

THE BIG HOOK 2015: SCIENCE

**The brain
is an organ that
creates an image of the world
and from it
predicts the future**

A consideration of human and non-human perceived realities

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“THE BIG PICTURE”:

The brain is an organ like the heart and the hand; an organ is a complex assemblage of cells and tissues with a function. What is the brain’s function?

Is there a singular real world out there? Or do we filter and manipulate what we sense into a uniquely human world which is only partially shared by animals?

What power would we have if we could predict the future? Is this the realm of the shaman and fortune teller? Or can we actually make accurate predictions of things to come, sooner or later?

How do we assess “truth”? *consider flute, shark and lobster.*

Part 1

What is a bone with holes in it?

What is this?



We have to be careful with our interpretations



Magritte, "This is not a pipe."

What is this?



“...or this”



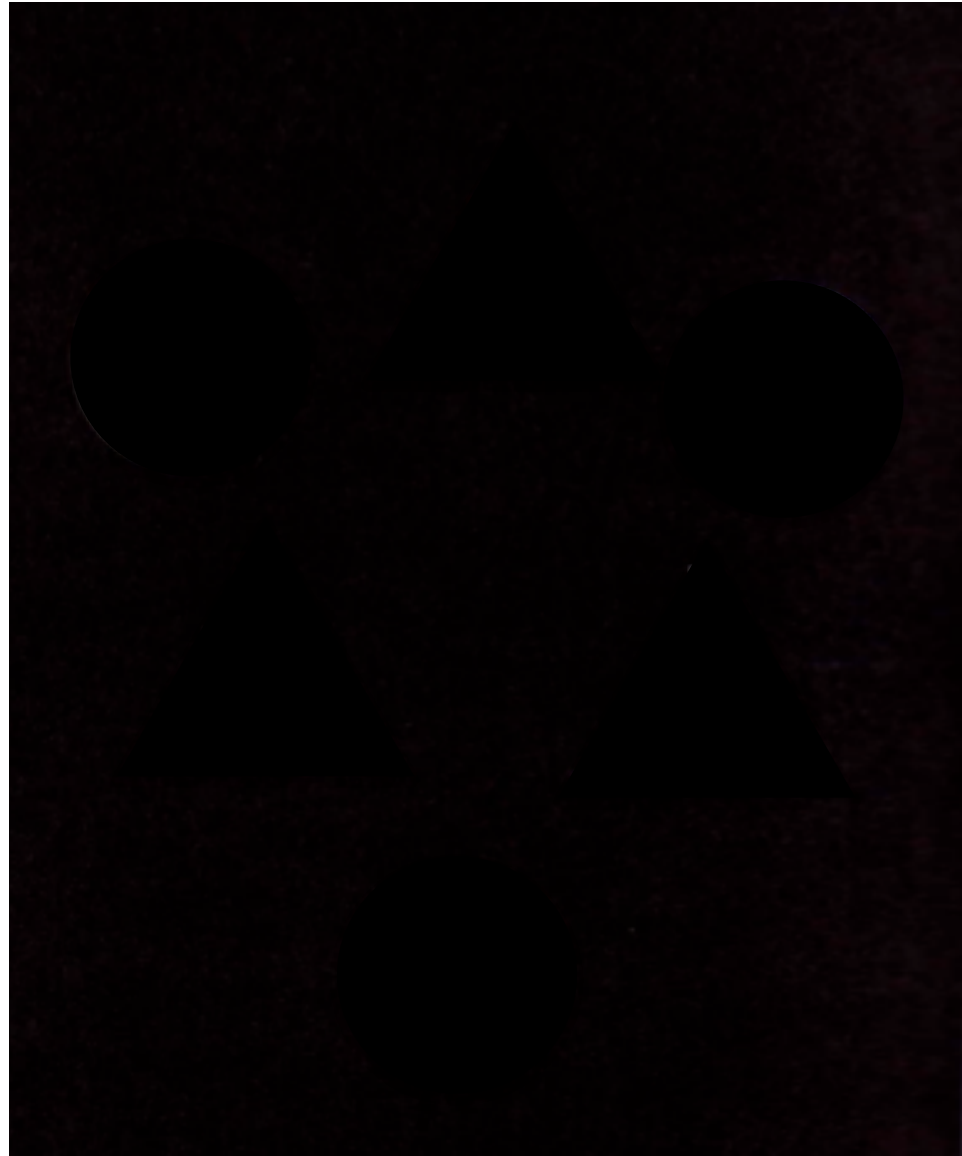
Now you cannot **NOT** see the dog anymore





Information and imagination: true *and* false

Kanizsa's Triangle: remove information



Jelle Atema plays the replica of the Slovenian Neanderthal “Divje Babe” flute made from a fossil cave bear femur with a fipple mouth piece



Cleaned original



Quena reconstruction

Fipple evidence

“La Roque”, deer (?) bone
British Museum
1,000 or 30,000 YBP



“Veyreau”, vulture bone
Musee des Cevennes,
Florac, France
4,000 YBP



Veyreau flute copy with ornamentation and carry cord



Divje Babe
50,000 YBP



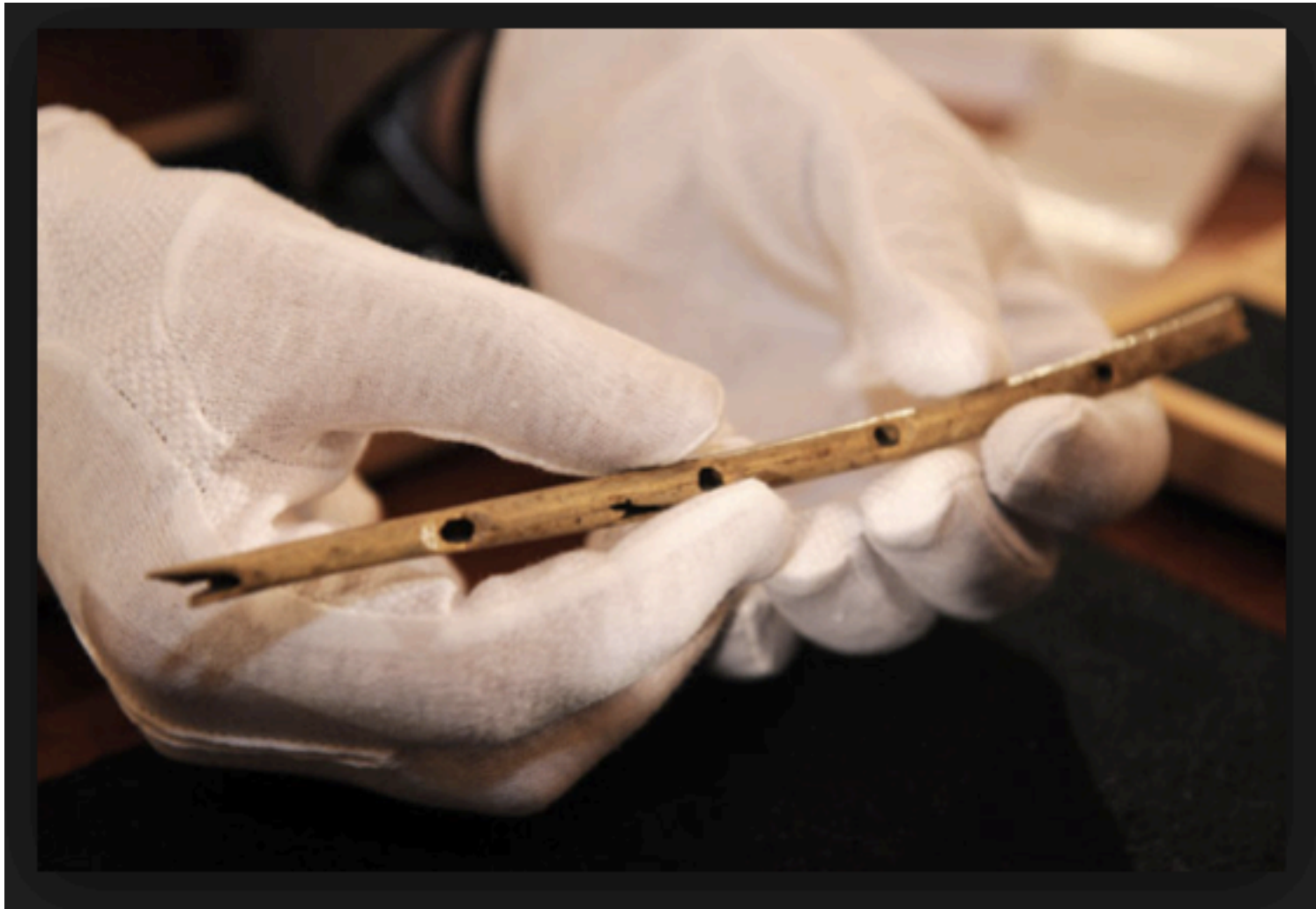
La Roque
1,000? YBP



Veyreau
4,000 YBP



“Hohle Fels 1”, Blaubeuren Museum, Upper Danube, Germany
Vulture radius
35,000 – 40,000 YBP



