

Labs Begin Next Week.

You must bring your copy of the  
lab book to your lab.

Online homework in Mastering  
is due Thursday midnight.

Register for MasteringGeology

Your thoughts about the  
definition of *science*, etc.

Scientific facts:

Scientific facts:

reproducible  
observations

Observations *always*  
involve **uncertainty**.

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involve **uncertainty**.

Understanding and  
describing uncertainty is  
an essential part of  
science.

Scientific hypotheses,  
theories, models:

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relate facts to each other;



Scientific hypotheses,  
theories, models:

relate facts to each other;  
are testable/falsifiable

Testable explanations of  
the relationship between  
scientific facts can be  
relatively simple and  
preliminary

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**hypothesis**

Explanations of the relationship between scientific facts that have been independently tested and not (yet) invalidated.

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**theory**

Theories about different aspects of a problem can be combined to predict the characteristics of a more complex system.

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**model**

We do not do  
experiments to prove a  
hypothesis is right.



We do not do  
experiments to prove a  
hypothesis is right.

We do experiments to  
determine if a  
hypothesis is wrong.

“Truth is what stands  
the test of experience.”

Albert Einstein

Our goal is to develop  
reliable information  
about Earth

How do we gain direct  
knowledge of a physical  
phenomenon?

We see something.

We see something.

(We detect and process electromagnetic radiation in the visible spectrum of ~380-775 nanometers.)

We hear something.

We hear something.

(We detect and process variations in pressure with a frequency of between ~20 and 20,000 cycles per second.)



We smell something.

We smell something.

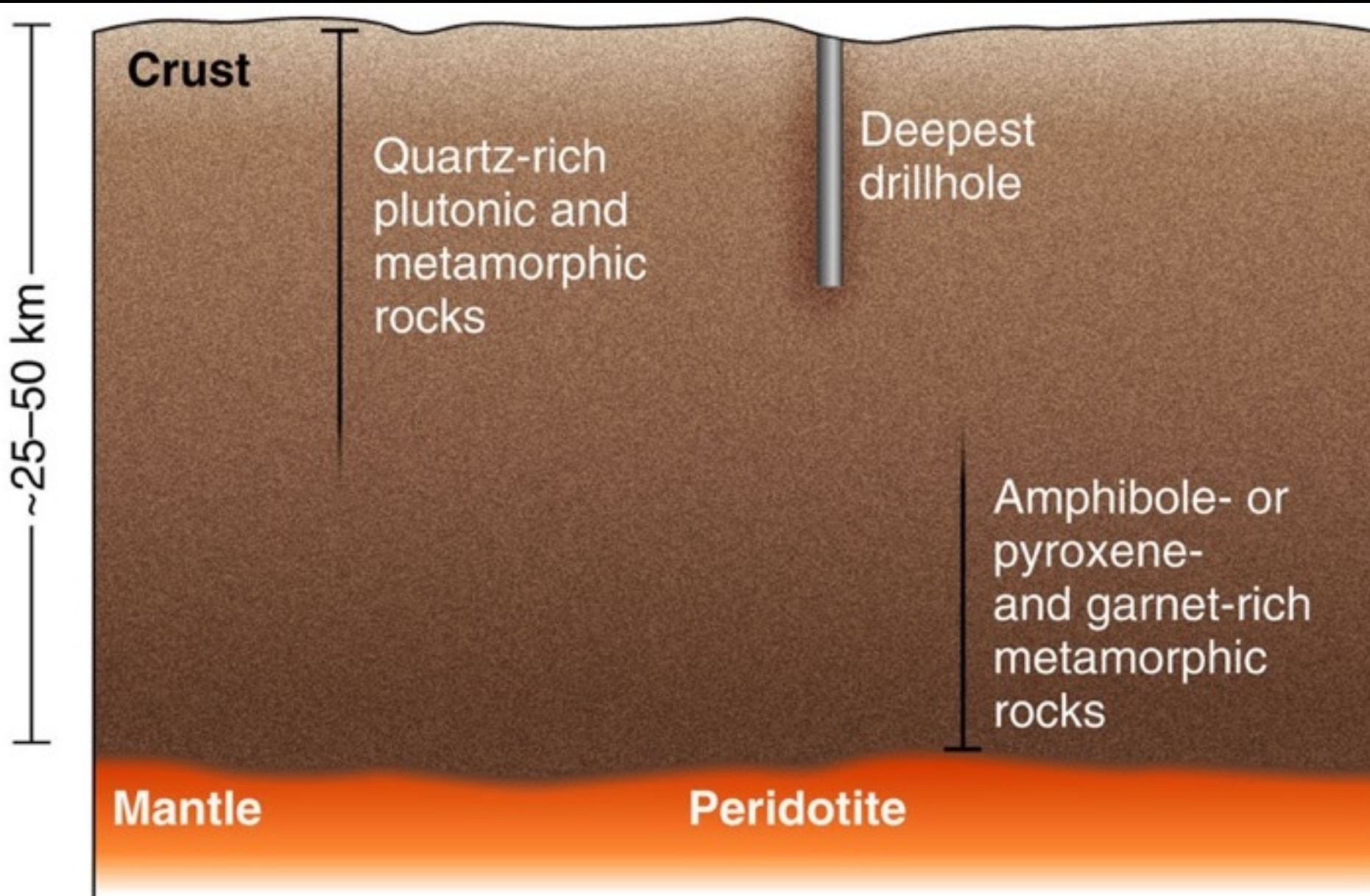
(We detect and process trace amounts of airborne chemical compounds, using chemical receptors in our head.)

We feel something.

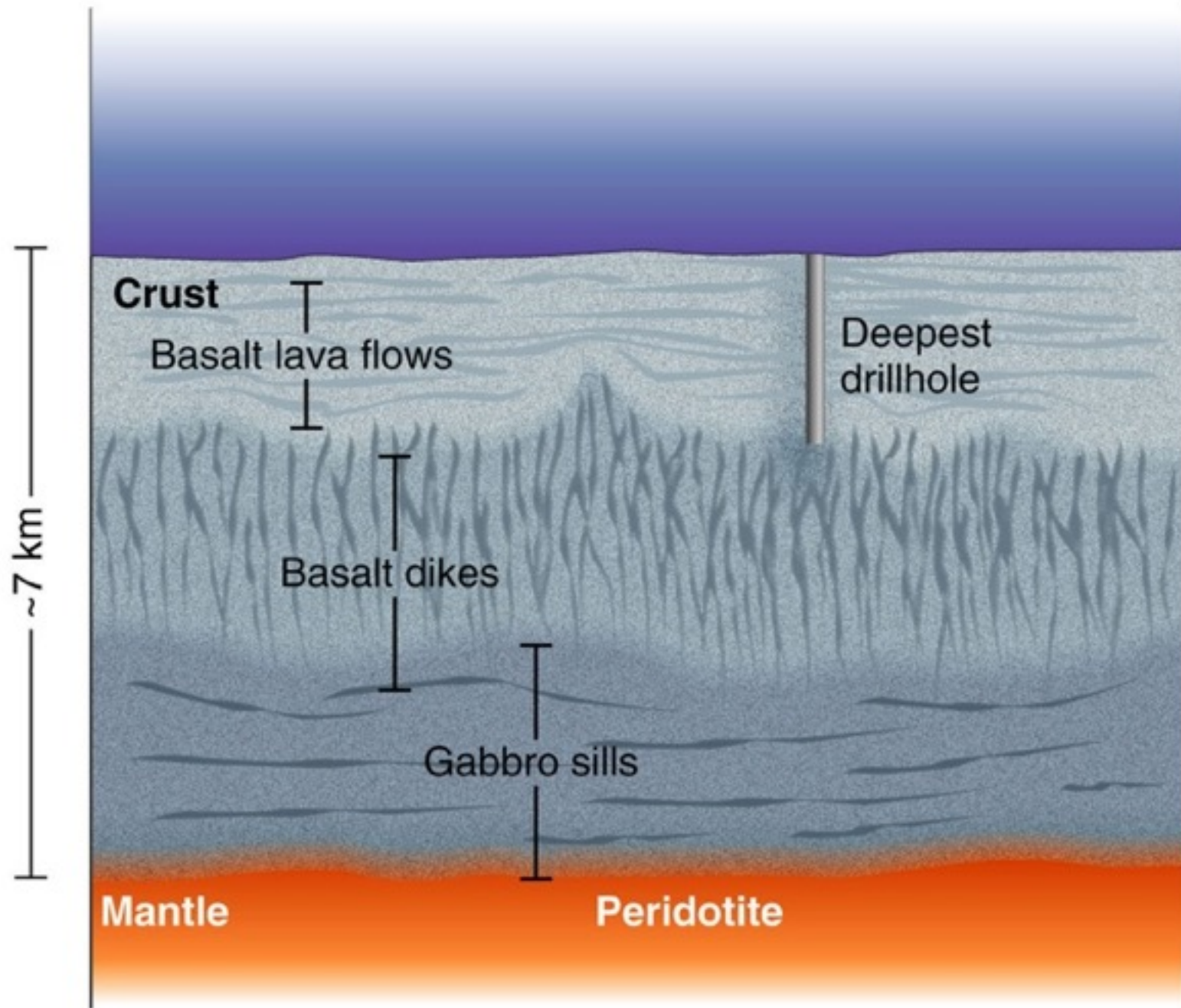
We feel something.

