

QIU ZHIJIE

邱志杰

ECO-LAB

邱志杰
Qiu Zhijie

生态实验室



GALLERIA CONTINUA
常 青 画 廊
SINIGRAGLIA BEIJING LES MOULINS HABANO ROMA SÃO PAULO PARIS

ECO-LAB

生态实验室

G A L L E R I A C O N T I N U A

B e i j i n g , 2 0 2 4 M a y 2 3 t h

常 青 画 廊

北 京 ， 2 0 2 4 年 5 月 2 3 日

邱志杰
Qiu Zhijie

Regarding epistemology and self-awareness, the most intriguing metaphor is undoubtedly the "brain in a vat." It evokes a visceral sense of unease that casts doubt on the world of Truman and stirs a sense of paranoia. Simultaneously, it imposes a higher-dimensional consciousness upon us, prompting us to avoid becoming overly immersed in life. The most valid metaphor in ecology is "a butterfly flapping its wings in the Pacific Ocean (could alter the path of a tornado)..." Ecology compels us to consider issues within a larger context, recognizing the interconnectedness of things and how many events occur simultaneously and influence each other. This, too, results from enhancing our observational and cognitive dimensions.

Ecological art expands its perspective from the biosphere to the lithosphere, atmosphere, and geosphere, operating at the intersections of biology and geography. Therefore, it concerns itself with the entire world, from viruses to celestial bodies, and the relationships between this world and the species that inhabit it.

In this exhibition, multiple transformations are happening simultaneously: plants are growing, wood is decaying, mold is spreading, mushrooms are flourishing, and silkworms are spinning silk; stones are weathering, crystals are forming on rocks, stalactites are slowly taking shape, and cosmic rays are penetrating everything; humans are hustling and bustling... Seawater is evaporating into salt, salt is being sculpted, sand is turning into glass, and glass is changing color; soil is transforming into ceramics, concrete is heating and solidifying, tea bricks are aging, dough is fermenting, wine is brewing, food is drying, and clothes are being sterilized by the sun.

The boundary between organic and inorganic is gradually blurring: cattle and sheep lick Himalayan salt bricks for mineral supplements, mealworms gnaw on the most indestructible polystyrene foam, coral polyps continuously calcify into calcium carbonate

skeletons that build up reefs, sea snail mantles secrete shell material to construct homes, while plastic waste over the oceans is finding every way to enter our bodies.

This exhibition at Galleria Continua explores several broad themes. The first is "drying": I am drying salt, sand, clothes, ham, seaweed, and tea leaves here, where fermentation, decay, and growth occur during the drying process.

The second theme is "transformation": tea bricks are aging, stones are weathering, cells are aging, fruits are ripening, and dehydration and soaking occur repeatedly, reminiscent of the "Chaotic Era" in "The Three-Body Problem." Occasionally, Shiva goes mad, his dance tearing the heavens and the earth apart, leaving his laboratory in disarray.

The third theme is "radiation": cosmic rays penetrate us, X-rays penetrate us, the sun's ultraviolet rays tan us, and every rock emits radiation, sculpting each other through radiation. However, we often rely too much on language and lack the organs to receive and decode invisible forces.

The fourth keyword should be "morphology." From chemical oscillations to biological oscillations, the textures of sea snails and zebras reveal intrinsic mechanisms. I am fascinated by the process of form production: the accumulation of dripping limestone solution into stalactites represents a natural form of additive manufacturing and is the origin of 3D printing. The growth of sea snail shells and coral reefs follows the same principles. I mimicked this process by allowing clay slurry to drip naturally, creating ceramic stalactites.

I am not an extreme environmentalist or an advocate of primitive farming methods and human inactivity. On the contrary, every farmer and baker is a great microbiologist and an

active natural transformer. Regarding the vicissitudes of life and the extinction of species, my attitude aligns more with Laozi's thought that "Nature is ruthless; it treats all things impartially without any preference or aversion." Many proponents of bio-art exaggerate when discussing "plant intelligence": artificial intelligence can already help us translate automatically, yet there is still debate about whether machines can think and pass the Turing test. Meanwhile, the neural response of a few mimosa leaves is loudly proclaimed as intelligence, which is highly hypocritical. I do not wish to exaggerate the intricacies of this world to avoid invoking an intelligent designer. Anti-anthropocentrism, as a stance, cannot stop a comet's trajectory nor influence solar flare activities. Believing that abandoning anthropocentrism can change the world is an arrogant thought. While there are many bad or foolish humans, this species is not entirely shameful and remains one of the most active creators on this planet, at least as active as volcanoes and viruses.

This exhibition results from my extensive interaction and study with scientists and laborers from various fields over the past few years. I do not care whether it resembles art in the traditional sense. Many ideas are still undeveloped and remain in an experimental state or even a state of conceptual experiments. Therefore, I call this exhibition the Eco Lab. The essence of a laboratory is to accept all failures. Many of these experiments have received support from scientists and research institutions, and many graduate students have participated in or even led the execution of specific experiments. I will mark everyone's contributions in detail on specific labels, forming an ecosystem among us, much like the material and energy exchange between the sky, earth, and ocean, and the interdependence between animals, plants, soil, and minerals.

关于认识论与自我意识，最有意思的隐喻肯定是“缸中之脑”——它以一种容易推人及己的切肤之痛让楚门的世界变得可疑，并唤起一种被害妄想。同时，它也把更高维度的意识强加给我们，让我们避免过于热烈地投入生活。而关于生态，最有用的隐喻则是“太平洋上一只蝴蝶扇动翅膀……”生态就是让我们在更大的场景中思考问题，意识到事物互相牵扯，意识到很多事情同时发生并互相影响。而这依然是提升观察和思考维度的结果。

生态艺术把自己的视野从生物圈扩展到岩石圈、大气圈、地球圈，在生物学与地理学的边沿地带开展工作。因此它关心小到病毒，大到天体的整个世界，以及这个世界和生息于其间的物种的关系。

所以在这个展览中，多种变化同时在发生：植物在生长，木头在腐烂，霉菌在蔓延，蘑菇在滋长，蚕在吐丝；石头被风化，岩石上长出晶体，钟乳石缓慢成型，宇宙射线在穿透一切；人类也在忙忙碌碌……海水晒成了盐，盐变成了雕塑，沙子变成了玻璃，玻璃在变色；泥土在变成瓷器，混凝土在发热凝固，茶砖在陈化，面团在发酵，酒在酝酿，食物在晒干，衣服在晾晒中杀菌。

有机与无机的边界逐渐混淆：牛羊舔舐喜马拉雅盐砖为自己补充矿物质，黄粉虫啃噬了最难降解的聚苯乙烯泡沫，珊瑚虫不断钙化成碳酸钙质骨骼建造礁石，海螺的外套膜分泌贝壳素为自己建造房屋，而遍布海洋的塑料垃圾正在千方百计地进入我们的体内。

常青画廊这个展览中有几个大致的主题，一是“晾晒”，我在这里晒盐，晒沙子，

晒衣服，晒火腿，晒海藻，晒茶叶，晾晒中的发酵、腐烂、生长。

二是“变化”，茶砖在陈化，石头在风化，细胞在衰老，水果在成熟，脱水和浸泡反复发生，像极了《三体》中的“乱纪元”。湿婆偶尔会发疯，他的舞蹈撕天裂地，他的实验室一片狼藉。

第三个主题是“辐射”，宇宙射线穿透我们，X光穿透我们，太阳的紫外线晒黑我们，每块石头都在发出辐射，通过辐射互相雕琢，只是我们大多数时候过于依赖语言，我们缺乏接受和解码不可见的力量的器官。

