MICROSCOPICAL EXPLORATION

FORTY (ME40)

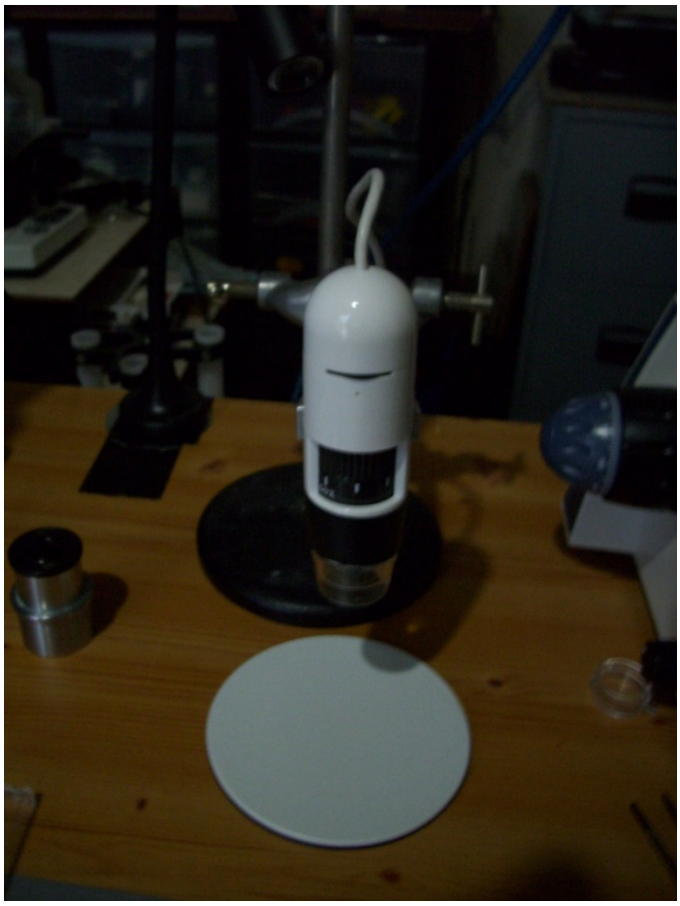
SEMI PRECIOUS STONES UNDER THE MICROSCOPE

Most of us are familiar with, or have at least heard of the four 'precious' stones, diamond, ruby, sapphire and emerald, which are used mostly as gemstones in the manufacture of jewelry. In the dim and distant past those four minerals became prized and precious due to their rarity, chromaticity, clarity, durability, marketability and even, some might say, sumptuosity.

There are, however, many other minerals which possess less of those itys, and which are, as a result, deemed to be 'semi-precious' stones. Those minerals can also be used as gemstones and are usually classified by their colour, translucency, lustre and hardness, which are no more than some of those itys under a different name.

For ME40 I have chosen a number of semi-precious stones, several of which are chemically similar and which will be named and described in more detail below.

A tumble polished fragment of each semi-precious stone was placed on a white microscope stage plate and for the microscopical observations I used my simple ATP USB microscope (as shown below) which gave an on-screen magnification of $\cong x20$.



Rock Crystal

Rock crystal is a transparent colourless form of Quartz which is Silicon dioxide with the chemical formula SiO_2. It has a vitreous lustre and a hardness of 7 on the Moh's scale which makes it eminently suitable for use in the manufacture of jewellery.

Amethyst

Amethyst is a form of quartz (SiO_2) which is violet-purple in colour due to inclusions of the highly oxidized Fe^{4+} ion within its crystal lattice. It, too, has a hardness of 7 on the Moh's scale and is used in the manufacture of jewellery.

Tiger's Eye

Tiger's eye is another variety of quartz (SiO_2) which gets its colour from inclusions of Fe^{3+} ions within the crystal lattice. It has a hardness of 6.5-7 on the Moh's scale and is used in jewellery and as an ornamental stone.

Falcon's Eye aka. Hawk's Eye

Falcon's Eye is a form of Tiger's eye which, instead of Fe^{3+} inclusions, has inclusions of lower oxidation state Fe^{2+} ions within its crystal lattice, which gives rise to the typically greyish-blue/greyish-green colour of this stone.

