外国語電子教材作成支援

科目名：極限環境デザイン

Design Solution for Extreme Environment

オオニシタクヤ

環境情報学部

ALOXYGEN
~Earth Homing Your Mars Life~

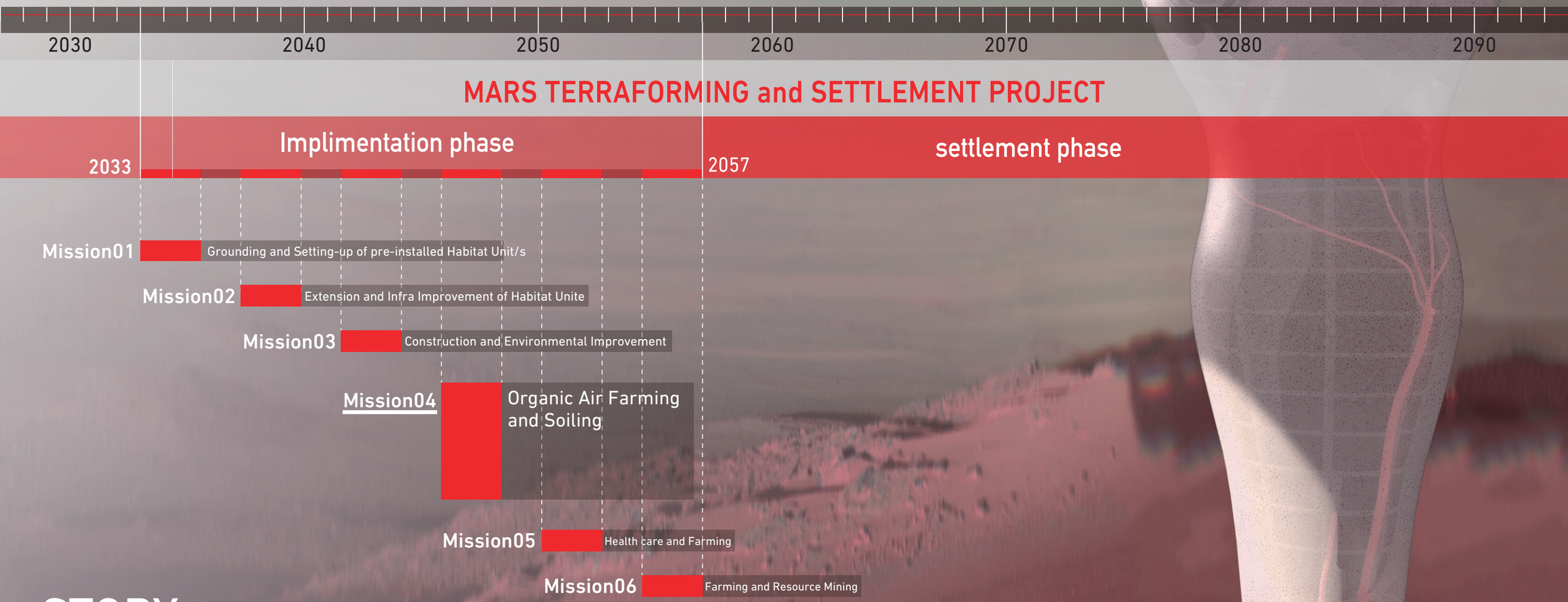
MARS Settlement Project

Built upon a legacy of robotic missions, “Earth Homing” is the pioneering transformation of the Martian environment. It will create a healthy, safe, and habitable location for Humankind to settle by 2057.

01

ALOXYGEN = ALGAE + OXYGEN

ALOXYGEN serves Earth quality natural Organic fresh air for settler on Mars. ALOXYGEN also can produce nutritious food, bio-petroleum and compost every 2~3 weeks constantly. This system is going to be developed on terraforming in the future.



STORY

MTSP (Mars Terraforming and Settlement Project) is the most ambitious frontier project in human history. The idea behind MTSP is to transfer Humankind to Mars, settling them there safely and healthily. The expected completion date for Mars’ transformation into an ‘Earth Homing’ colony is 2088.

This colony must achieve a self-sustaining environment with a minimum of initial resources and supplies from Earth. 40% of food will thus be grown locally, 80% of the air and water-supply will come from recycling and percolation systems, and 100% of all energy resources will be generated on Mars.

To complete this transformation, MTSP is divided into two phases. Phase I is called the ‘Implementation Phase’ and Phase II the ‘Settlement Phase’ . The ‘Implementation Phase’ will be completed by specially trained crews over the course of six Mars missions from 2033 to 2057. They will spearhead ‘Earth Homing’ by installing habitable units, basic infrastructure, transportation, farming-soil and energy solutions. These installations will pave the way for non-trained settlers arriving in the “Settlement Phase”.

Each First phase mission has a duration of 31 months and consecutively they streamline Humankind’ s transition to Mars.

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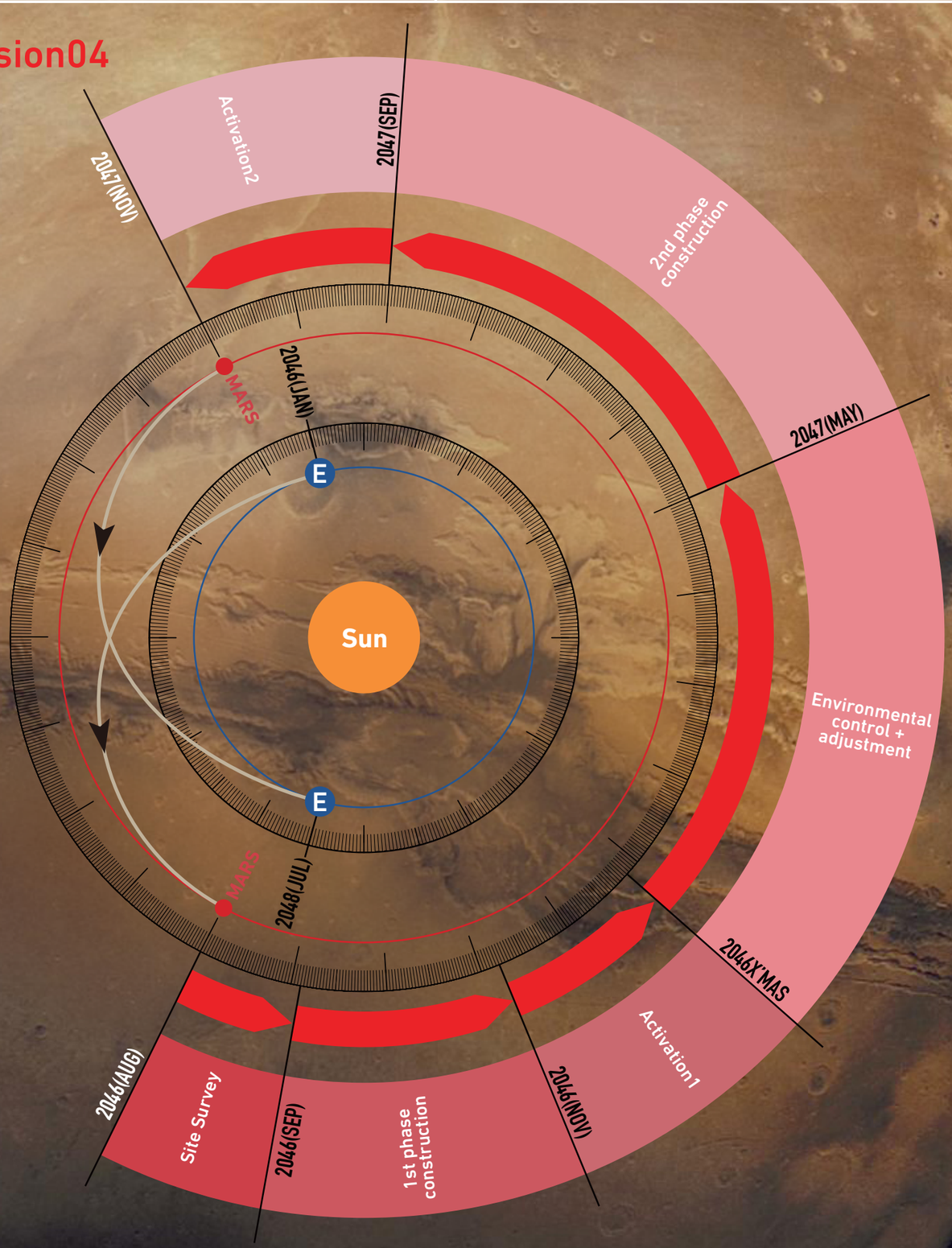
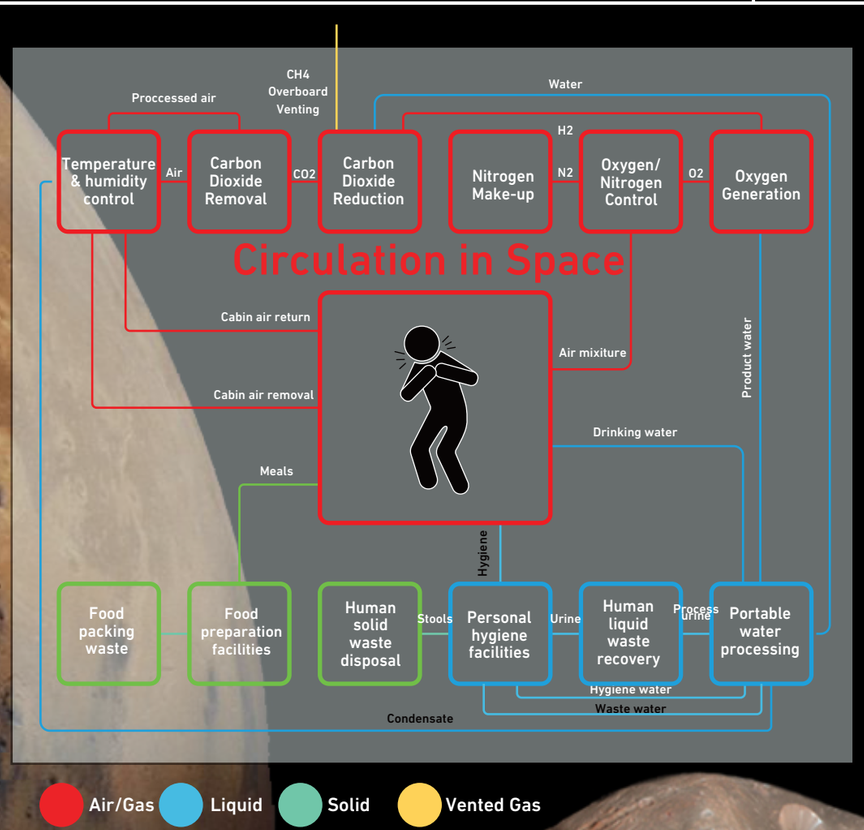
Suffocation on MARS

Previous projects on Mars suffered from mysterious symptoms of suffocation. Mission4 now journeys toward Mars to solve this problem.