Geissenkloesterle 3, Blaubeuren Museum, Upper Danube, Germany
Mammoth tusk ivory
43,000 YBP



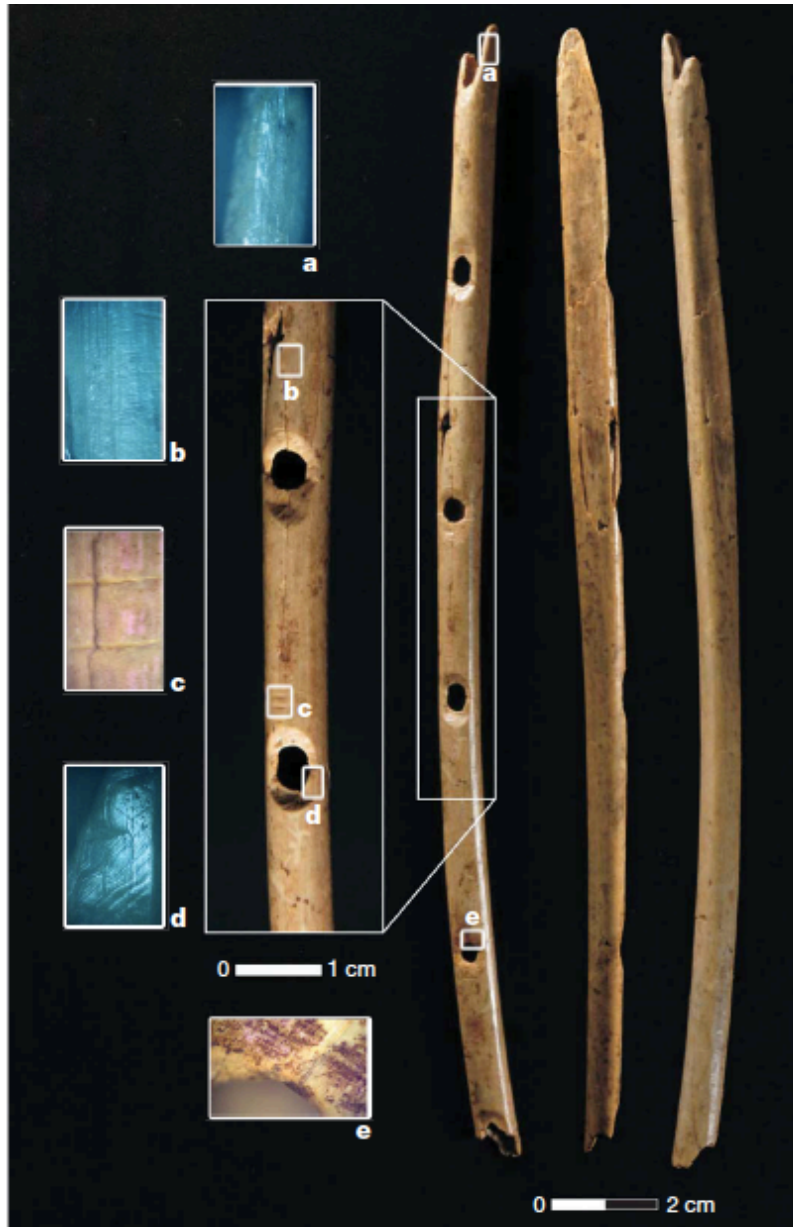


Figure 1 | Bone flute from Hohle Fels archaeological horizon Vb. Photomicrographs documenting striations and notches from manufacture and polish from use: a, b, d, incident-light fluorescence mode (ultraviolet- and violet-light excitation); c, e, incident light, obliquely crossed polars, λ plate. The photomicrographs were made with a Leica DMRX-MPV SP microscope photometer. The long axis of the micrographs is 2.8 mm long.

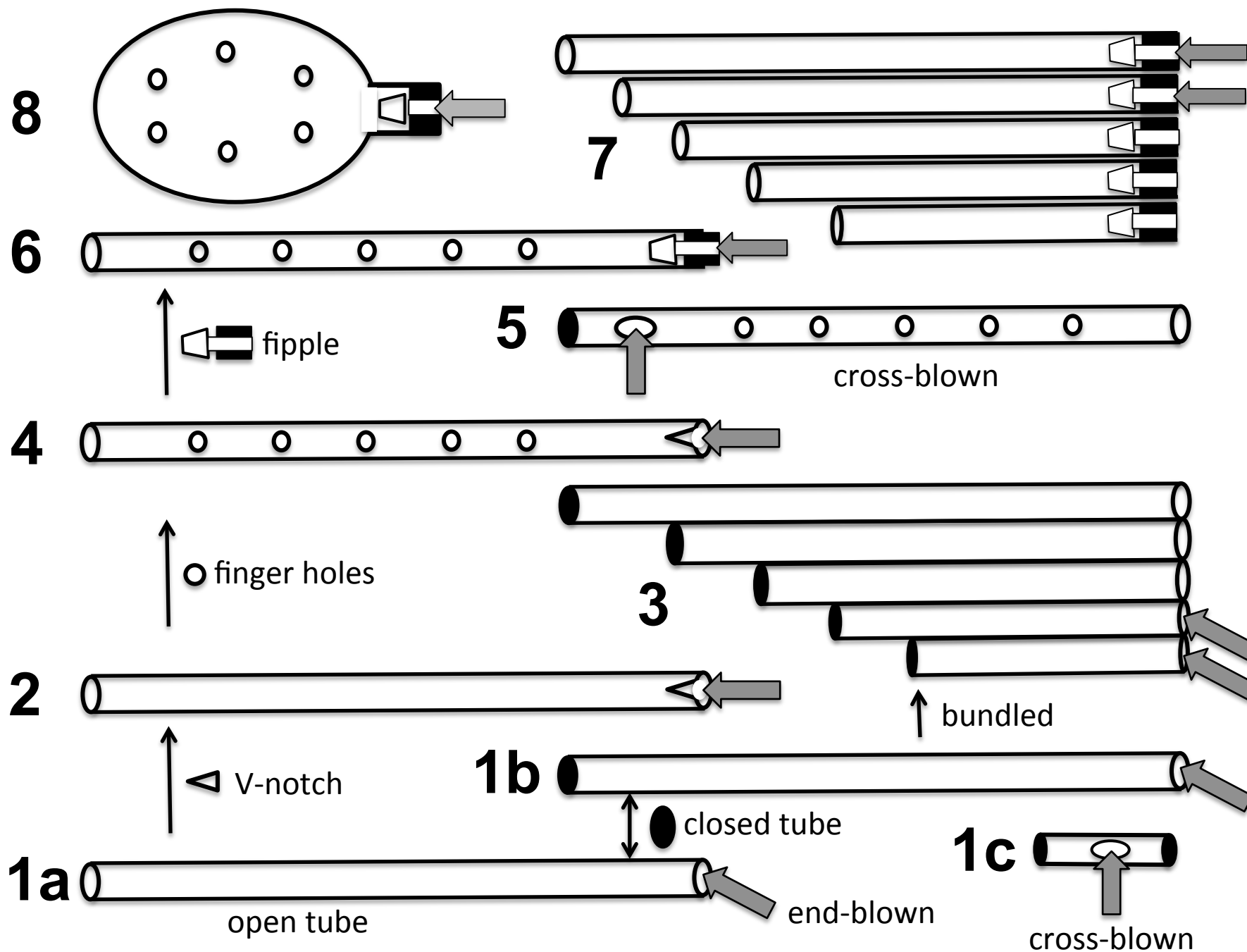


Hohle Fels 1
(NATURE 2009)

and

Seeberger,
V-notch (“quena”)
reconstruction
(swan radius)

What is a flute?



