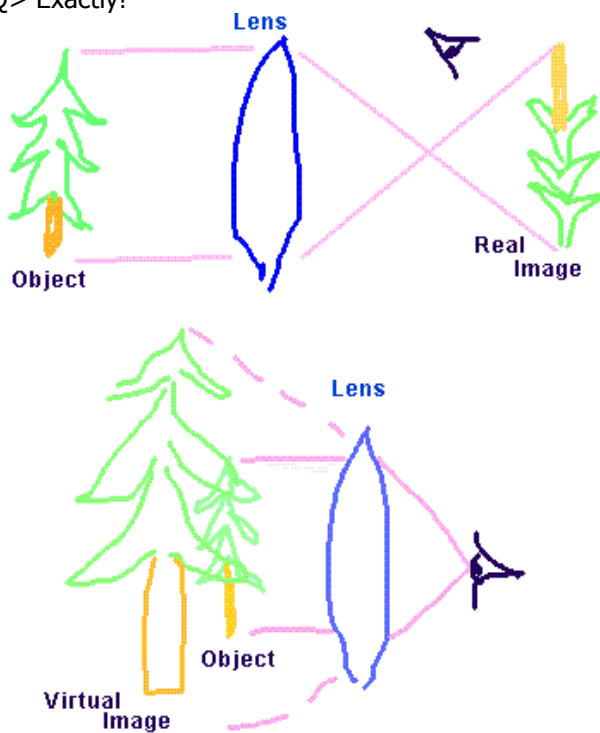


> <BrianQ> Did you guys find a small magnifying glass, or at least have  
> your loupe handy?  
> <doos> conoscope rod ok brian?  
> <DragonStek> yeah i do have a loupe handy  
> <BrianQ> mm, maybe... we'll try it Doos  
> <doos> i have both ready  
> <Tim> the nearest thing I could come up with is a monoc eyepiece  
> <BrianQ> I guess it is already dark over there in europe, eh?  
> <Keirkof> yup  
> <Keirkof> pretty much  
> <doos> not yet here  
> <BrianQ> can ya'll see out a window, so that there is a brighter light  
> outside than what is inside the room?  
> <Tim> gene may drop in  
> \* GemGuest93 has joined #gemology  
> <doos> yes brian  
> <Tim> nah mate it's bloody dark here  
> <Tim> thunderstorm and all  
> <BrianQ> he should, he can lead the discussion ;)  
> <Tim> hey gene  
> <doos> hi guest  
> <BrianQ> hmm, how about a lamp then, somewhere across the room from  
> where you are  
> <Keirkof> i can see advertisement panels in all colours outside usually  
> <Tim> yup  
> <doos> also handy BrianQ  
> <DragonStek> yes  
> <BrianQ> ok, then, have you got a white notecard or blank white sheet of  
> paper?  
> <Keirkof> evenings Gene, or guest "  
> <GemGuest93> Hi all...I'm back and have the blackboard  
> <Keirkof> check  
> <GemGuest93> Hi Gene...how you?  
> <doos> thats frank  
> <Keirkof> aah  
> <Tim> ow  
> <Tim> no gene then  
> <GemGuest93> ah are you calling me Gene Lol  
> <DragonStek> yes brian  
> <Tim> I just got a pm he was drop[ping in so started to assume things  
> <Tim> yep got the lot  
> <BrianQ> ok, hold up the sheet of paper vertical, and place the lens  
> close to the paper, between the paper and the light source.  
> <BrianQ> If you move the lens, change the distance between it and the  
> paper, at some distance...  
> <BrianQ> you should see something on the paper other than a blur of light  
> <doos> almost burns a hole in it  
> <BrianQ> um... that is a blur of light... remember, the light source has  
> to be far away  
> <Tim> it's on FIRE  
> <BrianQ> not close by.  
> <doos> 6 foot ok?