Mission04





Suffocation

During previous Mars missions, many crews reported symptoms of suffocation. According to different analyses of the past three missions, many crew members, working very hard under pressure, often reported symptoms of suffocation. With scientifically-certified fine air circulating within all rooms, environmental researchers failed to find any corresponding causes for their symptoms and it remained a mysterious phenomenon for many years. Following analysis undertaken by psychiatrists, the research team finally found that the 'AIR' itself was the cause of the problem.

In artificially controlled rooms, the heavy workloads and intense schedules of crew members left a feeling of oppression. We are simply not created to endure such surroundings and our mental state is not designed for lengthy exposure in artificial environments without nature. In our planetary history, Humankind has never found itself isolated from nature. Existing 'environmental control' and absolute 'life support' systems created sealed environments which eventually cause suffocation.

Mission4 is now journeying towards Mars to solve the suffocation dilemma. Their mission is scheduled to last 31 months from initial departure to Mars, until a safe return to Earth. Duration for the outward and return-trip between the two planets is approximately 8 months on the Hohmann Transfer Orbit leaving a 15 month working mission window on the Martian surface.

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Algae Solution

On outer space missions, Algae is undoubtedly the best organism to take with you to ensure your survival.

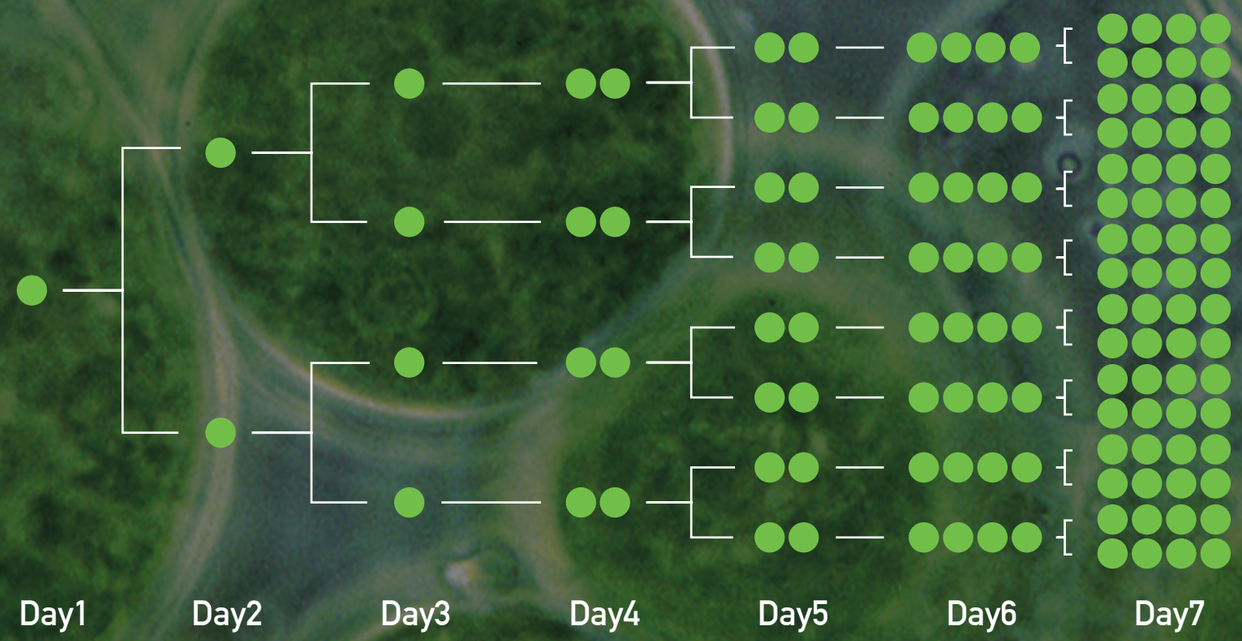
More Oxygen with ALGAE

To supply 1.5L of Oxygen/day (typical human demands) either 7.5 trees or 30L of Algae are required. Trees require fertilized soil, copious amounts of water and a large environment. Algae however require only 30 Litres of water and a much smaller environmental footprint to produce the same amount of oxygen.



ALGAE is Rapid Proliferating Organism

A single cell of Algae will rapidly multiply 64 times within a week, then 8,192 within only 2 weeks!



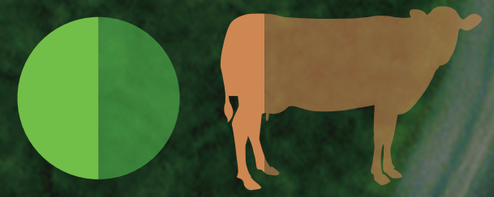
ALGAE is Nutritious Food

- Protain
- Vitamin
- Mineral
- Amino Acid
- DHA



Algae contains plenty of Protein, Vitamins, Minerals, Amino Acids and DHA (Docosahexaenoic acid)

Protein Proportion



50% 20%

The constitution of Algae offers 50% protein.

ALGAE is Bio-petroleum



The organic oil from Algae will be used for electricity generation in the future

ALGAE for Relaxation

Put simply, Green is the colour of natural life, harmony, and the environment.

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MARS Organic Air Farming

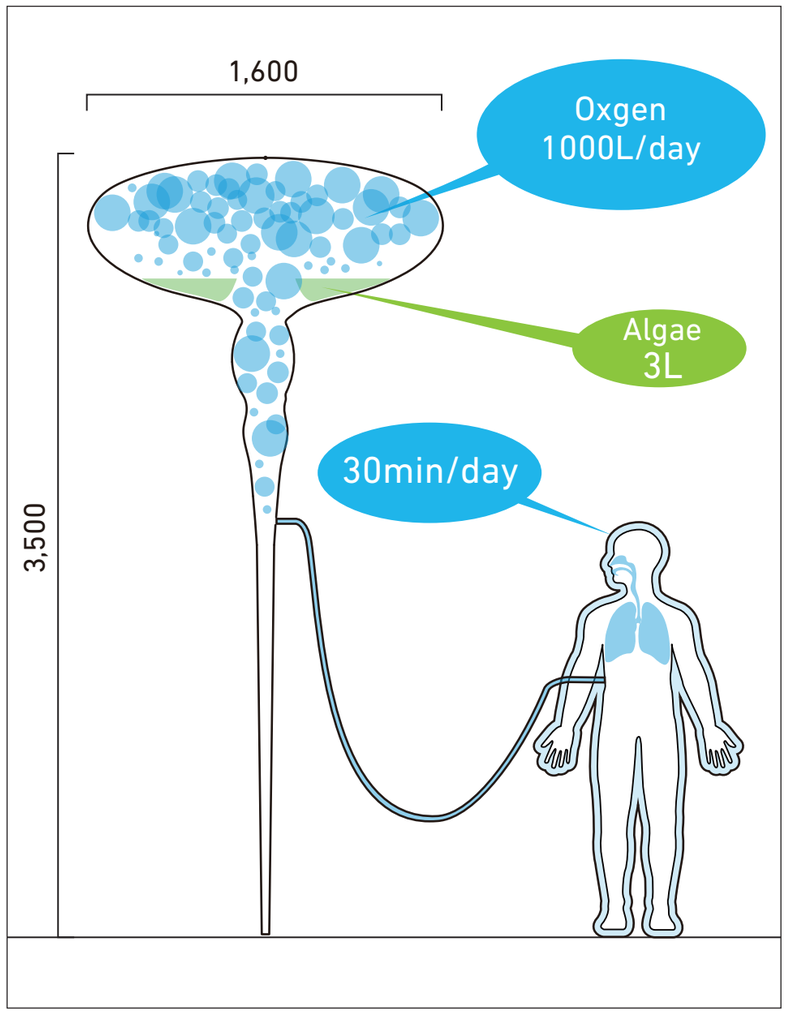
The mushroom-shaped product ALOXYGEN is a closed incubator with a micro eco-system that produces Organic Oxygen.



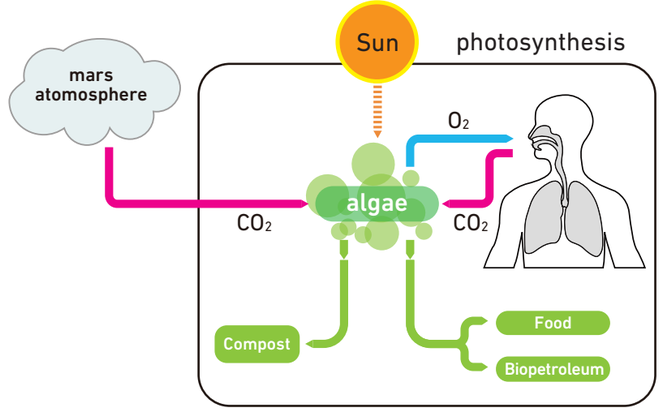
ALOXYGEN ~Earth Homing Your Mars Life~

MARS ORGANIC AIR FARMING
ALOXYGEN is an air-server for Mars settlers. It provides Earth-quality natural organic 'fresh air' to both physically and mentally vitalize people in the extreme Martian environment. ALOXYGEN contains an Algae incubator that generates 'organic' oxygen through photosynthesis. ALOXYGEN does not only produce oxygen, but also nutritious food, bio-petroleum and compost for farming. It invites humans to complete the algae micro ecosystem cycle by exhaling carbon-dioxide from human breath. This ecosystem is being developed as a future terraforming program.