第四个关键词应该是“形态学”。从化学振荡到生物震荡，海螺的纹理和斑马的纹理，存在着内在的机理。我迷恋探索造型生产的过程，石灰岩浓液滴落积累成钟乳石，这是增材制造的自然形态，也是3d打印的源头。海螺壳和珊瑚礁的生长，遵循着同一原理。我用泥浆自然滴落的方式模仿了这个过程，制造了陶瓷钟乳石。

我并不是极端意义上的生态保护主义者，不是原始农法和人类不作为主义的倡导者。相反，每一个农民和面包师傅，都是伟大的微生物学家，都是积极的自然改造者。对于沧海桑田、物种生灭，我的态度更接近于老子的“天地不仁，以万物为刍狗。”很多生物艺术的倡导者在谈论“植物智能”的时候其实是非常夸张的：一个人工智能已经可以帮你自动翻译了，还被质疑图灵测试机器到底能不能思考？而几片含羞草叶子的神经反应就被大呼小叫称为智能，这是非常双标的。我不想夸张这个世界的精巧，以免呼唤出一个智慧设计者。作为姿态的反人类中心主义并不能阻止彗星的行程，也不能影响太阳黑子运动。以为放弃人类中心主义就能改变世界，这种想

法其实太狂妄了。人类中有不少坏或蠢的成员，但总体而言这个物种并没有那么可耻，他们仍然是这个星球上最积极的创造者之一，起码和火山与病毒一样活跃。

这个展览是我这几年大量与各个领域的科学家、劳动者接触并开展学习的结果，我不是很在乎它是否像经典意义上的艺术品。有很多想法来不及展开，还处在实验室状态，甚至是思想实验状态，所以我把这个展览叫做“生态实验室”。实验室的意思，就是接受所有的失败。很多实验得到了科学家和科研机构的支持，很多研究生参与甚至主导了具体实验的执行，我会在具体的标签中——标注大家的贡献，我们之间也形成了一种互济的生态，正如天空与大地和海洋之间的物质和能量交换，动植物与土壤和矿物之间的互相依存。



Nº 1

SALT PILES
堆盐

Salt, Petri dishes,
Salt crystals
盐、培养皿、盐晶体

Variable
Dimensions
尺寸可变

一批海盐洒在地面堆成数堆。盐既为身体和饮食所必需，它被用来保存食物，甚至可以将尸体制成木乃伊；也用于净化——《圣经》提到所多玛和蛾摩拉是用盐净化的，而罪人变成了盐柱。不同文化中的人类通过撒盐来辟邪、威慑不受欢迎的陌生人，在葬礼上，房屋入口的两侧都可以找到盐。

这些盐堆之间，用过饱和溶液生成七根不同长短高矮的盐柱子，顶部出现模糊的云朵形状。指向海盐晾晒过程中的水分蒸发和升腾。盐堆里提前放置了灯泡，经过编程，灯光交替有节奏地发亮。

10 个不同口径的培养皿散布在这个场景中，培养皿中在生成盐晶体。加湿器对着它们释放水分，当湿度超过 75% 时，盐会吸收空气中的水分并溶解。这时候氯化钠溶液具有导电性。它接通了小太阳烘干设备的电源，小太阳开始烘烤盐溶液，当其脱水固态化，失去导电性，小太阳自动断电停止烘烤。培养皿中在生成盐晶体继续吸湿，直到恢复导电性。

A batch of sea salt is sprinkled on the ground, forming several piles. Salt, essential for the body and diet, is used for preserving food and even for mummifying bodies. It is also used for purification - it is mentioned in the *Bible* that Sodom and Gomorrah were purified with salt, and sinners were turned into pillars of salt. Salt is versatile in various cultures: to ward off evil, and to deter unwelcome strangers. It can also be found on both sides of the entrance to a house at funerals.

Among these piles of salt, there are seven salt pillars of varying heights, growing from supersaturated solutions, with amorphous cloud-like shapes appearing at the tops. These shapes are the traces left by the evaporation and sublimation of water during the salt drying

process. Light bulbs are placed in advance within the salt piles, programmed to emit light alternately and rhythmically.

Ten Petri dishes of different calibres are scattered throughout this scene, with salt crystals being generated within. A humidifier releases moisture toward them, and when the humidity exceeds 75%, the salt absorbs the moisture from the air and dissolves. At this point, the sodium chloride solution is conductive. It connects to the power supply of a small drying device, which begins to bake the salt solution. When it dehydrates and solidifies, losing its conductivity, the drying device automatically cuts off the power and stops baking. The Petri dishes continue to absorb moisture, generating salt crystals, until they regain conductivity.

Salt pillar production:
Lv Mingyue, Zou Dawen
盐柱制作：吕明岳、邹达闻

Crystal cultivation: Ma Qiuzi
晶体养殖：马秋子

Lighting programming:
Lan Lan, Fang Jing
灯光编程：兰兰、房静



几堆沙子堆积在地面成为沙堆。沙堆之间散布着用含硅量高的高质量海沙铸造的沙雕的城堡。未添加辅料的沙雕城堡局部进陶瓷电窑，在 800 摄氏度下转化为赤红色，但无法玻璃化。

未添加辅料的沙雕城堡局部进陶瓷电窑，在 1350 摄氏度下呈现流动的融化状态，冷却凝固后转为灰绿色。沙雕城堡局部掺入硼酸、硼砂以及石灰石、草木灰、石英砂、低温玻璃粉等辅助材料。用酒精喷灯烧灼，呈现局部玻璃状态。

来自腾格里沙漠和撒哈拉沙漠的闪电熔岩（fulgurite），这是落地雷击打含硅量高的沙子和泥土，在数千度高温下瞬间融化，然后又因雨水等原因快速淬火冷却凝固所形成天然玻璃质和新生矿物的混合体。闪电熔岩形状多是长条状，和闪电的路径相近，最高可长达数米，中空者内部光滑，可能有小气泡，外部多为沙质。

制作一批特殊的玻璃器皿，一半透明，一半含有沙子。它们与纯玻璃器皿和玻璃雕塑以及人造玻璃石一起放在沙堆上。一批晶圆插在沙堆里如同落日，互相成角度，激光笔打在晶圆，互相反复折射。一个家用太阳能电池板为激光笔供电。

Here are several dunes of sand piles, between which scattered castles carved out of high-quality sea sand rich in silica. Parts of the castles, with no other auxiliary material added, were treated in ceramic electrical kiln. At 800 degrees Celsius, they turned crimson yet not vitrified.

Other parts, treated the same way, melted into flowing fluids at 1350 degrees Celsius. They turned green-gray after solidifying and sawed. Those added with auxiliary materials, namely boric acid, borax, limestone, wood ash, quartz sand, and low melting point glass powder, were burned with an alcohol blast lamp and turned partially vitrified.

The fulgurite, which originated from the Tengger Desert and the Sahara Desert, is a mixture of natural vitreous material and new minerals. When a bolt of cloud-to-ground lightning hits sand and mud rich in silica, they instantly melt at thousands of degrees and are soon quenched and consolidated into the fulgurite due to rain or other causes. Fulgurites are mostly elongated in shape, similar to the path of a lightning bolt, up to several meters in length. The hollow ones are smooth on the inside, possibly with small bubbles, and mostly sandy on the outside.

We've made a batch of special glassware, half transparent and half containing sand. They are displayed on dunes of sand along with pure glassware, glass sculptures and artificial glass stones. Some wafers are inserted in the sand at an angle to each other, resembling the setting sun. Laser pointers powered by a solar panel hit the wafers, causing repeated refraction.

