FLUIDS: BUOYANCY

Unit 19 Dr. John P. Cise, Professor of Physics, Austin Com. College, 1212 Rio Grande St., Austin Tx. 78701 , jpcise@austincc.edu & New York Times , April 212, 2017 by Dan Levin

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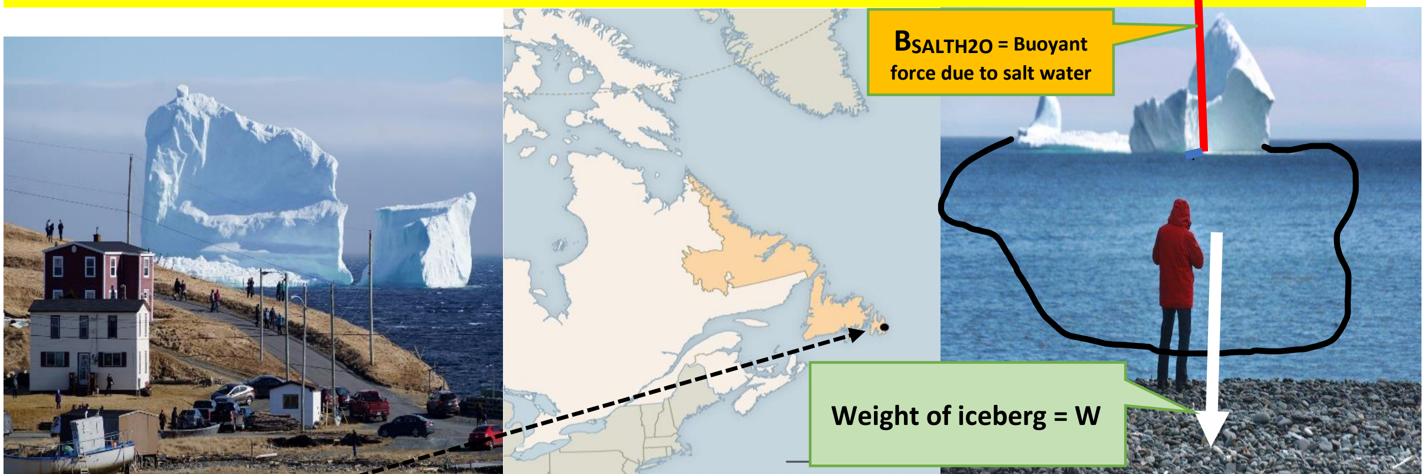
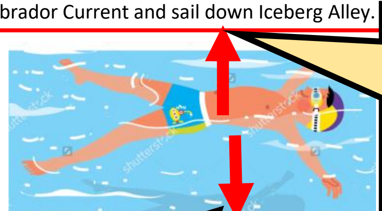
A CHUNK OF THE ARCTIC HEADS SOUTH FOR A PHOTO SHOOT



Iceberg watchers near Ferryland, Newfoundland. An iceberg ran aground over Easter weekend just off the small **Newfoundland town of Ferryland,** population 465, drawing knots of tourists eager to catch a glimpse. Some are locals or travelers who happened to be nearby, but many are a special Canadian breed, the iceberg chaser — people who flock to the coasts of Labrador and Newfoundland at this time of year hoping to see the huge frozen chunks of broken glacier that drift by on a stretch of sea known as Iceberg Alley. The berg at Ferryland rises about 15 stories above the waterline **— (((and that is only about 10 percent of its mass)))**. Some of the submerged ice comes into view when the berg is seen from above. Iceberg season starts in April, and there has been a bumper crop this year. **More than 600 bergs have drifted into the North Atlantic shipping lanes so far,** a count not usually reached until late May or early June, according to the International Ice Patrol of the United States Coast Guard in New London, Conn. The typical amount for April is closer to 80. The stunning view that is causing traffic jams of onlookers on the coast road is actually a snapshot of the iceberg's death throes**, 15,000 years in the making. What began as snowflakes falling on Greenland during the last ice age has crept to the sea in a glacier and then broken off,** probably sometime in the last three years, to float slowly out into Baffin Bay. Bumped and nudged by one another and by melting pack ice, the bergs eventually get caught up in the southbound Labrador Current and sail down Iceberg Alley.



B = Buoyant force on swimmer due to water displaced by his body. B = weight of water displaced = $D_{H2O}\,V_{Water}$ D_{H2O} = 1000 kg./m.^{3}

Weight of swimmer = W = $D_{HUMAN}\,V_{HUMAN}$ Typical D_{HUMAN} = 985 kg./m^3

Thus, to be in equilibrium: $B = W \quad (1)$

$$D_{H2O}\,V_{Water} = D_{HUMAN}\,V_{HUMAN} \quad (2)$$

$$V_{WATER}/V_{HUMAN} = D_{HUMAN}/D_{H2O} \quad (3)$$

$$\text{"} = 985 / 1000$$

$$V_{WATER\ DISPLACED} = 0.985\ V_{HUMAN} \quad \text{eq. 4}$$

Thus by equation 4 it is seen that the person floating displaces 98.5 % of his/her body volume. Persons who are fat have a smaller density, thus float higher out of water. Floating in salt water is more buoyant.

INTRODUCTION: **Function of this application is to verify in the above article the statement that only 10% of iceberg is seen…….90% of iceberg volume is under water. From Wikipedia: D_{ice} = 911.7 kg./m.^{3} , $D_{SALTWATER}$ = 1027 kg./m.^{3} .**

QUESTION: **(a) Find $V_{SALTWATER\ DISPLACED} / V_{ICEBERG}$ = ? (b) Thus, what % of iceberg is out of water?**

HINTS: **Use concepts seen is buoyancy example at left.**

ANSWERS: **(a) 0.89 , (b) ~ 10 %**

COMMENT: **The key to understanding how floating is made possible is to have a object of less density in a fluid of greater density. The greater the difference of those two density factors, the higher the floating object will be out of the fluid it is floating in.**