



*physically-based unbiased, biased & gpu render engine*



## Thea for Cinema 4D v2.2

[www.thearender.com/cinema4d](http://www.thearender.com/cinema4d)



User Manual  
Rev 2.2. 483

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## 1. INTRODUCTION

Thea For Cinema4D is the integration of Thea Render inside Maxon's Cinema 4D. It allows you to employ all of Thea Render's capabilities maintaining Cinema 4D's workflow.

As a note to the reader, this manual will cover mainly the aspects regarding the connection between Thea Render and Cinema 4D. The features of Thea Render will **not** be explained in detail here.

## 2. APPLICATION & SYSTEM REQUIREMENT

The integration runs in Cinema 4D versions R16, R17, R18, R19, R20 and R21. Older versions are not supported.

### SYSTEM REQUIREMENTS

#### WINDOWS

Vista/7/8/10, SSE2 CPU

Presto GPU: Nvidia CUDA graphics card (Compute Capability 2.0 or higher), OpenCL (Hawaii, Tahiti, Pitcairn, Capeverde, Bonaire)

#### MACOS

10.6 and above, Intel CPU

Presto GPU: Nvidia CUDA graphics card (Compute Capability 2.0 or higher).

### SYSTEM REQUIREMENTS FOR NVIDIA'S OPTIX DENOISER

#### GRAPHICS HARDWARE

All NVIDIA GPUs of Compute Capability 3.0 (Kepler) or higher are supported.

#### GRAPHICS DRIVER

Driver version 396.65 or later is required.

#### OPERATING SYSTEM

Windows 7/8.1/10 64-bit; Mac OS 10.9 or higher

## 3. INSTALLATION

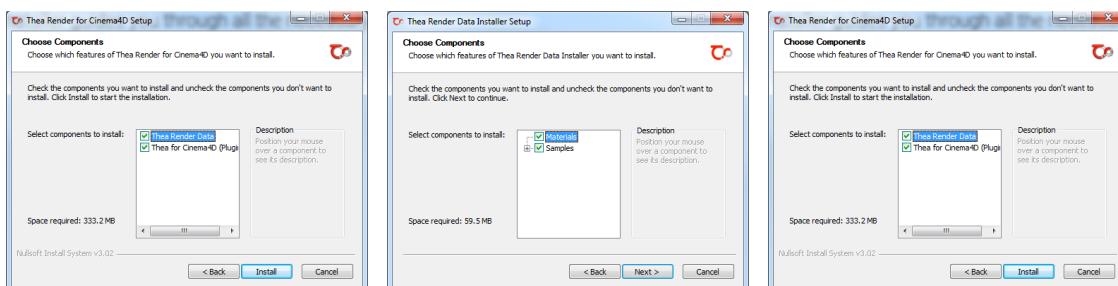
### WINDOWS

After running the installer, you will be asked whether you wish to install the Thea Render Data along with the plugin. Thea Render Data installs all the files and sample data that are needed for the plugin (IES, CRF, Thea Materials, etc).

Run the installer and select whether you wish to install the Thea Render Data along with the plugin.

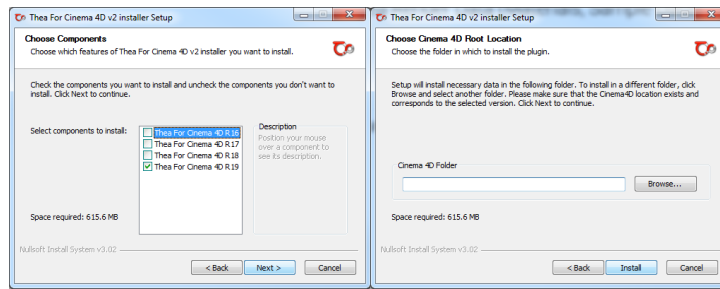
### INSTALLING THEA RENDER DATA

1. Select the components for the Thea Render Data (Materials, Sample Data)
2. Go through the rest of the steps.
3. Click Install and then Close.



### INSTALLING THE PLUGIN

1. Select the Cinema 4D version you wish to install the plugin to.
2. Select the Cinema 4D root folder. (e.g. C:\Program Files\MAXON\Cinema 4D R19\)
3. Click on Install and then Close.

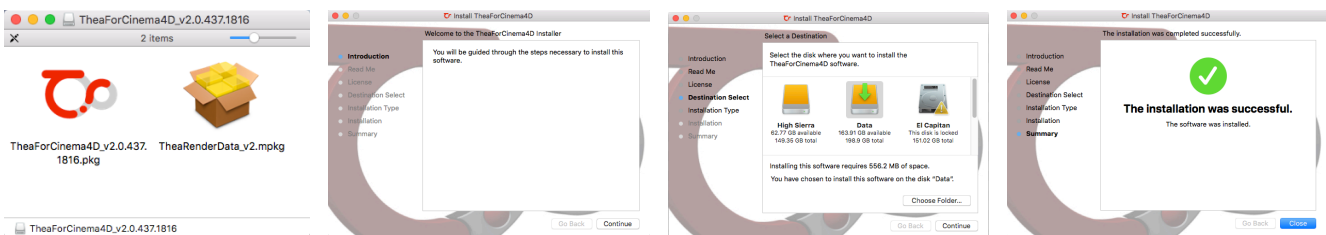


## MACOS

### INSTALLING THE PLUGIN

Run the .dmg file that you downloaded and then the TheaForCinema4D\_v2.0.xxx.xxxx.pkg file.

1. Go through the installer screens.
2. Select Destination: In this step, you need to select the disk containing Cinema 4D.
3. Click Close to complete the installation



**Important note:** Go to <Cinema4D folder>/plugins/Thea Render/ and uncompress the \*.dylib.zip file that matched the Cinema 4D version.

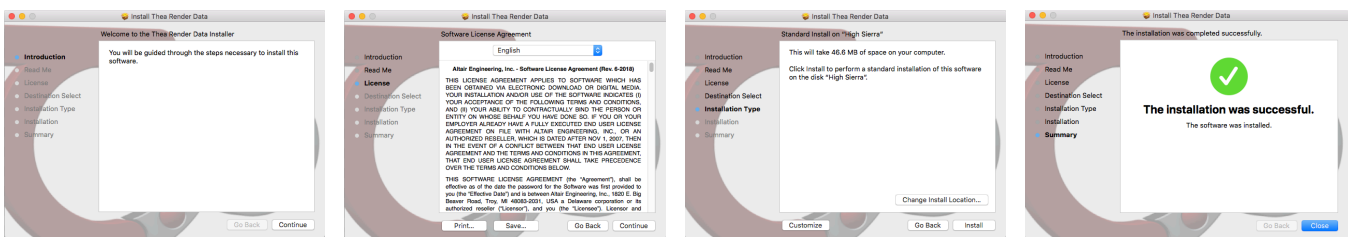
After running the installer, you will be asked whether you wish to install the Thea Render Data along with the plugin. Thea Render Data installs all the files and sample data that are needed for the plugin (IES, CRF, Thea Materials, etc).

Run the installer and select whether you wish to install the Thea Render Data along with the plugin.

### INSTALLING THEA RENDER DATA

Run the TheaRenderData\_v2.mpkg file and follow the steps.

1. Go through the Introduction, Read Me, License, etc.
2. Click on Continue and then Close to complete the installation.



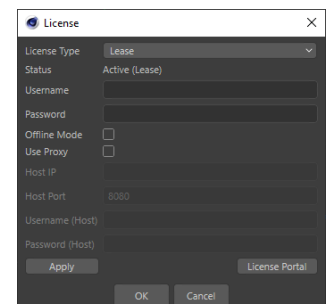
## 4. LICENSING AND ACTIVATION

### Lease License

After installing the plug-in, open the License form window from the main menu: *Thea Render* > *License*...

1. Enter the Username and Password that you used to sign-in to the Thea Portal.
2. Click on the "Activate" button to activate Thea for Cinema 4D.

*Note: The license returns to the server each time you close Cinema 4D and it can be used on any other machine.*



**Offline Mode:** This mode borrows the license from the licensing server to the specific machine. The plug-in will remain activated on the machine without the need of an internet connection. Maximum borrowing time is 14 days.



Note: You need to uncheck this option if you plan to use the license on a different machine though.

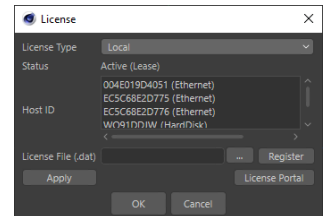
**Use Proxy:** In case your machine is behind a proxy server, you need to enter the IP Address and Port of the Proxy Server. Username and Password should also be filled if needed.

*Important:* All actions within the License window need an internet connection. When Offline mode is not active, the plugin checks periodically the license and if it cannot reach the server for up to 30 minutes, then watermarks will be introduced in the next rendering session.

### Node Locked (Local)

If you have a node-locked license, use this option to activate Thea for Cinema 4D. After installing the plug-in, open the license setup windows from the main menu: *Thea Render > License...*

Click "Register" and complete the form to receive your license file by email. To activate Thea, click on the browse button (...) and browse for your license file. The status is displayed at the top of the license form.