The production of glassware containing sand:
Prof. Li Jing, from Glassware Workshop,
Academy of Arts & Design, Tsinghua University
含沙玻璃器皿制作：
清华大学美术学院玻璃工作室李静老师

The vitrification experiment of sand-carved castles:
Jiao Zhixin, from Sichuan Fine Arts Institute
沙雕城堡玻璃化实验：
四川美术学院焦芷馨





Nº 3

GLASS TRANSFORMATION 玻璃变

Glass, water pump,
Glass cleaning robot
玻璃、水泵、擦玻璃机器人

Variable
Dimensions
尺寸可变

玻璃水母雕塑上涂布了天津理工大学材料学院张晨光教授团队研发的电致变色薄膜，整体浸泡在电解质溶液中，连接红外感应装置，当观众靠近时，玻璃水母雕塑变为金色。

一片电控磨砂化玻璃，局部保持透明，交替通电，呈现“动物最不能理解的是玻璃”和“The last thing an animal can understand is glass”文字。电调控光玻璃在 20 世纪 80 年代由美国肯特州立大学的研究人员发明并申请专利，美国得克萨斯州的 Polytronix, Inc 公司于 1991 年开始量化生产其旗下的电控智能调光玻璃，由通电与否改变玻璃夹层内液晶的电子分布。当电子整齐排列时，光线可以自由穿透，玻璃呈现为透明。

一个旋转底座上的焦散成像玻璃，通过灯光在墙面上呈现出一个带剖面的海螺的形象。光学中，焦散现象（caustic）是被弯曲的面或物体反射或折射后出现光线的包络或包络在另一面上的射影。也是汉朝透光铜镜之所以能将背面图案透射投射在光影中的原理。

靠墙斜放两片大玻璃，从上方流淌下带有绿藻的蓝绿色海水，四台擦玻璃机器人反复横斜运动驱赶水流形成海浪图像。底部水槽中水泵、玻璃管子抽取水，反复循环。

The glass jellyfish sculpture is coated with an electrochromic film, a development of Professor Zhang Chenguang's team from the School of Materials Science and Engineering at Tianjin University of Technology. The sculpture is entirely submerged in an electrolyte solution and connected to an infrared sensor. Upon the approach of a spectator, the glass jellyfish sculpture turns into gold.

A pane of electro-controlled frosted glass, with patches of transparency and alternating currents, reveals the phrase, “The last thing an animal can understand is glass.” Electrochromic glass, invented in the 1980s by researchers at Kent State University in the United States and subsequently

patented, was brought into mass production in 1991 by Polytronix, Inc., based in Texas. An electric current is utilized to alter the distribution of electrons within the liquid crystal layer of the glass. When the electrons are neatly aligned, light can penetrate freely, rendering the glass transparent.

A glass with caustic imaging mounted on a rotating base projects the silhouette of a conch with cross-sectional clarity onto the wall through the illumination of light. In optics, the phenomenon of caustics—the envelope of light rays refracted or reflected by a curved surface or object—underpins this effect, akin to the principle by which Han Dynasty bronze mirrors cast images of their reverse patterns through light and shadow.

Two large panes of glass are inclined against the wall, with blue-green seawater teeming with algae cascading from above. Four glass-cleaning robots execute repeated horizontal and diagonal movements, propelling the water into a visual semblance of ocean waves. A sump at the base, equipped with a water pump and glass tubing, circulates the water in an endless loop.

Electrochromic Glass Technology Research: Conducted by Professor Zhang Chenguang's team at the Tianjin University of Technology (in collaboration with the School of Mathematical Sciences at the University of Science and Technology of China)

电致变色玻璃技术研究：天津理工大学张晨光教授团队（中国科学技术大学数院团队）

Glass Jellyfish Sculptures:
Created by Li Jing at the Glass Studio of the Academy of
Arts & Design, Tsinghua University

玻璃水母雕塑：清华大学美术学院玻璃工作室李静老师

Caustic Glass Experimentation:
Executed by Li Bo

焦散玻璃实验员：李博



Nº 4

THE CORE OF THE THREE GORGES 三峡岩芯

Rock samples,
Round springs
岩石样本、圆形弹簧

Variable
Dimensions
尺寸可变

背景和研究：岩芯是指地质勘探或科学研究中通过岩石钻取得到的长柱状岩石样本。这些岩芯通常是通过钻探或取样工具从地下或水下的岩层中获取的，用于研究地质构造、岩石性质、沉积环境、地层年代等信息。岩芯通常被保存、编号、分析和描述，以便地质学家、地质工程师和其他研究人员对地质条件和地质历史进行研究和解释。圆柱形岩芯通过旋转钻头在地下或水下钻孔，取得的岩石样本呈圆柱形，直径一般为数厘米至数十厘米不等，长度则取决于钻孔深度和取样方式。

概念：这个装置中出现的圆柱形石柱，是三峡工程建设时地质队地质勘探中采集的岩芯，分别来自湖北宜昌和神农架地区。三峡岩芯记录了该地区古地理环境和古气候条件的变化。三峡地区主要由沉积岩和火成岩组成，沉积岩主要包括砂岩、页岩、泥岩等，火成岩主要包括花岗岩、闪长岩等。

操作：在这个装置中，相同粗细的长江岩芯用蛇形混凝土接头连接成在地面蔓延的龙蛇形。让“矿脉”的概念与“龙脉”的概念互相混淆。不同粗细的三峡岩芯则用圆形弹簧纵向堆积和排列，成为一种“不存在”的岩石矿脉，也创造出地壳承受压力的感觉。

Background and research: Core samples refer to elongated cylindrical rock samples obtained through rock drilling in geological exploration or scientific research. These cores are usually obtained from underground or underwater rock strata using drilling or sampling tools. They tell of geological structures, rock properties, sedimentary environments, stratigraphic ages, etc. The core samples are preserved, labelled, analysed, and described, facilitating geological engineers and other researchers to look into and interpret geological conditions and history. Cylindrical core samples are obtained underground or underwater, using rotating drill bits. Their diameters range from a few centimetres to several tens of

centimetres, while the length depends on the depth of drilling and the way of sampling.

Concept: The cylindrical stone pillars in this installation are collected from a geological exploration during the construction of the Three Gorges Project. They originate from the Yichang and Shennongjia region in Hubei Province. The samples document the changes in ancient geographical and paleoclimatic conditions of the area. The region mainly consists of sedimentary rocks and igneous rocks. The first covers sandstone, shale, and mudstone, while the second includes granite and diorite.

Procedure: In this installation, core samples of the Yangtze River, with the same thickness, are connected with serpentine concrete joints to form a dragon-like pattern spreading on the ground. This echoes both the concept of "veins" in geology and the concept of "dragon veins" in Chinese feng shui. Using circular springs, core samples in different sizes are vertically stacked and arranged, creating non-existent rock veins and evoking a sense of pressure on the Earth's crust.

