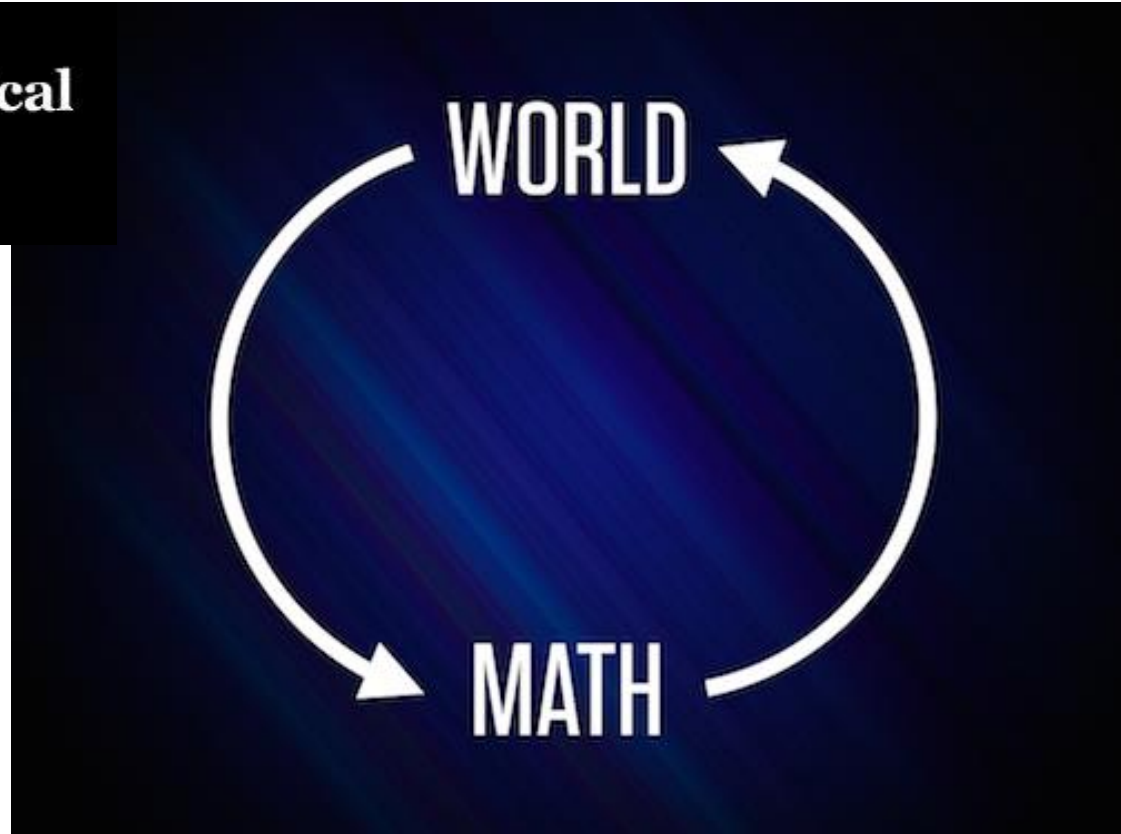




# Modeling: fun, effort and use



Kristiansand  
Peter Uylings  
August 10, 2016

# The curiosity, urge and need to simplify matters..



# Every model may be oversimplified by wishful thinking....

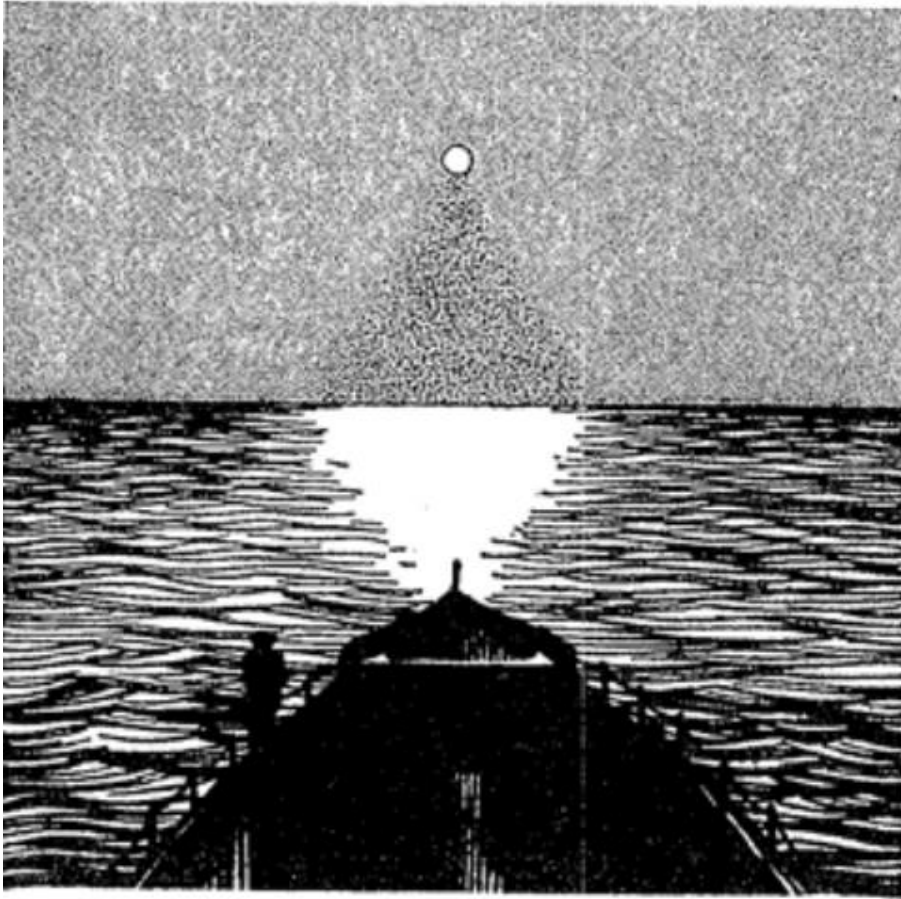


