



Razvoj interaktivnih svetil za ekstremne razmere

Developing
Extreme Environments
Interactive Lighting

Univerza Universitas
v Ljubljani Ljubecensis



Javni štipendijski, razvojni,
invalidski in preživninski
sklad Republike Slovenije



ZAVOD ZA GRADNENŠTVO SLOVENIJE SLOVENIAN NATIONAL BUILDING AND CIVIL ENGINEERING INSTITUTE



Projekt je bil izbran na javnem razpisu »Projektno delo z gospodarstvom in negospodarstvom v lokalnem in regionalnem okolju Po kreativni poti do znanja 2017 - 2020« Ministrstva za izobraževanje, znanost in šport Republike Slovenije, Javnega študentskega, razvojnega, invalidskega in preživninskega sklada Republike Slovenije in Socialnega sklada Evropske unije.

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PROJEKTI PARTNERJI

Univerza v Ljubljani:

Naravoslovnotehniška fakulteta, Fakulteta za strojništvo,
Filozofska fakulteta, Fakulteta za elektrotehniko

Zavod za gradbeništvo Slovenije

SIIPS AD, Splošno izobraževanje, inženiring in poslovno svetovanje, d.o.o.

PROJECT PARTNERS

University of Ljubljana:

Faculty of Natural Sciences and Engineering, Faculty
Of Mechanical Engineering, Faculty of Arts, Faculty of
Electrical Engineering

Slovenian Building and Civil Engineering Institute

SIIPS AD, General training, engineering and business
counseling Ltd

RAZVOJ INTERAKTIVNIH SVETIL ZA EKSTREMNE RAZMERE

Slovenija ima bogato rudarsko tradicijo. Polimineralni rudnik Sitarjevec v Litiji predstavlja geološko naravno vrednoto državnega pomena. Za razlago arheoloških in geoloških vsebin rudnika Sitarjevec sta poskrbeli doc. **dr. Tina Milavec** s Filozofske fakultete in **dr. Mateja Golež** z Zavoda za gradbeništvo Slovenije, ki v širokem naboru svojih dejavnosti združujeta tudi konservatorstvo in restavracijsko. Na Katedri za oblikovanje tekstilij in oblačil z Naravo-

slovnotehniške fakultete so študentje **Aja Knific Košir**, **Mark Cvelbar** in **Miha Žalec** sodelovali z **doc. dr. Tanjo Nušo Kočevar** in **prof. Marijo Jenko**. S pomočjo tridimenzionalnih računalniških programov so oblikovali plašče, zaslone in maske svetilk, ki na različne načine prepuščajo svetlobo. 3D tisk je izdelal **mag. Matej Mihelizza** v laboratoriju Zavoda za gradbeništvo Slovenije. Znanja s področja elektronike in programiranja sta študentom posredovala

doc. dr. Marjan Jenko in **asist. dr. Tomaž Požrl** s Fakultete za strojništvo. Študent strojništva **Jan Rugelj** je v sodelovanju s študentoma **Filipom Gabrovcem** in **Nejcem Pivcem** razvil zasnovano svetlobno animacijo, kjer lučke krmilijo v sistem povezani majhni vgradni sistemi, tj. mikro računalniki. Sistem je odporen na ekstremne razmere v rudniku. Pri umestitvi lučk v rudnik je študente vodil delovni mentor **mag. mag. Gorazd Hafner** iz podjetja Siips AD d.o.o.

DEVELOPING EXTREME ENVIRONMENTS INTERACTIVE LIGHTING

Slovenia has a rich mining tradition. The Sitarjevec poly-mineral mine in Litija contains Slovenia's most prominent geological wealth. Drawing on examples from Sitarjevec, **assist. prof. dr. Tina Milavec** from the Faculty of Philosophy at the University of Ljubljana and **dr. Mateja Golež** from the Slovenian National Building and Civil Engineering Institute introduced archeological and geological principles of conservation and restoration. **Aja Knific Košir,**

Mark Cvelbar and **Miha Žalec**, students from the Faculty of Natural Sciences and Engineering, collaborated with **assist. doc. dr. Tanja Nuša Kočevar** and **prof. Marija Jenko** on mine-inspired lighting design. Using three-dimensional computer design, different lampshades for various light effects were created and then printed in the Institute by **Matej Mihelizza, M. Sc.** Electrical programming and engineering were completed by **assist. prof. dr. Marjan**

Jenko and **assist. dr. Tomaž Požrl** from the Faculty of Mechanical Engineering. Their student **Jan Rugelj**, in collaboration with **Filip Gabrovec** and **Nejc Pivec**, developed the embedded computer system, which controls the light arrays that animate the mine lighting. The system was carefully protected from the extreme conditions found in the mine. It was installed in the adverse environment by **Gorazd Hafner, M. Sc., M. Sc.**, from the Siips AD Company.





