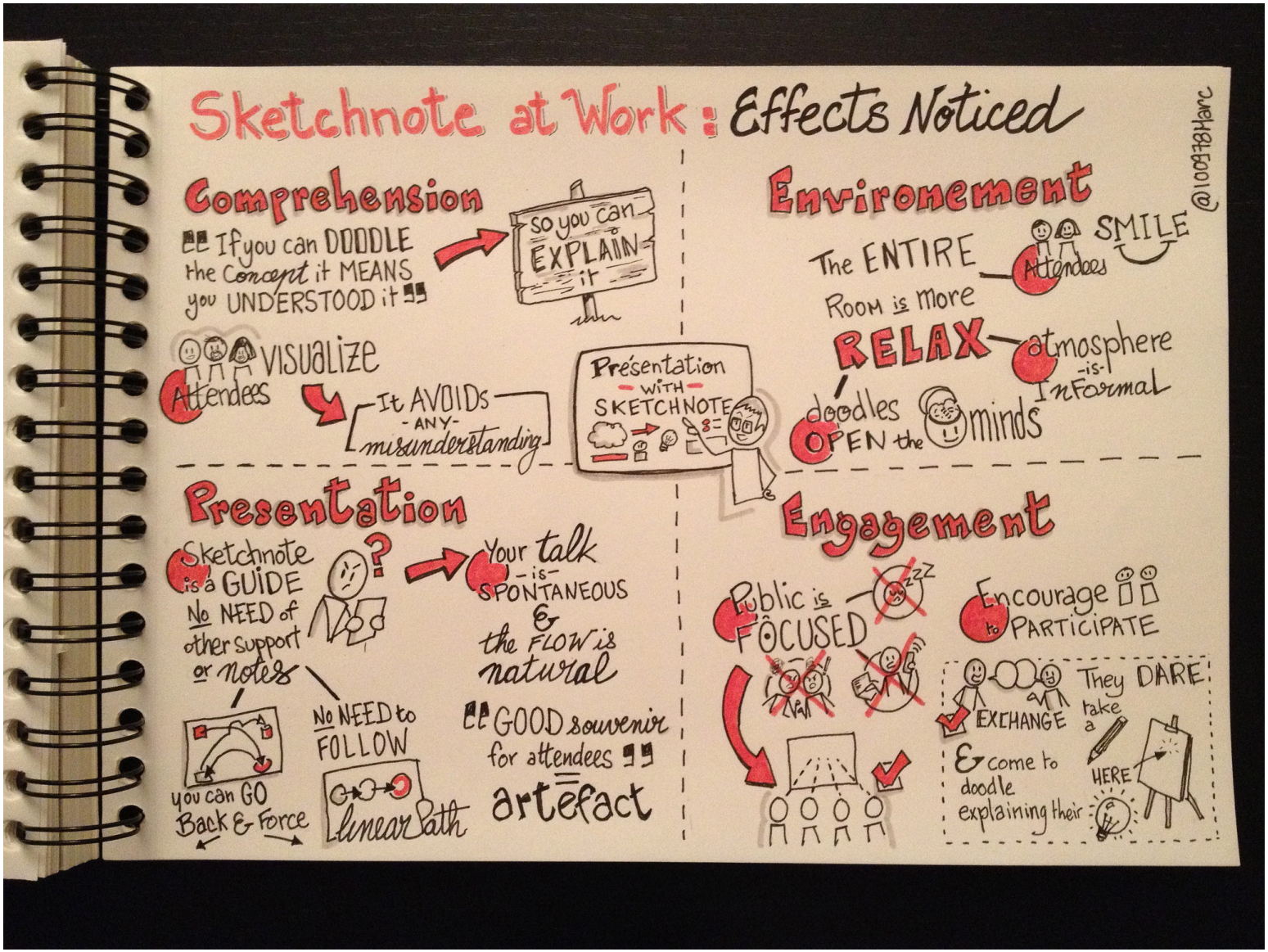
Marichiel Boudwin, Illustrator

@gary_schroeder



Gary Schroeder
UX, web designer & online communications manager

@100978Marc



Marc Bourguignon
Business Relationship Manager

Katharina Theis-Bröhl
Physics Professor

Sandra Martin - Visual design

Persönliche Betroffenheit = Distanzverlust !

Deutschland schrumpft & vergreist

= Zuwanderung ist gut !

+ JA

bezahlbarer Wohnraum in Ballungszentren wird noch knapper.

+ NEIN

Stimmung Kultur Erfahrung UNSERE Erziehung Meinung

positiv

negativ

Unsere Wirklichkeit

NEUTRALISATOR

Vorurteile abbauen:

Miteinander REDEN ZUHÖREN

Wertschätzung

Verständnis

DER FREMDE

ICH

Männer, Frauen und Kinder fliehen vor Krieg und Armut.

REFUGEES

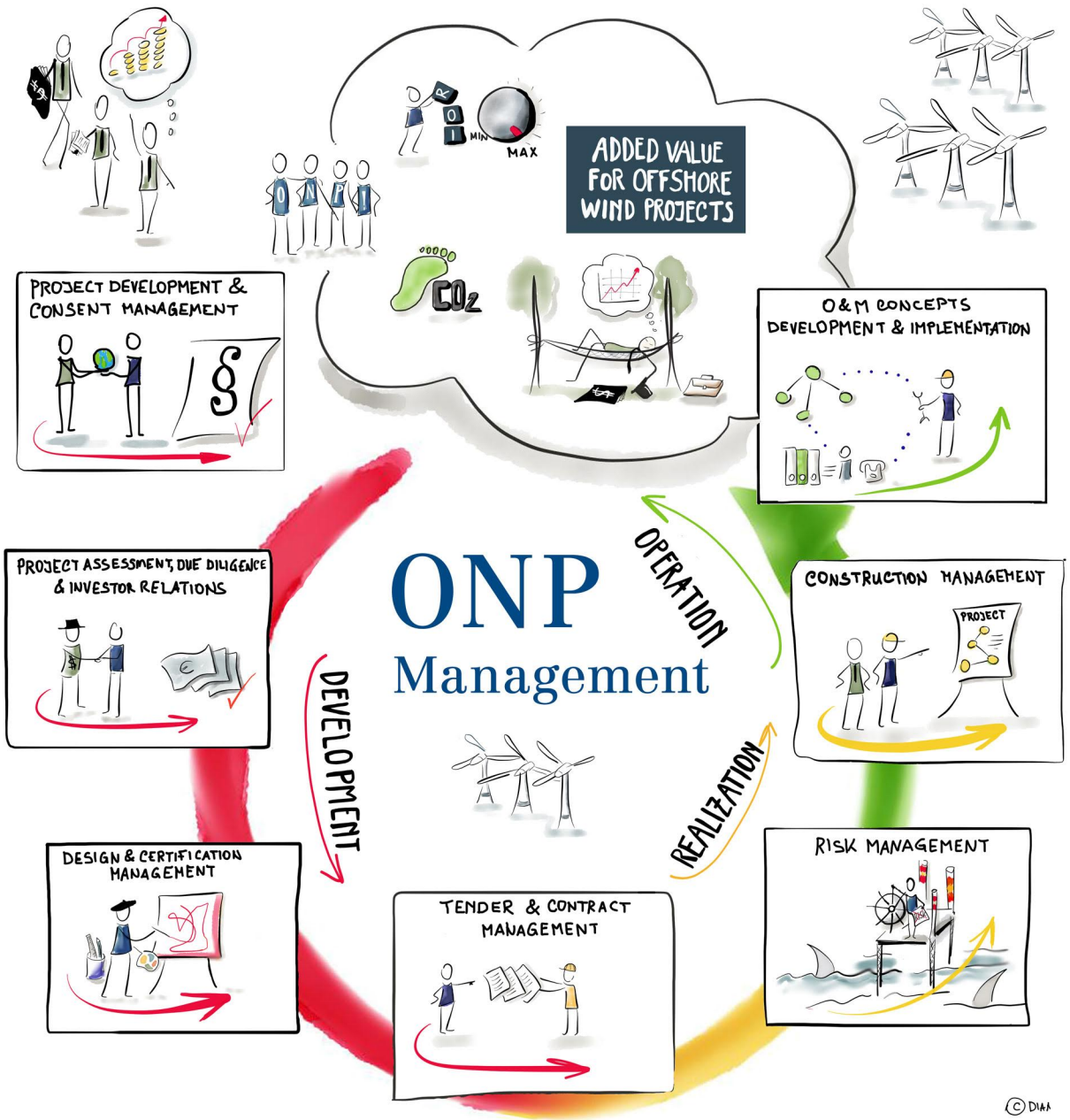
Flüchtlingsströme

ZIEL

Ihr Ziel: Sie möchten ihr Leben retten !

EUROPA

© sam_HH



Diana Meier-Soriat
Graphic recorder/sketchnoter

SKETCHNOTING INGREDIENTS

FOCUS ON the BIG IDEAS

CAPTURE IDEAS THAT RESONATE.

LISTEN FOR KEY THEMES AND IDEAS, THEN CAPTURE THEM WITH IMAGES AND WORDS.

Rather than trying to record every detail, focus on the most relevant, useful ideas you can apply in your life right away.

