

Winter 2016
COMP-250: Introduction
to Computer Science

Lecture 1, January 12, 2016

Algorithms

• Informal definition

An algorithm is the specification of a sequence of instructions to be carried out by a processor.

- Algorithms can be run on a computer, but they don't have to:
 - Mayas had algorithms to predict solar eclipses centuries in advance
 - Egyptians had algorithms to build pyramids
 - Indians had algorithms for factorizing polynomials
 - Greeks had algorithms to build all kinds of geometric construction using only a compass and straight lines.

Compass and straight-line construction

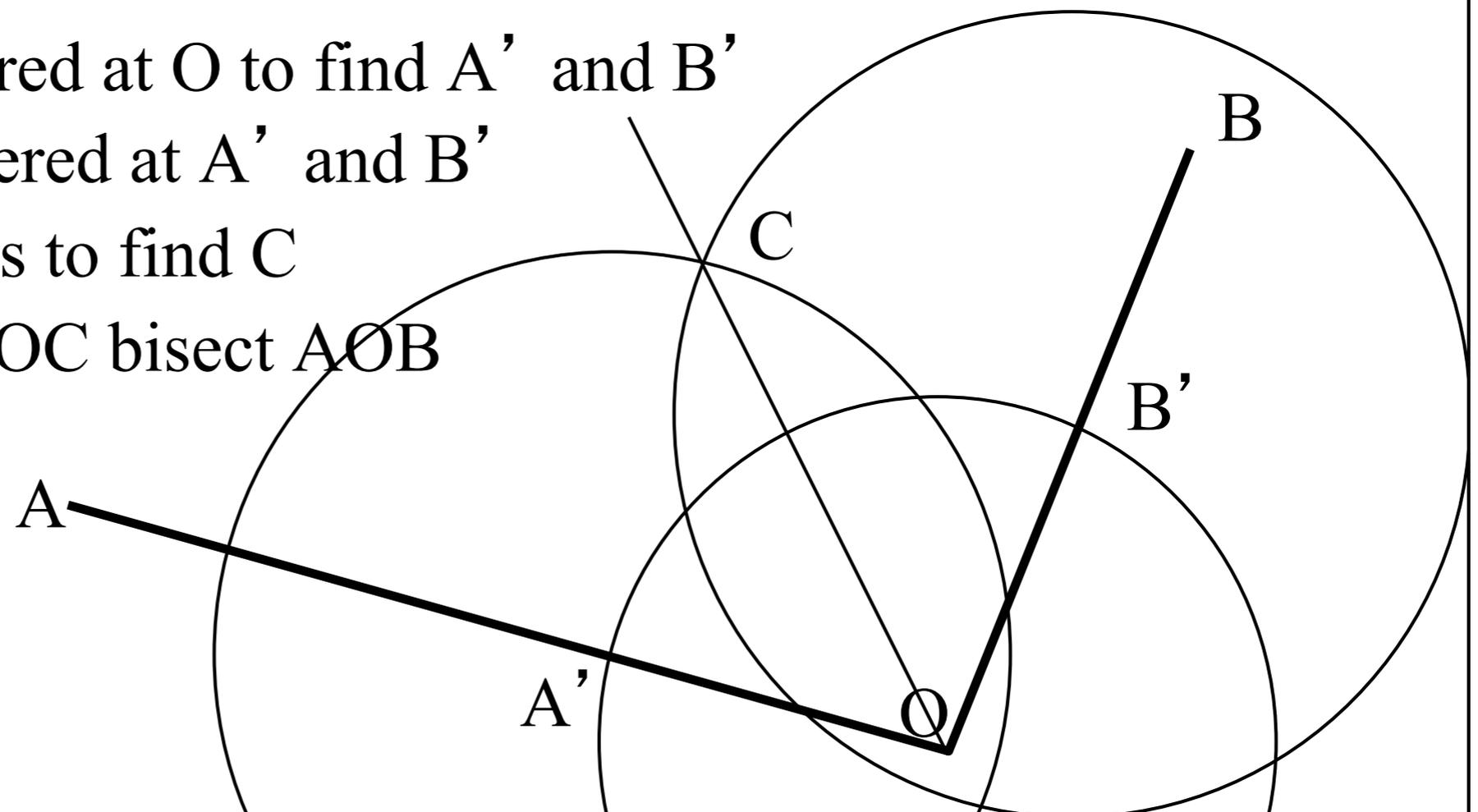
- Problem: Angle bisection

INPUT: An angle defined by three points AOB

OUTPUT: A point C such that $\angle AOC = \angle BOC$

- Algorithm:

- Draw circle centered at O to find A' and B'
- Draw circles centered at A' and B' of the same radius to find C
- Then AOC and BOC bisect AOB



Music SCORE

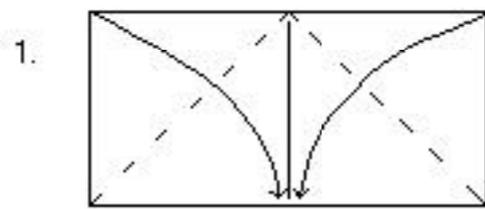
116 The blessed son of God

3 *p*
ev - - - er - more. Ky - ri - e - lei - - - son,
Lord - have mer - - - cy,
p
ev - er - more. Ky - ri - e - lei, e - lei - - - son,
Lord - have mer - cy, mer - - - cy
p
— Ky - ri - e - lei - - - son, e - lei - - - son,
Lord - have mer - - - cy, have mer - - - cy,
p
Ky - ri - e - lei - - - son. Ky - ri - e - lei - - - son,
Lord - have mer - - - cy, Lord - have mer - - - cy,
3
p
pp

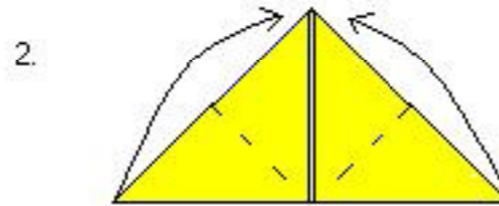
BUTTERFLY

Use a 2x1 rectangle with a different color on each side.

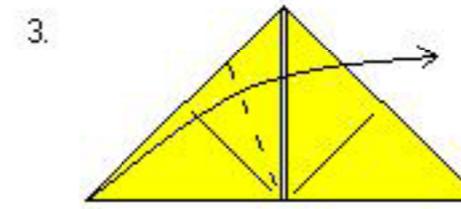
Start with the side with the color you want to be the wings. The other color will be the head and body.



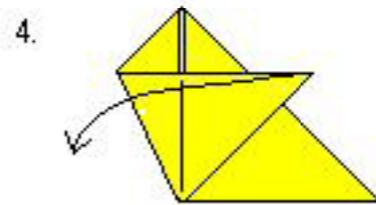
2 valley folds to the center



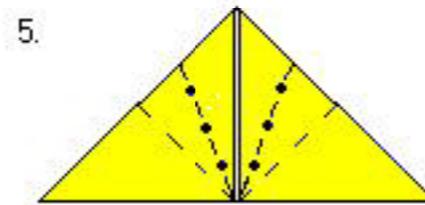
2 valley folds and unfold



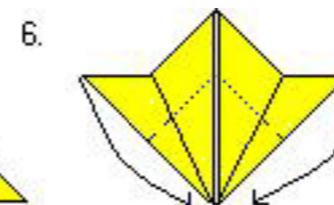
Valley fold to the right lining up the crease made in step 2 with the center line.



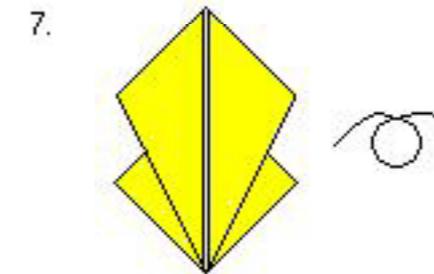
Unfold
Repeat steps
3 and 4 on the right



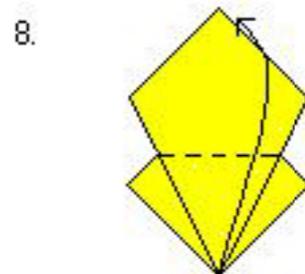
Reverse fold in and
out on each side



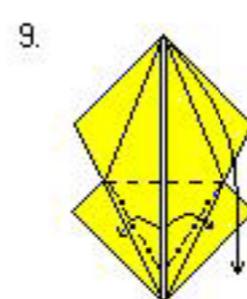
2 reverse folds



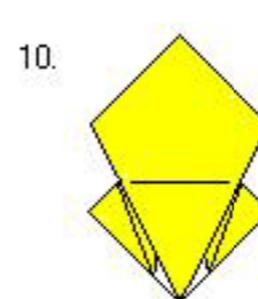
Turn over



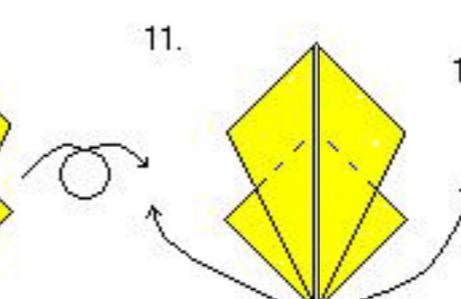
Fold the point up
to the top like a
petal fold



