**Enigma 6 resolved : Core on deck !**

Seven rocks cores from the ocean floor... among them a sediment core less dense than the others hard rocks cores ... How to find it using the balance only two times ?

There were many comments to solve this mystery question.
A enigma that can be solved as follows:
Take 6 of 7 cores... Weigh three on each side of the balance.

Two possibilities:
The cores are the same weight, the sediment core is found not among them, the remaining core is that we seek (and we ended up with one weighing!).
If you are not so lucky, three cores have a lower weight than the other three ...that’s mean that the sediment core is one of them! You proceed to another weighing (the second one).
Take two of three cores, put one on each side of the balance.
Two possibilities ... if they have the same weight, the sediments are not in these two cores, or one of them is lighter and therefore detects the sediment core.

In total, it takes no more than two weighings to find our lost sediment core from the heavy cores gabbros!

Well here is one more enigma resolved, an enigma about density of the rocks, one of the physical properties measured on the JR.
Congratulations to all those who found such

One team on board is specifically dedicated to the physical properties of cores. This team is responsible for carrying out a series of measures that reveal the physical properties of rocks drilled from the bottom of the ocean.
Two techniques are used on the vessel to evaluate the density of the rocks:
First technique: all core samples pass under gamma radiation machine. A sensor collects the rays which could pass through the rocks and determines indirectly the density called 'bulk density' in g/cm$^3$. This allows to estimate quickly and automatically the density of each portion of the core.

![Gamma radiation machine](image)

Evaluation of the density cores 'bulk density'

The second technique consists to estimated for some samples (cubes) the volume and the mass. The Hess Deep Gabbro has a density of about 2.9 g/cm$^3$ ... one of the most dense rocks known on the Earth. !

I could not resist to make myself a small measure on a cube, easy to do it even your school! :

a balance, a graduated cylinder, water ...

![Measurements](image)

Reference sample: 345 U1415 I 2R 1W 51: dry mass: 22.748 g, 9 ml displacement volume (cm$^3$) ... so density $\rho = m / v = 22.748 / 9 = 2.527$ g/cm$^3$ ... we can certainly do better with a better precision in the volume calculation. !
To go further:

Physical properties are carried out quickly on the boat in the core lab. The measurements are carried out either on the whole core (very soon after his arrival in the laboratory), or half core (each core is cut into two symmetrical parts: A. W and W for the working core and A for core archive) Some others physical properties:
The seismic waves velocity in each sector of the core. The P seismic waves speed is evaluated by a microphone system. The speed calculated for our little gabbro cube is around 6250 m / s.

Preparation of two half-cores before examination by scientists

Scientists also evaluate the rock porosity, the magnetic susceptibility, the colorimetry, the thermal conductivity. All these measures are recorded in a huge database shared with other teams. All these data will useful for some later interpretations.

Reflectance and magnetic susceptibility measurements

The ship is also equipped with machines for the study of magnetism registered (residual magnetism) in the rocks. Magmatic rocks contain many ferromagnesian minerals. We should expect that the magnetic field is recorded by these rocks during their gradual cooling from magma. But the team of 'paleomagnetism' specialists aboard the JOIDES will tell us more later.