AS YOU TRAIN YOUR EARS AND MIND, YOUR ABILITY TO LISTEN AND CAPTURE IDEAS WILL IMPROVE.

MIKE ROHDE

SKETCHNOTES TIP #1

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

5 BASIC Elements

YOU CAN DRAW ANYTHING WITH JUST 5 BASIC ELEMENTS:

CIRCLE SQUARE TRIANGLE LINE DOT

Once you realize objects can be built from these 5 elements, it becomes easier to draw your ideas:

laptop house coffee flower car robot donut

NOT AN ARTIST? NOT A PROBLEM. THESE 5 BASIC ELEMENTS MAKE DRAWING EASIER.

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

MIKE ROHDE

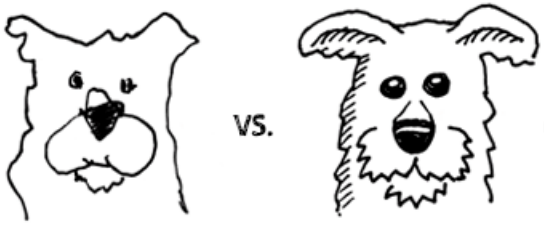
SKETCHNOTES TIP #2

IDEAS, NOT Art

AIM FOR QUALITY IDEAS INSTEAD OF FANCY ART.

IF YOU'RE NOT AN ARTIST, DON'T WORRY!

Sketchnotes help you think visually, blending images and words together. Even badly drawn ideas communicate clear thinking:



A BAD DRAWING vs. A GOOD DRAWING → EITHER WAY IT'S STILL A DOG.

SKETCHNOTES ARE A VISUAL WAY TO CAPTURE IDEAS. LEAVE THE ART BAGGAGE BEHIND AND HAVE FUN!

MIKE ROHDE

SKETCHNOTES TIP #3

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

DRAWING Type

THE TWO-LINE METHOD

This simple approach to creating lettering makes it easy to quickly add bold headlines to your notes:

1. DRAW A SINGLE LINE
A simple, single-line letter will do the trick.

2. DRAW PARALLEL LINES
Mirror your single-line letter strokes with parallel lines.

3. CLOSE OFF THE ENDS
This is a great time to fix errors or tune up details.

4. FILL IN THE LETTER
Using the structure you've created, fill in your letter.

WHEN DRAWING TYPE, JUST RELAX AND LET THE LETTERS FLOW. DRAW YOUR LETTERS WITH CONFIDENCE. NEVER HURRY.

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

MIKE ROHDE

SKETCHNOTES TIP #4

Key Idea Icons

HIGHLIGHT IDEAS WITH SIMPLE VISUAL ICONS

Icons are a great way to mark the most important ideas or action items in your notes:

LOOK FOR NEW ICON IDEAS IN APPS, ON WEBSITES AND IN EVERYDAY LIFE. WHEN YOU LIKE AN ICON, STEAL IT AND ADD IT TO YOUR ICON LIBRARY.

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

MIKE ROHDE

SKETCHNOTES TIP #5

Task Icons

USE ICONS TO TURN YOUR IDEAS INTO ACTIONS

You can embed task icons right in your notes to identify next actions.
Try using some of these icons to visualize your tasks:

OPEN
Task you have to do

ACTIVE
Task you're working on

COMPLETED
Task you've completed

CANCELLED
Task scratched off the list

DEFERRED
Task deferred or delegated

USING ICONS IN YOUR NOTES TO AMPLIFY YOUR TASKS CONNECTS YOU TO THE WORK YOU DO.

MIKE ROHDE

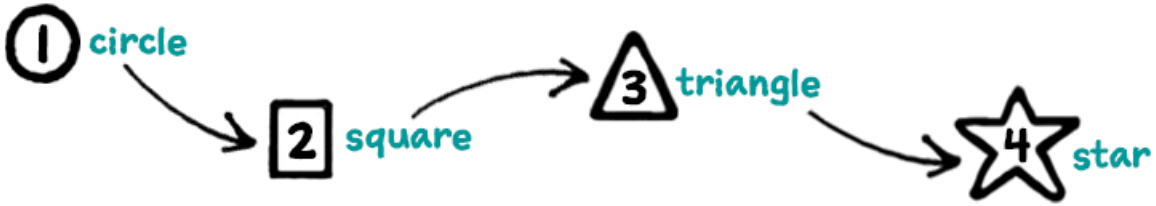
SKETCHNOTES TIP #6

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

Fun With Numbering

DOCUMENT PROCESSES WITH NUMBERED STEPS

Use numbers and arrows to suggest a workflow or show decision points in a process. Different shapes make the steps more distinct.



MAKE IT EASY ON YOURSELF OR ANYONE WHO FOLLOWS YOUR DIRECTIONS BY USING NUMBERS TO INDICATE STEPS IN A PROCESS.

MIKE ROHDE

SKETCHNOTES TIP #7

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

Fun With Bullets

SEPARATE AND HIGHLIGHT IDEAS WITH BULLETS

Use bullets to group related ideas or to highlight a single idea among drawings or text.
Here's a variety of easy to draw bullets to try in your sketchnotes:

●	▶	✱	→	★	♥
DOT	**TRIANGLE**	**BURST**	**ARROW**	**STAR**	**HEART**
The good ol' classic bullet	Put more focus on your ideas	Eye-catching, simple to draw	More emphasis on each idea	Amplify ideas with star power	Mark ideas you love

IF YOU BUILD A LIBRARY OF CUSTOM BULLETS, GIVING EACH A SPECIFIC MEANING, YOUR NOTES WILL GAIN ADDED DEPTH WHEN YOU USE THEM.

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

MIKE ROHDE

SKETCHNOTES TIP #8

Fun With Dividers

VISUALLY SEPARATE YOUR IDEAS WITH DIVIDERS

Dividers create structure and give ideas their own space. Here are a few samples:

SINGLE LINE		*simple and effective*
DOUBLE LINE		*adds a bit of gravity*
DASHED LINE		*separate, yet related*
DASH-DOT-DASH		*adds a touch of flair*
CLOUDS		*perfect for use under headings*

MIKE ROHDE

SKETCHNOTES TIP #9

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Fun With Containers

WRAP YOUR IDEAS IN HAND-DRAWN CONTAINERS

Your ideas gain depth and interest when you place them inside visual containers:

SPEECH BUBBLES

THOUGHT BUBBLES

REALISTIC SHAPES

GEOMETRIC SHAPES

ORGANIC SHAPES

COMBO SHAPES

DIMENSIONAL SHAPES

Get more sketchnoting ideas for OneNote in ***The Sketchnote Handbook*** and ***The Sketchnote Workbook*** at **rohdesign.com/books**