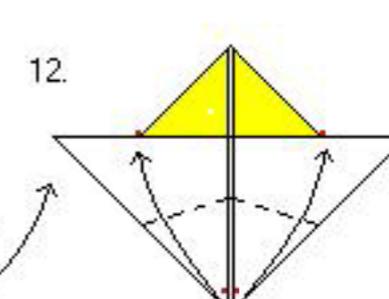
Fold the point back down
while sliding some paper out
on each side



Turn over

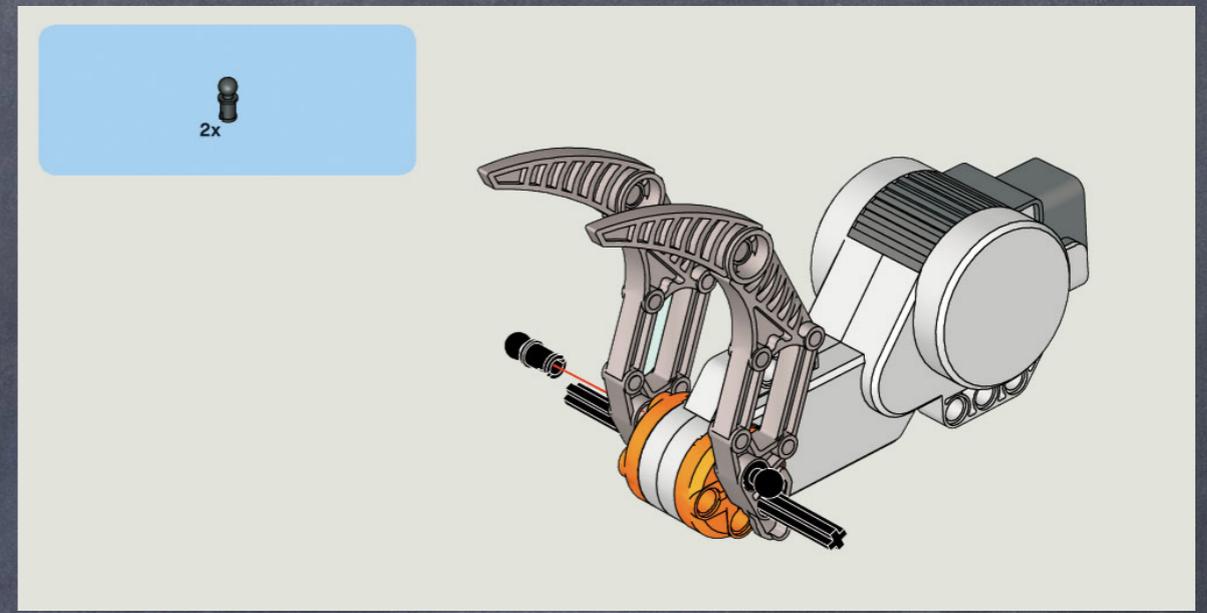
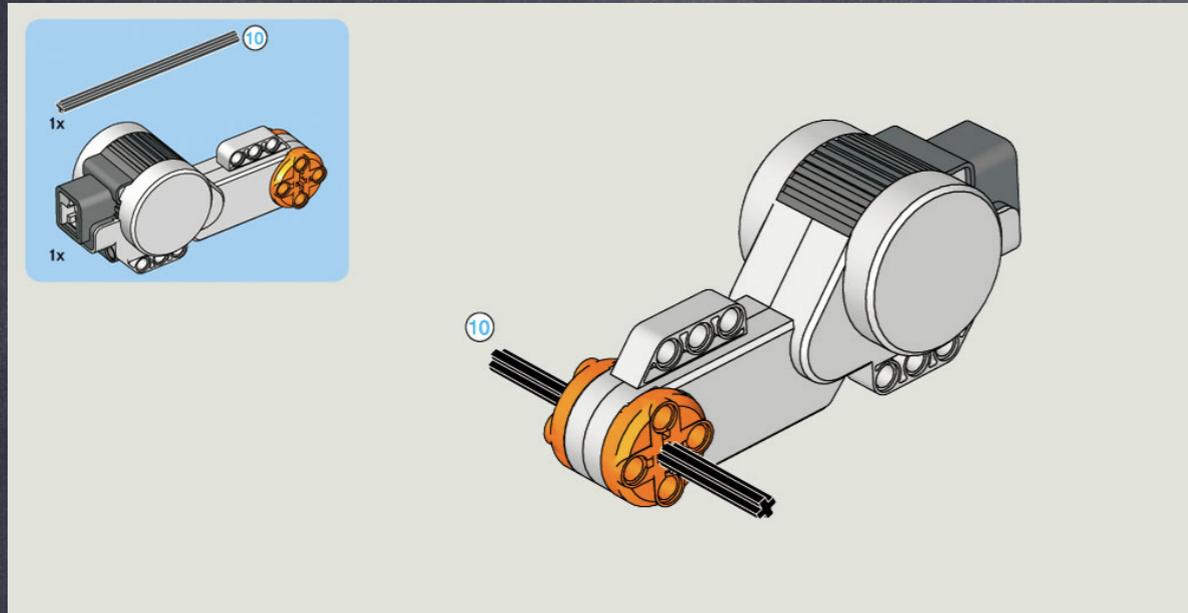