> <GemGuest93> I missed the initial instructions...what am I doing?  
> <BrianQ> 10 foot is better.  
> <doos> ok, holdon  
> <BrianQ> ok Frank, find a light source somewhere far away from you...  
> <BrianQ> like a window, if there is enough light outside  
> <GemGuest93> I'm Frank by the way...the other one on the list won't  
> disappear  
> <GemGuest93> no but I have a wall light  
> <doos> 18 foot noww  
> <BrianQ> like a tube fluorescent light, or like an incandescent light  
> <BrianQ> ?  
> <GemGuest93> incandescent TH bulb  
> <BrianQ> well, we can try, but the result won't be quite as impressive...  
> <GemGuest93> what do I need?  
> <doos> loupe and sheet of paper frank  
> <BrianQ> you need a lens, and a sheet of paper  
> <BrianQ> usually, I do this with 4th graders in a classroom...  
> <GemGuest93> I have those...loupe or magnifier?  
> <Tim> and they probably are quicker then we are ey?  
> <BrianQ> I think a magnifier for now... I've never done it with a loupe.  
> <GemGuest93> ok I have both on hand  
> <BrianQ> But if you have a loupe, might as well try it.  
> <Keirkof> none of the lights is strong enough to get through the paper,  
> but i'll retry when the streetlight is on  
> <BrianQ> and so place the loupe between the paper and light source, very  
> close to the paper (very far from the source)  
> <GemGuest93> ok I got it  
> <Keirkof> ah, they flipped the switch - in a few minutes the sodium  
> light will be nice and bright ^^  
> <BrianQ> Then slowly move the lens back from the paper until at some  
> distance between lens and paper you should see something other than a blur.  
> <BrianQ> on the paper, that is  
> <BrianQ> see something on the paper.  
> <GemGuest93> The light circle shining on the paper focuses down to a  
> fine pont  
> <doos> a spot of light .. brighter/dimmer smaller/larger  
> <BrianQ> I think that is about as close as you are going to get with  
> your light source, Frank  
> <GemGuest93> smaller and brighter by the looks  
> <doos> like burning a hole in paper with the sun  
> <BrianQ> When I do this with fourth graders, I pass out some cheap  
> magnifying lenses and white note cards.  
> <Tim> f0r the smokers among us: a converging beam of light coming from  
> the lens  
> <GemGuest93> at about 10 inches away...I'm using a three inch magnifier  
> <BrianQ> Yes, probably Doos, if all you have is a small point of light  
> for a source.  
> <BrianQ> Then I turn out the lights in the classroom, and have them hold  
> up the notecard toward a window (where daylight is coming through)  
> <BrianQ> They put the lens close to the paper, and then slowly move it  
> away from the paper. Close to the paper they just see a white blur, but  
> as they draw the lens away...  
> <BrianQ> at some distance, an image of what is seen in the window

- > appears on the paper.
- > <BrianQ> so if you can see a tree outside the window, you can see an
- > image of the tree on the piece of paper.
- > <DragonStek> lol u can see me brian
- > <DragonStek> thats what i see
- > <BrianQ> heh, Dragon, can you see a tree out your window? and then a
- > tree on the piece of paper?
- > <DragonStek> yes
- > <doos> darned timezones
- > <GemGuest93> It's dusk here :(
- > <GemGuest93> but I'll try it tomorrow
- > <DragonStek> oh you try when its light
- > <BrianQ> Yay, Dragon... now looking at the image on the piece of paper,
- > do you notice anything strange about the tree?
- > <DragonStek> upside down
- > <BrianQ> Exactly!



- > <BrianQ> it is upside down, and it is reversed left-right as well.
- > <DragonStek> i couldnt make out what i was seeing at first
- > <doos> is our tricking us with this?
- > <doos> \_eye somewhere
- > <DragonStek> oh wait let me look again
- > <BrianQ> yes, once I did it with a class, and a person was walking
- > outside... and the kids were like...
- > <BrianQ> "what is that person-shaped bug walking on the ceiling?"
- > <doos> heh
- > <GemGuest93> lol
- > \* GemGuest93 is now known as \\_Frank\_
- > <BrianQ> anyways, it is fun to surprise the students with what they will
- > see... but it is just as fun, even when you know what to expect.
- > <BrianQ> I love picking up a big lens I have at school, one that I have
- > to hold with two hands...

