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Richard CHAPIN

Interstellar Light Collector

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Jeff Topping

Light from a full moon is reflected off the 'Interstellar Light Collector' (R) onto people in a moveable trailer (small lighted object in center of photo) in the Sonoran desert near Three Points, Nov. 23, 2007.

Financial advisor Jaron Ness stands in the cool desert air waiting for the clouds to clear and the moon to rise.

As the conditions come into alignment, he steps into the path of a cool blaze of blue-white light bounced off a wall of highly polished parabolic mirrors five stories high.

"It feels magnetic," he says, turning his hands slowly in the reflected glow of the light from the almost full moon.

The young professional from Colorado is among a growing number of curious people beating a path to this patch of scrub-strewn land out in the Arizona desert to bask in light from the world's first moonbeam collector.

A Tucson-based inventor and businessman Richard Chapin and his wife Monica are behind the giant device, which gathers up and focuses the light of the moon.

The effect of the moon's gravitational pull on the Earth's tides and other natural phenomena has been studied for millennia. Less attention has focused on the sunlight reflected from its surface.

The Chapins built the large, one-of-a-kind contraption that stands in the desert some 15 miles west of Tucson, Arizona, in the belief that moonlight might have applications for medicine, industry and agriculture.

"So much work has focused on the sun. We have just forgotten about this great object that has been here for billions of years, has affected us in all forms of our evolution," said Chapin, who paid for the project with his own money.

"If it could affect plants and animals ... I thought, 'what could the amplification of that light do?'"

BATHING IN MOONLIGHT

Neither of the Chapins are scientists. The couple used income from a popular swap meet they own in Tucson to develop what they call their "Interstellar Light Collector," which has so far cost them $2 million.

It consists of a large frame sunk into a 45-foot-deep crater, on private land in sparse desert, in an area known for its dark skies a few miles from the Kitt Peak National Observatory.

The device is five stories tall and weighs 25 tons, and is covered with 84 mirrored panels set on a hydraulic mount that, the Chapins say, can focus the light of the moon with "the precision of a Swiss watch."

There is no charge to use the facility, although the couple accept donations of $10 from people who use it to defray some of the operating costs.

So far they have had more than 1,000 visitors, with interest from as far a field as Australia, Japan, India and Saudi Arabia from people seeking either a new experience or in the hope of some kind of medical benefit.

Some dress in robes, others strip to their underwear to bask in the moon glow from the glittering bank of mirrors, spending anywhere from three minutes to 15 minutes at a time.

Visitors enjoy the experience. Some say it is like swimming underwater, while others say it feels like standing in a warm breeze and leaves them feeling upbeat.

"When I got in the moonlight it was an instant and profound sense of euphoria ... it was very peaceful," said Eric Carr, a hypnotherapist from Tucson who has visited several times.

BENEFITS OF LIGHT

Some visitors to the site believe that exposure to the moonlight has helped alleviate some medical conditions. After bathing in the moonbeams, Carr said he noticed an improvement in a long-standing asthma condition.

However, no clinical experiments with moonlight have been carried out on people. Scientists say there is no proof that it has any effect whatsoever on medical conditions and diseases, and are skeptical of anecdotal claims.

"I haven't seen any hard scientific evidence that it's not a placebo effect. There hasn't been enough real research on it yet to say that it's doing anything," said Katherine Creath, research professor of optical sciences and medicine at the University of Arizona.

"But whether or not it's the placebo effect or the light, I don't think that matters as long as people feel like they are having a positive effect, then it's worth it to them to do it," she added.

The Chapins are eager for researchers to use the site to determine if moonlight does have any demonstrable applications in areas including medicine, plant biology and certain industrial processes. They also welcome visits by skeptics to the site.

Meanwhile, visitors continue to trek out to the imposing installation and listen to ambient music as they wait for a break in the clouds to step into the moonlight. For them, it is a very enjoyable experience in itself.

"You feel almost like you are in heaven," said Aranka Toniatti, a cancer patient who has driven from Colorado twice to stand in the moonlight. "It's a gorgeous feeling."

Interstellar Light Collector

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Abstract --- Devices and methods that collect, concentrate, and disperse celestial light into spectra of different wavelengths by utilizing a large collection mirror and a means for dispersion located at a focal point.