Fold the 2 points up

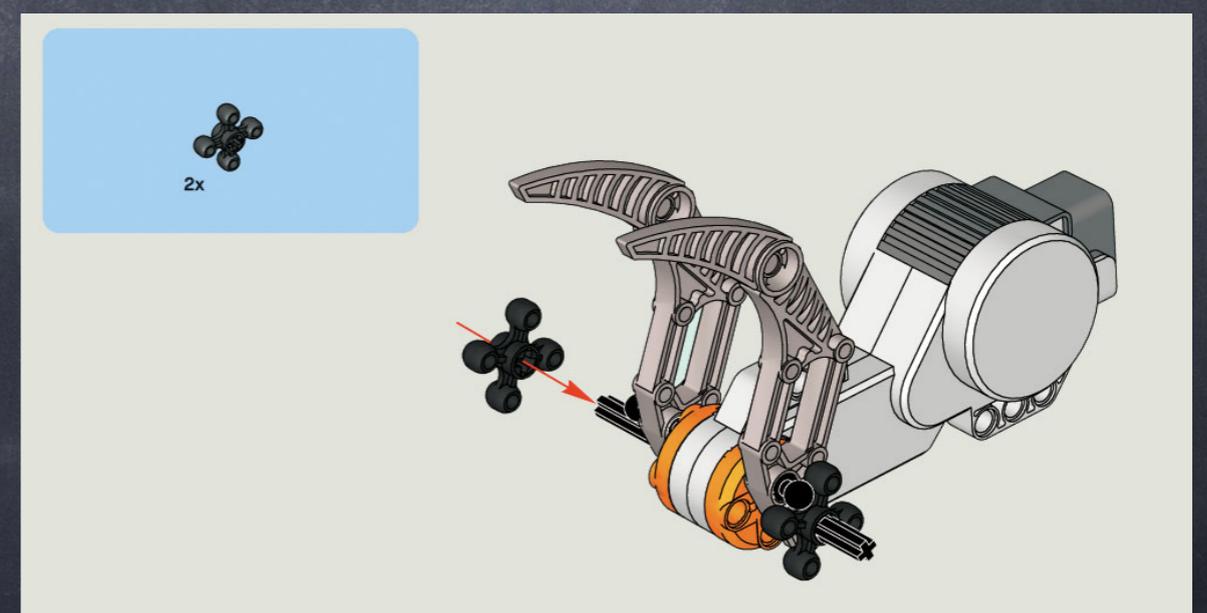
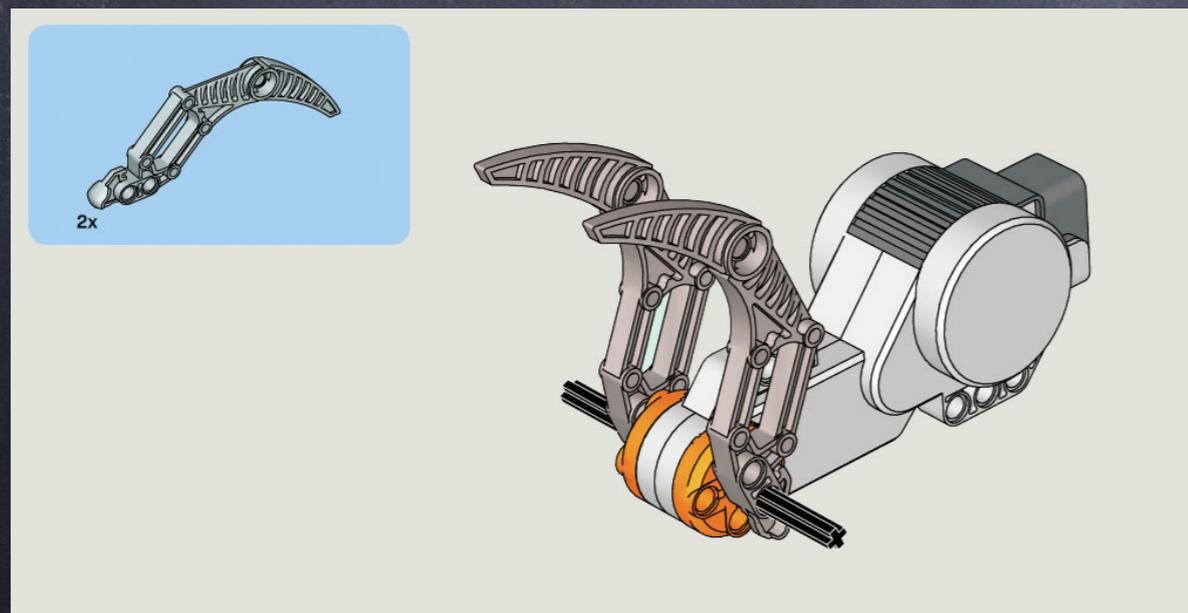