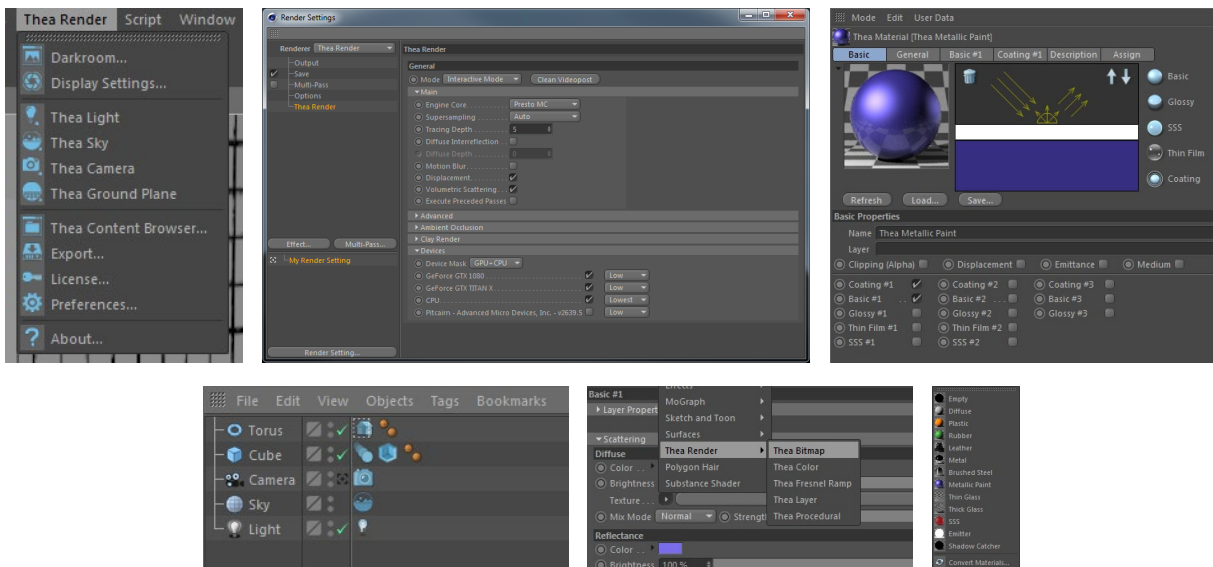


Note: If you don't activate your license, you will remain in Demo mode with certain limitations.

*Demo Version Limitations:* Please note that when the plug-in is not licensed, the rendered image resolution will be limited (1280x720) and watermarks will be added. All other features and functionalities are fully supported.

## 5. GETTING STARTED

Installing Thea For Cinema 4D will give you access to a variety of tools that will allow you to connect your scenes with Thea Render. The integration consists of a Thea Render menu, Thea Tags, Render Settings, Thea Shaders, Thea Materials and Material Preset Menu.



Before start rendering, go to *Render Settings > Thea Render > Devices* and set the priority of your devices to **Lowest** (This is needed only the first time you launch Cinema 4D after installing the plugin).

To render your first scene, add a cube, go to main menu *Thea Render > Darkroom* and click **Render** . Of course, you can create any complex scene, add materials, configure the environment settings and utilize Thea Render's full capabilities to generate high-quality photorealistic images!

Transitioning from Thea Render v1.5 into v2.0 is done automatically by simply loading the scene into the new version. Nevertheless, since some data have been removed or changed, while new ones have been added, some tweaking might be necessary by users.

## 6. RENDER SETTINGS

To access Thea Render Settings, go to *Render Settings > Renderer > Thea Render*. Here you will see all the parameters that allow you to configure the complex algorithms based on which Thea Render operates.

The groups Main, Advanced, Ambient Occlusion and Clay Render refer to general engine settings. In Termination group you can set the termination criteria of your renders based on Time and Sample limit (Time format: 1h 15m 30s). Distribution group allows you to set the Network Rendering settings and last, Devices group allows you to configure you rendering devices. You can choose to enable or disable each device or set their priority. The groups Termination and Distribution are visible only in Production Rendering.

The data in the above groups refer directly to Thea Render and they are explained in detail in Thea Render manual ([Link](#)). Nevertheless, Denoise and Execute Preceded Passes parameters affect directly the plugin.

### GENERAL

#### Mode

Thea For Cinema 4D utilizes both Production and Interactive render modes of Thea Render. You can switch between Interactive and Production mode either in Render Settings or in the Darkroom. Not all parameters are functional in both modes. For example, Termination Criteria or Distribution settings are ignored in Interactive mode.

- *Interactive Rendering (IR)* is used to produce fast rendering results of your scene, while you are still working and making modifications on it. In this mode, the scene is updated directly after any tweak keeping the data between Cinema 4D and Thea Render synchronized. This mode can only be used in the Darkroom.
- *Production Rendering (PR)* is used to finalize your work and produce high quality renders taking into advantage Thea Render's full capabilities. You can generate photorealistic images, while combining with a denoiser it can be achieved in no time. Production Rendering works either in Darkroom or Cinema 4D's Picture Viewer. Once Production is selected in Mode control, you will notice the groups Channels and EXR appear in the top of Render Settings window. The parameters in these groups are functional only in this mode.

#### Engine Core

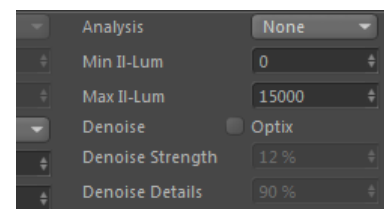
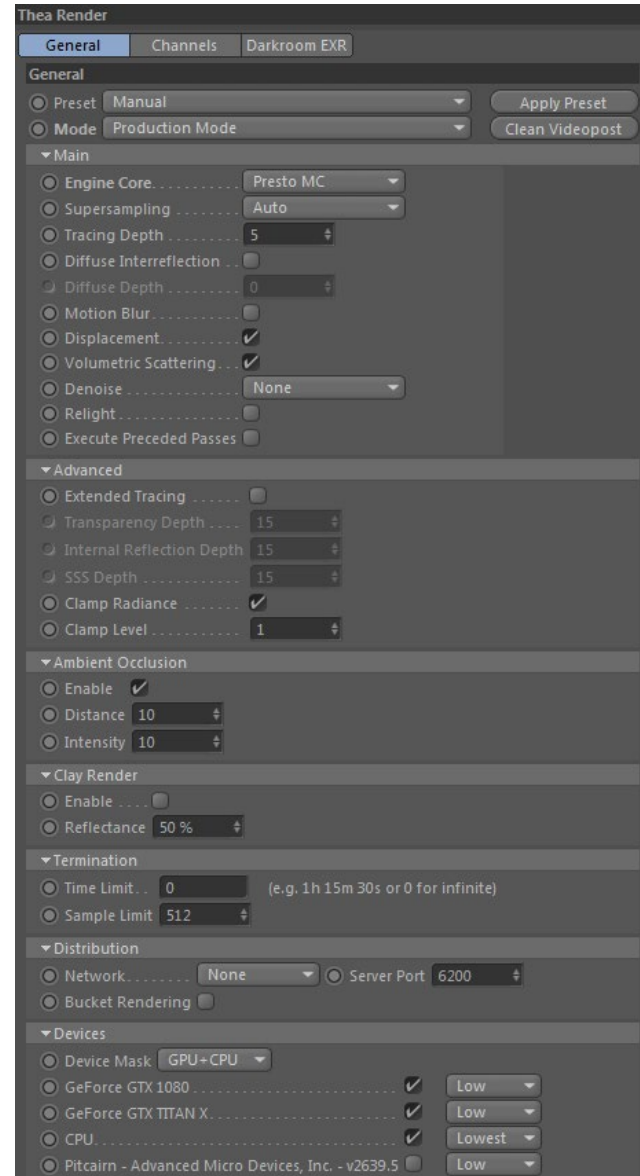
Thea Render offers a large variety of render engines to choose from depending on your needs. Presto MC is set as the default engine in Interactive Render and Unbiased TR1 in Production.

- *Presto MC*: Supported Interactive and Production modes, utilizes both CPU and GPU employing 100% your machine's power.
- *Adaptive (AMC)*: Supported in both Production and Interactive modes. Functional only in CPU.
- *Unbiased (TR1)*: Supported only in Production mode, CPU only. Used for exterior rendering.
- *Unbiased (TR2)*: Supported only in Production mode. User for Interior scenes.
- *Adaptive (BSD)*: Supported only in Production mode. It is a Biased engine that is based on field mapping and final gathering techniques. Once selected in the engine list, you will notice Biased RT and Biased GI groups appear in Render Settings. Since the setup time in this engine can be time-consuming, consider using the presets that have been designed to nullify this drawback.

#### Denoise

Allows you to select the Denoise method that will be used during Production Rendering.

Denoising is a technique that allows the user to produce noise-free images with low sample count. It is produced as a post-process effect after a series of calculations based on certain render channels. Basically, it utilizes the channel information to reduce the noise making highly-demanding scenes easier and faster to render. Thea Render supports two denoise methods:



Non-Local Means (NLM) and Nvidia's Optix. In case a user wants to render with any denoiser, they must enable it in Render Settings before rendering. That's necessary since the engine needs to know prior to rendering if it has to also produce the channels related to the Denoiser. The requiring channels are activated and generated **transparently** in order to calculate the Denoise effect. The user doesn't have to do any further action regarding the channels since it is taken care of automatically by the engine.

After that you can switch it on/off as a post-process effect in Display settings.

### Execute Preceded Passes

Due to dynamics and simulations, hair animation is quite hard to transfer into Thea on a specific frame. This option forces the calculation of all the frames that precede the current one. That way hair will have the form when they are about to be transferred into the engine.

**Important note:** Enabling this option will affect the scene conversion time, so it must be used only when hair animation is necessary.

### CHANNELS

Here you can select which channels you want to produce along with RGB for any post-processing effect.

