



The
Unseen
World

Exploring innovative approaches
and techniques in Macro Photography

Visual Communication | Project 3

Submitted for the partial fulfilment of the requirement of the
degree of Masters of Design in Visual Communication at the
Industrial Design Centre, Indian Institute of Technology (Bombay)

Guide: Prof. Sudesh Balan

Radhika Gujar | 08625802

Certificate

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Chairperson _____

Internal Examiner _____

External Examiner _____

Guide _____

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature:

Name of the student: Radhika Pranay Gujar

Roll No.: 08625802

Date: 15th April, 2010.



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I would like to extend my gratitude to Professor Sudesh Balan for his valuable guidance.

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I am grateful to my family for their love and never ending belief in my ability.



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f 2.8, 1/100, ISO 800

Introduction

“Exploring innovative approaches and techniques in Macro Photography” is a project in which I will be exploring and learning the different facets of macro photography.

I will be exploring techniques used to do macro photography and present the images in a novel way.

In doing so I will increase my knowledge and enhance my skills of macro photography.

At a later stage I will be combining Macro photography techniques with time lapse photography to give the project a whole new dimension.



f 2.8, 1/160, ISO 400

Macro Photography:

Macro photography is seeing the unseen world. It is capturing details in objects that are not be visible to our naked eyes.

In macro photography the image projected on the film plane is of the same size or larger, than the size of the subject.

[1] Macro photography is one which covers a range of magnification from life size (1x magnification or 1:1) to 40 times life size (40x magnification or 40:1). However 10x is the practical limit using 35mm equipment that is readily available in the market.

Macro Photography is a branch of close up photography. It is considered to be any picture taken from about 12 inches or less from the subject down to half an inch or even closer. Macro is derived from the Greek word Marko meaning "long"; but it has come to mean large and the exact opposite of micro.

[2] Yet a macro picture is not a huge picture but rather a normal sized picture of a tiny object that has been made to appear large. You might not even be able to recognise common objects when enlarged in macro photography.



f 5.6, 1/1000, ISO 400

Factors affecting Macro photography



f 16, 1/60, ISO 100



Magnification:

Magnification is an important factor that affects macro photography and needs to be taken into consideration.

Magnification is the enlargement of the image of a subject on the film plane, which may be of the same or larger size than that of the subject.

Magnification is always represented as a 1x, 2x, 5x etc. For example 5x means the image on the film plane is 5 times enlarged.

Level of magnification can be measured using the following scale:

1:1 (same size as that of the object) to 1:10 and above (being extremely enlarged).

⁽¹⁾According to Stan Sholic, Ron Eggers:

Formula for Magnification = $\frac{\text{Image size on film plane}}{\text{Actual size of the subject}}$

It is independent of the film format in use.

Magnification of objects is what makes macro photography different from the other forms of photography. According to me, magnification of an object always adds the surprise factor in a macro photograph. It shows us details of the object that are not visible to our naked eye. The details add to the 'surprise' factor.





Lighting:

^[3]Photography comes from the Greek word photos meaning light and graphé meaning representation by means of lines or drawing, together meaning drawing with light.

In Macro photography it plays a different and important role. Moving the lens closer to the subject to create its macro photograph may result in a situation where the shadow of the camera falls on the subject. This could result in low light condition and under exposure. Additionally low light makes it difficult to see the subject and focus. Low light can result in long exposure. This may be may be undesired if the subject is moving.

To resolve the problem of low lighting in macro photography a ring flash can be used.



Depth of field:

It is one of the most important considerations in macro photography making it essential to focus on the most important part of the subject.

[4] It is the zone, measured in terms of near distance and far distance from the camera, where the image appears acceptably sharp.

Depth of field depends on various factors for a film or video that may be the type of film, lens used, filters, and lighting.

The factors that may affect the depth of field are focal length, aperture and distance of the object from film plane.



f 4, 1/200, ISO 800

Bokeh:

^[5] The term comes from the Japanese word boke, which means “blur” or “haze”, or boke-aji the “blur quality”. The Japanese term boke is also used in the sense of a mental haze or senility.

Bokeh is the blur or the out of focus area of an image. It is the way a lens renders the out of focus areas of highlight in an image. Bokeh occurs in that area of the scene that lie out of the depth of field.

Bokeh is visible in areas of background where there are highlights and is often associated with such areas though it occurs in all out of focus areas of the image. The number of blades determine the shape of the aperture which in turn affects the shape of a bokeh. Different lenses give different bokeh.



f 2.8, 1/20, ISO 1600

Techniques for doing Macro photography



⁽⁶⁾ Image 1 : function of a lens in the normal position.

Image 2: Function of the lens in the reversing position

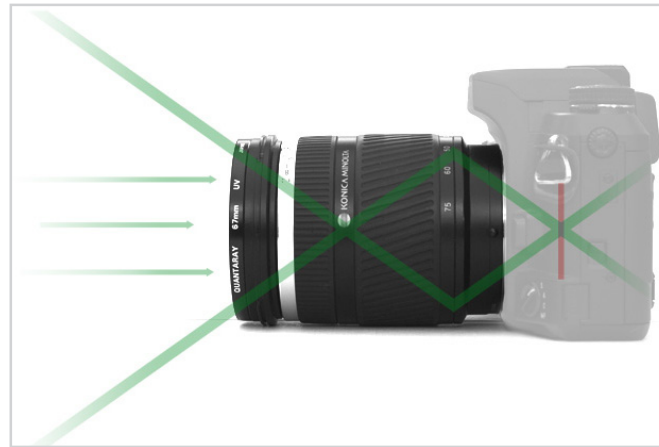


Image 1



Image 2

Reversing a lens:

As the name suggests, this technique involves reversing any lens so as to give magnification from 1:1 and above. The lens is reversed using a 'lens reversing ring' as shown in the image. This ring has two sets of threads, one set which matches with the camera mount. The other set which matches the filter mount ring of the lens. This ensures that the rear end of the lens is exposed.

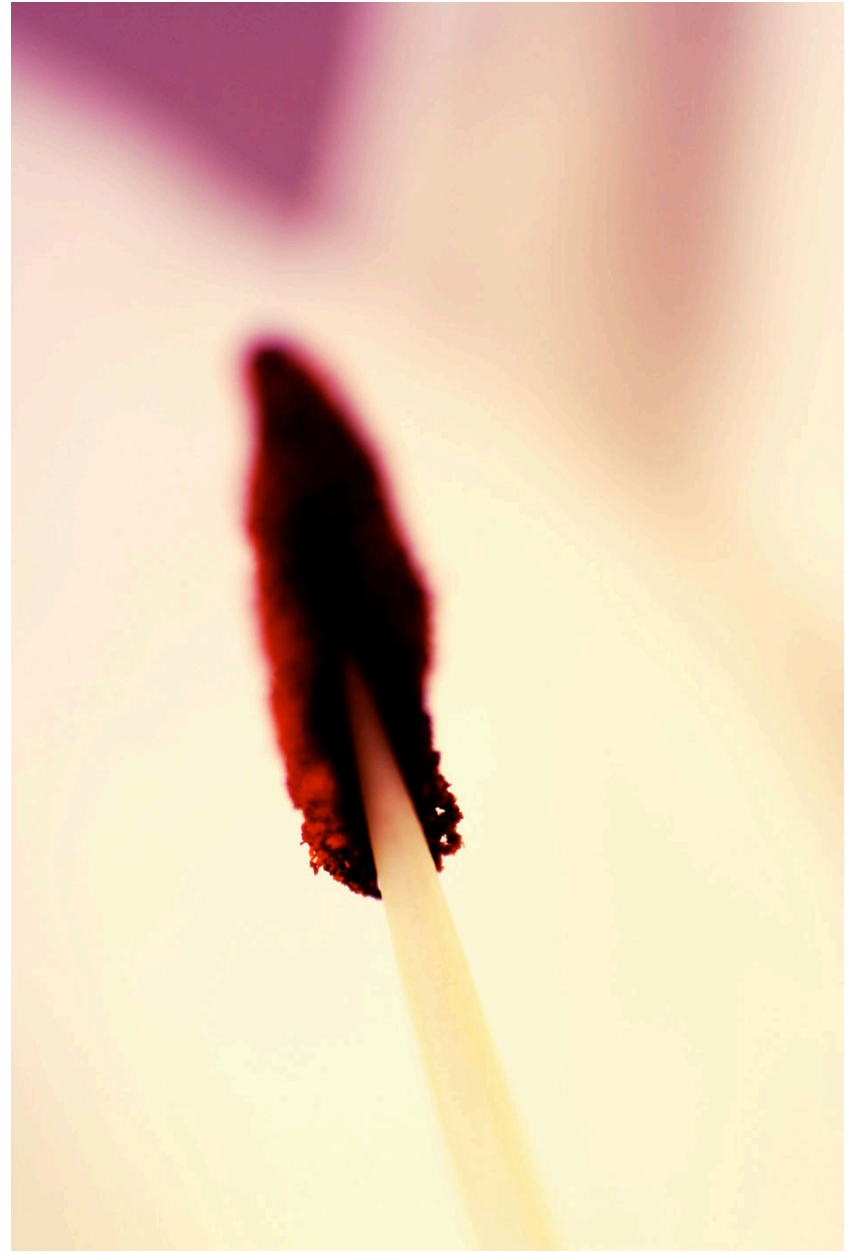
Advantages:

- This technique gives a higher magnification ratio.
- Due to lack of control over the aperture it gives extreme bokeh and very shallow depth of field.
Control over the aperture can be gained by releasing the lens from the mount while pressing the 'depth of field preview' button. This will result in locking of the aperture at which it was set. However, care should be taken while using this technique as it may damage the lens and its motor.
- It is a cheaper option to an expensive macro lens.

Disadvantages:

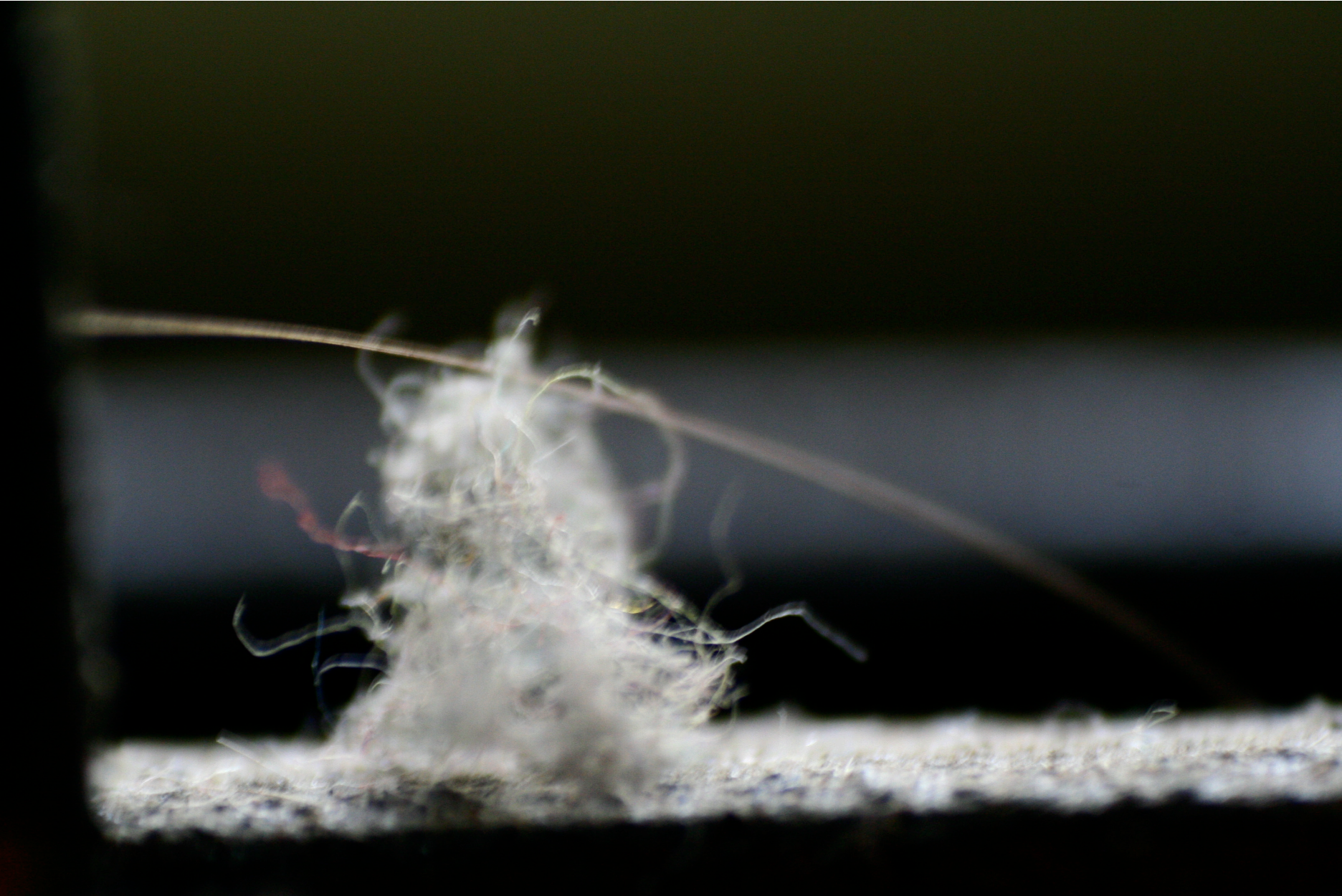
- Extremely shallow depth of field.
- No command on the functions of the camera.
- Also due to this one has to manually move the camera set-up for focusing by moving it back and forth.
- Difficulty in resetting and changing the aperture.
- Loss of intensity of light reaching the film plane.
- High probability of blurring of the image due to slow shutter speed.