Correspondence Name and Address:
QUARLES & BRADY STREICH LANG, LLP
ONE SOUTH CHURCH AVENUE, SUITE 1700
TUCSON, AZ 85701-1621

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Description

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The invention is directed generally to devices and methods for collecting and concentrating light emanating from outer space and celestial bodies, including, but not limited to, stars, planets, moons, and comets. More specifically, the invention involves interstellar light collection apparatus and methods for collection, selection of component wavelengths (e.g., through dispersion), and application of interstellar light to matter for investigative purposes.

[0003] 2. Background of the Invention

[0004] Since the dawn of time, "light" (i.e., the electromagnetic spectrum) has been instrumental in everything from photosynthesis to modern photography. Solar light has been harnessed in photovoltaic cells to create electricity, light has been manufactured artificially to promote plant growth, and even non-visible light has been used in various medical applications such as X-rays and tumor detection devices.

[0005] Indeed, a large quantity of background reading is available on the subject of the industrial and medical application of light (see, for example, National Research Council, Harnessing Light. Optical Science and Engineering for the 21.sup.st Century, National Academy Press, 1998; Kaler, James B., Stars and Their Spectra: An Introduction to the Spectral Sequence, Cambridge University Press, 1989; Scranton, Bowman, & Peiffer, Editors, Photopolymerization: Fundamentals and

Applications, American Chemical Society, 1996; and Kalyanasundaram & Gratzel, Photosensitization and Photocatalysis Using Inorganic and Organometallic Compounds, Kluwer Academic Publishers, 1993).

[0006] Current technologies for collecting celestial light involve the use of "light buckets," i.e., optical receiving telescopes that collect photons but are not diffraction limited. In other words, a light bucket cannot concentrate photons into a very small tightly focused spot.

[0007] Accordingly, light bucket technologies are hampered by the inability to concentrate light as would be useful in various methods of application, such as lasers. Moreover, traditional telescopes do not provide a means for dispersing focused light into component spectra for industrial or medical experimentation and application.

[0008] Thus, there exists a need for methods and devices for improved collecting, concentrating, and dispersing celestial light.

SUMMARY OF THE INVENTION

[0009] The invention relates in general to devices and methods for celestial light collection, concentration, and application. More specifically, the invention includes devices and methods for collecting, concentrating, and separating celestial light of different wavelengths and frequencies by utilizing a collection mirror and a means for dispersion located at a focal point.

[0010] It is the intended use of the inventive device to collect and harness interstellar light in order to utilize the uniqueness of its spectra for the benefit of humankind through various applications. Hence, the invention will collect, harness and apply the spectrums and intensities of the stars and other celestial bodies, which are notably different from the spectrum of the sun, and furthermore cannot be duplicated anywhere on earth.

[0011] This invention builds upon the principles and technology of basic telescopes. Instead of merely looking upon celestial bodies from earth, the present invention collects and concentrates light from celestial bodies down from the heavens and separates that light into various spectrums.

[0012] In one embodiment, the inventive method includes the steps of collecting light from a celestial source by utilizing a mirror, focusing the light collected by the mirror to a focal point, dispersing the focused light utilizing an aperture located at the focal point, and exposing terrestrial matter to at least a portion of the dispersed light.

[0013] Thus, it is a primary objective of the invention to provide a celestial light collector for concentrating and selecting light from celestial sources.

[0014] Another embodiment of the invention relates to a celestial light collector that includes a mirror, a focus cage disposed along a focal axis of the mirror, and a means for dispersing celestial light reflected by the mirror, wherein the means for dispersing is located along the focal axis and housed within the focus cage.

[0015] In another embodiment of the invention, a fresnel lens adapted to refract celestial light within a focus cage is utilized as, or in addition to, the means for dispersing. Alternatively, the means for dispersing light includes a lens between 0.5 and 8 millimeters in thickness or a prism.

[0016] Preferably, the mirror of the embodiments above is a polycarbonate parabolic mirror that is between 0.5 and 1.0 millimeters in thickness. Also preferably, the mirror is an altitude-azimuth off-axis segmented mirror that is between 2,000 and 4,000 square feet in size.

[0017] An aspect of the invention is that celestial light travels unobstructed into the focus cage, which may be disposed upon a rotating base member to better align with the mirror/collector. Moreover, the mirror itself in an embodiment of the invention is made rotatable by being disposed upon a rotating base member. Preferably, the rotating base member is a vertical axis azimuth stewing ring disposed atop a concrete pad.