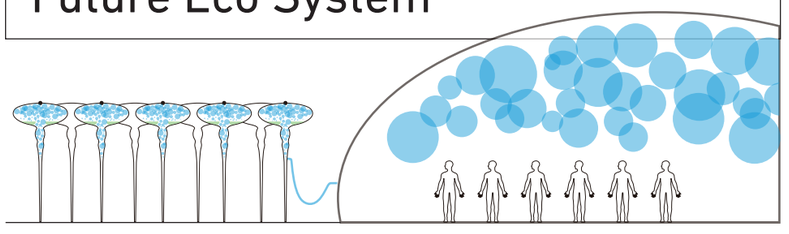
Engineer and biologist, Dr. Alg Aethome, is one of the seven crew members of Mission4. His mission is to complete the first-phase installation of ALOXYGEN before Christmas 2046. Once ALOXYGEN is installed, other crew members and settlers can own their own ALOXYGEN, naming them, maintaining them, taking great care of them, loving their growth, and enjoying their very own fresh air. Raising your own ALOXYGEN - via temperature control, circulation and feeding – will be one of the most important activities. Doing so simply connects you to "a life of Earth", keeping you a healthy human-being.



Algae Organic Eco System



Future Eco System



In 2088
1,300 ALOXYGENs support
pressurized Biosphere Dome.

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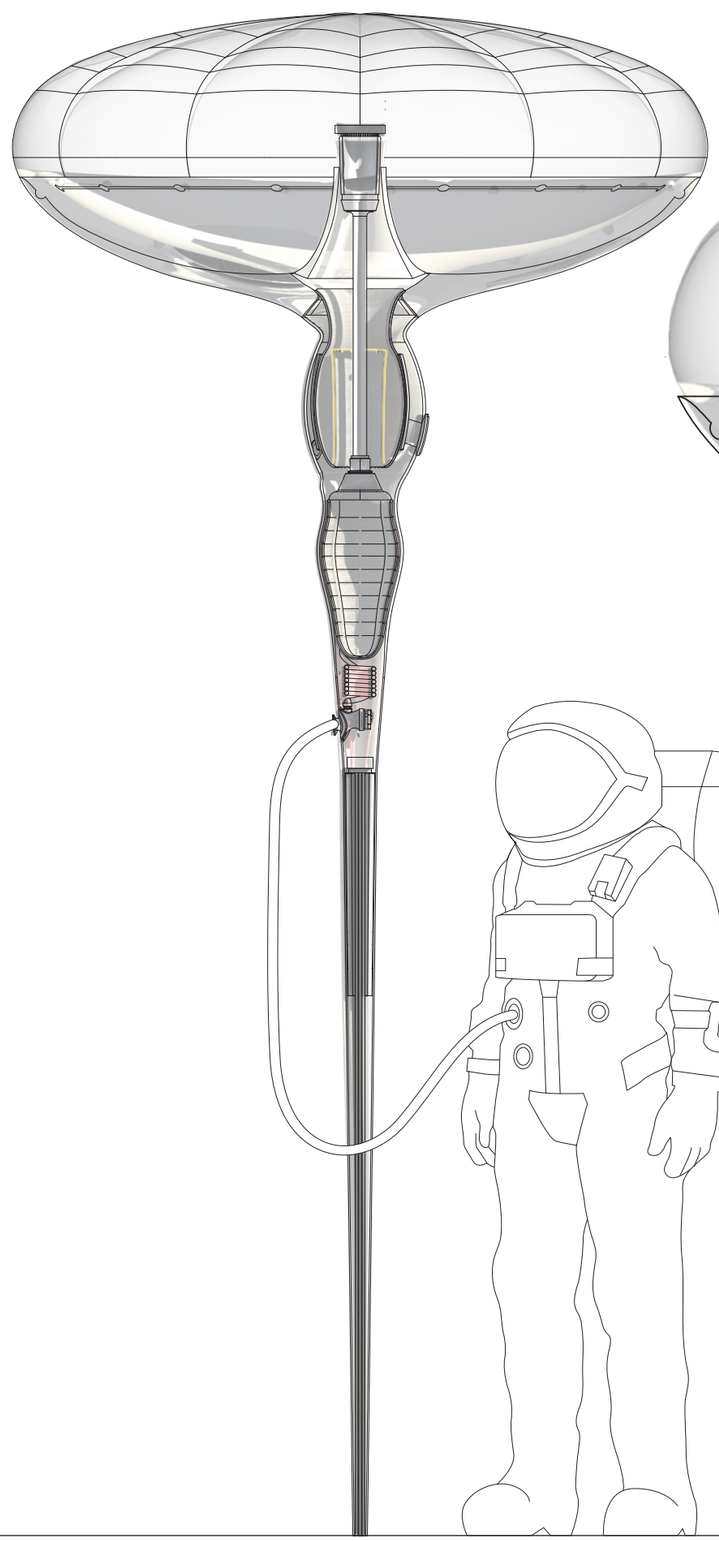
Algae and Air Circulation

During the daytime, the Algae present within the Photosynthesis Balloon produces O2 effectively. During the night time, it is enveloped in the thermal incubator.



Photosynthesis

Sun

O_2 O_2

CO_2 CO_2

O_2 O_2

CO_2 CO_2

CO_2

Intake of CO2 from the Martian atmosphere

CO_2

Algae

Algae

O_2

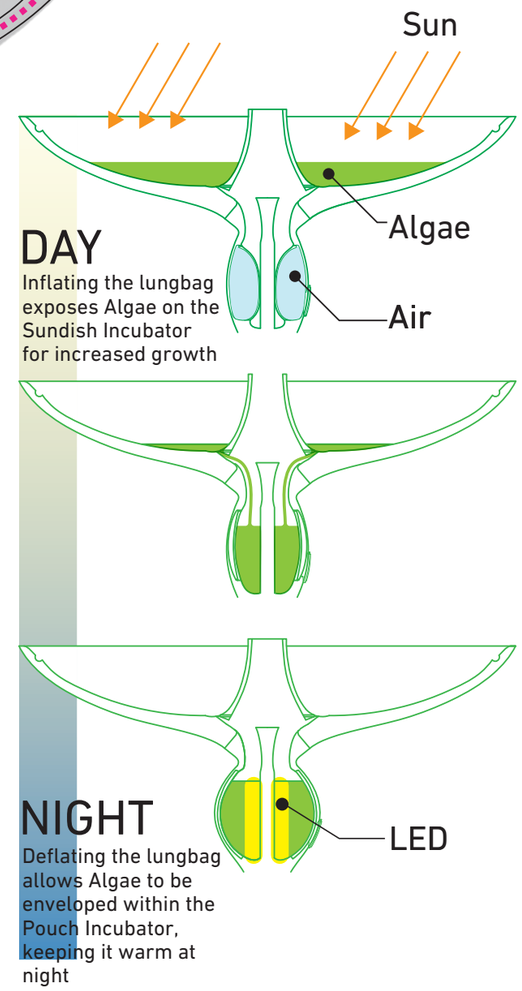
CO_2

Heating

Heating of Organic natural air for comfortable breathing

Breathable air O_2

Exhaled human air CO_2



DAY

Inflating the lungbag exposes Algae on the Sundish Incubator for increased growth

NIGHT

Deflating the lungbag allows Algae to be enveloped within the Pouch Incubator, keeping it warm at night

