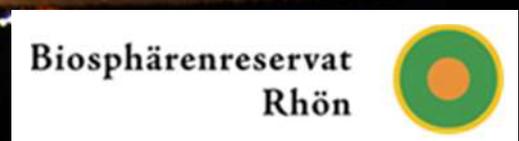


**International Dark Sky Reserve**  
**Rhön UNESCO Biosphere Reserve**

**ANNUAL REPORT 2018/19**

**Sternenpark im**  
**UNESCO Biosphärenreservat Rhön**



*International Dark Sky Association*  
*Dark Sky Reserve*

Presented to



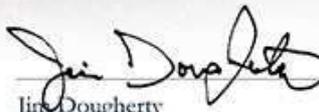
*Sternenpark*  
*Rhön*  
*Silver Tier*

Biosphärenreservat  
Rhön



*Certified by the International Dark Sky Association in 2014*

  
W. Scott Kardel  
Acting Executive Director

  
Jim Dougherty  
President, IDA Board of Directors

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## General

The Rhön UNESCO Biosphere Reserve was designated as an IDA Dark Sky Reserve on August, 7<sup>th</sup> 2014 on the basis of the IDA DARK-SKY PARK PROGRAMM (Version 1.31).

The reserve spreads over the three federal states Bavaria, Hesse and Thuringia and five county districts with in total about 225 000 inhabitants on 220 000 km<sup>2</sup>. It is situated in the center of Germany and surrounded by cities and development arieas. The applicant, the ARGE Rhön, which is a cooperation of the heads of the five county districts and the three Biosphere Reserve administrations, is the institution in charge concerning all matters of the Dark Sky Reserve Rhön (Sternenpark Rhön).



Picture of the Lioba Church, Petersberg, during Earth Hour 2019

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## Contacts

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Facebook: <https://www.facebook.com/sternenpark.rhoen>

Twitter: Sternenpark Rhön

### **Non-profit support association:**

Verein Sternenpark Rhön e.V. [www.verein-sternenpark-rhoen.de](http://www.verein-sternenpark-rhoen.de)

Chairman: Mark Rehm, Jens Müller

### **UNESCO Biosphärenreservat Rhön – Dark Sky Reserve Coordinators**

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# Summary

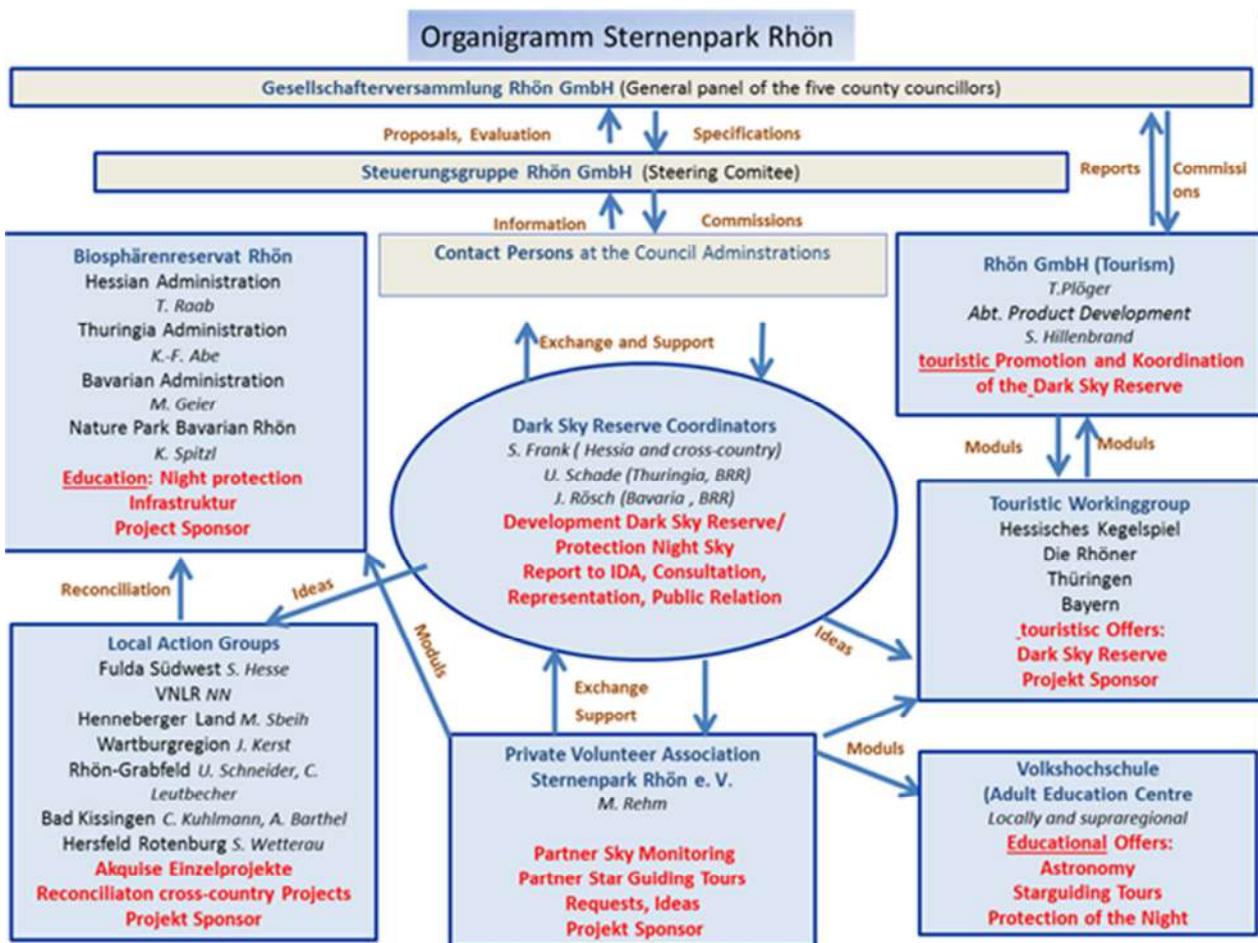
## I. Establishment of an organizational structure

As pointed out in the past years, the sheer size of the reserve, the major business developments in the surrounding area and the complex structure of the several institutions across three federal states remain a major challenge.

Nevertheless, it has eventually been possible to establish a **cross-federal state structure** including all relevant actors. It is gratifying that for the Thuringian and the Bavarian part of the Rhön Sternenpark coordinators have been installed. Ms Ulrike Schade is now the coordinator in the Thuringian and Ms Julia Rösch in Bavarian part of the Dark Sky Reserve UNESCO Biosphere Rhön.

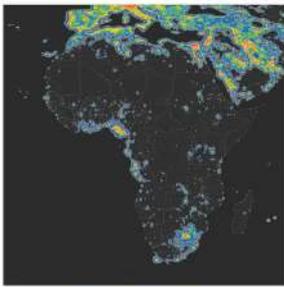
In addition, it has been possible to establish a cross-national structure at district level. This was a major aim in the past as it is the district council administrations which are able to make many important adjustments for the protection of the night. The lower nature conservation authorities, the building supervisory authority, the water authority and the regional development services are all actors on district level. District admins are therefore the most important partners when it comes to a sustainable and efficient protection of the night.

The situation so far was difficult, as the Sternenpark coordination person had many different contact persons at each of the five district administrations, which made communication considerably more difficult. It was therefore very important to have a binding contact person at each district administration who is able to communicate and process the information and tasks centrally in the respective district. For the selection of the contact persons, it was specified that they had to be persons who were well connected into regional development and who were thus able to identify local structures, institutions and decision-makers.



In this context, a lot of time has been spent so far on how to sustainably **regulate the usage of light** in developing areas without any nature conservation protection label via construction supervision procedure.

Umweltbeeinträchtigungen durch Kunstlichtquellen  
– Handlungsmöglichkeiten für den Landkreis Fulda



Quelle: <http://www.umweltschutz.de/Content/17/1644417/>

A young law student, who completed a legal clerkship at the legal office of the district of Fulda, has written an extensive legal expertise on the subject of environmental damage caused by artificial light.