(We detect and process information about stresses imposed upon our skin or other stress/pressure-sensitive organs.)

How do we know about  
Earth's deep interior?  
After all, we haven't  
been there.



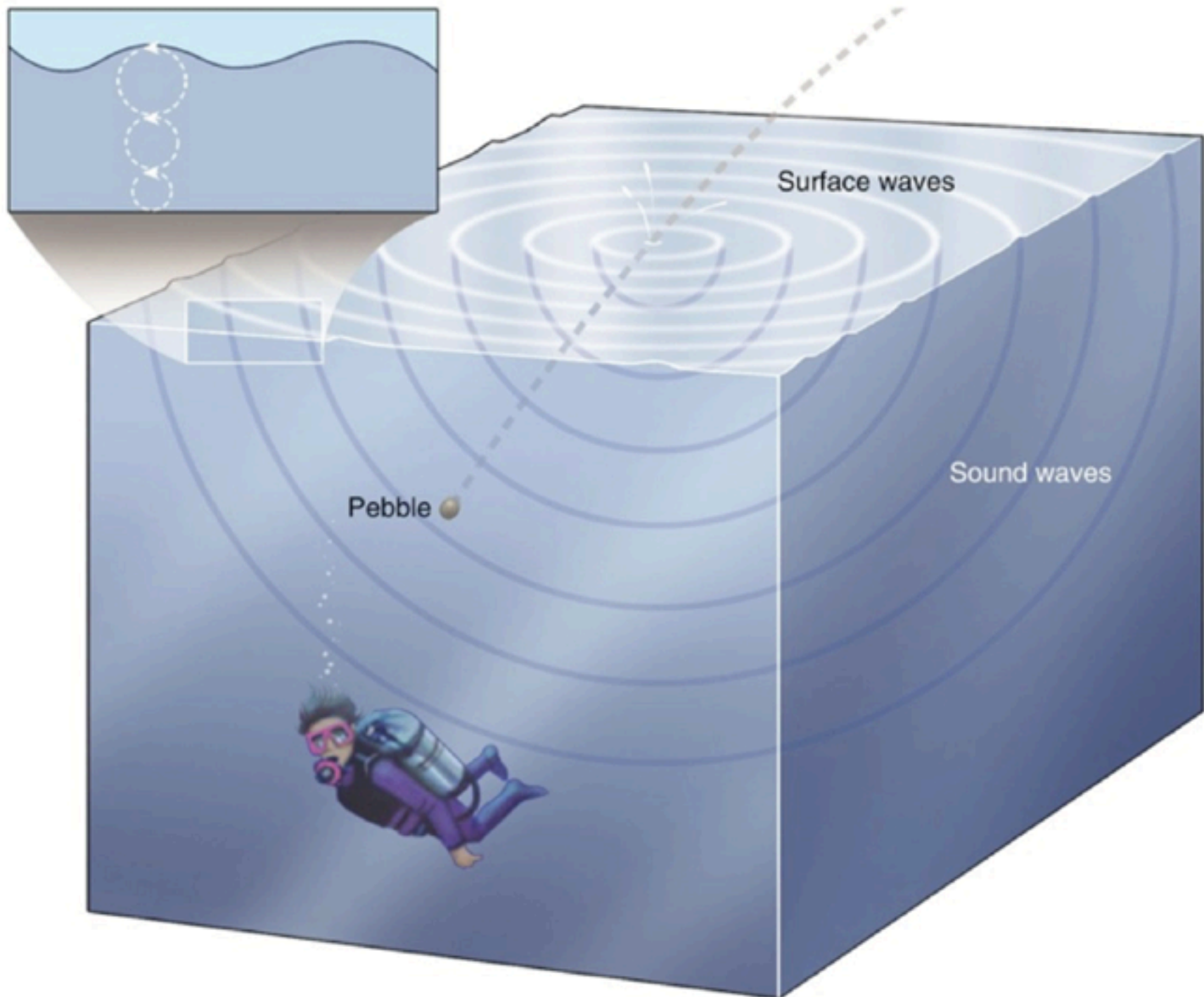
(a)



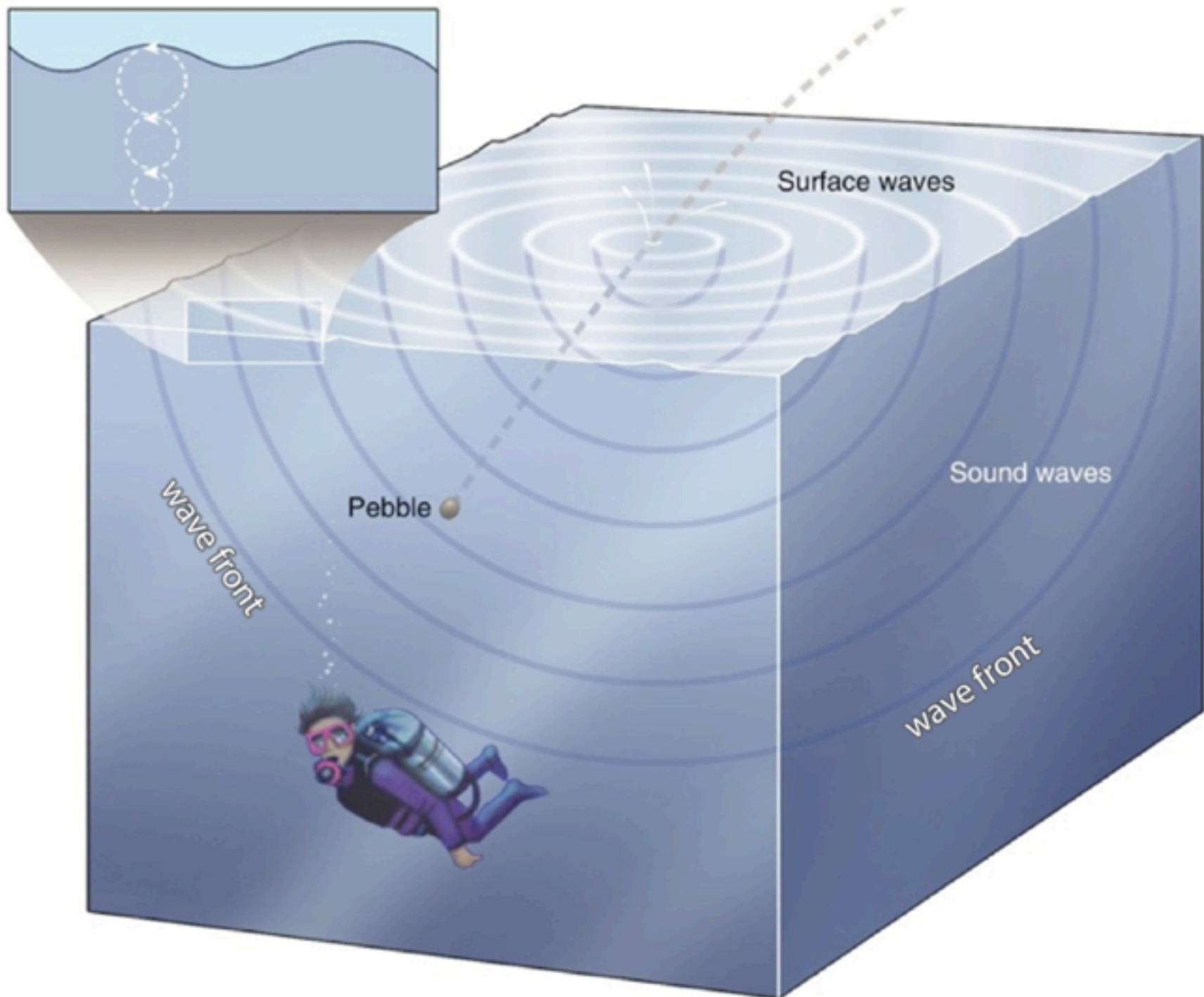
(b)