What is a flute?

A pipe with holes?

Is every pipe with holes a flute?

What is music? “Organized sound”

(Edgar Varese and John Cage)

Debussy “Syrinx”

Varese “Density 21.5”

What is Art?

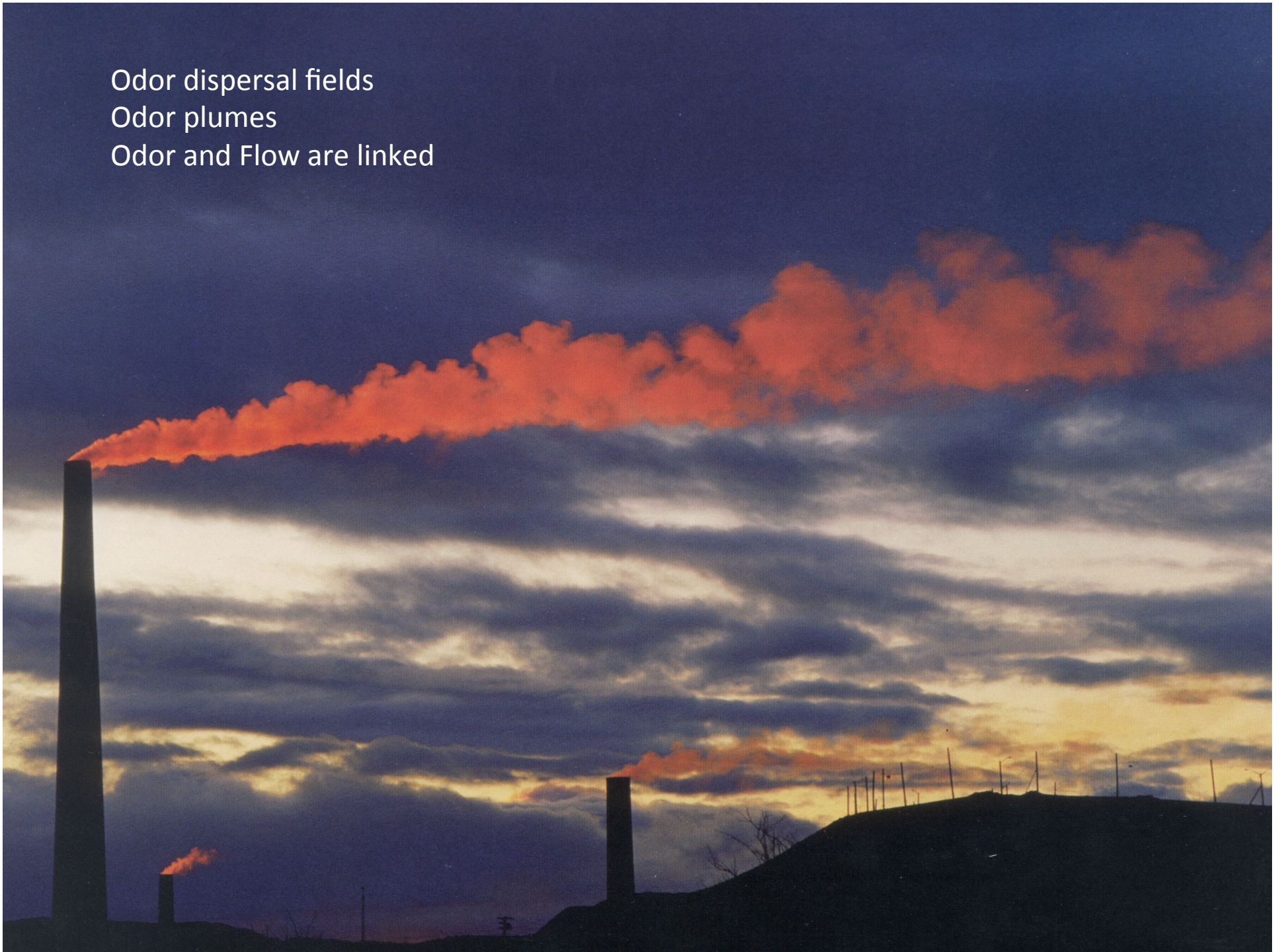
Rembrandt?

Rothko?

Part 2

How do sharks find odor sources?

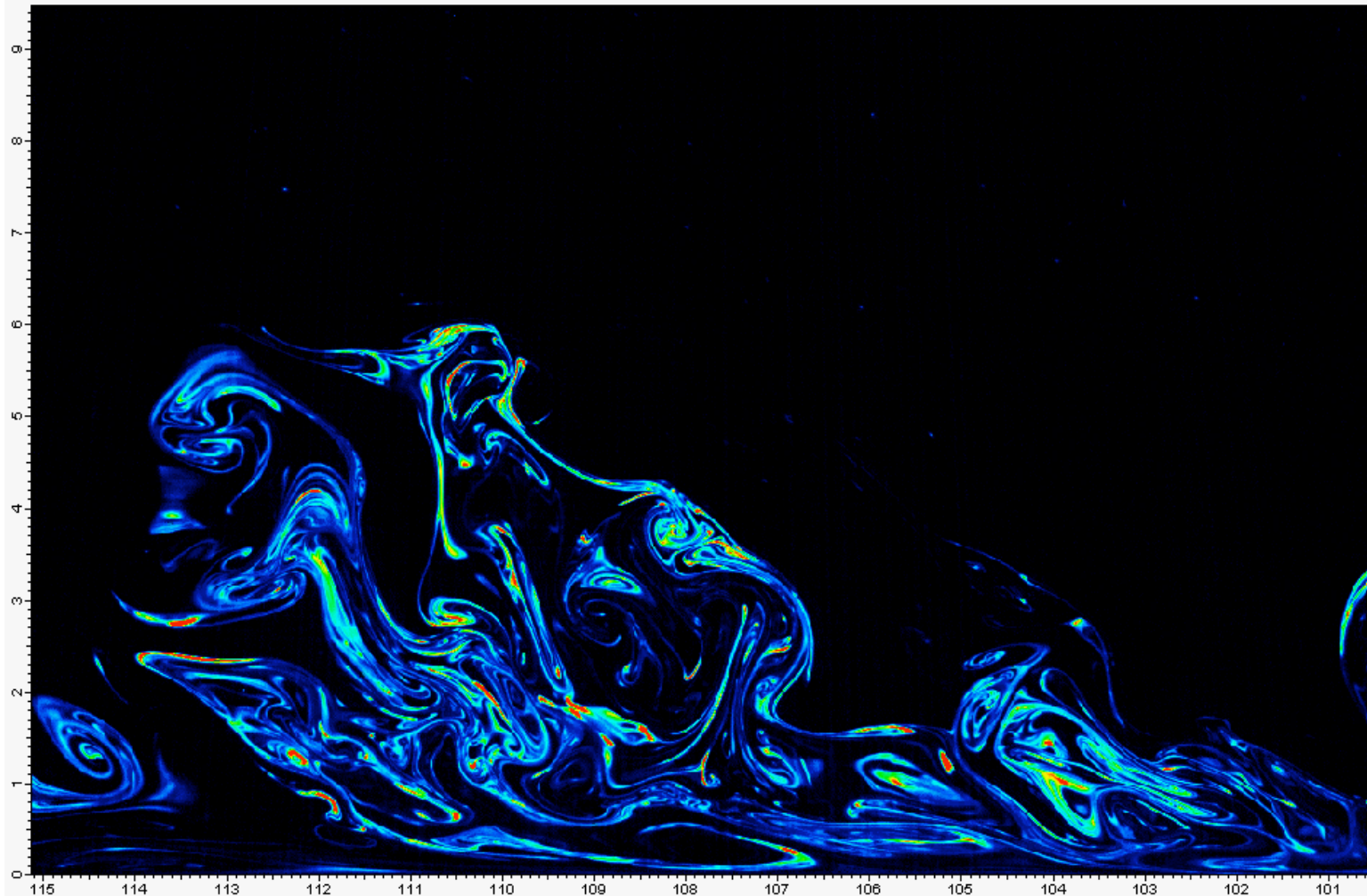
Odor dispersal fields
Odor plumes
Odor and Flow are linked