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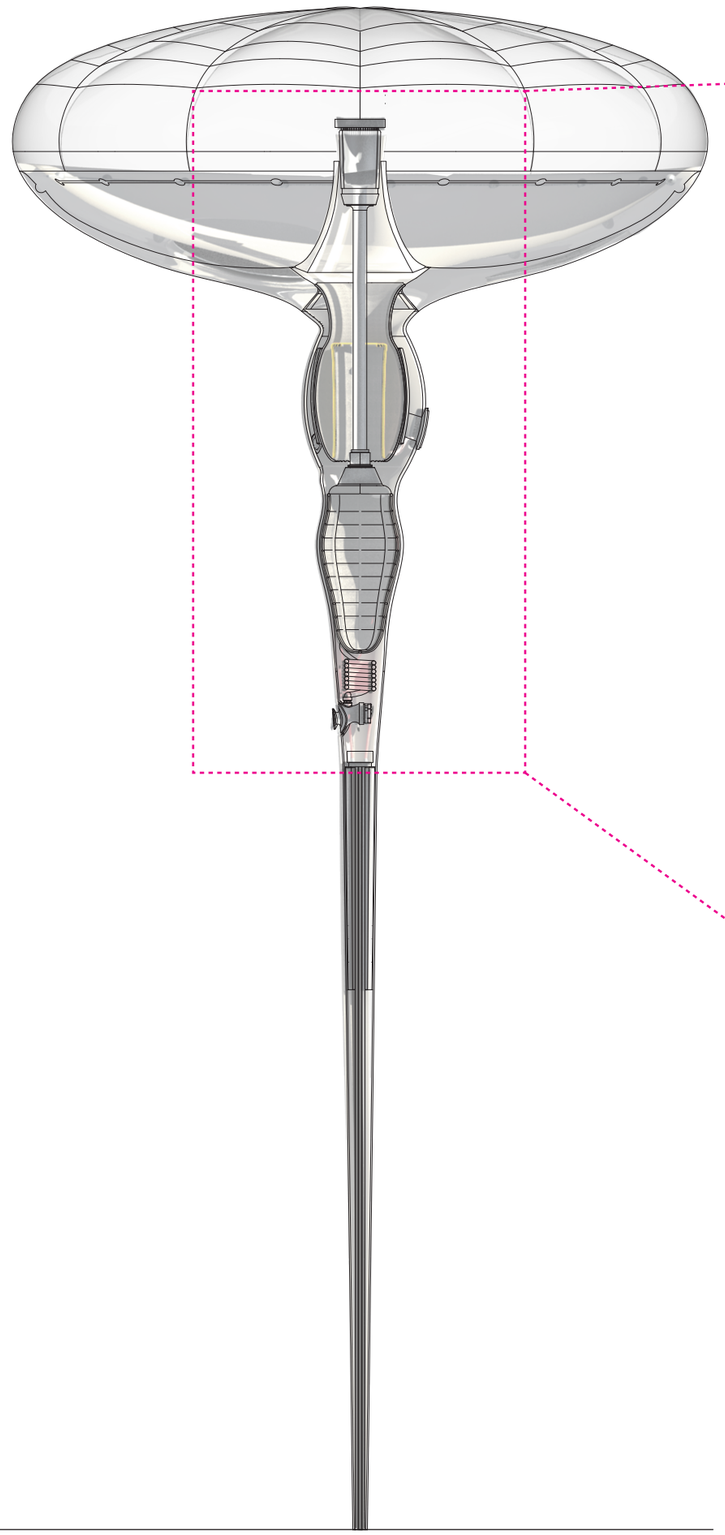
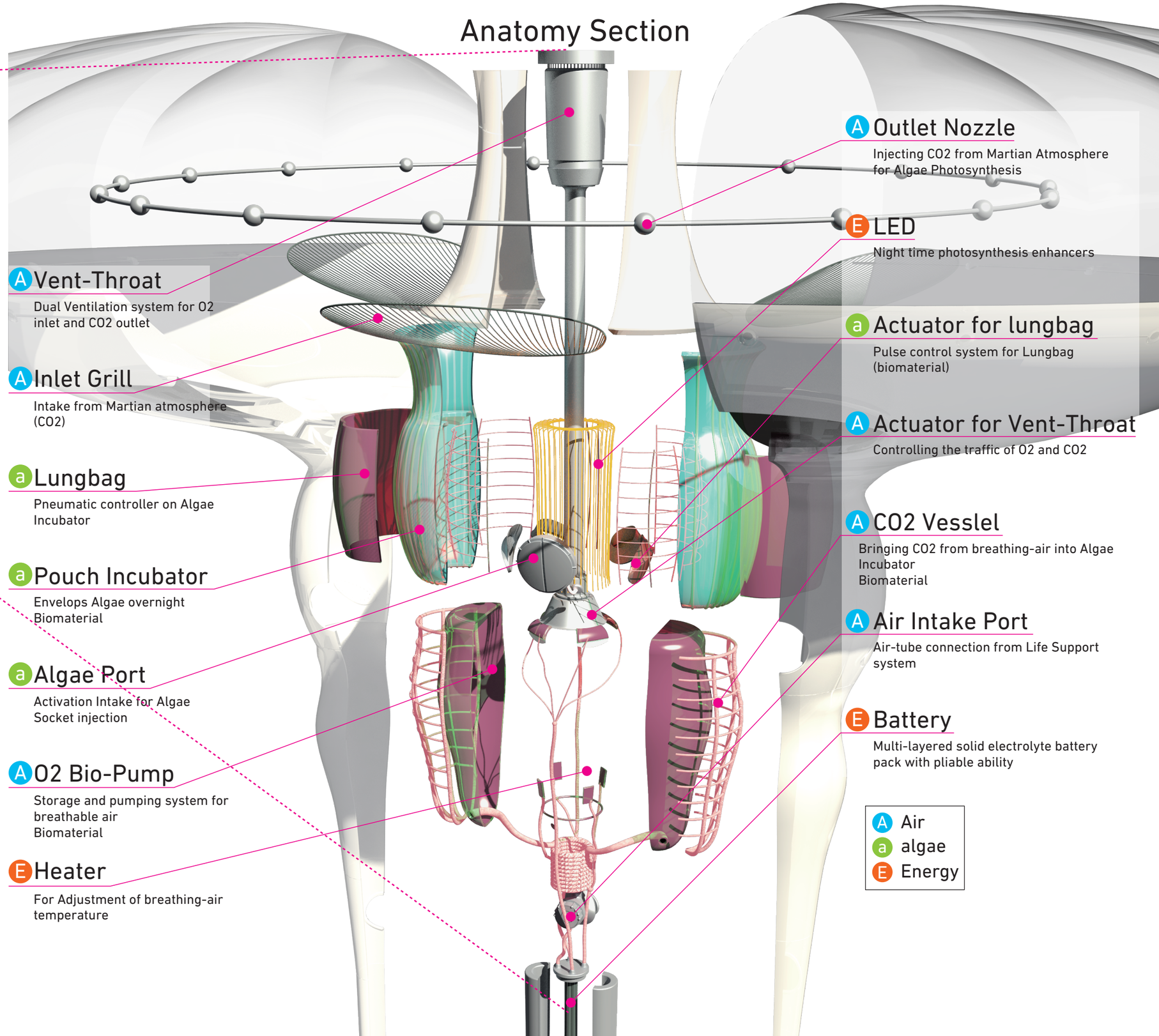
Organs and Function

Biomaterial is partially used in this product due to its durability and performance when compared to existing silicon-based materials. It is replaceable when the organs themselves age.



Anatomy Section



A Vent-Throat
Dual Ventilation system for O2 inlet and CO2 outlet

A Inlet Grill
Intake from Martian atmosphere (CO2)

a Lungbag
Pneumatic controller on Algae Incubator

a Pouch Incubator
Envelops Algae overnight
Biomaterial

a Algae Port
Activation Intake for Algae Socket injection

A O2 Bio-Pump
Storage and pumping system for breathable air
Biomaterial

E Heater
For Adjustment of breathing-air temperature

A Outlet Nozzle
Injecting CO2 from Martian Atmosphere for Algae Photosynthesis

E LED
Night time photosynthesis enhancers

a Actuator for lungbag
Pulse control system for Lungbag (biomaterial)