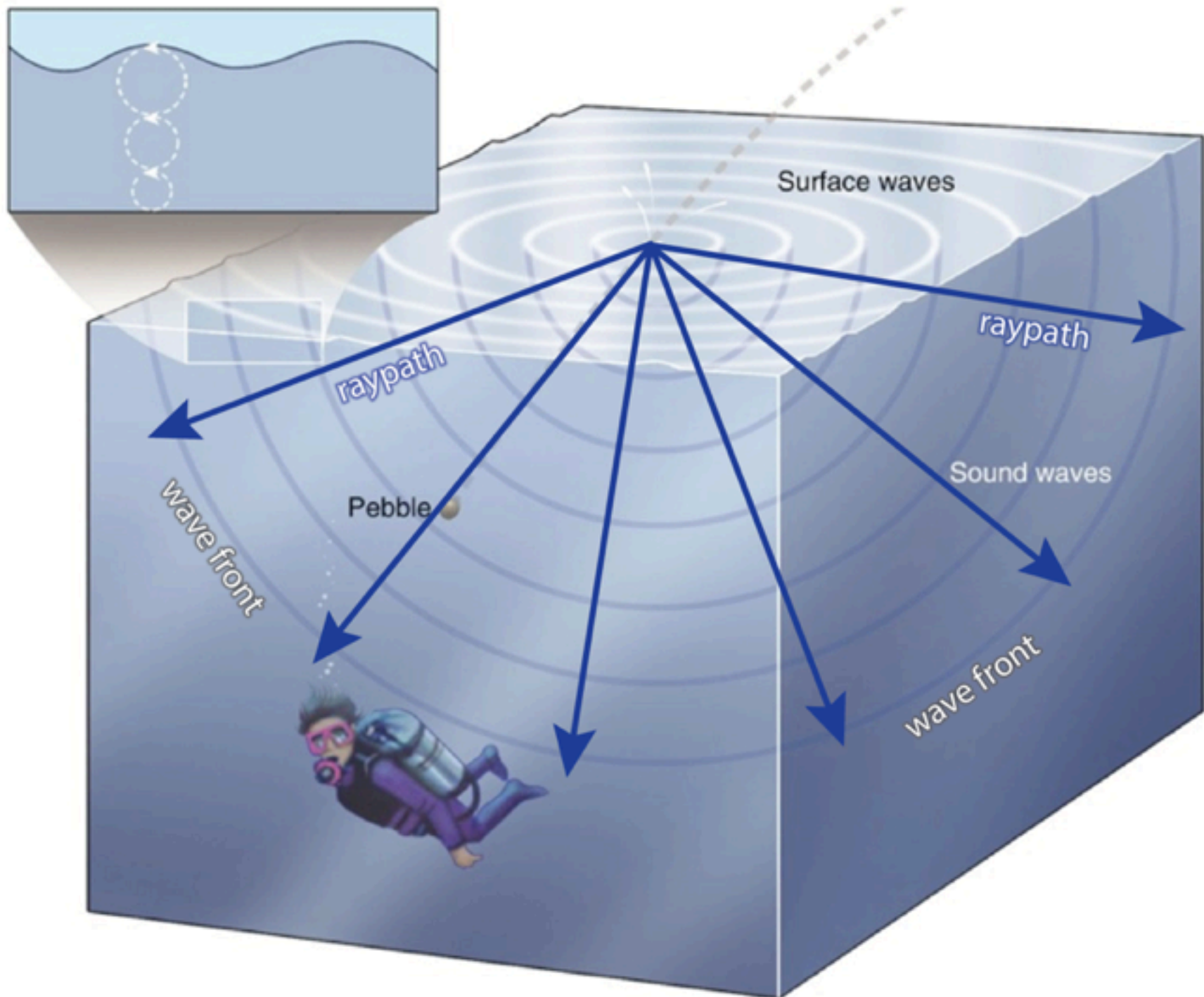




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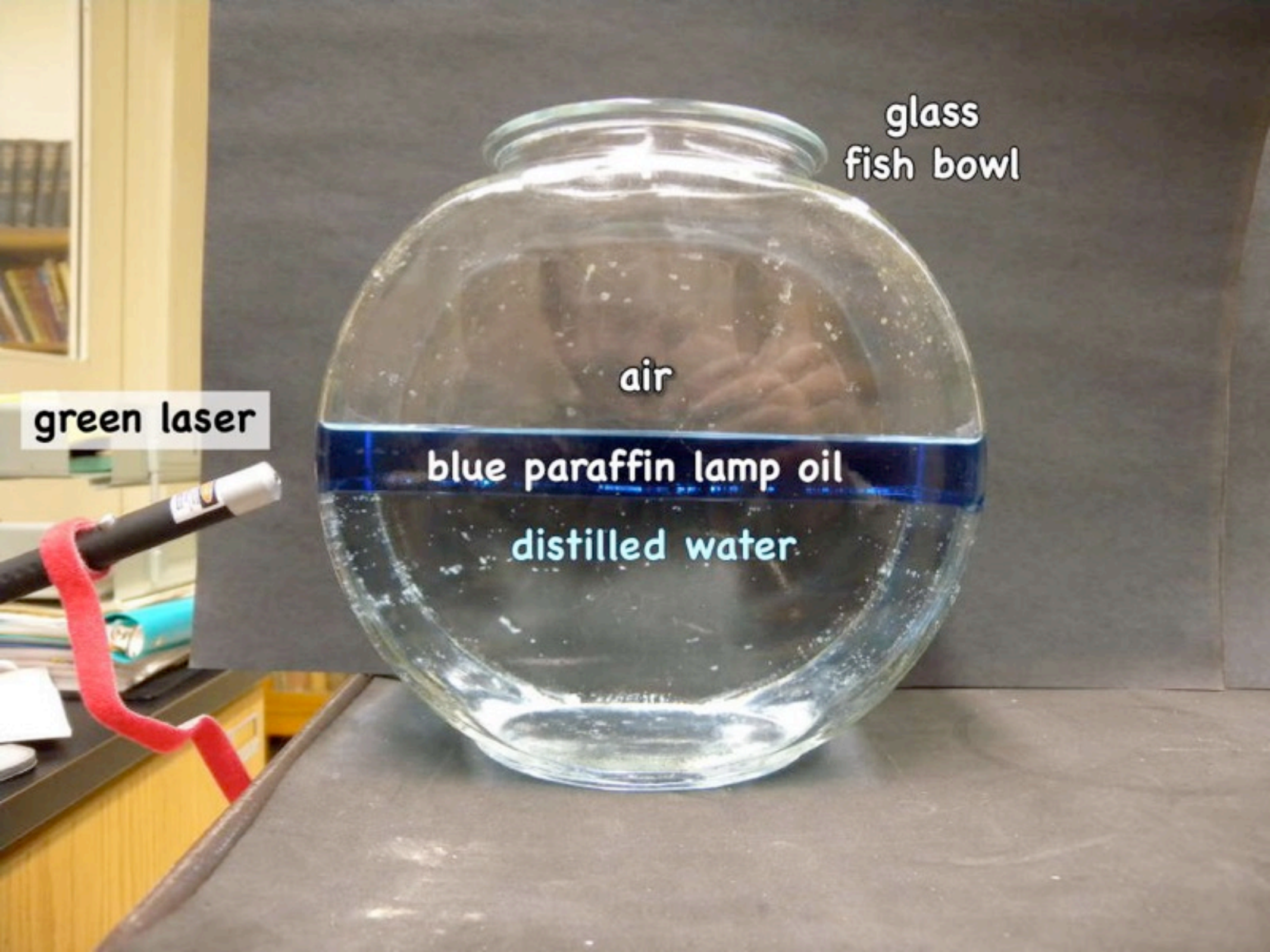
glass  
fish bowl

