Introduction to Time-lapse Photography

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Bridgewater Photographic Society
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ver 1.2
What is time-lapse photography?

Capturing many photographs at an interval slower than the rate they will be viewed (or played back), where time appears to be moving faster (lapsing). The captured photographs are then played back at a specific frame rate (frames per second, fps), typically viewed as a video.

Basically it’s the same as still Photography except you take many, even thousands of, photographs, where each is considered a snap shot in time, taken at a chosen interval.

The interval at which the photographs are captured is different for each type of subject, pick an interval that best suits the subject to achieve a smooth (or cinematic) appearance during playback.

What is a motion time-lapse?

A technique used in time-lapse photography by moving the camera over small distances while capturing a time-lapse typically using a device referred to as a slider or dolly.

What is a hyperlapse?

A technique used in time-lapse photography by moving the camera over large distances while capturing a time-lapse such as the camera attached to a vehicle that is moving while the time-lapse photographs are taken.
A Couple Examples

**Example 1 - City Limits Time-lapse By Dominic Boudreault [Vimeo]**
https://vimeo.com/23237102

**Example 2 - Diabetes Time-lapse by Richard Harrington [YouTube]**
https://www.youtube.com/watch?v=zs8BQAXV5yo
Is time-lapse photography expensive and what kind of equipment do I need?

It can be expensive depending on the type of time-lapse you choose to shoot and the results you are looking for. If you require a simple time-lapse, you may already have all the equipment you need except for an intervalometer.

How much time is required to shoot one?

This is based on your subject and the final duration of video required, some simple math.

What format do I shoot the images?

For high quality results RAW is the best, but you can use JPG if the exposure is fairly consistent with good results. JPG may show color banding in skies.

What shutter speeds should be used?

Think from a video point of view, shutter speeds < 1/60sec or less will provide smoother results. Blur in photographs are considered better as it appears to provide a smoother result when the time-lapse is viewed. Blur is not the same as soft or out of focus images.
**Frequently Asked Questions about time-lapse photography**

**How do I post process the possibly thousands of images?**

With a combination of software packages and a structured workflow.

**How do I convert all the images to a Time-lapse?**

The many images are exported to a resulting time-lapse as a video using software. This can be a 1 step or 2 step process depending on the software used.

**What additional technical skill do I need to learn?**

Manual Mode, better understanding of exposure, and some basic video knowledge. Also learning how to use some optional equipment sliders, intervalometers, tethering, etc...

**How do I add sound to my Time-lapse?**

Use a video editor to incorporate the time-lapse video and the sound track.
Simplified steps to create a time-lapse

1. **Setup your camera**
   Configure your camera settings, use a sturdy tripod/slider, choose a good subject and composition (16:9 aspect ratio vs 3:2).

2. **Setup your intervalometer**
   Calculate the interval and number of photographs

3. **Take many photographs**
   Wait while the photographs are being captured, try not to touch the camera

4. **Post-process the many photographs**
   Load the files onto your computer and use software that can copy settings

5. **Export the photographs to a video**
   Best to process from RAW directly to video
   Depending on software choices you may need to export as JPG then convert to video
   Adding sound is an additional step
**Essential Equipment for Time-lapse**

**Camera**
- DSLR (preferred), larger sensor better [KEEP SENSOR CLEAN], consider shutter actuation rating, eye piece cover typically comes with camera, consider tethering to keep hands off

**Lens**
- Most time-lapses are shot with wide (<35mm) and normal (>35mm) focal lengths, sometimes telephoto (>135mm). May require wide aperture (F/2.8) for low light applications. Remember the longer the focal length the faster the movement appears, which impacts the choice of interval time. Lenses with aperture rings are best to eliminate the effect of aperture induced flicker.

**Tripod**
- Must have item, as sturdy as you can afford, keep it low to the ground, consider extra support techniques, consider where to place your tripod (bridge movement etc...)

**Intervalometer**
- Genuine manufacturer as well as third party devices available varying in cost and capability. Some cameras have this feature built in the firmware.

