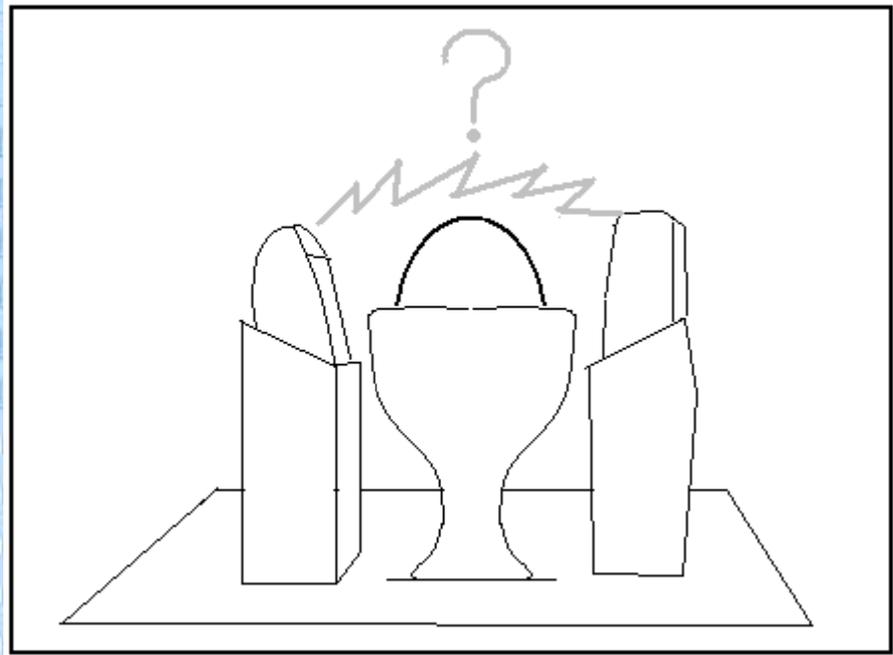


Cell phone and Internet hoax

The cell phone for all its versatility, cannot boil an egg, says S.Ananthanaryanan.

The Internet has recently carried a story to warn the public about the dangers of using cell phones. The story suggests that the microwaves of cells phones are pretty strong and it says that two Russian experimenters actually cooked an egg in fifty five minutes - using a pair of cell phones which were connected to each other.



Is it true then?

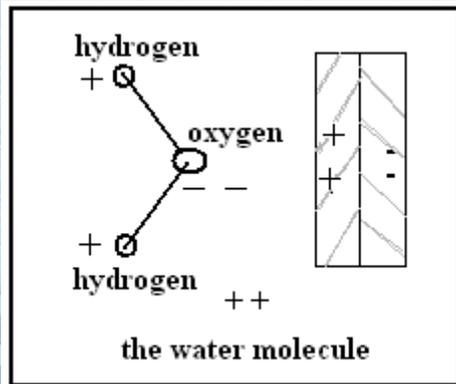
Well, not that cell phones do not use microwaves. But just how do they use these waves – can cell phones behave like a microwave oven? And how do microwaves cook, can they, in fact cook an egg? Answers to these questions can help us say if the story in the Internet is true.

Microwaves

We may know that X rays, visible light, the heat that radiates from a warm object and even radio waves are basically the same – electromagnetic waves, or waves of electric and magnetic effects, flowing out like the waves of the sea. The waves of X rays and visible light are short, and they move up and down very fast, while radio waves are long waves and they fluctuate much slower. Some where in between are the microwaves, with the waves being about a micron long, and they fluctuate at an intermediate speed.

The intermediate speed happens to match the speed of rotation, or changes in rotation, of the water molecule. We can imagine that if smaller tops usually spin faster than bigger tops, a water molecule must spin very fast indeed. And the water molecule also happens to be one of the few

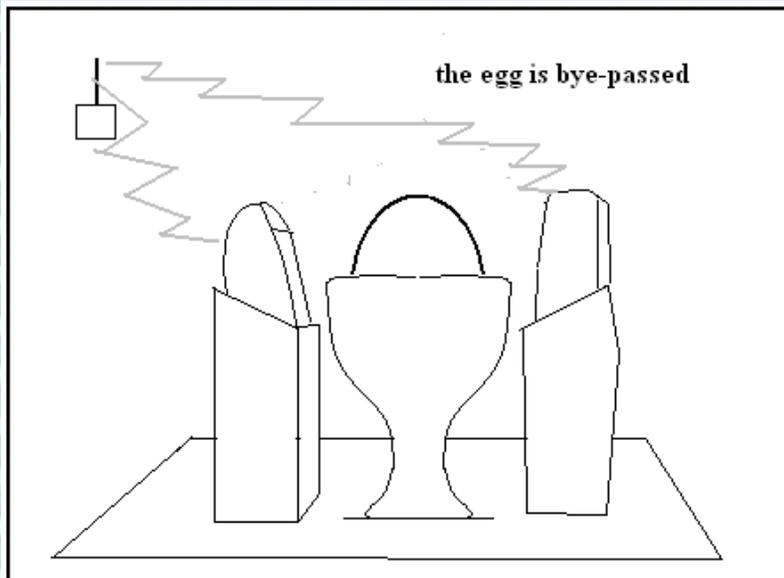
molecules where the internal charges are not symmetrically distributed. The charges are *not in line*, and the water molecule is something like a magnet, with a pole at each end.



Now this kind of 'polar' thing, in an electromagnetic field, can be set spinning – and if the frequency is right, the spin can get progressively *faster!* This is exactly what happens to the water molecule in the microwave blast in the micro oven and the spinning of the molecules results in the water getting warm and then hot. But it is only the water part of what is in the oven that heats up and micro ovens can warm coffee or tea and blow up poppadams, but the micro cannot fry or toast!

Cell phones

Cell phones are two-way radio sets, which have the advantages of being portable and also able to re-use the same communication frequency which other cell phones are using some distance away. The method is that a city is divided into 'cells', within which each phone is provided with a unique frequency to talk with a base station for the cell. But in cells a little removed, the same frequencies can be used again, to talk with other base stations – and this is the reason that thousands of cells phones can be working!



But the main thing is that unlike radio sets, cell phones do not talk directly with each other but they talk with the base station. The idea that there is something going on between two cell phones, which can affect an egg placed between the phones, is thus pretty imaginary! And in any case, there is no stronger radiation in the direction of another cell phone or the base station, the cell phone just radiates in all directions and the base station in range just picks up the signal!

Cooking the egg

Quite apart from whether the power radiated is enough to affect even a microbe, a question is whether microwaves can cook an egg. As we have seen, what the strong microwaves in the micro oven do is to heat the water content of things placed inside. Water molecules inside the egg would thus get heated and the rest of the egg may war, by sharing the heat. But well before the egg heats to any material extent, the water would vaporise and the egg itself would burst! I would not suggest an attempt of putting an egg inside a microwave oven unless one has very willing help available to clean up!

And if the microwaves are so faint that they cannot vaporize the water, then they would hardly affect the whole egg, to cause the albumin to harden and also cook the yolk inside. In any case, the average power used by a cell phone is less than half watt. This is equivalent to about a quarter of a calorie every second. Boiling an egg needs water at 100°C for 9 minutes, A small egg weighs 50 grams. Getting just 50 grams of water up to 100°C would take about $50 \times 70 = 3500$ calories. All the power of a cell phone, concentrated on 50 grams of water would then take 14,000 seconds to get it boiling. This comes to 233 minutes, or about four hours. Except that this is assuming the water takes in all the energy of the cell phone and does not cool. In practice, it may only just warm slightly. In reality, not even that.