Fig. 94. Een nog onverklaarbaar contrastverschijnsel.



# Layout

- Models to start with
- Medical imaging (Exam 2016-1)
- Jupiter (Exam 2016-2)
- Compex Exams Sahara
- Fun interlude (student animations)
- Façade wave
- Dafne & Ireen

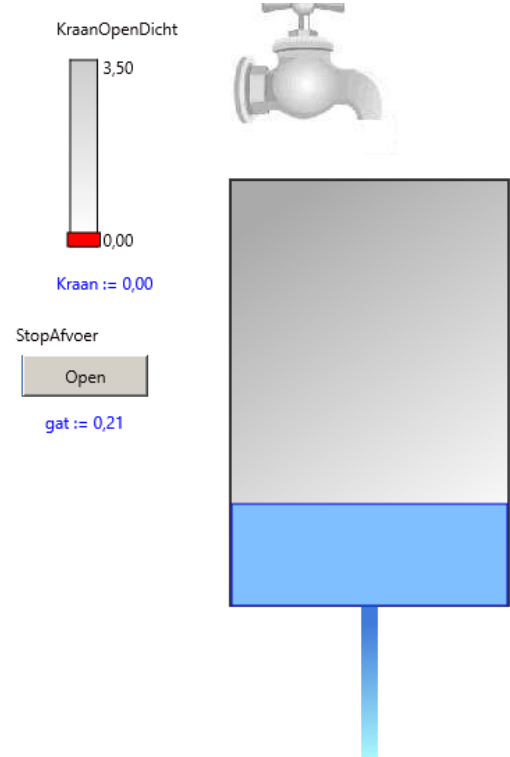
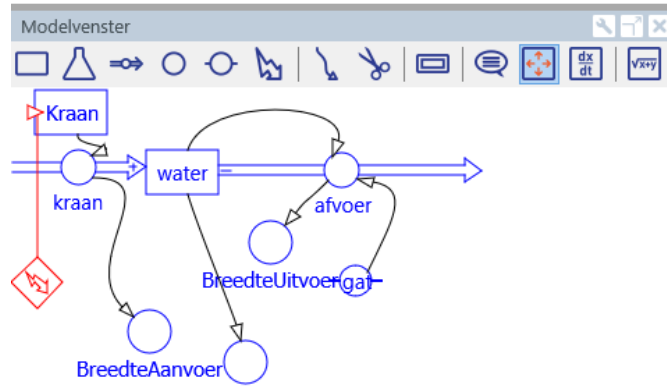
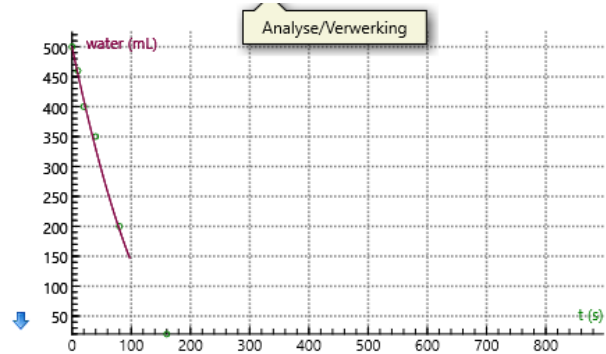
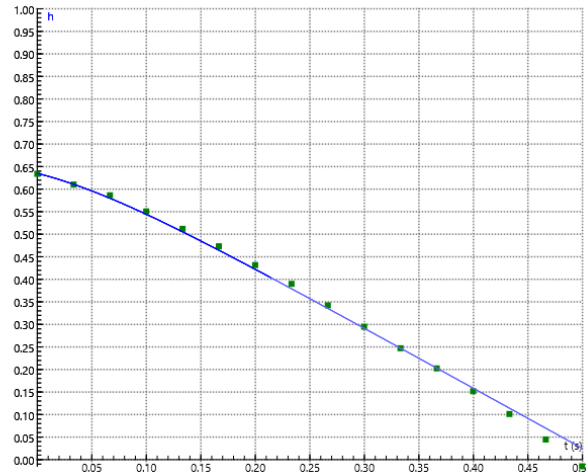
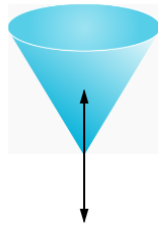
# What I will *not* talk about..