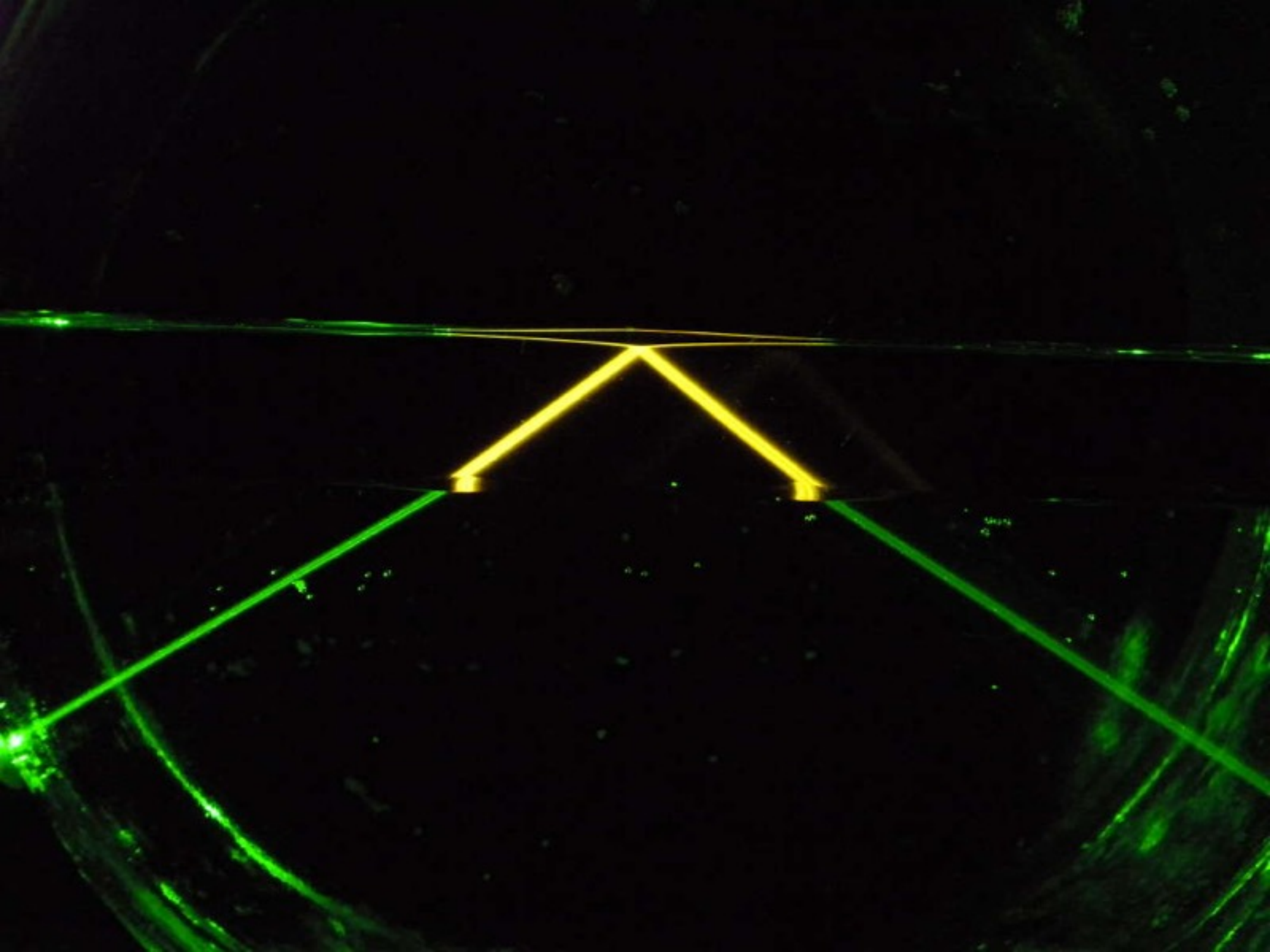
air

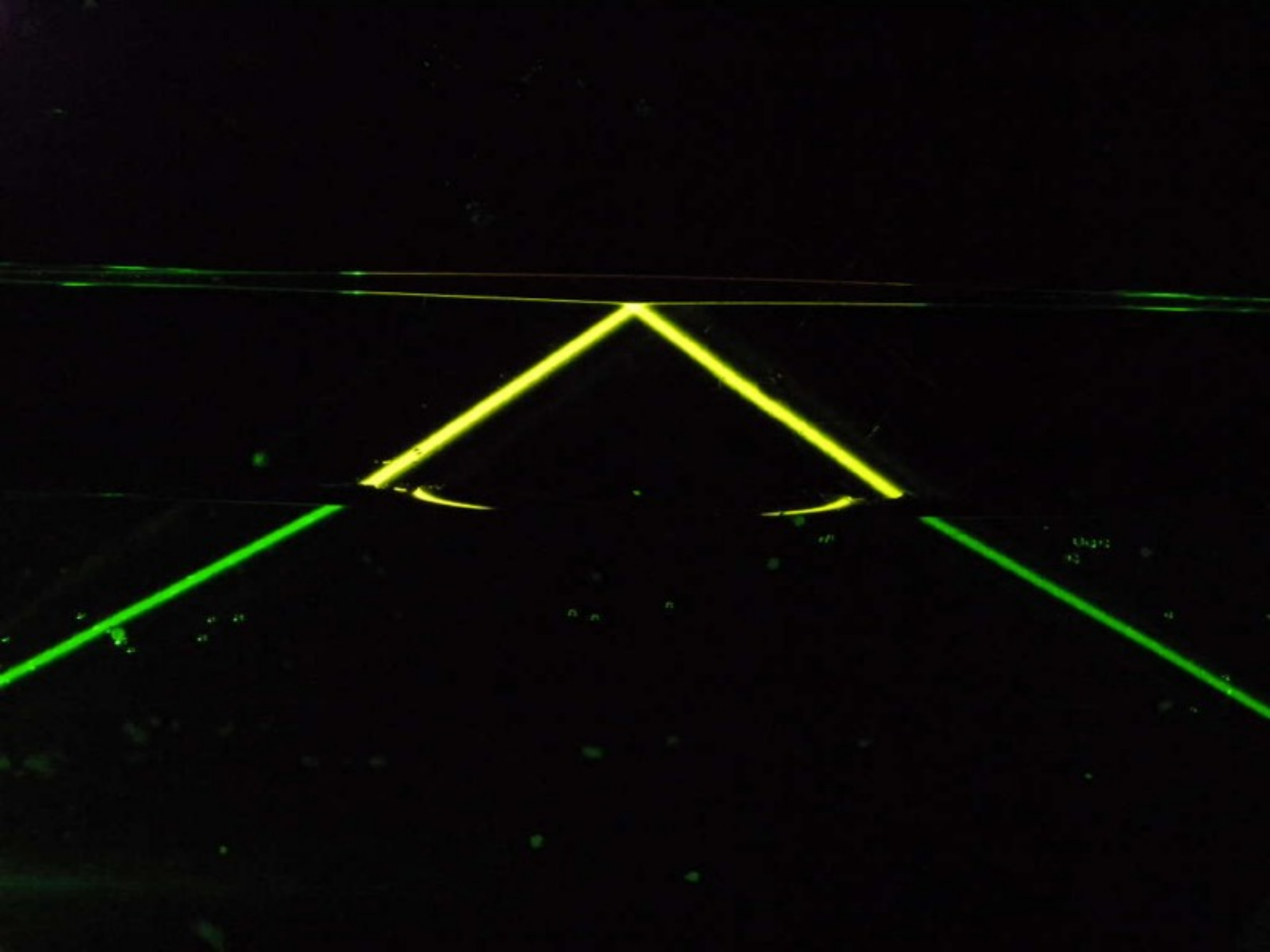
green laser

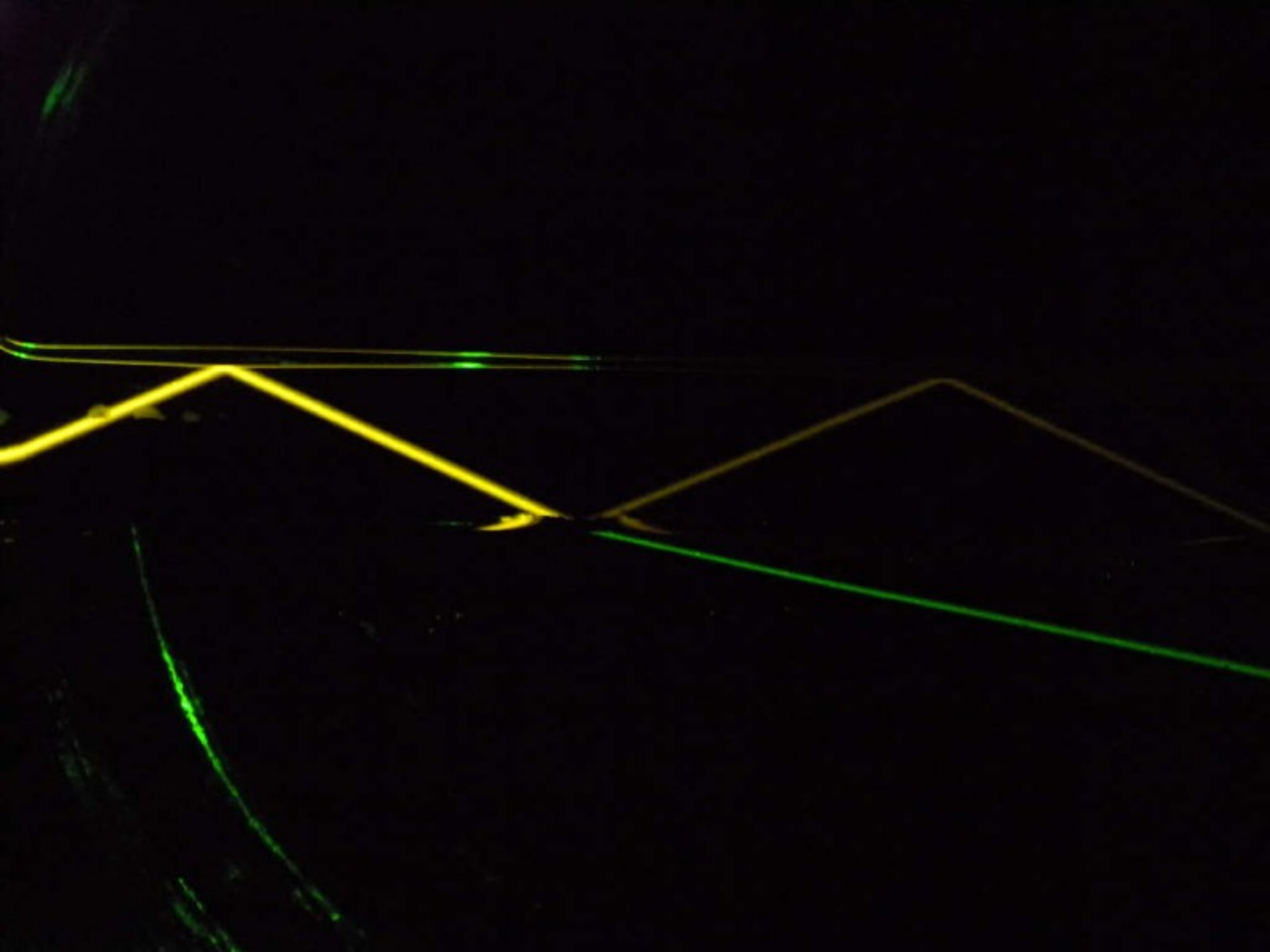
blue paraffin lamp oil

distilled water



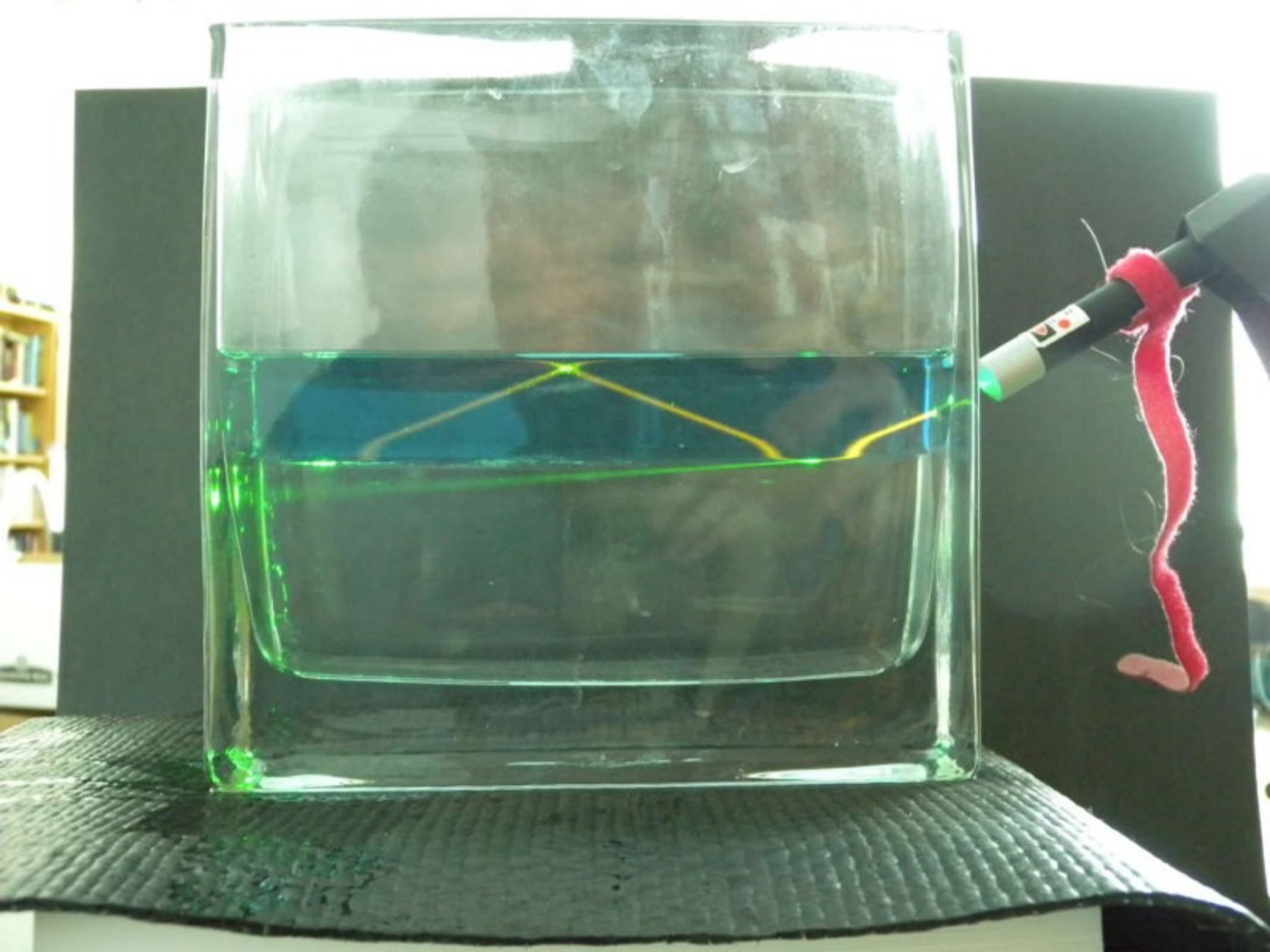