Collection of Three Gorges core samples: Shen Yanbing
三峡岩芯采集：沈彦冰

Dragon Veins production: Wang Diliang, Lv Mingyue
“龙脉”岩芯制作：王迪亮、吕明岳





Nº 5

TREASURE TROVE
COLUMN TURNS INTO RADIO
聚宝柱成了收音机

Various Oores
多种矿石

Variable
Dimensions
尺寸可变

背景和研究：一个塔状石柱上汇聚了多种矿石，包括：黑曜石、石英、紫水晶、黑水晶、印尼葡萄玛瑙、柠檬水晶、萤石、孔雀石、青金石、天然沙漠玫瑰、祖母绿宝石、天然水晶蓝光拉长石、高透蓝文石、胆矾晶体蓝矾石、天然雄黄、天然碳化硅晶体、矿物晶体石榴石、天然水晶簇霰石、广东水晶方解石、马达加斯加日光绿萤石、赞比亚黑碧玺、湖南上堡黄铁矿石、秘鲁黄铁矿石、三水铝石、俄罗斯自然铜原石、天然斑铜矿原石、湖南瑶岗仙车轮矿石、玫瑰方解石（荧光锰矿）、蓝铜砷钙铜与水晶共生、菱铁矿与黄铜矿物晶体共生、磷铝矿天然原石、江西辉锑矿晶簇、磷氯铅矿、江西红水晶黄铜矿、摩洛哥铅钼矿石、湖南天然闪锌矿水晶簇、天然黑碧玺电气石矿石、磷锌铜矿晶体矿石、天然狗头金、天然水晶电镀彩虹水晶簇、天然铋矿原石、高纯锗块、铬粒、锰铁合金、高纯金属锑块、高纯硅、金属硅、单晶硅、多晶硅等等。

特定品种的矿石被视为宝物，既是因为其稀缺程度，也因为其自身的美感，更因为各种各样的相信其具有疗愈能量的信念。而矿石收音机开发了晶体的半导体特性，晶体转化为通讯工具。矿石收音机是最简单的无线电接收设备。第一个矿石收音机由 Greenleaf Whittier Pickard 在 1900 年制造，使用条形晶体矿石来探测无线电信号。常见的可用于检波器的矿石种类有硫化铅矿、方铅矿、红亚铅矿、黄铜矿、黄铁矿和自然铜等，用作检波器，将无线电信号转换为音频信号。随着技术的进步，晶体收音机逐渐被更先进的半导体器件所取代，如晶体管收音机和集成电路收音机。

Background and research: A tower-like stone column gathers a variety of minerals, including obsidian, quartz, amethyst, black tourmaline, Desert Rose Stone, Indonesian grape chalcedony, lemon quartz, fluorite, turquoise, lapis lazuli, emerald, natural blue light labradorite, highly transparent sodalite, chalcantinite, natural realgar, natural silicon carbide crystals, mineral crystal garnet, natural crystal clustered aragonite, Guangdong crystal calcite, Madagascar sunstone fluorite, Zambian black spinel, Shangbao, Peru yellow iron ore, Sanshui alumstone, natural copper

nugget from Russia, natural bornite copper ore, wheel ore from Hunan Yaogangxian, rose calcite (fluorescent manganese ore), azurite and conichalcite with crystals, siderite with chalcopyrite mineral crystals, variscite natural ore, Jiangxi stibnite crystal cluster, pyromorphite, red crystal and brass ore from Jiangxi, Moroccan vanadinite ore, natural sphalerite crystal cluster from Hunan, natural black spinel piezoelectric ore, zinc phosphate copper ore, natural gold nugget, naturally electroplated rainbow crystal cluster, natural bismuth ore, high-purity germanium block, chromium grains, ferromanganese alloy, high-purity antimony metal block, high-purity silicon, metallic silicon, monocrystalline silicon, polycrystalline silicon, etc.

Certain varieties of minerals are considered treasures not only because of their scarcity but also due to their inherent beauty. Moreover, it is believed that they possess healing powers in various cultures. Crystal radios tap into crystal's functionality as semiconductor, which transformed them into communication tools. A mineral radio is the simplest wireless receiving device. The first crystal radio was developed by Greenleaf Whittier Pickard in 1900, utilizing a bar-shaped mineral crystal to detect radio signals. Common minerals used as detectors include lead sulphide, galena, iron pyrite, silicon, molybdenite, and silicon carbide, etc, which convert radio signals into audio signals. With technological improvement, crystal radios have gradually been replaced by more advanced semiconductor devices such as transistor radios and integrated circuit radios.

The production of crystal radio: Ma Qiuzi
矿石收音机制作：马秋子

Experimental Materials: A Variety of minerals
实验材料：多种矿石



背景和研究：《建筑师》是一种形态学研究，探讨自然界的结构形式。我们时常会将建造巨大金字塔的白蚁、用蜂蜡建造六角形网格蜂巢的蜜蜂、用毛料建造悬挂式鸟窝的中华攀雀称为动物界的建筑师。但其实人类的建筑行为虽有创意，也不得不遵守材料、尺寸和结构的基本逻辑，与晶体成型的方式并没有差别。人类忙着建造，他体内的骨骼也在建造，遵循的法则与人类支撑矿坑的方法是相似的。而早在人类发明螺旋楼梯之前，古老的扭螺（Turritella）就已经在内部建造了这一复杂结构。在人类发明辐射状道路体系之前，蜘蛛早就这么做了。树木的分支结构能够最大程度地承受外部重力和风力的作用，分枝和树干之间的角度和位置通常是经过精密设计的。而晶体是由原子、分子或离子按照一定的规律和排列方式组成，其结构通常具有高度的对称性和规则性，不管是黄铁矿还是镜铁矿，都有令人惊艳的建筑设计。所有这些聚集在柱体结构上，不加标注，让诸物处于匿名状态，让人们猜测它的身份和来源。

Background and research: *The Architect* represents a study of morphology that explores structural forms found in Mother Nature. The termites that construct massive pyramids, the bees that build hexagonal grid honeycombs with beeswax, and the Chinese penduline tits that create suspended nests with plant fibers are deemed as the architects of the animal kingdom. Similarly, human architects, despite their profound creativity, must adhere to the basic logic of materials, dimensions, and structural principles, which is no different from the way crystals form. While humans are busily constructing, their skeletal systems are also being built, following principles similar to those used in mining. Even before humans invented spiral staircases, ancient Turritella had already internally developed this complex structure. Spiders had been netting long before humans invented radial road systems. The structure of tree branches maximizes their ability to withstand external forces such as gravity and wind, and the angles and positions between branches and trunks are often intricately designed. Crystals, composed of atoms,

molecules, or ions arranged in a specific pattern, showcase symmetry and regularity in their structures. Whether it's pyrite or specularite, both boast stunning architectural designs. All of this is gathered on the column structure, unlabeled, leaving the object anonymous, allowing people to guess its identity and origin.

This artwork brings together various "architectural structures" found in Mother Nature, including but not limited to:

这件作品汇集了自然界中各种“类建筑”结构物，包括但不限于：

Animals: Various Bird Nests, Different Types of Beehives, Ant Nests, Cross-sections of Cow Bones, Seashells, Corals, Sea Urchin Shells, etc

动物类：各种鸟窝、各种蜂窝、蚂蚁窝、牛骨剖面、海螺、珊瑚、海胆壳等；

Plants: Pods of Yunnan Eye Beans, Fruits of Hazelnut Trees, Walnut Shells, Pulp of Loofahs, Maple Balls, Fruits of Baiké Trees, Sunflower Flowerheads, Annual Rings of Flame Coral Tree, etc.

植物类：云南眼镜豆荚、鸡冠木榛果棒果实、核桃壳、丝瓜瓤、枫树球、白柯果实、向日葵花盘、年柱刺桐等；

Minerals: Amethyst Cave, Quartz Cave, Fluorite, Pyrite, Epidote, Cassiterite, Guangdong Specularite, Wheel Ore, Stibnite Crystal Cluster, etc.