Yet, lacking a proper national law, it turns out to be a very complex juristically issue to clarify on district administration level. As an outcome, we will continue finding solutions on how to regulate private and industrial light beyond awareness-raising measurements and put it on safe juristical grounds. The creation of last year's guidelines for sustainable lighting issued by the Hessian Ministry of the Environment for Sustainable Lighting has laid the ground for this. All other German (night protection) areas shall benefit from our important work on legal matters.



## II. Dark Sky Community Fulda – Sternenstadt Fulda

Also, the DSR Rhön is still benefiting a lot from the dark sky city Fulda, as it brings the issue of light pollution as a serious environmental problem to the public and settlements. Since designation many administrations, political parties, associations, or parties in major German cities have been asking for information on how to prevent light pollution. In addition, there have never been so many enquiries from television stations. A report in one of the largest news magazines on a national level stands out here, which in turn caused a lot of inquiries. We call it the Fulda effect: <https://www.tagesschau.de/inland/sternenstadt-fulda-103.html>

Luckily, it could be arranged, that the Hessian Minister of the Environment, Ms Priska Hinz, attended the award ceremony on 30 March 2019 - Earth Hour Day – which was a great honor and shows the respect for this great task. She also held a speech.

The Hessian Ministry of Environment also installed dark sky issues on their website: <https://umwelt.hessen.de/pressearchiv/pressemitteilung/wie-lichtverschmutzung-reduziert-werden-kann>

Impressions of the ceremony:



### III. Procurement of measuring instruments



With funds from the Hessian Ministry of the Environment, some **high-quality equipment** was purchased at the end of 2018: among others: luminance meter (Konica Minolta), luxmeter (Gossen), spectrograph (Mavospec Base von Gossen), SQM-LE, SQM-LU, SQM-Handheld, camera, different objectives and filters.

Also, some of the fundings were used for the creation of meaningful graphics, which of course can be downloaded from our site for anybody.

### IV. Award for our Workshop “Save the night”

Our workshop for children “Save the night” won the Award for the promotion of school and amateur astronomy, the Reiff-Förderpreis. The Sternepark Rhön association received the prize money of 500 € and committed itself to creating a teaching folder on the topic of night protection. This is currently in the conception stage.



## V. Dark Sky Reserve Rhön - Pioneering role for German Nature Parks



Another nice confirmation of our work was the award of the Rhön Nature Park as a premium partner of the nature parks quality offensive. The main reason given for the decision was that the Rhön Nature Park has taken on a pioneering role in finding ways to protect the night and set a standard for lighting ordinance.

This is of great importance in so far as there are 105 Nature Parks which cover approx. 27% of the German area. In this way our work finds its way into the other nature parks - independent of an award as an IDA Dark Sky Place. In Germany like in most countries, nature parks are subject to legally regulated territorial protection, which is part of nature conservation law.

Naturparkauszeichnung insbesondere wegen Sternenpark, da dadurch Vorreiterrolle in Deutschland: <https://www.lokalo24.de/lokales/fulda/hessische-rhoen-qualitaets-naturpark-10412938.html>

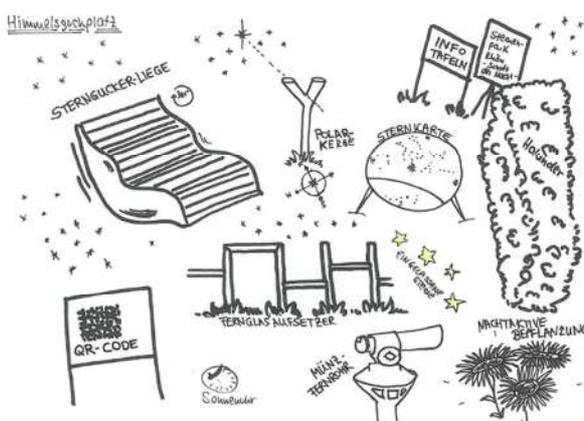
Map of Nature Parks in Germany (Wikipedia)

## VI. Sky Watch Places and Information Boards

The largest project was the planning and implementation of the **five sky watch places** with the simultaneous installation of **information boards** in 22 municipalities with a total invest at the expenditure of **113,300 €**. It was always aim to make the IDSR Rhön visible even during the day. One of the reasons for this was that the Rhön is a popular hiking area and also that the local population should be introduced to observing the sky. The sky view place with its furnishings also has the intention to offer teachers and schools an opportunity to deal with the topics of light pollution, astronomy, physics, technology, celestial mechanics, weather and biology. In the coming year, a teaching folder will be created for this purpose. Last but not least, these sky watch places also function as a sentinel for dark skies.



Sky Watch Place Hohenroda Soislieden



Originally, this was to be a cross federal country project that would have enabled simultaneous installation in all three federal states. It turned out, however, that the funding conditions and structures vary so greatly from one federal state to another and that joint implementation was simple not possible for formal reasons. For this reason, work was initially started in the Hessian part of the Rhön. The team consisted of 10 people, who participated in different working groups.

Left: Frist Sketch of the Sky Watch Places dating 2017

Fundings for this project: From May 2018 onwards, voting on the application with Landkeis Fulda and WiBank. Application on 28.09.2018; Approval on 17.12.2018; total expenditure 113,300 €.

(Eligible costs LAG Rhön and RFFS 75.100, 55%, subsidy € 41.300; eligible costs LAG Hersfeld-Rotenburg 20.100, 75% subsidy, 15.100 €)

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In addition to the sky scenes, information boards were set up in each municipality in the district of Fulda – meaning even communities, which are not located within the boundaries of the DSP Rhön - on the subject of DSP Rhön und and the protection of the night with information on how to use light more sensitively. During the installation, care was taken to ensure that the information boards reach as many passers-by as possible.



Examples of the information board: Steely construction in NeuhoF (left), woody construction in Hofaschenbach (right)



Also, in the Thuringian part of the Rhön in the courtyard of the information centre and on the Hohe Geba information boards were set up - in this case even bilingual German and English.

The sky watch places were officially opened on 13.09.2019. More than 300 people took part in the event. After the official opening ceremony, observations and night walks took place.

Film of the opening ceremony of the Sky Watch Places: [https://www.mediathek-hessen.de/medienvuew\\_20338\\_Felix-Karpe-OK-Fulda-Er%C3%B6ffnungsfeier-in-Hofaschenbach-am-13.09.2019--Erste-Himmelsschaupl%C3%A4tze-im-Sternenpark-Rh%C3%B6n.html](https://www.mediathek-hessen.de/medienvuew_20338_Felix-Karpe-OK-Fulda-Er%C3%B6ffnungsfeier-in-Hofaschenbach-am-13.09.2019--Erste-Himmelsschaupl%C3%A4tze-im-Sternenpark-Rh%C3%B6n.html)

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Some impressions of the opening ceremony with more than 300 participants:



There was a wide media coverage – here some more impressions:

<https://www.fuldaerzeitung.de/regional/huenfeld/nuesttal/erster-himmelsschauplatz-im-sternenpark-rhon-ist-eroffnet-zwei-weltneuheiten-IL9278857>

It was nice in connection with the establishment of the sky scenes that the National Committee of UNESCO (MAB) met in the Rhön and visited the sky watch places before opening. <https://osthessen-news.de/n11625465/mab-nationalkomitee-tagt-in-der-rhoen.html>



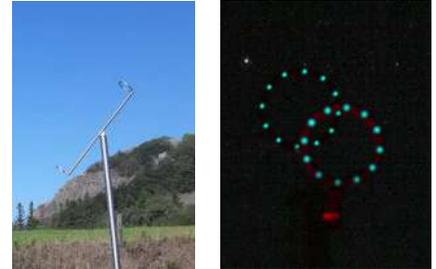
The head of the Hessian administrative office of the UNESCO Biosphere Reserve Rhön, Torsten Raab, explains the history and background of the Sky Watch Place in Nüsttal-Hofaschenbach to the MAB Committee. It was reported that the committee was very impressed by how the protection of the night and the use of the night were combined at the sky watch places.