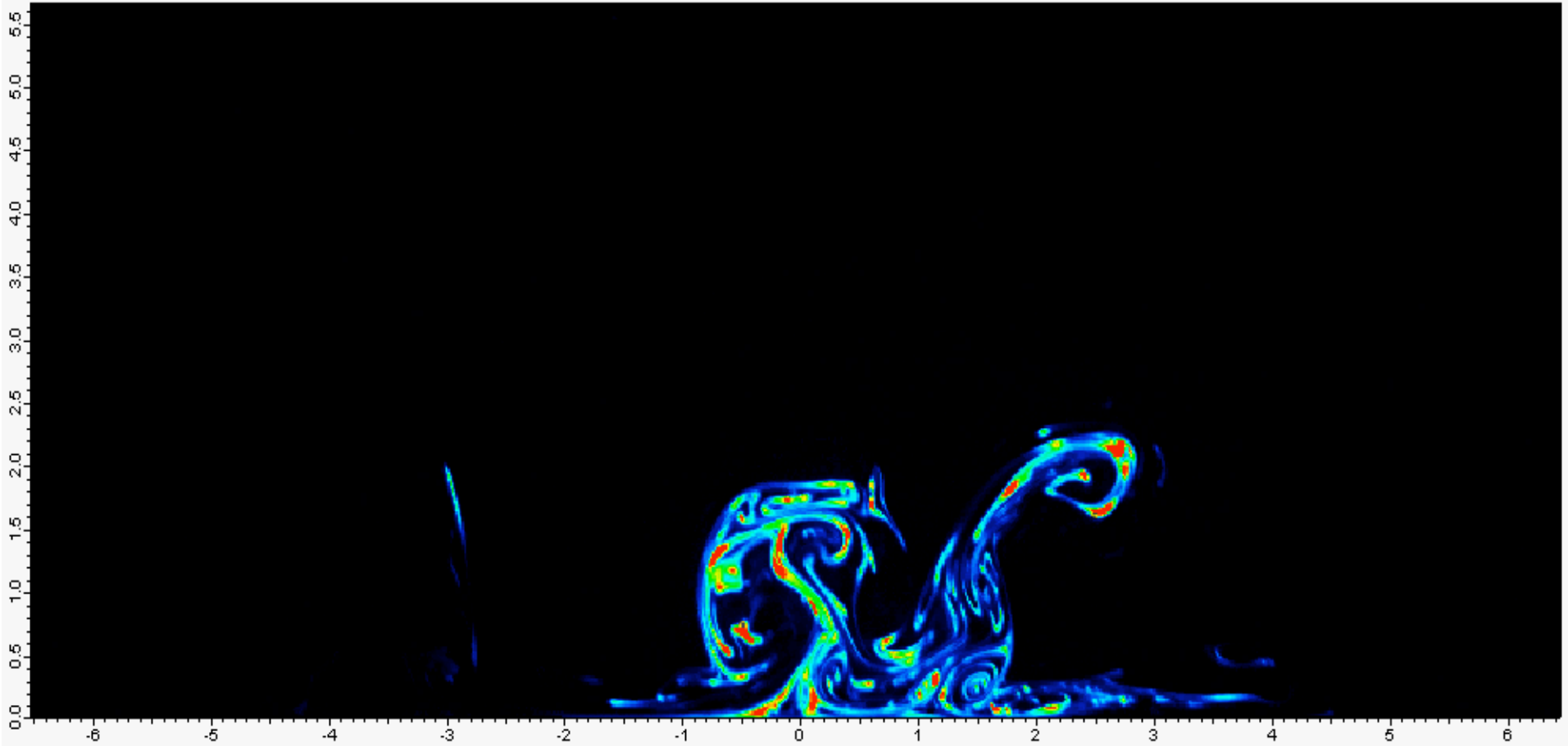
Odor plume dispersal:

*in real time

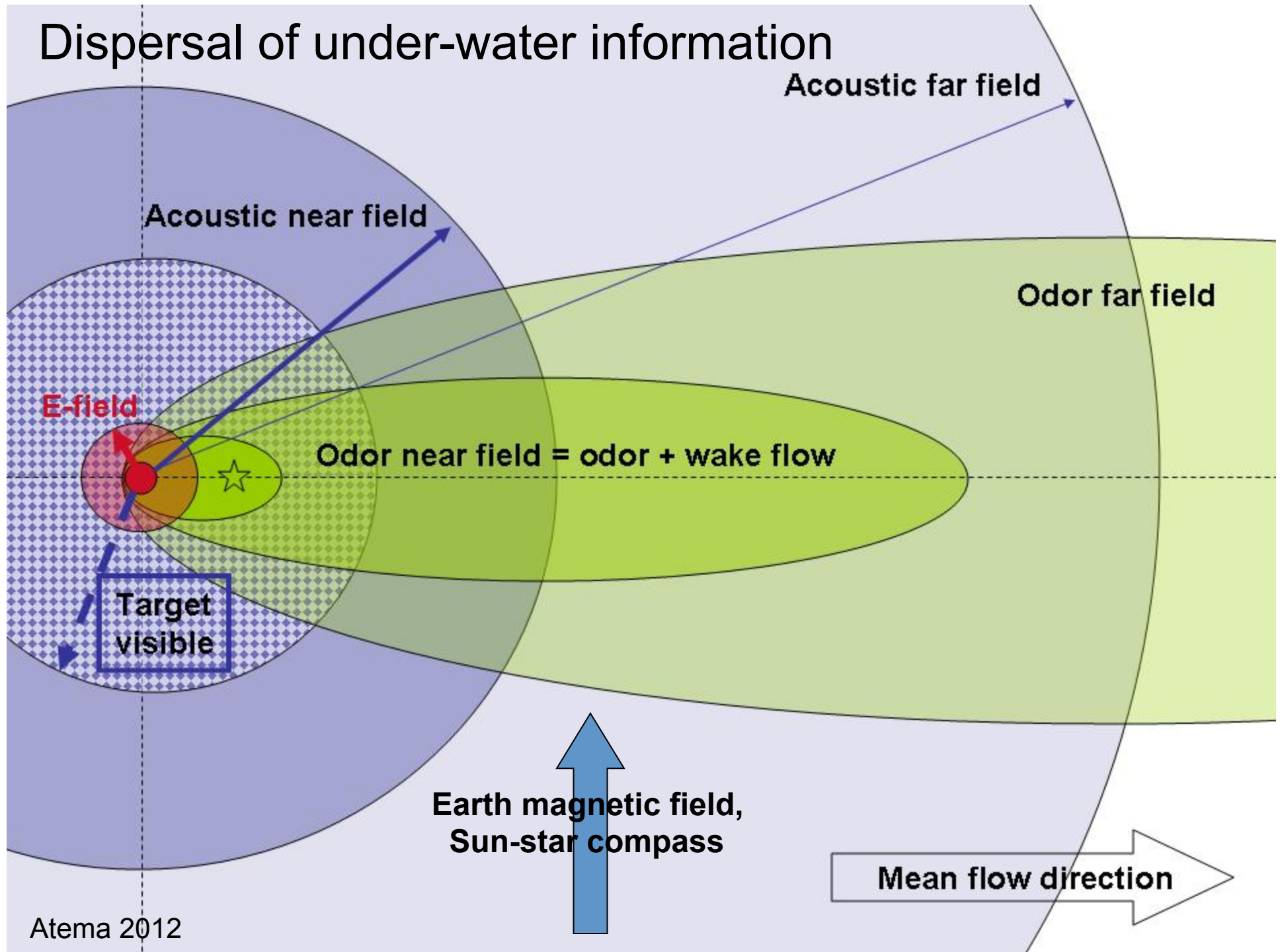
*at the resolution of noses and receptor cells