矿物类：紫水晶岩洞、白水晶岩洞、萤石、黄铁矿、绿帘石、锡石、广东镜铁矿、车轮矿、辉锑矿晶簇等。

Production: Ma Qiuzi, Gao Yang

制作：马秋子、高扬





Nº 7

SARIRA: EXTERNAL AND INTERNAL CRYSTALS 舍利子: 外部和内部的晶体

Pebbles, Agates
鹅卵石、玛瑙

Variable
Dimensions
尺寸可变

概念：晶体有时在外部，有时在内部。正如骨骼有时外露。而动物体内会产生结石和珍珠，修行的高人会烧出舍利子。

1. 螺钿鹅卵石：用鲍壳完全覆盖包裹几颗鹅卵石，做成螺钿鹅卵石。地上散落鲍壳碎片。
2. 一堆鹅卵石堆，石头上钻孔，雕刻放射纹理、雕刻闪电裂纹，在这些空洞和裂纹中培养各种颜色的晶体。让各种颜色的晶体如苔藓一般在鹅卵石蔓延。
3. 几颗未切割的水晶晶原石和玛瑙原石，外表也接近鹅卵石。几颗切开成两半的水晶原石和玛瑙原石。
4. 将它们纵向累积起来。

Concept: In some cases, crystals are found on the outside, while in other cases, they exist within objects. Just like how bones can sometimes be visible externally. Within animal bodies, stones and pearls can form, and eminent monks can generate sarira through incineration.

1. Abalone Shell-Encased Pebbles: Fully envelop several pebbles with abalone shells. There are scattered abalone shell fragments on the ground.
2. Stack of Pebbles with Carved Patterns: Drill holes and carve radial and lightning-like patterns on the stones, cultivating crystals of various colours within these cavities and fractures. This allows the crystals of multiple colours to spread across the pebbles like moss.
3. Uncut Crystals and Agates: Their surface resembles pebbles. Displaying several crystals and agates cut in half.
4. Stack them vertically.

Lustrous Shell Pebbles: Crafted by Wang Diliang
螺钿鹅卵石制作：王迪亮

Crystal Cultivation: Managed by Ma Qiuzi
晶体养殖：马秋子





Nº 8

THE CALCIUM
CARBONATE FAMILY
碳酸钙家族

Stalactites, Coral,
Books, Conch Shells
钟乳石、珊瑚、书、海螺壳

Variable
Dimensions
尺寸可变

背景和研究：珊瑚礁的主要成分是珊瑚虫的外骨骼，这种外骨骼主要由碳酸钙组成，同时也含有少量的有机物质。

钟乳石的主要成分也是碳酸钙，通常以方解石或者石灰石的形式存在。钟乳石是由地下溶洞中滴水形成的矿物沉积物，这些滴水中含有溶解了大量碳酸盐的地下水。当这些水从洞顶或者洞壁滴落下来时，碳酸钙就会沉淀下来，并逐渐形成钟乳石。

芦管石的成因是山涧边芦苇水草等生长旺盛，山涧里过饱和和碳酸钙不断对其包裹，形成了类似芦苇杆状的钙化石，所以人们形象地称之为芦管石，通常用于园林造景。

还有许多其他类型的石头也是由碳酸钙组成的。方解石、石灰岩，大理石则是由石灰岩经过高温高压作用形成的变质岩。当然，蛤蜊壳和牡蛎壳也是碳酸钙，在我的家乡，人们用牡蛎壳烧成石灰作为高档涂料。海螺壳的主要成分也是碳酸钙。

因此，这些物质可以很好地结合。

操作：在钟乳石上钻一个小孔，种上树枝状的珊瑚，原汤化原食，是天作之合。将一卷绳子浸泡在过饱和溶液中，或者放入温泉中，可以获得绳子结构的芦管石。用浓稠的碳酸钙溶液从高处滴落，则可以人为制造钟乳石。当然，这支钟乳石可以凭空堆积起来，也可以是跌落在一摞书，或者一些海螺壳上。

Background and research: The primary constituent of coral reefs is the exoskeleton of coral polyps, predominantly composed of calcium carbonate, with a minor presence of organic materials.

The main component of stalactites is also calcium carbonate, commonly found in the form of calcite or limestone. Stalactites are mineral deposits formed by the dripping of water, which contains a large amount of dissolved carbonate from the groundwater, in underground caves. As this water drips from the cave ceiling or walls, the calcium carbonate precipitates and gradually forms stalactites.

The formation of reed tube stones is due to the vigorous growth of reeds and aquatic plants along the banks of mountain streams. The oversaturated calcium carbonate in the stream continuously envelops them, forming calcium fossil structures that resemble reed stalks, hence the name reed tube stones. They are often used for landscaping in gardens.

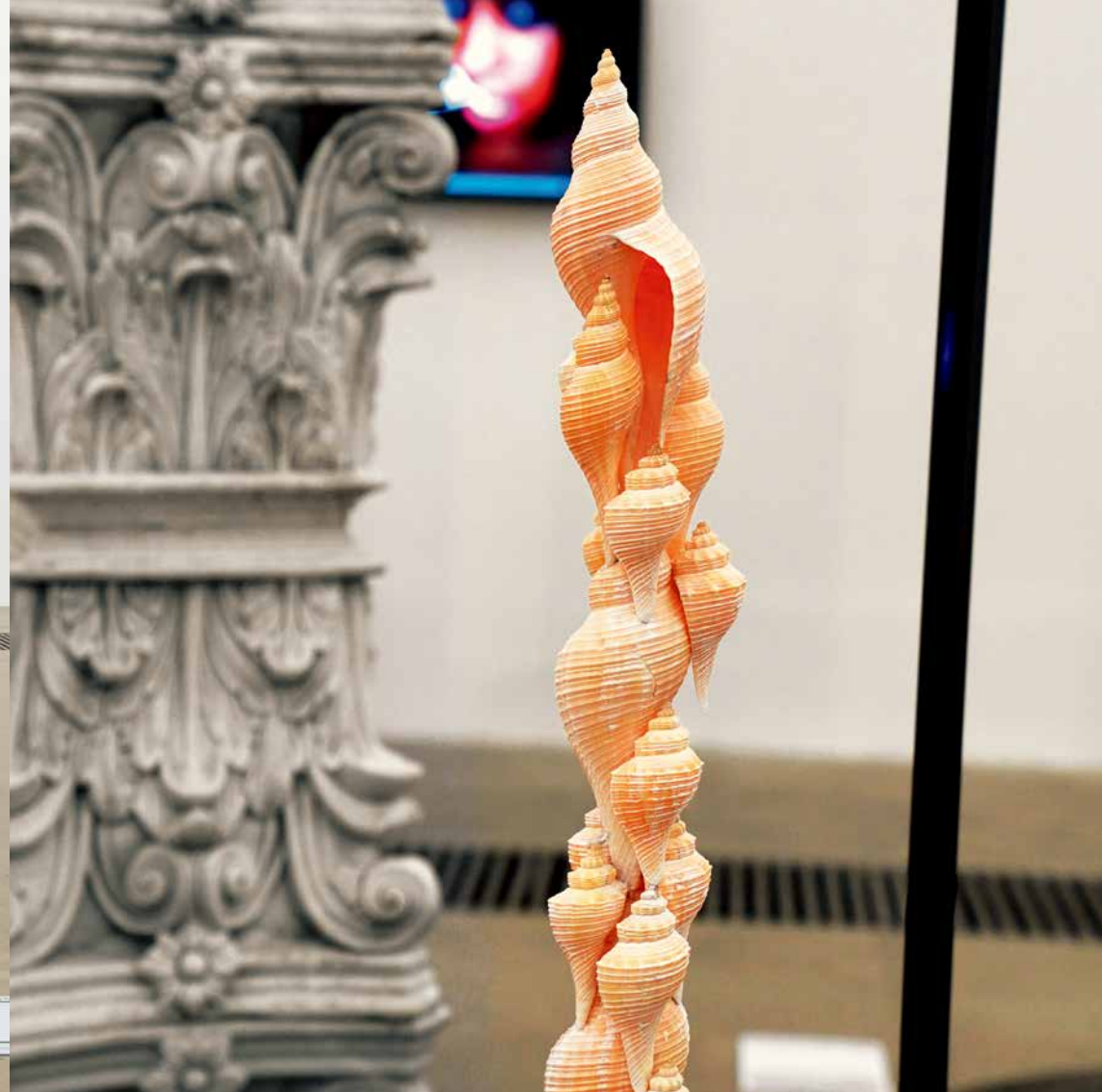
Numerous stones are also composed of calcium carbonate. Calcite, limestone, and marble are metamorphic rocks formed from limestone under high temperatures and pressure. Naturally, clam and oyster shells are also made of calcium carbonate; in my hometown, oyster shells are calcined to produce lime for high-quality paint. Similarly, the main component of conch shells is calcium carbonate.