# Description of the objects of the Sky Watch Places including two world novelties

General Information for the Public: <https://biosphaerenreservat-rhoen.de/himmelschauplaetze>

The astronomical objects were developed in close and trustful cooperation with the astronomers of the <https://www.astronomiemuseum.de/> Astro Museum and Observatory Sonneberg in Thuringia: Dr. Peter Kroll, Dr. Bernd Müller, Stefan.

**Polar Star Finder:** A 4 m high stainless steel mast with pointer and two rings is used to find the Polar Star. If both rings are brought together to form one single ring when viewed through, the center of the rings points exactly into the direction of the north celestial pole. About three-quarters of a degree away from it stands the Polar Star, whose position changes slightly depending on time of day and season. However, it can always be seen in the field of rings. The polar star finder was adjusted at night time.



**Star map:** The current starry sky can be adjusted with the help of a rotating star map. By matching time and date on the rotating disk, one can easily find oneself way around up in the sky with the help of the star constellations drawn on the map. We used the sufficient space on the reverse to give more information. On the one hand the objects of the Sky Watch Place are explained in detail. On the other hand we described topics like what can be seen with the naked eye in the sky, what can be seen with binoculars and also during the day. Also, we included a big graphic on the different cloud types – because we live in the middle of Europe with a lot of clouds and also to match our expectations on a sky watch place for the day.

Front side with the rotation star map:

### Orientierung am Himmel

Der einfachste Bezugspunkt für uns ist der Polstern (Polaris), der mit dem Rotationsindikator durch die beiden Ringe zum Polaris gefunden werden kann. Die Rotationsindikatoren sind besonders hilfreich.

Auch die Sterngruppe Große Wagen – Teil des Sternbildes Große Karre – zeigt den Weg zum Polstern:

Die Verbindungslinie der beiden hellsten Sterne muss dazu für ein recht „gerades“ Dreieck sorgen. Verlangt man diese Linie über die Polaris hinaus, so gelangt man zum „Himmels-N“, dem Sternbild Cassiopeia.

Der Große Wagen ist immer besser orientiert. Denn auch direkt leicht zu finden. Die rotationsindikator zeigt vier verschiedene Richtungen für den großen Wagen an. Im Uhrzeigersinn sind: 1. März, 15. Juli, 15. September, 15. Dezember.

## Drehbare Sternkarte

Auf der drehbaren Scheibe ist der gesamte Sternhimmel abgezeichnet, der von 90° nördlicher Breite bis 90° südlicher Breite ausreicht. Der weiße Ausschnitt zeigt nur den Teil des Himmels, der zu einer bestimmten Uhrzeit und einem bestimmten Datum über dem Standort beobachtet werden kann. Wegen der Drehung der Erde um ihre Achse und ihrer Jahresbewegung um die Sonne verschiebt sich der Ausschnitt ständig.

**Wie „best“ man die Sternkarte?**  
Der Rand gibt den Horizont mit den Hauptmeridianen an. Die Mitte der Karte zeigt den Zenit direkt über uns. Am besten lässt man sich die Karte als „Tafel des Kopf“ gestalten.

**Was ist Nordens?**  
Der Himmelsnord enthält auch den Polaris und ist ein wenig größer als der Rest.

**Uhrzeit bei Sommerzeit (MESZ)**  
Nur von April bis Oktober: MESZ = MEZ + 1 Stunde  
Bsp.: 10:00 Uhr MESZ = 9:00 Uhr MEZ

**Wie sind Sonne, Mond und Planeten zu finden?**  
Diese Objekte ändern sich ständig. Die Positionen sind zu dem Zeitpunkt und dem Standort nicht auf der Karte dargestellt. Lediglich die Bahn der Sonne, die Ekliptik – gelb hervorgehoben – ändert sich praktisch nicht. Die Planeten bewegen sich über die Sonne hinaus. Die umgebenden Sternbilder sind zu diesem Zweck eingezeichnet, damit sie leichter zu finden sind.

**Die Website „www.drehbaresternkarte.de“ (QR Code)**  
Die Website zeigt die aktuelle Position aller Planeten, die Sonne, die Sterne und weitere Objekte.



Reverse side of the star map with many information about the sky:

## Himmelschauplatz unendliche Weiten

### Die Elemente des Himmelschauplatzes

**Sternenplatte**  
Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind. Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Sternenplatte**  
Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind. Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Küsterstern**  
Der Küsterstern ist ein Stern, der im Sommer und Winter zu sehen ist. Er ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

### Astronomie mit dem bloßen Auge

Die Astronomie mit dem bloßen Auge ist eine der ältesten Formen der Astronomie. Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Planeten**  
Die Planeten sind die Himmelskörper, die im Sommer und Winter zu sehen sind. Sie sind ein Teil des Himmels und zeigen die Sterne, die im Sommer und Winter zu sehen sind.

**Aufgabenplan**  
Der Aufgabenplan ist ein Plan, der die Aufgaben der Astronomie mit dem bloßen Auge zeigt. Er ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

### Astronomie mit dem Fernglas

Die Astronomie mit dem Fernglas ist eine der ältesten Formen der Astronomie. Sie ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Mond**  
Der Mond ist der einzige Himmelskörper, der im Sommer und Winter zu sehen ist. Er ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Planeten**  
Die Planeten sind die Himmelskörper, die im Sommer und Winter zu sehen sind. Sie sind ein Teil des Himmels und zeigen die Sterne, die im Sommer und Winter zu sehen sind.

### Atmosphärische Erscheinungen

Die atmosphärischen Erscheinungen sind die Erscheinungen, die im Sommer und Winter zu sehen sind. Sie sind ein Teil des Himmels und zeigen die Sterne, die im Sommer und Winter zu sehen sind.

**Regenbogen**  
Der Regenbogen ist eine atmosphärische Erscheinung, die im Sommer und Winter zu sehen ist. Er ist ein Teil des Himmels und zeigt die Sterne, die im Sommer und Winter zu sehen sind.

**Halo und Heiligenschein**  
Die Halo- und Heiligenschein-Erscheinungen sind atmosphärische Erscheinungen, die im Sommer und Winter zu sehen sind. Sie sind ein Teil des Himmels und zeigen die Sterne, die im Sommer und Winter zu sehen sind.



Stabilizing support for binoculars

The stabilizer for binoculars was built with the idea behind it, that most people have binoculars, but do not necessarily carry a tripod when hiking. In order to stabilize the binoculars in the hand, this high bar was built, which also has an approval as gymnastic apparatus. The zigzag bars serve as supports for the arms for people with different heights. A binocular - no matter what magnification - is an ideal companion when "walking" in the sky or even when looking for specific objects. All objects can thus be viewed at rest, even at eight, ten or multiple magnifications, without the image being blurred.



Wave forest sofa: For those who want to enjoy the view of the Rhön day or night sky, there is a mobile, comfortable "sky couch" available on every sky watch place. But it is not an ordinary rotating wave sofa, but its special function is that it is also tiltable.

Information boards: But light pollution is also a topic: how harmful night-time light sources can be for people and animals is illustrated by information panels on every sky watch place (pictures and description see above).



Adjustment of the polar star finder at night



The Sky Watch Place Team:  
 Christoph, Sabine, Bernd, Christian, Stefan, Dr. Peter Kroll



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## VI. Visit of Dr. John Barentine, IDA

Another highlight and great honor was the visit of Dr. John Barentine of the IDA. In addition to many discussions with representatives of the city of Fulda, RhönEnergie Fulda and the observatory, the handing over of the IDA stele to Deputy Councillor Frederik Schmitt was also on the agenda. But also an observation night and a small hike at the memorial Point Alpha were part of the program.



Dr. Barentine and Dr. Heun, RhönEnergie Fd



At the vize deputy councillor



At the star observatory in Fulda



Members of the private association Sternepark Rhön e.v.



Ulrike Schade

## VII. Technical recommendations for various lighting purposes

Another very extensive and strenuous work in the past period was the further development and refinement of technical recommendations for action for various lighting applications: Sports facilities, roads, paths and parking lots, commercial enterprises and illuminated advertising, as well as churches and floodlights, and technical recommendations for site management procedures. Starting as a little internal project last year, it has turned out, that recommendations for the individual tasks in terms of lighting are needed.