Oblikovanje svetil

Likovna zasnova svetil, ki so jo navdihnile arheološka, naravna in rudniška dediščina, celovito in izvirno nadgrajuje pestro vsebino mladega, v muzej spremenjenega rudnika Sitarjevec s sodobnim umetniškim pristopom k milijone let staremu geološkemu razvoju. Svetila vzbujajo začudenost in porajajo vedno nova vprašanja o nastanku kamnin, mine-

ralov in življenja. Na drugačen način izobrazujejo ne samo o rudarski tradiciji, ampak tudi o udejanjanju nenavadnih zamisli, ki se v začetku zdijo nemogoče. S premislekom, pogovorom in študijem pa postopoma postanejo resničnost in celo zrejo v prihodnost, ko bo rudnik Sitarjevec zaživel kot sodobni učni center za mladino in druge obiskovalce.

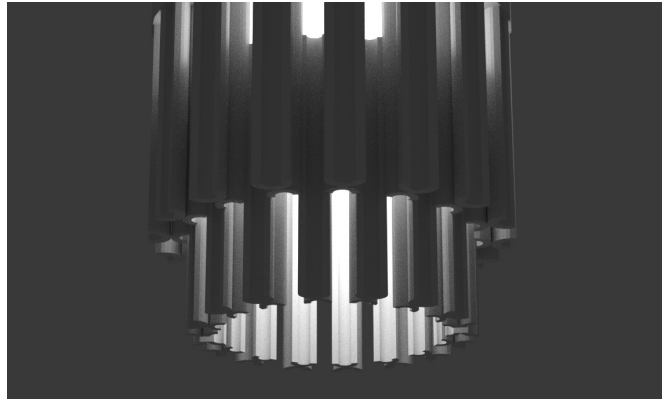
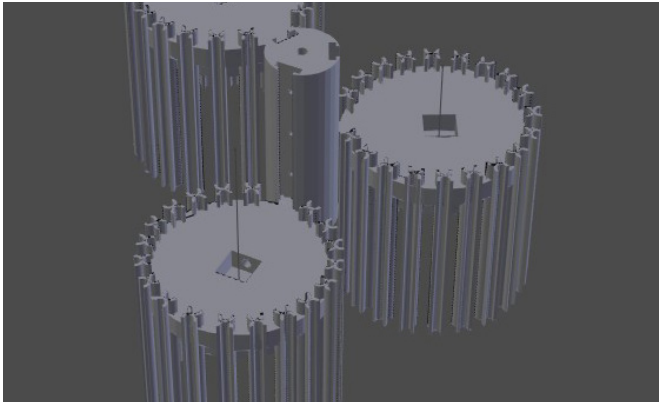
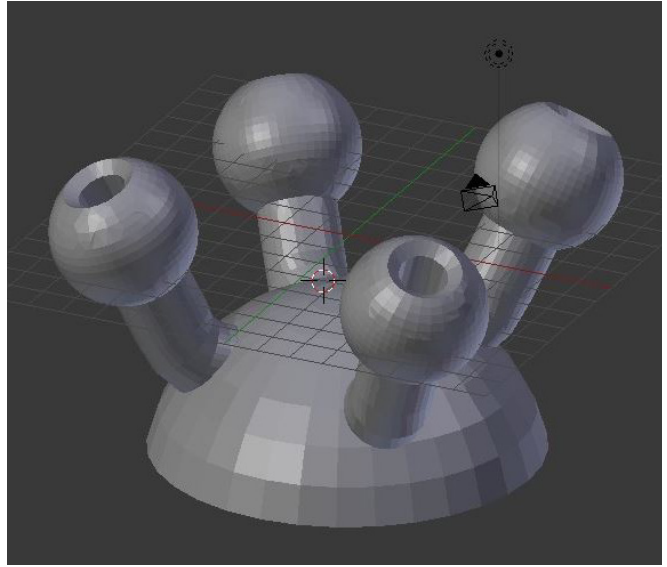