> <BrianQ> and creating the window image on the whiteboard.  
> <BrianQ> I never get tired of doing it.  
> <BrianQ> I never get tired of doing it.  
> <doos> you can do it with reflection as well?  
> <BrianQ> So this is something you guys will have to try tomorrow....  
> <DragonStek> it cool i will show my son  
> <doos> how do you hold the whiteboard against a window brian?  
> <Keirkof> with considerable effort ;p  
> <doos> heh  
> <DragonStek> tape it  
> <BrianQ> The window is at the back of the room (far away) and the  
> whiteboard is at the front of the room  
> <BrianQ> The window has to be several feet away from the paper.  
> <BrianQ> We have these glass doors to the outside in our hallways, and I  
> also do this demonstration on the wall opposite those glass doors...  
> turning out the lights in the hallway  
> <BrianQ> So... a darkened room with a window in daylight.  
> <BrianQ> A flat (white) surface on the opposite side of the room from  
> the window.  
> <BrianQ> Hold the lens very close to the white surface and then move it  
> away. At some distance between the lens and the surface, a detailed  
> image of what you see in the window appears on the surface.  
> <BrianQ> Close inspection shows the image is reversed left-right and  
> upside down.  
> <BrianQ> Dragon, did you do this with a loupe or a magnifier?  
> <DragonStek> both but magnifier worked better  
> <BrianQ> yes, with the loupe, probably the image was very small and the  
> loupe had to be very close to the paper?  
> <DragonStek> clearer image and bigger then with loupe  
> <doos> brb  
> <DragonStek> ok yes  
> <BrianQ> So... you Europe guys have the instructions down for the  
> experiment you will conduct tomorrow?  
> <Tim> yesh  
> <\\_Frank\_\> yes  
> <Keirkof> certainly  
> <BrianQ> good, like I said, it is a really amazing thing to see the  
> first time, so it is worthwhile.  
> <DragonStek> that was fun  
> <BrianQ> Anyways, this image the lens is creating is called a "real image"  
> <BrianQ> Let's characterize this "real image"..  
> <BrianQ> you can tell a real image of some object, because it is  
> reversed left-right and upside down from the object.  
> <BrianQ> The real image is located on the side of the lens opposite the  
> object.  
> <BrianQ> and you need a screen in order to observe the image....  
> <BrianQ> But the image is there whether or not a screen is present.  
> <BrianQ> Got all that?  
> <\\_Frank\_\> yes  
> <DragonStek> yes  
> <Tim> aight  
> <BrianQ> Three definite characteristics of a real image... upside-down  
> left-right, opposite side from object, screen to observe but exists

> whether a screen is there or not.  
> <doos> back  
> <BrianQ> Can you catch up on the reading, Doos?  
> <doos> yes  
> <BrianQ> ok... now we know our eye has a lens in it, correct?  
> <\\_Frank\\_> yes  
> <BrianQ> at the front, so to speak  
> <doos> yes  
> <DragonStek> yes  
> <BrianQ> The lens in our eye creates a real image of the world in front  
> of it..  
> <BrianQ> What is the screen?  
> <\\_Frank\\_> back of eyeball  
> <doos> the retina?  
> <BrianQ> yes, yes  
> <doos> or what was it called again  
> <BrianQ> the things that sense light... the cones and rods  
> <BrianQ> that is the screen...  
> <BrianQ> the back of the eye is on the opposite side of the lens from  
> the world outside, yes?  
> <\\_Frank\\_> yes  
> <DragonStek> yes  
> <BrianQ> so far, then, the image is fitting our definition... but what  
> about the upside-down?  
> <BrianQ> how come we see everything right side up?  
> <Keirkof> software!  
> <\\_Frank\\_> the brain reverses the image  
> <BrianQ> exactly  
> <BrianQ> Exactly!  
> <BrianQ> the brain has evolved to reverse what it sees.  
> <BrianQ> clever little lump of grey matter  
> <doos> or adjusted to it  
> <BrianQ> that too...  
> <doos> they did experiments with that  
> <Tim> if I go stand on my head for 24 hours it reverses again doesn't it  
> <BrianQ> now those people who are near-sighted or far-sighted (like me)...  
> <BrianQ> Absolutely Tim, give it a try!  
> <doos> babies are not used to that yet and they see everything upside down  
> <BrianQ> Their screen is not at the optimum position for the lens in  
> their eye  
> <BrianQ> So my screen is a little too far back for my eye's lens and  
> things look blurry  
> <BrianQ> As Dragon can verify... when the lens is moved away from the  
> optimum distance, the image on the screen gets blurry.  
> <DragonStek> yes  
> <doos> oh wait .. question  
> <BrianQ> Yes Doos?  
> <doos> should I sit behind the paper or in front of it .. I assume the latter  
> <BrianQ> The side of the paper facing the window will have the image.  
> <doos> ah .. I did it all wrong then .. clear now  
> <BrianQ> Now here's another little bit about our "real image".... The  
> window is several feet away, which in optics that distance can be  
> approximated as infinity

