<@Spauwe> shall we do a 1 one 1 on physical optics?

<DragonStek> we can if you want

<DragonStek> or do you want to study

<@Spauwe> it's revision to me so I'm keen

<DragonStek> ok

<@Spauwe> it's hitting two flies in one stroke

<DragonStek> oh your good

<@Spauwe> cool so here we go:

<@Spauwe> any idea what I am aiming at when mentioning colour causes by physical optics?

<DragonStek> sheen ,

<@Spauwe> yep, more the cause of sheen

<@Spauwe> and things like:

<@Spauwe> dispersion

<@Spauwe> diffraction

<DragonStek> interference and diffraction

<@Spauwe> thin film interference

<@Spauwe> scattering

<@Spauwe> and inclusions

<@Spauwe> let's start with dispersion

<@Spauwe> doos surely did a chat on it in the past

<@Spauwe> what is it?

<@Spauwe> or made more easy: do you know a synonym for it?

<DragonStek> wavelength gets refracted

<@Spauwe> when we talk about a diamond's dispersion we often call it the.....

<DragonStek> fire

<@Spauwe> exactly

<@Spauwe> when a beam of white light enters a gemstone it gets refracted

<@Spauwe> every single colour has a different wavelength

<@Spauwe> different wavelengths ask for slightly different refractions

<DragonStek> violet refracted the most red the least

<@Spauwe> yep you got it

<DragonStek> the dispersion is dependent to the gemstones RI

<@Spauwe> this different refraction will result in the gemstone acting like a prism

<@Spauwe> you've gotta watch that last statement of yours

<DragonStek> yes i see

<@Spauwe> it would make sense and in a lot of cases it's true

<@Spauwe> but in some it doesnt

<DragonStek> its related i should say

<@Spauwe> corundum for instance has less dispersion than a demantoid garnet

<@Spauwe> yet they have close RI's

<@Spauwe> but yes, in the big picture it goes like that

<@Spauwe> so the light enters the gemstone and every colour is bend in a slightly different way

<@Spauwe> it bounces around in the stone a bit and then leaves the stone through the crown again

<@Spauwe> IF the stone is cut correctly

<@Spauwe> there's something going on with the proportion of the crown and dispersion

<@Spauwe> you heard of that relation?

<DragonStek> yeah we had the chat with jleb

<@Spauwe> exactly

<@Spauwe> what did he say?

<@Spauwe> which crown will cause more dispersion to reach our eyes?

01[23:56] <@Spauwe> a shallow one or a higher one?

<DragonStek> lower the crown the higher the dispersion

<@Spauwe> nope, the other way around

<DragonStek> ok i guessed

<@Spauwe> that's ok

<DragonStek> i dont have those notes

<@Spauwe> I do a lot of guessing on the sundays

<@Spauwe> :)

<@Spauwe> a reminder:

<@Spauwe> dispersion will reach you through the crown's facets that are on a angle

<@Spauwe> so the mains, starts and brakes

<@Spauwe> the table facet will not

<@Spauwe> so the smaller the table facet (the higher the crown) the bigger the surface that will throw fire

<@Spauwe> makes sense?

<DragonStek> yes

<@Spauwe> ok onto the second one: diffraction

<@Spauwe> when light passes an edge between materials with different RI's or between a transparent and opaque material

<@Spauwe> light gets spread out around the edges

<@Spauwe> the best example is your diffraction grating spectroscope

<@Spauwe> you know how that grating thingy works?

<DragonStek> yes im getting better

<@Spauwe> it's all very fine grooves

<@Spauwe> causing that 'spreading out'

<@Spauwe> it's not just fine grooves that do this though

<@Spauwe> thin slits, small holes or tiny particles do it as well

<@Spauwe> the best example that comes to mind is opal

<@Spauwe> it's made up out of tiny spheres

<@Spauwe> the spaces in between 'm are in the same order of size as lightwaves

and some of the light that travels through 'm will 'suffer interference'

<@Spauwe> now that needs a bit of explaining

<@Spauwe> interference has been discussed by doos as well

<@Spauwe> can you remember what interference was about?

<DragonStek> thin layers of differing refractive indexs

<DragonStek> light hitting it

<@Spauwe> that's one thing that can cause it yes

<DragonStek> pasing through it

<@Spauwe> In the case of opal it works different though

<@Spauwe> the holes in between the spheres are so small

<@Spauwe> that some wavelengths will not be able to pass

<@Spauwe> so that colour is taken away from the light to start with

<@Spauwe> the rest that manages to pass through gets 'spead out' like in your spectroscope

<@Spauwe> some wavelengths will travel 'in phase'

<@Spauwe> meaning: they have there up and down curves going up and down simultaniously

<@Spauwe> these wavelengths are percepted by us as intensified

<@Spauwe> some wavelengths will travel 'out of phase'

<@Spauwe> meaning their up and down motion is exactly opposite to each other

<@Spauwe> these lightwaves are said to cancel each other out

<@Spauwe> we don't see 'm

<@Spauwe> so that's what's happening in an opal

<@Spauwe> is this making sense?