[0018] Given the wind shear and other potential constraints on utilizing large exposed mirrors (i.e., mirrors not housed within a structure such as a building or silo), the mirror preferably is disposed within a topographic depression, the depth of which is equal to at least one-third of the height of the mirror.

[0019] Another embodiment of the invention features a celestial light collector that includes a parabolic mirror supported by a structure including struts and at least a pair of slewing rings such that the structure is rotatable in a horizontal plane, a focus cage disposed along a focal axis of the mirror, and a means for dispersing celestial light reflected by the parabolic mirror, with the means for dispersing located along the focal axis and housed within the focus cage.

[0020] In accordance with these and other objects there is provided new and improved devices and methods for collecting, concentrating, and selecting celestial light spanning light spectra of electromagnetic radiation (e.g., infrared, visible, and ultraviolet light).

[0021] Various other purposes and advantages of the invention will become clear from its description in the specification that follows. Therefore, to the accomplishment of the objectives described above, this invention includes the features hereinafter fully described in the detailed description of the preferred embodiments, and particularly pointed out in the claims. However, such description discloses only some of the various ways in which the invention may be practiced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] **FIG. 1** is a schematic side elevational view of an apparatus of the invention.

[0023] **FIG. 2** is a schematic side elevational view of a second embodiment of the invention.

[0024] **FIG. 3** is a front elevational view of a third embodiment of the invention.

[0025] **FIG. 4** is a cross-sectional detail view along line 4-4 from FIG. 3 showing the layer composition of a preferred mirror segment.

[0026] **FIG. 5** is a block diagram illustrating method steps of the invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0027] The invention relates in general to devices and methods for collecting, concentrating, and separating celestial light of different wavelengths and frequencies by utilizing a relatively large collection mirror and a means for dispersion located at a focal point. As such, the invention does not provide images of celestial objects.

[0028] The section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described. All references cited in this application are expressly incorporated by reference for any purpose.

[0029] The term "celestial light" refers to light or electromagnetic spectra originating from somewhere other than the earth and covering the entire range from ultraviolet to infrared.

I. Celestial Light Collectors

[0030] FIG. 1 is a side elevational view of a first embodiment of the invention. Shown is a celestial light collector 2 that includes a mirror 3, preferably of parabolic configuration and manufactured of polycarbonate between 0.5 and 1.0 millimeter in thickness, supported by a substrate 5 and made rotatable by pivot 6. The pivot 6 is disposed horizontally on a stand 8, which is joined to a rotatable base 10 in a pad 11 of, preferably, cement. The pivot 6 and base 10 allow the mirror 3 to be adjusted in both the vertical and horizontal planes.

[0031] A focus cage 12 is disposed along a focal axis A of mirror 3 and positioned a distance from the mirror corresponding to a focal point f.sub.p. Located along the focal axis A and housed within the focus cage 12 is a means 14 for dispersing celestial light reflected by the mirror 3. Preferably, the means 4 for dispersing light is located at the focal point f.sub.p, thereby concentrating the spectrum before dispersion takes place. Exemplary means for dispersing light include, but are not limited to apertures, such as filters, lenses, diffraction gratings, and prisms.

[0032] Although not shown in this figure, the collector 2 may further include a fresnel lens and/or a parabolic mirror adapted to refract celestial light within the focus cage.

[0033] In order to collect and concentrate a large amount of light, the collector 2 must be relatively large. Preferably, the mirror 3 is actually a segmented array made up of many smaller mirror areas that total between 2,000 and 4,000 square feet. Given this large size, the focus cage 12 and mirror 3 preferably are not co-located within a common building. Indeed, for the collector illustrated by FIG. 1, there is 100 feet of open distance between the mirror and the focus cage. Accordingly, the distance between the focus cage and mirror such that the cage can be located at a focal point will necessarily depend on the mirror size.

[0034] In this regard, the focus cage 12 preferably is mobile. Mobility may take the form of rotation, such as that achieved by having the focus cage 12 disposed upon rotating base member 16, or, for example, by attaching the cage to a track system (not illustrated) such that it may move toward or away from the mirror 3 or concentrically around the mirror as the mirror rotates.

