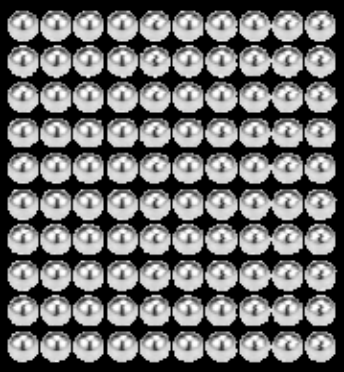
THE MAGIC BALL-BEARING?!

By Mol Smith –UK

So... here's a thing! Something you probably never thought about. Same here! Until this idea hit me and I wished to see if it was an ill-conceived idea or if maybe it might have a small significance. Have you noticed when observing freshwater organisms in a water droplet on a slide, how you rarely see the front of them. Maybe because they are quite flat and maybe due to gravity, you mostly see them as long subjects on one side or the other. There are some exceptions, I know. Anyway, I was wondering if one could position miniature mirrors into the slide, such that if you focused on the mirrors, you might glimpse a reflection of an organism. What could i use to try it out? I thought about it for awhile and then realised they might make miniature ball-bearings. I took a look on Amazon and to my astonishment discovered this...



100 ball-bearings, 0.5mm diameter, and just under £4.00.

It seems I was on with a hope of furthering my experiment. As far as I know, no-one has done this before!

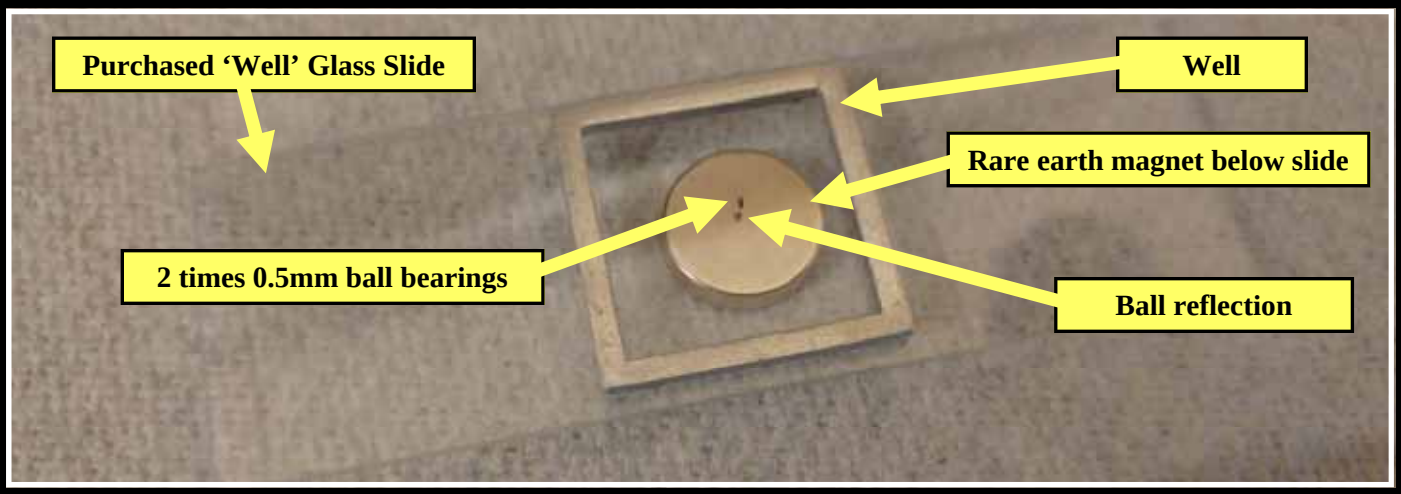
Before we begin, I want you to think about this for a moment. Hopefully, you understand the aim? It's a bit like owning a telescope to look at something say, a mile away in a room. You can't see directly into the room except perhaps, through an open window, and noticing a mirror on a table angled to reflect a part of the room's interior. You focus your telescope on the mirror, and viola you see inside the room. In our case, the ball bearing is our mirror and the microscope is our telescope.

What problems might exist with my idea? The steel chrome-plated ball-bearings look shiny and very reflective. And they look perfectly smooth, well—to my naked eye. But will they look perfectly smooth at say, 800x magnification? Another issue could be fixing the ball or balls to the glass of a well slide. What will I glue it with? And will it be too big for a cover slide to fit over the well? The final issue will be distortion caused by the convex nature of the spherical surface of the ball.

I had solutions, I think! I could use a tiny drop of resin to stick the ball on the slide. I won't know about how smooth or rough the surface of the ball might be until I look with the microscope. The distortion I can fix with software on my pc. It would mean 'looking' with a camera to take a photograph or video instead of using my eye. But that is fine.