> <BrianQ> physicists are good at figuring out what is a useful  
> approximation to infinity, so you'll just have to trust me.  
> \* Keirkof trusts BrianQ  
> <BrianQ> Then if you take out a ruler and measure the distance between  
> the lens and the screen, when you have a nice sharp image on the screen...  
> <BrianQ> that distance is the lens focal length.  
> <BrianQ> Dragon, any guess as to how far your magnifier is from your  
> paper, when you get the image?  
> <BrianQ> a couple inches, maybe... or more?  
> <BrianQ> or an inch?  
> <DragonStek> oh manybe 5 or 6  
> <DragonStek> not sure  
> <BrianQ> oh, that then creates quite a big image on the paper!  
> <doos> familiar number  
> <DragonStek> yeah which is why i didnt know what it was  
> <DragonStek> but the closer to the paper i got it got clearer  
> <DragonStek> not sure how close  
> <BrianQ> I use a lot of lenses in my research, and even though they are  
> supposed to be in the correctly labelled boxes, you don't want to find  
> out weeks later that one wasn't  
> <BrianQ> So I use this little test to measure the focal length of a lens  
> I'm about to insert in the experiment, to make sure it matches what is  
> written on the box  
> <Keirkof> ahh, it's a shame to waste such an excellent prank opportunity ^^  
> <BrianQ> experimentalists learn how to come up with lots and lots of  
> checks... errors are good at teaching one to do that.  
> <BrianQ> Now lets use our loupes and lenses to look at another type of  
> image, the one you are more familiar with  
> <BrianQ> If you have an alphabet letter on a piece of paper, or maybe  
> just a period, you can look through the lens at the letter and it is  
> magnified, yets?  
> <BrianQ> yes?  
> <Keirkof> aye  
> <doos> yes  
> <DragonStek> yes  
> <BrianQ> ok, when you are looking at the letter through the lens, you  
> don't actually see the letter itself (the object"  
> <BrianQ> What you are actually seeing is "a magnified image of the letter"  
> <BrianQ> This type image is called a "virtual" image  
> <BrianQ> Let's characterize this "virtual image", in order to compare it  
> point-by-point to a "real image"  
> <BrianQ> ok, how about orientation... is the virtual image reversed  
> left-right and upside down?  
> <doos> depends on the distance ..  
> <doos> when the letter is readable .. no  
> <BrianQ> exactly, when the letter is readable! When you have a clear  
> "image"  
> <BrianQ> it is not reversed.  
> <DragonStek> yes  
> <BrianQ> so... there is a distinguishing characteristic between the real  
> and virtual image!  
> <DragonStek> so they are opposite  
> <BrianQ> And do you need a screen to see a "virtual image"?

> <DragonStek> no my eyes  
> <BrianQ> no, you do not need a screen to see a virtual image  
> <doos> no .. it is always there  
> <DragonStek> yes my eyes  
> <BrianQ> and which side of the lens is the virtual image, is it on the  
> same side as the object, or the opposite side?  
> <doos> same?  
> <DragonStek> opposite side  
> <\\_Frank\_\> opposite since it's in my eyes  
> <BrianQ> it is on the same side...  
> <Tim> it's 'in' the lens so to speak aint it?  
> <BrianQ> no... it is on the same side... that alphabet letter you are  
> looking at through the lens ... it is THROUGH THE LENS on the same side  
> as the object  
> <BrianQ> so... this is another difference between real and virtual images.  
> <BrianQ> so basically, the three distinguishing characteristics for real  
> images are reversed for virtual images  
> <BrianQ> And so here's the key point... the optics we use create  
> "images" and we need to figure out whether they are being used to create  
> "real" or "virtual" images  
> <doos> question  
> <BrianQ> yes, Doos?  
> <doos> when I use my loupe as a gemologist does (close to the eye) .. I  
> must be looking at the virtual image .. correct?  
> <BrianQ> yes, this is the point I was just going to get to!  
> <doos> oops  
> <DragonStek> oh ok i get it now  
> <BrianQ> As I mentioned, I am farsighted... so I wear corrective  
> lenses... glasses, of course  
> \* Keirkof has been playing with the blackboard :)  
> <BrianQ> Are the lenses in my glasses used to create real or virtual image?  
> <doos> virtual  
> <BrianQ> Yes, but how can I tell?  
> <doos> because you are not seeing everything upside down  
> <\\_Frank\_\> stuff isn't upside down  
> <\\_Frank\_\> or reversed  
> <DragonStek> its clear and right side up  
> <BrianQ> exactly!  
> <\\_Frank\_\> nice pics keirkof  
> <doos> two lenses in a row  
> <BrianQ> Without my glasses, the tree looks blurry but right-side up...  
> with my glasses, the tree is right-side up.  
> <BrianQ> So the glasses create a virtual image that is on the same side  
> of the lens as the object, but in a slightly different place there.  
> <BrianQ> The lens in my eye takes that image (treating it as the  
> "object" now) and creates a real image on the back of my eye.  
> <BrianQ> Since the position of the "virtual image" is slightly different  
> than the actual object, the position of best focus for the "real" image  
> created by the eye lens has changed.  
> <BrianQ> And so now the "real" image lands at the right place on my eye.  
> <BrianQ> So, two lenses, a couple different processes.  
> <BrianQ> The eyeglass lens creates a "virtual image" of the object, then  
> the lens in the eye takes that virtual image.... treats it as the