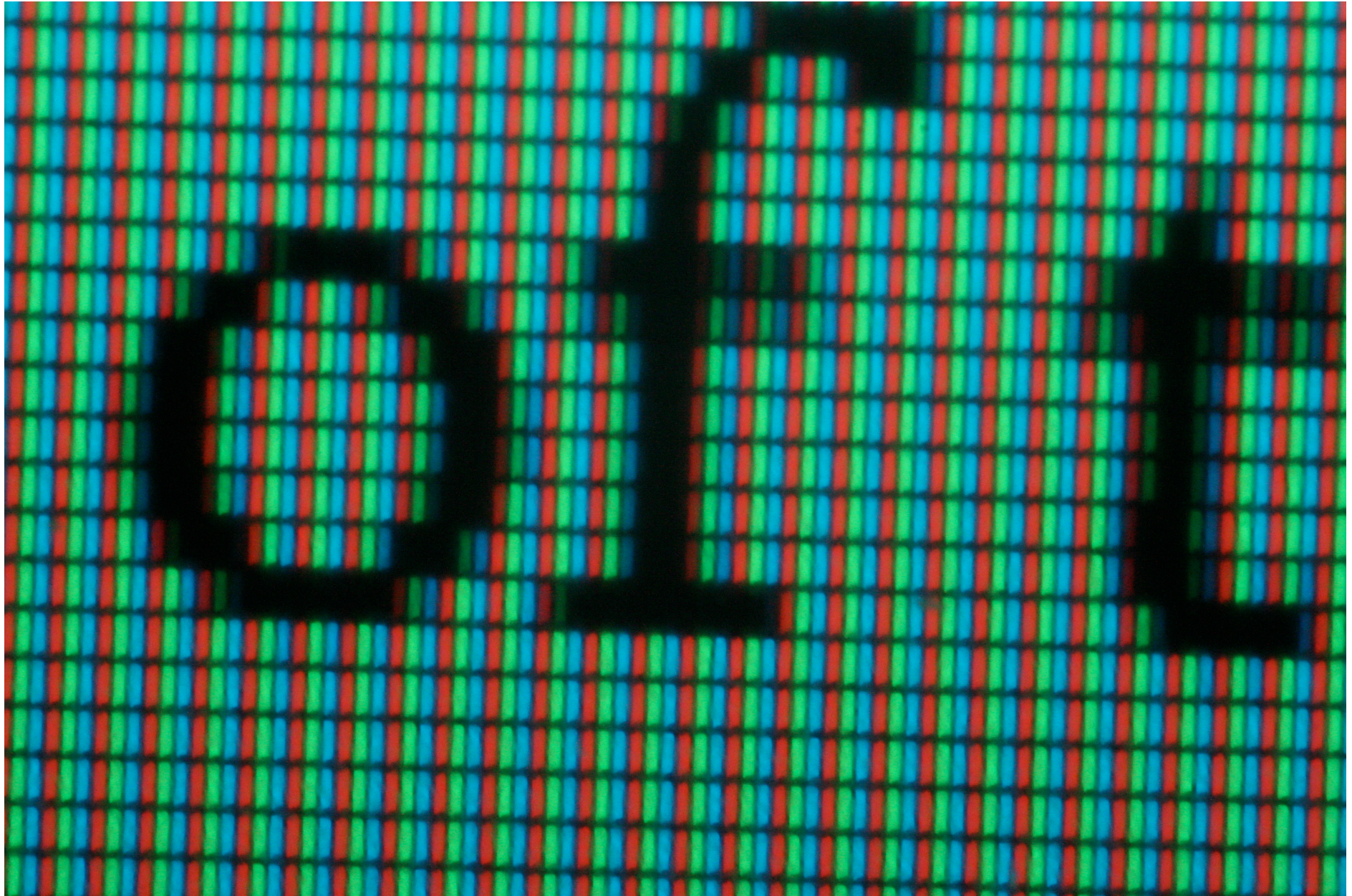




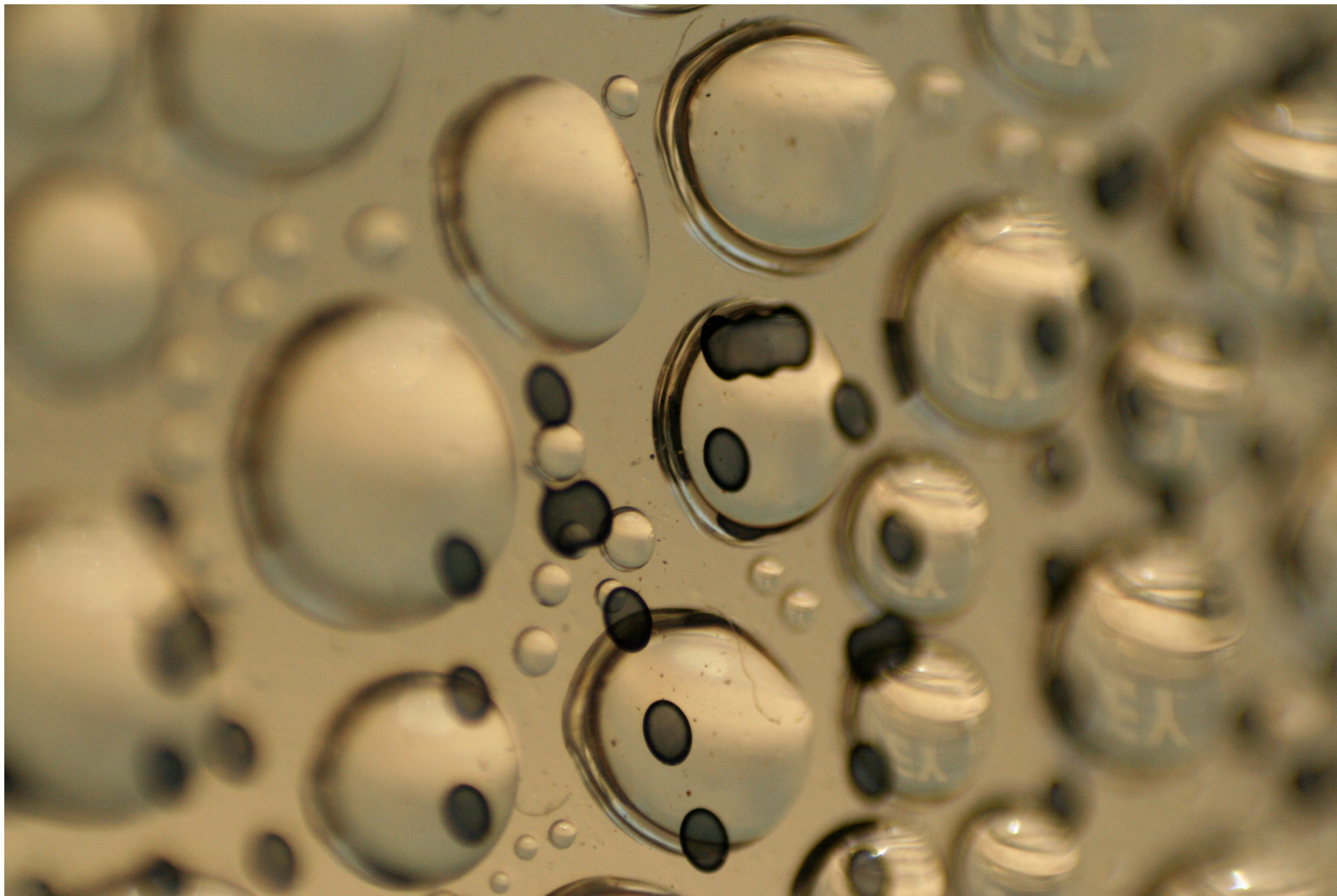






















f 2.8, 1/320, ISO 400

Canon 100mm f 2.8

Macro lens:

Technical details from Canon 100mm f 2.8 manual:

Focal Length Range 100mm

Lenses / Groups 12/8

Aperture Range - f/2.8-32

Number of Aperture Blades: 8

Manufacturer Specification Weight: 21.2 oz

Manufacturer Spec Size (DxL): 3.11 x 4.69"

Filter Size: 58mm

AF Motor Type : Ring USM

Close Focus

Specified Min Focus Distance 12.2"

Maximum Magnification: 1.0x

MM with 12mm Extension Tube: 1.19-0.12x

MM with 25mm Extension Tube: 1.39-0.26x

Personal Experience

Generally the USM (Ultrasonic Motor), the Canon 100 Macro internally focuses very fast, quietly and very accurately but it is a bit slow when the lens is at the minimum focusing distance from the subject.

This lens is sharp wide open and even sharper stopped down slightly with corners showing the most improvement. The tiniest details in the tiniest subjects will come to life with the lens. This lens with a small f-stop number results in beautiful bokeh .It is also a great portrait lens.