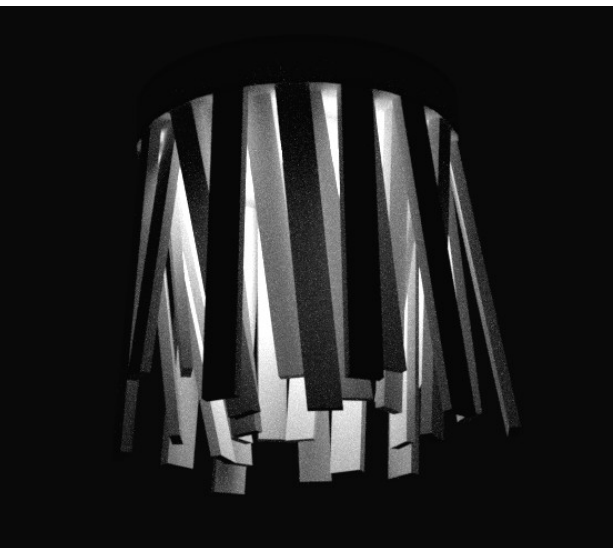
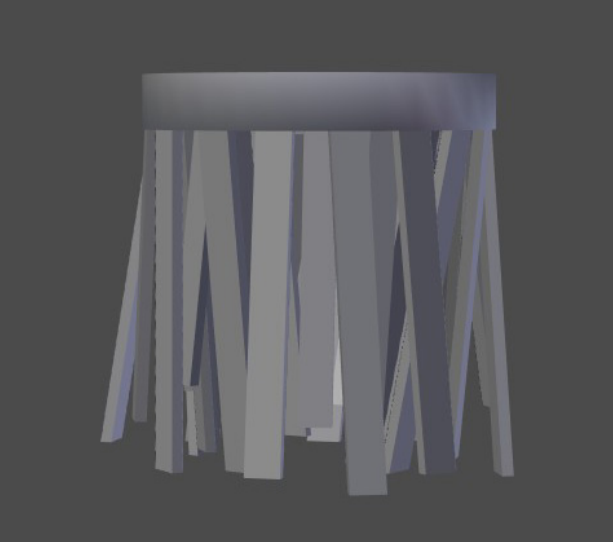
Lighting Design

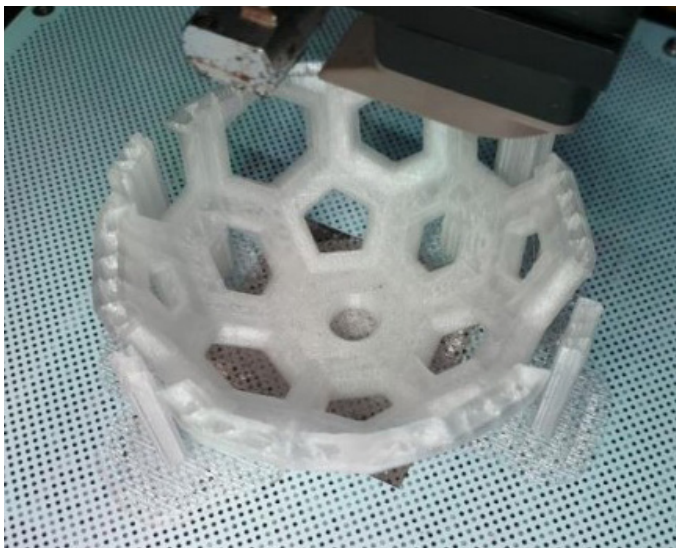
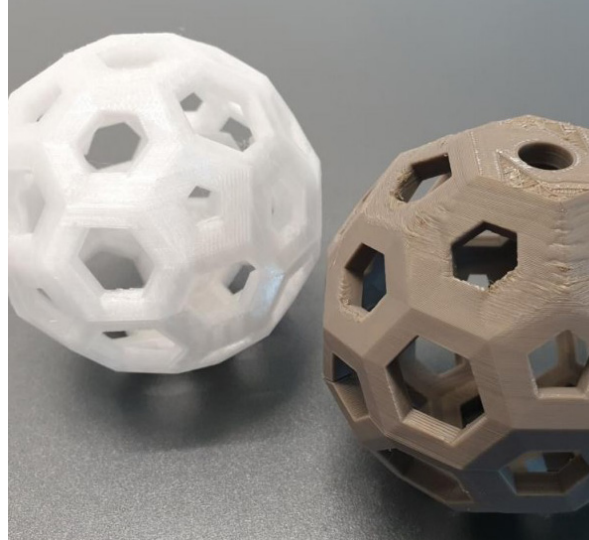
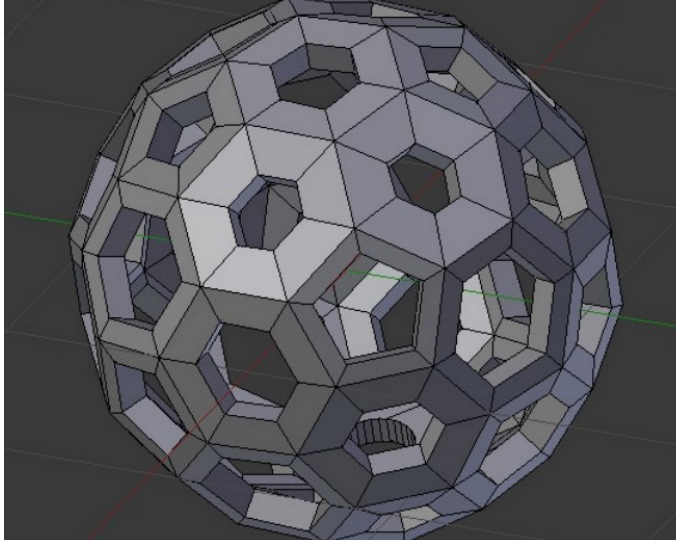
The concept of artistic lamps, inspired by archeological, natural and mining heritage completes the variegated content of the Sitarjevec mine as a museum that shows a new approach to a geological inheritance millions of years in development. The colourful lights created by these lamps are astonishing. They reflect on the origins of stones and minerals, and life itself. They pose continuous-