Thus, these substances are allowed to intermingle harmoniously.

Procedure: Bore a small hole into a stalactite and implant coral with a branch-like structure; it is a match as if crafted by nature itself. Immerse a coil of rope in a supersaturated solution or place it in a hot spring to acquire a reed-like stone structure resembling the ropes. By allowing a dense solution of calcium carbonate to drip from a height, one can artificially create stalactites. These stalactites can be formed in mid-air or be made to appear as if they have fallen onto a stack of books or a collection of conch shells.

Accelerated artificial reed pipe stone formation through electrochemical methods: Wang Mengru, Lv Mingyue
电化学法加快人造芦管石生成：王梦茹、吕明岳

Stalactite formation: Wang Mengru, Lv Mingyue
钟乳石生成：王梦茹、吕明岳



背景：珊瑚礁的主要成分是珊瑚虫的外骨骼，这种外骨骼主要由碳酸钙组成，同时也含有少量的有机物质。

A. 在福建德化蕴玉瓷庄苏献忠工作室，我用浓稠的瓷泥泥浆从高处滴落，在几根空心瓷泥管子上，滴出了一只钟乳石。与真的钟乳石相当逼近，我不是超级写实主义雕塑家，我只是采用了和大自然制造钟乳石同样的方式。这是上帝的造型手法。

B. 我采用普通的雕塑手法，用瓷泥做了几块石头，石头上镶嵌着很多几何体，我有意地分别模仿了黄铁矿石、晶簇和石英的造型特点。然后，当地的工艺大师帮我在其上施加宝石釉。这是将稀有矿石粉碎后加入釉料产生的奇幻窑变风格，又称为结晶釉。

C. 我模仿芦管石成形的逻辑，将几捆棉绳完全浸泡入瓷泥泥浆，试图让泥浆完全渗透。我设想这些绳结和成捆的绳子造型的结构物可能在干燥的过程中轻微开裂，需要多次补刷泥浆。可以先入窑素烧 800 度左右。棉绳应该在烧制过程中消失，如果仍有裂纹，可以喷釉后让釉料填充裂纹，这样可以获得空心的瓷管子。这样的结构应该可以连接水循环系统，或者经过钻孔，成为特殊的吹奏乐器。

D. 我设想 3D 扫描滴落成型的陶瓷钟乳石，获得 3D 模型，用陶瓷 3D 打印复制这根陶瓷钟乳石，保留 3D 打印的横纹，体量可以放大到尽可能大的极限。

E. 我用陶瓷 3D 打印技术打印了暴露出剖面的海螺。3D 打印自然出现的横纹和海螺的生长形态非常接近，而 3D 打印技术必须提供的内部支撑和海螺的结构十分相似。陶瓷因为要进窑高温烧制。在 1300 度以上的高温中，泥浆塑造结构处在熔融状态，容易瘫软，不得不采用内部和外部的支架。

F. 因此，下一步我设想将同样的海螺和钟乳石 3D 模型在北京用碳酸钙材料同时打印。为此需自行研发碳酸钙材料打印机。

Background: The main component of coral reefs is the exoskeleton of coral polyps, which consists mainly of calcium carbonate and also contains small amounts of organic material.

A. At Su Xianzhong's Studio in Yunyu porcelain village, Dehua, Fujian, I dripped thick porcelain slurry from a height onto several hollow porcelain tubes, forming a stalactite that closely resembles a

natural one. I am not a hyperrealist sculptor; I merely employed the same method nature uses to create stalactites, a technique that could be described as divine craftsmanship.

B. Utilizing conventional sculptural techniques, I fashioned several stone pieces from porcelain clay, embedding numerous geometric shapes for them to deliberately mimic the characteristics of pyrite, crystal clusters, and quartz. Subsequently, a local master craftsman applied these pieces a gemstone glaze to, a fantastical kiln transformation style produced by incorporating crushed rare minerals into the glaze, also known as crystalline glaze.

C. Following the logic behind reed-like stone formation, I immersed several bundles of cotton rope fully into porcelain slurry, aiming for complete saturation. I envisioned that these knotted and bundled rope structures might slightly crack during the drying process, which necessitated multiple saturations. They could initially be fired in a kiln at around 800 degrees Celsius. The cotton ropes should disappear during the firing process. If cracks appear still, glaze could be sprayed to fill the cracks, yielding hollow porcelain tubes. Such structures could potentially be connected to a water circulation system or, with drilling, turned into unique wind instruments.

D. I conceived the idea of scanning a stalactite formed by the dripping process to obtain a 3D model and then replicating the ceramic stalactite using 3D ceramic printing. The horizontal lines characteristic of 3D printing will be preserved, and the volume enlarged to its maximum limit.

E. I utilized ceramic 3D printing technology to print a conch with an exposed cross-section. The natural horizontal lines that emerge from 3D printing resemble the growth pattern of a conch, and the internal support structures required by 3D printing technology are similar to the conch's structure. Ceramics must be fired at high temperatures in a kiln. At temperatures above 1300 degrees Celsius, the clay structure in a molten state is prone to collapse, necessitating the use of both internal and external brackets.

F. Therefore, I then intend to print the same conch and stalactite 3D models in Beijing using calcium carbonate material. This would require the independent development of a calcium carbonate material printer.



Technical guidance for the formation of slurry-dripped ceramic stalactites and cotton rope porcelain tubes: Su Xianzhong, Master of Chinese Ceramic Art

泥浆滴落成型陶瓷钟乳石和棉绳瓷管技术指导：
中国陶瓷艺术大师苏献忠

Technical guidance for gemstone glaze: Xu Ruifeng, Master of Chinese Ceramic Art, Representative inheritor of the National Intangible Cultural Heritage Protection Project for Dehua porcelain firing techniques.