> "object" and creates a "real image" of the object.  
> <BrianQ> Does that further explain your question Doos?  
> <doos> yes thanks  
> <doos> you could make a living from teaching, well done  
> <BrianQ> I think I'm going to need more time for this microscope topic  
> :) We haven't even gotten to that!  
> <BrianQ> Shall we continue this topic in the next chat?  
> <doos> yes please  
> <\\_Frank\\_> yes please  
> <DragonStek> yes this is good  
> <Keirkof> i'll be there  
> <Tim> hi guys, this is Tim's mother in law.  
> <doos> hi mom-in-law  
> <DragonStek> hi tims mom in law  
> <Tim> Tim passed out, he was hanging upside down over the lounge  
> <Keirkof> 'navond :)  
> <doos> heh  
> <DragonStek> hehehe'  
> <BrianQ> heh  
> <Tim> you guys know why?  
> <BrianQ> just as long as he continues to log the chat!  
> <doos> the experiment?  
> <DragonStek> lol he listened  
> <BrianQ> Yep, he was trying to reverse the world :)  
> <Tim> I think he popped a vein  
> <doos> :)  
> <DragonStek> give him a beer  
> <BrianQ> Oh, that was from trying to take in all this knowledge  
> <Keirkof> lol :)  
> <BrianQ> the hanging around didn't cause that ;)  
> <Tim> ghehe  
> <BrianQ> Ok, so now we know what a loupe is and does... which is a start...  
> <BrianQ> It is basically a single "compound" lens  
> <BrianQ> that is used to create a virtual image.  
> <BrianQ> for our eye to process into a real image.  
> <doos> question  
> <BrianQ> This is the general nature of any eyepiece lens, whether it is  
> the eyepiece of a microscope or telescope  
> <BrianQ> or whatever... yes Doos?  
> <doos> when I Hoover the magnifier over the lettering until it flips to  
> a real image .. is that the focal length of the lens?  
> <Keirkof> or twice the focal length?  
> <BrianQ> no... because the letter is not located an infinite distance  
> from the lens  
> <doos> is it still a real image then?  
> <BrianQ> yes, it is a real image, if you need a screen to view it.  
> <\\_Frank\\_> you mean still a virtual image?  
> <BrianQ> if it is flipped upside down  
> <doos> my eye for instance  
> <BrianQ> no...  
> <Tim> nonono  
> <BrianQ> if you are looking through a loupe and you see something  
> through the loupe, it is a virtual image

> <doos> but if I move the lens away from the letter .. it looks like a  
> real image  
> <doos> first a virtual one then a real one  
> <BrianQ> It is sharp and inverted?  
> <doos> yes  
> <DragonStek> yes me too  
> <BrianQ> oh!  
> <doos> it sort of flips at some point  
> <\_Frank\_> but it's still on the wrong side of the lens  
> <DragonStek> yea i was doing thaqt  
> <BrianQ> yes... now I realize what is happening...  
> <\_Frank\_> I see it works with a loupe but not with my magnifier which  
> just gets blurry  
> <Keirkof> yes frank i get the same thing  
> <DragonStek> with a loupe i can see what doos is saying  
> <Keirkof> must be the triplet lenses doing some magic...  
> <BrianQ> it is indeed going from a virtual image to a real image  
> <Tim> your loupes actually are three lenses  
> <BrianQ> nope... it is just that you don't have to position your eye too  
> differently from the best virtual image to intercept the real image  
> <BrianQ> Even though the loupe is three lenses, we treat it as a single  
> "compound" lens  
> <Tim> gotta try that when I get home  
> <BrianQ> Ok... so heres what is going on...  
> <BrianQ> When you see a right-side-up image... that is the virtual image  
> on the other side of the loupe from your eye  
> <BrianQ> When you see the upside-down image... that is the real image on  
> the same side of the loupe as your eye... so what is the screen for this  
> image?  
> <Tim> the retina  
> <Keirkof> must be the eye itself then?  
> <Tim> ghe  
> <BrianQ> yes! the eye itself  
> <BrianQ> is the screen  
> <Tim> but...  
> <Tim> real image is up side down inside out  
> <BrianQ> even though it looks like the image is located ON THE LOUPE  
> ITSELF (not behind the loupe)  
> <Tim> my screen (with software) will flip it back, so will not be  
> reversed...  
> <BrianQ> no... it will not...  
> <Keirkof> the image is not on the retina if i get it right  
> <BrianQ> your brain doesn't reverse the image produced by another lens,  
> only the real image produced by your eye's lens  
> <doos> aha  
> <Tim> ok  
> <Keirkof> it's on the exterior side of your eye, from which it is again  
> projected toward the retina at the back  
> <Tim> so everything i see upright has been flipped  
> <BrianQ> yes  
> <BrianQ> ok... now here's the reason we don't usually run across the  
> real image with an ordinary magnifying glass  
> <BrianQ> usually we look at something through the magnifying glass, and