Basically, all specifications are based on the information brochure of the Hessian Environment Ministry for Sustainable Outdoor Lighting, which was published the year before. Yet, it turned out, that the brochure of the Ministry is simply not handy enough for usage. That was another reason for creating technical versions for various purposes separately.



In addition, graphics were created with funds from the Hessian Ministry of the Environment, which - if labeled - carry the same information as on the recommendations for action and the Hessian Broschure in order to be very consistent. All recommendations were placed on the website and the graphics were also made available for download: <https://biosphaerenreservat-rhoen.de/handlungsempfehlung-nachhaltige-beleuchtung>. The number of hits on the website and the number of downloads show us how important this material is, especially since it was published by a public body. For sure we register a raising awareness throughout the nation and it seems, that many citizens and organizations are grateful for the information we provide. At the moment, the recommendations for action are being layoutet and then sent to the municipalities in printed form. Also, it is planned – using the distribution of the recommendations - to have a talk in every single municipality about how night protection can be more integrated locally.



## VIII: Visitors to the Sternenpark

Still it is not possible to count the visitors to a full. But for the first time in 2019, the registration for the public star tours was handled by the Volkshochschule of the Landkreis Fulda, which has a professional registration system. On this way we could notice that many guests of the public guided tours actually come from far outside the Rhön. It was also noticeable that the public guided tours were fully booked within a short time. With good reason one can claim that the Sternenpark Rhön pays off touristically.

- 22 public star guiding tours attracted 846 participants.

The private guided tours are handled by the private association Sternenpark Rhön e.V. association. The association has concluded an organizer's liability for the star guides and participants of the guided tours. With the private guided tours we register an increase of inquiries from hotels and family groups. We still do not actively promote private tours. The amount of requests seems to be fueled by a broad media coverage in nationwide magazines like the magazine of the Deutsche Bahn, which is displayed in all trains in Germany and therefore has a long range. In August an article about the dark sky city Fulda and the star tours was published.

- 151 privately organized star guiding tours attracted 3377 participants.

Reporting Month	Pubic Star Guiding tours	Participants Public tours	Private Tours	Participants Private tours
10/2018	1	48	19	505
11/2018	1	23	7	87
12/2018	1	11	10	233
01/2019	1	24	4	49
02/2019	1	31	12	131
03/2019	4	238	11	274
04/2019	2	32	12	208
05/2019	2	26	12	224
06/2019	3	73	10	198
07/2019	2	88	11	176
08/2019	2	201	20	377
09/2019	2	51	23	492
<b>Summary</b>	<b>22</b>	<b>846</b>	<b>151</b>	<b>2954</b>
	<b>Star Guiding Tours Total</b>		<b>Participants Total</b>	
	<b>173</b>		<b>3377</b>	



Participants of a star guiding tour



# Lighting

In general it can be observed, that public lighting is getting more and more compliant with the lighting management plan. As pointed out before, this is because the suppliers of public lighting are usually the energy suppliers in whose supervisory boards the municipalities are represented, do usually not offer any public light other than meeting our requirements of night-friendly lighting.

## Data supplied by the Energy Suppliers

Conversions in the supply area of RhönEnergie Fulda (mainly Hessian part of the DSP). The excel list will be provided separately.

Similar to other star parks or dark and non-dark regions, it is clear that private and commercial lighting in particular needs to be more closely monitored. As described at the beginning, it is not so easy to legally enforce the possibilities for regulation and there is also simply a lack of means for raising the awareness of each individual polluter. However, the way in which construction management procedures and building permits are carried out, needs to be examined. Although it is not yet customary, it is a goal to establish the first best-practice examples on this field here in our Dark Sky Reserve within the next period.

Anyhow, wherever we have the opportunity to get into conversation with those responsible, we often encounter understanding and the situation improves. So it is worth to always address as many polluters as possible. It helps to take pictures before the interview in order to be able to make suggestions for improvement. In the case of the Fulda Golf Club, which operates its golf course within the Rhön Star Park, the images shown have led to a permanent shutdown of the superfluous lighting. Every reduction is worth fighting for.



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Best practice – the conversion of the village of Silges, Nüsttal and its medial reception:

The village of Silges, which is a part of the municipality of Nüsttal, converted last year completely to so called amber-LED with 1800 Kelvin. <https://silges.de/aktuelles/silges-summt/> This was described in the report of the last period. Yet, the reception in the media across the nation was so enormous, that many municipalities and associations from all over the country asked for more information. Even the South Korean State Television visited Silges for reporting purposes.

The before-after-pictures went viral and were printed in many newspapers across the nation, like even in the renowned Sunday edition of the Frankfurter Allgemeine Zeitung.



Unfortunately, rumours have reached us that there are ambitions within the EU to promote even more efficient LEDs (Single Light Directive). In view of the fact that the proportion of blue light in particular is so harmful to humans and nature, this would be more than fatal if light would only be judged with a focus on efficiency and leaving out ecology. We are therefore working through the Federal Environment Agency to clarify and maintain environmentally efficient light colours.

Yet, a further rebound effect is to be feared, if the trend to evaluate light sources purely on the factor of energy efficiency continues.



We hope to have a standing by showing that amber-LED is not an exception but should be standard in outside lighting. With the company of RhönSprudel we now have the first company that works at night and yet converted its complete outdoor lighting to full-cut off amber LED. This will be reported about in more detail in the next report. Also, there are companies that massively propagate the light colour amber.

Left: The Company RhönSprudel, which produces at night, is in the process of converting all outdoor lighting to full-cut-off amber.

In order to achieve a good balance between ecology and efficiency, the manufacturer Siteco presented a demo luminaire with 2200 Kelvin. In the office of the Sternenpark the sample lamp was measured with the newly acquired spectrograph. In addition, the colour rendering was examined. The visual impression given of this light colour was subjectively a good one.

**Darstellung SL11 2200K**

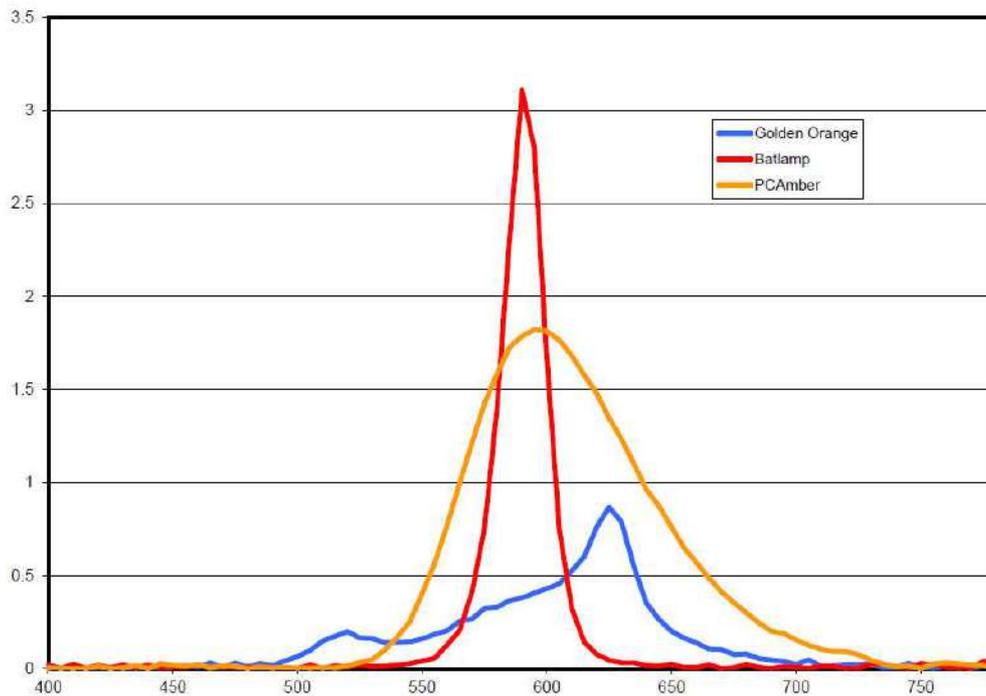


Fig.: Spectra of LEDs without blue in the Rhön: GoldenOrange, PCAmber and Batlamp (amber)

Note: There was just information, that another small village in the Rhön has converted completely to full-cut-off amber LED. This will be a nice feature in next years report.