<DragonStek> opals difraction and interference

<DragonStek> the size of the gaps or hole that depends on which color is seen

<DragonStek> yes

<@Spauwe> yep the light is diffracted (spread out) and some of them lightwaves vanish for our eyes (suffer destructive interference)

<@Spauwe> others are intensified cause they travel ‘in phase’

<@Spauwe> resulting in the bright colours we see in opal

<DragonStek> ok

<@Spauwe> sometimes the holes in between the spheres are so small only blue and green wavelengths are allowed to pass

<@Spauwe> this is where we start calling that opal 'blue opal'

<@Spauwe> so opal is clear?

<@Spauwe> small holes

<@Spauwe> light is spread out trying to peep through

<@Spauwe> interference takes place

<@Spauwe> we see funny colours

<DragonStek> yes

<@Spauwe> you like opals?

<DragonStek> not myfav

<@Spauwe> me neither

<@Spauwe> but interesting concept

<@Spauwe> unique really

<DragonStek> yes

<@Spauwe> and the cool stuff is

<@Spauwe> sometimes people find opalized fossils

<@Spauwe> I do like them

<DragonStek> yes i admire them on line alot

<@Spauwe> I love fossils and when they're throwing colours at me I like 'm even better

<@Spauwe> imagine stumbling upon a opalized Trex skull

<@Spauwe> :0

<DragonStek> hehee

<@Spauwe> or even a opalized trex tooth

<@Spauwe> that would be good

<@Spauwe> but onto something different

<@Spauwe> thin film interference

<@Spauwe> this is the stuff you just described

<@Spauwe> thin layers of materials with different RI's that cause interference the way you know it

<DragonStek> yes

<@Spauwe> the surface reflects one set of waves

<@Spauwe> another is refracted into the different material and reflected onto the next

<@Spauwe> I should say: from the next

<@Spauwe> these two mentioned rays will travel parallel to each other and may or may not intensify or destruct each other

<@Spauwe> what is a good example here?

<@Spauwe> you think about that one while I check whether I'm still a boy

<@Spauwe> yup everything is still on there

<@Spauwe> you found an example yet?

<DragonStek> oh good she'll be happy

<DragonStek> no

<@Spauwe> pearls

<DragonStek> yes

<@Spauwe> as you know pearls are build up out of concentric rings

<@Spauwe> comparable with trees

<DragonStek> you see you ask me a question my mind goes blank

<@Spauwe> every season a different layer

<@Spauwe> no worries

<Spauwe_> let's round that chat up

<Spauwe_> pearls

Spauwe_> and thin film interference

<Spauwe_> pearls are made up out of thin layers of nacre

<Spauwe_> light can get through them but bounces off 'm as well

<Spauwe_> interference can take place there

<Spauwe_> nacre is partially made up out of platelets of aragonite

<Spauwe_> (a polymorph of calcite)

<Spauwe_> around these 'flat lying' platelets diffractions occurs as well

<Spauwe_> the 'spreading out'

<Spauwe_> so it's a double effect

<Spauwe_> interference from the different layers and

<Spauwe_> diffraction from the aragonaite crystals

<Spauwe_> again

<Spauwe_> ; quite unique

<Spauwe_> you like pearls?

<DragonStek> so its the out of phase and cancel again

<Spauwe_> some are some aren't

<DragonStek> ok

<Spauwe_> with the light being reflected of the different layers

<Spauwe_> the aragonite platelets mess with that again

<Spauwe_> a second factor

<DragonStek> yeah see i have to get my thought better

<Spauwe_> a more clear example would be labradorite showing labradorescence

<Spauwe_> different layers of feldspar cause interference in it's pure form

<Spauwe_> light reflected of surface one

<Spauwe_> put penetrates beyond surface one as well

<Spauwe_> is refracted (bend) and then is reflected of surface two

<Spauwe_> and three

<Spauwe_> and four

<Spauwe_> etc

<DragonStek> where would ammolite fall

<Spauwe_> these reflected rays may travel parallel to each other and either intensify or destruct eachother

<Spauwe_> ehm...

<Spauwe_> it's quartz in them ones

<Spauwe_> let me check

<Spauwe_> dunno

<Spauwe_> not sure

<Spauwe_> will look that one up

<Spauwe_> I'm pretty sure it's some sort of multicrystalline Quartz in there

<Spauwe_> what causes the iridescence I can't say with certainty

<Spauwe_> you searching as well?

<DragonStek> was just thinking when you where saying

<DragonStek> so i thought what causes that

<DragonStek> sorry

<Spauwe_> It might be similar to opal

<DragonStek> ok

<DragonStek> i try to see if i can find more on it

<Spauwe_> good question for on the forum

<DragonStek> it was a great class

<DragonStek> thanks

<Spauwe_> catch you 2morrow

Session Close: Sun Jun 15 01:19:20 2008