A Actuator for Vent-Throat
Controlling the traffic of O2 and CO2

A CO2 Vesslel
Bringing CO2 from breathing-air into Algae Incubator
Biomaterial

A Air Intake Port
Air-tube connection from Life Support system

E Battery
Multi-layered solid electrolyte battery pack with pliable ability

A Air
a algae
E Energy

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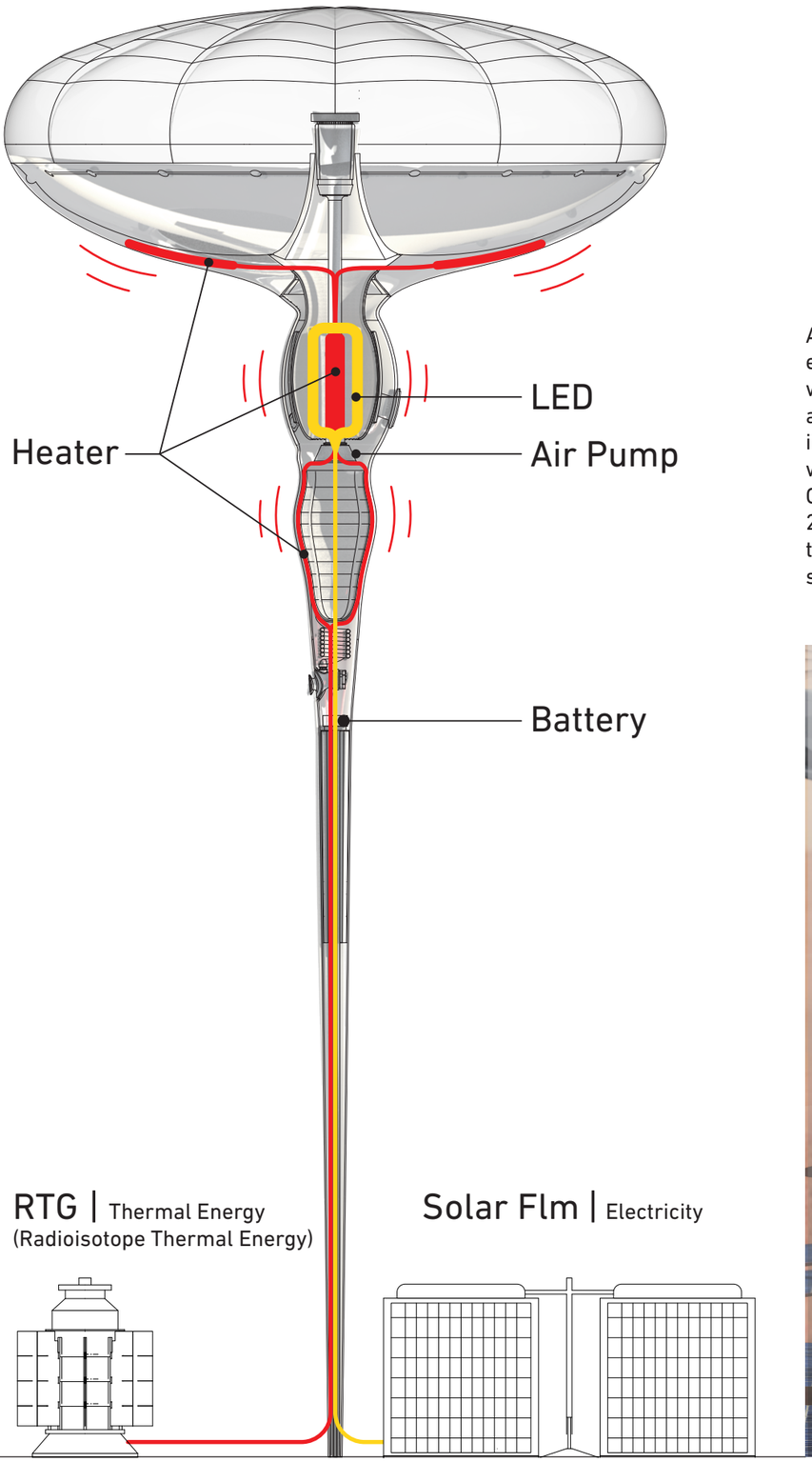
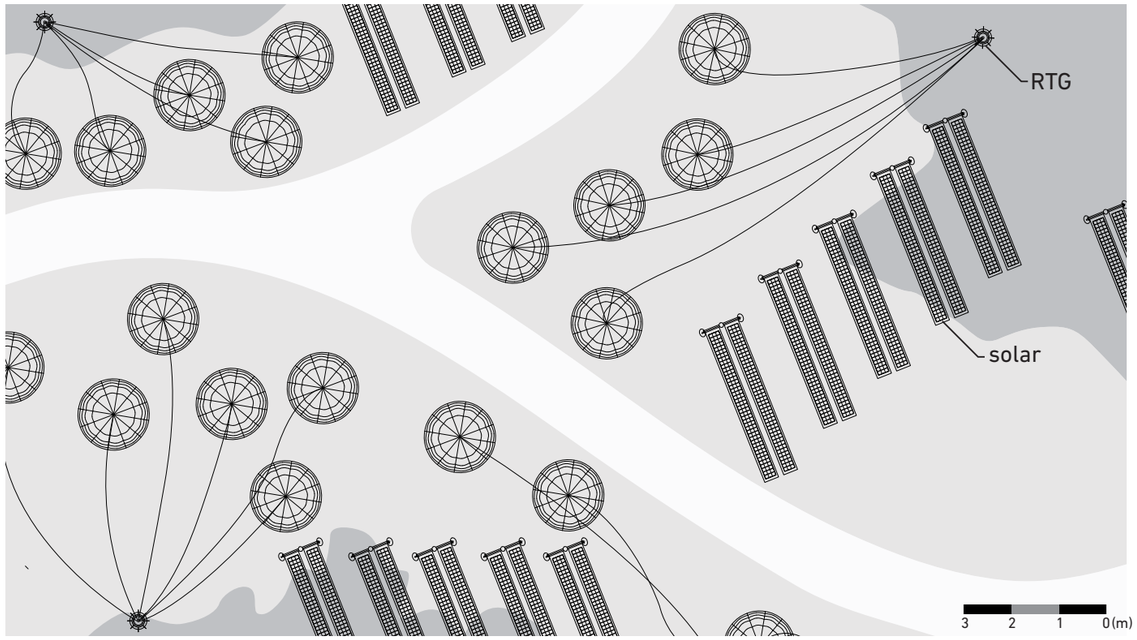
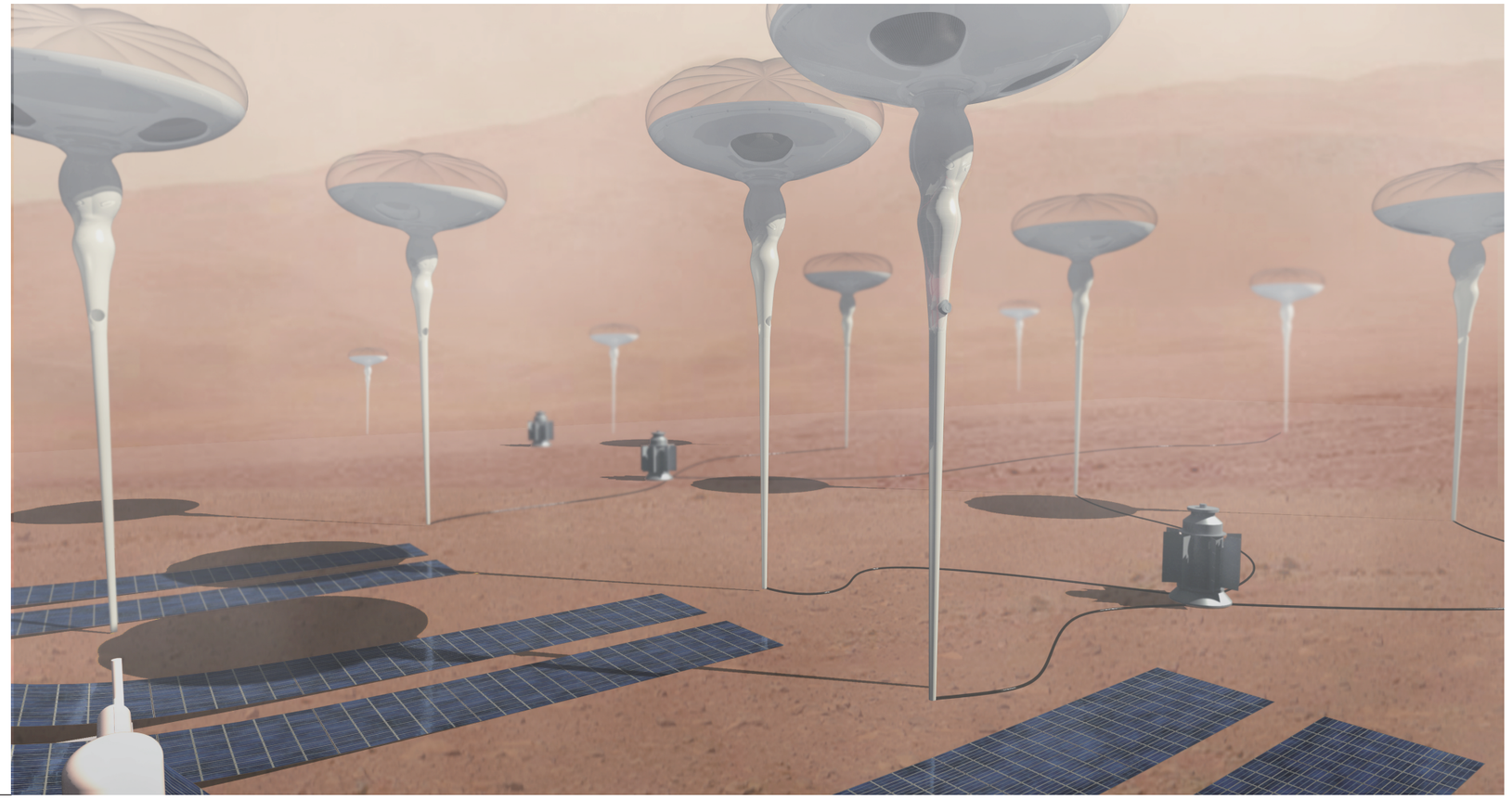
Energy System

ALOXYGEN uses solar-cells to power its electrical system and a Radioisotope Thermoelectric Generator (RTG) for its heating system.



ALOXYGEN requires only a small amount of electricity as 'initial pulse' to activate the whole system. It does however require large amounts of thermal energy to maintain an ideal temperature in the cold Martian weather. RTG (Radioisotope Thermoelectric Generator) provides 3500W ~ 4000W, for 25~30 ALOXYGEN simultaneously. In addition, the installation of infrastructural solar-powered generators will create 80kw.





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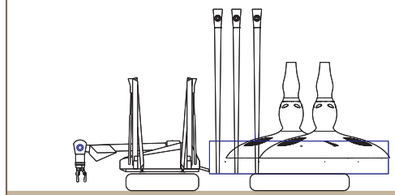
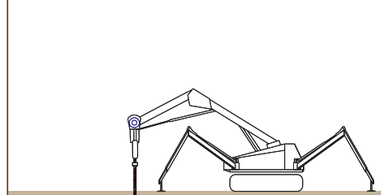
Installation and Activation

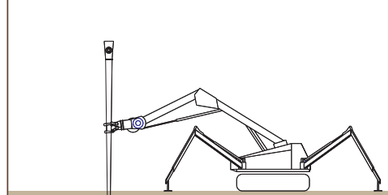
The ALOXYGEN installation process is simple. A vertical hole is drilled into the Martian surface and an ALOXYGEN base-rod embedded. An Algae Unit is then inserted into the rod, automatically delivering Algae into the heart of the ALOXYGEN system to defrost and begin photosynthesis



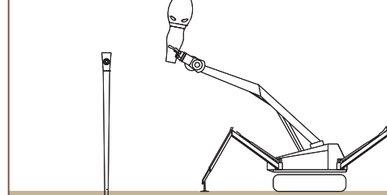
1: TRANSPORTATION: ALOXYGEN is carried to planting site using Spider construction robot



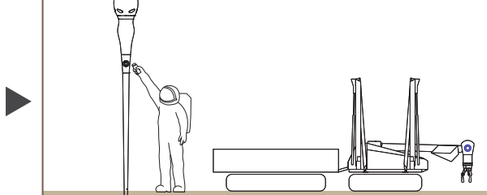
2: GROUNDING: Firm ground is located then bored to a depth of 1500m.



3: CONSTRUCTION1: Main Mast is positioned vertically into the ground-hole and the base is strengthened.