(unless you ask me to)

- Quantum mechanics (hydrogen, deuteron, particle-in-a-box...)
- Function peeling
- Cycloids: disk, elbow
- Somersault into pieces
- Yoyo
- GPS, jumping pole, bungee trampoline, slinky.... lots more!



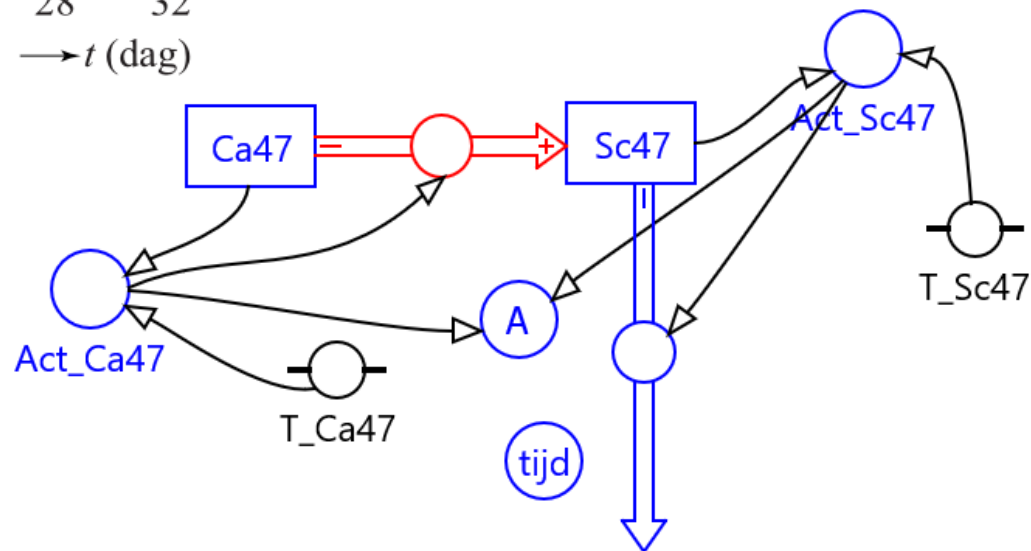
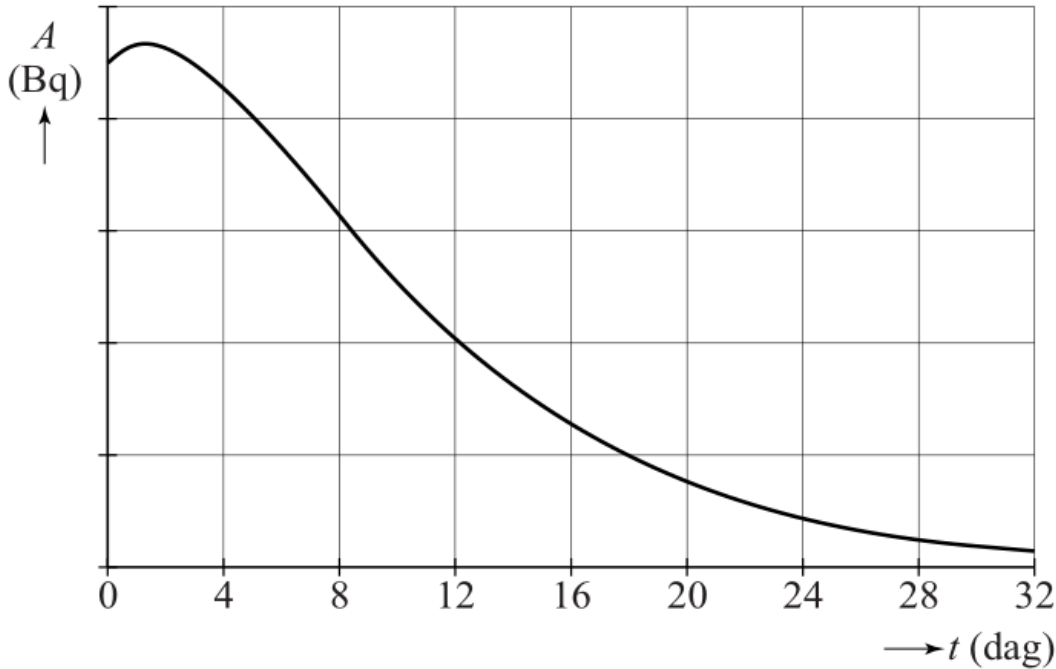
# Some basic models to start with: Cone, Measuring Cup





# Medical imaging (2016-1) UvA

## find the half-life of Scandium-47



# And then there is Jupiter.. (2016-2)

## model 1

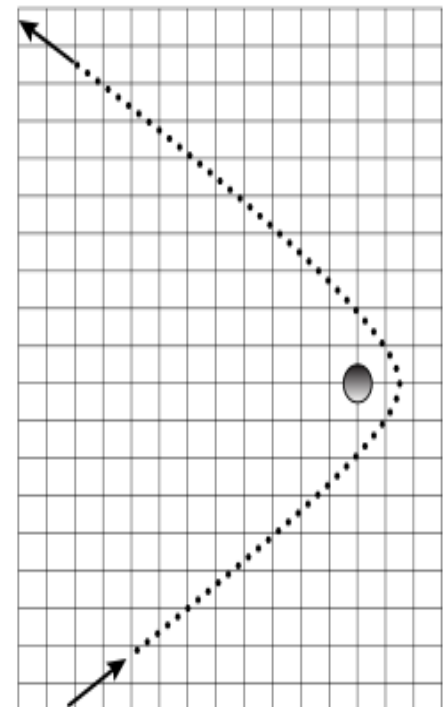
In dit model beweegt de verkenner om een stilstaande planeet. Zie figuur 1.

Christy beweert dat er uiteindelijk snelheidswinst ontstaat doordat de verkenner naar de planeet toe steeds sneller gaat.