**Channel Custom Depth:** Select the bit depth for each channel (8 and 32 bit)

### EXR

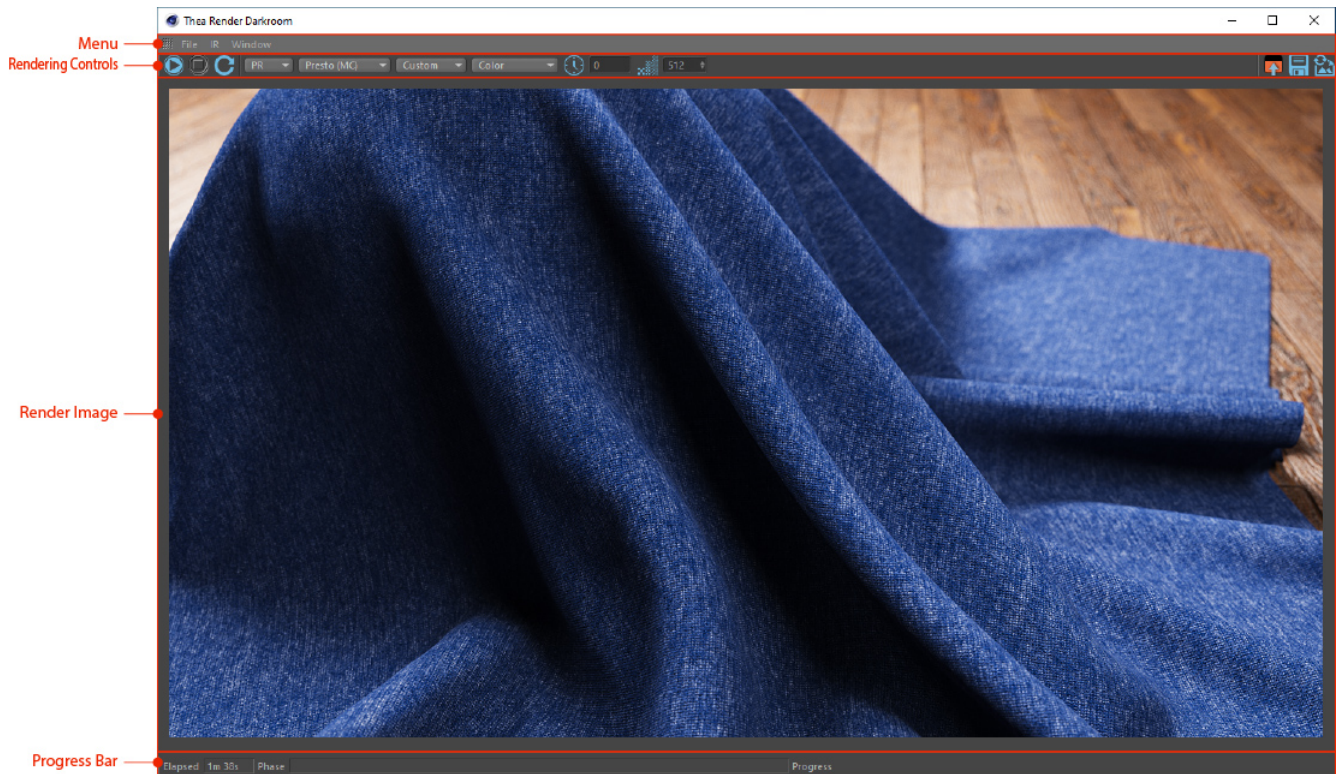
These parameters refer to EXR options in Thea Render. They are stored into the engine and they are taken into consideration only when the image is saved into EXR.

To render in 32-bit images in Picture Viewer, first you must select *Channels > Channel Custom Depth > 32 Bits*. That way you directly command Thea to produce 32-bit renders. Then, go to **Save** page in Render Settings and select a format that can store images in 32 bits (such as OpenEXR). For more information on EXR options, please refer to Thea Render Manual ([link](#))

## 7. THEA DARKROOM

Darkroom is Thea Render's IPR window, which provides a fast preview in Interactive and Production rendering. It can be used to configure the Display Settings as well as the Denoiser options (in case of production rendering).

Thea Darkroom window consists of the menu bar, rendering controls, Render Image, progress bar and display settings.



### DARKROOM MENU BAR

#### FILE

- Save: Saves Darkroom Image in selected format.
- Send to Picture Viewer: Launches the Picture Viewer and copies the image to it.

#### IR

- Block size: Once Interactive Render starts, the initial image consists of small square blocks. By increasing their pixels, these blocks are now bigger and working with IR while editing your scene is faster, but may offer a lower viewing quality
- Enable SuperSampling: The IR image is produced with Super Sampling.
- Enable Termination Criteria: Enables Termination Criteria in Interactive Rendering. The same values as in *Render Settings > Thea Render > General > Termination* are used.

#### WINDOW

Here you can choose whether you want to hide the different areas of Darkroom.



## Render Controls



### START/STOP

- Starts rendering
- Stops Rendering

### RETRANSFER

Causes the scene to be retransferred to the engine. That means the next time you render, the whole scene will be reconverted from scratch.

### RENDER MODE

Allows you to switch between Interactive and Production modes.

### RENDER ENGINE

**IMAGE RESOLUTION:** Sets the default camera's resolution based on the selected option.

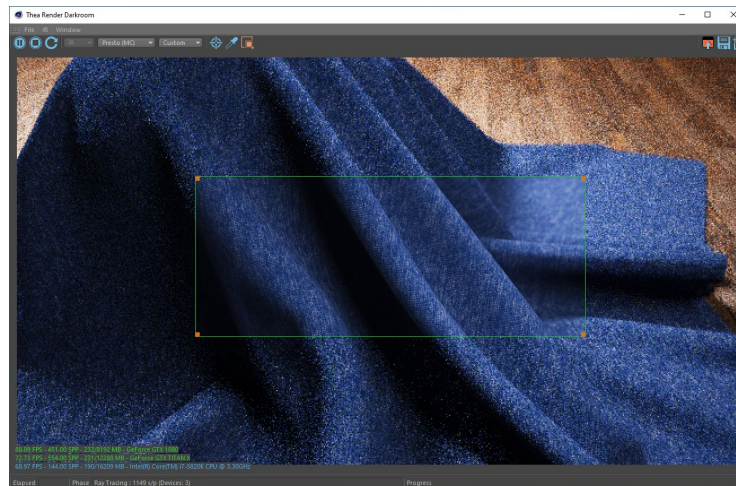
- *Fit to darkroom:* The camera resolution will be equal with the size of the Darkroom image.
- *Custom:* The width and height that is set in Render Settings > Thea Render > Output will be used as camera resolution/
- *Any other constant values:* Sets the limitation to the resolution of the camera to the selected width and height (e.g. 1920x1080)

### INTERACTIVE RENDER CONTROLS

These controls are visible and functional only in Interactive Mode.



- *Pick focus:* Sets the Camera's focus distance based on the clicked position in the Darkroom Image.
- *Pick material:* Sets as active the picked material.
- *Render Region:* Allows to create and modify the Interactive Render Region in the Darkroom Image. To create a render region, hold left click and drag & drop anywhere in the Darkroom Image. To modify the region, drag the handlers in the corners of the region. If you double-click anywhere in the Darkroom Image, the render region will be disabled. The minimum Render Region is 32x32 pixels.



### PRODUCTION CONTROLS



These controls are visible and functional only in Production Mode. They are synchronized with the corresponding parameters in Thea Render Settings.

- *Time limit:* Sets the time limit. Format example: 1h 15m 30s. Use 0 for infinite.
- *Sample limit:* Sets the sample limit.

### Send to PV

Launches Picture Viewer and sets its image from the Darkroom.

## Save Image

Saves Darkroom Image.

## REFRESH IMAGE

Retrieves the last generated image from the engine.

## DARKROOM IMAGE

This is the area that hosts the image produced by the engine during rendering. In Interactive mode, the image is refreshed automatically every 100ms, while in Production mode it is refreshed once every second.

## CAMERA CONTROLS

In this area you can also apply camera manipulation commands as happens in Cinema 4D's viewport.

- *Pan*: Hold Alt + Mouse wheel and drag the mouse.
- *Rotation*: Hold Alt + Left click and drag the mouse.
- *Zoom*: Hold Alt + Right click and drag the mouse. Alternatively, you can hold Alt and use the wheel up and down to zoom in and out.

## PROGRESS BAR

These controls are updated by the engine on rendering.



## Time elapsed

This field shows the passed time in seconds.

## Phase

Shows the rendering state.

## PROGRESS

Shows the progress per render pass.

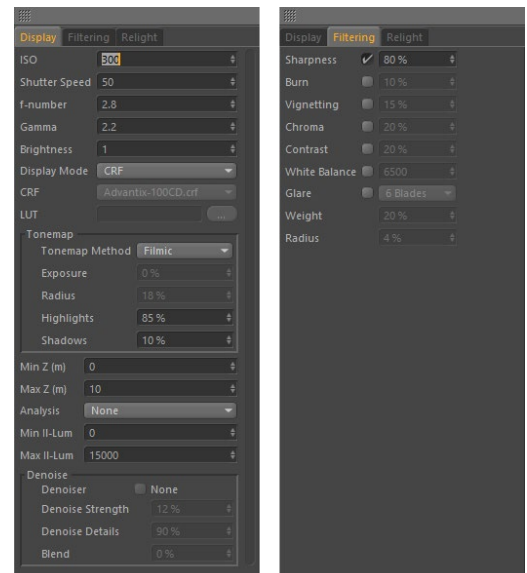
## DISPLAY SETTINGS

These settings are used to configure Thea's active camera display settings. On modification, they are automatically transferred into the engine, refreshing the Darkroom Image accordingly.

## TONEMAPPING

There are three Tonemap methods that can be applied to the image: Standard, Reinhard Global/Local and Filmic.

- *Standard*: No Tonemapping is applied.
- *Reinhard Global/Local*: Reinhard Global performs great for low contrast images while Reinhard Local, on the other hand, produces images of higher contrast. Both methods respect the chromaticity of the image (color hue & saturation) while adjusting the brightness of each pixel.
- *Filmic*: It provides better control over the Highlights and Shadows of the image while giving a photographic look. With this Tonemap method, it is possible to increase the overall exposure of the scene without losing details or overburning the highlights.



## DENOISE

These options refer to denoising and as we have described above they are functional only in production mode. The **Enabled** parameters are used to switch the denoising effect on and off. **Denoise Strength** and **Denoise Details** affect only Non-Local Means.

## 8. THEA MATERIAL

The material system is the most important and complicated concept in a render engine. Since materials define how light interacts with objects, sometimes they can be highly knowledge-demanding in order to simulate correctly all effects that take place. Thea Materials have been designed in a way making them capable of describing every aspect of this interaction. They are

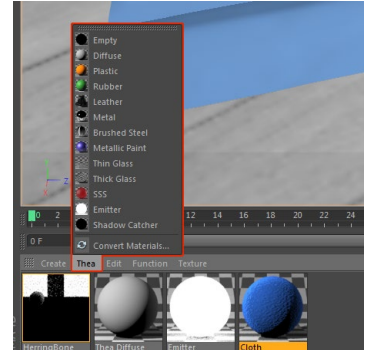
well integrated inside Cinema 4D and they allow users to design the desired behavior with flexibility producing correct photorealistic results. In this section we will describe the workflow to design Thea materials inside Cinema 4D.

## CREATE A NEW THEA MATERIAL

Thea Material can be created either using presets or Thea Content Browser.