# Sky Quality

## I. Sky Brightness Observations

The following sky brightness measurements have been taken in 2019 with the same SQM-L (#2536) like in the years before. Additionally the sky brightness values derived from allsky images with the Sky Quality Camera software (SQC) are given. With dark values both measurements are about the same, while measurements under the bright city sky of Fulda gave differences of about 0.2 mag/arcsec<sup>2</sup>.

Date	CET	place	long	lat	alt.	SQM-L	cd/m <sup>2</sup>	SQC
2019-02-23	22:30	Schwarzes Moor	10.07116	50.52446	780	21.30	0.33	21.14
2019-02-24	20:45	Hohe Geba	10.27020	50.58880	740	21.40	0.30	21.38
2019-03-29	22:15	Fulda Fuldaue	9.66587	50.55416	250	19.90	1.18	19.72
2019-03-30	0:30	Schwarzes Moor	10.07116	50.52446	780	21.88	0.19	21.80
2019-03-30	1:15	Schwarzes Moor	10.07116	50.52446	780	21.92	0.18	21.81

Variations at a certain place can be considerably as can be seen for the reference point Schwarzes Moor. In the night 29/30 March the till now darkest value could be measured at the place, the SQM-L measurement is just 0.1 mag/arcsec<sup>2</sup> darker than the SQC value (simulating the SQM-L with a 10° measurement circle). At other places in Germany this spring similar dark values could be measured which might be due to the very low solar activity.

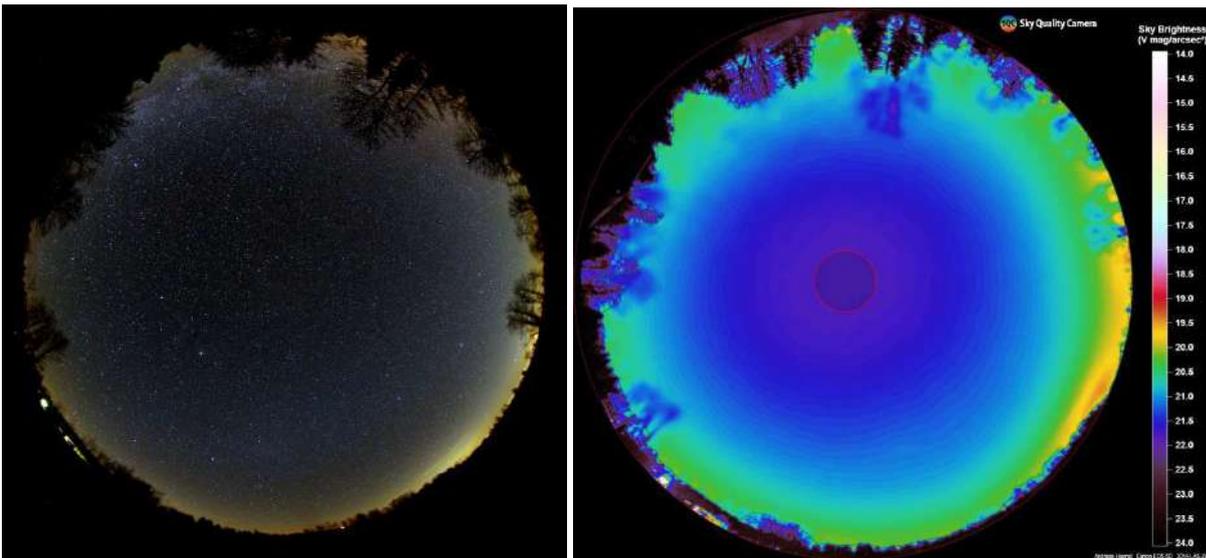


Fig. : Fisheye picture from Schwarze Moor with the sky brightness derived with the SQC software. The measurement circle of 10° is indicated.



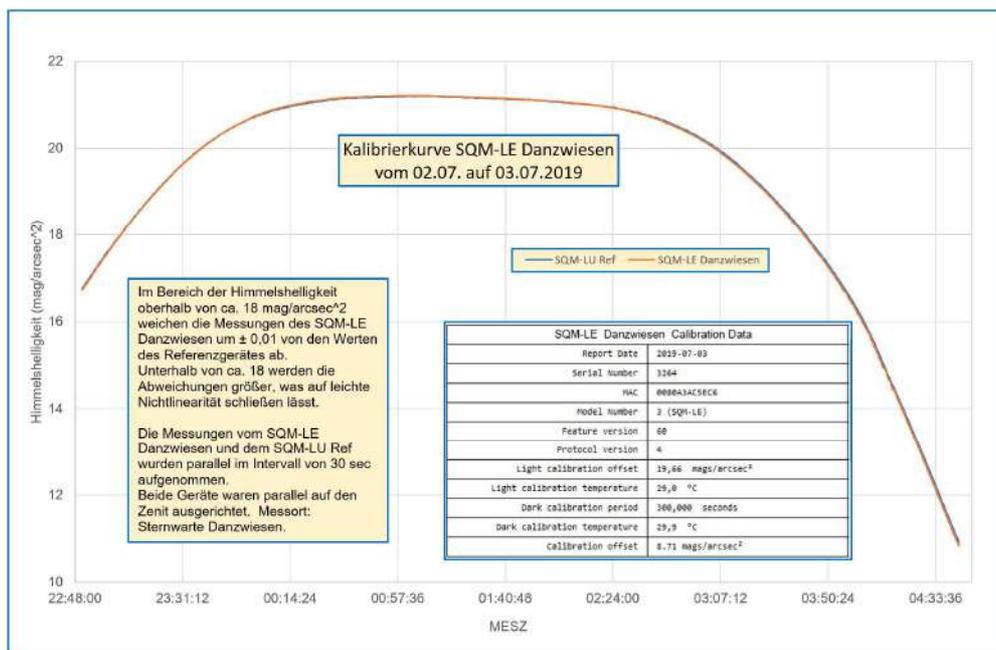


Fig. :At Hohe Geba the zodiacal light could be observed at the end of February. A bright light dome towards the West could be identified as the light dome of Frankfurt.

## Conservation and Research

### I. Measuring Network

A working group consisting of members of the observatory Fulda, the association Sternenpark Rhön e.V., the administrative district, the Biosphere Rhön administration and the university Fulda is currently working on a project for **the establishment of a cross-border sky brightness measurement network** with online access. After the SQM devices have proven to be unsafe, TESS devices are currently being tested. It remains to be expected that the first cross-border measurements will take place in 2020.



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## II. Instrumental tests and calibrations

Landkreis Fulda bought some new measurement instruments which had been compared to the reference instrument SQM-L (#2536). The handheld SQM-Ls (vers. 2.19) measured typically 0.25 – 0.3 mag/arcsec<sup>2</sup> darker than the reference instrument:

#037F: -0.25

#03d0: -0.25

#0367: -0.25

#0734: -0.3

#0748: -0.3

Also some SQM-LUs were compared giving also darker values:

#4156: -0.21

#4159: -0.15

#4162: -0.20

#4170: -0.27

#4204: -0.61 (error?)

These comparisons show that it is very important to intercalibrate the measurement instruments, especially if changes of the sky brightness will be monitored. The SQMs will be used to install a measurement net in the Rhön.

Comparison pictures of different fisheye lens (Sigma 4.5mm, 8mm, Wallimex 8mm, Meike 6.5 mm)– camera (Canon 700D, 6D, 6D MarkII, M100) combinations have also been made.

## Funding

With installing a DSP coordinator in both Bavaria and Thuringia, funding for staff is now provided by the UNESCO Biosphere Reserve and the district administration of Fulda. Also, the district council of Fulda finances office, printing information material, travel costs, car etc.