**Software**
- There are many choices of post-processing and video conversion software
Accessories for Time-lapse

Tethering
Consider tethering to keep your hands off the camera, however consider power required

Extra Batteries
Shooting over a long period of time, battery grip is a good choice (typically two batteries)

Memory Cards
Shooting hundreds to thousands of images requires the card to be large and fast enough to keep up with the camera buffer. Procedure to know which ones are full/empty

Filters
Neutral Density for better control of shutter speed to be in the range of 1/60 or slower. Slowing down the shutter speed in this fashion is called “dragging the shutter”. Graduated Neutral Density for controlling dynamic range.

Unique Tools
“Lenskirt” is useful when shooting through a window to minimize/eliminate reflections

Smart Phone
Use various apps; weather, sunrise/sunset/twilight, track the sun/moon/stars, tide times, time-lapse calculator, tethering, entertainment while waiting for the photographs

Computer & Storage
Post-processing, video editing, sound editing, external disk drives
**What Camera is best for Time-lapse Photography**

**DSLR**

Manual control, larger sensors, RAW, accessories (intervalometer)

**Point & Shoot**

Only some manual control, smaller sensors, Typically JPG only, lack of accessories
Photographs directly to time-lapse video, with limited frame rates (no access to original images limits post-processing)

**GoPro**

Limited focal length & exposure control (auto). Small sensors, photographs directly to time-lapse video, with fixed frame rates (no access to original images limits post-processing)

Flexible mounting options and waterproof

**Cell Phone**

Limited focal length & exposure control. Small sensors, photographs directly to time-lapse video, with fixed frame rates (no access to original images limits post-processing)

Some apps provide a level of flexibility

Always with you
Sensor Examples

Full Frame

APS-C

Four Thirds

High End Point & Shoot

Advanced Point & Shoot

iPhone 5 & 6

Point & Shoot

Note: Keep your sensor clean!

Note: Not to exact scale
What Lens is best for Time-lapse Photography

Wide vs Telephoto

- Depends what your composition requires
- Ultra Wide angle lenses are considered to be <=24mm (sensor height)
- Wide angle lenses are considered to be <=35mm (sensor width) (examples: 18-55mm/17-40mm/16-35mm) allow for more inclusion of the sky when you want to show moving clouds which makes a dramatic scene as long as there is good foreground interest
- Normal/longer telephoto lenses (examples: 55-250mm/24-70mm/70-200mm) can compress the scene which can appear to speed up the motion, this will affect your choice of time-lapse interval

Aperture

- Important from an exposure point of view
- For low light applications, it’s best to use a higher quality lens with at least an f/2.8 specification, however they can be very expensive
- Pay attention to depth of field

The aperture mechanism can cause flicker, when the aperture starts at an undetermined position (based on the camera’s firmware) that may be different than the set aperture. A lens with a manual aperture ring is better. Do some tests, recommend to shoot wide open however usually not the sharpest aperture for the lens.
Intervalometer

A device that controls the camera shutter via the remote shutter connector triggering the camera to take a picture. The number, interval, and duration of the shutter can be configured. Get the proper cable/connector for your camera.

Some Nikon cameras have this feature built into the firmware, Menu -> interval timer shooting.

Canon users could use 3rd party firmware called “Magic Lantern” which has this feature, however use it at your own risk (will void your warranty). (http://www.magiclantern.fm/)

Most have no ON/OFF switch, remove batteries when not in use.
Intervalometer

Trigger Trap, [http://triggertrap.com/](http://triggertrap.com/), an iOS/android app + a dongle that can work as a simple remote trigger or intervalometer. It also has many other different interesting capabilities. The “dongle” connects to the headphone jack of your iOS/android device then to the remote shutter connector on your camera. You purchase the “dongle” that works with your camera.

Trigger Trap Mobile App $0

Trigger Trap Mobile Kit £29 + ship + taxes

Trigger Trap Timelapse Pro App $5.79 – provides creation of timing sequences for more control
Intervalometer

- **Delay** – initial time at the start of the sequence to allow for the camera to stabilize.

- **Exposure Time** – how long the shutter is to stay open, this allows for a “bulb” mode scenario. If not using “bulb” mode then set your camera to only shoot one image. The shortest time is typically limited to 1 second.

- **Interval Time** – the time between images. The shortest time is typically 1 second.