### PRESET MENU

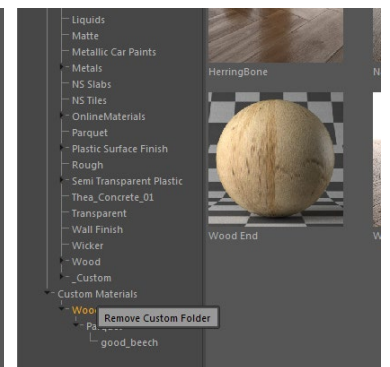
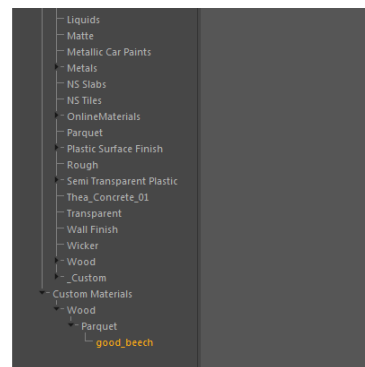
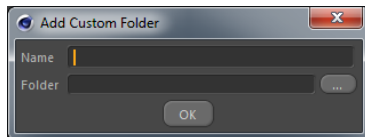
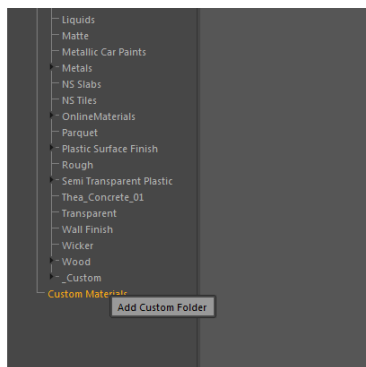
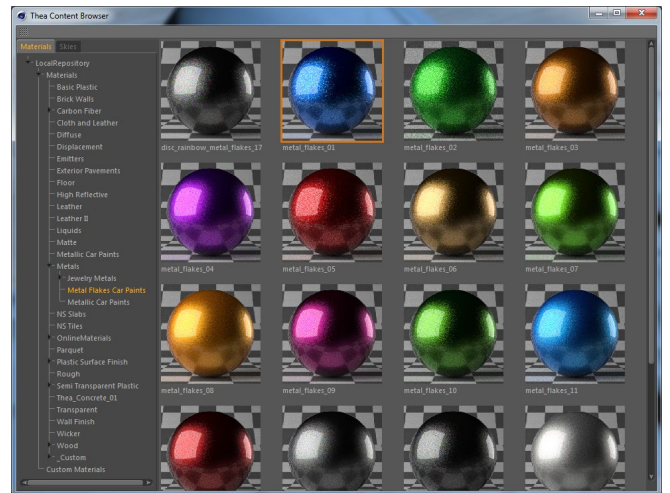
To create a preset material, go to Material Manager (by default in bottom left of your Cinema 4D) and select any material in Thea menu. This list contains the most common materials and they can be used as basis for any material you require. You also have the option to select the "Empty" preset, which will allow you to create a material from scratch.



### CONTENT BROWSER

The other option you have to create a Thea Material is by using the Content Browser.

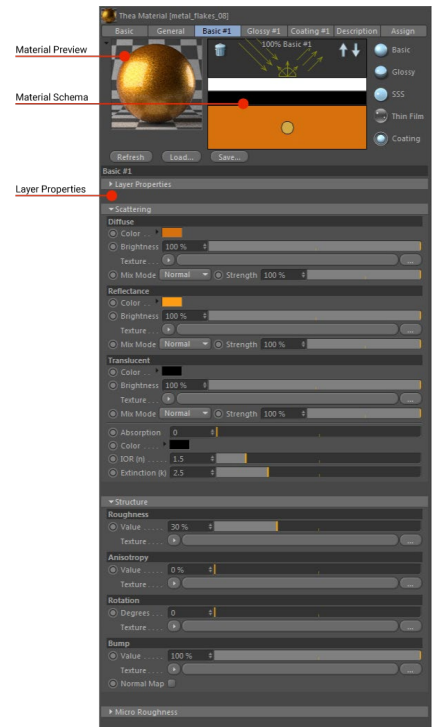
Content Browser points directly into the Material folder of Thea Render Data directory. In any case, if you have your own libraries, you can just right-click the Custom Materials group and add any folder with Thea Materials in your disk. The folder will be added in content browser and the hierarchy tree will be extended. You can also remove a custom folder by right-clicking it and selecting "Remove Custom Folder"



## EDITING THEA MATERIALS

Thea Materials have the same workflow as Cinema 4D Materials. You are able to add or remove Layers and modify their parameters in their corresponding tab.

First of all, in the material interface, you can see the Preview, the Material Schema, utility buttons and the properties from the selected tab. Another way to edit your material is via Material Editor. You can launch it by double-clicking the material.



### BASIC TAB

In Basic tab, you can activate the layers and components, which will give physical properties to the material. Activating a layer or component, its corresponding tab will appear that contains the layer/component parameters.

### GENERAL TAB

Here, you can find the global material settings. The following properties appear only if you use Adaptive BSD: Perceptual Level, Tracing Depth, Min Blurred Subdivs and Max Blurred Subdivs.

**Animated Textures** parameters allows you to enable the animation in your bitmaps. After enabling this parameter, go to any Bitmap Shader in this material and add an image with a number in its name (e.g. effect\_0000.jpg). Of course, the rest of the frames have to be in the same folder (effect\_0001.jpg, effect\_0002.jpg, effect\_0003.jpg etc.). Click the shader for more options and in "Animation" tab click "calculate". Animated textures are refreshed in every frame in the Darkroom's IR and in Picture viewer but not in the viewport (unless you refresh the material manually). The mode "Ping-Pong" is not supported yet.

## LAYERS

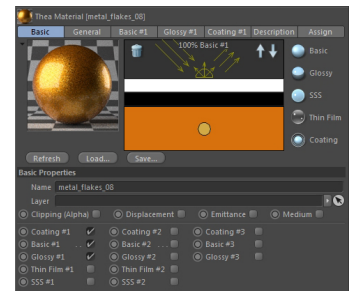
**Basic:** It is the most common Layer since it contains Diffuse, Reflectance and Translucency properties.

**Glossy:** It is used for its reflection and refraction properties.

**SSS:** SSS is based on Bidirectional Subsurface Scattering Distribution Function model that is used to describe the light interaction through the media.

**Thin Film:** This glass model is used for its reflection and transparency properties.

**Coating:** This layer is applied on top of the other layers to add Specular properties on the object.



## COMPONENTS

**Clipping (Alpha):** Clipping is used to cut the material based on a given texture.

**Displace:** This component causes the geometric position points to be displaced based on a texture or a height map.

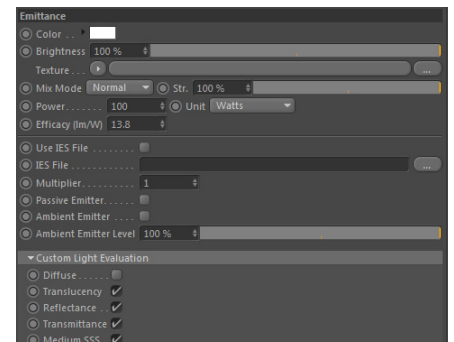
**Emitter:** It is used to create area lights in your scene. Once applied in any object, it will distribute light based on the surface. In Thea Render v2.0, point lights and area lights support Custom Light Evaluation for Diffuse, Translucent, Reflectance, Transmittance and Medium SSS surfaces. That means you can control the emitter's contribution on objects based on the selected layers.

## EXAMPLE

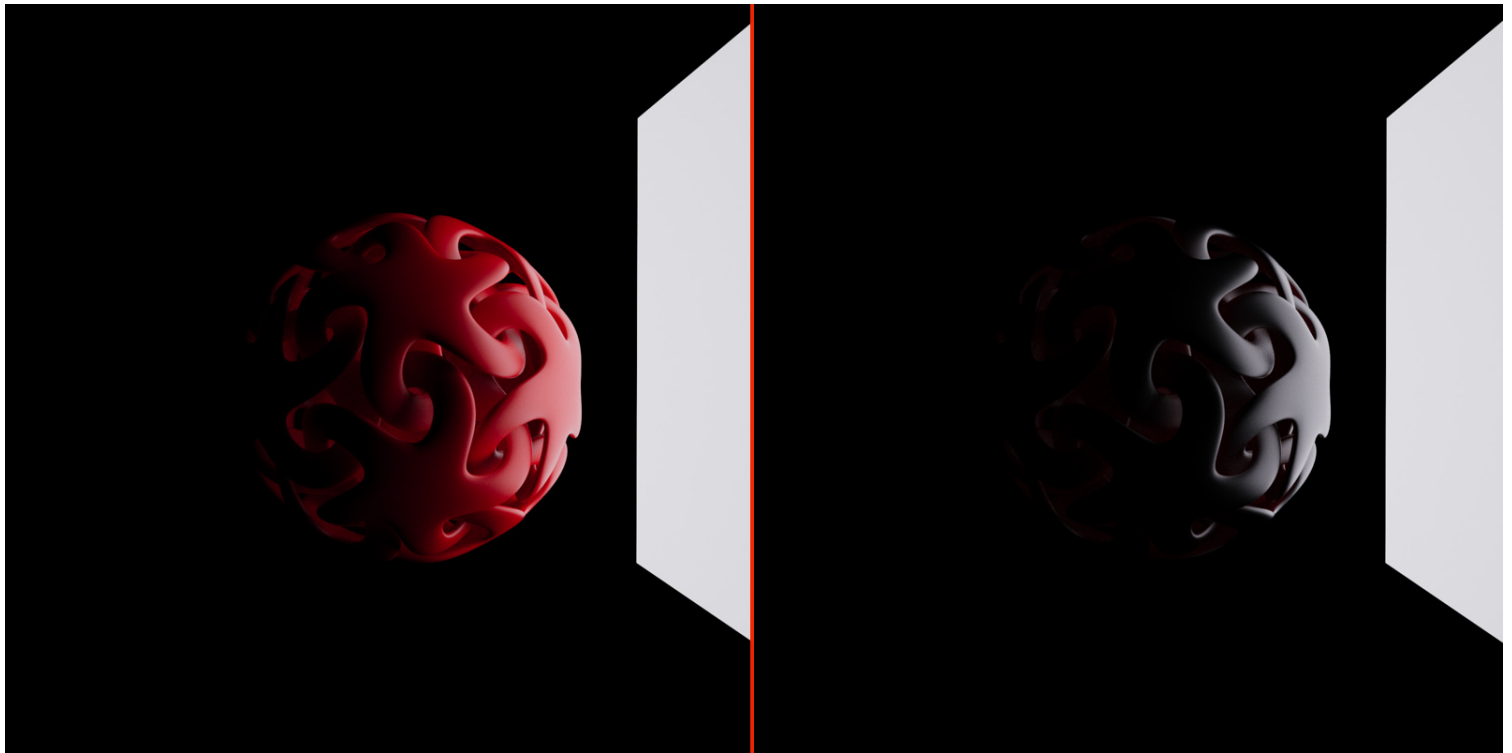
Create an object with emitter material and in Custom Light Evaluation parameters disable Diffuse.