Almandine Garnet

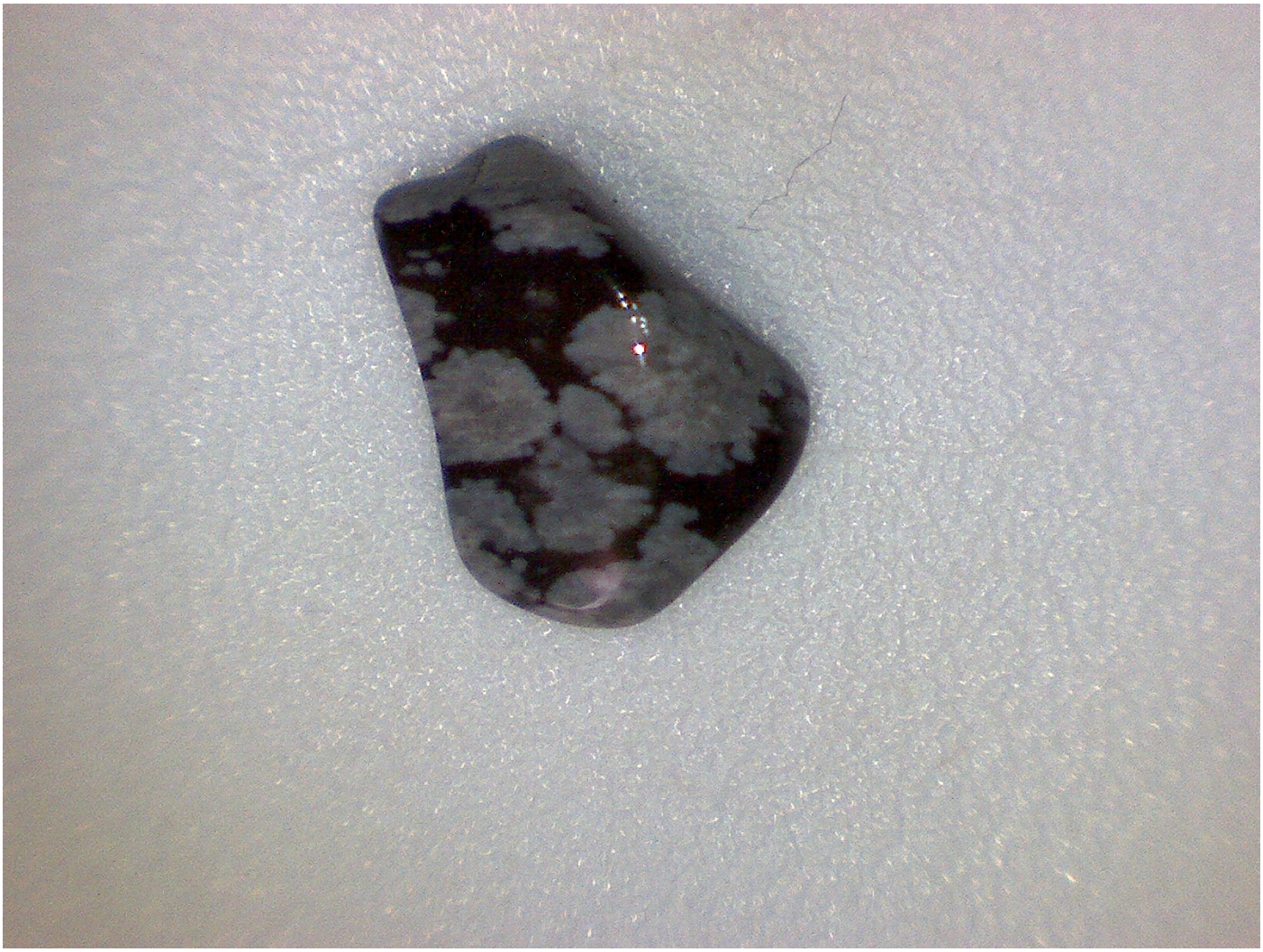
This semi-precious stone is NOT a variety of quartz, but is an Iron aluminosilicate with the chemical formula $Fe^{2+}_3Al_2(SiO_4)_3$, and can be coloured from deep red through brownish-red to black.

Sodalite

Sodalite is a so-called tectosilicates mineral with the chemical formula $Na_4(Si_3Al_3)O_{12}Cl$, and a Moh's harness of 5.5-6. It has varieties of different colours from white to pink to dark blue, although the blue is used most often in jewellery.

Snowflake Obsidian

This is a natural volcanic glass containing snowflake-like crystals of the mineral Cristobalite, another form of Silica. It is usually coloured black with white patches and has a Moh's hardness of 5 -5.5.



Red Jasper

Here we go again…another form of quartz, again with Fe^{3+} in the crystal lattice imparting the red colour to this stone. Moh's hardness: 6.5 -7

Aventurine

Another of the quartz minerals, this one has inclusions of fuchsite ($K(Al,Cr)_3Si_3O_{10}(OH)_2$) which imparts a green colour. This stone has a Moh's hardness of 6.5 – 7. And is sometimes used to make decorative beads.