宝石釉技术指导：中国陶瓷艺术大师、国家非物质文化遗产保护项目德化瓷烧制技艺代表性传承人许瑞峰

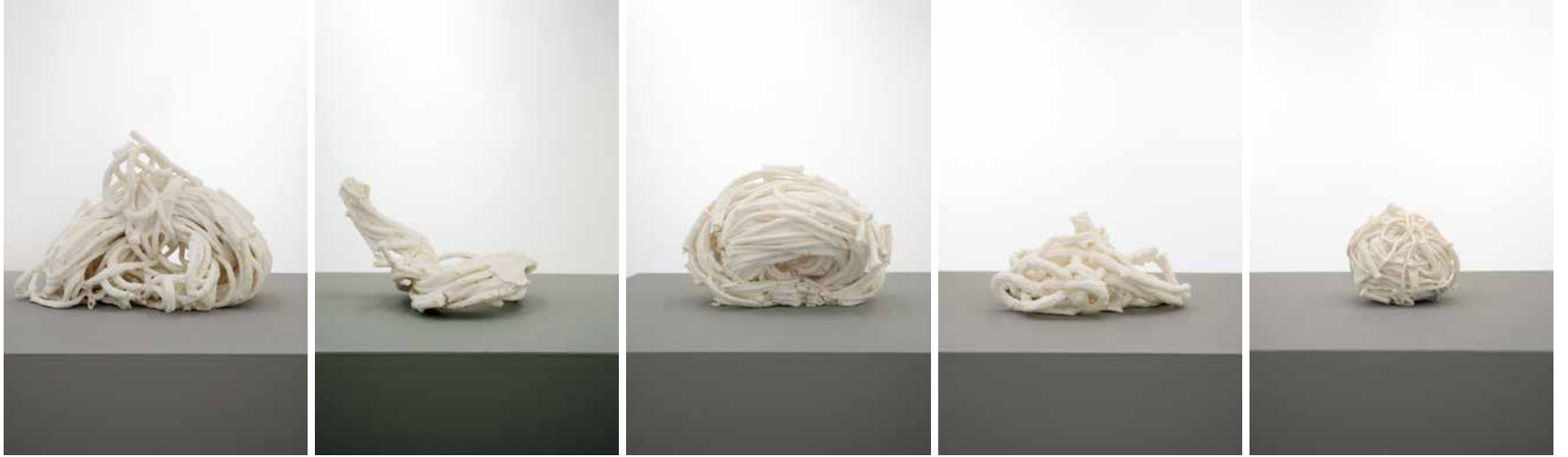


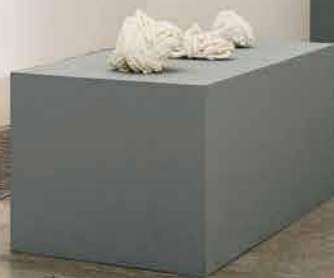
Technical support for ceramic 3D printing: The team of Mr. Lin Zhenzhong from Quanzhou School of Arts and Crafts.

陶瓷 3D 打印技术支持：泉州工艺美术学院林振中老师团队

Technical support for ceramic 3D printing: The 3D printing technology for Dehua ceramics is currently being developed by Professor Qiu Honglie, the eldest son of Professor Qiu Shuangji, a Chinese Arts and Crafts Master, and a geography professor at California State University, capable of printing pieces over two meters in length.

陶瓷 3D 打印技术支持：目前德化陶瓷的 3D 打印技术由中国工艺美术大师邱双炯的长子加州州立大学地理学教授邱宏烈教授研发，能做到两米多





Nº 10

PURGATORY: AGING CHAMBER 炼狱：老化箱

Taihu Lake stones, metal sculptures, porcelain, artificial sponge, sculptures in the shape of Taihu Lake stone, pie-shaped compressed tea, wine bottles, fashion magazines

太湖石、金属雕塑、瓷器、人造海绵、太湖石造型的雕塑、茶饼、酒瓶、时尚杂志

Variable
Dimensions
尺寸可变

背景：老化试验主要是指针对橡胶、塑料产品、电器绝缘材料及其他材料进行的老化试验和研究。通常用可移动的老化柜或是不可移动的老化房，仿真出一种大温差、恶劣环境测试的设备，这是提高产品稳定性、可靠性的重要实验设备。通常的老化箱都是特定目的，光照老化箱测试户外材料受到的主要老化破坏，主要针对涂料、油墨产品，通讯、电器等设备外壳，汽车件、摩托车配件。热老化箱与湿热老化箱针对电器中的绝缘橡胶、斜拉索大桥用外套料等等；盐雾试验箱测试金属材料的耐海洋腐蚀能力；臭氧老化主要考察橡胶产品的耐臭氧性能。高低温循环与冻融循环主要用于建筑涂料、特殊环境使用设备等检测。

概念：道教中有“洞天”的概念，进入“洞天福地”，则“山中一日，世上千年”，时间变得缓慢甚至停滞。老化箱则是一种“反洞天”，它用特设的环境模拟了时间的加速。或者说，因为这个老化箱是一种极端恶劣环境，对于进入老化箱的物品来说，它就是一座“炼狱”。

实验：我们在这里设计的一种综合老化箱，交替使用了光照老化手段：氙弧灯老化（300-800nm）、UV 紫外灯（280-400nm）、碳弧灯（300-700nm），金属卤素灯（280-3000nm）；高低温循环、冻融循环、雨淋、超声盐雾、臭氧老化等多种方法，将其中的物品迅速进行老化。

制作：我们在综合老化箱中放入了真正的太湖石、金属雕塑、瓷器、人造海绵和聚苯乙烯材料雕刻的太湖石造型的雕塑、用贝壳粉和海藻酸钠制备的生态混凝土、黑茶和普洱茶茶饼、几瓶酒和最新的时尚杂志。启动电源，等待结果。

Background: Aging tests primarily refer to the aging trials conducted on rubber, plastic products,

electrical insulating materials, and other materials. Typically, these are carried out using either portable aging cabinets or immovable aging rooms that simulate a harsh environment with significant temperature differences. The rooms serve as crucial equipment for enhancing product stability and reliability. Aging chambers are generally purpose-specific: photo-aging chambers test the primary aging damage to outdoor materials, mainly targeting coatings, inks, communication and electrical equipment casings, automotive and motorcycle parts; thermal aging and humidity aging ones focus on the insulation rubber in electrical appliances, cable-stayed bridge coatings, etc.; salt spray chambers test the corrosion resistance of metal materials to marine environments; ozone aging primarily examines the resistance of rubber products to ozone; high and low-temperature cycles and freeze-thaw cycles are predominantly used for testing building coatings and equipment used in special environments.

Concept: In Taoism, there is the concept of a "cavernous heaven," where time slows down or even comes to a halt, and "a day in the mountains is equal to a thousand years in the world,." The aging chamber, in contrast, is an "inverse cavernous heaven," using a specially designed environment to simulate the acceleration of time. In other words, due to the extreme conditions within, the aging chamber becomes a "purgatory" for the items placed inside.

Experiment: We have designed a comprehensive aging chamber here that alternates between various aging methods: xenon lamp aging (300-800nm), UV lamps (280-400nm), carbon arc lamps (300-700nm), and metal halide lamps (280-3000nm); along with high and low-temperature cycling, freeze-thaw cycling, rain exposure, ultrasonic salt spray, and ozone aging, rapidly aging the items within.

Production: We placed genuine Taihu stones, metal sculptures, porcelain, artificial sponges, sculptures of Taihu stones carved from polystyrene, eco-concrete prepared from shell powder and sodium alginate, black and Pu'er tea cakes, several bottles of wine, and the latest fashion magazines, in the comprehensive aging chamber. Then we turned on the power and waited for the result.