Then create a Thea Material with Basic Layer activated. Set its Diffuse color parameter to red and apply the material to any object.

You'll notice that since the emitter has its Diffuse evaluation disabled, the object is not affected by it.







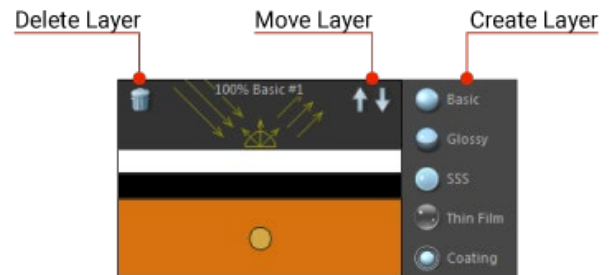
**Medium:** This component is used by Thea Render's workflow to apply volumetric scattering on entities.

## STACKING LAYERS

You will notice that as you add more layers in your material, the Material Schema will be updated as well. In material schema you can either add new layers or manage the existing ones regarding their stacking status. As we have said above, you can add new layers by switching to Basic tab and enable the ones you want. Alternatively, you can add new layers by clicking the 5-layer buttons on the right of the Material Schema.

The buttons on the top of Material Schema are used to either stack up or down a layer or to delete it.

Simply, click the layer you want to modify and any of the 3 buttons.



## BUTTONS

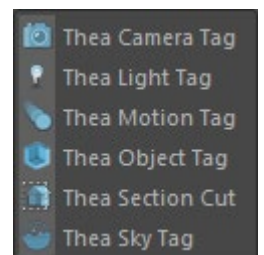
**Refresh:** Recalculates the material's preview.

**Load:** Loads \*.mat.thea files into the selected Thea Material inside Cinema4D.

**Saves:** Saves the selected Thea Material in \*.mat.thea and \*.mat.pack format.

## 9. THEA OBJECTS

Once you click start rendering in the Darkroom or in PV, all Cinema 4D data will be transferred into Thea Render (objects, materials, settings, etc.). Transferring is a pre-render procedure in which Cinema 4D's hierarchy is parsed and objects are converted into Thea Models and Thea Lights. Thea Render's hierarchy supports only two types of objects: Models and Lights, everything else is a derivative of one of these two types. At the same time, all materials that are used in the hierarchy are also converted into Thea Materials. Along with the object and material conversion, Render Settings, Display Settings and Environment Settings will also be transferred into the Thea Render before rendering.



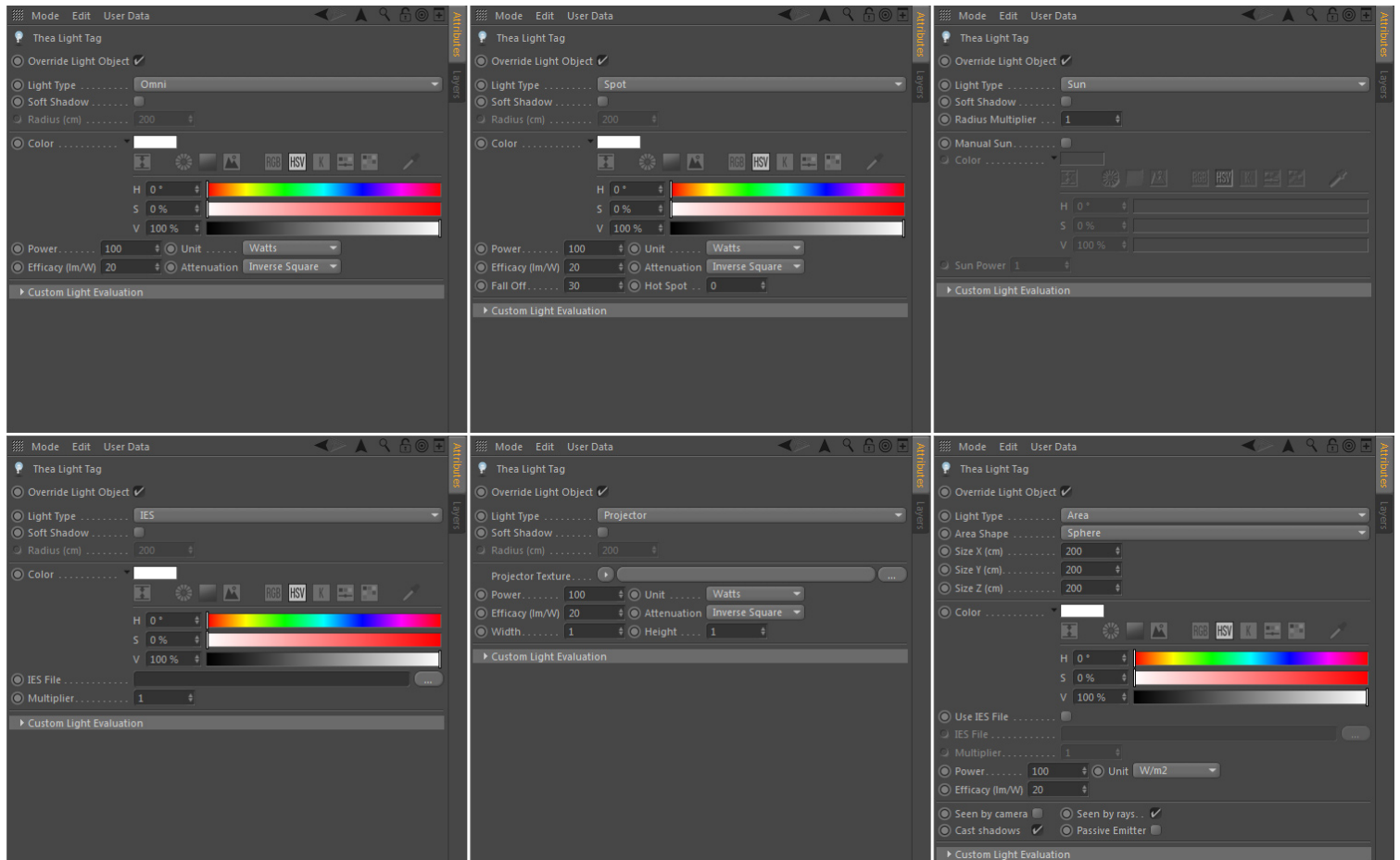
In Cinema 4D, each object can be configured via a set of parameters in Attribute Manager. The same thing happens in Thea Render, but since there is not a visual representation of these attributes inside Cinema 4D, we have created a set of Thea Tags, which allow you to parameterize the Thea Objects during the transferring procedure. Thea Render inside Cinema 4D comes with Thea Light Tag, Thea Sky Tag, Thea Camera Tag, Thea Object Tag, Thea Section Cut Tag and Thea Motion Tag. Some tags correspond to a specific type of objects, while some others can be used to extend the general properties of any object.

To easily add Cinema 4D objects with Thea Tags attached, use Thea Render main menu.

## THEA LIGHT

There are two types of Thea Lights: Point Lights and Area Lights.

The correct way to create a Point Light is by creating a Cinema 4D Light object and apply a Thea Light Tag to it. In Thea Light tag you can see all the light parameters supported by Thea. Once you enable **Override Light Object**, the tag will supersede over the Light Object. That means the object parameters will not be taken into consideration and the tag parameters will be used instead. Also, as long as the **Override Light Object** is enabled, the tag's parameters will be synchronized with the ones in the object and every change to them will also affect the corresponding ones in the light object. That way the viewport shows the correct representation of the tag for parameters such as color and type. The supported types for Thea Lights are Omni, Spot, Sun, IES, Projector and Area.



All these light types create point lights, except for "Area" of course. There two ways to create an Area Light. The first one is via a Light Object and a Thea Light Tag with Area set as type. Then, you can proceed by choosing the area shape and set the light parameters. The other way to do it is via a Cinema 4D polygon (or primitive) with an Emitter material on it (as we have mentioned in the Materials chapter).

Even though it appears to be two different workflows, transparently it is the same. In Thea Render, area lights can be created only with a Thea Model paired with an emitter material. So basically, if you use a Cinema 4D Light Object along with Thea Light Tag to create your Area lights, internally the plugin will generate a Thea Model and a Thea Material with the emitter component enabled. The model will have the exact same size as defined in Light Object.

### Light Type

- Omni
- Spot
- Sun
- IES
- Projector
- Area
  - Sphere
  - Rectangle
  - Disc
  - Cylinder
  - Perpendicular Cylinder

**Soft Shadow:** user can select if the light will create soft shadow to the objects that illuminates or not.

**Radius (cm):** Define the radius of the emitter in centimeters.

**Radius Multiplier:** A user multiplier for radius in order to tweak automatic radius generation for sun.

**Color:** Defines the desired color of the emitter.

**Power:** Define the power of the emitter in relation to the selected units.

**Units:** Select the unit of measurement (lumens, lm/m<sup>2</sup>, cd/m<sup>2</sup>, Watts, W/m<sup>2</sup>, W/sr, W/sr/m<sup>2</sup>, W/nm, W/nm/m<sup>2</sup>, W/nm/sr and W/nm/sr/m<sup>2</sup>)

**Efficacy (lm/W):** Sets the efficacy of the emitter. Maximum efficacy is 683 lm/W which corresponds to lights with no energy loss.