- **Count** – the number of images to take before the sequence stops. You can set the count from 1 to a maximum, typically 399 or 999, however you can typically set it to unlimited.
**Time-lapse Interval**

**Interval = 1 sec**
- fast moving clouds
- Traffic
- animals

**Interval = 2-3 sec**
- sunset/sunrise
- moonrise/moonset
- slower moving clouds
- people
- using telephoto lens

**Interval = >15 sec**
- flowers
- stars
- construction

*Understanding the choice of the best interval requires lots of practice*
**Intervalometer Calculations**

**Calculations**

- Think about the scene you are about to capture, make sure the interval you choose provides a smooth result.
- Consider the length of the final time-lapse video.
- Decide on the fps.

**Example 1:**

Final video clip is 10 sec at 24 fps, (typical range is 8 – 12 sec)

Calculate the minimum number of photographs (frames) required:

\[
10 \text{ sec} \times 24 \text{ fps} = 240 \text{ frames}
\]

How long is the event taking place, as an example let’s use 10 min

Calculate the interval at which the photographs need to be taken:

\[
\frac{10 \text{ min} \times 60 \text{ sec/min}}{240 \text{ frames}} = 2.5 \text{ sec}
\]

Most Intervalometers shoot in 1 sec increments

\[
\frac{10 \text{ min} \times 60 \text{ sec/min}}{2 \text{ sec}} = 300 \text{ frames} (12.5\text{sec})
\]

\[
\frac{10 \text{ min} \times 60 \text{ sec/min}}{3 \text{ sec}} = 200 \text{ frames} (8.3\text{sec})
\]

*Always shoot more than you need, expect the unexpected.*
Intervalometer Calculations

Example 2:

Duration of the event = 4 hrs. Convert to seconds.

\[4 \text{ hrs} \times 60 \text{ min/hr} \times 60 \text{ sec/min} = 14,400 \text{ sec}\]

Determine the required fps, typically = 24 fps

What is the duration of the final time-lapse video, for our example let’s say = 12 sec

Calculate the minimum number of frames (photographs) required.

\[12 \text{ sec} \times 24 \text{ fps} = 288 \text{ frames}\]

Calculate the interval.

\[14,400 \text{ sec} / 288 \text{ frames} = 50 \text{ sec}\]

Intervalometer settings

- Delay = 2 sec
- Long (exposure) = 1 sec
- Interval = 50 sec
- Count = 288

Result is 4 hours of time compressed into 12 seconds.
Memory Cards

Compact Flash (CF) 266X
266X
45MB/s read
40MB/s write
$40
266X
32GB
32GB
64GB
$53
$100

SDHC 200X
200X
16GB
16GB
32GB
$22
$29
$53

SDHC 400X
400X
16GB
32GB
$27
$29
$43

SDXC 400X
400X
64GB
128GB
$70
$115

SD – Secure Digital (<= 2G Bytes)
SDHC – Secure Digital High Capacity (<= 32G Bytes)
SDXC – Secure Digital Xtra Capacity (<= 2T Bytes)

Demystifying Speeds

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Ultra Direct Memory Access (UDMA)

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Note: USB 2 max speed = 60MB/s
USB 3 max speed = 640MB/s

Example Speed Calculation:
266 x 150KBytes/sec = 40MBytes/sec

CD 1x speed
Memory Cards

Canon 7D (18Mpix)
Raw file size ≈ 26.9Mbytes
- 16G card ≈ 595 (595/24fps ≈ 24 sec)
- 32G card ≈ 1190 (1190/24fps ≈ 49 sec)
- 64G card ≈ 2380 (2380/24fps ≈ 99 sec)

Canon 5D MKII (21Mpix)
Raw file size ≈ 27.7Mbytes
- 16G card ≈ 577 (577/24fps ≈ 24 sec)
- 32G card ≈ 1154 (1154/24fps ≈ 48 sec)
- 64G card ≈ 2308 (2308/24fps ≈ 96 sec)
**Software**

**Processing the many photographs**
- Canon Digital Photo Professional (comes with your camera)
- Nikon Capture NX2
- Lightroom

**Exporting to video**
- Quicktime Pro 7 $35  
- LRTimelapse – plugin for Lightroom €99 ($133)  
  ([http://lrtimelapse.com/](http://lrtimelapse.com/))