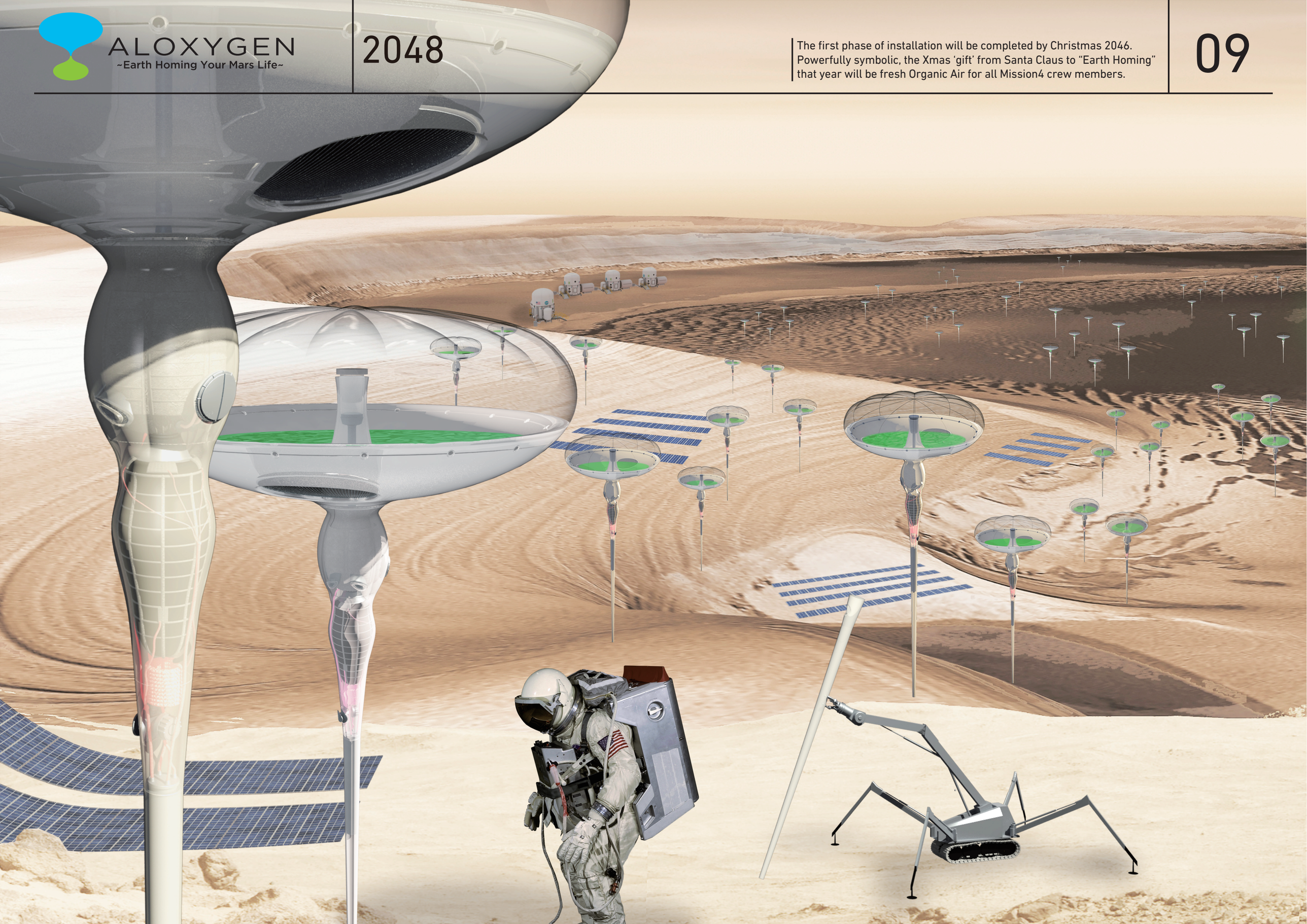
4: CONSTRUCTION2: Incubator Unit is attached to top of Main Mast.



5: ACTIVATION: Algae Socket is injected into the main-body to defrost and activate photosynthesis.

2048

The first phase of installation will be completed by Christmas 2046. Powerfully symbolic, the Xmas ‘gift’ from Santa Claus to “Earth Homing” that year will be fresh Organic Air for all Mission4 crew members.



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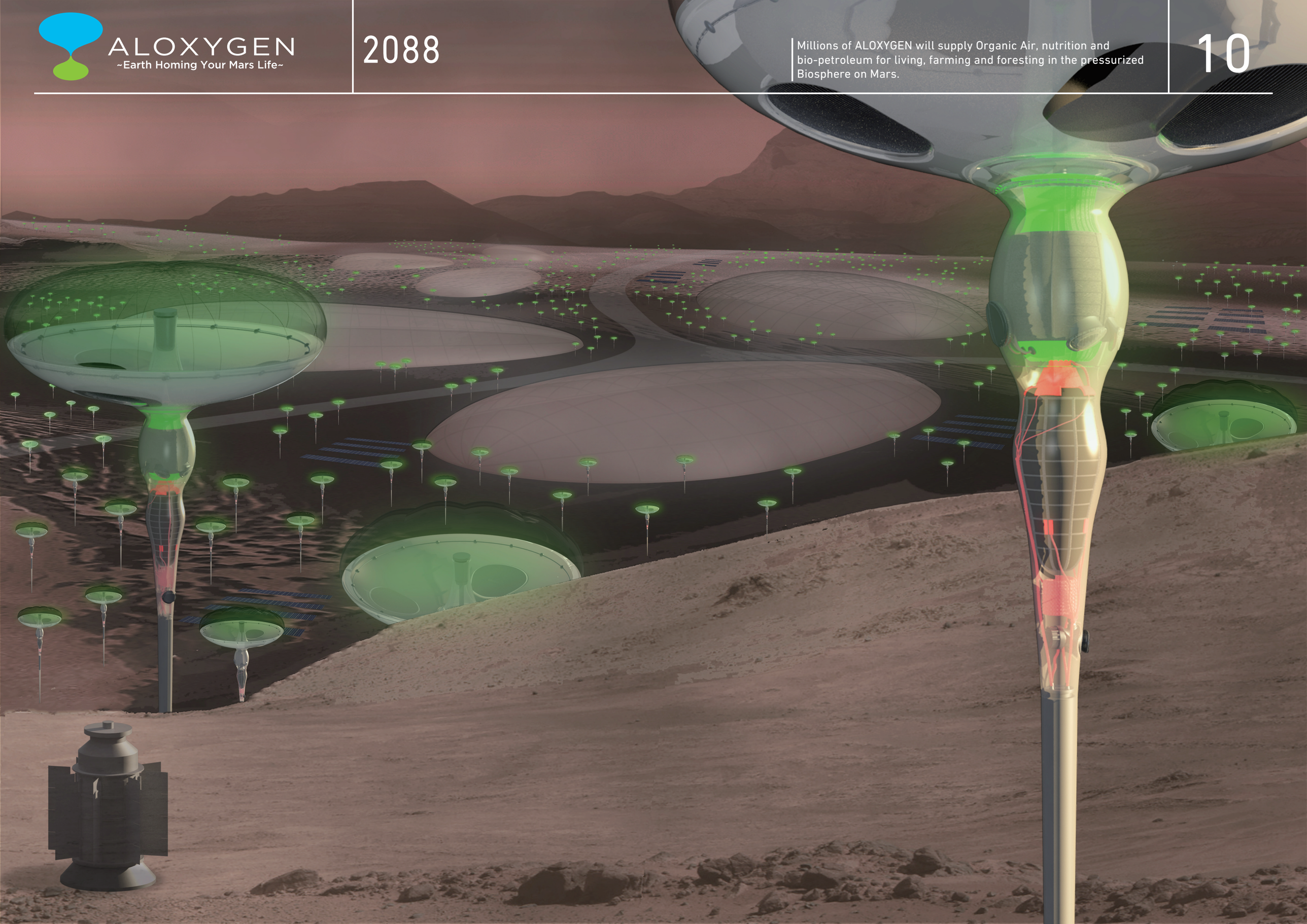
2088

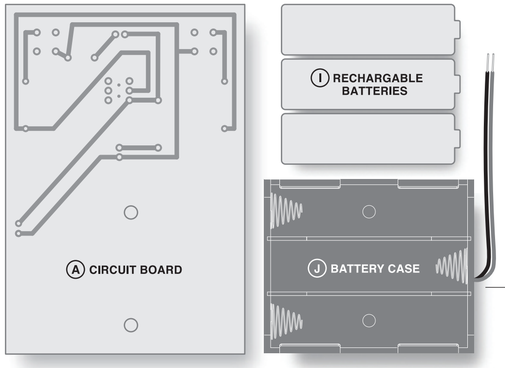
Millions of ALOXYGEN will supply Organic Air, nutrition and bio-petroleum for living, farming and foresting in the pressurized Biosphere on Mars.

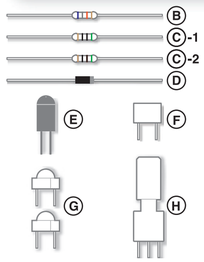


谷折
天
山折
裏1c
仕上がり線
A2変形
（583×413mm）
仕上がり線

1 Before Starting

Assembly Instruction Guide for Ages 10+



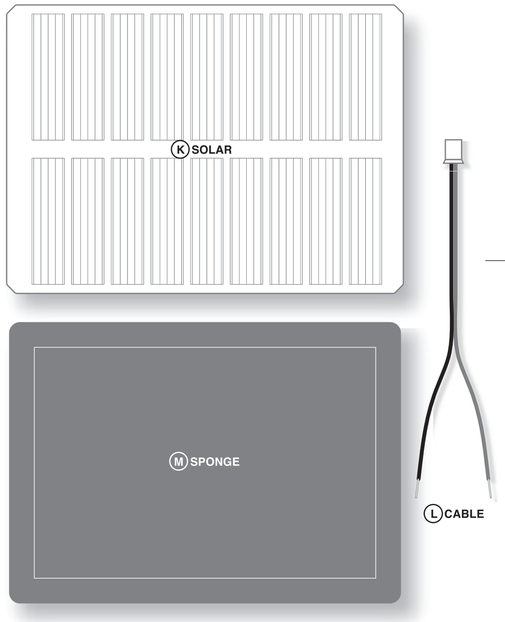


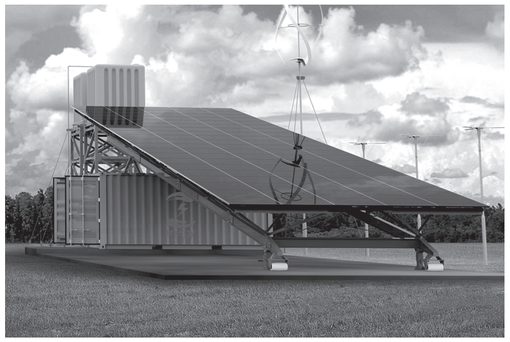
Ⓑ REGISTOR1	Ⓔ GREEN LED
Ⓒ-1 REGISTOR2	Ⓕ GENERIC FEMALE HEADER - 2PINS
Ⓒ-2 REGISTOR2	Ⓖ WHITE LED×2
Ⓓ RECTIFIER DIODE	Ⓗ PUSH BUTTON

Please ask an adult for advice on how to solder electronic parts before starting to assemble the device. Always work under adult supervision (i.e. with an instructor, teacher, advisor, engineer or adult family member).