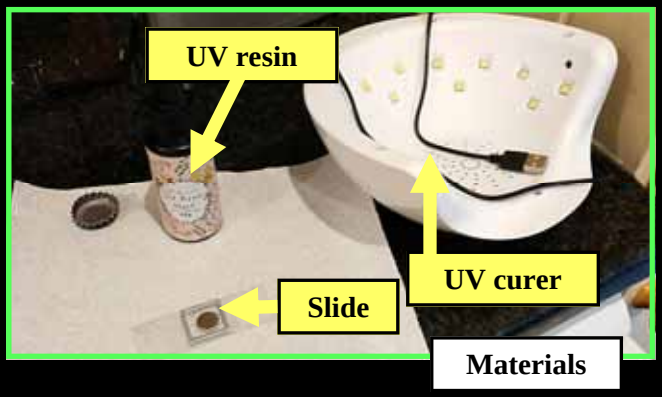
And here are the balls (above), with a ball-point pen (biro) for size comparison. The ball in the big looks much bigger.

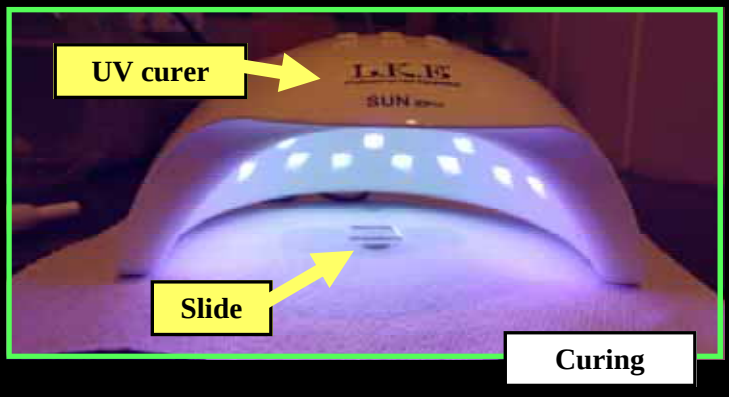
Off we go then. First problem was getting one of the tiny balls out of the bag. I used fine tweezers but the ball stuck to it with a weak magnetic force. I ended up wiping the tip of the tweezers with my finger tip to coax the ball into the well of the slide. Amazingly, I could feel the ball with my finger tip. They are very sensitive, after all. When I looked, I realise two balls have gone into the well. See blow.



I used a very strong rare-earth magnet to hold the ball in the centre. I moved the ball/ balls to one side and put the ,merest hint of UV curing epoxy resin on the slide and moved the balls back onto the resin.

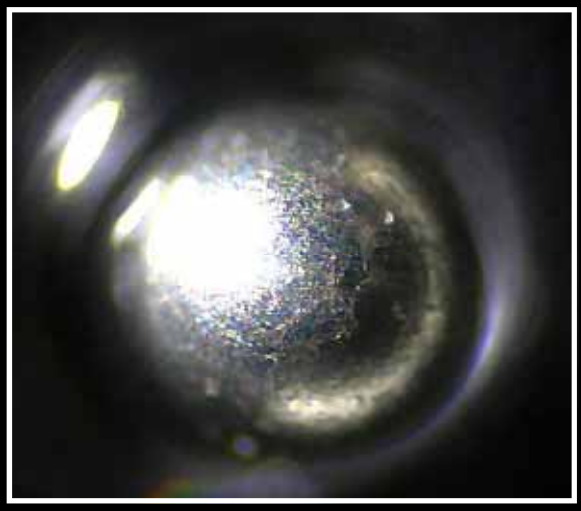
I put the slide under a UV curing device for 6 minutes, a device used to harden a resin based polish in beauty parlours to decorate nails. You can see my set up below. One of the balls rolled off so I just used the one.