**Tethering – (keeps your hands off the camera)**
- Lightroom + laptop
- Canon Digital Photo Professional + Laptop
- digiCamControl (for Nikon and some Canon) + laptop  
  ([http://digicamcontrol.com/](http://digicamcontrol.com/))
- CamRanger $300  
- qDslrDashboard (for Nikon or Canon) + laptop or smart phone or tablet (may require TP-Link TL-MR3040 battery powered wireless Router ex. Apple ios devices) App $12, TL-MR3040 $60  
  ([http://dslrdashboard.info](http://dslrdashboard.info))
qDslrDashboard is a cross platform application for controlling Nikon and Canon DSLR cameras. It uses the PTP and PTP/IP protocol to communicate with the connected DSLR camera. Currently it runs on Android, iOS, Linux, OSX and Windows platforms

Set camera image format to full size RAW + small size high quality JPG
Filters

ND

Neutral Density, are used for controlling shutter speed. Depending on the amount of light and the aperture chosen the shutter speed may be considered too fast. If your time-lapse is shot at shutter speeds > 1/60 sec you may find the resulting time-lapse motion to be jerky, referred to as staccato. To have smooth motion the shutter speed should be < 1/60 sec or slower. Slowing down the shutter speed in this fashion is called “dragging the shutter”.

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<tr>
<td>2.7</td>
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http://en.wikipedia.org/wiki/Neutral_density_filter
ND Grad

Graduated Neutral Density, are used for controlling scenes that have a significant dynamic range of light, typically during sunset and sunrise. They are typically used in conjunction with a filter holder system that can hold multiple filters which allows for adjusting the area of the composition that needs to be darker.

These filters gradually go from dark to light over ½ of the filter. There are hard and soft transitions as well as reverse graduated types.

This technique has been around since the film days and is still used to minimize post-processing providing a more “in camera” result. It also prevents the camera sensor form being over saturated vs using HDR techniques.

Hitech 100 Series ND Grad Soft Edge Filter Kit (0.9, 0.6, 0.3 densities)
**Lens Skirt (Lenskirt)**

http://www.lenskirt.com/lenskirt/

**Product Description**
The LENSKIRT is a portable, flexible hood which you attach to the end of your camera lens. It allows you to shoot pictures / video through glass without internal environmental reflections such as yourself, room lights, camera flashes, light leak from under a door, etc.

Mini review Photofocus web site:
http://photofocus.com/2012/09/13/lenskirt-mini-review/

≈ $50
Slider

A slider, sometimes referred to as a dolly, is a track that contains a carriage, to mount the camera, driven by a motor and control system which is used to create a motion time-lapse. The slider can be mounted on two stands/tripods and can be positioned level or at an angle placed parallel or perpendicular to the scene. The carriage can also include a pan and tilt mechanism. These systems are of various lengths and can be expensive.

Example not a recommendation at this point:
Cinetics Axis360 Pro Motorized Motion Control System and Slider $900

Exposure controls the sensitivity of the camera sensor to light (it affects image quality, called digital noise).

Aperture controls the amount of light that reaches the camera sensor, (the size of the hole in the lens), the setting on the camera is FStop.

Shutter Speed controls the duration the camera sensor sees the light (think of the shutter as a door).

ISO sets how much light the camera sensor is sensitive to.

The current histogram display is based on a JPG image with an 8 bit depth limited to a dynamic range of 5 stops.
Exposure

**Shutter Speed**
- 1/125 sec can be used to achieve sharper objects but the result time-lapse will appear choppy (staccato)
- 1/30 sec used for cinematic look, blur provides a smooth time-lapse result. Usually *best to closely match to the frame rate*, however sometimes it’s necessary to choose much slower shutter speeds based on exposure.
- Choose the speed to best suit the subject
- When using longer shutter speeds, sunset/sunrise or star/night situations it is important to consider some dark time between intervals, for example if the exposure is 30 sec then dark time should be 30 sec (i.e. Interval of 60 sec) try not to exceed 60% exposure time for the given interval.