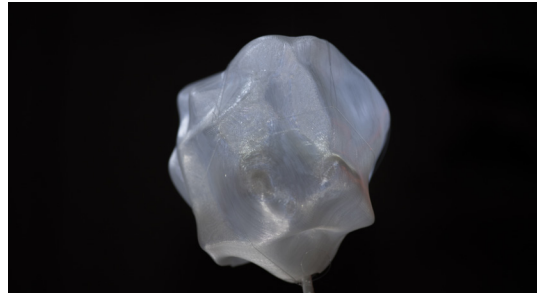
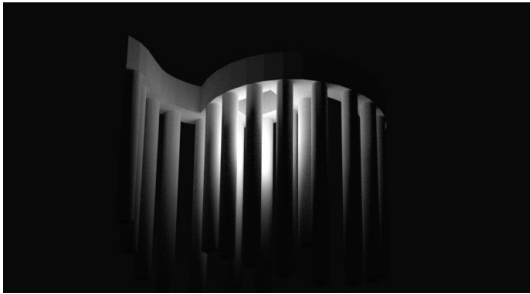
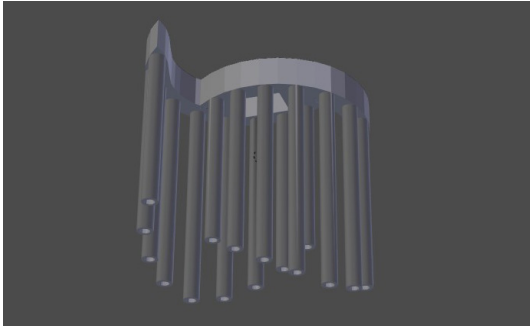
ly evolving questions to the observer; where are we, why are we here, and how did it all start? The lighting experience not only educates about mining tradition, but also about how initially insurmountable ideas can be executed with perseverance, research and science. One such idea is the transformation of the Sitarjevec mine into a contemporary youth educational centre and visitor centre.









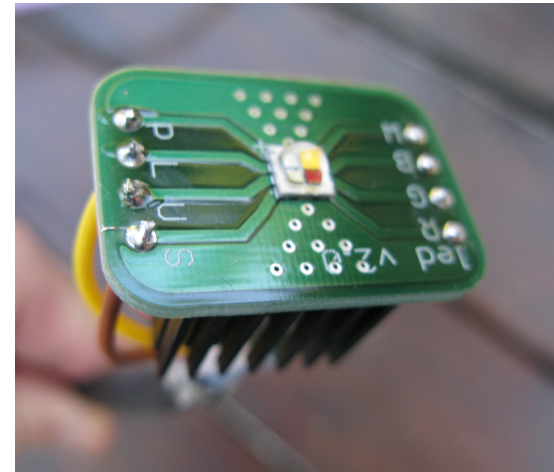




Vgradni sistem

Obnašanje lučk je delno programirano vnaprej, različni svetlobni učinki pa nastanejo tudi s pomočjo zaznaval, ki spremljajo aktivnosti v prostoru. V različnih časovnih presledkih se spreminjajo svetlost in barvni odtenki lučk. Krmilniki lučk, tj. majhni vgradni sistemi so povezani v sistem, ki je odporen na ek-