12 Waarom heeft Christy **geen** gelijk?

Om uiteindelijk snelheidswinst te boeken is het dus noodzakelijk dat de planeet zelf een snelheid heeft. Dit bestuderen ze in model 2.

figuur 1

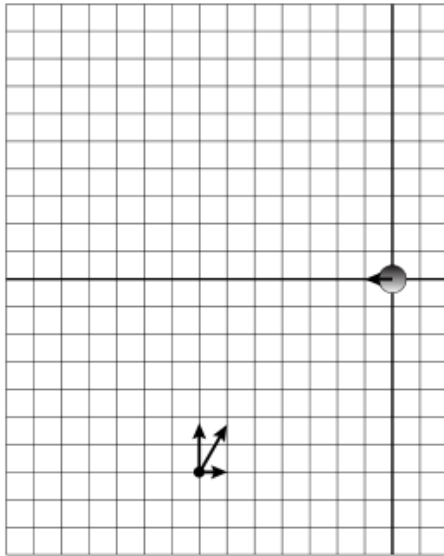




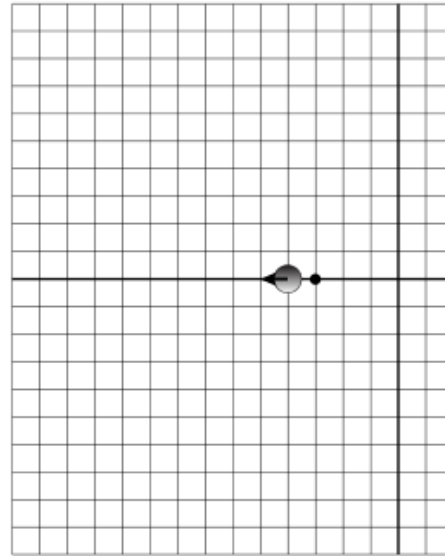
# Jupiter's gravity fly-by & animation

- may the satellite be considered a point?
- may Jupiter be considered a point?
- is Jupiter's velocity to be considered?
- may Jupiter's rotation be neglected?
- may energy-loss be neglected?
- is Jupiter's momentum change essential?
- should the Sun's gravity be added?
- is it essential for the force to be attractive?

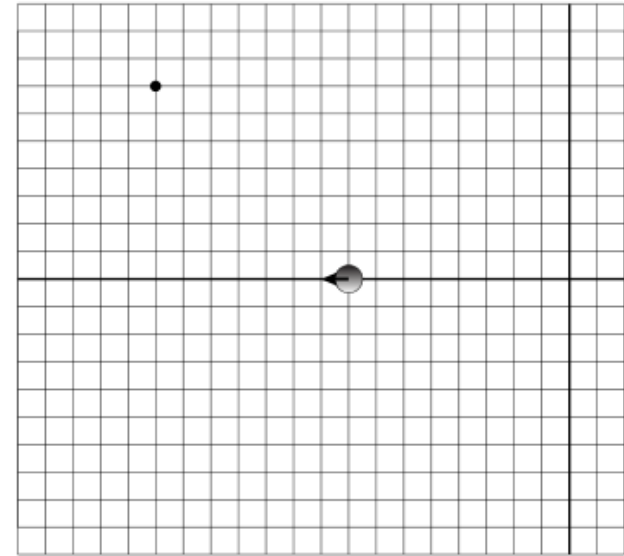
figuur 3a



figuur 3b



figuur 3c



De snelheid van de verkenner vóór de passage noemen ze  $v_{\text{voor}}$ ,  
de snelheid ná de passage noemen ze  $v_{\text{na}}$ .

Model 2 levert eindsnelheden, die je kunt berekenen met de volgende formules:

$$v_{\text{na},x} = 2v_j - v_{\text{voor},x} \quad (1)$$

$$v_{\text{na},y} = v_{\text{voor},y} \quad (2)$$

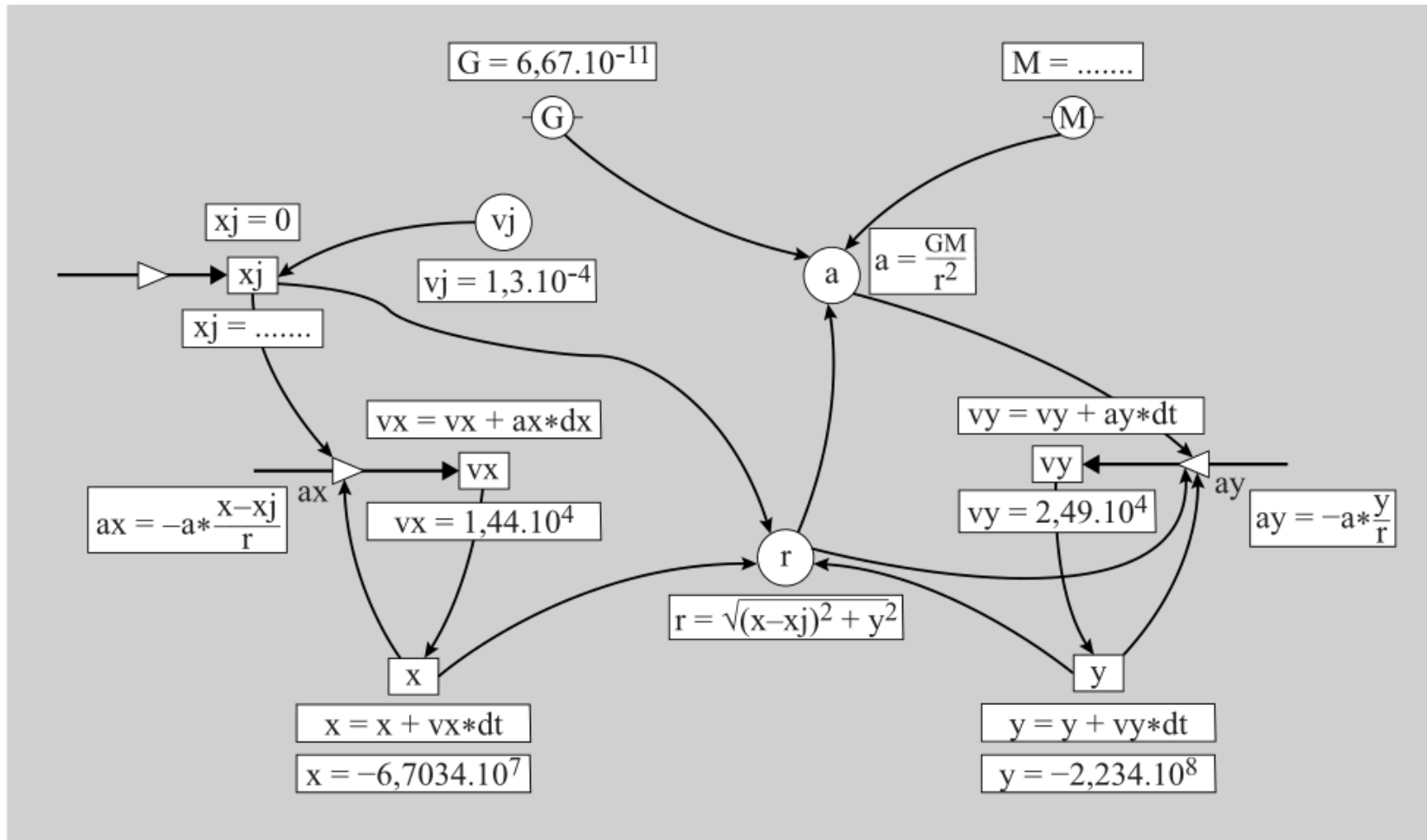
# Textual modeling

figuur 4a

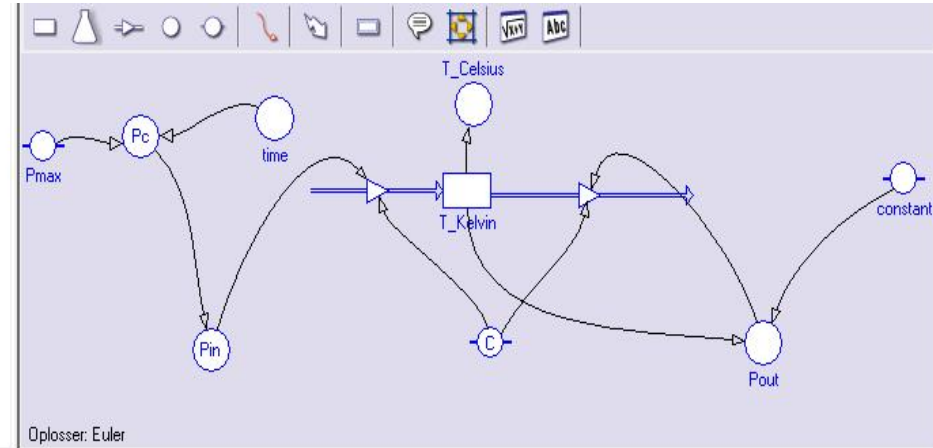
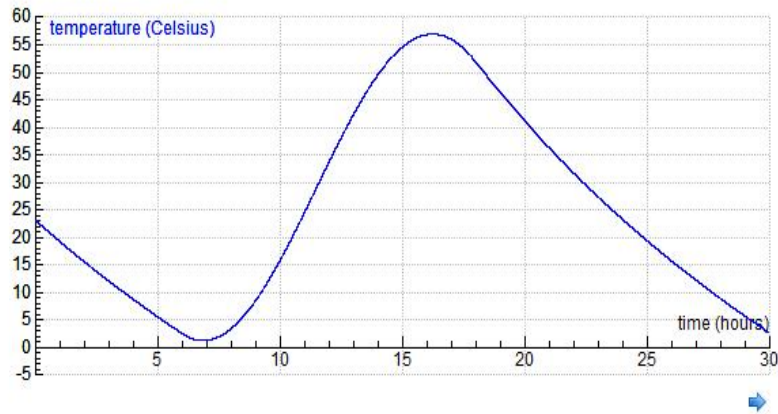
	Modelregels	Startwaarden (SI)
1	$r = ((x - x_j)^2 + y^2)^{0,5}$	$G = 6,67 \cdot 10^{-11}$
2	$a = GM/r^2$	$M = \dots\dots\dots$
3	$a_x = -a \cdot (x - x_j)/r$	$v_x = 1,44 \cdot 10^4$
4	$a_y = -a \cdot y/r$	$v_y = 2,49 \cdot 10^4$