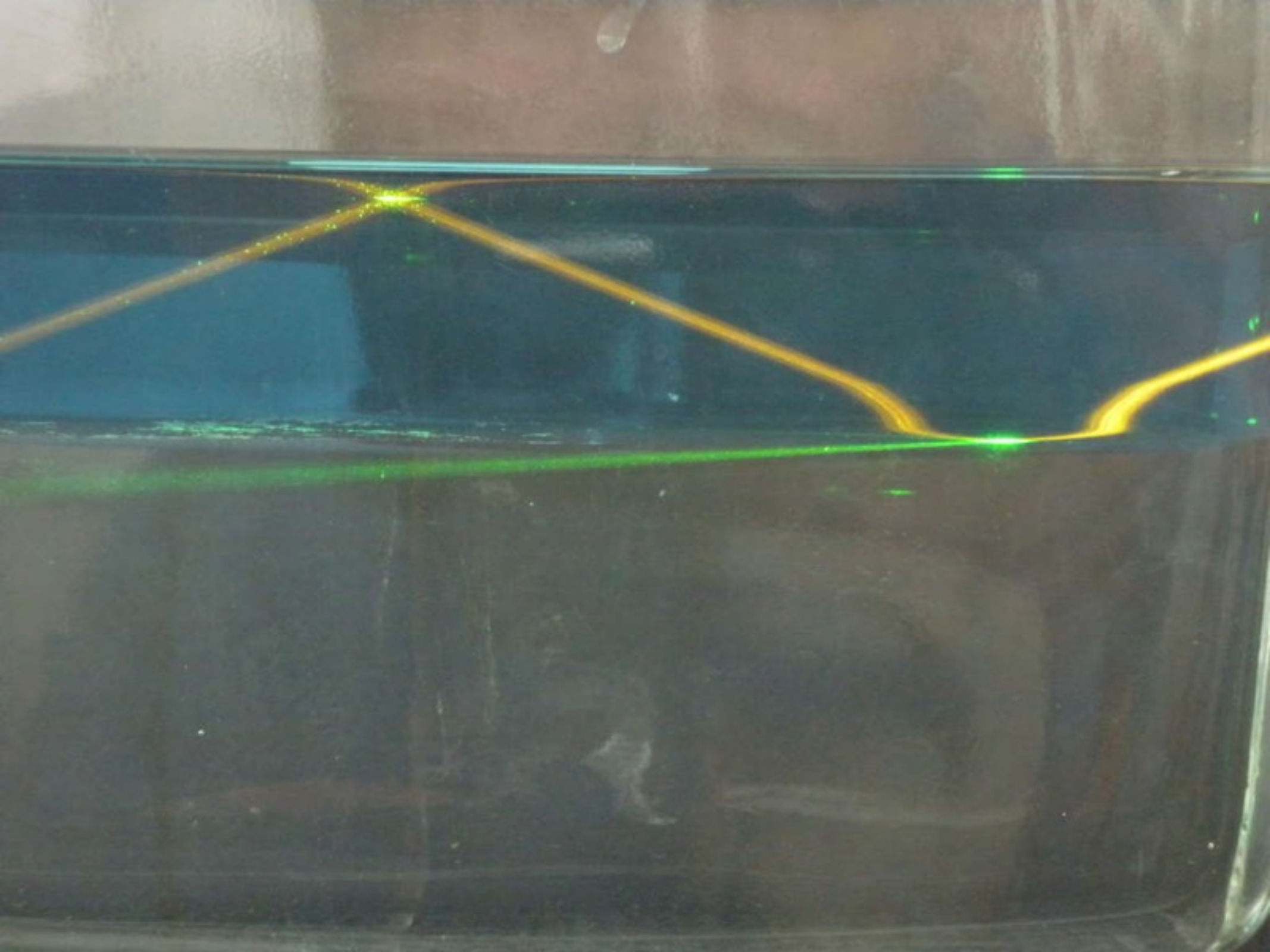


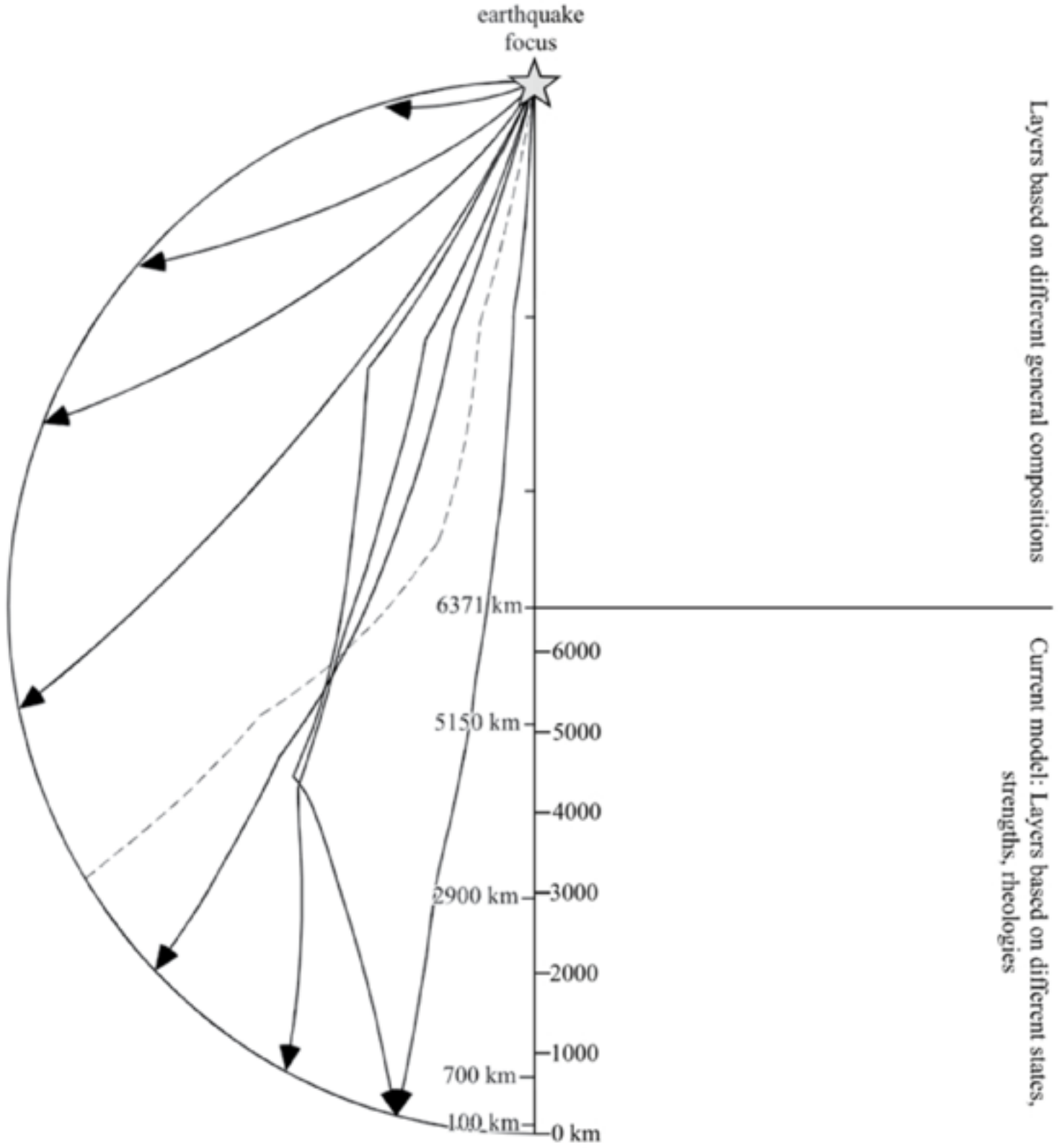


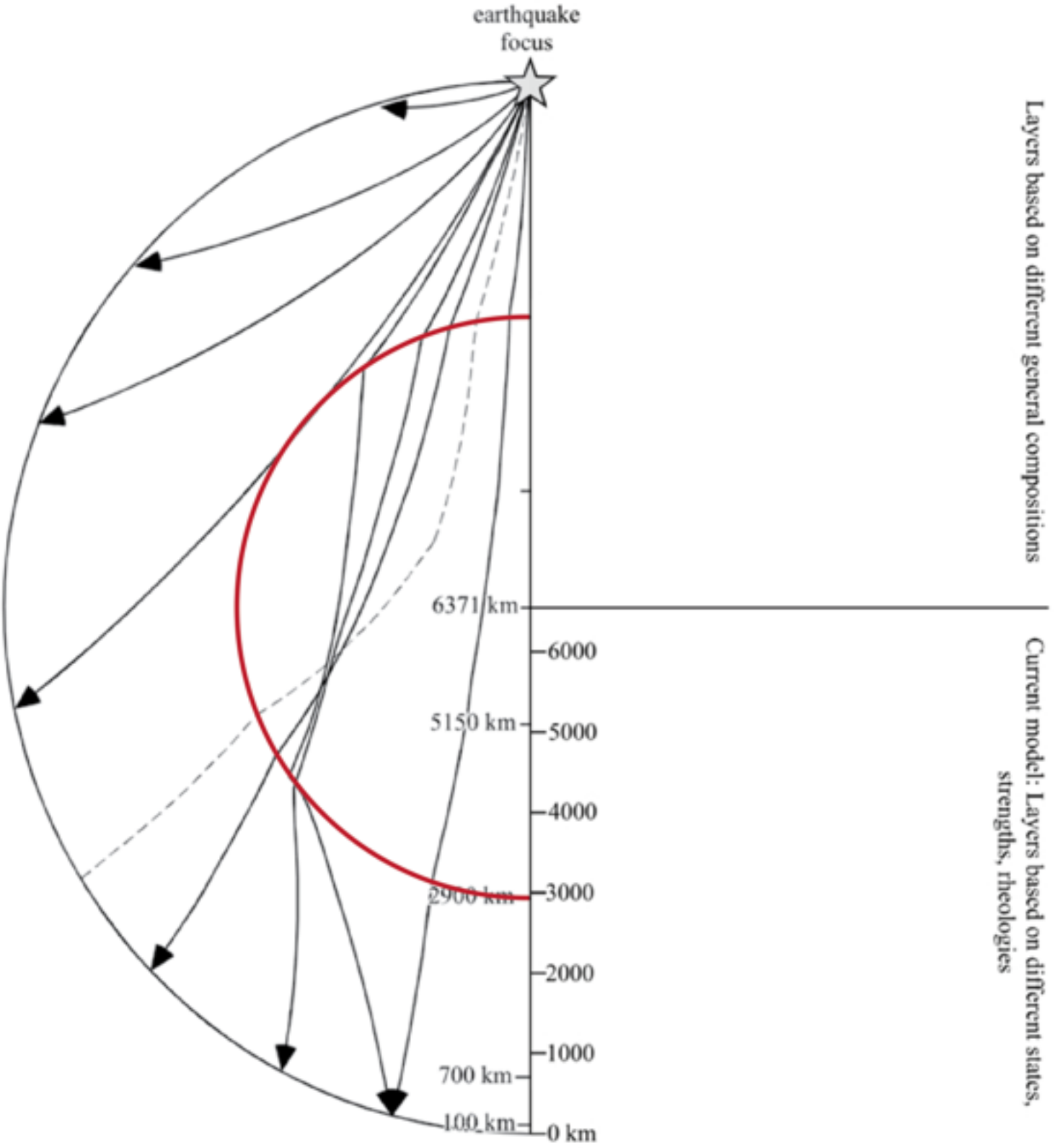


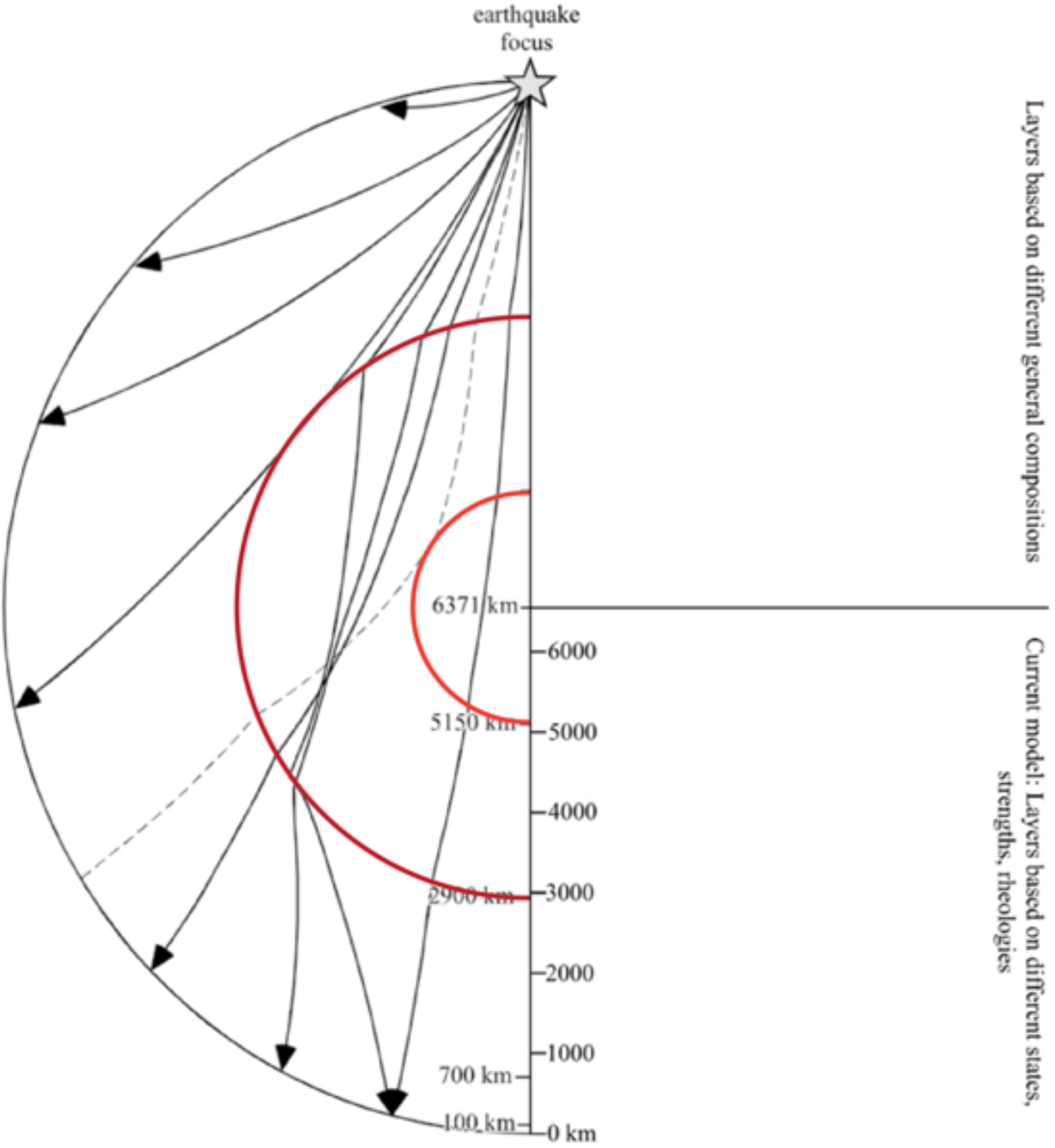