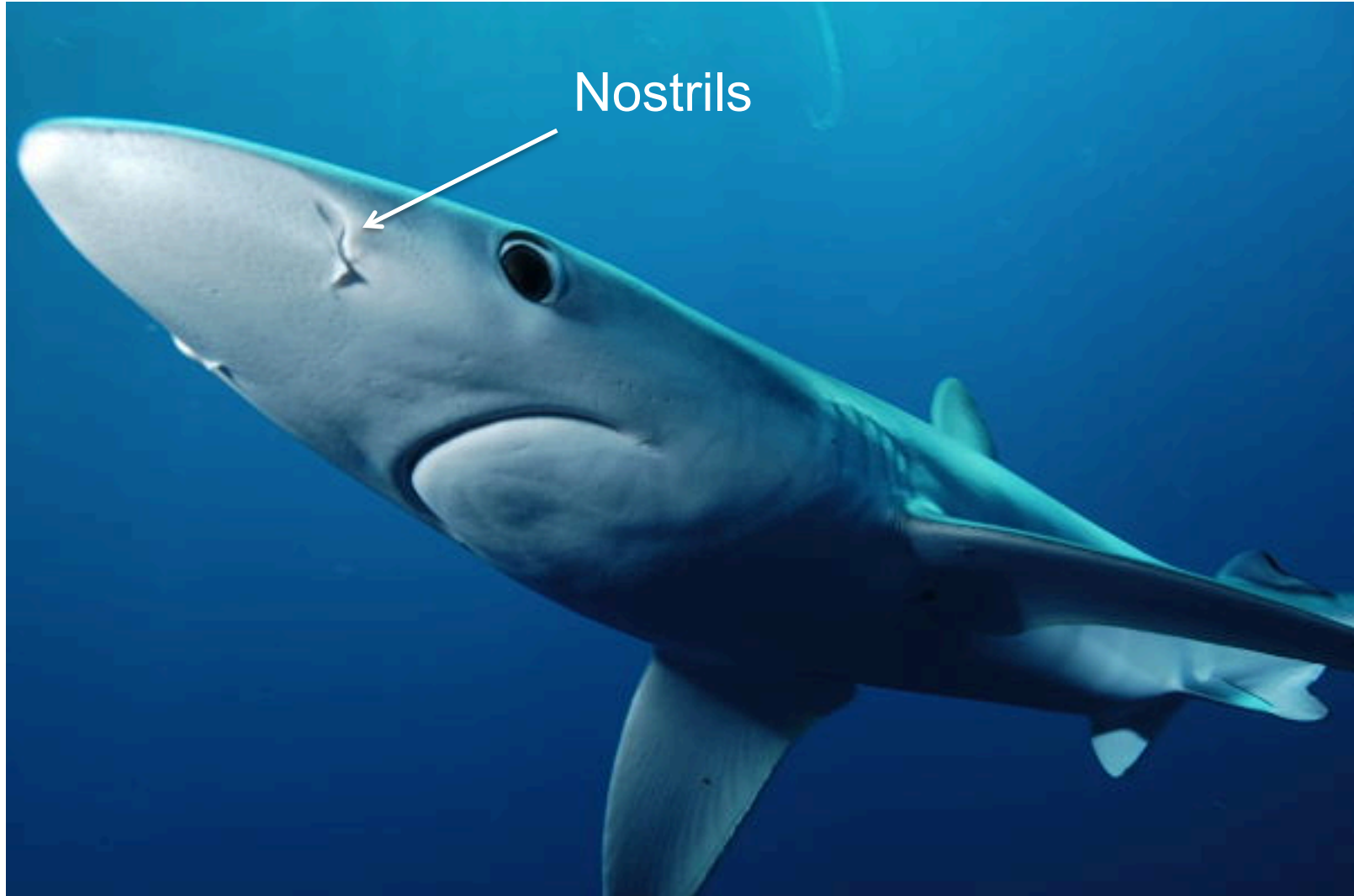
Experience the plume head-on

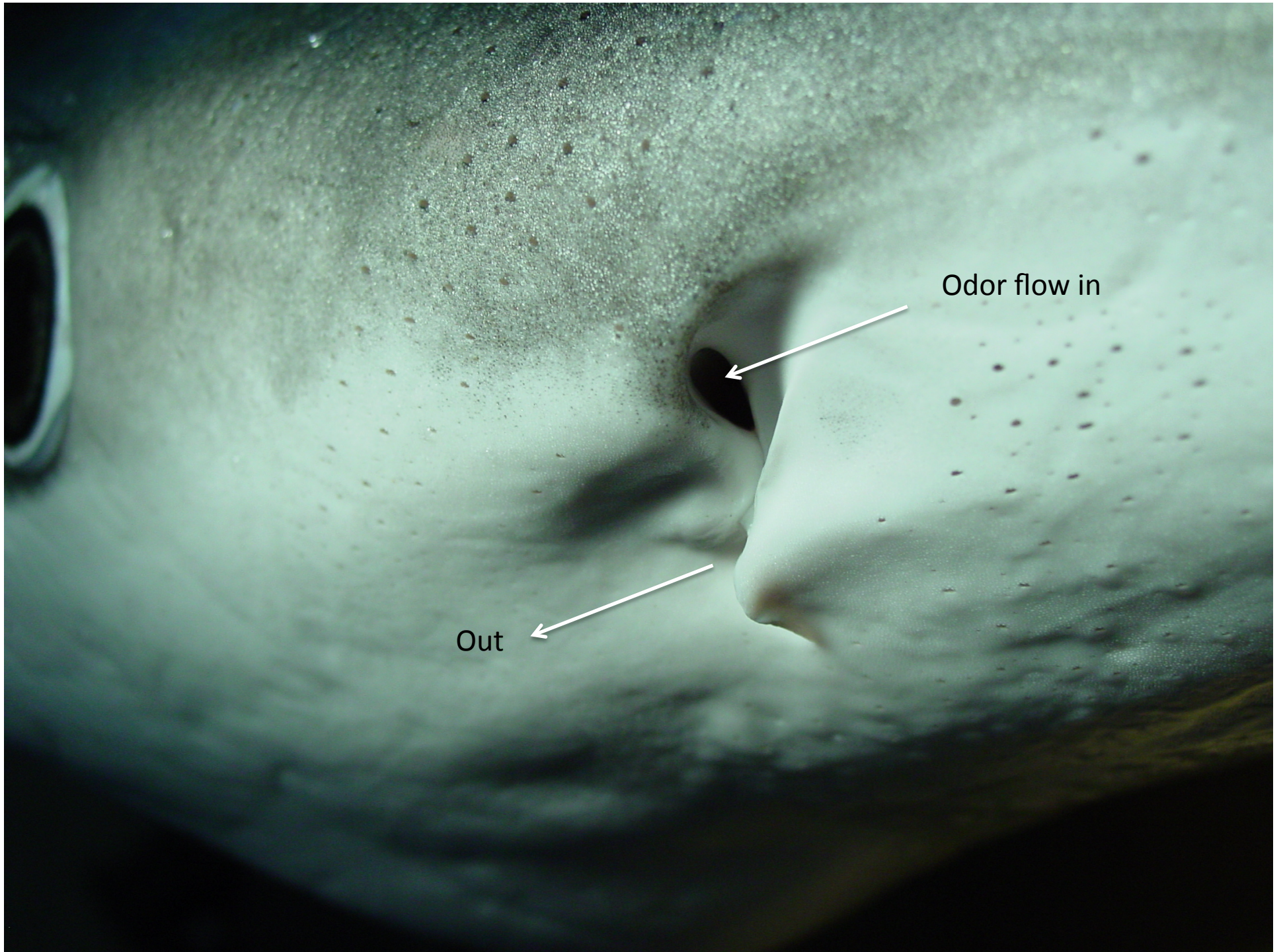


Dispersal of under-water information



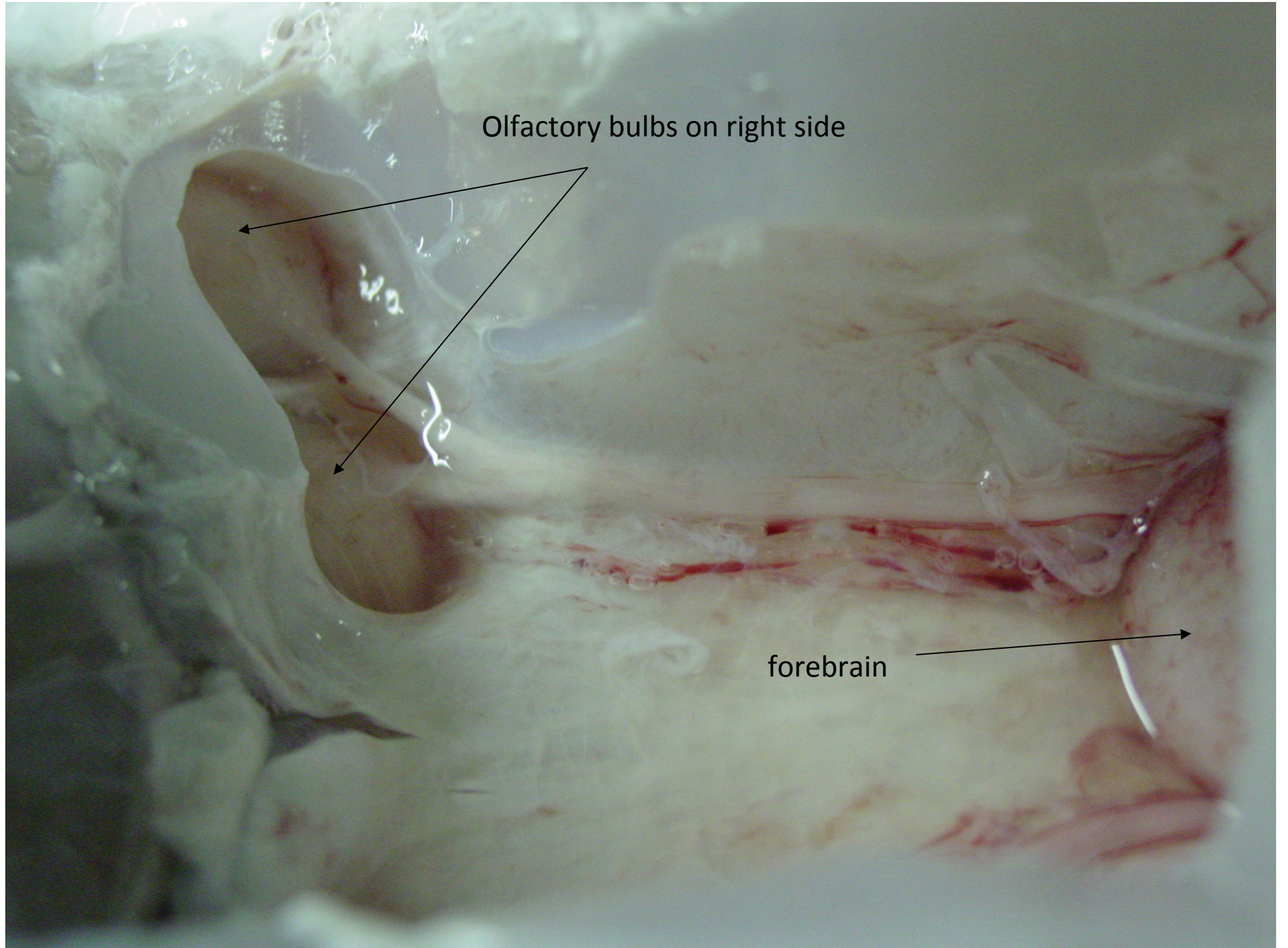
Blue shark





Odor flow in

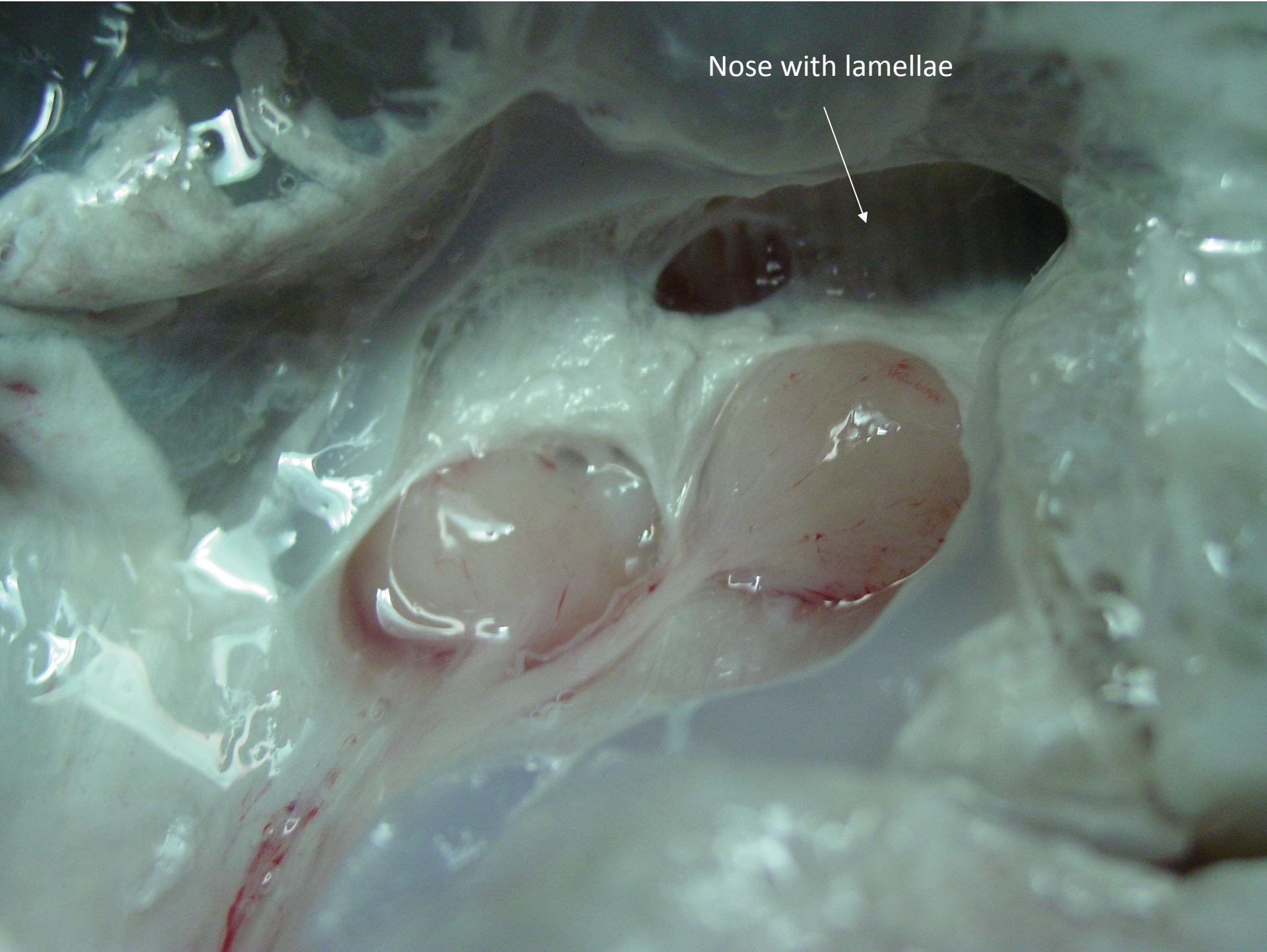
Out



Olfactory bulbs on right side

forebrain

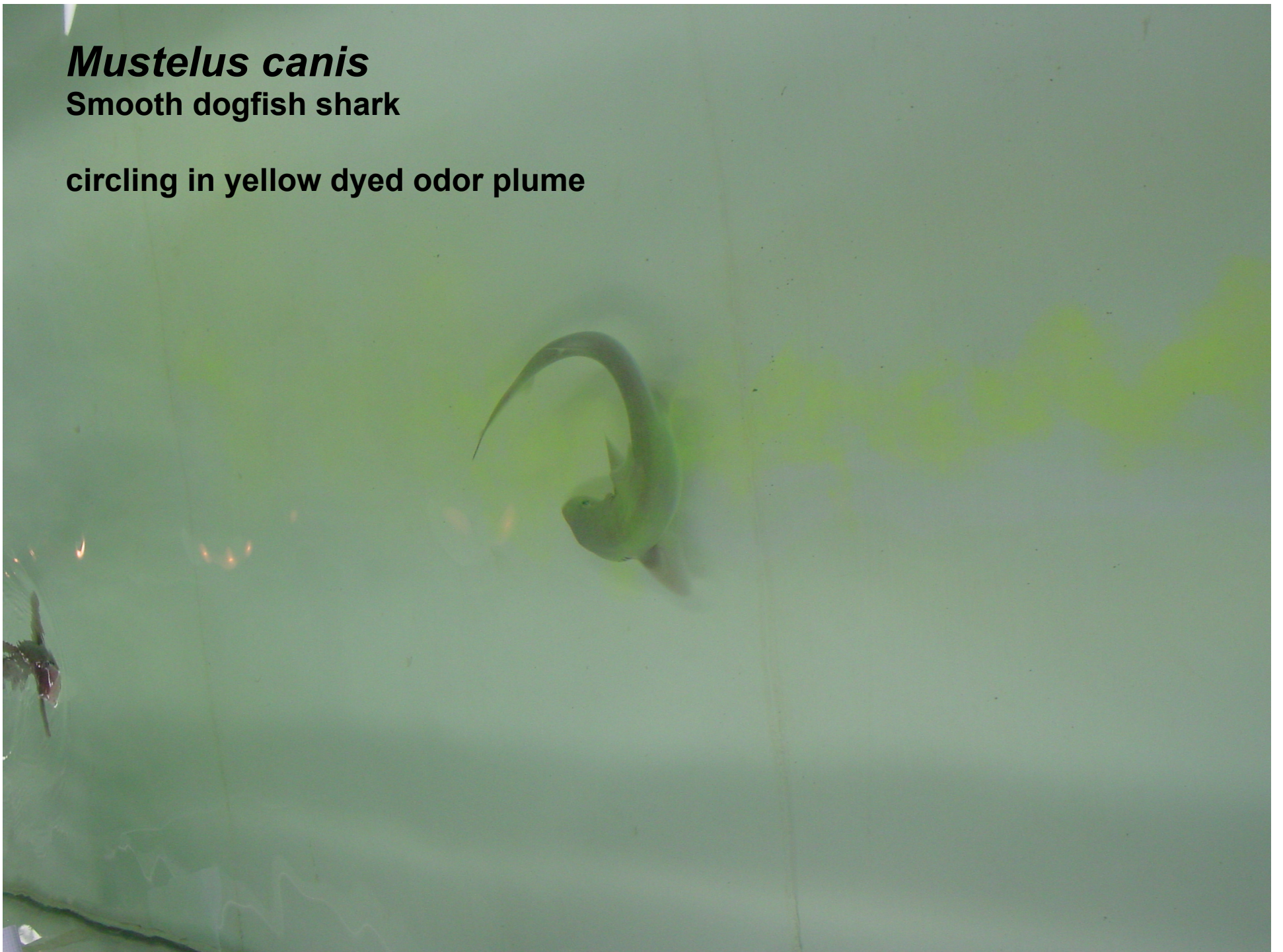
Nose with lamellae