5	$v_x = v_x + a_x \cdot dt$	$x = -6,7034 \cdot 10^7$
6	$v_y = v_y + a_y \cdot dt$	$y = -2,234 \cdot 10^8$
7	$x = x + v_x \cdot dt$	$x_j = 0$
8	$y = y + v_y \cdot dt$	$v_j = -1,3 \cdot 10^4$
9	$x_j = \dots\dots\dots$	$t = 0$
10	$t = t + dt$	$dt = 5$

# Graphical modeling

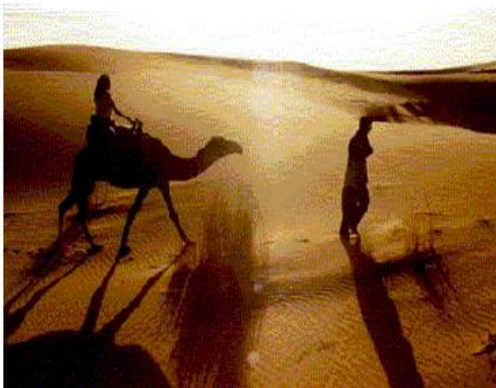
figuur 4b



# Complex examples



Sahara



Sundown





# Some student's trials of animations

- Hole in the bucket (1 and 2)
- Mario (1 and 2)
- Ebola in the Netherlands
- Stock Control
- Flappy Bird