**Attenuation:** The attenuation of the emitter. Available options: None, Inverse, Inverse Square)

**Falloff:** Sets the fall off angle of the emitter in degrees. Fall off defines the maximum angle, after which, lighting is not emitted at all.

**Hotspot:** Sets the hot spot angle of the emitter in degrees. Hot spot represents the angle in which the light beam has a constant power.

**Manual Sun:** When checked, it allows you to set a custom color and intensity for the Sun.

**Sun Power:** Define the intensity of the Sun when **Manual Sun** is active.

**IES File:** Select the IES file that will be used for the light distribution.

**Multiplier:** Specifies the intensity of the IES light.

**Width:** Sets the width of the Projector's light rectangular area.

**Height:** Sets the height of the Projector's light rectangular area.

**Size X (cm):** Sets the size of the area emitter on the X-Axis.

**Size Y (cm):** Sets the size of the area emitter on the Y-Axis.

**Size Z (cm):** Sets the size of the area emitter on the Z-Axis.

**Seen by camera:** Makes the area light invisible to the camera.

**Seen by rays:** Makes the light to be invisible in both reflection and refraction.

**Cast Shadows:** The emitter will not cast shadows into the scene.

**Passive Emitter:** The emitter will not cast light into the scene.

## CUSTOM LIGHT EVALUATION

Except for the emitter components in Thea materials, Custom Light Evaluation is also supported in light objects. The same rules apply here as well. Disabling a property, will cause all affected objects to ignore this specific light.

## UNTAGGED

As we have said above, Thea Light Tag offers a visual representation of all Thea Light parameters that exist in the engine. Nevertheless, there are might be Cinema 4D lights that don't have a Thea Light Tag applied to them, probably in old unmaintained scenes. Cinema 4D untagged Lights will still be converted into Thea Lights, but some heuristic rules have to be applied for the conversion to be correct.

In this case, those Thea Light parameters that exist in C4D Light as well (e.g. color, type) will be transferred as they are, while those Thea Light Parameters that don't exist in the Light Object will be transferred with the default value.

## THEA ENVIRONMENT

In Thea Render, the environment settings are global, and they refer to the illumination that comes from the sky. It also describes how the surrounding environment affects the scene in general. In Cinema 4D you can have multiple Sky objects in your hierarchy, but only the first one will be taken into consideration to be transferred into the engine. The correct way to setup the environment settings in Thea For Cinema 4D is by creating a Sky object and apply a Thea Sky Tag to it. All the necessary configurations in environment can be achieved in the tag.

The environment illumination is described with two types in Thea Render: Sky and Image Based Lighting (IBL). In Sky mode you are able to parameterize the physically-based sky model of Thea Render, while in IBL you are requested an Image that will be used to illuminate the scene (HDR preferably).

Other than the illumination parameters, you can also set the properties of your sun.

## SHOW SUN IN RENDER

It is used to make the sun visible in your image. In Sun Mode you can choose any of Infinite Light Object, Location/Time and Sun Position.

- *Infinite Light Object:* Drag and Drop a Light object in "Sun Object" parameter. Of course, it will be preferable for the *Infinite Light Object* to have a Thea Light Tag applied to it. Only in this case, to make the sun visible in your image, you need to enable both "Show sun in render" and "Shadow" from Thea Light Tag in Light Object. If its type is set to Infinite, it will be considered your scene's sun, otherwise it will be ignored. In this mode, the properties of your Sun light object will be transferred into Thea and they will be the sun properties for your render.
- *Location/Time:* In this mode you can set the position of your sun via the location and data parameters.

- *Sun Position*: Here you can set the sun position based on Polar Angle and Azimuth (degrees). You can also do it easily by clicking the sky image.

The sun in the last two modes (Location/Time and Sun Position) operates with the default properties as defined in Thea Render.

## ENVIRONMENT MAPPING

In Environment Mapping group, you can configure the **Background**, **Reflection** and **Refraction** of your environment based on images. If these parameters are left empty, your IBL image will be used by default (if IBL is set as illumination mode).

## GLOBAL MEDIUM

Last, Global Medium group refers to the medium surrounding our scene. We usually need it to produce foggy effects inside Thea Render.

To fully understand how Thea controls the interaction between Light and Global Medium, please refer to Thea Render Manual (link: [thea manual](#))

## CONTENT BROWSER

Finally, using the Content browser, you can easily create Sky objects with Thea Sky Tag attached. Simply launch the content browser, select the "Skies" tab and double click any HDR image. A sky object will be created in the hierarchy along with a Thea Sky Tag attached to it. The selected Image will be set as IBL automatically.

## THEA CAMERA

Obviously, to be able to produce an image of your scene, you need to have a camera. Unlike Cinema 4D, Thea cameras don't operate in a hierarchy. Even if there isn't any camera object in your Cinema 4D hierarchy, Thea Render will always create one employing the Viewport's camera as default. To properly adapt a Cinema 4D camera object into a Thea Camera, we have created the Thea Camera Tag that allows you to extend its functionality as well as apply Display Settings to it. So, the correct way to setup your camera is to create a camera object and apply a Thea Camera tag to it.

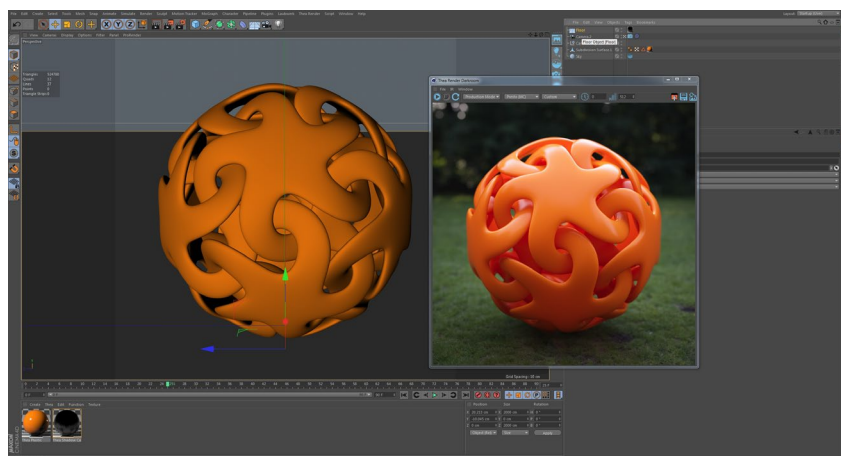
In Thea Camera Tag you can find all the properties related to Thea Camera. Please refer to Thea Render Manual (link) for more details on Camera parameters. If override Darkroom Display is activated, the camera's display settings will be used instead of the Darkroom's ones.

## UNTAGGED

As happens with Thea Lights, Camera objects can be converted even if they are untagged. In this case, the camera's properties that are supported by Thea will be read and transferred in the engine's active camera, while the default values will be used for those parameters that are requested but don't exist in a Cinema 4D camera object. The default viewport camera always operates without a tag.

## GROUND PLANE

Thea allows the creation of an Infinite Plane that can be used as Ground Plane in the scenes. It doesn't have geometric properties and it is employed only as shadow catcher. The correct way to add a Ground plane in Thea Render is by creating a Floor Cinema 4D object and apply a Shadow Catcher material to it. This particular material has been designed to cover most of ground plane cases and of course it can be modified as any other material. It contains a Glossy layer, which is used for reflectance purposes and it has the "Shadow Catcher" parameter enabled in its General tab. Thea Render can have only one Ground Plane, so if there are multiple floor objects in Cinema 4D's hierarchy, only the first one is transferred into the engine.





## SECTION CUT

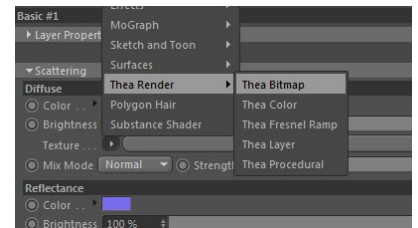
Section Cut is a Thea Render entity that allows the users to cut parts from his scene. It is defined as a plane and it is added transparently into the active camera. To add a Section cut in your scene, create a Plane primitive object and add the Thea Section Cut Tag. The plane's Y axis shows which part of the scene will be invisible from your rendering. Since only the matrix is needed to define a section cut, instead of just a primitive, any object can be used as section cut, but it is preferable to use Planes since it makes it easier to visualize the section cut in the viewport.

Last, Thea supports multiple Section cuts in the same scene and all of them are added in the active camera.



## 10. THEA SHADERS

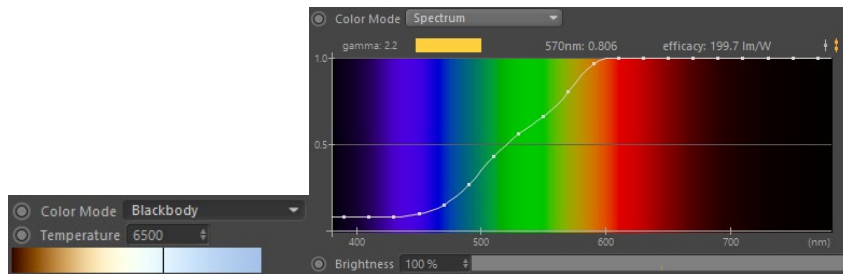
One of the reasons Thea Render can achieve such a photorealistic accuracy is due to the quality of its Textures that are used in Materials and Lights. We have brought these textures inside Cinema 4D by designing a set of Thea shaders, which are translated into native Thea Textures through the standard transferring position. Thea Textures are supported in Cinema 4D via five Thea Shaders: Thea Color, Thea Bitmap, Thea Fresnel Ramp, Thea Layer and Thea Procedural.



### THEA COLOR

Thea Color is the shader that allows you to set a color into your shader parameters. It gives you many capabilities in Materials and Lights by supporting RGB, Spectrum and Blackbody.