Mustelus canis

Smooth dogfish shark

circling in yellow dyed odor plume



Mustelus canis
Smooth dogfish shark

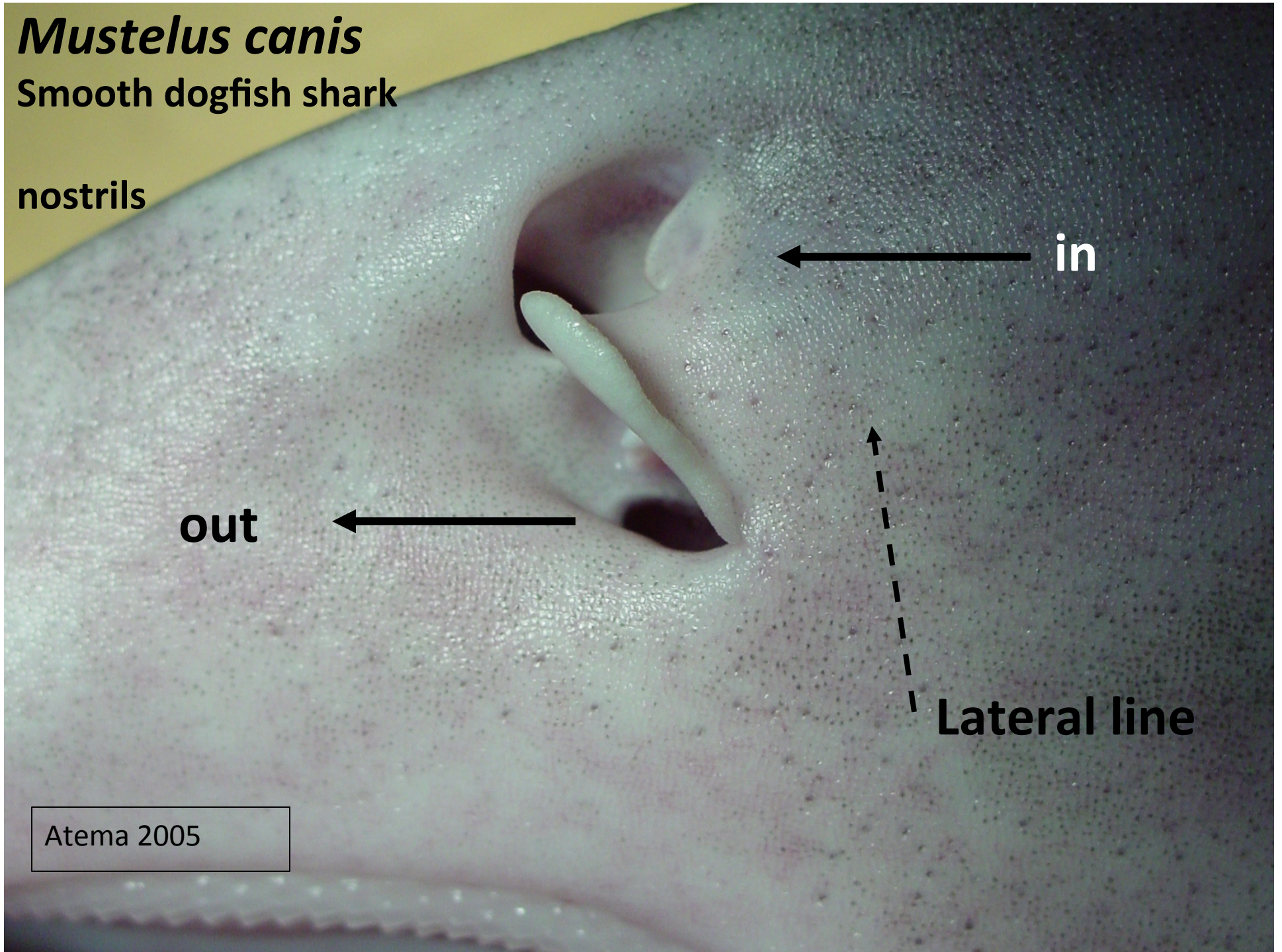
nostrils

in

out

Lateral line

Atema 2005

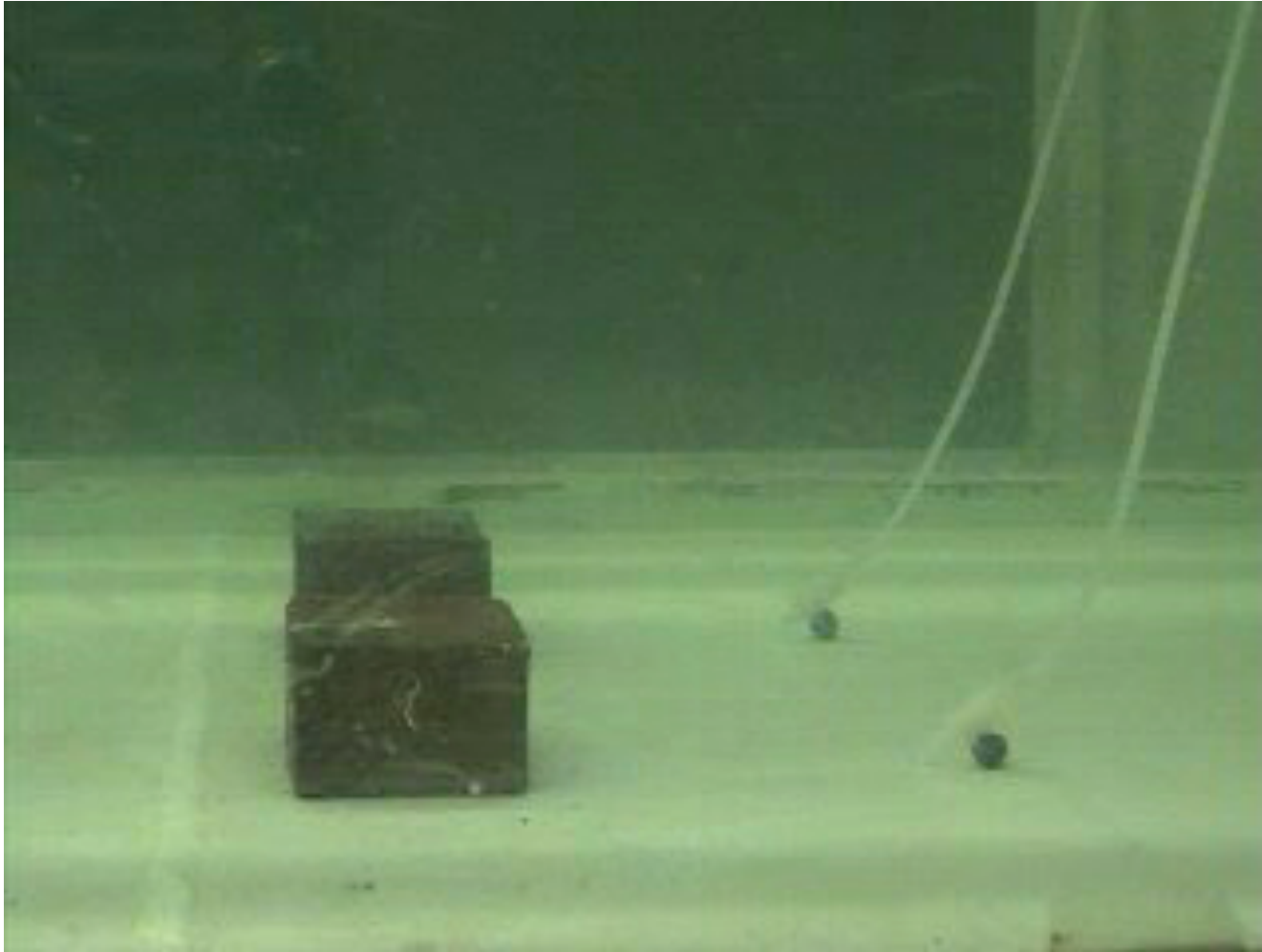


10-meter laminar flow channel for odor tracking experiments; WHOI shark lab

Dye visualization of odor dispersal (shark to scale)