Make sure there are no missing pieces. Locate and place all the electronic parts onto the illustration!

始める前に：
袋に入っている全ての電子部品を、イラストの上に並べて確認しましょう。はんだ付けの経験のある大人と一緒に組み立てましょう。





01_ENERGY Gift

http://energymeet.org/project/energy-gift

We all have a right to access the energy necessary to sustain our own healthy and meaningful lives on this planet! Unfortunately, as things stand, energy is not delivered to everybody equally. Remoteness from an energy supply can be for reasons of poverty, economy, politics, population and culture.

'ENERGY GROWS SOCIETY' is our belief and our mission is to help people achieve their own life goals. In many developing countries, where small communities remain widely spread over a large continent, people have been facing the difficulty of connecting to an energy grid. Their life is simply a huge struggle to secure their own health in a non-electrified society. ENERGY MEET have thus been collaborating on philanthropic projects with KMUTT (our Asian University partner) for many years. Now, the ENERGY GIFT is a shipping-container package with 80 solar-panels. Its energy system produces 40.8kWh/day. It is a simple gift of energy, helping to motivate local people to grow their own community towards a brighter future.

私たちには、エネルギーが当たり前にある社会に生き、健康で充実した人生を送る権利があります。しかしながらその権利は平等にすべての人たちのもとには届いていないのが現状です。理由は様々で、貧困問題、経済的な理由、政治的な理由、人口過疎、そして文化的背景などが考えられます。

「エネルギーは社会を育てる」と私たちは信じています。私たちの目標は、すべての人々の元にエネルギーがある社会を実現し、彼ら自身の人生の目標に向かって前向きに生きる環境を整えていくことです。特に広大な土地に小さなコミュニティーが散在しているような途上国エリアは、費用対効果の点で、発電所やグリッドの建設がまだまだ難しいと言われています。そのようなエリアの人々は、健康を維持することもままならない困難な暮らしを強いられています。そんな地域に向けて、我々は、タイ現地のKMUTT（キングモンクット工科大学）と共に、ENERGY Gift プロジェクトを進めています。ENERGY Gift は、80枚のソーラーパネルを搭載したコンテナボックスで、一日40.8kWhの発電が可能なシステムです。この電力は地域住民自身が自らの力でコミュニティーを発展させる起爆剤となることが期待されます。



02_Why ENERGY Gift mini

http://energymeet.org/project/energy-gift

We believe ENERGY GIFT will soon have a great impact on vitalizing local communities in remote off-the-grid areas. Currently, as the ENERGY GIFT concept remains costly, we have established a smaller energy project known as ENERGY GIFT 'mini'. The 'mini' is only a palm-sized device with solar-powered LED lights that provide free light for poor kids wanting to study after dark in off-the-grid areas.

ENERGY GIFT 'mini' also gives supporters easier access in contributing to our social relief project. Now, large million-dollar donors no longer drive the project. Our alternative 'mini' energy gift can magnetize a wider variety of supporters, such as organizations, companies, schools, individuals, even young kids can engage with the relief project, exposing themselves to electronic science whilst dedicating their effort to helping poor friends at the same time. Our 'mini' gift product is designed to be affordable and attractive for everyone. In this way, we can grow our ENERGY GIFT diverse community.

ENERGY Gift は貧困エリアに多大なインパクトを与えることができます。しかしこれは非常にコストのかかるプロジェクトです。そこで新たにスタートさせたのが、小さなバージョンであるENERGY Gift mini です。これは手のひらサイズのソーラーパネルで充電できるLEDライトのプロダクトです。電気の無いエリアの子供たちに届けることで、彼らが夜でも勉強できる環境づくりを目的としています。

この "mini " プロジェクトは、私たちの取り組む社会貢献プロジェクトに、支援者の参加をよりしやすくし、大きな金額の協賛金を集めなくとも、皆さんと共に前進できるよう企画しました。これらのサイズの違うプロジェクトを同時に進めることにより、様々なタイプの支援者（民間企業やNPO、個人など）との協働が可能となります。また先進国の子供たちに対して、プロダクトの組み立てなどを学びながら社会貢献ができる、といったプログラムを構築することを試みています。ENERGY Gift のコミュニティーを多様な地域と多様な世代に広げていく為に、「安価」で「楽しい」プロジェクトをデザインしています。



03_Design Development

http://energymeet.org/project/energy-gift

Our design team is formed at the incubation facility at King Mongkut's University of Technology Thonburi, Thailand (KMUTT). The team includes intern students and young junior designers. The incubation strategy is designed to train students through professional jobs and real projects. The design process is integrated into the academic program at university level. Sketch development, design research, local surveys, prototyping, discussion with local communities, electronic engineers and manufacturers, in fact, the entire production has been carefully orchestrated to fit the academic curriculum at KMUTT.

ENERGY GIFT 'mini' is developed in collaboration with many professionals, young motivated designers and students. Our final product is not the release of a ready-made lighting device, rather it has been designed as an 'assembly-kit' for school kids to fabricate in their electronic science class. For this reason, our assembly instruction graphics (the sheet you're holding!) are also designed as an attractive poster for kids.

私たちのデザインチームは、タイのKMUTT（キングモンクット工科大学）のインキュベーションセンター内にあり、インターンの学生や卒業したばかりの若いデザイナー達が集まっています。ここでは、若者たちが学外のプロフェッショナルと共に仕事ができる環境を整えています。つまりここで行われているデザインプロセスそのものが、大学の教育、トレーニングと直結しており、スケッチ手法、デザイン・リサーチ、現地調査、試作、エンジニアとの調整、地域コミュニティーとの会話、マニュファクチュアーとの打ち合わせなどKMUTTの大学教育のプラットフォームに一致するように、カリキュラムが丁寧に組まれています。

さらに、私たちの ENERGY Gift mini は、完成品として提供せずに、子供向けの組み立てキットとして販売あるいは贈呈することを目指しています。小学校などでの科学の授業に役立ててもらえるよう意図しており、「組立図」（このポスターがそうです！）も、子供たちにとって親しみやすいデザインとしています。このように、多くの専門家と学生たちによって、プロダクト開発やブランディングされたのが、このプロジェクトなのです。



04_Assembly workshop

http://energymeet.org/project/energy-gift

Attending the Bangkok Design Festival and holding our first ENERGY GIFT 'Mini Assembly Workshop' with KMUTT was a great opportunity to meet people and gain support for the project. Many adults, tourists, families and young kids visited our workshop, spending the 20-30 minutes necessary for assembling the product with us. Some left warm messages to poor kids and donated money via our donation box. Many school kids who were excited about learning electronic science in a social way also joined-in, and we were delighted that they found the 'Mini Assembly Workshop' fitted in with their basic electronic science classes and could attract them.

We would like to deeply thank all workshop visitors, especially those who spent time with us assembling our product and leaving warm messages and donation money for poor underprivileged kids. Now, ENERGY MEET's final responsibility is to electronically check all of the 'Mini' gift products constructed during the workshop and then distribute them to remote areas of Thailand.

バンコク・デザイン・フェスティバルで、ENERGY Gift mini の組み立てワークショップを開催しました。このデザイン・フェスに参加したことは、私たちにとって、とても大きな収穫でした。デザインに興味のある多くの人が訪れるこの1週間の間で、新たな支援者と出会い、多くのサポートや声援を頂くことができました。子供から大人まで、また観光客や家族連れなど、多くの方々が、20～30分ほどの組み立てワークショップに参加してくれました。その中の多くの人が、プロダクトの中に封入するメッセージや寄付金を残していってくれました。またこの期間中には、バンコクの小中学生にも参加してもらい、KMUTTの大学生の指導のもと、幾つものプロダクトを製作しました。これらの企画を通して、我々のワークショップが、地元の小中学校の科学の授業に役立てられることが確認できました。

ご来場くださった皆さま、特に組み立てワークショップに参加してくださった方、寄付金にご協力頂いた方々、ありがとうございました。現在、このプロダクト製作の最終検査段階にあり、合格したものを電気の無いエリアの子供たちに届ける準備を進めています。



05_Gift of light for Hang Island

http://energymeet.org/project/energy-gift

Many regions in Thailand remain remote from the energy grid, in particular at the northern border between Laos, Myanmar and Cambodia and at the southern islands. Our first project site is called 'Hang Island' near the well-known resort destination of Krabi.

There, we met two girls who had dreamt of taking higher-education after elementary school. They explained how most kids there easily gave-up on such dreams, choosing instead to work on rubber farms as they never found much value in study.

The concept of ENERGY GIFT 'mini' is to free kids from a solitary family candle when studying homework at night and liberating them to bond together into a fun study environment for a world of deeper knowledge. We believe that our gift is small but it may be able to change kids' attitudes. After all, it will be these local kids, with a higher education, that will bring a bigger and better future to their local community.

タイにはまだ多くのエリア、特にミャンマー、ラオス、カンボジアと隣接する北部の国境線沿いの村や、南部の小さな島々で電気の無い生活を強いられている人々がいます。我々の最初の目的地は、観光で有名なクラビーの近くにある小さな島、ハン島です。

この島の主産業はゴムの栽培で、タイの農村の中でも最も貧しい環境にあります。島で出会った二人の少女達は、中学進学を希望しているそうですが、村の多くの子供達は、あまり積極的に就学を望まず、進学を諦めて、実家のゴム農家を手伝う子がほとんどだと話してくれました。

ここでのENERGY Gift miniの役割は、家族全員で使っている一本のロウソクの火から、子供達を解放してあげることです。小さなロウソクを囲っての家族団らんは素晴らしいひと時ですが、勉強をするには、子供達が集中できる環境が必要です。その環境を太陽光で充電できるこのLEDライトでつくることがこのプロジェクトの狙いです。このプロダクトは小さなデバイスですが、より多くの子供達が積極的に勉強することで進学率が上がり、近い将来学業を終えて帰ってきた子供達によって、地域のコミュニティーに大きな発展の可能性が開かれることを期待しています。

山折

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4CYCLE

EDITOR'S VISION by Alvaro Conti

Over recent years, with the support of all our collaborators, the Energy Meet team has been able to realize the 'ENERGY Gift Mini' initiative. I would like to thank all of you who attended our workshops and kindly donated during our events. To all readers of this EM MAGAZINE; you are the window of our activity. Please keep staying with us. A profound thank you to all our benevolent and generous sponsors.