f5.6, 1/250, ISO 400





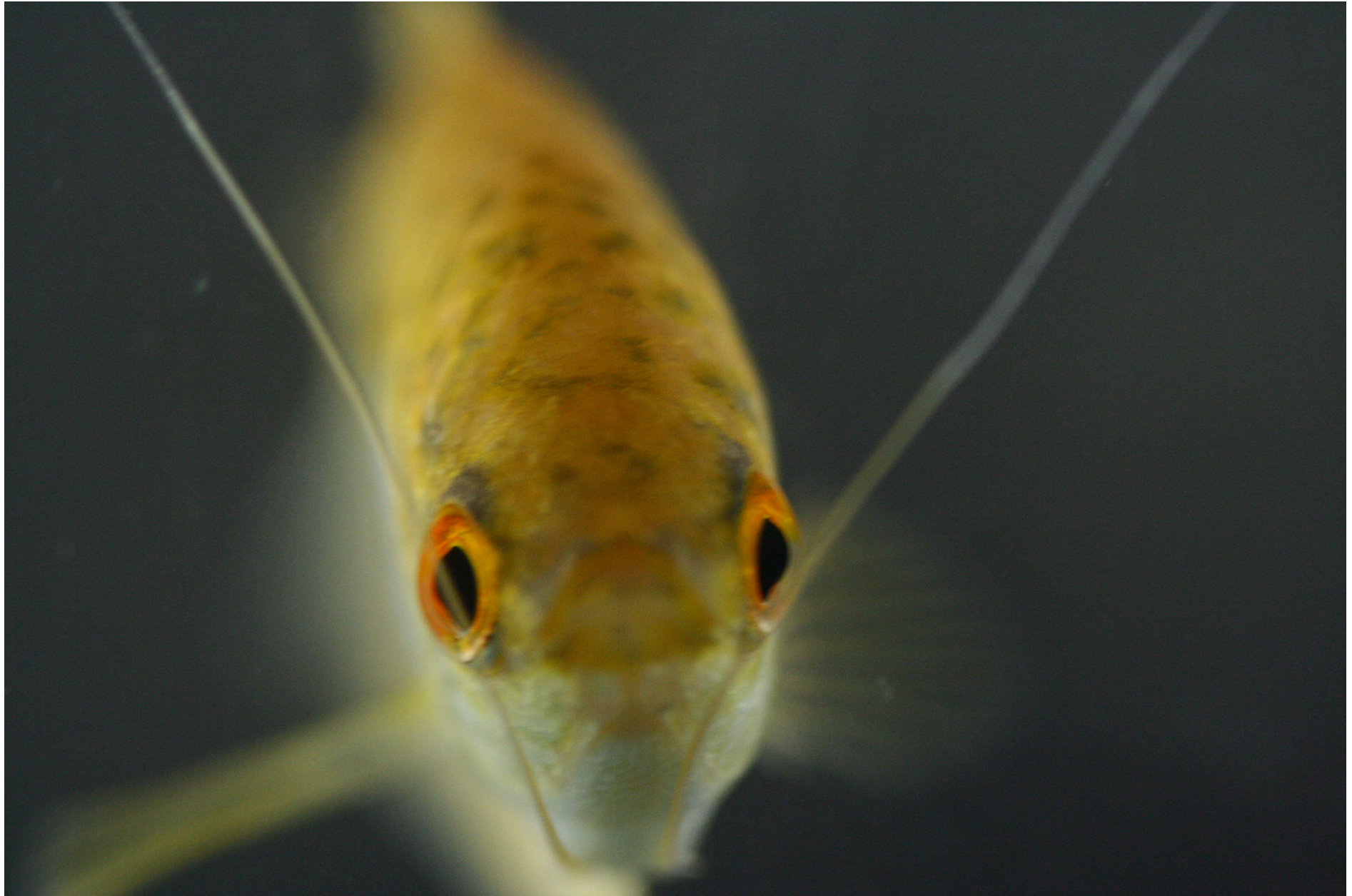
f2.8, 1/160, ISO 400















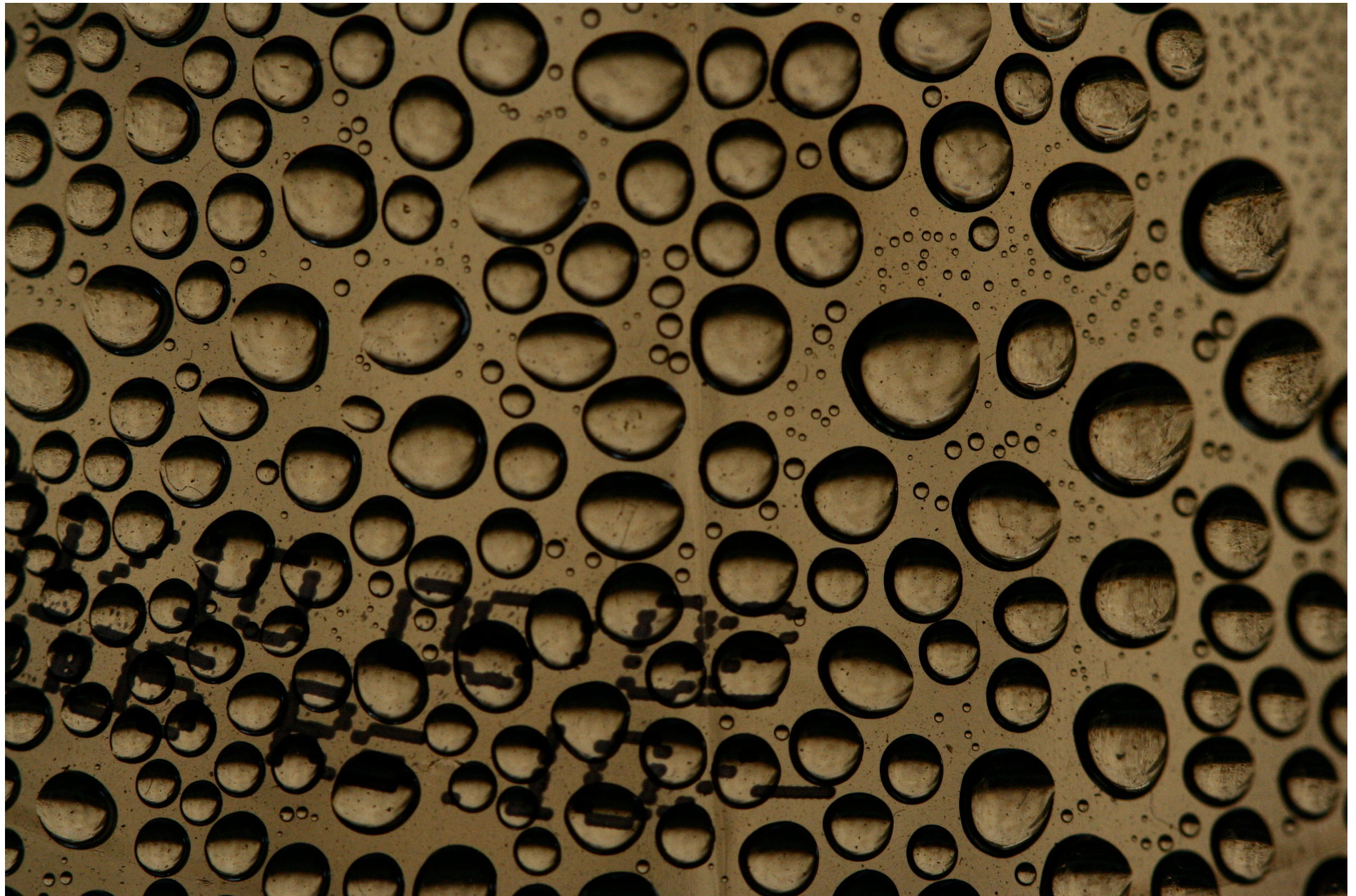


f 8, 1/80, ISO 400

























f 8, 1/80, ISO 400





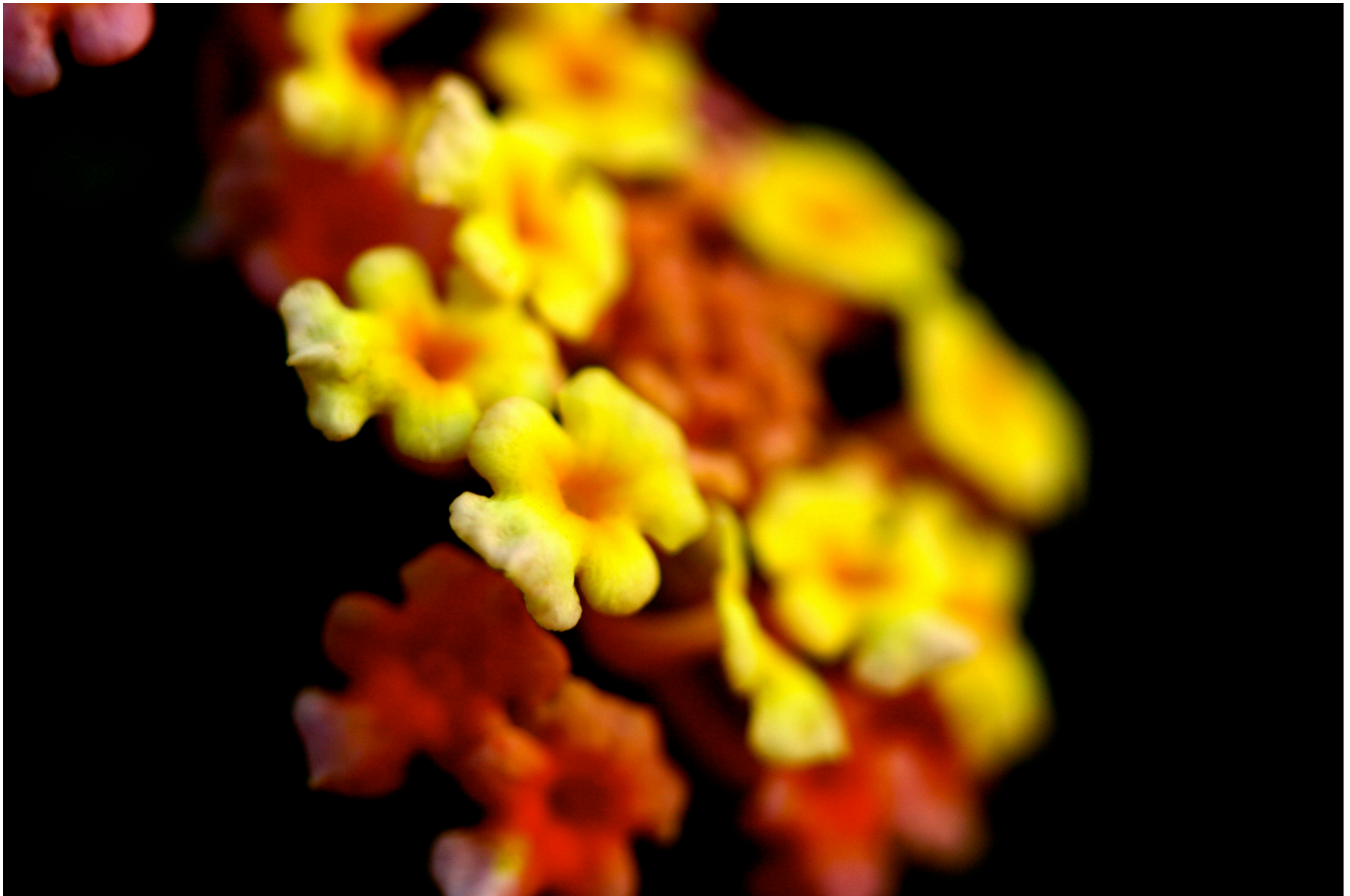
















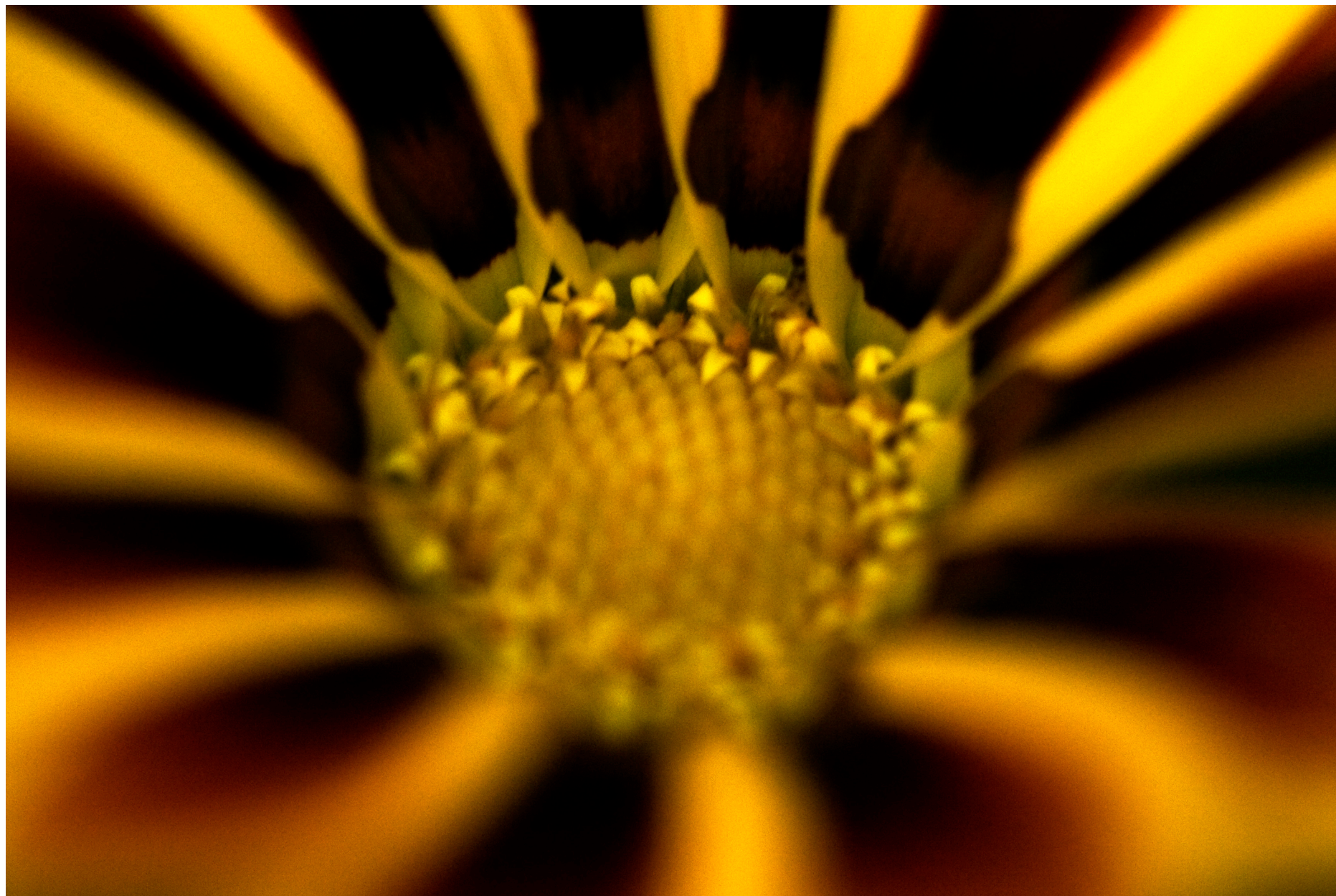




f4, 1/200, ISO 800



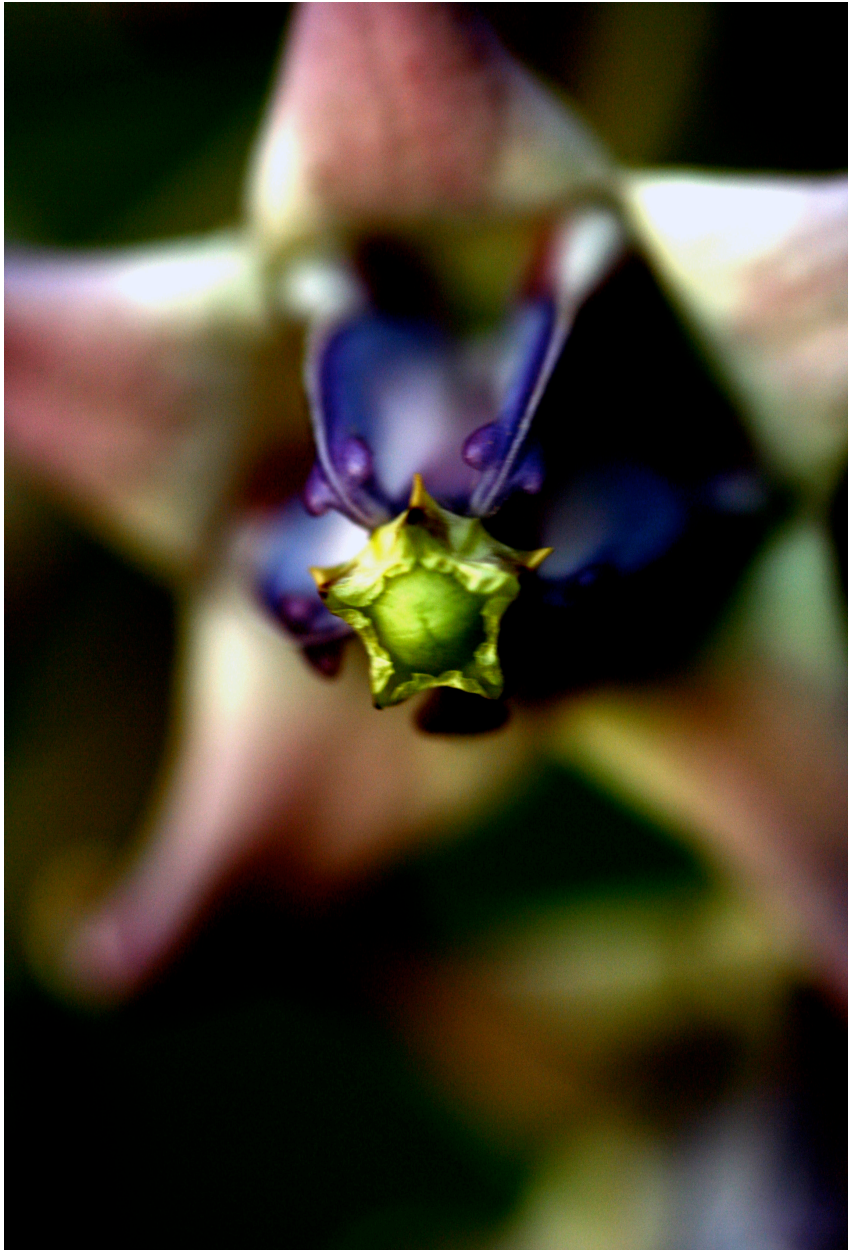


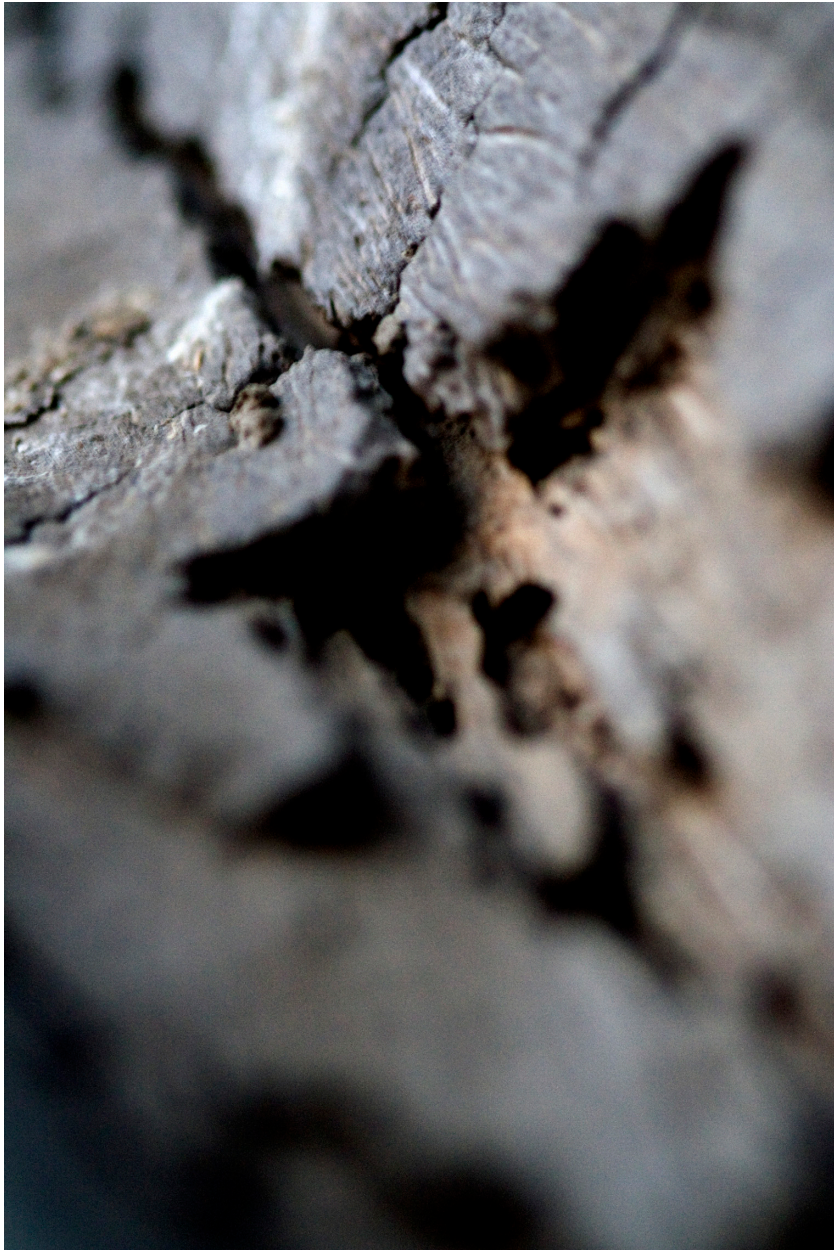




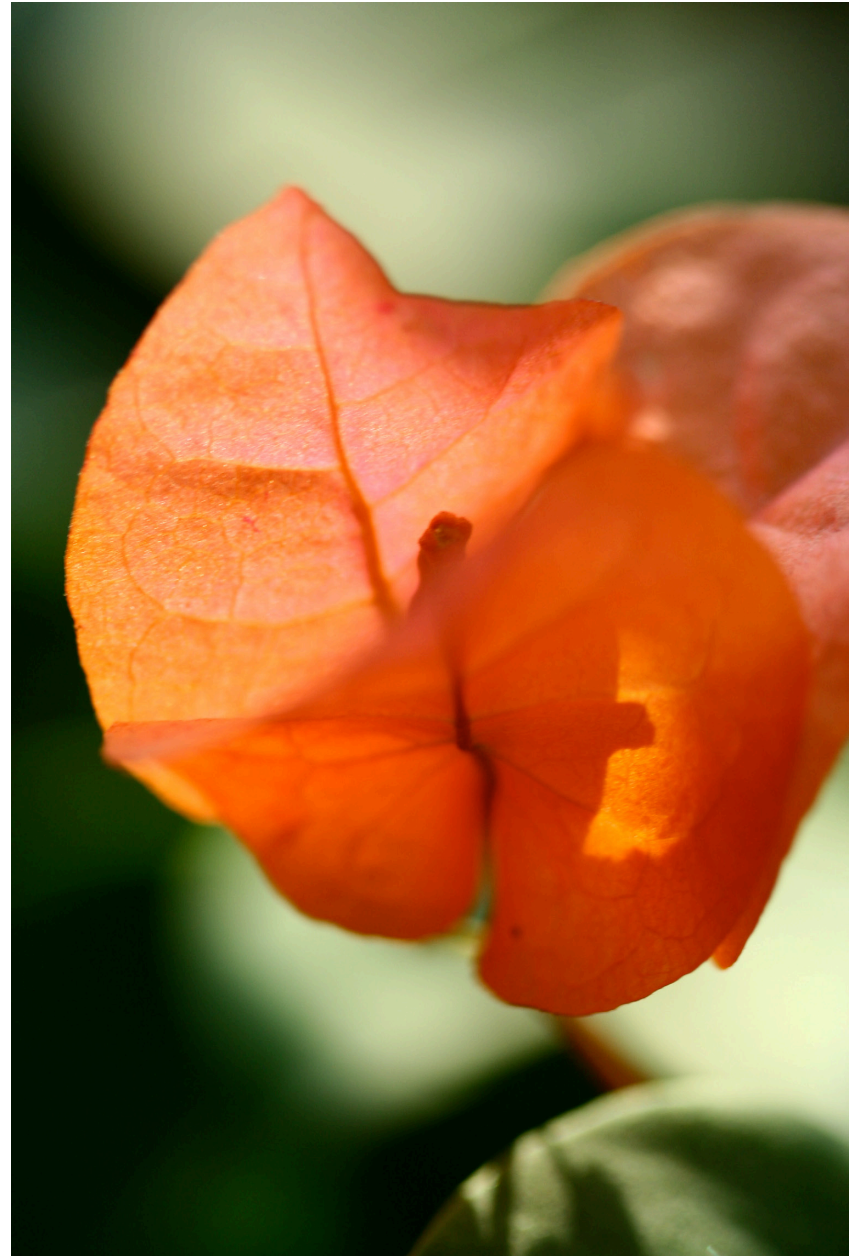




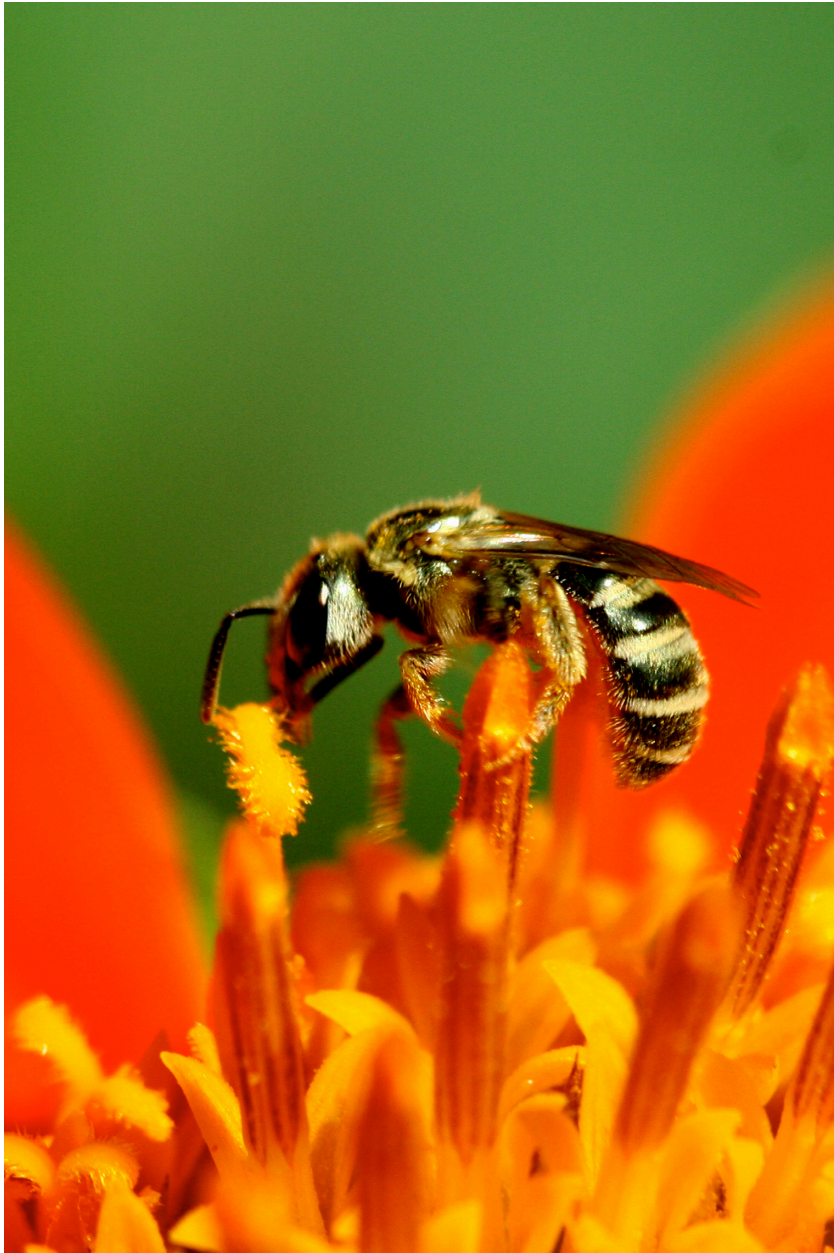




f2.8, 1/120, ISO 1600



f2.8, 1/320, ISO 200



f5.6, 1/160, ISO 400



f6.3, 1/320, ISO 800

Macro and Close up filters & a telephoto lens

With these filters the focusing distance decreases to less than an inch and the clear focusing area is around 40mm of the filter.

Only if the object is within this range will it appear the sharpest but as it approaches the edges of the frame it gets blurred. This is so as the filter is just like a Magnifying glass..

The image always requires cropping to get rid of the blurry edges. Sometimes this blur can be used creatively for aesthetic purposes.



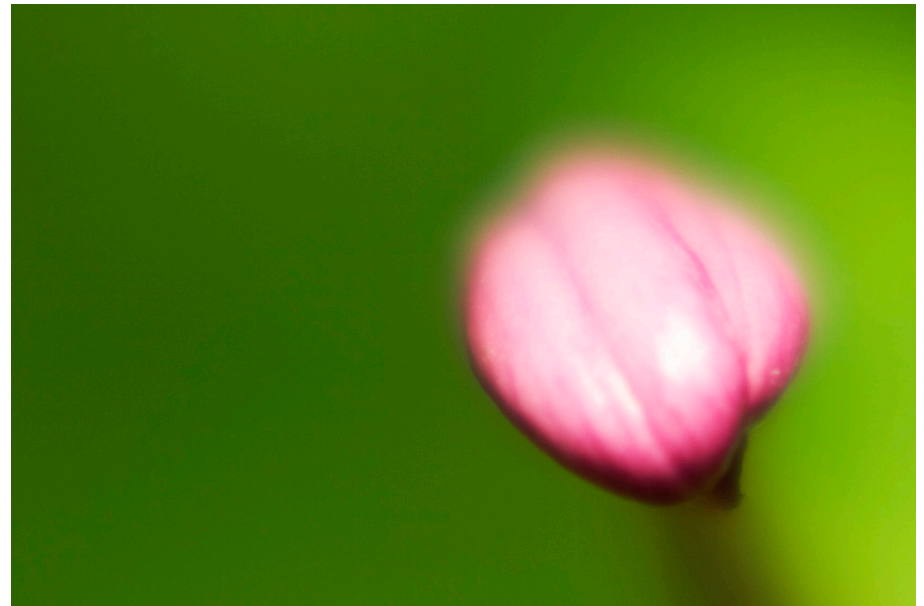
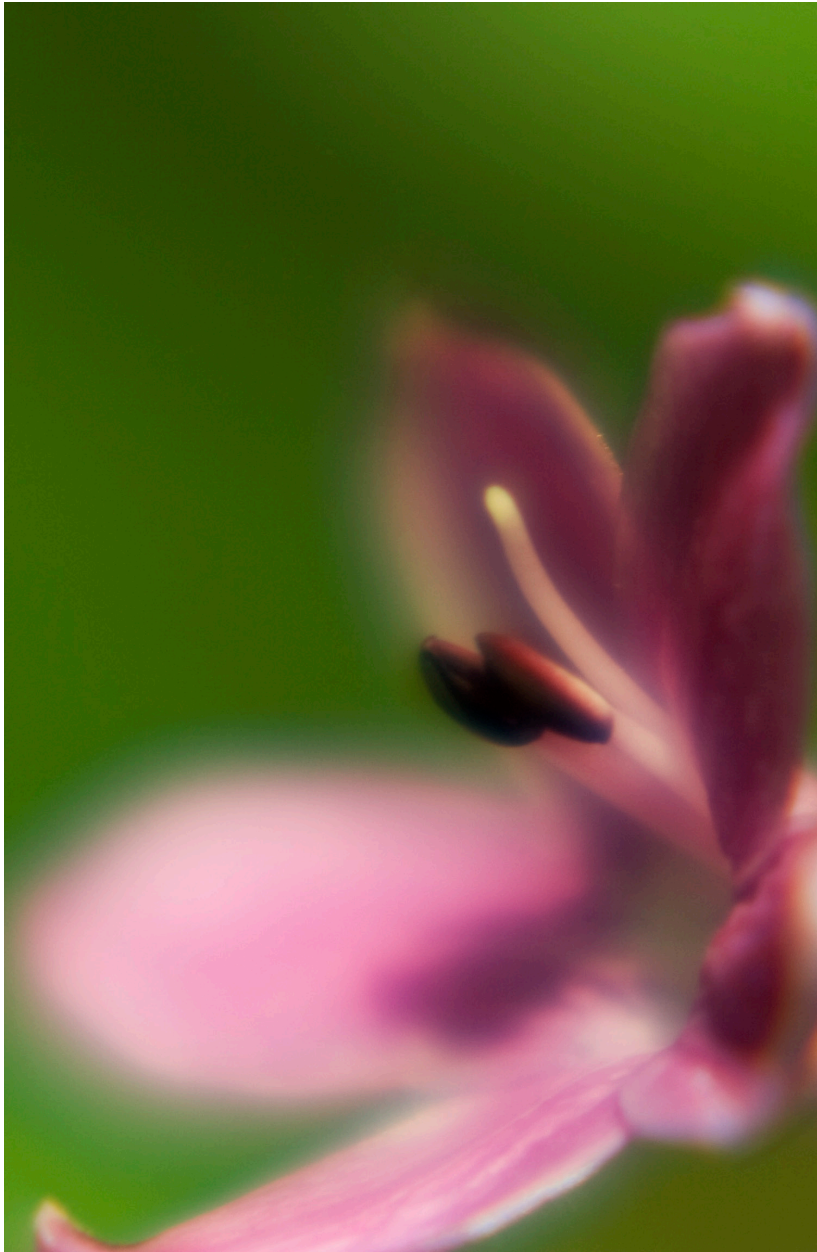
Photograph courtesy Ameya Surve



Photograph courtesy Ameya Surve



Photograph courtesy Ameya Surve



The following techniques are a part of my research towards of macro photography although I have not used them in my project.

^[7]Raynox magnifying lenses:

DCR-150 MacroScan conversion lens:

The lens includes a snap-on universal mount suitable for 52mm to 67mm filter size. DCR-150 Macro lens obtains the maximum macro magnification power when set at the most telephoto position of zoom lens. The lens is made of high index optical glass elements, which produce rich and razor sharp image.

MSN-505 Super Macro/Close-Up lens

With this lens attached, the camera captures an intricate tiny object like 2.7mm x 2mm for a frame-filling enlarged close-up image from the distance of 18.5mm to the object at the infinity focusing position*. You can simply “Snap On” MSN-505 Super Macro lens onto the 52mm filter threads of H-FS045200(f=45-200mm) by using a universal adapter UAC3500 and it will be able to capture macro images with minimum distortion at the maximum telephoto position.

UAC3500 Universal adapter is Included in MSN-505

^[8]Extension tubes + telephoto lens:

Kenko Extension tubes are designed to enable a lens to focus closer than its normal set minimum focusing distance. Getting closer has the effect of magnifying your subject (making it appear larger in the viewfinder and in your pictures). They are exceptionally useful for macro photography, enabling you to convert almost any lens into a macro lens at a fraction of the cost while maintaining its original optical quality.

The Kenko dg auto extension tube set contains three tubes of different length, a 12 mm, 20 mm, and 36 mm, which can be used individually or in any combination to obtain the desired magnification.

Kenko’s Auto Focus extension tubes are designed with all the circuitry and mechanical coupling to maintain auto focus and TTL auto exposure with most Canon lens. Some things that we should take into consideration while using extension tubes:

- When using extension tubes the lens will not focus to infinity. The focus range will be greatly limited to a very close focusing distance.
- There is light fall off when using any extension tube, sometimes the equivalent of 3 f-stops of light is lost when using multiple extension tubes together. This light lost can affect the camera’s ability to auto focus. Manual focusing is recommended in such situations.



f 2.8, 1/100, ISO 800

Time Lapse Photography



f 3.5, 1/40, ISO 400

Time Lapse

Time-lapse photography is a technique which consists of capturing images of a movement at a much slower rate and then playing it back at a faster pace. When replayed at normal or faster speed, the time also appears to be moving fast and thus lapsing.

The processes or movements that would normally appear subtle to the human eye or take a larger duration to complete, such as the motion of the sun and stars in the sky, become pronounced and comprehensible.

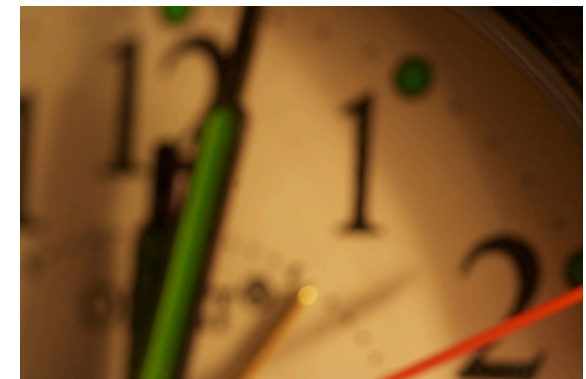
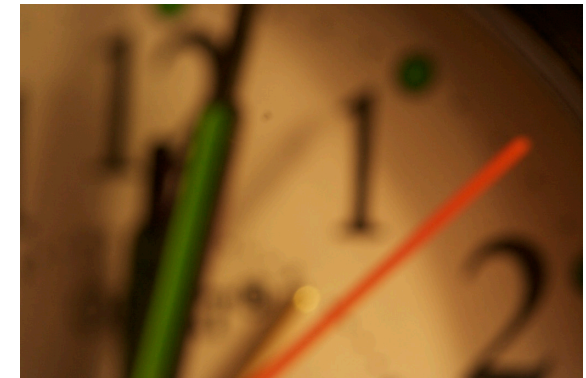
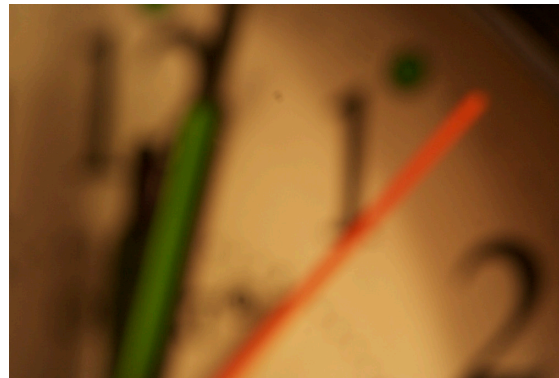
Time lapse photography can be easily mistaken for stop motion animation but it has a very distinct and stark difference. In stop motion animation one has to physically move the subject around. Where as time lapse is capturing the naturally occurring movement in a given frame.

Time lapse video is a video which has the ability to play like a film and has continuity in the movement. Sometimes the movement may be abrupt due to larger time difference while shooting the images.