[0035] Unlike spectroscopes, the collector of the invention does not rely on slits or diffraction gratings to separate light into component wavelengths, and the celestial light collected by the mirror does not pass through analytical instrumentation, such as a photomultiplier or photodetector. Moreover, in contrast to spectroscopes, the invention concentrates interstellar light before dispersion into component wavelengths takes place.

[0036] To reduce stress such as wind shear upon the invention, the collector 2 preferably is disposed within a topographic depression, the depth of which is equal to at least one-third of the height of said mirror. However, in the embodiment illustrated in FIG. 1, the collector 2 is disposed in a depression that is approximately sixty feet deep from ground level, which well exceeds one-third of the mirror height (also about sixty feet).

[0037] Turning to FIG. 2, a light collector array 20 of the invention is shown. The collector array 20 includes a parabolic mirror 22 housed within a structure of struts 24, with a pair of slewing rings 26 disposed at each end of the parabolic mirror 22. The slewing rings 26 provide for attitude control, and, moreover, allow light reflected from the mirror to travel unobstructed to the focus cage 30 along an optical axis B. The focus cage 30 is a building that will preferably contain research subjects, organic and inorganic matter, etc., onto which light may be applied.

[0038] Preferably, the structure of struts 24 is mounted upon a rotatable base 32, such as a vertical axis azimuth stewing ring 34 bolted atop a concrete pad 36. Also preferably, the focus cage 30 is disposed along focal axis B of the mirror 22 such that a means 38 for dispersing celestial light reflected by parabolic mirror 22 is located at a focal point (f.sub.p2) that is housed within the focus cage.

[0039] As a result of locating the dispersion means 38 at focal point f.sub.p2, concentrated light is separated into component wavelengths (e.g., .lamda..sub.1, .lamda..sub.2, .lamda..sub.3). One or more of the component wavelengths are then used to expose matter (in this case biological matter 40), thereby ascertaining the effects of a spectrum of light not found on the earth. The concentrated light may further be manipulated by, for example, fresnel lens 41 or prism 42 before matter exposure.

[0040] Preferably, the collector 20 has only a single mirror to reflect light to the focus cage 30, allowing light to travel unobstructed thereto. Also preferably, the means for dispersing light includes a lens between 0.5 and 8 millimeters in thickness.

[0041] Turning to FIG. 3, a third embodiment of a mirror of the invention is shown.

[0042] Mirror 44 is composed of an array of segments 46 and is preferably parabolic in shape. The segments 46 are surrounded by a drive ring 48 that is in rotational contact with altitude yoke 50 via rollers 52. The altitude yoke 50 preferably surrounds the drive ring 48, although only a cut-away portion is shown in this particular illustration.

[0043] The segmented design allows the construction of relatively large mirrors, i.e., 20-80 feet in diameter. Given this relatively large mirror size, the concentration of interstellar light is believed to be well beyond known collectors, in that the concentrated light is at least five orders of magnitude brighter than a single object viewed.

[0044] FIG. 4 is a cross-sectional view of an individual mirror segment. A thin (e.g., 0.5 millimeter) plastic mirror 56 (e.g., polycarbonate) is laminated onto a foam substrate 58. The foam substrate may include, for example, a five centimeter slab of urethane. The foam substrate layer 58 is further laminated onto a rigid panel 60, such as aluminum sandwiched between fiberglass for good thermal conductivity.

II. Methods for Concentrating and Selecting Celestial Light by Wavelength and/or Frequency

[0045] As summarized in FIG. 5, the inventive method for collecting celestial light includes the steps of collecting light from a celestial source by utilizing a mirror, focusing the light collected by the mirror to a focal point, dispersing the focused light utilizing an aperture located at the focal point, and exposing terrestrial matter to at least a portion of the dispersed light.

[0046] In some applications, the method of the invention may further involve collimating the collected and/or dispersed light, utilizing a fresnel lens, or utilizing a polycarbonate parabolic mirror prior to dispersion. Preferably, the mirror comprises a polycarbonate mirror structure that is between 0.5 and 1.0 millimeters in thickness and is disposed upon a mobile supporting structure. Moreover, the focal point aperture preferably is a lens between 0.5 and 8.0 millimeters in thickness.

[0047] In other applications, the concentrated interstellar light is collimated and further pinpointed to less than a millimeter by using fresnel lenses or parabolic mirrors. In still other applications, the collimated light is pulsed or strobed. Due to the barriers, such as the atmosphere, and the relatively weak intensity of un-concentrated interstellar light, the method presents a unique opportunity to expose biological matter to previously unknown spectra.