If you are interested in our activities, please contact us at: info@energymeet.org

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A2変形
（583×413mm）約98%
仕上がり線

表紙

2 Make the Circuit-Board

Step1: Pick **Circuit-Board** Ⓐ, and make sure the front of the circuit-board is facing you. Position electronic parts Ⓑ, Ⓒ×2 and Ⓓ onto **Circuit-Board** Ⓐ. Carefully solder all electronic parts to the circuit-board.

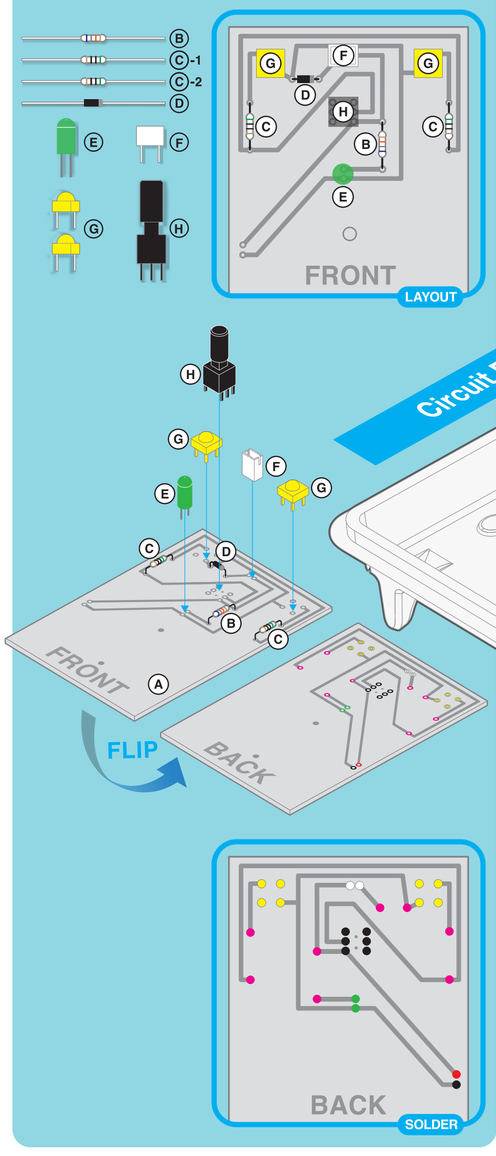
Step2: Position electronic parts Ⓔ, Ⓕ and Ⓖ×2 onto **Circuit-Board** Ⓐ and solder all parts to the circuit-board.

Step3: Position **Push Button** Ⓗ onto **Circuit Board** Ⓐ and solder it onto the circuit-board.

Step1: 裏表に注意してサーキットボードⒶを準備し、Ⓑ, Ⓒ×2とⒹのパーツを配置しはんだ付けしましょう。

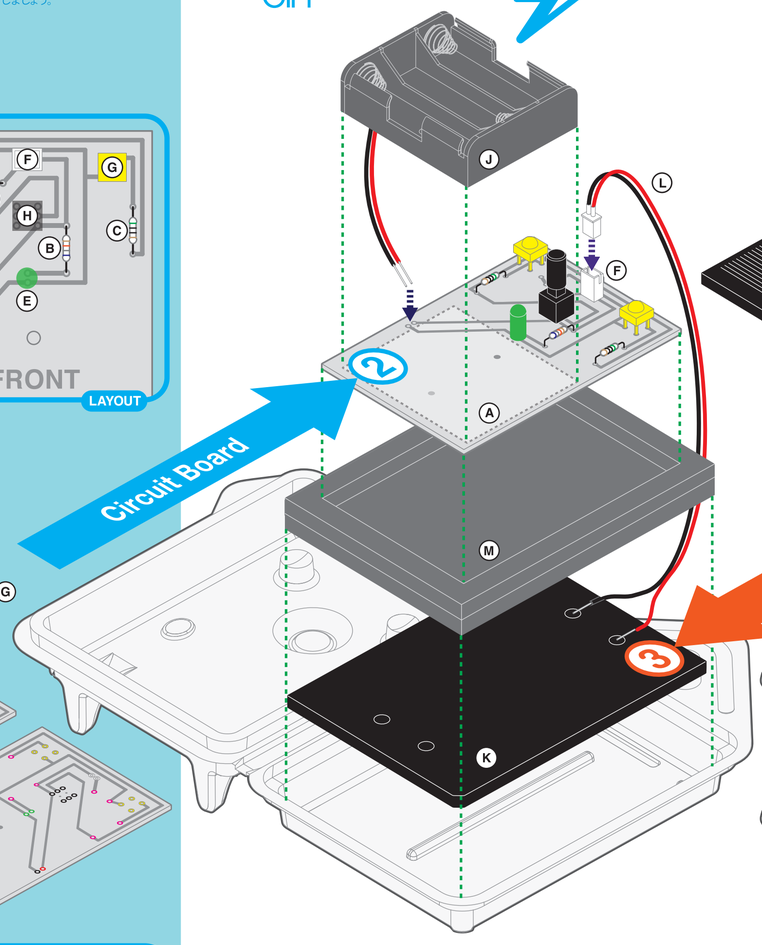
Step2: 次に、Ⓔ, Ⓕ, Ⓖ×2 をサーキットボードⒶにはんだ付けしましょう。

Step3:
プッシュボタンⒽをサーキットボードにはんだ付けしましょう。



energy mini GIFT

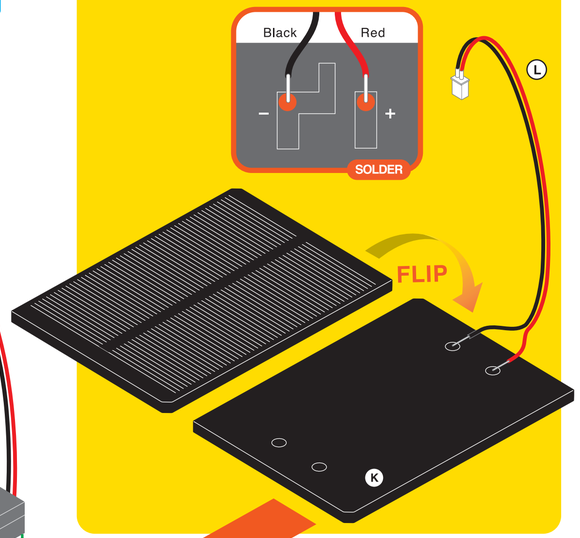
ENERGY Gift 'mini'
Palm-Sized Solar Powered LED Light for Remote Area.

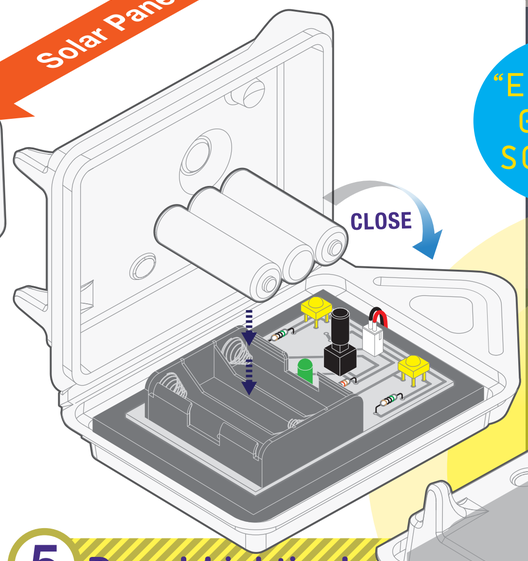


3 Make the Solar Panel

Take **Solar Panel** Ⓚ and **Cable** Ⓛ. Attach them together by soldering the Red wire to the positive [+] channel and the Black wire to the negative [−] channel.

ソーラーパネルⓀを裏返し、接続ケーブルⓁをはんだ付けします。
赤いワイヤーは[+]に、黒いワイヤーは[−]に接続しましょう。





4 Assembly & Packaging

Solder **Battery Box** Ⓙ onto **Circuit-Board** Ⓐ as shown in the illustration.
***Note: Do not place batteries into the battery-box before completing the entire assembly process.**

バッテリーボックスⒿとサーキットボードⒶを図のようにはんだ付けします。
注意:完成するまでバッテリーをバッテリーボックスの中に入れないでください。

Stack-up **Solar Panel** Ⓚ (face down), **Sponge Spacer** Ⓜ (flat down, edge up) and **Circuit-Board** Ⓐ.

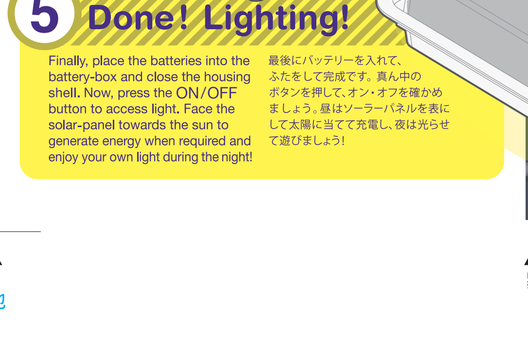
ソーラーパネルⓀ(裏向き)と、スポンジⓂ(凹みが上)と、サーキットボードⒶを重ね、接続ケーブルⓁの赤と黒を正しい方向に差し込みましょう。

Connect the **Electric Cablel** Ⓛ to Socket Ⓕ making sure the Red & Black cables are aligned.

5 Done! Lighting!

Finally, place the batteries into the battery-box and close the housing shell. Now, press the ON/OFF button to access light. Face the solar-panel towards the sun to generate energy when required and enjoy your own light during the night!

最後にバッテリーを入れて、ふたをして完成です。真ん中のボタンを押して、オン・オフを確かめましょう。昼はソーラーパネルを表にして太陽に当てて充電し、夜は光らせて遊びましょう!



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