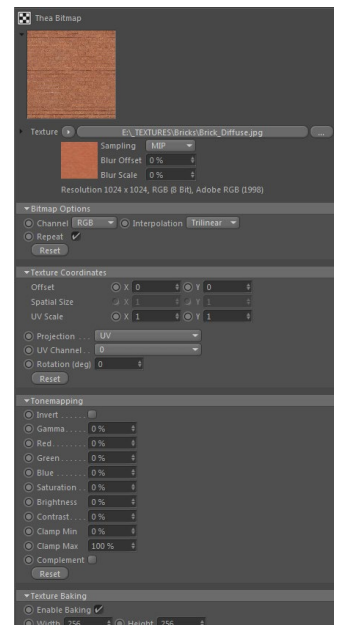
- *RGB*: You create a color based on RGB channels.
- *Blackbody*: You can select a color based on its correlated blackbody temperature.
- *Spectrum*: You are able to change the distribution in spectral space



### THEA BITMAP

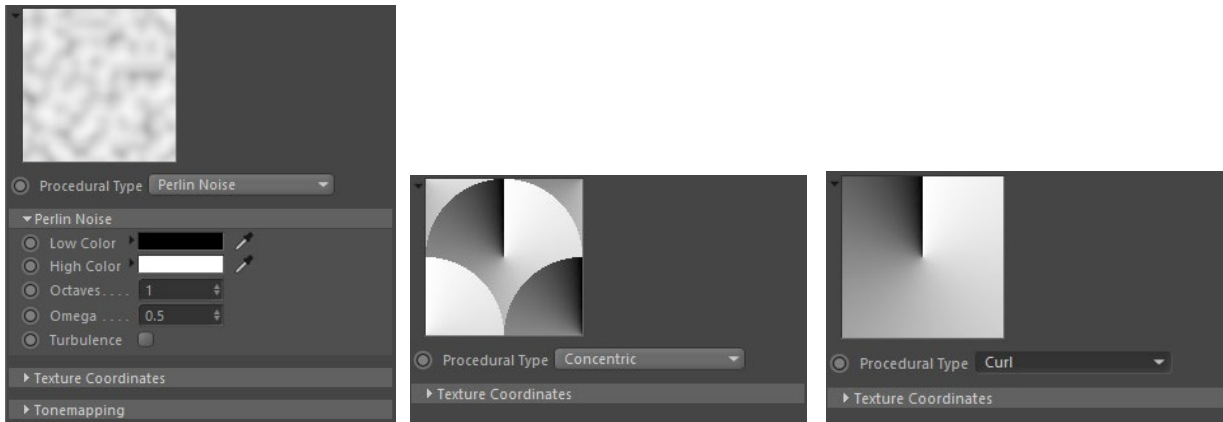
Thea Bitmap is used to apply Bitmap Options, Texture Coordinates and Tonemapping on any image. The parameters in these 3 groups work in the same way as in Thea Render.

Other than manipulating the imported image, Thea Bitmap Shader is also used to configure the Texture Baking parameters. Texture Baking is the procedure where shaders unknown to Thea Render will be baked into images. This behavior is active by default even if you don't use a Thea Bitmap Shader. The only Cinema 4D shaders that are recognized by Thea are Cinema 4D's Color and Bitmap. Any other shader (Noise, Gradient, etc..) that is used in Thea content is baked, unless it is defined otherwise in Thea Bitmap's texture baking parameters.



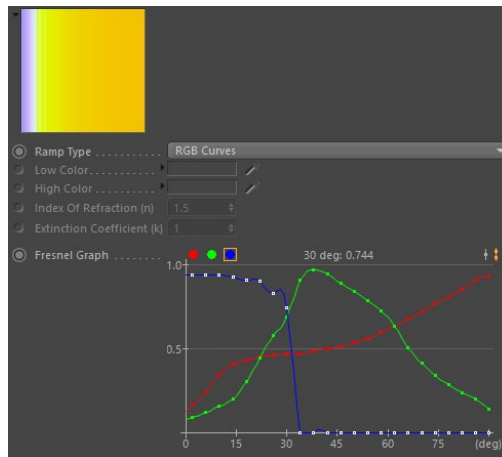
## THEA PROCEDURAL

This shader makes use of Thea's procedural textures. Currently, it supports only Perlin Noise Curl and Concentric, but in the upcoming versions, all of Thea's procedural textures will be integrated inside Cinema 4D.



## THEA FRESNEL RAMP

This shader allows the user to alter an object's reflectance with respect to the viewing angle.



## THEA LAYER

Thea Layer Shader allows you to create any layered structure consisting of Thea Texture and/or Cinema 4D shaders. To handle any layering scenario, Thea Layer shader **transparently** makes use of Thea Combined and Thea Weighted textures. These are not visible to use but they are created automatically via each shader's mode. Multiply mode creates a Combined Texture, while Add creates a Weighted Textures.

### COMBINED

Combined textures are used to multiply any number of shaders

### WEIGHTED

Weighted Textures are used to add them based on a weight value

The mode percentage is used only in weighted mode (it appears disabled if Multiply is selected). Of course, you can use Thea Shaders along with Cinema 4D shaders to create any layering scenario

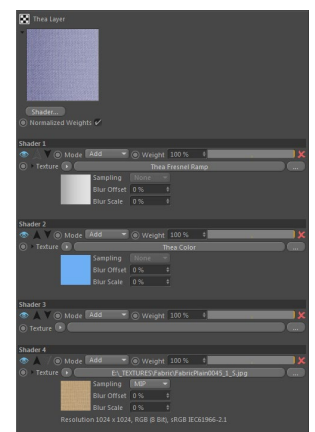
In the following scenario we multiply 3 shaders (shader 1,2,3) in a Combined Texture.

The result has a weight value of 30%.

Then we create a Combined Texture (4,5), which is weighted 50%.

Last, we use a weighted (20%) procedural shader.

$$C1 * 30\% + C2 * 50\% + Procedural * 20\%.$$

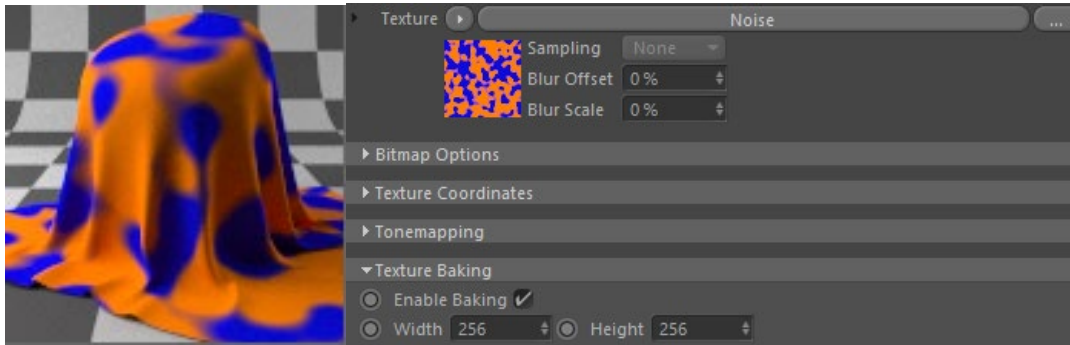


## CINEMA 4D SHADERS

Cinema 4D Shaders can be used instead of Thea Shaders. Nevertheless, only Color and Bitmap shaders are translated into Thea Textures. Color shader is converted into RGB Texture and Bitmap Shader into a Bitmap Texture. Both of these textures are Thea Render's native structures.

All Cinema 4D procedural shaders are converted into Bitmap Texture via baking. That means a bitmap is created based on the shader, which is used in a Bitmap Texture and it will be transferred into the engine.

Cinema 4D shaders can be used in Thea Bitmap Shader as well. In this case, the bitmap options, the texture coordinates and the tone mapping options will be applied on the baked image. In general, the only way to configure the baking procedure is using the Baking Settings in Thea Bitmap Shader, otherwise the default baking settings will be applied (Width and Height 256 pixels).



## 11. ANIMATION

Since Thea Darkroom renders only the current frame, you have to use Picture Viewer in order to render multiple frames in the same scene. Picture viewer always employs Thea Render's production engine set in Render Settings.

Once you start the rendering procedure, the first thing that happens is the transferring of the scene into the engine. For any subsequent frame, the scene will be checked and only the modified objects will be retransferred. Of course, the same procedure applies when the scene is rendered in Interactive mode. If you change the current frame, the rendering will stop, the scene will be checked and all modified objects will be retransferred.

### THEA OBJECT TAG

To change the way the objects operate during transferring procedure works, you have to use Thea Object Tag. For now, it has only two commands, but it will be extended to include more transferring options affecting other aspects of the workflow.

### TRANSFERRING TYPE

This option is used to alter the way an object operates during transferring.

- *On Tweak*: This is the default transferring option in all objects (even those that don't have a Thea Object Tag applied to it). In this option, after the very first scene transferring, the object will be retransferred only if it is modified, otherwise it will be ignored and it will remain in the engine in its current state.
- *On Frame Change*: With this option the object behaves exactly as in On Tweak, but also it is forced to be retransferred every time the timeline frame is changed.
- *Never Retransfer*: Other than the very first transferring, the object will not be retransferred even if it has been modified.

### TRANSFER BUTTON

Forces the object to be retransferred immediately. If Never Retransfer is selected in Transferring Type, the transfer command will be ignored.

### MOTION BLUR

Motion blur is supported on either geometry (primitives, polygons, mograps, particles, render instances) or camera objects. In order to produce this effect in the final rendered image, a motion spline has to be calculated by Thea engine. To do that, Thea For Cinema 4D has to transfer future and past PSR (Position, Scaling, Rotation) matrices for each animated object. To generate these matrices and transfer them in the engine, a motion tag is required to be added on the movable object. This tag is inherited by the hierarchy children (same as material texture tag).

### Enabled

Enables/Disables motion blur for the specific object.

### Motion Accuracy

Since the motion spline consists of keyframes, they have to be retrieved from each animated object and transferred into the engine. This parameter defines the way the keyframes will be retrieved.

- Use Keyframes: During the PSR matrix retrieval, only the object's keyframes will be used.
- Use Timeline Frames: There are objects that even though they are movable, they don't have any keyframes assigned to them (e.g. particle generated objects). Using this option, Cinema4D's timeline will be used to generate the past and future PSR matrices that the engine requires to calculate the motion blur. This is the most generic method to retrieve the matrices since it doesn't require the object to have actual keyframes in the timeline.

### Frame range (+/-)

This option defines the length of the motion spline that will be passed in the engine. For example, if the current frame is 35, the motion blur will be calculated for frames 30 - 40.