**Aperture**
- Try to avoid the aperture mechanism from moving
- Leave the aperture at one setting
- Consider Depth Of Field, smaller apertures shows more sensor dust

**ISO**
- Best to adjust the ISO to control the overall exposure.
- For extreme exposure changes such as during sunrise/sunset you may also need to adjust the shutter speed.
Depth Of Field 17mm F/4

Canon 5DMKII (Full Frame Sensor) 17-40mm F/4 Lens @ 17mm @ F/4

Canon 7D (APS-C Sensor) 17-40mm F/4 Lens @ 17mm @ F/4

App-> Simple DOF ver 3.2 by Dennis van den Berg https://appsto.re/ca/kTe9r.i
**Depth Of Field 24mm F/2.8**

- **Canon 5DMKII** (Full Frame Sensor)
  - 24-70mm F/2.8 Lens
  - @ 24mm
  - @ F/2.8

- **Canon 7D** (APS-C Sensor)
  - 24-70mm F/2.8 Lens
  - @ 24mm
  - @ F/2.8

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**App-> Simple DOF ver 3.2 by Dennis van den Berg**
[https://appsto.re/ca/kTe9r.i](https://appsto.re/ca/kTe9r.i)
**Depth Of Field 50mm F/2.8**

**Canon 5DMKII (Full Frame Sensor)**
24-70mm F/2.8 Lens @ 50mm @ F/2.8

**Canon 7D (APS-C Sensor)**
24-70mm F/2.8 Lens @ 50mm @ F/2.8

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**Hyper Focal Distance**

**Canon 5D (Mark II, III), 6D**

Hyper Focal Distance: 96' 9.92"

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**Canon 7D, 60D, 50D, 40D, 30D, 20D, 10D**

Hyper Focal Distance: 152' 9.47"

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</tbody>
</table>

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App--> Simple DOF ver 3.2 by Dennis van den Berg https://appsto.re/ca/kTe9r.i
**Camera Setup**

**Manual Mode** – set the Aperture (Fstop), Shutter Speed, ISO. Try a few test shots to verify exposure

**Manual Focus** – Once the focus is set turn off “AF” on the lens. Use live view with x5 & x10 function and focus at the hyperfocal distance

**Image Stabilization** – Turn it off (typically on the lens)

**White Balance** – DO NOT USE Auto. Manually set an appropriate white balance and leave it alone. This can be adjusted in post-processing, and more easily if using RAW images.

**Auto power off** – Disable this function

**Image Review** – Disable this function, keeps LCD off saving battery power. Manually display the images and use the histogram during your initial test shots. For extreme exposure situations best to consider tethering and remotely controlling the camera.

**Format Memory Card** – Recommended to format the card before each use, this ensures that the camera can recognize the card and the maximum space is available.
**Camera Setup**

*Set the image Format* – For best results, set to RAW. JPG is compressed format and is limited in dynamic range. In some cases it may be required to set highest quality RAW + small high quality JPG (for handheld device tethering).

*Set ISO, Aperture, Shutter Speed* – Always protect the highlights. Use your histogram.

*Mirror Lockup* – Minimizes camera shake, however each shot is a two step process; 1st shutter press mirror goes up, 2nd shutter press image is captured and mirror goes back down. The result is ½ the shots at twice the interval.

*Helpful* – “highlight alert”, enable “live view” provides x5 & x10 with Live view set to “still image exposure” (turn off after setup), “grid function” 3x3, tie down the camera strap and misc cables.
**Mirror Lockup**

*Initial state*

1. Mirror Lockup
2. 1st shutter press: Mirror up
3. 2nd shutter press: Capture image, Mirror down

**Intervalometer Settings**

*With Mirror Lockup*
- Delay = 2 sec
- Long (exposure) = 1 sec
- Interval = 2 sec
- Count = 300

*Without Mirror Lockup*
- Delay = 2 sec
- Long (exposure) = 1 sec
- Interval = 4 sec
- Count = 150

*With Mirror Lockup* (Result – 300 images, 2 sec interval)

*With Mirror Lockup* (Result – 300 images, 2 sec interval)
Additional Setup Tips

**Tripod**

Tighten the knobs. Keep it low. Tie down camera strap, intervalometer, tethering etc... Use additional weight if necessary. Solid ground, larger legs first, do not extend center column.