Valley fold the 2
bottom points up so
that the dots line up

Assembly Instruction



LEGO (RoboArm (Machine)) instructions



Indian Chickpeas

From: demers@ere.umontreal.ca (Demers Serge)

Date: Sun, 12 Sep 93 14:20:01 -0400

Here is one of our favorite "vegetarian dish".
We always include it to our menu for an indian dinner.

250 gr of chickpeas (1 cup)
2 Tbsp vegetable oil
1 onion chopped
2 cm cinnamon stick
4 cloves
2 garlic cloves, squashed
2 cm fresh ginger, chopped
1 green chili pepper, finely chopped
2 tsp ground coriander
3/4 cup of chopped tomatoes (from a can)
1 tsp garam massala
1 Tbsp cilantro, chopped

Soak chickpeas overnight, rince, cook in water until tender. Drain, **KEEP THE COOKING LIQUID!**

In a frying pan heat the oil, fry onion until golden. Add cinnamon and cloves, cook a few seconds. Add garlic, ginger, chili pepper, ground coriander and cook 5 minutes, stirring.
Add tomatoes, with the juice and cook until all liquid has evaporated.

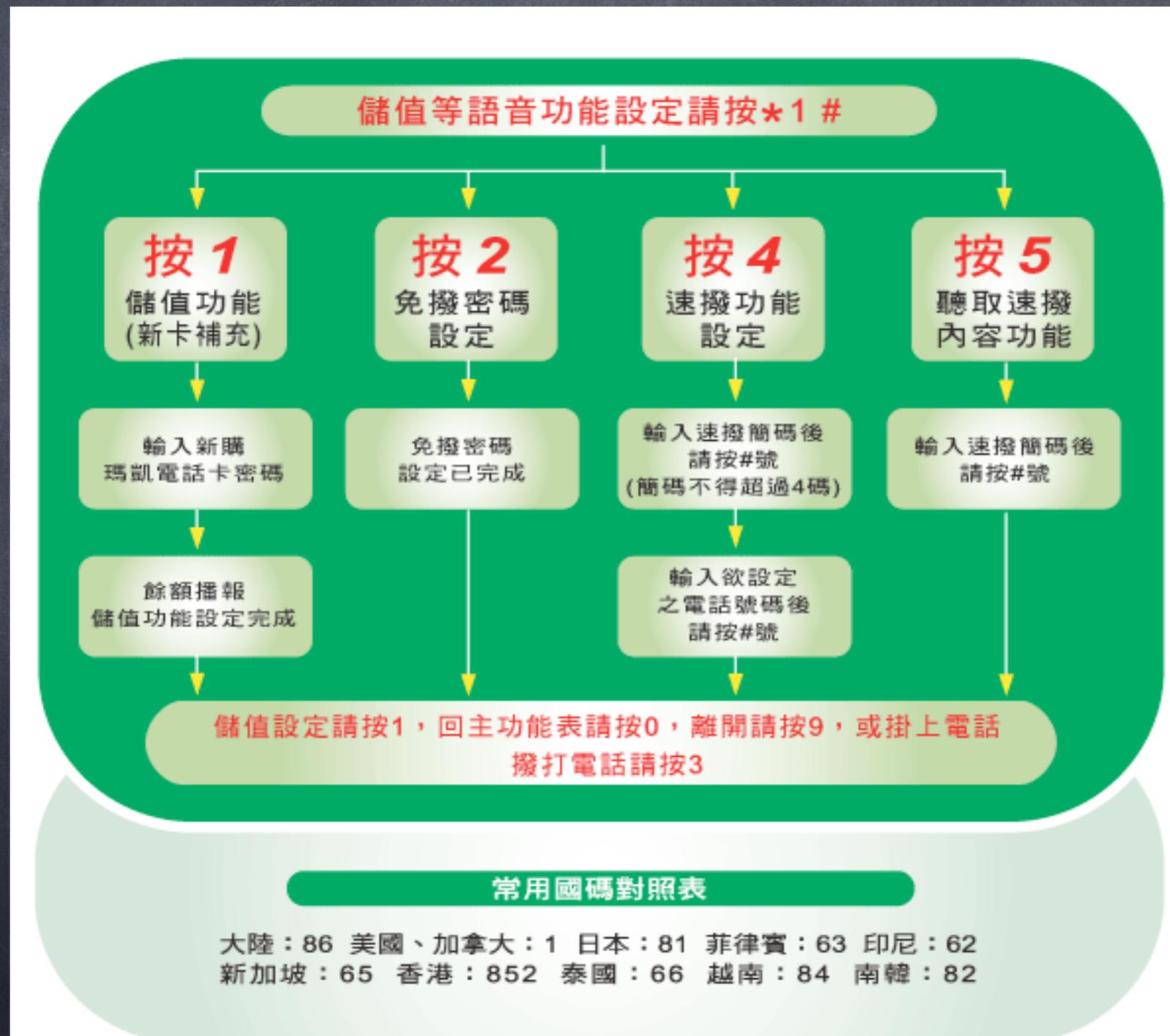
Add the chickpeas to the pan, mixe well, cook 5 minutes.
Pour the cooking liquid of the chickpeas and simmer for 25 minutes, until all the liquid is gone.

Sprinkle with the garam massala and cilantro.

Can be served hot of cold.