MIKE ROHDE

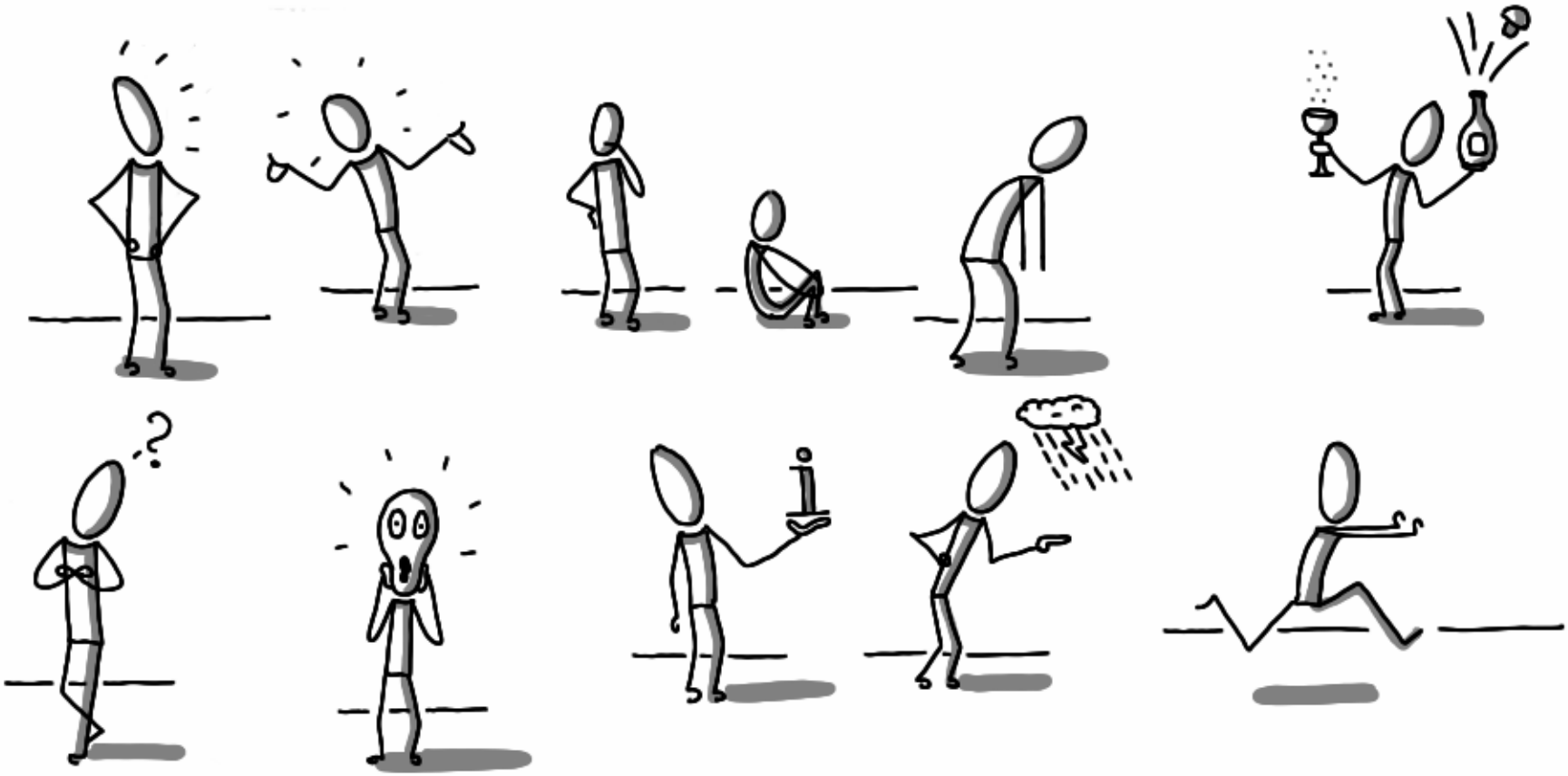
SKETCHNOTES TIP #10

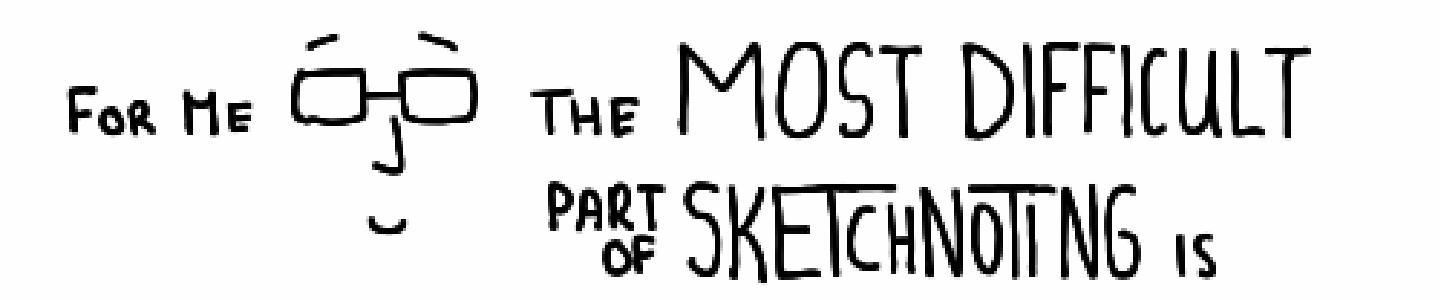
Drawing people for sketchnotes

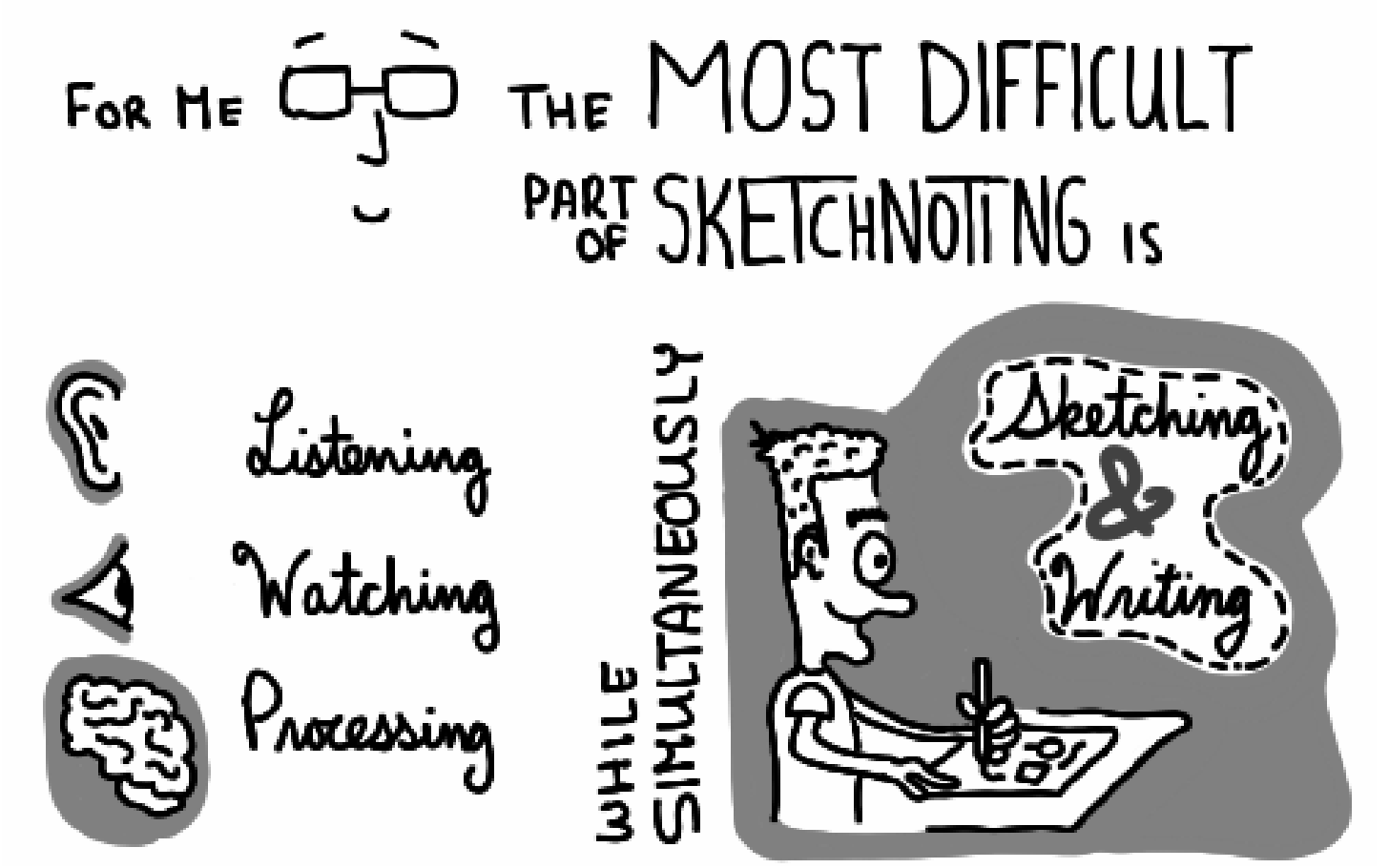
Why? - For visual interest

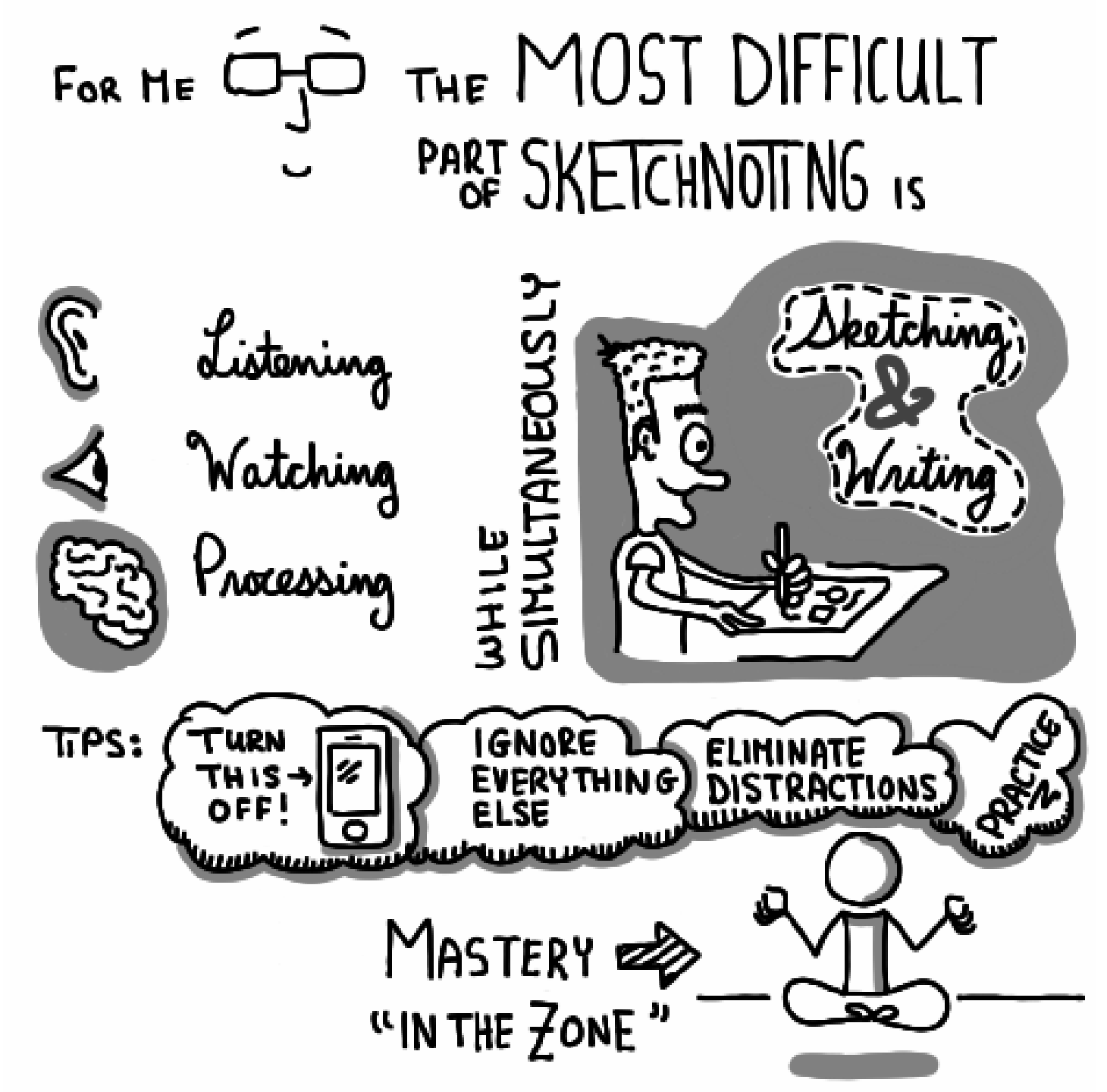
How? - Stick figures are simple & fast

- make them expressive
- e.g. Bikdolo akademie style




FOR ME
THE MOST DIFFICULT
PART OF SKETCHNOTING IS


FOR ME THE MOST DIFFICULT PART OF SKETCHNOTING IS
Listening
Watching
Processing
WHILE SIMULTANEOUSLY
Sketching & Writing


FOR ME THE MOST DIFFICULT PART OF SKETCHNOTING IS
Listening
Watching
Processing
WHILE SIMULTANEOUSLY
Sketching & Writing
TIPS:
TURN THIS OFF!
IGNORE EVERYTHING ELSE
ELIMINATE DISTRACTIONS
PRACTICE
MASTERY
"IN THE ZONE"

VISUAL VOCABULARY

ICONS, ICONS, ICONS

pencil

pen

world
global
internet

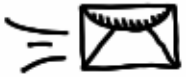
cell phone

sign

phone
(phone call)

angry

book


mail

e-mail

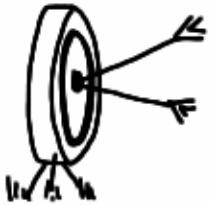
risk

publication

travel

date

gas (cylinder)


goal / target

brain

Swiss army knife
multi-purpose

boom!

calendar
schedule

computer

Holy Grail

scientist
smart guy

wireless
communication

medicine
drugs
drug delivery

bored

clueless
confused
uncertain

SKETCHNOTING & DAILY WORKFLOW

OU Directors Lunch

- Customer Council -
  - initial meeting discussed charter for group
  - representatives required to speak on behalf of the OU's

- Space Allocation / Management -
  - Got a space need? See the Space Board
  - NIST facilities can inspect OU space and recommend underutilized space to space board without OU involvement

WELCOME and OVERVIEW

Welcome to NIST

Thank you! for taking the time to come (teaching) (I know many of you have lots going on like) give us expert advice on future instruments at the NCNR
we really appreciate it!

Logistics

Here's your charge again
1. What do the new capabilities enable?
2. What should we build next?

- You have been assigned to one of nine topical BREAKOUT GROUPS
- Each has a chair, responsible for guiding/leading discussions and responsible for making sure the group has a written report within a week of the workshop. You should shoot for ~3 pages. Also the chair is responsible for a 10-minute presentation on Friday afternoon.
- A scribe from the NCNR has been assigned to assist the group in getting what they need.
- Collin Broholm & Rob Briber will write an executive summary.