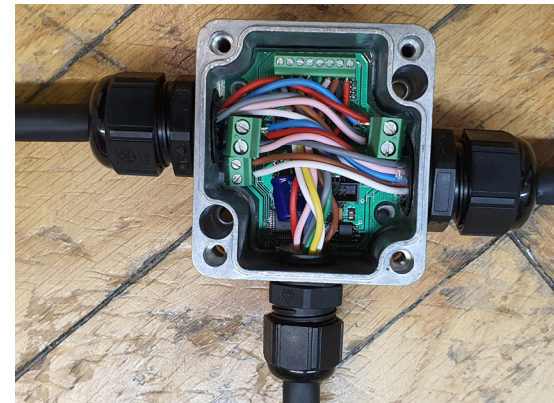
stremne razmere v rudniku. Lučke so različnih oblik, velikosti in prosojnosti; postavljene so na različnih mestih po prostoru, zato ima tudi svetloba iz lučk raznoliko pojavnost. Izhaja iz naravnega ambienta, a njegove pomenske in vidne lastnosti združuje v novo celoto, ki se v obliki svetlobnih učinkov vrača nazaj vanj.

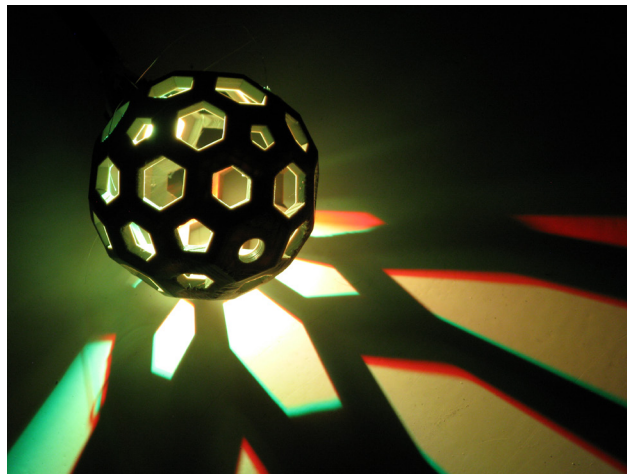
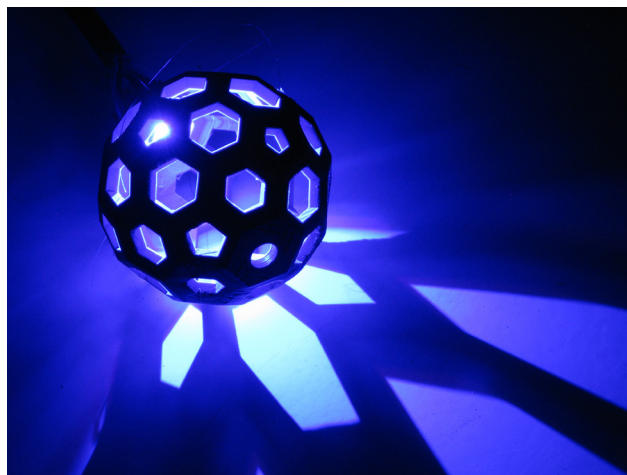
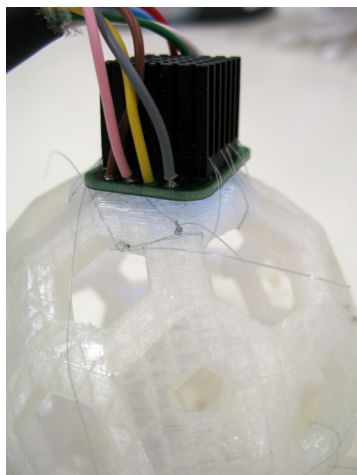


Embedded Systems

The lighting sequences are partly programmed in advance. Additional varied lighting effects are made by use of sensors that detect activity in the surrounding space. Lights are connected in a system which is governed by small embedded systems. The whole system is water-resistant. It is adapted to the extreme adverse environment of the mine. The lamps are of different shapes

and sizes, with solid or translucent shells. They are strategically positioned in different areas of the mine's room to optimize the variety of effects displayed. The lamps' design is derived from the natural ambient of the mine. It merges the mine's visual and metaphorical features into a new entity that melds itself back into the mine using lighting effects.