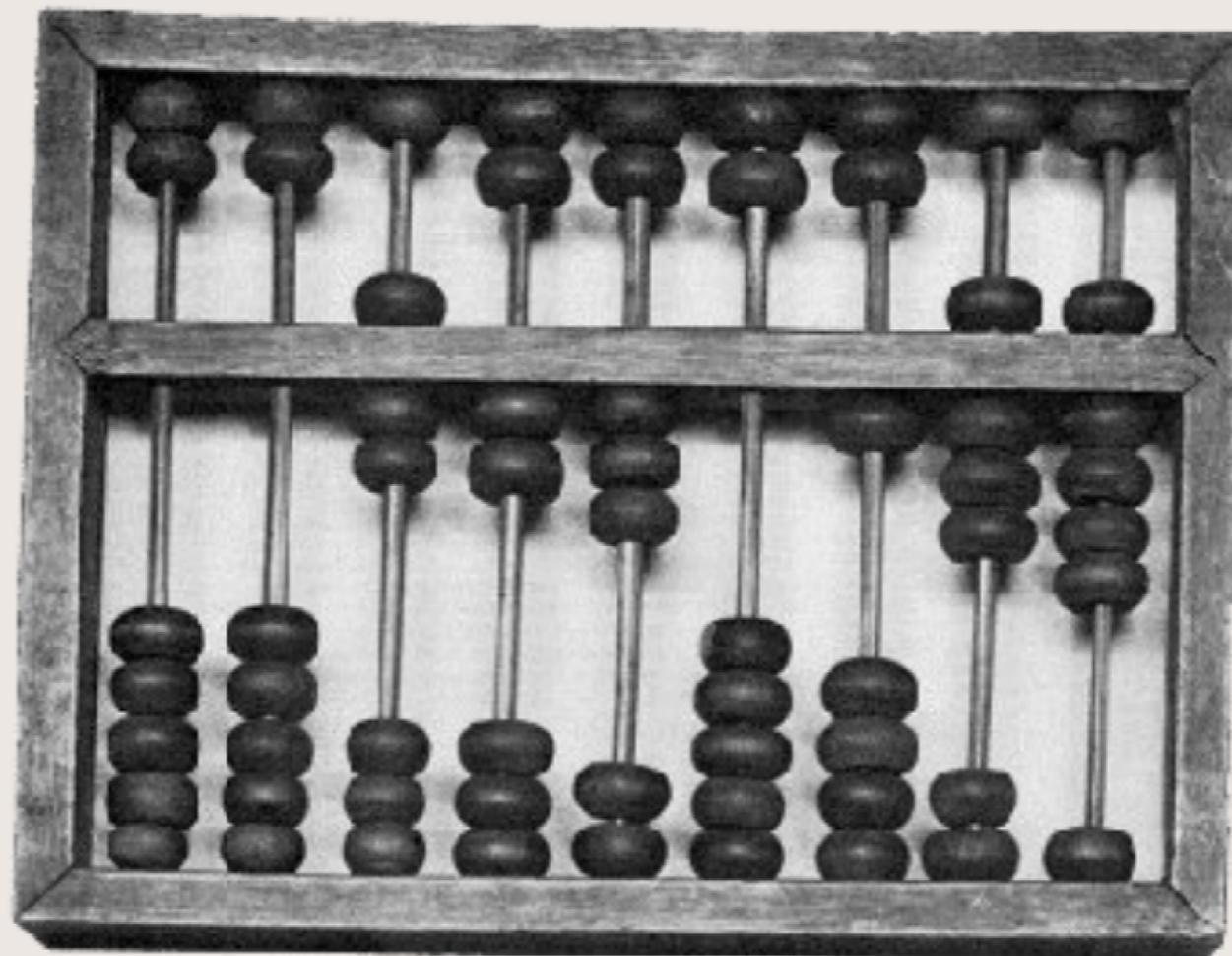
Serge Demers

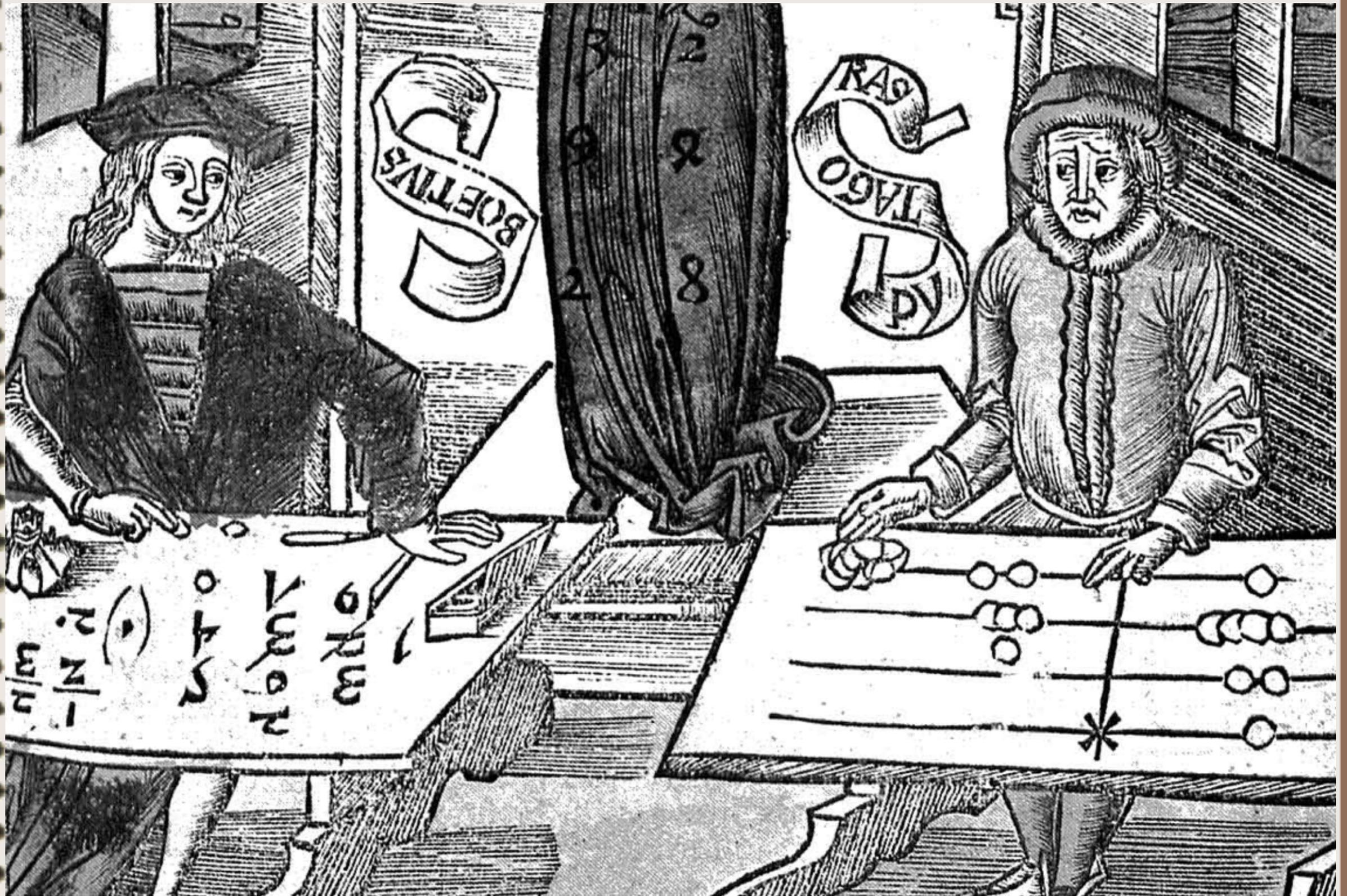
Dialling Instructions



Abacus 3000 BC

The Abacus, a simple counting aid, was most likely invented in Babylonia.





Fight around 1503 about calculation method

TODAY



CD / DVD / Blu-ray



Smart phones



Flat Screens



laptop



MP3 players