- All presentations & write-ups sent to Rob Briber

- Your **Task** needs some context setting. This morning you'll hear science talks from Collin, Norm, and Mike. Then you'll hear talks on enabling capabilities from Chuck Mielke, Dan Hussey, and Chuck Majkrzak.
- During this workshop there will be NCNR staff, including myself & Dan Neumann, available to provide further context on the NCNR capabilities. Please feel free to use us to help you as you need it.
- For some initial context on the Expansion and where it brought us to today, I'll cover some of the development highlights.

MY SLIDES

8 YEARS AGO IN 2006

- We asked the user community for input on the next generation of neutron instruments and enabling capabilities
- Some of you have returned that participated in 2006
- They gave us input that we could use as a direct part of our multi-year cold neutron expansion.
- We listened — and the NCNR has been literally, physically transformed
- A new cold source
- A new advanced cold neutron guide system
- New instruments
- Polarized beam capabilities

With just 2 more instruments left in development, vSANS and CANDOR, we now find ourselves at a point where we want more input from you.

Your **Charge** is two-fold:
1. What new research opportunities could be addressed by new capabilities in the NCNR Expansion?
2. What are the new measurement capabilities that would open new research opportunities for the U.S.?

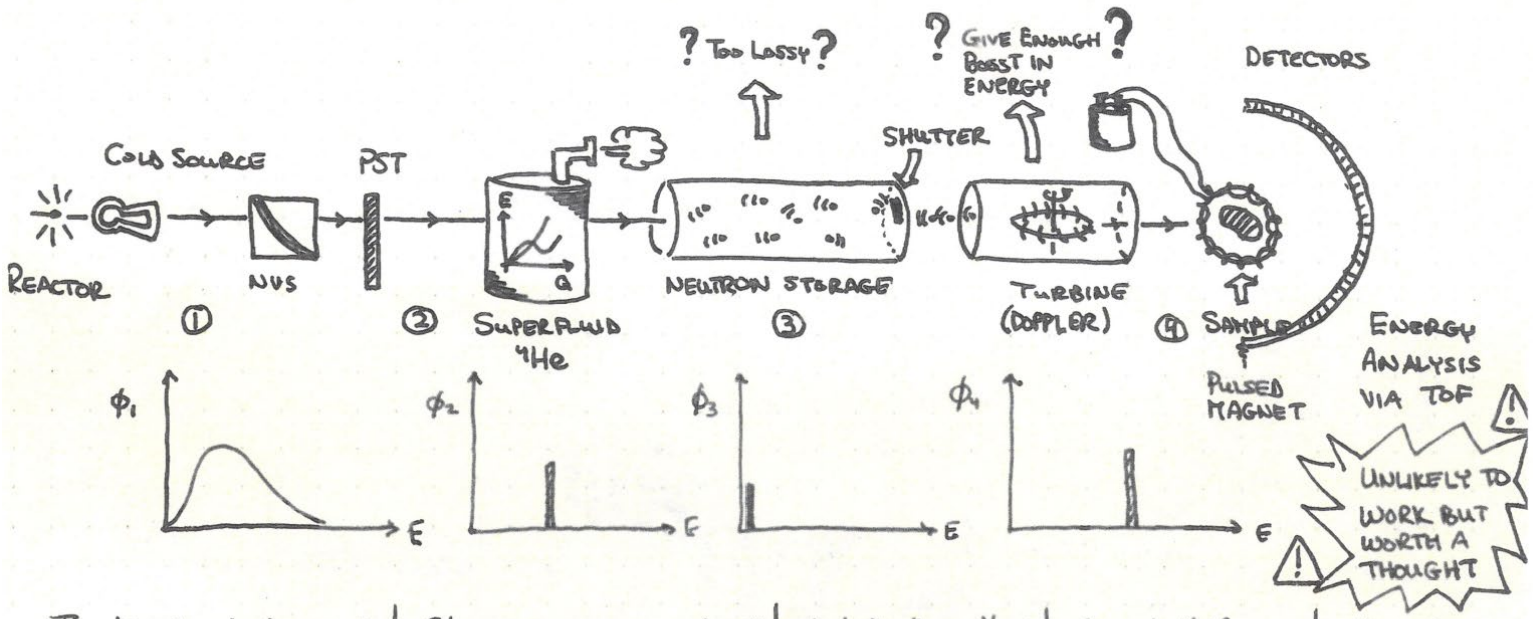
Think BROADLY → New instruments, Upgraded instruments, New or better sample env.

This is about enabling the best science through neutron scattering

What do the users need?

Crazy Idea for Matching to a Pulsed Magnet

Discussed with Chuck Mielke (NHMFL) and Nick Butch (NCNR)



The Nojiri pulsed magnet has a rep rate of 5-30 minutes. So need to synchronize a high peak flux neutron pulse from a steady state source.

Choose a narrow wavelength band from the cold flux distribution with a velocity selector followed by a phase space transform chopper.

Inelastically scatter neutrons from superfluid ^{4}He to get very cold neutrons that can be stored and built up in a magnetic trap.

Open shutter when ready to fire off magnet. VCN are given energy boost from Doppler shifter and strike sample.

Use TOF or some other energy analysis and detect the neutrons in a multi detector.