With Lateral Line flow detection



Gardiner & Atema 2007 J. Exp. Biol.

Without lateral Line flow detection



Gardiner & Atema 2007 J. Exp. Biol

“head set” for odor pulse delivery via long tubing directly into nostrils

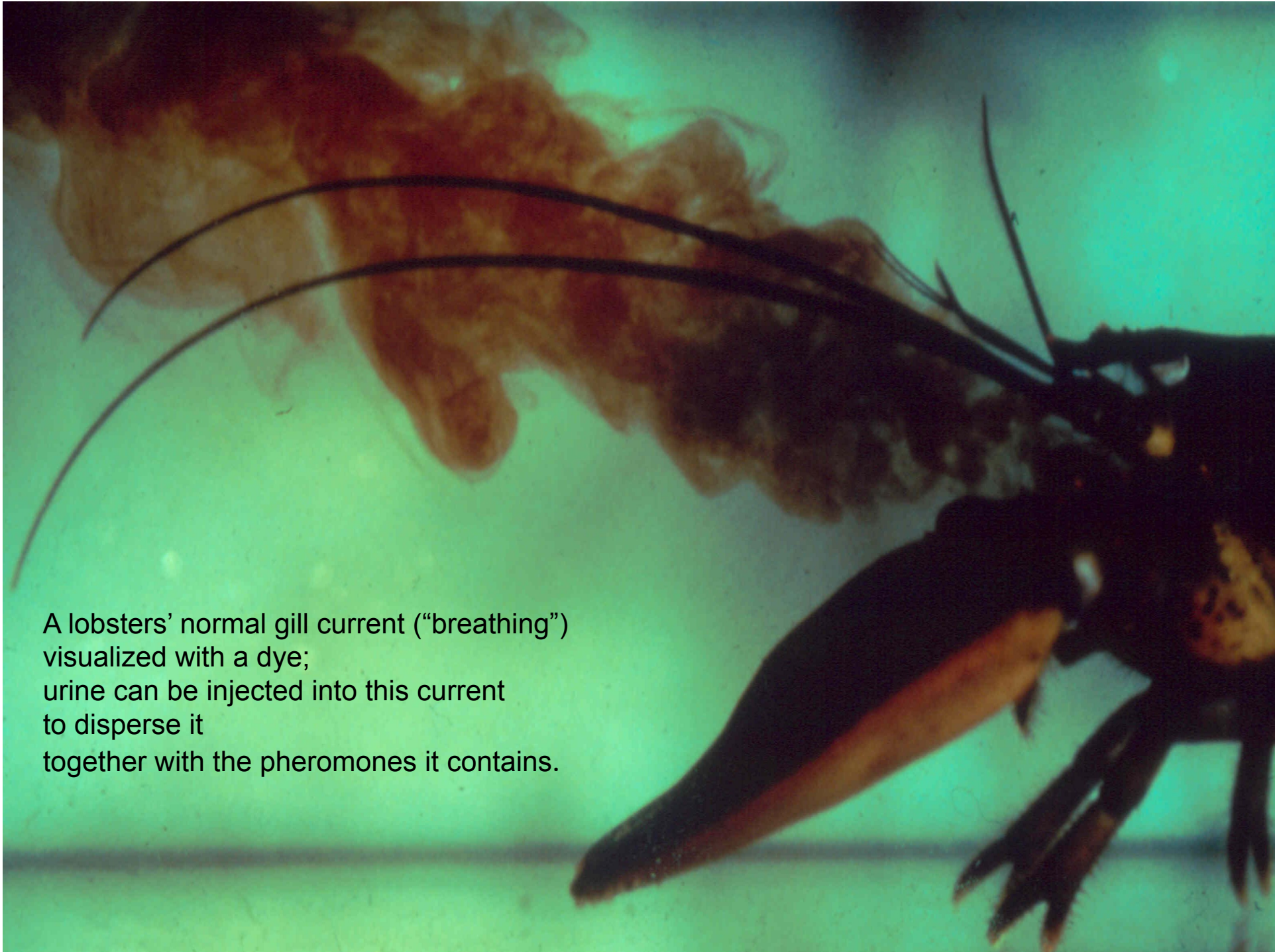


Gardiner & Atema, 2010



Part 3

The secret life of lobsters



A lobsters' normal gill current ("breathing") visualized with a dye; urine can be injected into this current to disperse it together with the pheromones it contains.



A critical moment in a lobster fight for dominance and thus attractiveness to females: claw lock and crunch. Touch, crunch, see, smell...all are used to remember the odor of the winner and to back off before a next fight. They forget the smell after about a week.