U S B connectivity

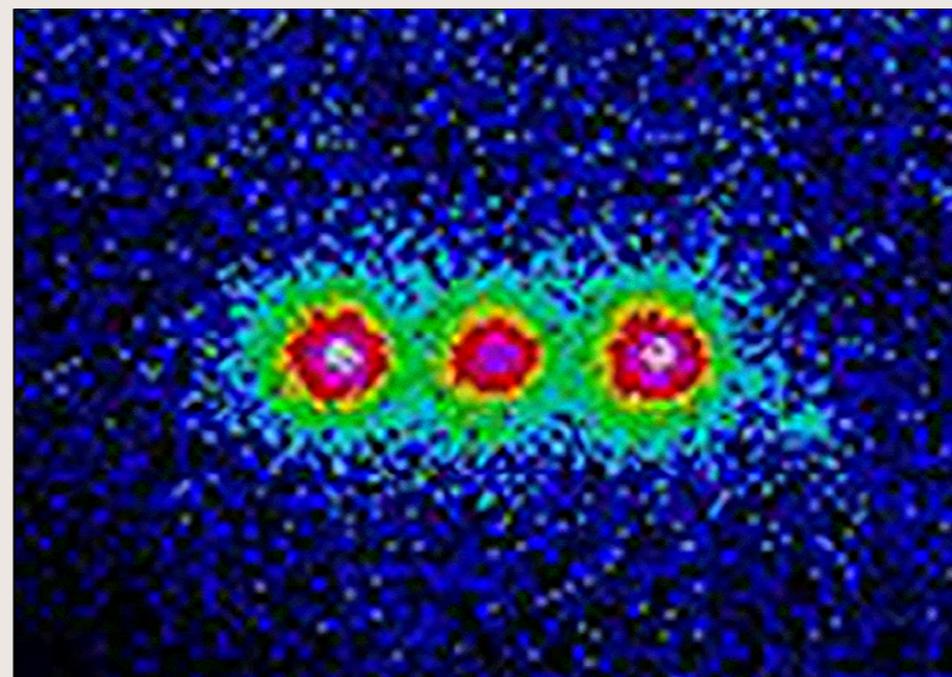


Electronic Tablets



scanner

TOMORROW ...???



Computer Science

- **Computer Science** is the study of algorithms for computing machines.
- (Formal) Definition of an Algorithm

A **well-ordered** collection of **unambiguous** **effectively computable** operations that when executed produces a **result** and halts in a **finite** amount of time.

What distinguishes computer algorithms ?

- Instructions are executed very fast
- Little or no human interaction is possible
- Algorithm must be fully specified before execution
- Algorithm must be unambiguously specified

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