Unfortunately current traps can store only a few neutrons / cm^3

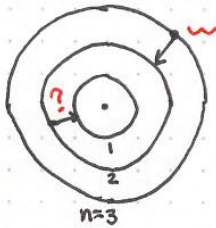
Adventures Inside the Atom
Detecting Neutrons with Far UV Radiation

10.14.2014

Charles Clark

It's hard to imagine doing this work anywhere else other than NIST.

NIST = NCNR + SURF III + CNST



$\lambda = 656$ nm
$\Delta n = 3 \to 2$
Balmer α line

$\Delta n = 2 \to 1$ predicted but not observed
$\lambda = 1216$ Å

Lyman α line difficult to see due to impurities

Bohr model... still useful here.

CC asked R Vest: what's the mean free path of Lyman α in air?

RV: Not sure but moisture may be a problem.

Lyman α blobs are largest, most massive objects known

$\leftarrow 3\times10^5$ LY $\rightarrow$

Absolute Radiometry
A DISMAL SCIENCE

?

Don't distract me with your questions!

Far UV is hard b/c it bridges x-ray to radio measurements

Bill Phillips

Clark

A chance encounter with Tony Leggett steered CC to trying to understand why a slow neutron caused a phase change in SF ^{3}He at mK temps.

Werner's Rule of Twos

2 Å
20 meV
2000 m/s

How do you detect thermal neutrons? They're not charged.

You need the help of **GOD**

$n + {}^3He \to p + t + 0.76$ MeV
$n + {}^6Li \to \alpha + t + 4.87$ MeV
$n + {}^{10}B \to {}^7Li + \alpha +$ (2.8 or 2.3 MeV)

But what happens to the 2 electrons in the $n + {}^3He \to p + t$ reaction?

M. Arif ⇒ "No one knows."

Neutron detection
A DISMAL SCIENCE

M. Coplan ⇒ "I know a guy. He sez to look for Lyman-α"

Found it — but not by the mechanism they originally thought

Lyman α neutron detector

Patent # 7,791,045

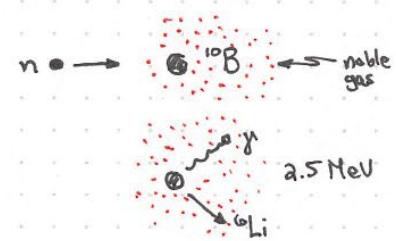
R&D 100 recipient

^{3}He crisis ⇒ explore other gases than ^{3}He

^{10}B

"Reticulated vitreous carbon foam" for possible lattice gas
C. Lavelle (JHU) acquired RVC foam but fab technique is proprietary

Detection Process



Excites noble gas creating excimer (excited noble gas atom + unexcited)

Excimer decays releasing far UV light

SKETCHNOTING SCIENCE

Publications & Talks

MY WORKFLOW FOR SKETCHNOTING TECHNICALLY DETAILED SCIENCE TALKS

① PLAN AHEAD

When is the talk?
Schedule prep time

PREP IS CRITICAL

② PREPARATION

Find out as much about the talk beforehand

- Abstract for the talk
- Speaker's published work
- Speaker's website
- Slides on-line from other presentations (PPT)

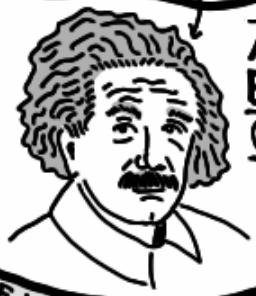
Think of some quick doodles & icons that might come in handy.

Expand vis vocab

Create the title area with speaker's name, affiliation, and date.

Find photo on-line and include a quick sketch of speaker.

TRACING IS OK!



ALBERT EINSTEIN
General Relativity
ETH Zurich
05.02.1912

③ MAKE LIVE SKETCHNOTES

NOW I have enough background so I can listen a lot, write down the big ideas & sketch the major plots/graphs.

HIGH POINTS

Mining & Sorting

④ REFINE THE NOTES AFTER THE TALK

Clarify points with speaker after the talk.

Clean up plots/graphs & sketches after. Check with speaker's pubs if available or if slides are available.

⑤ SHARE SKETCHNOTES WITH COMMUNITY (YOU!) AND THE SPEAKER

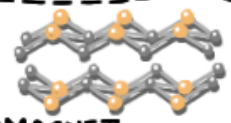
- ↳ Speakers seem to like it (few SN-ers in phys. sci.)
- ↳ Community helps me improve

IT IS A LOT OF WORK BUT IT'S WORTH IT FOR ME!

@Rob_Dimeo

05.03.2015

TiAu



An Itinerant Antiferromagnet Metal Without Magnetic Constituents

E. Svanidze et.al., Nature Communications
DOI: 10.1038/ncomms 8701
13 July 2015

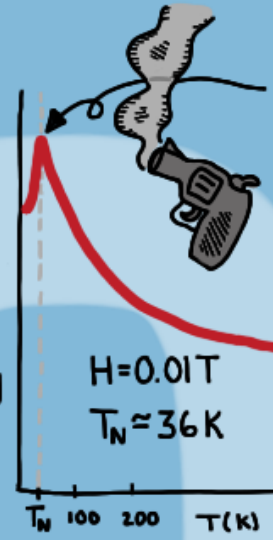
Ti → magnetic
titanium

Au → magnetic
gold

Local Moment Magnetism
magnetic moments localized in real space

Itinerant Magnetism
moments localized in reciprocal space

$\chi_m = \frac{M(T)}{H}$
magnetic susceptibility



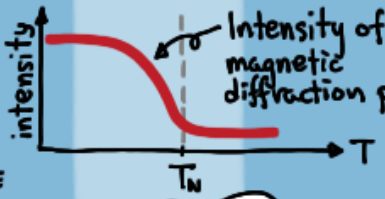
Is cusp in χ_m a "smoking gun" for anti-ferromagnetic ordering ground state?

It's a good indicator

...↑↓↑↓↑...

+ μSR measurements revealed static magnetic order

+ We can use **NEUTRON DIFFRACTION** to measure magnetic structure → Long Range AFM Order



Intensity of magnetic diffraction peak

On their own, neither Ti nor Au are magnetic.

But we can combine them to get TiAu.

Not really how you make TiAu!

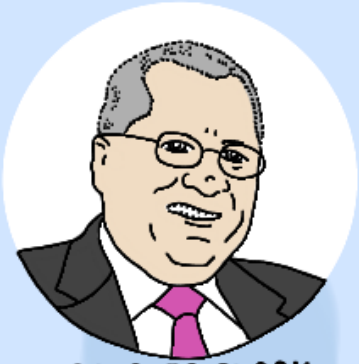
TiAu is MAGNETIC.
Anti-ferromagnetic to be precise.

Why is this important?

1. It's rare – TiAu is only known itinerant AFM without magnetic constituents.
2. It can help scientists develop a better understanding of magnetism in metals, esp. itinerant magnetism vs. local moment magnetism.

SKETCHNOTE: Rob Dimeo 07.25.2015

Roman Barankov, Michael Huber, Muhammad Arif, David Cory, Dmitry Pushin

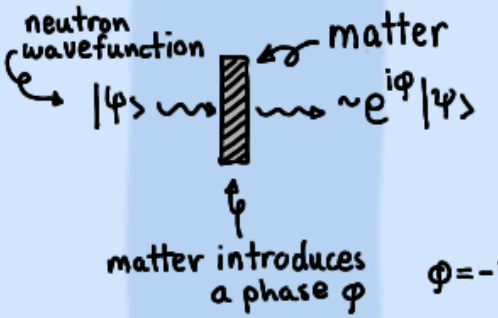


CHARLES CLARK

Neutron Wave Control

07.29.2015

WE KNOW HOW TO CHANGE THE NEUTRON PHASE

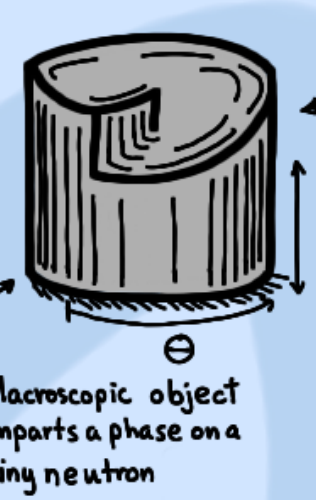


Ok... that's simple enough

$\varphi = -N b_c \lambda d$

DESIGN THE MATERIAL'S SHAPE to ENCODE OR IMPRINT

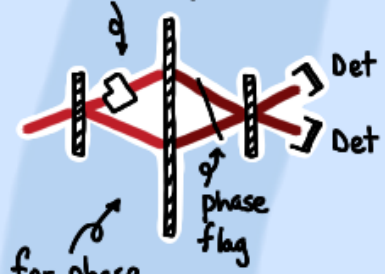
information in the phase, φ



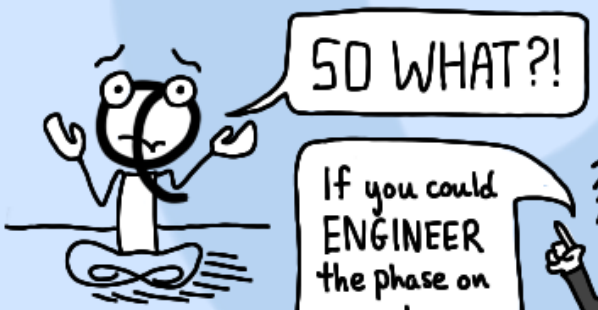
$h = h_0 + \frac{h_s}{2\pi}\theta$

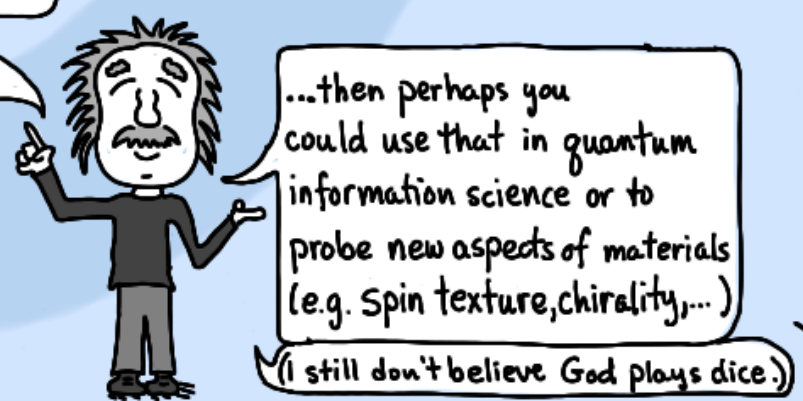
Can change the neutron's orbital angular momentum, imprint a phase