Umestitev svetil v rudnik

Postavitev lučk je poklon rudarjem, povzema lepoto in neulovljivost vesolja. Svetlobni dogodek predstavlja nadgradnjo vsebin, ki v tem prostoru že potekajo in iščejo možnosti za nove turistične in izobraževalne dosežke.

Projekt, ki predstavlja nadgradnjo mednarodnega projekta VirtualMine, je bil usmerjen k razmisleku o

pomenu svetlobe za delo v rudniku z umetniško interpretacijo. V popolni temi svetloba pokaže in poudari detajle opustele podzemne arhitekture, ustvari svojskost prostorov, jim nadene prijaznejši izraz ter vnese v obisk rudnika nemir. V sinhroniziranem svetlobnem performansu se metaforično zmešajo svetlobni odsevi

lučk in sence sedimentnih nanosov in kapnikov. Tu in tam se najde tudi kapljica živega srebra ali kristal barita. Roj umetnih kresničkov, ki osvetljujejo same sebe in hkrati tudi bližnjo okolico, lebdi nad razbrazdanim kamnitim ostenjem, po katerem nenehno polzi voda in ga oblaga z limonitno oblogo od temno rjave do živo rumene barve.

The Mine Light Installation

The light installation was created to pay tribute to miners. It aims to represent the beauty and elusiveness of the universe. The light feature adds a new opportunity to the list of contents and activities already existing in the mine. The Litija community is seeking to improve tourism and educational potentials of the Sitarjevec mine.

This project that supplements the international project VirtualMine is focused on conceptual upgrade of the

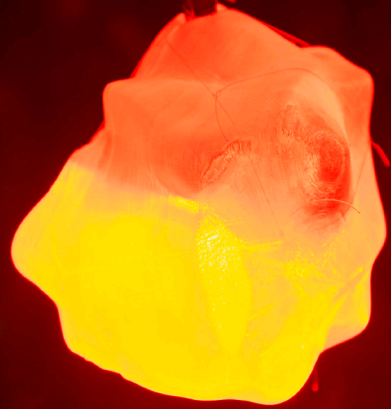
background lighting in the mine as a whole. The light illuminates exquisite details of the abandoned underground architecture, creates a unique atmosphere, frames the details and adds a new impression at every visit. A “normal” white light is used in most spaces, but in a special cul-de-sac gallery an artistic interpretation as a synchronized colorful light performance has been created. Various lampshades are projected onto natural relief surfaces, which are covered

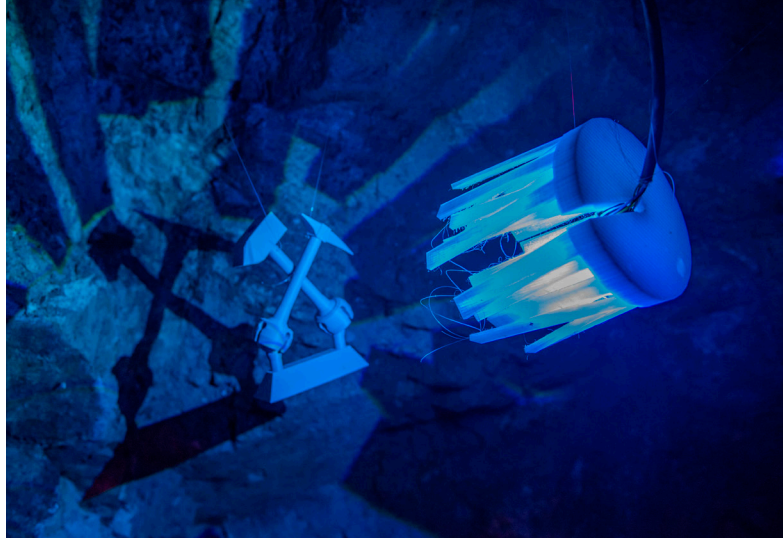
with sediment deposits, where the light projection interacts with stalactite and stalagmite shadows. Occasionally the light reveals a drop of mercury, caught between rocks. Or it may shine through a barite crystal. A swarm of artificial fireflies illuminates the surroundings with floating colors on the ridged stony gallery walls. Water, rich with iron, drips down the wall and deposits brown and yellow ochre limonite rust.















Katalog projekta - elektronska verzija
**RAZVOJ INTERAKTIVNIH SVETIL ZA EKSTREMNE
RAZMERE**

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