### Total timeline frames used

This option defines the number of frames that will be used to create the motion spline. The higher the value, the more accurate is the motion blur. Always, the minimum frame, the maximum and the current one will be added in the motion spline regardless the value of this parameter.

### EXAMPLES



*Use Keyframes:* Consider an animated object that has keyframes in positions 3, 9, 14, 20. So, in the end [b]only[b] 4 matrices will be transferred in the engine for this particular object, retrieved by these 4 frames. This will be fast, but not very accurate for complex animations.

*Use Timeline Frames:* Let's say the current frame is at 15, the frame range is +/- 10. The motion spline will have a length of 21 frames (5 to 25). With 50% as "Total timeline frames used", only the half of these 21 frames will be used to produce the matrices that will be transferred in the engine. So, the matrices in frames 5,7,9,11,13,15,17,19,21,23,25 will create a motion spline.



## Important notes

1. Motion blur is depended on Camera's shutter speed. So, to affect freely the blurry trail of the animated objects, a Camera object with a Thea Camera Tag is required. At this point, the tag's shutter speed can be used to make motion blur more tense.
2. The option Use Timeline Frames can be used, even if the object is animated based on keyframes. That way you can increase the frame number in motion splines, resulting in a more accurate motion blur effect.
3. What matters in the motion blur calculation, is the position of the object in each future/past frame, regardless the method that causes the animation (keyframes or emitters).

## Limitations

1. Motion Blur on deformable meshes is not currently supported. It will be added on a later TheaForCinema4D version.
2. Xpression and Constraint tags might cause issues in object's position during the calculation of motion blur. As a workaround, use "Dynamics" or "Generators" in tag's priority.
3. If the animation comes from particle emitters, they have to be baked.

## 12. NETWORK RENDERING

In Thea Render's production mode, users are able to utilize many machines to contribute to the rendering, either in a single frame or in a multi-framed animation.

Thea For Cinema 4D employs two methods that can be used for Network Rendering purposes: **Thea Network Client** and **Team Render**.

### THEA NETWORK CLIENT

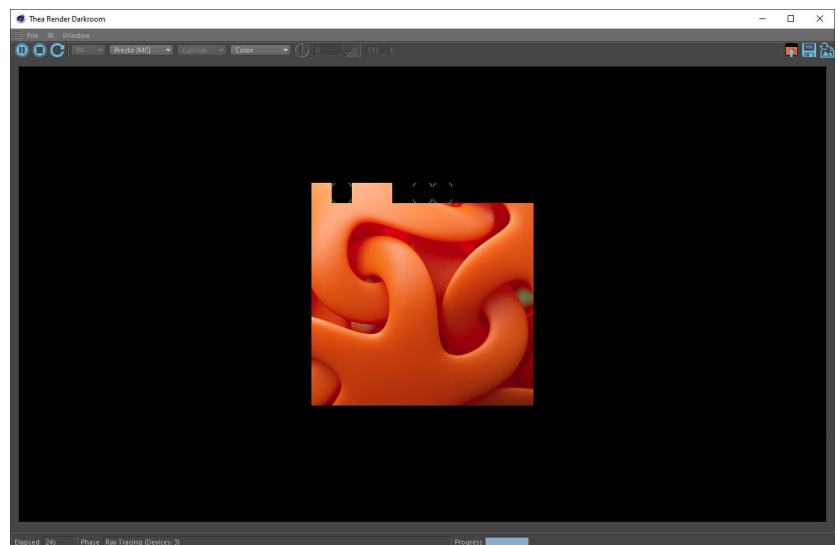
First of all, you need to install Thea Node in the node machines. To enable network rendering via Thea Network Client, go to *Render Settings > Thea Render > Distribution* and switch **Network** option from *None* to *Server* or *Pure Server*. The *Server* machine will contribute to rendering, while in *Pure Server* it will not. In the latter case, the machine is just used to setup the procedure. Each machine in your network with a running Thea Node application will be requested to contribute to the rendering. The scene will be sent to it and once its task finishes, it will send the results back to the server.

### TEAM RENDER

In this method, Thea Render operates with Team Render instead of the Thea Node. As happens with Cinema 4D rendering, launch Team Render client in any machine in your network and add the machine in your sever with *Render > Team Render Machines*. Start Picture Viewer render and the client machines will contribute to your rendering normally. This method is functional only in Picture Viewer. Darkroom cannot employ Team Render. In distribution group, only Bucket Rendering is functional with the method. The rest options are ignored.

### Bucket Rendering

This option appears only in Presto MC and allows the engine to render the image bucket-by-bucket. A bucket is basically a very small part of the image and each image consists of multiple buckets. If used in Network Rendering, all render nodes will contribute to the same frame by rendering a different bucket. Once all buckets are completed, the engine will fetch the next frame and the buckets will start being distributed to the render nodes. In a multi-framed animation, if bucket rendering is disabled, each node will render a different frame.



## 13. PREFERENCES

These options are stored in Cinema 4D's preference files and they are synchronized in all scenes.

### Default Production Engine/Default Interactive Engine

Allows you to setup the default engine in each mode. Keep in mind that Unbiased (TR1/TR2) and Adaptive BSD engines are not available in Interactive Mode.

### Default Material Room

Specifies the default material preview room that will be used in every newly Thea material.

### Auto Refresh Material

Allows the material to refresh its preview every time a parameter is changed. The **Refresh** operation might take some time to generate, depending of course on the material's complexity.

### Default Export Extension

Sets the default extension in *Thea Render > Export command*.



## 14. SUPPORTED CINEMA 4D FEATURES

In order to render a Cinema 4D scene using a Thea engine, the Cinema 4D objects have to be converted into Thea objects.

### GEOMETRY CONVERSION

All of Cinema 4D's geometries should be converted out of the box. Polygon objects, primitives, generators, instances and render instances are translated into Thea objects (models and proxies). There are some objects though such as hair that their generated geometry is depending on the current frame. In this case, please enable the "Execute Preceded Passes" in Thea's Render Settings.

### CAMERA CONVERSION

A Cinema 4D camera object is converted into Thea Camera. The parameters that are currently supported are projection, focal length, film offset, focus distance, near/far clipping, sensor size and zoom (in case of parallel projection). Regarding the projections, only Perspective and Parallel are available from Cinema4D to Thea. To extend Cinema 4D camera with Thea features (such as extra projection options), one has to apply a Thea Camera tag to it.

### MATERIAL CONVERSION

Cinema4D materials are converted automatically into Thea materials before transferred to Thea's rendering engine. Due to differences in the material system, the conversion is taking place using heuristic rules. That means there are some features/parameters in C4D materials that are not supported in Thea ones and vice versa.

The following channels are supported: Color, Diffusion, Specular, Reflection, Transparency, Bump, Alpha, Luminance, Fog and Displacement.

- **Color or Diffusion:** A Basic BSDF will be created with the diffuse parameter enabled.
- **Color:** If Oren-Nayar is used as illumination model, its value will be copied in Basic's sigma parameter.
- **Color + Diffusion:** if they are both enabled, a combined Thea XML texture will be created and used in Basic Diffuse parameter.
- **Specular:** Each reflection layer (max 3) is converted into a Basic BSDF with reflectance enabled. Thea's IOR, Roughness and K parameters are calculated based on C4D reflectance's width, falloff, inner width and specular strength parameters.
- **Reflection (prior to R16):** It's converted into Coating with IOR 3.5. Blurriness is copied to roughness.
- **Transparency:** A Glossy BSDF with transmittance will be created. Absorption value, absorption color and Index Of Refraction (IOR) are copied to the corresponding parameters. Blurriness is copied to Glossy's roughness
- **Luminance:** A Thea material with emittance component will be created. Thea emittance will have Power 100 watts and Efficacy 20 (lm/w). If generate GI is disabled in C4D's luminance's channel, Thea's emittance passive emitter parameter will be enabled.
- **Alpha:** A Thea material with clipping (Alpha) component will be created. Soft and Invert parameters are preserved.
- **Fog:** A Thea material with Medium will be created. Fog's distance will be translated into Absorption Density. Also, Isotropic will be used as phase function.

- **Bump/Normal:** If any of Bump or Normal channel is enabled, the bump (or normal) channel is copied to each bsdf's bump parameter. If Bump channel is enabled, the Normal channel will not be taken into consideration. If normal is enabled and bump isn't, the "Normal Map" of each BSDF will be enabled.
- **Displacement:** Cinema4D's displacement parameters will be copied to Thea Material's Displacement component. Height, Texture and Subdivision Level will be copied to the corresponding parameters in Thea's Material.

In any case, the color and the texture parameters are preserved unmodified (only for the channels described above). Brightness range value is [0,100], since it is multiplied with the color.

The shaders that are supported in Thea materials are Color, Bitmap, Color Mograph and any procedural that operates in UV coordinates. To handle the procedurals, a Thea material applies Texture Baking on them. This procedure generates a bitmap based on the shader, which can be used later in Thea's render engine as bitmap texture. Texture Baking can be parameterized either from the "Bake" tab in Render Settings or via a Thea Bake Tag.

## LIGHT CONVERSION

Cinema 4D light objects are converted into Thea light objects. The supported parameters are color, brightness, light type, shadow type, falloff, photometric units, photometric intensity and photometric data (IES). To convert a light into sun without using a Thea Sun Tag, select an infinite, distant, parallel or square parallel light type. In order to make the sun visible, select "Shadow Maps (Soft)" as shadow type.

## INTERACTIVE RENDERING

Cinema 4D's own interactive render region is supported. Nevertheless, it invokes production rendering from Thea Render's side. To employ Interactive Rendering (IR) in Thea Render, you have to use the Darkroom. While IR runs, any object change is converted solely and transferred anew into the engine.

While this works for most of tweaks (Materials, Render Settings, Display Settings, etc.), hierarchy changes cause full retransfer of the scene.

## TEAM RENDER

Team Render is supported by the integrated plugin but only for animations where each client processed a full frame. Co-operative rendering on the same frame using Team Render is not supported; currently, you can only use Thea Render's network rendering for co-operative rendering on still images. If you are about to render via Team Render, use relative paths in resources (textures, hdr), otherwise if the absolute path is not valid in the client, the resources won't be found.