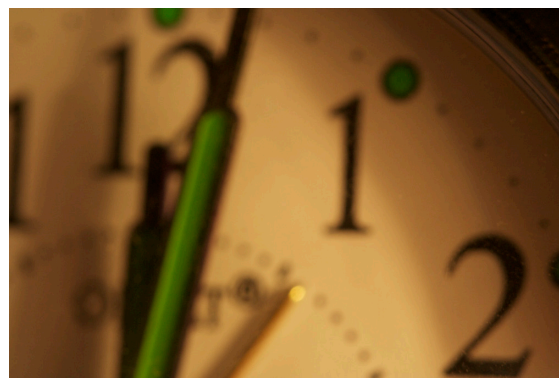
f 2.8, 1/30, ISO 400

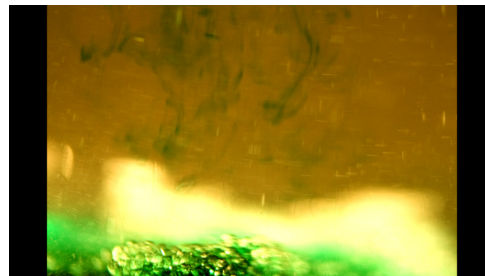
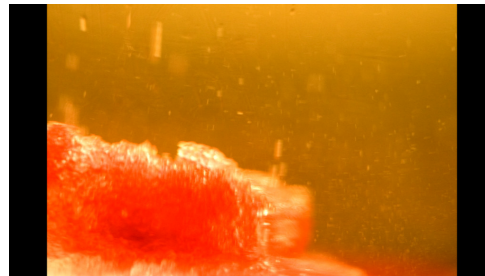
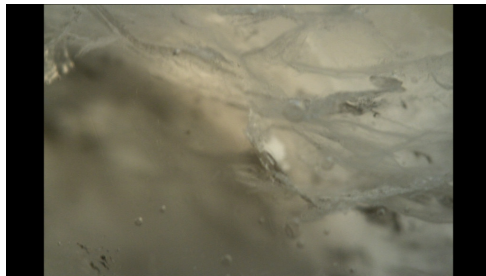
Combining Macro and Time lapse photography



Macro photography has the capacity to capture the unseen world. Time lapse photography can contract time to enthrall the viewer. Combining them can take this project to a whole new level of viewing.

There are movements in the macro world that are subtle and happen around us everyday. Yet sometimes tend to not notice these movements as they are such a part of our daily life or happen over a long period of time. Showing these movements will be very exiting for me as well as the viewer to see.

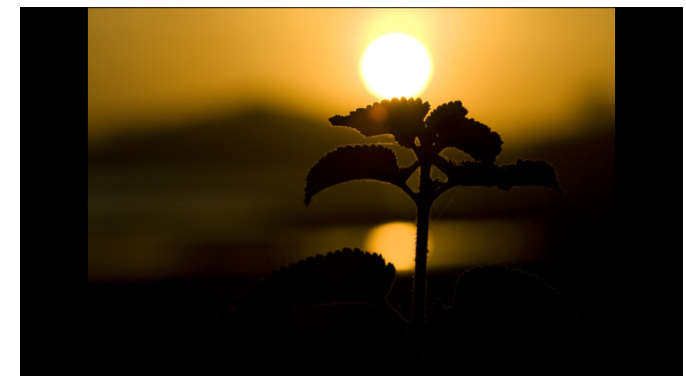




Explorations

Explorations of different possibilities in time lapse video.

- Clock ticking
Parallel plane shot
Horizontal with a visible low depth of field
- Candle
Macro shot of the wick of the candle
- Formations in the melting wax
- Process of melting
Ice melting
Ice Cracking
- Flower blooming
Actual process of blooming
Existence of flower in its environment: wind movement, effect of sunlight, dew drops etc.
- Sugar Dissolving
- Bubble in a glass
- Soda bubbles in a glass
- Sunset behind a flower/ plant
- Growth of a seed/ plant.





f 2.8, 1/250, ISO 800

Story Board for Time lapse video

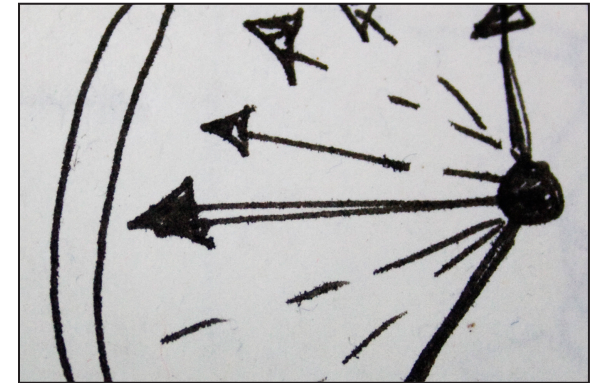
Concept 1

This is a story board which shows the movements that happen on a macro level around us that we may not notice. This a video which has three loops of events which start from the same frame and come back to it. It has immense possibilities of macro photography time lapse.

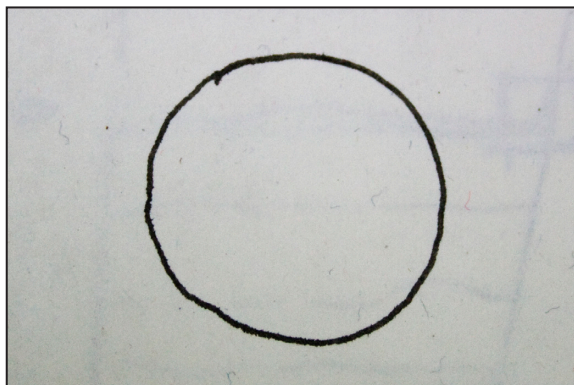


We always look at the larger picture, not noticing the smaller movements happening around us.

A scene of a table with a lot of objects that have the capacity to take macro photographs



Zoom in to the table clock on the table to show the movement of the hands of the clock.



Blurring this image out to form a bokeh pattern which will slowly transform or dissolve into the next image / video shot.

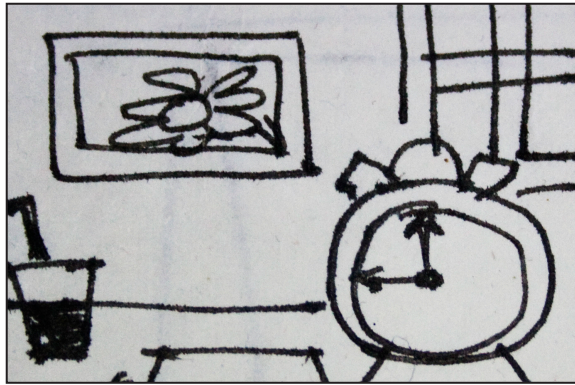


Blurred to a focused image of a plant from the back of which the sun rises.

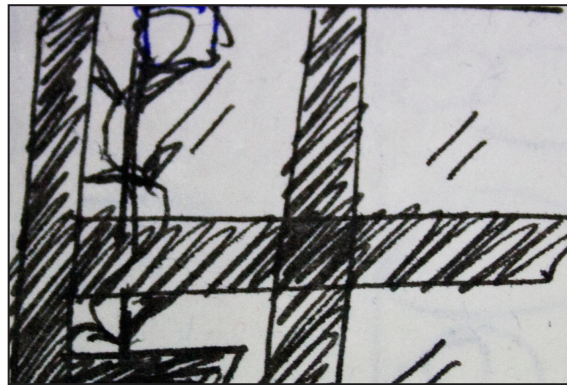
This shot will have the flower in focus and the sun creating a moving bokeh in the backdrop.



Zoom into the same flower. It is closed at first and then slowly blooms. Also this shot could begin with focusing on the dew of the plant which evaporates and the flower which will bloom.



The last shot of the previous frame would then remain as it is and the camera will zoom out of the frame from the first shot of the table top.



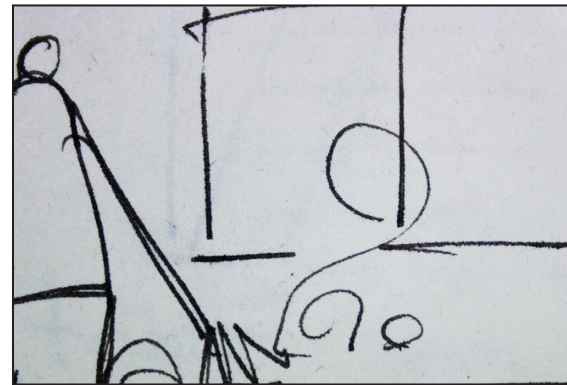
From here the camera zooms into another part of the scene ie window in the background and to the plant in the window. It still zooms into a macro level where I can show growth or movement in the plant.



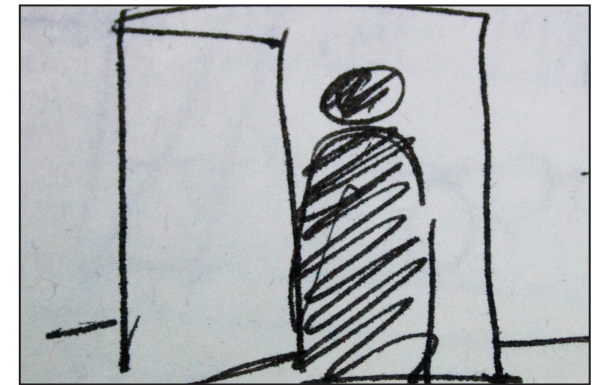
Next shot is of a stone on the ground. Then to show evaporation of water from the surface of the rock or the play of shadows on it.



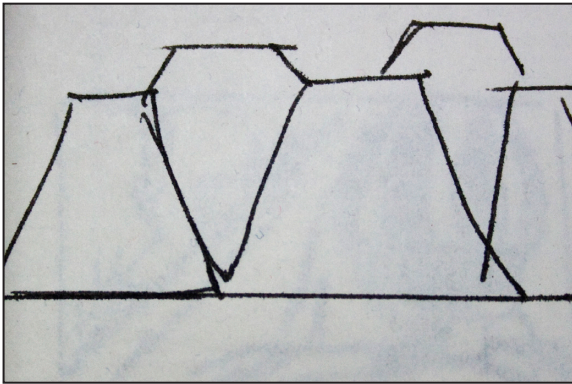
Suddenly a broom appears and sweeps the rock away. This shows the movement in dust and how particles move.



Zooming out shot of the person sweeping the ground.



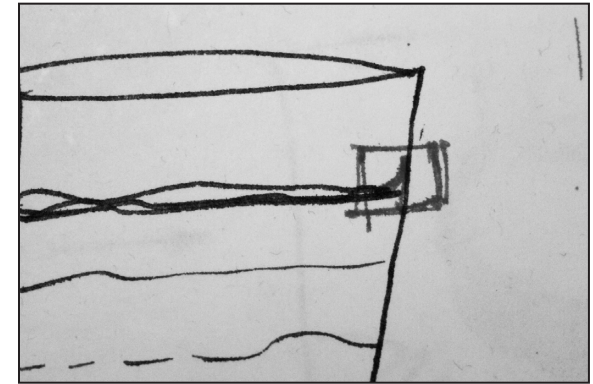
The person stops sweeping and walks into the door in the background



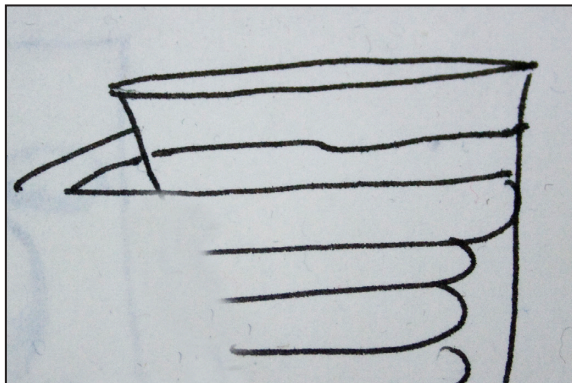
Cut shot to glasses place on a table from where one of glasses will be picked up.



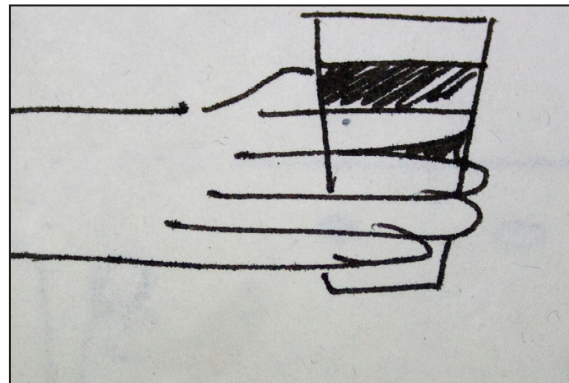
Cut to the running water from a tap to show the movement in shape of the flowing water.