Peridot

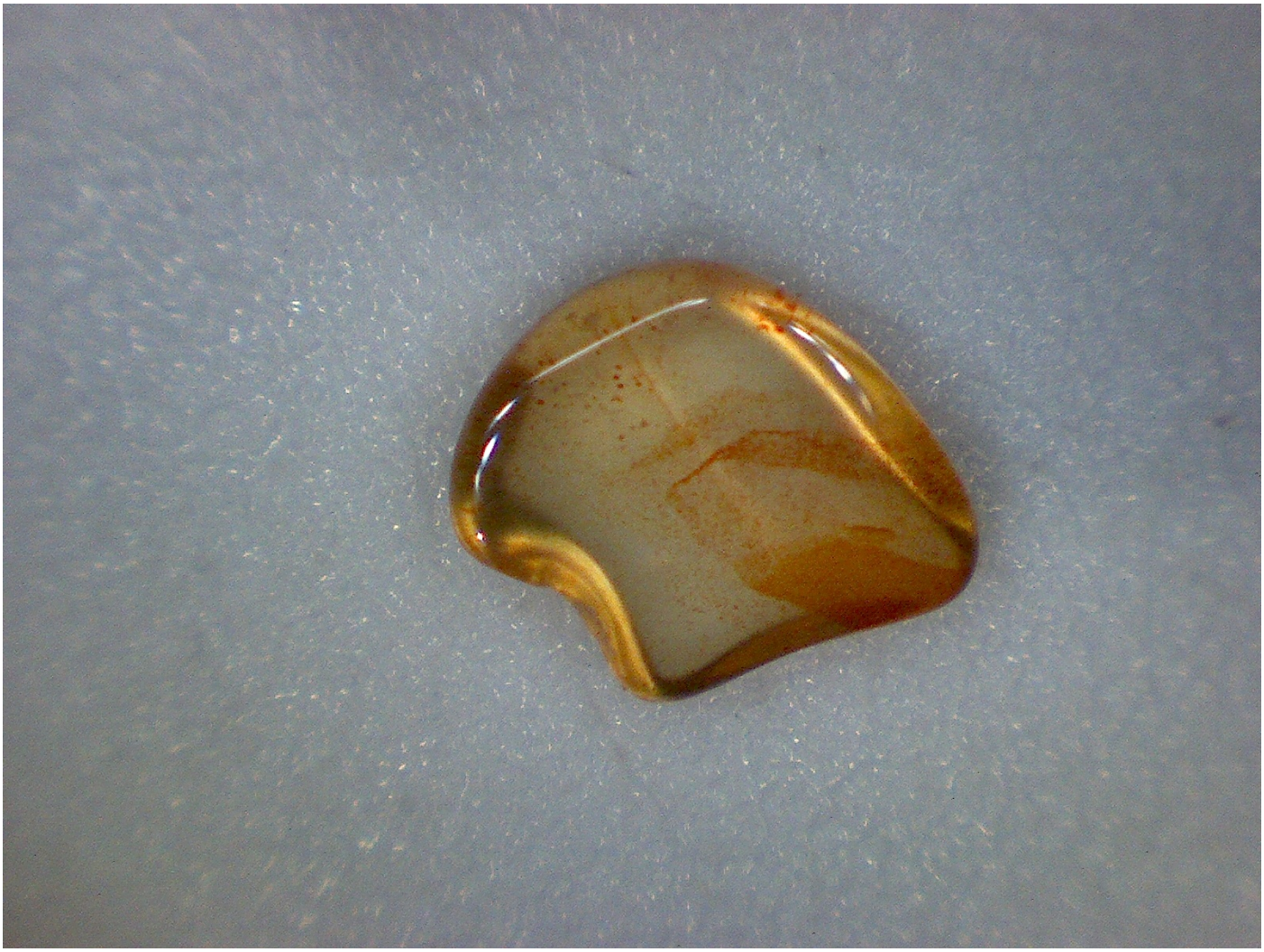
Peridot is the transparent form of Olivine with the chemical formula Mg_2SiO_4. Another silicate mineral, it has a Moh's hardness of 7 and is widely used in jewellery.

Unakite

This rock is a bit of a mixture, composed of epidote, K-feldspar and quartz. The links will take you to mindat.org, which is a wonderful source of mineralogical data.

Citrine??

If this is Citrine, we have another form of quartz whose colour is caused by aluminium-based colour centres in the crystal lattice. **BUT,** if this is iron-stained quartz then that's exactly what it is, quartz with inclusions of Iron(III) oxide in the lattice.
You, dear reader, can make up your own mind on that one, but I reckon it's the latter, regardless of what my iPhone rock identifier app tells me.



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As we say here in Cumbria:

'Ave a go yersel'!

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