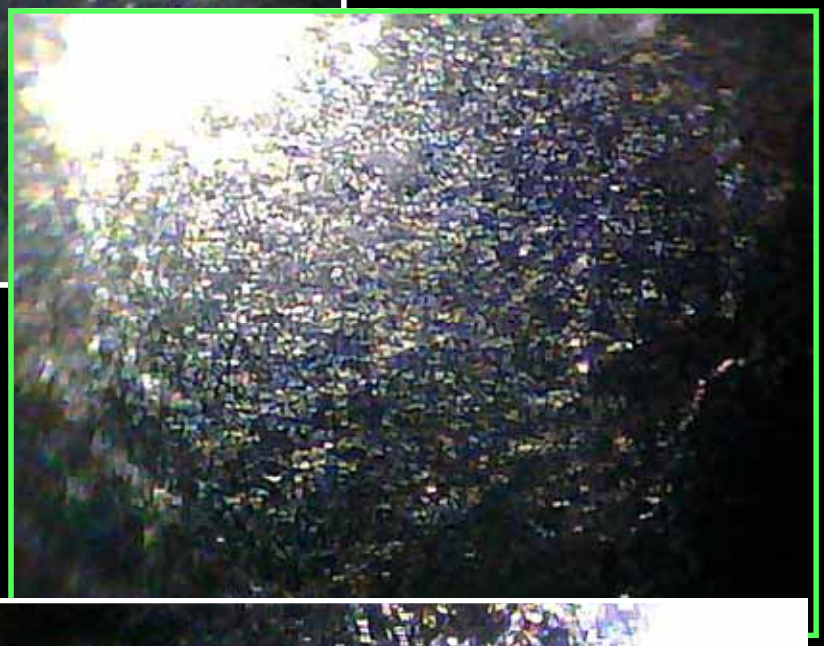


Once I checked the ball was now secure, I tested the cover slip to make sure it sat down on the walls of the well. It did! All good so far. The time has come to put it under a microscope and take a look.

Uh-ho! Using an overhead torch to shine down on the slide at various angles, and using 100x magnification, I could see the surface of the ball was quite grainy and not so smooth after all. There was another problem, I will explain in a moment. But first, turn the page, and see my 0.05mm ball at around 400x magnification. The truth is about to be revealed!

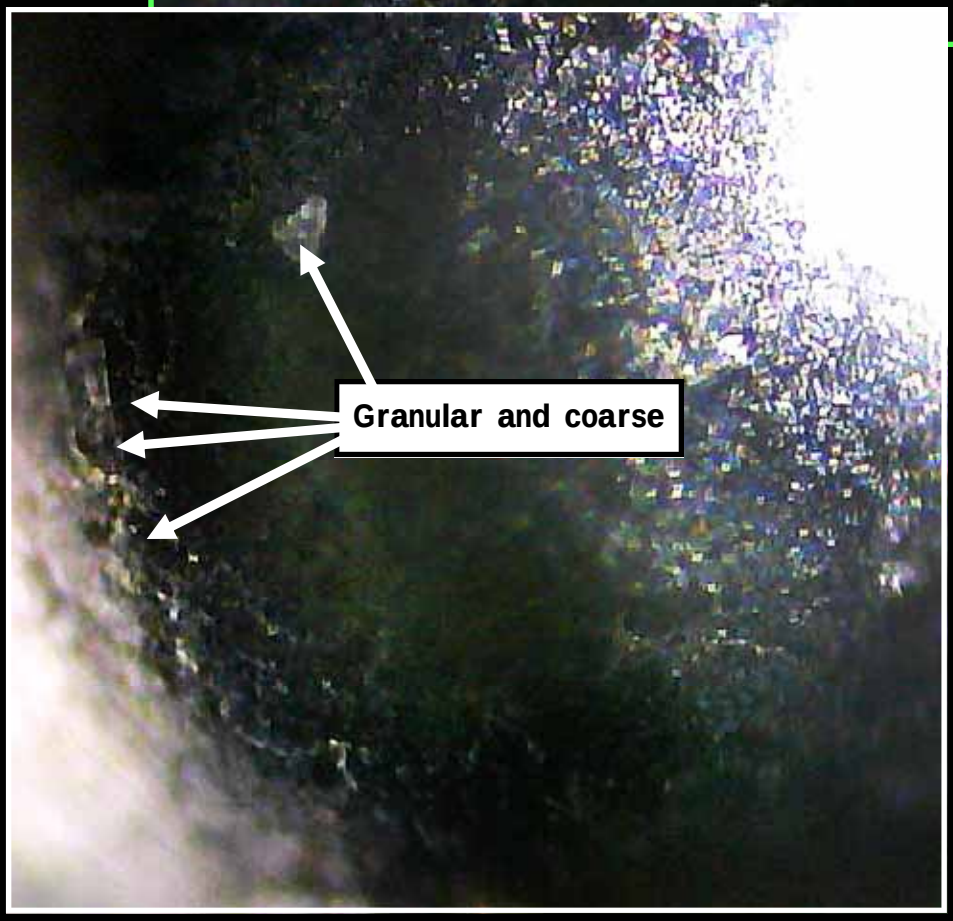


These two pictures were taken at 400x. They clearly show the ball is too rough and granular to reflect an image. The addition issue, is because of the narrow depth of field at increased magnification, the spherical mass not only distorts any reflection, if it were possible to even reflect one (which it isn't), it would also have large areas of the images out of focus! Another thing is the sphere disperses light in every direction, interfering with attempts to see detail.