Cut to the water filling the glass.



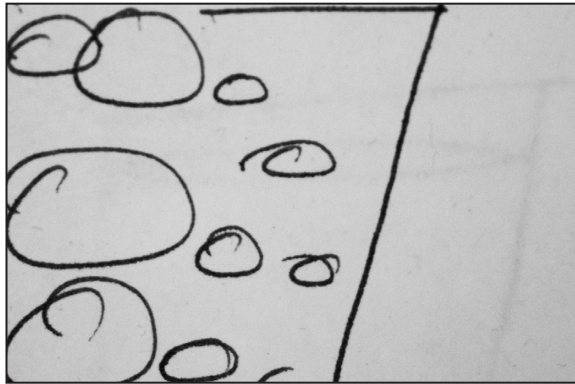
A hand picks up the glass



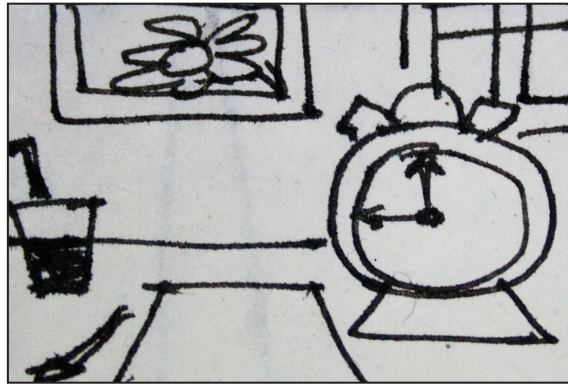
Carries the glass forward



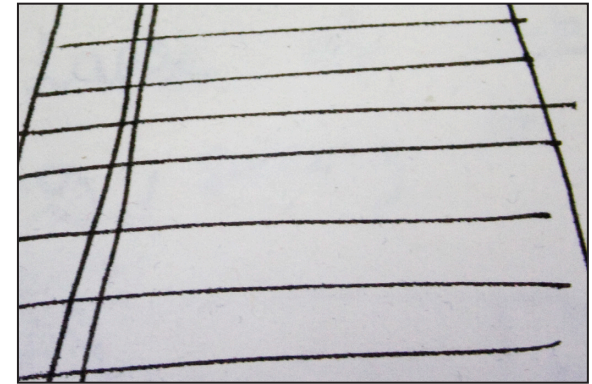
Rests the glass on a table or some surface



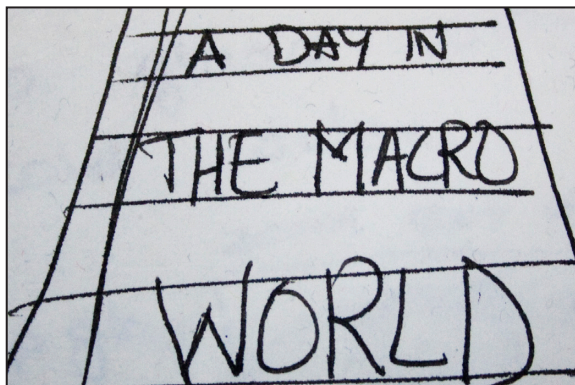
Condensation happens on the surface of the glass.



Zooming out shot
This scene matches the first scene of the video.



Zoom in to the paper on the table.



Words get written on the paper. This is the title of the video. Credits will appear after this.

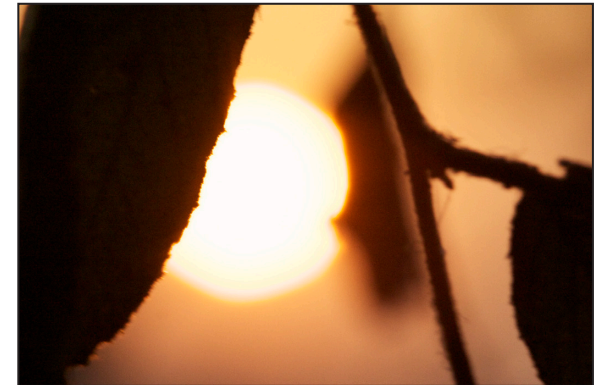
End of video.

Concept 2

Stringing together a series of Time lapse videos with the music that will be used. Each time lapse video has a particular rhythm to it and this rhythm will be matched to the pace and beats of the musical piece to create a pleasing video.



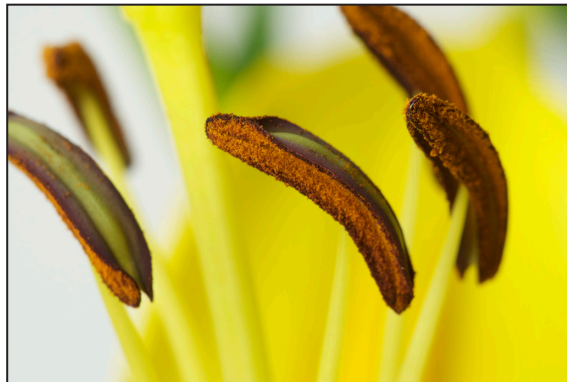
Ticking of a clock



Sunrise



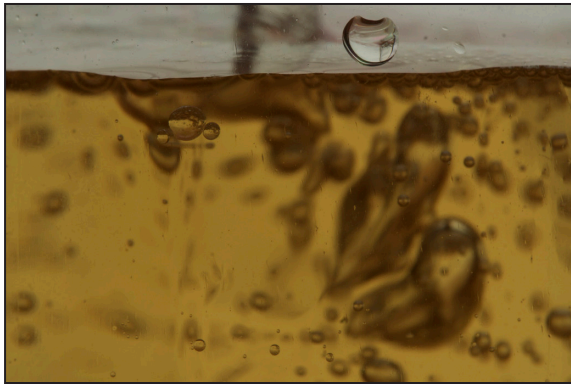
Blooming of a flower



Blooming of a flower



Formation of droplets on a surface.



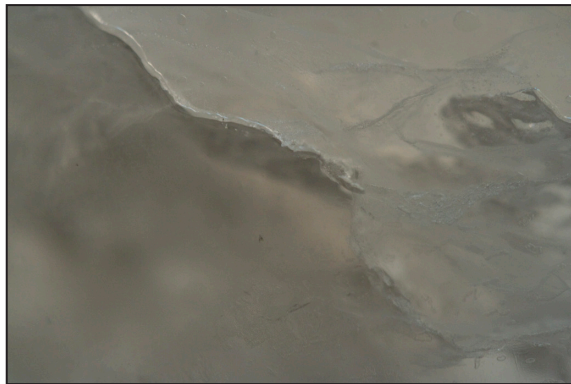
Pouring of water



Blooming of a flower



Flames of a burner



Melting of ice



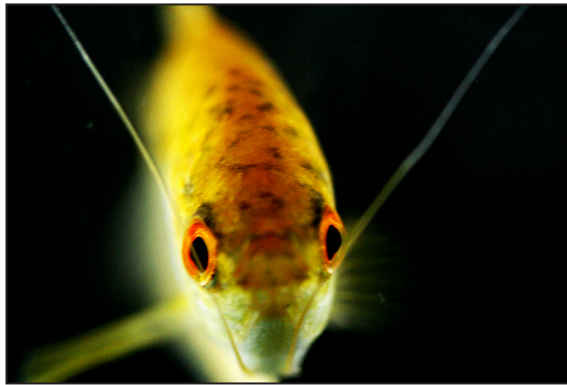
Formation of a bubble



Melting of ice



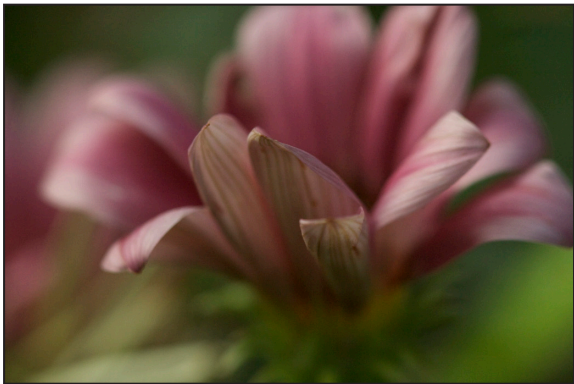
Blinking, darting opening etc. of an eye



Movement of a fish



Playing a musical instrument.



Closing of a flower at sunset



Sunset



Burning of a candle

Music for the video



f 2.8, 1/160, ISO 1600



f 2.8, 1/160, ISO 1600

Music

The music that I am searching for can have the following characteristics:

Fast
Catchy
Energising
Folk
Instrumental
Climactic.
Gypsy music
Peppy
Beats changing regularly

Examples of music with these characteristics:

^[9]August Rhapsody from August Rush.

This a classical piece of music which is experimental in nature. It is fast has a combination of beats which is ideal for a time lapse video. The only limitation of the track is that it has copyright restrictions

^[10]Bucás - Tiruleque:

This is a folk musical piece which has a varying pace. This piece of music has a very lively beat. I consider this track to be appropriate for the time lapse video.

^[10]Xota Bakalada - Tiruleque:

It has a strong base of a bagpipe which is interesting as this piece has a lot of varying paces and styles which are suitable for the time lapse video. Overall, it is a good piece of music for my video

**[11]Thème de combat: Julien PETITJEAN -
Jean qui rêve**

This piece of music is also very catchy and energetic. It keeps on changing its pace and beats. Hence I find that this piece is suitable for the video.

[12]Spring: Schwarzweiss - Untitled

This piece of music is a instrumental piece which has changing pace, continuous and subtle. This is music which can be easily used to match the pace of the various time lapse videos. The music will support the video and not overpower it.

The final piece of music will be decided after the string out or the placement of videos along the music. The musical piece that suits the final time lapse video the best will be used. For the final version of the video, the rhythm of the music will be matched with the pace of the time lapse video.



f 2.8, 1/100, ISO 1600





f 8, 1/80, ISO 400

Final Output:

The final output of this project will be a time lapse video. This video will try and incorporate movements that happen on a macro level.

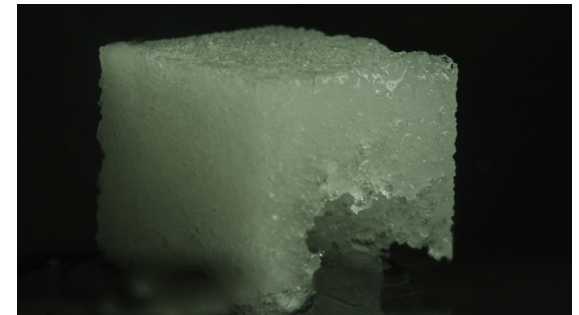
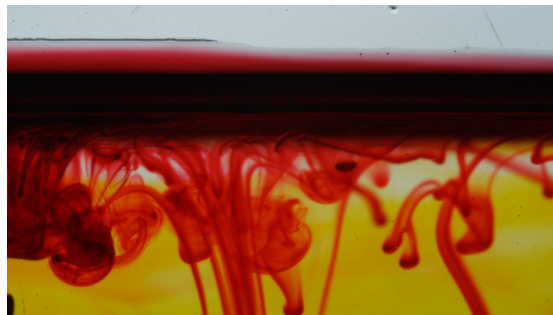
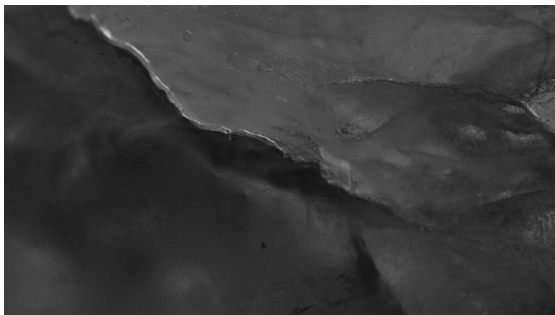
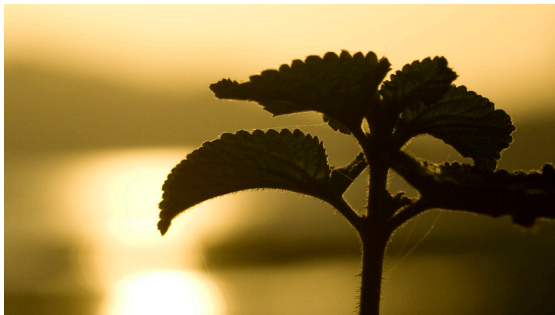
I will also put up an exhibition of the photographs along with the description of techniques used.