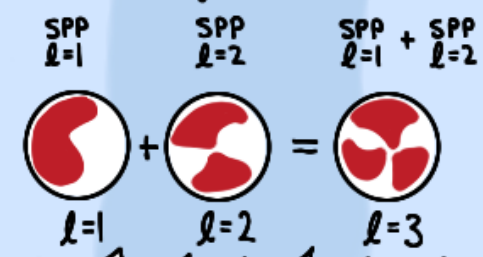
SPP is inserted in one leg of a Mach-Zender neutron interferometer (NI)



NI for phase analysis







SUCCESS! ADDITION OF ANGULAR MOMENTA

SKETCHNOTE: Rob Dimeo

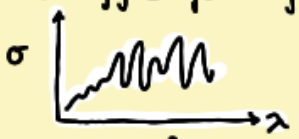
A Neutron Microscope for Energy & Materials Research

Dan Hussey
NIST
09.01.2015

2006

NIST BT2
Thermal neutron imaging
GM + DoE + DoC

Bragg edge imaging



$\sigma \sim F_h \lambda^2$

→ Cold neutrons are ideally suited!

Cold neutron imaging

NG-6 in NCNR guide hall
8×8cm flat field
Peak at 5Å
$L/D = 200$ ⇨ $1\text{-}2 \times 10^8$ n/cm²/s
10× BT2

Plans: Pol n imaging
Talbot-Lau interferometer
Neutron microscope

"For the purpose of this talk, I want you to visualize Hooke's original microscope."

Talbot phase imaging

10^3 more sensitive to changes in density & thickness
Better CONTRAST

Polarized neutron imaging

Flat window cells for uniform flat fields

in-situ polarization in development

Wolter Optics

Chandra x-ray telescope
Good off-axis imaging

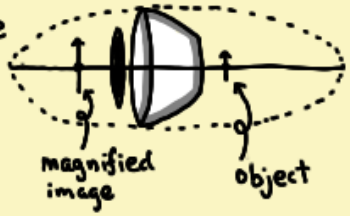
100+ flux increase

10× magnification

1 μm resolution

⇩

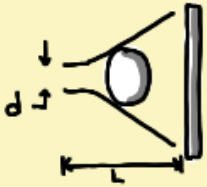
"We can build a neutron microscope!"



nesting 14 mirrors with m = 1.2 guide ⇨ ×100 BT2 with 10μm resolution

SANS use – focal spot λ-independent

Pinhole optics



1 μm resolⁿ @ 10^6 n/cm²/s

⇩

1 n every 100s

So.... what will we be able to do with this neutron microscope?

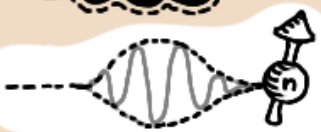
1. transient (1 sec) processes with 10μm resolⁿ
2. Rapid 10μm resolⁿ tomography
3. 1 μm resolⁿ radiography in 2-20 minutes
4. High resolⁿ imaging with bulky sample env.

SKETCHNOTES: @Rob_Dimeo #ECNS2015

NEUTRONS as QUANTUM OBJECTS

Helmut Rauch
Atominstitut Technische Universität, Austria

Walter Hälg Award Ceremony
09.03.2015



250 kW TRIGA reactor

AUSTRIA

1st Gd neutron detector

POLARIZED NEUTRONS Focus

SF chopper
SF selector
Dynamic Polarization

"Wooden spectrometer"

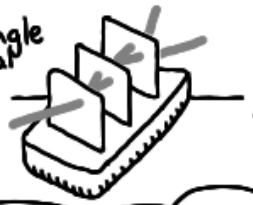
Radiography & tomography

Bonse-Hart camera

neutron optics resonator

Overlooked Supermirrors & multilayers

NEUTRON INTERFEROMETER



neutron in the NIF at a time!

Self-interference

NIF Applications

Spinor symmetry
$\psi(2\pi) = -\psi(0)$
$\psi(4\pi) = \psi(0)$

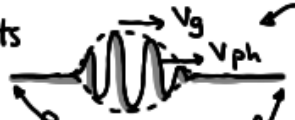
Spin Superposition
$\uparrow + \downarrow = \leftrightarrows$
not $\uparrow\downarrow$

Quantum beat effect w/ resonance flipping magnetic Josephson effect
$\Delta E \sim 10^{-18}$ eV!

He discussed Berry Phase robustness too!

21st CENTURY APPLICATIONS

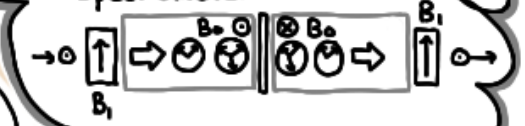
Wavepackets
$\lambda = h/mv$
$i\hbar \frac{\partial \psi}{\partial t} = H\psi$



extends over all space

Can measure WP structure!

Neutron Spin Echo Spectrometer



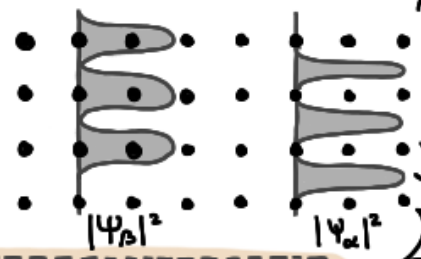
NSE is the BIGGEST quantum device on Earth!

Observation of Schrödinger cat-like states

Cliff Shull's measurement of Pendellösung oscillations

Evidence for Dynamical Diffraction

Dynamical Diffraction



Always 2 wavefields in xtal

Wavefnc can be calculated!

... + much more! See text by Rauch & Werner 2nd ed.

SKETCHNOTES: @Rob_Dimeo

Engineering Functional Magnetic Properties Through Interfacial Discontinuities

Alex Grutter - NCNR
UMD - CNAM Colloquium
09.24.2015

Functional Magnetic Properties

Key control knob to control magnetism at the nanoscale

e.g. for magnetic logic devices

Interfacial Discontinuities

→ Sudden chemical changes band structure

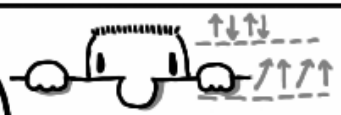
KNOBS
- Tune interfacial symmetry
- Tune E fields
- Tune chemical migration

Electric Field Control

Wanna study a single unit cell interface? Re-evaluate your life's choices!

M extremely sensitive to charge transfer → E control M → ? (yes!)

Emergent Magnetic Phenomena

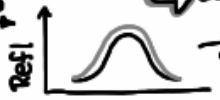


$CaMnO_3$ – AFM insulator
$CaRuO_3$ – paramagnet
But combined in heterostructure?

↑↑ ⇒ Ferromagnetism at interface

How thick is this interface?

PNR
- nuclear depth profile
- magnetic depth profile
- doesn't see magnetic contamination

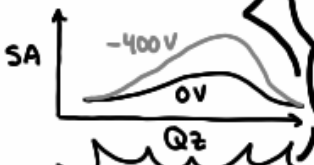


→ magnetic layer 1 unit cell thick

Theory
- → Changes superexchange to double exchange in first unit cell of $CaMnO_3$
- → Stabilizes canted AFM

$SrTiO_3$ has RIDICULOUSLY high dielectric const
→ move lots of charge carriers
$0.2 \times 10^{14}/cm^2$ @ ±100V

SA = (↑↑ − ↓↓)/(↑↑ + ↓↓)
Spin asymmetry



PNR – structure at 0V and −400V is same
→ Any changes must come from magnetism

Ferromagnetism from 1 layer at the interface

Interfacial Symmetry

m even 1 μ_B/Mn
m odd 0.5 μ_B/Mn

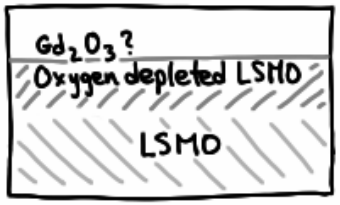
m $CaMnO_3$ unit cells

Structure NOT perfectly cubic but tilted in & out of phase

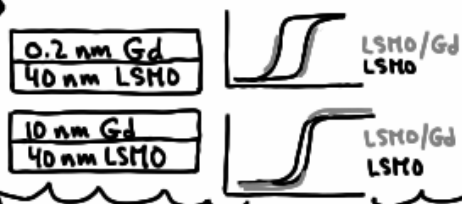
Structural coupling?
Symmetry mismatch at interfaces?