Funding was granted for the construction of the five sky watch places and 64 information boards at a total expenditure of 113,300 €.

Funding was also granted for the procurement of technical instruments.

## Arts and Culture (Selection)

### I. Rhöner Hiking Day 2018

The Rhöner Hiking Day is a very popular event and reaches a lot of people across the Rhön. And it offers a very good opportunity to reach people who might not be interested in astronomy and therefore not necessarily get to know about the work of protection. In order to reach these people, an astronomical twilight hike was invented within the framework of the hiking day, which dealt astronomically with the topic of the change of seasons and at the same time covered the topic of protection of the night. This tour was so well received that it is now an integral part of our star guide program.

## II. National German Day of Astronomy

It was a great honor this year to host the main event for the National German Astronomy Day in Fulda. The event consisted of various lectures and astronomical walks in Fulda in order to reach as many people as possible. A special honor was that the first chairman of the Association of Star Friends Germany (VdS), affiliated association of the IDA, Sven Melchert, was among the speakers and guests. The event was organized together with the Planetarium Fulda and the observatory. The Fulda Observatory and the planetarium also have light pollution firmly as a fix topic in their respective program.



## III. Thanksgiving Service dedicated to the Night “Thank God for the dark Night”

Another unusual event was the organization of the Thanksgiving Service in the Luther Church in Fulda. The theme was the night, its beauty and its protection with songs, poems and prayers. The event was very inspiring and 3 weeks later an astronomical moonlight tour was organized.

**Vom Anfang bis zum Ende**  
Vom Anfang bis zum Ende  
hört Gott seine Hände  
über sein Volk erheben  
Ja, er hat es versprochen,  
hat nie sein Wort gelockt  
„Gedenke mir, ich bin bei dir  
immer, und überall ist  
immer bei ich da.“

Photo: Hans-Hilg, Bremen (https://www.flickr.com/photos/hans-hilg/10000000000/)

**„Danke Gott für die dunkle Nacht“**  
22. September 2019, Kirchweih-Gottesdienst

Photo: Hans-Hilg, Bremen (https://www.flickr.com/photos/hans-hilg/10000000000/)

**Israeller Gedichte:**  
Wenn ein Tag Zerstört und Fehle  
blau im Ungewissen Raub,  
recht die Sternwelt der Sterne  
Nirrtische Gedächtnis ist best,  
So der Gedächtnis, so am besten  
brüht sich ein neuer Eng,  
und das Oben wird die Unter  
lang dem neuen Gedächtnis  
(Lobere Witzgang von Gedächtnis)

**Psalm 8**  
„Wenn ich schaue die Himmel, deiner Finger Werk, am Mond  
und die Sterne, die Du bereitet hast...“

**Welcht du mirsel Sternlein stehen?**  
Hilft du, wie viel Sternlein stehen  
An dem Himmel herab?  
Woher du, wie viel Wölken gehen  
Über Erden oder Meer?  
Gott der Herr hat sie gemacht,  
Das sie auch nicht ohne Ruh  
An der gemess genen Zeit.  
Weißt du wie viel Mosen speien  
In der hellen Sonnenhit?  
Weißt du wie viel die Sterne  
Denn sie all im Leben lehren,  
Dass sie nur so schön sind,  
Nicht da wie viel Kinder Fische  
sich aus ihrem Becken auf,  
Dass sie ohne Sorg und Mühe  
Frisch sind in Tag und Nacht?  
Gott im Himmel hat sie alle  
seiner Lust, sein Wohlgefallen:  
Nur auch dich und hat dich lieb.  
Gibtes Wort für alle Licht in der Nacht  
Gelbes Wort ist was Licht in der Nacht,  
es hat Hoffnung und Zucht gebildet,  
es gibt Trost, es gibt Mut in Bedrängnis, Not und Angest,  
ist ein Stern in der Dunkelheit

**ODER**  
Wo ich auch gehe, wo ich auch stehe  
bist du lieber Gott, bei mir,  
Wenn ich dich auch niemals sehe,  
weiss ich immer, du bist hier.

**Zwei kleine Wölfe**  
Zwei kleine Wölfe geht des Nachts im Dunkeln,  
man hört das einen zu dem andern maulen:  
Warum gehst du denn immer nur des Nachts herum?  
Man tritt dich an den Kraxeln ja die Pfoten herum,  
Warum nur so hoch heiler wärst?  
Wenn nur der Wald mit Sternensicht beleuchtet wär,  
So du, so dich, so dich, so du, so du, so du.

**Hallelu Hallelu Halleluja**  
Hallelu Hallelu Halleluja - Preiset den Herrn, 42  
Preiset den Herrn - Halleluja 42

**Ein Licht geht uns auf**  
Ein Licht geht uns auf in der Dunkelheit,  
durchbricht die Nacht und erteilt die Zeit,  
Licht der Liebe, Lebenslicht,  
Gottes Geist wandert uns nicht ab,  
Ein Licht leuchtet den Weg, der zur Hoffnung führt,  
erfüllt den Tag, diese es jeder spürt,  
Licht der Liebe,  
Ein Licht erweckt uns von, wir sind nicht allein,  
An jedem Ort wird es bei uns sein,  
Licht der Liebe...

Psalm 8:3:

*When I see the heavens, the work of your fingers, the moon and the stars that you have prepared.*

## IV. Obviously: 50 years moon landing exhibition



Waning Moon in the Rhön (Jens Müller)

## VII. Astronomic Summer Camp

The annual astronomical summer camp for young people took yet again place in the Rhön, organized by VEGA, the Association for Youth Work in Astronomy.

<https://www.mainpost.de/regional/moenngrabe/1/schullandheim-bauersberg>



BISCHOFSHHEIM

09. August 2019 12:13 Uhr

### Schullandheim Bauersberg: Astronomisches Sommerlager

Wissenschaftliche Themen standen im Vordergrund des Sommercamps. Dabei tauchte man tief in die Theorie ein. Aber auch praktisches stand im Fokus.

Zwei Wochen lang befassten sich interessierte Jugendliche im Schullandheim am Bauersberg mit Themen rund um die Astronomie. Wenn das Wetter es zuließ und der Himmel klar war verbrachten sie die ganze Nacht im Freien. Sie widmeten sich physikalischen und mathematischen Fragestellungen, sie

beschäftigten sich mit wissenschaftlichen Themen – und das alles in den Sommerferien.

Es handelte sich um kein gewöhnliches Sommercamp, sondern um das "Astronomische Sommerlager" der VEGA, der Vereinigung für Jugendarbeit in der Astronomie. "Die Rhön ist bestens geeignet, um den nächtlichen Himmel zu beobachten", sagte Lucia Härer (Erlangen), die in diesem Jahr das Camp organisiert hatte. Doch leider seien die Witterungsbedingungen in diesem Jahr nicht ideal gewesen, es habe nur wenige Abende mit einem wirklich klaren Sternenhimmel gegeben. Für die jugendlichen Astro-Fans, die aus ganz Deutschland und dem europäischen Ausland zum Bauersberg gekommen waren, war dies aber kein Problem. Neben der nächtlichen Sternebeobachtung gab es genügend Arbeitsgruppen, Vorträge und Workshops zu verschiedenen Gebieten der Astronomie, Raumfahrt und Physik.

#### In der Rhön kann man noch die Milchstraße sehen

Seit 20 Jahren gibt es das "Astronomische Sommerlager", das erstmals anlässlich der Sonnenfinsternis im Jahr 1999 von Jugendlichen organisiert worden war. Schon viele Male waren sie im Schullandheim am Bauersberg, zwischendurch machten sie Station im Harz, im vorigen Jahr waren sie in Thüringen und nun sind sie wieder zurück am Bauersberg. "Wir versuchen immer in der Mitte Deutschland attraktive Standorte zu finden. Die Rhön zählt zu den besten Standorten. Hier wird es noch richtig dunkel", sagte Härer. Für viele der Campteilnehmer, die meist aus Großstädten kommen, sei das eine ganz neue Erfahrung. "Dass wir hier die Milchstraße sehen können ist eine Besonderheit."