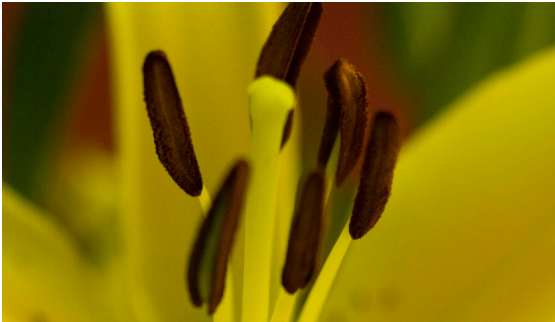
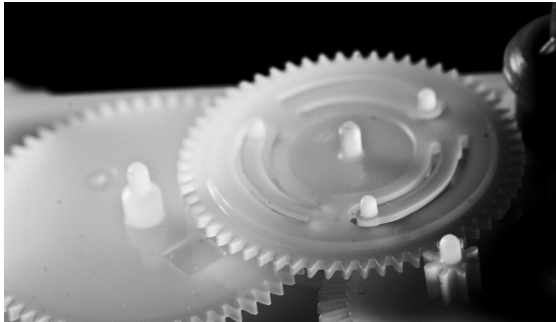
I will also be putting the photographs in a book so that it would be an extension to the exhibition and would show other photographs that could not be projected in the exhibition.

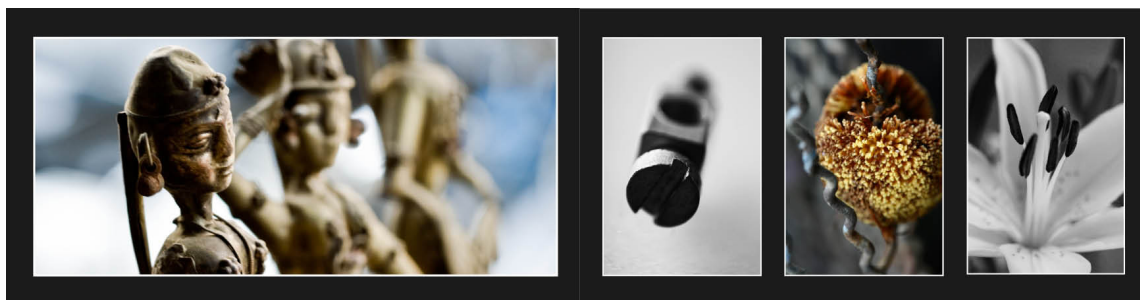
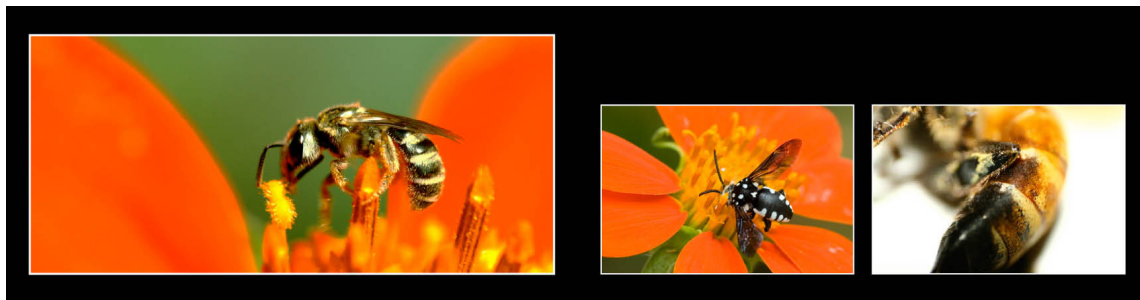
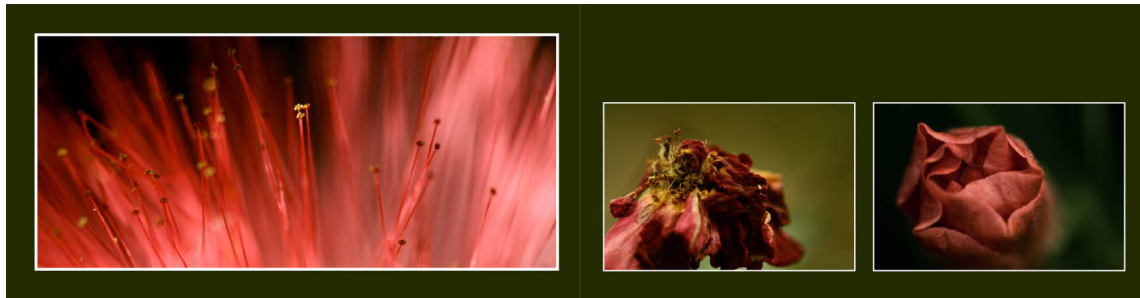
The Video:

The final video has been edited and re sequenced. The music has been finalised. At first I thought it would be good to use gypsy music with a lot of variations. The music was taking the essence away from the video which is to see movement at a macro level.

The music was changed to Spring by the artist Schwarzweiss fro the album Untitled. This piece of music is a piano piece with rising and slowing of the pace which enhances the video and does not over power it.







Concept 2

This concept was mainly designed in such a way so as to focus on the main images and also give similar images space. This book has the major image on the left hand side of the book and the secondary images on the right hand side. The images have been sorted with on basis of the kind, colour etc.

This book is more like a portfolio of my work in the past months.

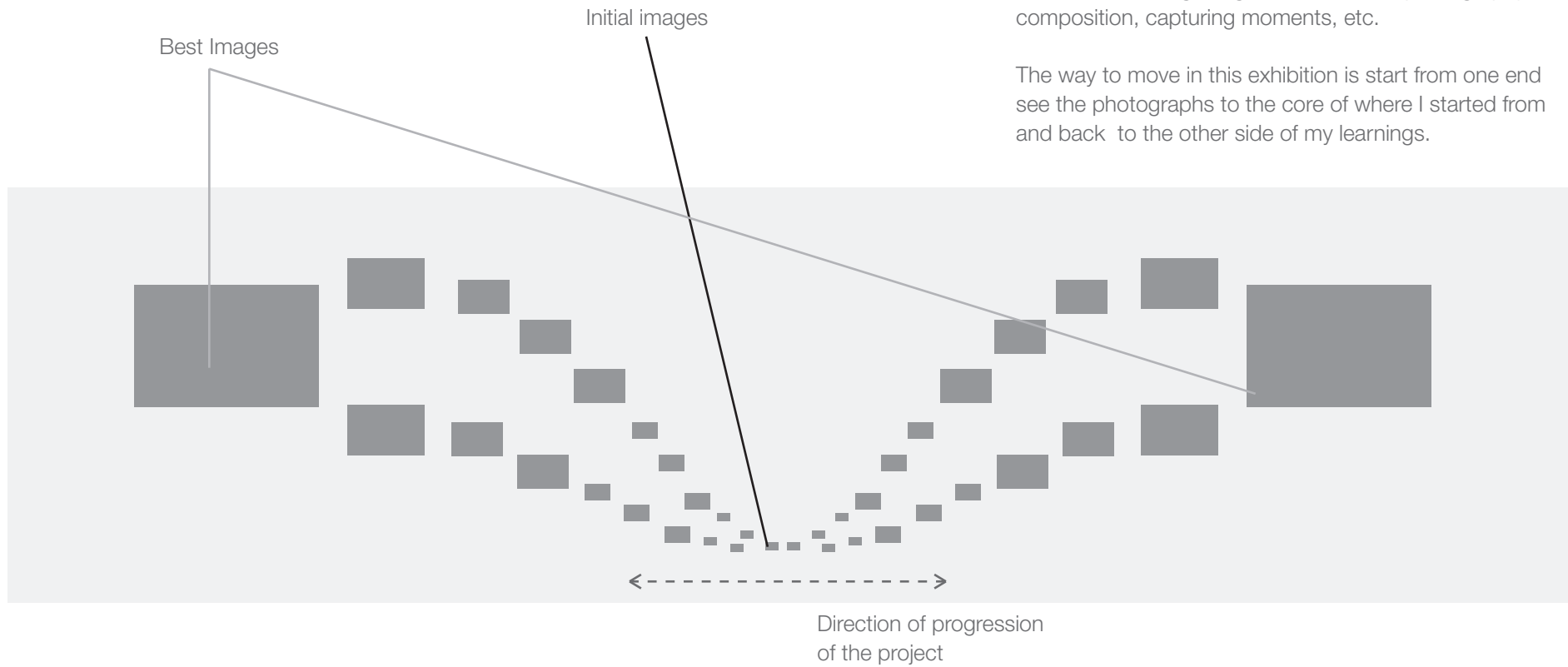
Exhibition Design

Concept 1

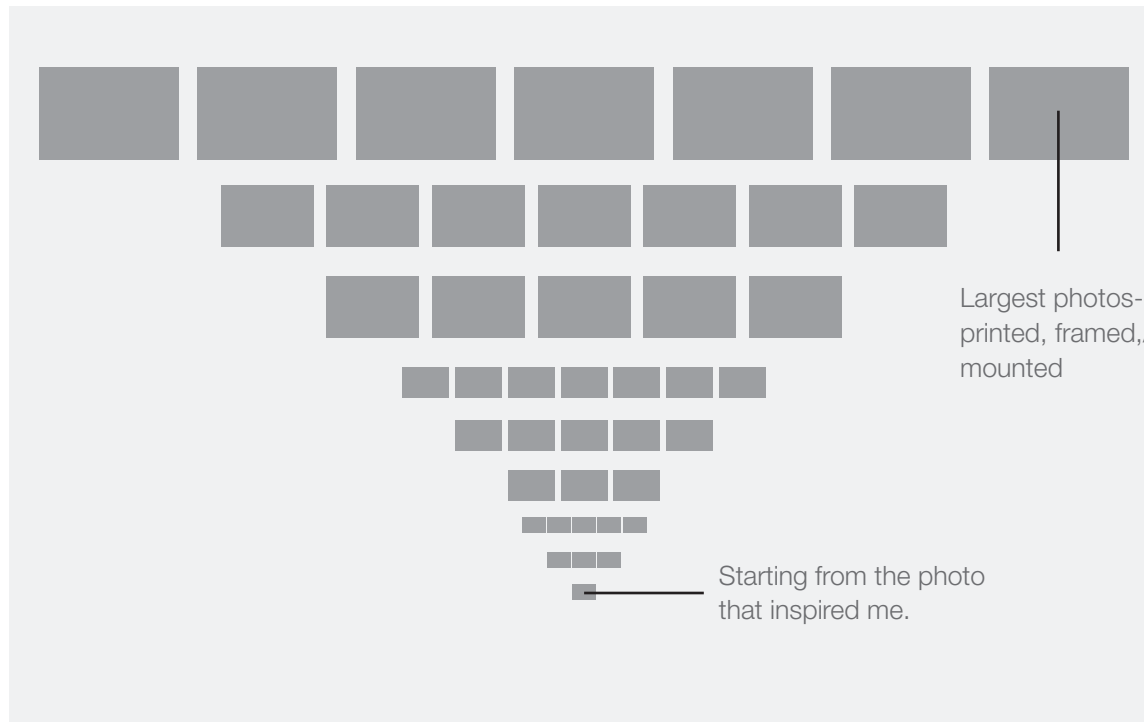
This concept is about the progression I have made during the course of my project work. The work has taken me into two directions.

One direction is the experiments I have been doing. The other direction is getting better at macro photography like composition, capturing moments, etc.

The way to move in this exhibition is start from one end see the photographs to the core of where I started from and back to the other side of my learnings.



FOR A WALL EXHIBITION



Concept 2

This concept was mainly designed to display my work in a way that I could show it getting better due to the learnings.

This concept works its way in a down to top kind of a way wherein the top photographs are the best of my shots and working my way down to the inspiration of this project.

This concept is mainly for the Changing Display Wall at IDC which is a flat wall surface.

The exhibition will look as shown in the figure.

This exhibition has one draw back which is that there are too many images in one given space to concentrate on.



f 4, 1/125, ISO 800

Conclusion

Through this project I have learnt a lot about the basics of photography, camera handling, lighting, essentials in outdoor photography, etc. It has been a great learning experience for me.

The work done in this project dwarfs in comparison to the decades of work and dedication put in by some photographers.

This project has made me more confident about my skills in photography. Doing this project was a unique experience as it helped me discover the unseen side of nature. There is a lot more that I can do in the field of macro photography and I hope to pursue this topic further.



f 3.5, 1/125, ISO 1600

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f 2.8, 1/320, ISO 400

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