Chemical Migration

$La_{0.7}Sr_{0.3}MnO_3$ / Gd films
$La^{3+}_{0.7}Sr^{2+}_{0.3}Mn^{3.3+}O^{2-}_3$ FM with DE

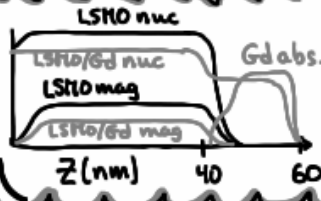


Since Gd is big O getter



Thickness-dependent magnetism

PNR ⇒ 10 nm Gd, 40 nm LSMO

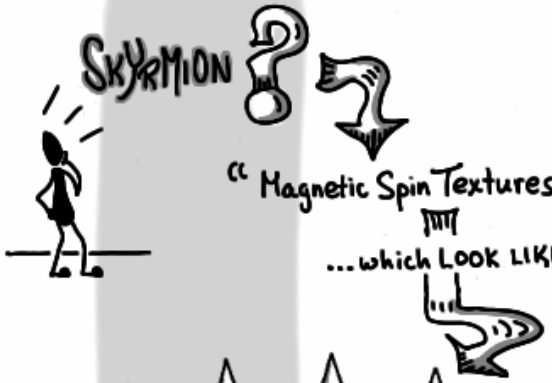


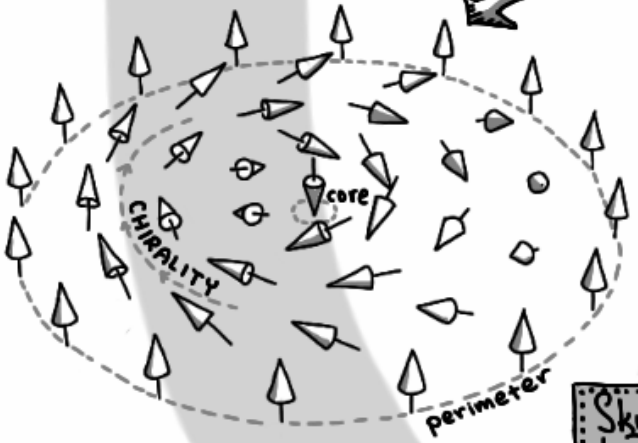
Emergent magnetic properties at oxide interface result in highly tunable magnetic states

SKETCHNOTES: @Rob_Dimeo

Realization of Ground State Skyrmion Lattices at Room Temperature

Dustin Gilbert et.al.
DOI: 10.1038/ncomms9462





in-plane CHIRALITY

mirror image not equal

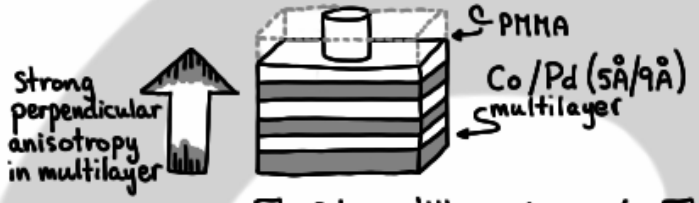
out-of-plane core & perimeter have opposite orientations

Skyrmions are topologically protected

i.e. object can't be deformed into a different topological structure

Possible robust info storage medium

How to make a SKYRMION (VORTEX/SPIRAL)



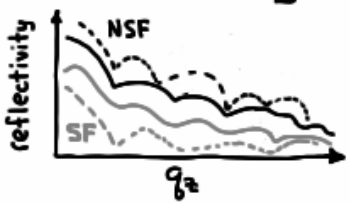
1. e^- beam lithography used to cut asymmetric holes into PMMA layer
2. Irradiate with 1 keV Ar^+ ions. Exposed regions develop in-plane anisotropy. Rest of multilayer remains unaffected.
3. Lift-off procedure yields Co nanodots with in-plane anisotropy.
4. Field sequence applied to yield skyrmion texture:
   - i. Co/Pd layer saturated & removed
   - ii. Small in-plane field applied to Co dots
   - iii. Field applied as in-plane field removed.
   - iv. Last field removed.

et voilà... SKYRMIONS At room temperature

How to Measure SKYRMIONS

- Other techniques used but PNR results shown
- OOMF simulations predict that recipe above yields the skyrmion structure.

Polarized Neutron Reflectometry



PNR data consistent with OOMF model and the designed skyrmion structure.

In-plane magnetization extends 3nm into the Co/Pd multilayer indicating an imprinted interfacial layer – but no deeper.

Artificial skyrmions imprinted by vortex state Co dot into the Co/Pd underlayer

SKETCHNOTES: Rob Dimeo 10.09.2015

THE FISHER HOUSE FOUNDATION

Dave Coker, President
(and Employee #1 at FH in 1994)

ZACHARY FISHER
Founder

When you get the call that a loved one has been injured,

YOU WANT

1. best medical care
2. be there with him/her

Dave Coker's job highlight: visiting families in the homes

DIGNITY should be afforded to all those who served in the armed forces and their families.

ZF felt he owed a DEBT to those who SERVED

"What can I do to honor our vets?"

When Fisher saw a family visiting their loved one in the hospital and saw their suitcases

Where are they going to stay?

65 houses to date

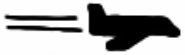
250,000 families served

26,000 families supported in 2015

70 houses by January

9 days average length of stay

Transportation is biggest barrier to families being there



FH partnered with airlines

$12/airline ticked

We need something like the Ronald McDonald House.

A HOME AWAY FROM HOME

House is a CATALYST for SUPPORT

NO CONTRIBUTION IS TOO SMALL

2015 NIST CFC KICK-OFF | SKETCHNOTES: @Rob_Dimeo

Reinventing Lighting

John Edmond, Director
Advanced Optoelectronics
Cree, Inc.
10.23.2015

Figures of Merit

CRI

Color Rendering Index – How "true" object colors appear under "white" illumination

CRI = 100 for incandescent

Does your "rare" steak look like it?

Vividness

Color saturation relative to the blackbody

CRI = 78 looks better than CRI = 94 for colorful objects.

CRI not good enough!

Correlated color temperature

"Shade of white from yellowish to bluish"

incandescent 2700 K | halogen 3000 K | white 3500 K | fluorescent 4200 K | metal halide 5500 K

Lumens & LPW

Lumens per watt

Losses matter!

1. optical
2. driver
3. thermal

Kid's old Holly Hobby ovens baked by lightbulb

LED's will be the most efficient mainstream light source

LPW > 185 for roadways possible

Goal: Eliminate obsolete inefficient lighting

~A brief history of lighting~

oil lamp	gas lamp	limelight	Edison light bulb	fluorescent
1783	1810	1826	1879	1938

Current technology is 100 years old!

Gas lighting
- little light
- lots of heat
- poison

Cree's Approach

Vertical integration
- lamps
- materials

$181M invested in 2014 in R&D

SiC/GaN chip basis

A photon is a terrible thing to waste

But phonons are bad... HEAT!

Why LED lighting?
- energy availability & cost
- environment
- Safe (Hg is a neurotoxin (CFL))
- Better visual environments
- Immediate savings
- Long lasting
- Clean & safe for developing countries

LEDs lit the 2015 Super Bowl

SKETCHNOTES: @Rob_Dimeo

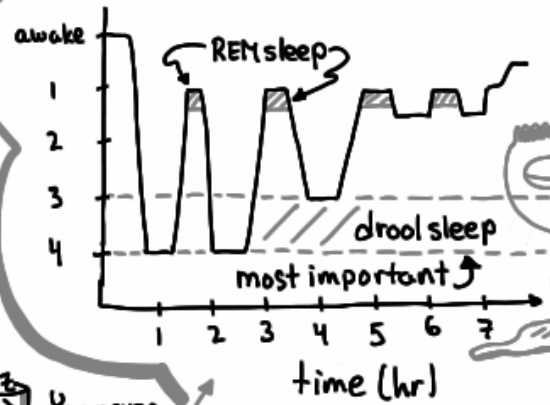
MANAGING FATIGUE IN THE WORKPLACE

11.06.2015

Scott Shappell
Embry-Riddle Aeronautical University

In temporal isolation, your body naturally shifts to a 25 hour circadian cycle

STAGES OF SLEEP



Drool sleep = restorative
healing
building muscle

Sleep 8 hrs in Peak of CR? ⇩ feel awful

Sleep 8 hrs in trough of CR? ⇩ feel great

How tired are you?

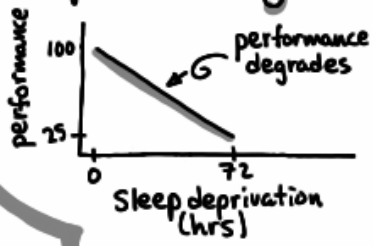
The worst person to ask is you!