This small selection is to demonstrate, that there are various different ways and means to sensitize for the night.

# Outreach (small selection)

## I. Our monthly sky preview

In addition to the star guiding tours, the monthly sky previews are one of the most



important public relations instruments. The greatest thanks for this goes to our association member Roland Müller, who every month writes a demanding but yet understandable and wonderfully entertaining sky preview, always with a sideview to the preservation of the night sky. The preview is meanwhile printed in the press media far beyond the borders. Beyond that Roland writes a three-month sky preview for the magazine of the Rhönklub, which is the only transnational magazine. In this way, so many people can be reached for our cause.



## II. Information on Lectors on Dark Sky Issues

A total of 36 detailed information presentations on night protection, the effects of light pollution and recommendations for action against it were held during the reporting period. In addition to those with a private interest, the target groups included nature conservation associations, constructors and political parties - both within and outside the Dark Sky Reserve. A special focus was placed on the possibilities for action of citizens, institutions, the administration and businesses. Apart from the fact that the topic of light pollution and its avoidance is an integral part of every star guiding tour, more than 1000 people could be reached with the information lectures and hopefully become multipliers.

In addition, a lecture on the subject of light and law was created specially for nature conservation associations and has already been held several times. It has turned out that light is a body of legal regulations and that there are many uncertainties. One of the reasons for this is that there are many myths about lighting requirements and safety. These special lectures are intended to help multipliers to better classify the subject of light and safety.

## III. Workshop “Rettet die Nacht - Save the Night” for Children aged 8-12

Two workshops were held in October 2018 and April 2019. 55 children could be reached.



## IV. Telescope Workshop 2019:

Home » Lehrerbildung » Lehrerbildung: Der Fernrohrführerschein

### Lehrerfortbildung: Der Fernrohrführerschein

Von 24. Januar 2019 10:00 bis 25. Januar 2019

Ort: Umweltbildungsstelle Oberelsbach

**Ziele:**

- Vermittlung grundlegender Kenntnisse zu Theorie und Praxis im Umgang mit Fernrohren
- Erfahrungen von Beobachtungsaufgaben für Schüler
- Entwicklung von Aufgaben rund um das Schulteleskop

**Inhalte:**

- Fernrohrgröße: Fundamentals von Linsen- und Spiegelteleskopen, Grundgrößen für die visuelle Beobachtung
- Aufbau und Inbetriebnahme eines Fernrohrs: Montierung und Polarisierung, Nachführung und Go-To-System, Verankerung von Zubehören
- Praktische Übungen mit dem Schulfernrohr
- Beobachtungsaufgaben: Orientierung am Meridian, Auswahl geeigneter Beobachtungsobjekte
- Einführung in die Himmelsatlasgalerie
- Sicherheitsmaßnahmen zur Sonnenbeobachtung
- Technik moderner Großteleskope

mit Übernachtung

Anmeldung für begehobte Lehrkräfte über TESS möglich.

A teacher training for the handling with a telescope (“telescope driving licence”) took place in the environmental education place Oberelsbach with our star guide Dr. Joachim Schneider. The event was fully booked.

<http://proxy-oberelsbach.rhoeniversum.de/home/veranstaltungen/event/42-lehrerfortbildung-der-fernrohr%C3%BChrschein>

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## V. Market stalls and other events

On three local markets we could inform the public on light pollution and astronomy. One stall was served in cooperation with the observatory Fulda.

Another fine event was the visit in a library doing a space walk by using VR-Glasses. By doing this, we could reach a lot of parents with their children who happily travelled through space. The other topic was polar lights. At the same time we were able to inform about dark skies.



## VI. Training “Sternenpark Rhön”

The many certified nature and landscape guides of the Thuringian Part of the Rhön received an additional training on Sternenpar Rhön and dark sky issues.

## VII: Earth Hour 2019



Impressions

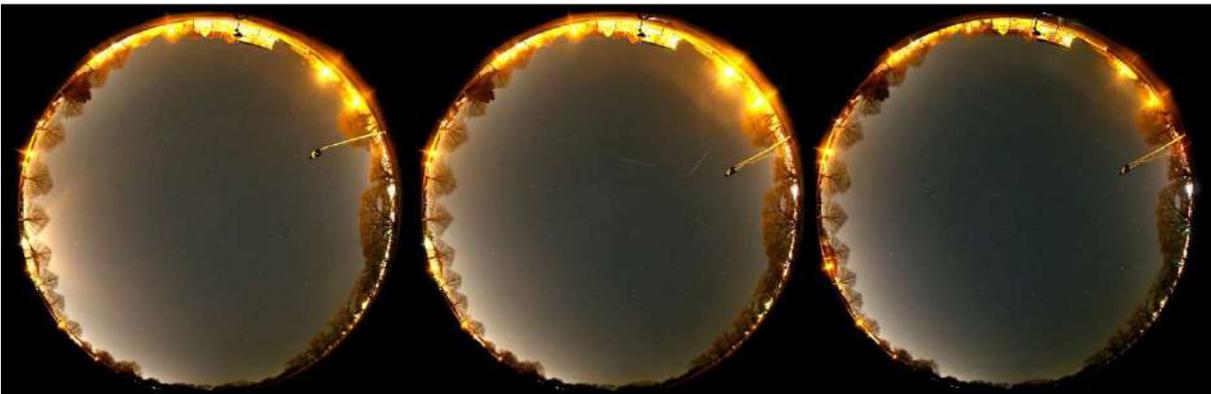


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The event of the Earth Hour was used for the documentation of the reduction of light in Fulda:



Top: The switch off of the monuments in Fulda at 22:00 was documented from the Petersberg



Top: Another night the reductions were documented from the city center (Fuldaauen): left: before switch-off, middle: after switch off of the monuments (here especially the Dom) at 22:00, right: after reduction of the public lighting at 22:30. Parallel measurements of the sky brightness are still being evaluated.

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## Community and Media Relations (Selection)

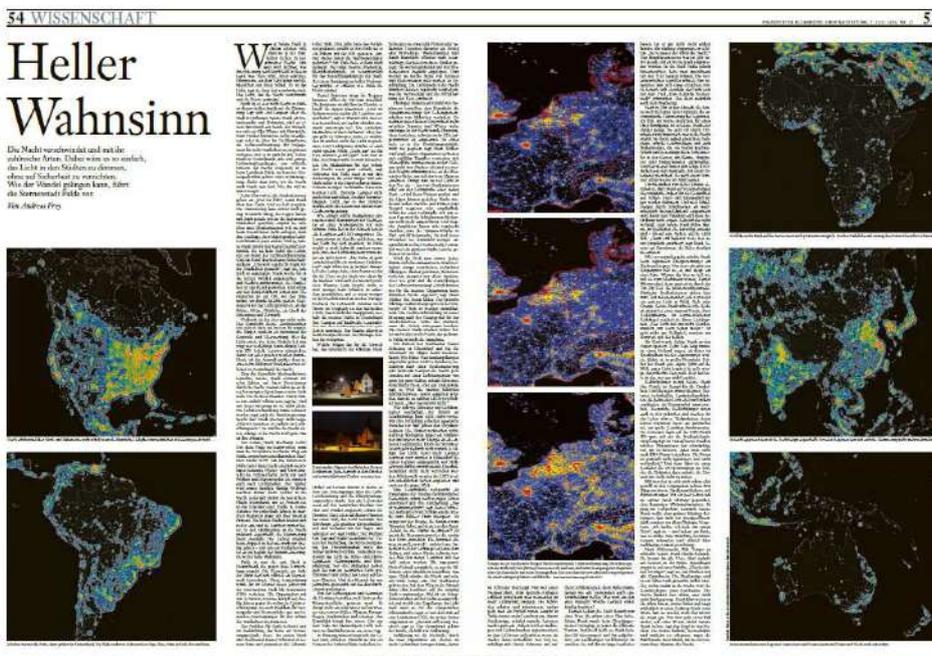
This year there was extensive reporting - especially on Dark Sky City Fulda. One of the biggest German Sunday newspapers reported in detail and since then many newspapers in Germany have reported about the protection of the night. This led to some cities like Freiburg and Eschborn to start to deal with measurement for the reduction of light pollution in their realms. Also, our star guiding tours were also covered in reports throughout Germany. One result is, that media relations meanwhile occupies a very large part of the working time and, on the other hand, the Sternenpark Rhön seems to be a first contact address for all individuals who look for help in terms of light pollution.