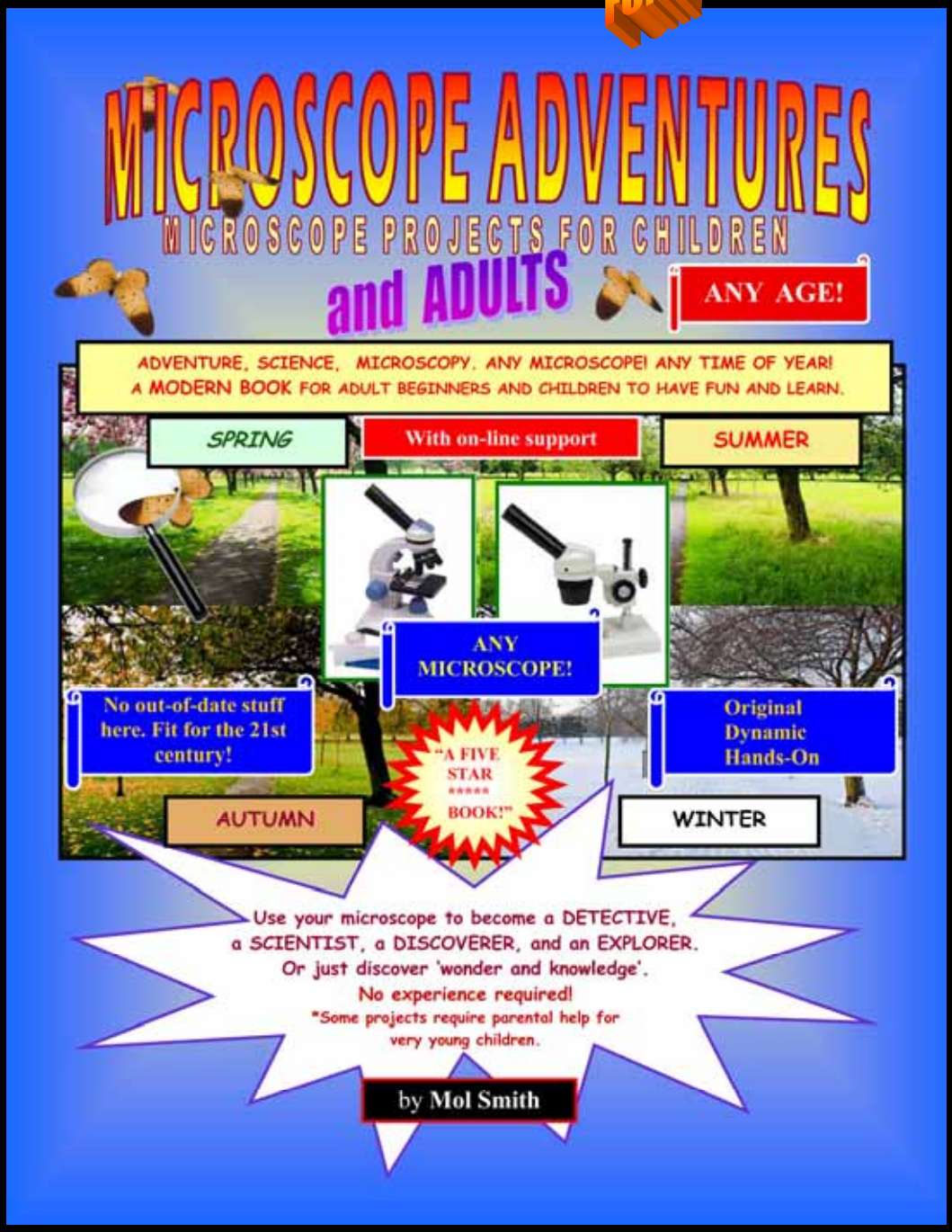


In the last image—right, I managed to get the torch angled better so you could see better details at the edge of the ball. So why is this a magic-ball? And why bother showing you my failure? Well, to make a ball-bearing, even if not so smooth only 0.5mm in diameter *is magic!*

And showing you how a microscope can help you prove ideas or check engineering accuracy explains what a very useful tool it is in industry!



Please note: this was an extract from my upcoming NEW book for home microscope users, young and old alike, especially beginners. Projects to do any time of year any microscope! Due out this Christmas. With online support, videos, links. Never be without a guide again. Up-to-date techniques. No old hat here! Imaginative, creative, informative, educational, and above all— FUN!



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