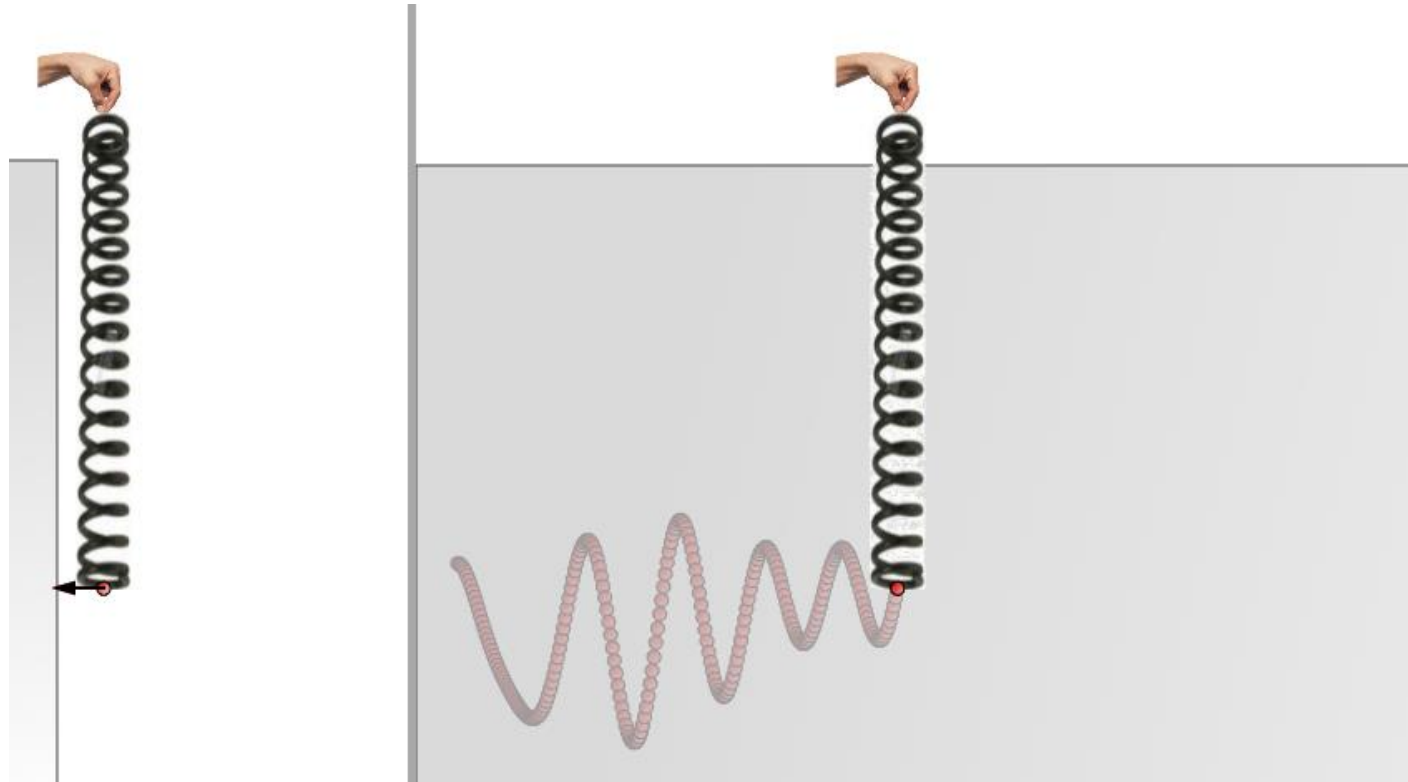
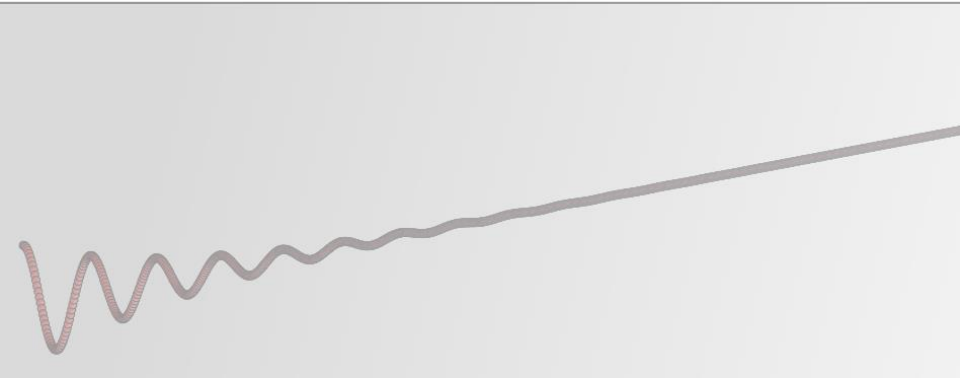


# Artwork at the façade

UvA



**using a paint  
spray!**



# The female Usain Bolt?





# Running versus Skating!

## VWO Complex 2016: Dafne or Ireen?

---

Four times Olympic champion Ireen Wüst recently challenged athlete Dafne Schippers for a contest over 100 meter: Wüst on skates, Schippers on spikes. Whomever is going to win, on ice or tartan, we will face two totally different ways to make speed with roughly the same end time. See figure 1.

figure 1