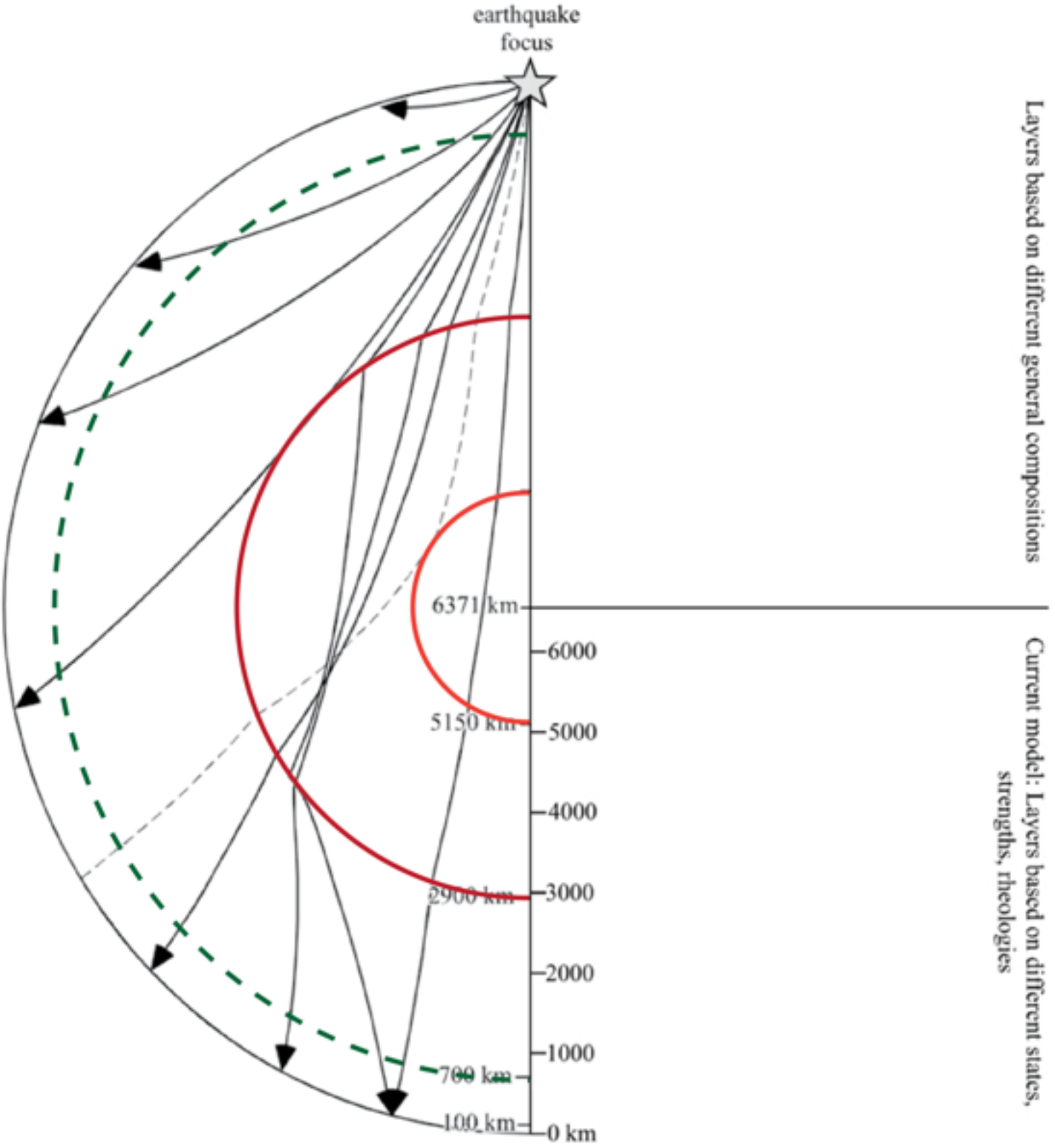


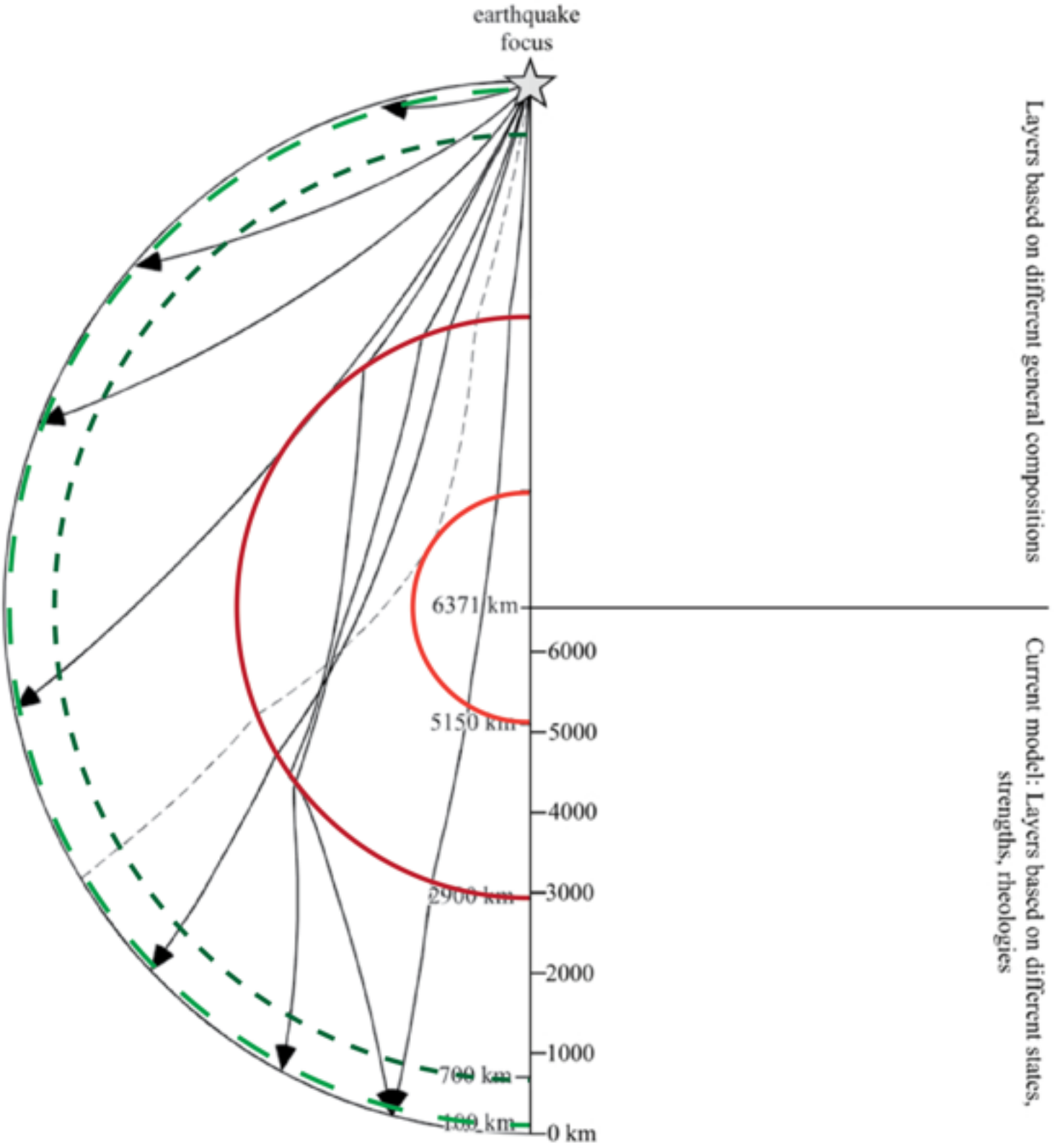


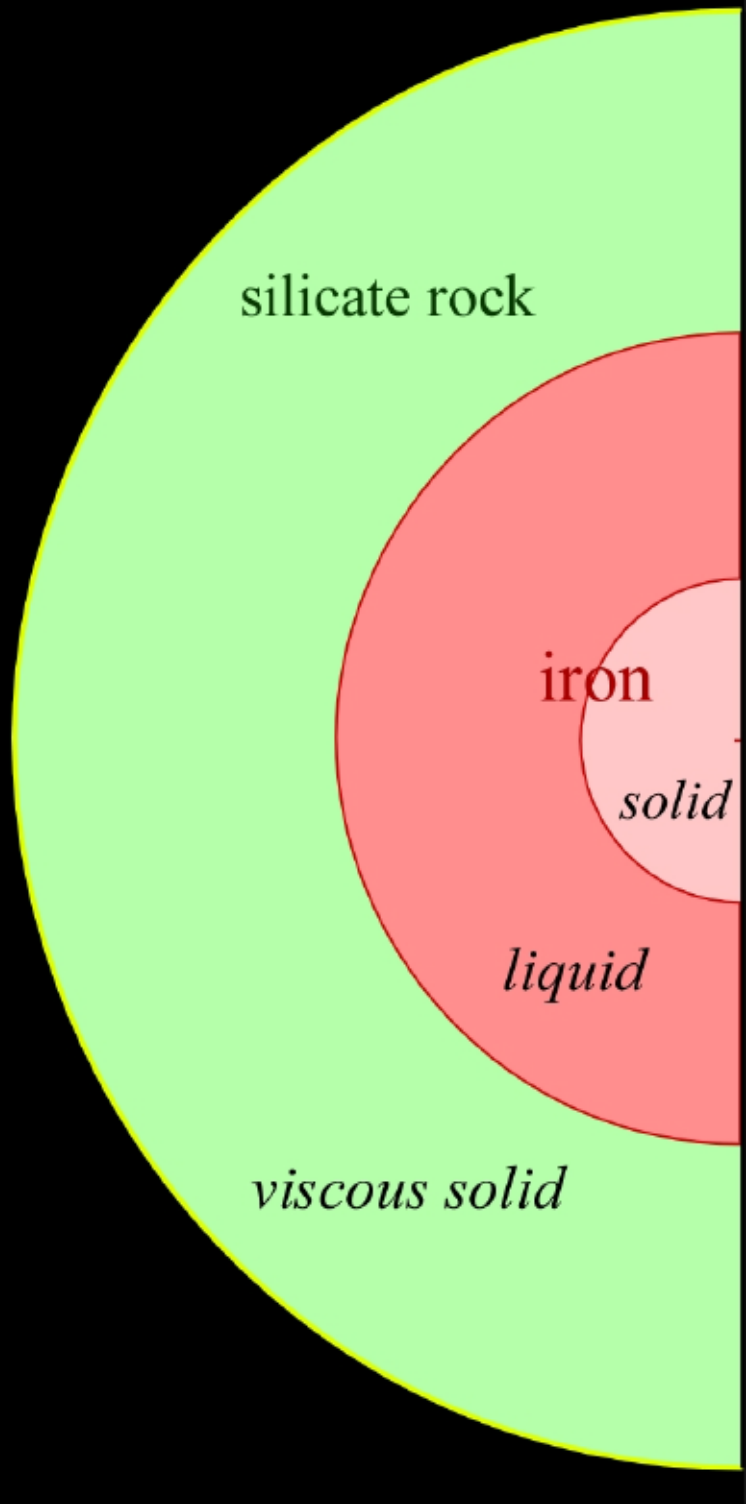












crust

mantle

2886 km

outer core

5150 km

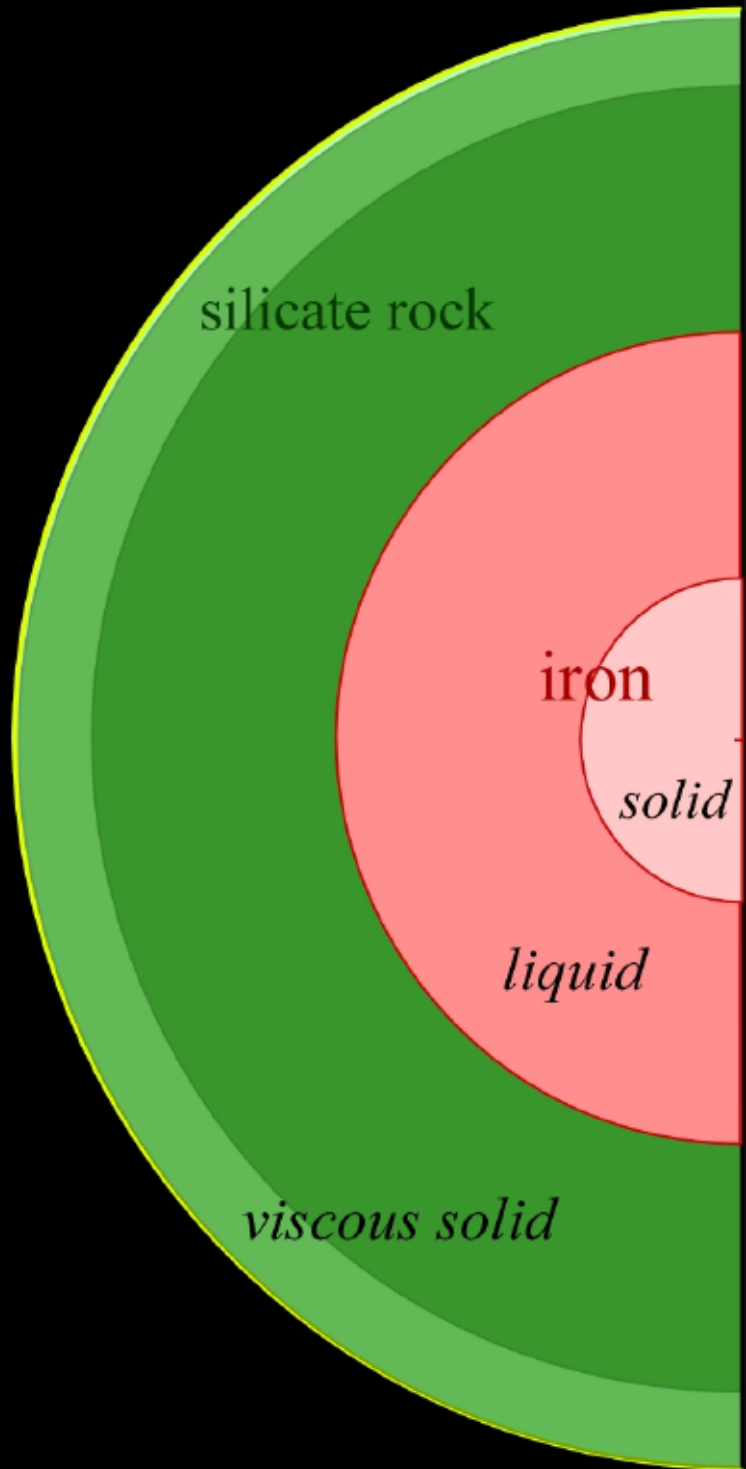
inner core

6371 km

average radius

Earth's layers  
based on  
general  
composition





**lithosphere**

**asthenosphere**

**mesosphere**

**2886 km**

**outer core**

**5150 km**

**inner core**

**iron**

*solid*

*liquid*

**6371 km**

**average radius**

*silicate rock*

*viscous solid*

**Earth's layers  
based on  
mechanical  
properties**

***lithosphere = crust + rigid-  
elastic upper part of mantle***