III. Applications of Collected and Concentrated Celestial Light

[0048] In certain embodiments, methods for applying concentrated and selected celestial light are contemplated.

[0049] 1) Medical: [0050] A) Photo Dynamic Therapy--Using light to treat cancer, detect tumors, and to treat skin diseases such as psoriasis. Other uses would be to treat ailments such as Seasonal Affective Disorder or clinical depression. [0051] B) Surgery--Using light to develop new technologies for minimally invasive therapies, methods that reduce trauma involved with traditional surgical techniques. [0052] C) Optical Diagnostic Techniques--In this field, light has such applications as blood monitoring, retinal photography, and glucose monitoring in diabetes.

[0053] 2) Entertainment: [0054] A) LASER Light Shows--Entertaining light shows, often choreographed with music, such as those seen at hotels and casinos in Las Vegas, Nev., or at amusement parks. [0055] B) Holograms--Including advancements in reversible holography and switched holographic gratings.

[0056] 3) Agriculture [0057] A) Germination: Using light to stimulate or inhibit the growth processes, such as photoblastic stimulus of seeds. One potential use would be longer seed dormancy. [0058] B) Phytochromatic Stimulus: Using light to control responses of the photoreceptor phytochrome in plants, in order to stimulate desired growth patterns. [0059] C) Vegetative Stimulus: Using light to stimulate the major growth receptors in plants, such as cytokinine, in order to achieve desired effects.

[0060] 4) Industry: [0061] A) Photopolymerization: Currently, there are a myriad uses for photopolymerization. Four such applications would involve using light to create the following: plastics that are more durable, adhesives, sealants, and metal coatings. [0062] B) Photolithography: Using light essentially as an enabler in integrated circuit processing. [0063] C) Optical storage: Using light to enable existing technologies, such as compact disks, to store more information. [0064] D) Printing Materials: Including pre-press proofing systems, printing inks, printing plates, and the production of Braille materials.

[0065] 5) Scientific Research: [0066] A) Photochemistry: Including experimentation through photosensitization and photocatalysis. [0067] B) Photoelectric Effect

[0068] The invention, having been described above, may be better understood by reference to examples. The following examples are intended for illustration purposes only, and should not be construed as limiting the scope of the invention in any way.

PROPHETIC EXAMPLES

Example 1

[0069] Celestial light is concentrated and selected for application to the skin of a test subject suffering from depression. This can be achieved with as little as 30 min. of very bright light near 10,000 lux or with a couple hours of light of about 2500 lux so as to simulate an average daily exposure for light, i.e., 250 or more lux for a sunny location.

Example 2

[0070] A theory has been developed that celestial pure light, being comprised of alpha particles, ions, protons and neutrons, is different than artificially produced light; and, that this light comes in various wavelengths and frequencies and therefore various colors. The invention could be used to test this theory by collecting, concentrating, and dispersing celestial light so that its color, wavelength, and frequency can be studied and compared with artificially produced light.

Example 3

[0071] A theory has been developed that the effects of the celestial pure light on the growth of various polymers and crystals will result in important shapes, sizes and structures in the industrial and scientific communities. This theory would be tested by exposing polymers and crystals to different wavelengths and intensities of celestial light collected, concentrated, and dispersed according to the method of the invention.

Example 4

[0072] A theory has been developed that celestial light will have profound effect on the chromophores in plants, and also the phytochromes, yielding various growth factors. To test this hypothesis, plant matter will be exposed to different wavelengths and intensities of celestial light collected, concentrated, and dispersed according to the method of the invention.

Example 5

[0073] A theory has been developed that utilizing the various wavelengths and frequencies of the celestial bodies will show results that are different than what is being researched in reference to porphyrins. In particular, we propose to expose porphyrins to different wavelengths and frequencies of celestial light collected, concentrated, and dispersed according to the method of the invention.

[0074] Various changes in the details and components that have been described may be made by those skilled in the art within the principles and scope of the invention herein described in the specification and defined in the appended claims. For example, the mirror of FIG. 3 may instead be trapezoidal in configuration. Therefore, while the present invention has been shown and described herein in what is believed to be the most practical and preferred embodiments, it is recognized that departures can be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent processes and products.