**Intervalometer**

Review the settings, tie it down to the tripod.
### Video Resolution

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<th>Details</th>
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</tr>
<tr>
<td><strong>fps</strong></td>
<td>Frames per second (fps) <a href="http://en.wikipedia.org/wiki/Frame_rate">http://en.wikipedia.org/wiki/Frame_rate</a>&lt;br&gt;60fps (59.94 NSTC some broadcasters)&lt;br&gt;30fps (29.97 NSTC broadcaster)&lt;br&gt;24fps (23.976 NSTC or 25 PAL)</td>
</tr>
</tbody>
</table>

**Canon 5DmkII** 5616 x 3744 (21.026 Megapixels) 3:2 aspect ratio<br>**Canon 7D** 5184 x 3456 (17.916 Megapixels) 3:2 aspect ratio
Image Resolution

(Canon 5DmkII) 5616 x 3744
(16:9)
(Canon 7D) 5184 x 3456
(5616 x 3159)
(5184 x 2916)

(4K) 3840 x 2160
(15.176Mpix)

(1080p) 1920 x 1080
(17.741Mpix)

(720p) 1280 x 720
(2.074Mpix)

0.922Mpix

21.026Mpix
(2.074Mpix)
### Basic Post Processing Example

<table>
<thead>
<tr>
<th>Lightroom or DPP</th>
<th>Quick Time Pro 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lightroom</strong></td>
<td></td>
</tr>
<tr>
<td>Import images</td>
<td></td>
</tr>
<tr>
<td>Make adjustments to one of the images</td>
<td></td>
</tr>
<tr>
<td>Crop image to 16:9 ratio</td>
<td></td>
</tr>
<tr>
<td>“Sync” adjustments to all images</td>
<td></td>
</tr>
<tr>
<td>Export as JPG at 1920x1080 at 72dpi</td>
<td></td>
</tr>
<tr>
<td><strong>QuickTime Pro 7</strong></td>
<td></td>
</tr>
<tr>
<td>Open folder and select 1st image</td>
<td></td>
</tr>
<tr>
<td>Select frame rate 24fps</td>
<td></td>
</tr>
<tr>
<td>Pick a codec H.264 (mp4) (Export)</td>
<td></td>
</tr>
<tr>
<td>Export images to Video</td>
<td></td>
</tr>
</tbody>
</table>

**Adding audio requires Video Software such as Windows Live Movie Maker, show quick example**

### Similar process, however you move between Lightroom and LRTimelapse plugin in steps to complete the process.

**Adding audio also requires Video Software.**

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*Basics of Time-lapse Photography YouTube Videos by Vincent Laforet Part 4*

https://www.youtube.com/watch?v=F8r10zoSQQO

*You can view Tutorials at the following link:*

http://lrtimelapse.com/tutorial/*
References

A Introduction to Still Photographs in Motion Time-lapse eBook by Dave Delnea
http://craftandvision.com/collections/all/products/timelapse

Time-lapse Photography eBook by Ryan Chylinski
http://www.learntimelapse.com/time-lapse-ebook/

Time-lapse Shooting and Processing eBook by Gunther Wegner
http://lrtimelapse.com/shop/ebook/

Basics of Time-lapse Photography YouTube Videos by Vincent Laforet
Part 1: Introduction
https://www.youtube.com/watch?v=DPeEZn0_ezs
Part 2: Setting Up Your Camera
https://www.youtube.com/watch?v=E7VIWhchVBY
Part 3: Creative Choices for Time-lapse
https://www.youtube.com/watch?v=mgp2KfOR6Vw
Part 4: Post Production for Time-lapse
https://www.youtube.com/watch?v=F8r10zoSQBQ

Getting Started with Timelapse Photography YouTube B&H by Richard Harrington
https://www.youtube.com/watch?v=vGFnrOsdobw
LRTimelapse Ver 3 Tutorials by Gunther Wegner
  Basic Tutorial for LRTimelapse 3
  Deflicker Tutorial for LRTimelapse 3
  Day to Night (Holy Grail) Tutorial with LRTimelapse 3’s Holy Grail Wizard
    http://lrtimelapse.com/tutorial/
  Automatic Exposure and ISO-Ramping with LRTimelapse & qDslrDashboard
    http://lrtimelapse.com/gear/dslrdashboard/

qDslrDashboard website
  http://dslrdashboard.info/

qDslrDashboard - flashing and configuring the TP-Link TL-MR3040 Router by Zoltan Hubai
  http://dslrdashboard.info/tp-link-mr3040-openwrt-flash/