The greatest media attention was achieved with an almost 3-minute feature in the biggest TV news, the ARD Tagesthemen.

### **Print- and Onlinemedien (selection):**

Frankfurter Allgemeine Sonntagszeitung FAZ (nationwide):

<https://www.faz.net/aktuell/wissen/lichtverschmutzung-wir-schaffen-die-nacht-ab-16276111.html>



DB Mobil (Magazin of the Deutsche Bahn, with great national reach)

[https://mobil.deutschebahn.com/system/magazines/files/000/000/056/original/Gesamt-pdf\\_DB-Mobil\\_08\\_2019\\_NEU-2.pdf?1565252909](https://mobil.deutschebahn.com/system/magazines/files/000/000/056/original/Gesamt-pdf_DB-Mobil_08_2019_NEU-2.pdf?1565252909)



Welt:

<https://www.welt.de/regionales/hessen/article198684909/Fuenf-Jahre-Sternenpark-Kampf-gegen-Lichtverschmutzung.html>

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Informationsdienst der Wissenschaft  
<https://idw-online.de/de/news712259>

Fuldaer Zeitung  
<https://www.fuldaerzeitung.de/regional/fulda/rhoen/funf-jahre-sternenpark-kampf-gegen-lichtverschmutzung-geht-weiter-HD9252393>

Main-Echo  
<https://www.main-echo.de/regional/kreis-main-spessart/art12200,6565919>

Sternenstadt – Osthessen-News (siehe auch Ordner Sternenstadt)  
<https://osthessen-news.de/n11610127/ob-wingefeld-verrat-in-sickels-wir-sind-die-erste-sternenstadt-in-deutschland.html>

Sternenstadt Fuldaer Zeitung  
<https://www.fuldaerzeitung.de/regional/fulda/ob-wingefeld-verkundet-fulda-wird-erste-sternenstadt-deutschlands-XA8673725>

Schöner Bericht Sternenstadt  
<https://www.lokalo24.de/lokales/fulda/fulda-deutschlandweit-erste-sternenstadt-11745940.html>

Bericht Joachim Schneider und Michael Pinato – schön – war auch in den Printmedien  
<https://osthessen-news.de/n11610897/beliebtes-bildungsangebot-sternenfuehrung-fuer-einheimische.html>

Merkur  
[https://www.merkur.de/bayern/bayern-gegen-lichtverschmutzung-ab-23-uhr-soll-es-jetzt-richtig-dunkel-werden-12241098.html?fbclid=IwAR1IbN0UM7oZ56yPZ6H0wNGMRixF-bxdUZ57L1Rn5o2dn\\_N3yWdnX2oht3s](https://www.merkur.de/bayern/bayern-gegen-lichtverschmutzung-ab-23-uhr-soll-es-jetzt-richtig-dunkel-werden-12241098.html?fbclid=IwAR1IbN0UM7oZ56yPZ6H0wNGMRixF-bxdUZ57L1Rn5o2dn_N3yWdnX2oht3s)

Badische Zeitung  
<https://www.badische-zeitung.de/eine-stadt-kaempft-gegen-lichtverschmutzung-und-schuetzt-damit-die-umwelt>

Kitzingen  
<https://www.infranken.de/regional/kitzingen/Vortrag-im-Stadtteilzentrum-Der-bestirnte-Himmel-ueber-mir;art218,4408093>

Spiegel  
<https://www.spiegel.de/reise/deutschland/sternenparks-die-besten-adressen-fuer-sterngucker-in-deutschland-a-1284962.html>

Bonn  
<https://bonnstern.wordpress.com/2019/10/03/die-rhon-fulda-zwei-tage-in-sternenstadt-und-sternenpark>

Spektrum:  
<https://www.spektrum.de/news/lichtverschmutzung-schadet-menschen-und-tieren/1676336>

Nationale Pressemeldung  
<https://www.heise.de/newsticker/meldung/Fuenf-Jahre-Sternenpark-Kampf-gegen-Lichtverschmutzung-geht-weiter-4499916.html>

Spiegel  
<https://www.spiegel.de/reise/deutschland/sternenparks-die-besten-adressen-fuer-sterngucker-in-deutschland-a-1284962.html>

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Spiegel

<https://www.spiegel.de/reise/fernweh/sternenbeobachtung-auf-reisen-die-dunkelsten-orte-der-welt-a-1290646.html>

Osthessen-News

<https://osthessen-news.de/n11625637/300-besucher-feiern-eroeffnung-der-himmelsschauplatze-im-sternenpark-rhoen.html>

Fuldaer Zeitung

<https://www.fuldaerzeitung.de/regional/fulda/wissenschaftler-empfehlen-fulda-und-rhon-zum-sternebeobachten-BE9305102?fbclid=IwAR19wIAvck19JRipyA9oUHAcMV7weHHrhK2paljbKBXxpduQctpnlyvXCxM>

## Television

ARD-Tagesthemen (nationwide news magazine)

<https://www.tagesschau.de/inland/sternenstadt-fulda-103.html>

<https://www.ardmediathek.de/ard/player/Y3JpZDovL2Rhc2Vyc3RILmRIL3RhZ2VzdGhlbWVuL2JkNmFkYTNI LTZIN2QtNGZmMy05NDVkLWUzNjZjM2RmYTQ2NQ/tagesthemen> (ab Minute 24:26)

Hessenschau

<https://www.hr-fernsehen.de/sendungen-a-z/hallo-hessen/sendungen/hallo-hessen--der-sternenhimmel-ueber-hessen-,sendung-65982.html> (ab Minute 03:44)

Talkshow SWR Nachtcafe

<https://www.swr.de/nachtcafe/sendung-am-27-nachts-wenn-alle-schlafen/-/id=200198/did=24685934/nid=200198/mvga9q/index.html>

Sternenstadt Fulda aus ZDF logo

<https://www.zdf.de/kinder/logo/sternenstadt-fulda-104.html>

Bayerischer Rundfunk

<https://www.br.de/mediathek/video/freizeit-24032019-sterne-ohne-ende-schmidt-max-sucht-die-verlorene-dunkelheit-av:5c63fb6671a30200184501f8>

Hallo Hessen (live magazine, 3 x studiogest in 2019)

<https://www.hr-fernsehen.de/sendungen-a-z/hallo-hessen/sendungen/hallo-hessen-der-sternenhimmel-ueber-hessen-,sendung-49692.html>

RTL

<https://www.rtl-hessen.de/index.php/beitrag/lichtverschmutzung-fulda-alternativen-lichtsmog-dunkelheit>  
[Merkur München](#)

MDR

<https://www.mdr.de/thueringen/sued-thueringen/schmalkalden-meiningen/rhoen-sternenpark-biosphaerenreservat-100.html>

Hessischer Rundfunk - Garten

[HR- Die Ratgeber – Beitrag Gartenbeleuchtung](#)

<https://www.hr-fernsehen.de/sendungen-a-z/die-ratgeber/sendungen/die-ratgeber--lichtverschmutzung,sendung-62788.html>

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## Radio (small selection)

<https://www.hr2.de/gespraech/kulturgespraech/kulturfruehstueck,epg-kulturfruehstueck-sonntag-404.html>

<https://www.deutschlandfunknova.de/beitrag/international-dark-sky-association-fulda-wird-zur-sternenstadt>

On a regular basis, the Sternenpark Rhön reports about current sky via various radio stations. This is not kept track off.

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Fulda, 30<sup>th</sup> October 2019

This report was compiled by Sabine Frank, B.A., cross-country coordinator of the IDA Dark Sky Reserve UNESCO Biosphere Rhön. Unless otherwise documented, all photos were provided by the employees of the district Fulda and the members of the association Sternenpark Rhön or taken from the press.

If there are any questions, please contact:

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