Fatigue symptoms not always the best indicator of performance.

"SLEEP DEBT"

You never really catch up!

How much sleep do you need?



Physical & mental workload > normal limits? Need more sleep.

5 hrs uninterrupted core sleep during trough needed to maintain perf in the lab.

Sleep > 10 hours ⇩ "sleep drunkenness"

CIRCADIAN RHYTHMS (CR)

Biological clock

Core temperature follows circadian rhythms closely.

Problem with SHIFT WORK

Need to perform when body thinks it should be asleep.

Best measure of CR is body's core temperature

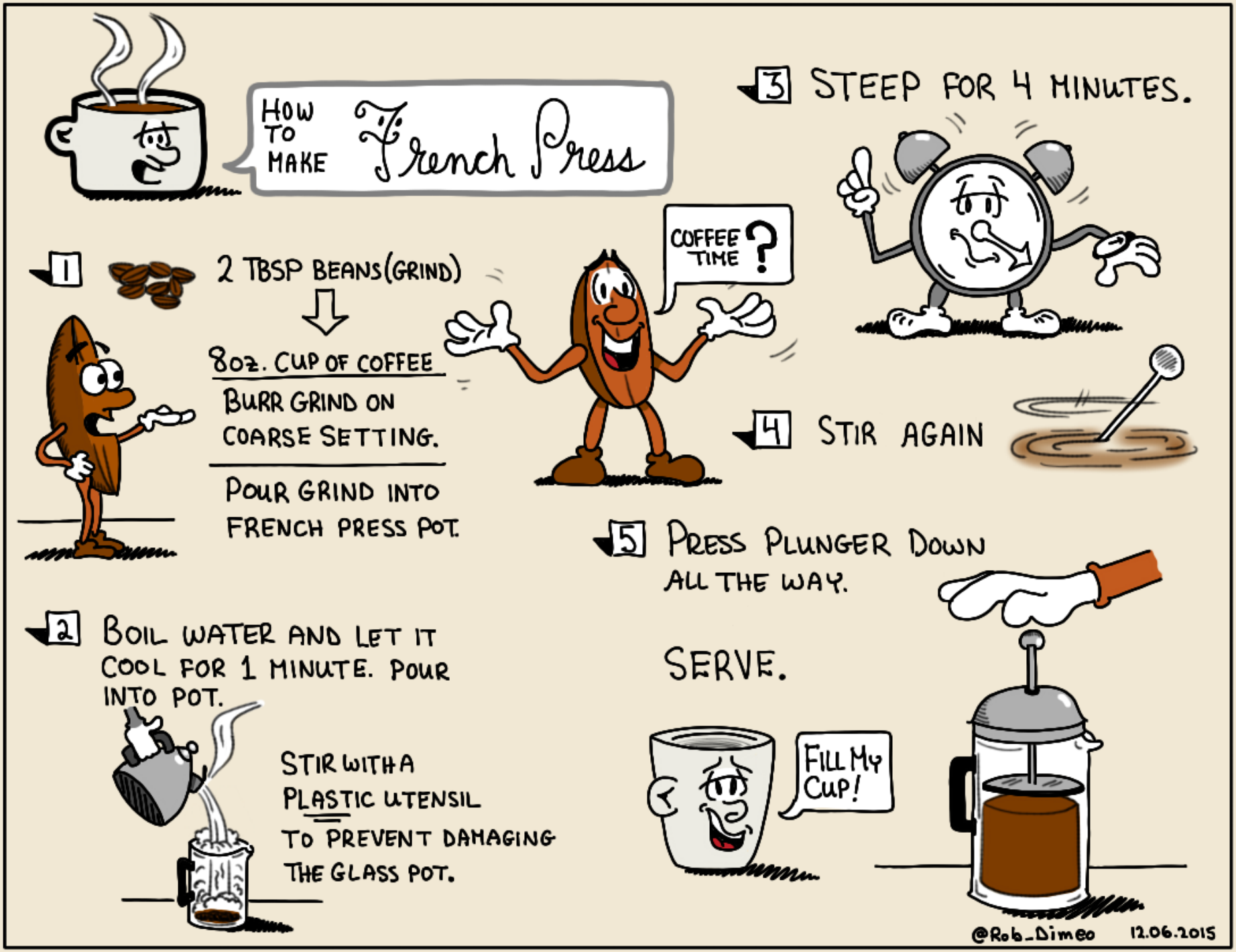
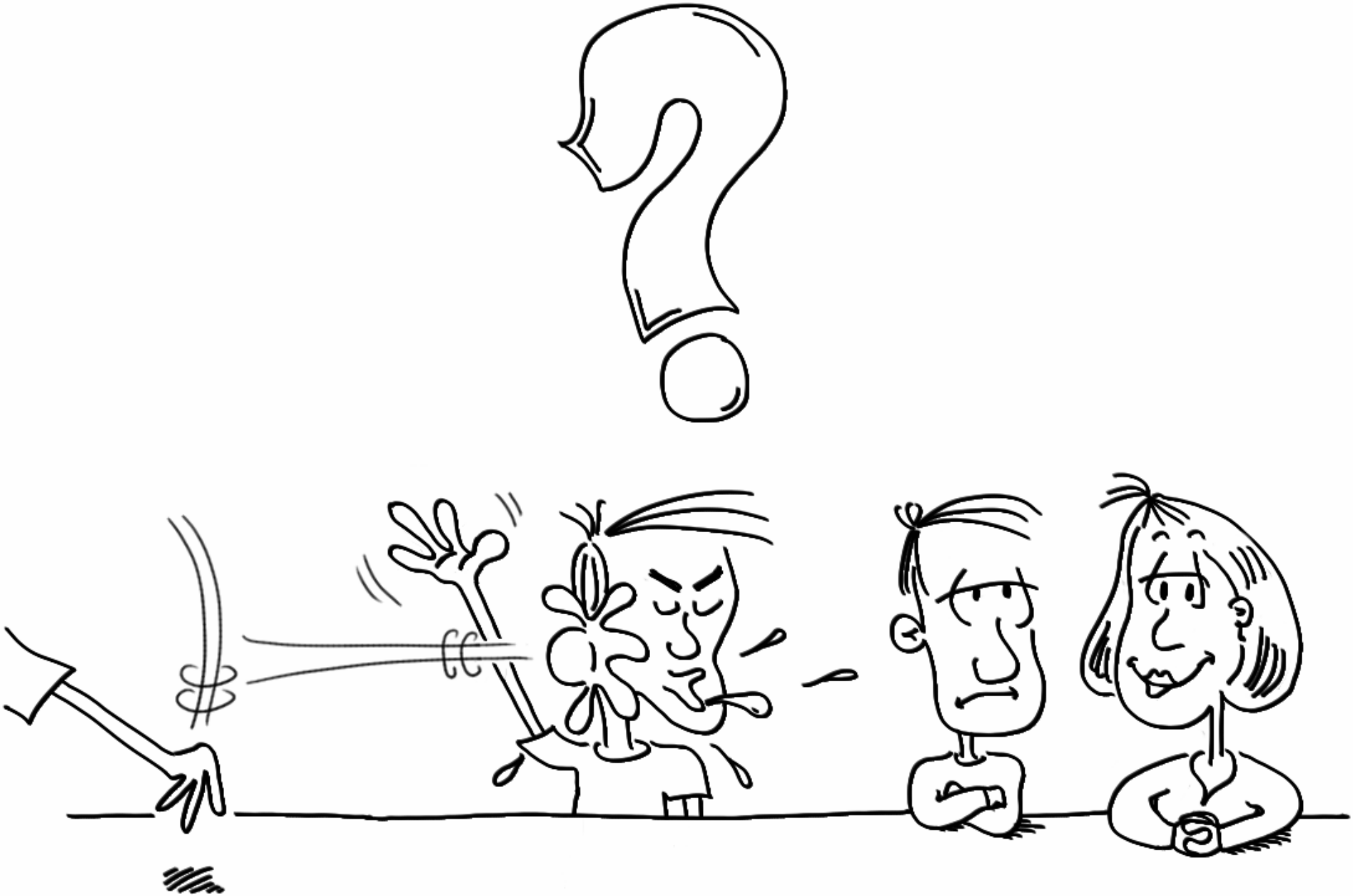
Strategic naps important when sleep not an option

10-15 minute naps restorative

Morning person vs. Evening person

attitude only
no performance difference

SKETCHNOTES: Rob Dimeo


How to Make French Press
1
2 TBSP BEANS (GRIND)
8oz. CUP OF COFFEE
BURR GRIND ON COARSE SETTING.
POUR GRIND INTO FRENCH PRESS POT.
COFFEE TIME?
2
BOIL WATER AND LET IT COOL FOR 1 MINUTE. POUR INTO POT.
STIR WITH A PLASTIC UTENSIL TO PREVENT DAMAGING THE GLASS POT.
3
STEEP FOR 4 MINUTES.
4
STIR AGAIN
5
PRESS PLUNGER DOWN ALL THE WAY.
SERVE.
FILL MY CUP!
@Rob_Dimeo
12.06.2015