> roughly the distance from the object we are looking at and the  
> magnifying glass is a couple inches or so.  
> <BrianQ> And the distance from the magnifying glass and our eye is  
> roughly a couple inches.  
> <BrianQ> Keeping the distance between the object and the glass the same,  
> we would have to move our eye way, way back... a couple feet ... in  
> order to intercept the real image with our eye.  
> <\_Frank\_> isn't it the lens which would have to move?  
> <BrianQ> You can try this out for yourself if you can mount the  
> magnifying glass in front of something and then position your eye some  
> distance from the magnifying glass  
> <BrianQ> For an ordinary magnifying glass, the distance from the lens to  
> where you position your eye to see the best focus virtual image is maybe  
> a couple inches.  
> <BrianQ> the distance from the lens to where you position your eye to  
> see the best focus real image is a couple feet.  
> <BrianQ> But for the loupe... you position your eye a couple millimeters  
> from the lens to see the virtual image  
> <BrianQ> so then you can position your eye maybe only a couple  
> centimeters (or less, apparently) to see the real image  
> <Tim> never noticed that...  
> <BrianQ> You can test it.... your eye is closer to the loupe when you  
> see the virtual image...  
> <doos> due to the high magnification power?  
> <Tim> going home now to see  
> <BrianQ> your eye is further when you see the real image  
> <Tim> c u guys laterrr  
> <Tim> cheers brian  
> <Tim> all te best  
> <Keirkof> cya timmeh  
> <doos> bye tim  
> <BrianQ> yes Doos, due to the high magnification power  
> \* Tim has quit IRC ("Java user signed off" )  
> <DragonStek> night tim  
> <BrianQ> one last point, and I'll let y'all go...  
> <BrianQ> to answer Doos... no the distance between eye and lens when you  
> see the real image does not give focal length of the lens  
> <doos> ok thanks  
> <DragonStek> so with a loupe and when i pull away the image is inverted  
> , so its ?  
> <BrianQ> a real image being created on the screen called your eye  
> <DragonStek> oh ok  
> <doos> thanks Brian .. a bit smarter again  
> <DragonStek> wow lots of cool things to play with  
> <DragonStek> thanks brian  
> <BrianQ> The reason that distance doesn't give you the focal length of  
> the loupe is because of the added complication of the lens in the eye.  
> <Keirkof> yes brian thanks, good session  
> <BrianQ> No problem, that was fun. Hopefully someone will be nice and  
> send Barbra a chat of the log...  
> <BrianQ> I don't think Tim is in a position to do so.  
> <Keirkof> that's what i'm here for :)  
> <BrianQ> Great!

> <doos> you have it covered Keirkof?  
> <doos> ah ok  
> <Keirkof> can i copy the blackboard in some way doos?  
> <DragonStek> we like the trees lol  
> <doos> tims drawing?  
> <Keirkof> i don't dare push buttons too much lest i delete everything  
> <Keirkof> mine, thank you ;p  
> <doos> you have to ask Brian .. something to do with a windows drawing  
> program  
> <BrianQ> We'll have to call this chat "Loupe" instead of "Microscope"  
> <\_Frank\_> Thanks Brian  
> <\_Frank\_> Tim you can use screen copy  
> <BrianQ> Next time, we'll get to the microscope.  
> <Keirkof> well, gotta start with one lens to get forward :)  
> <BrianQ> Have fun trying out the experiment.  
> <doos> bye Brian  
> <BrianQ> Ciao ciao  
> -----