Experimental Materials: Taihu Stone, Metal Sculptures, Porcelain, Artificial Sponge, Taihu Stone-styled Sculptures, Tea Cakes, Wine Bottles, Fashion Magazines

实验材料：太湖石、金属雕塑、瓷器、人造海绵、太湖石造型的雕塑、茶饼、酒瓶、时尚杂志



背景：牛羊等动物会舔舐矿盐是为了补充身体所需的矿物质，特别是钠。在动物的食谱中，有时可能缺乏某些矿物质，尤其是钠。而矿盐通常含有丰富的钠，因此动物会通过舔舐矿盐的方式来摄取所需的矿物质。矿盐还含有其他一些矿物质，如钙、镁、钾等，摄入这些矿物质可以维持牛羊机体的电解质平衡，促进家畜的生长，还能防治家畜矿物质营养缺乏症，如异嗜癖、白肌病、营养性贫血等。

分析：动物骨骼的主要成分是羟基磷灰石（hydroxyapatite），它是一种无机盐，其化学式为 $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$ 。羟基磷灰石是一种钙磷复合物，具有高度的硬度和稳定性，是构成骨骼和牙齿的主要成分。牛羊舔舐盐砖的动作是具有象征性的，有机世界和无机世界从来没有停止过互相转化。古代的动植物在地质作用之下成为今天的石油和煤，矿物质在各种机缘和力量的搬运之下在生命体的内外流动。

操作：

- 1，来自巴勒斯坦的喜马拉雅矿盐块雕刻成牛、羊、马、骆驼等动物的头像
- 2，将这些盐雕刻羊头雕塑放到牧区，让牛羊舔食，使这些雕塑模糊变形。拍摄牛羊舔食雕塑的视频。
- 3，把变形的动物头盐雕安装在墙面，同时展出视频。
- 4，地面放置一批牛羊头骨化石，在动物头骨的间隙中长出盐晶体。

Background: Animals such as cows and sheep lick mineral salts, particularly sodium, to replenish essential minerals. Sometimes, the dietary intake of animals lacks certain minerals, especially sodium. Mineral salts are typically rich in sodium; hence animals consume the necessary minerals by licking these salts. Mineral salts also contain other minerals like calcium,

magnesium, and potassium, which help maintain the electrolyte balance in the bodies of cattle and sheep, promote the growth of livestock, and prevent mineral deficiency diseases such as pica, white muscle disease, and nutritional anemia.

Analysis: The main component of animal bones is hydroxyapatite, an inorganic salt with the chemical formula $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$. Hydroxyapatite is a calcium-phosphate compound known for its high hardness and stability, and it is the primary constituent of bones and teeth. The act of cattle and sheep licking salt blocks is symbolic, representing the unceasing transformation between the organic and inorganic worlds. Ancient flora and fauna, under geological processes, have become today's petroleum and coal, with minerals circulating within and among living organisms through chances and forces.

Procedure:

1. Himalayan mineral salt blocks from Palestine are carved into the heads of animals such as cows, sheep, horses, and camels.
2. These salt-carved animal head sculptures are placed in grazing areas for cattle and sheep to lick. The licking causes the sculptures to blur and deform. Videos are taken of the animals licking the sculptures.
3. The deformed animal head salt sculptures are mounted on a wall, with the video displayed alongside.
4. A collection of cattle and sheep skull fossils is placed on the ground, with salt crystals growing between the gaps of the animal skulls.

Mineral Salt Animal Head Carvings:

Fang Jing, Lan Lan

矿盐动物头雕刻：房静、兰兰

Cultivation of Salt Crystals on Sheep and Cow Skulls:

Ma Qiuzi

牛羊动物头骨上培植盐晶体：马秋子

Experimental Materials: Mineral Salt Sculptures, Video Recordings

实验材料：矿盐雕塑、录像





背景：动物舔舐矿盐，盐分和微量元素进入动物体内，大自然的循环系统在身体内外贯通，心跳驱动着的是体液，也是无机物质的搬运。人也以身心不断感受和交换这些物质。解放军第 306 医院的研究人员的论文《健康心血管自主神经功能与微量元素的关系》显示：微量元素锰、铅、铝的浓度及其与心血管自主神经功能密切相关。微量元素锰、铅会影响到 HRV 的稳定性，进而对心血管自主神经功能产生影响。微量元素锰、铅、铝对神经行为功能也有着不同方面的影响。微量元素摄入过量、不足、不平衡或缺乏都会不同程度地引起身体异常和病变。

操作：

- 1，成堆的自然形状喜马拉雅矿盐，堆积成堆。一些矿盐块雕刻成动物心脏造型。
- 2，从心脏的动脉处开口，装入灯泡。编程控制灯泡以接近人类心跳的节律闪亮。
- 3，另一组贯穿心脏雕塑的则是把十来个心脏之间用塑料导管连接，内置血红色液体，用蠕动泵驱动造成循环系统。

Background: When animals lick mineral salts, the salts and trace elements enter their bodies, connecting the natural cyclical systems within and outside their bodies. The heartbeat propels not just the body fluids but also the transport of inorganic substances. Humans too continuously perceive and exchange these substances with their bodies and minds. A paper by researchers at the 306th Hospital of the People's Liberation Army, titled "The Relationship Between Healthy Cardiovascular Autonomic Nervous Function and Trace Elements", indicates that the concentration of trace elements such as manganese, lead, and aluminum is closely related to the function of cardiovascular autonomic nerves. Trace elements like manganese and lead can affect the stability of heart rate variability (HRV) and subsequently impact cardiovascular autonomic nervous function. These elements also have various impacts on

neurobehavioral functions. Excessive intake, deficiency, imbalance, or lack of trace elements can cause varying degrees of abnormality and disease in the body.

Procedure:

- 1. A heap of naturally shaped Himalayan mineral salt is piled up. Some salt blocks are carved into the shape of animal hearts.
- 2. An opening is made at the arterial end of the heart, and a light bulb is installed, which is programmed to flash at a rhythm close to the human heartbeat.
- 3. In another set, a series of heart sculptures are interconnected by plastic tubes filled with a blood-red liquid, creating a circulatory system driven by a peristaltic pump.

Mineral Salt Animal Head
Carvings: Fang Jing, Lan Lan,
Quyang Anda Sculpture
矿盐动物头雕刻：房静、兰兰、
河北曲阳安达雕塑集团

Lighting Programming and
Circulatory System Design: Wang
Di Liang, Fang Jing, and Lan Lan
灯光编程和循环系统：
王迪亮、房静、兰兰

Experimental Materials: Mineral
Salt Sculptures, Light Bulbs
实验材料：矿盐雕塑、灯泡



Nº 13

FLOATER

漂浮物

Plastic, foam ore crystals,
yellow mealworms

塑料、泡沫矿石晶体、黄粉虫

Variable
Dimensions

尺寸可变

背景：聚苯乙烯泡沫塑料是以聚苯乙烯树脂为主体，加入发泡剂等添加剂制成，它是使用最多的一种缓冲材料。由于其质量小（特别是发泡型）、残余价值低，聚苯乙烯不容易循环再生。在福建东山等海洋养殖地区，人们一度广泛使用聚苯乙烯泡沫作为养殖海藻和贝类的吊桶，目前已被空心塑料吊桶所取代。它也被用来作为竹筏上的增加浮力的材料。这造成了巨大的海洋污染，难以在自然环境中降解的聚苯乙烯泡沫碎片不但以白色垃圾的形态破坏海洋景观，更以微塑料的方式通过海产品进入人体。

研究：我们设想用真菌菌丝体来代替聚苯乙烯泡沫，作为未来海洋养殖悬浮吊桶。真菌菌丝体就是蘑菇的根系，与真菌的生长基质混合成密实的网络，通过精心选择真菌品种和添加强韧的植物纤维，可以产生抗菌、防火、隔热和防水的真菌菌丝体材料。

实验：我们将依次尝试竹编织结构成型和模具成型的方式来获得特殊造型的菌丝体。一旦成形，进行烘干处理，使菌丝体失活，不再生长孢子，从而产生一种类似于膨胀聚氨酯或聚苯乙烯泡沫的材料。在本实验中，我们选择了云朵造型。一旦实验成功，我们设想获得云朵造型的菌丝体固体。它可以在生产蘑菇的过程中制造，漂浮在海面上代替聚苯乙烯泡沫，用于海藻和贝类养殖，同时创造出海面上飘满白色云朵的海洋养殖景观。

制作：在东山收集鹅卵石形状海洋垃圾聚苯乙烯泡沫，在屋顶和地面的墙角堆积，如同云朵。部分用来养殖植物。用编织结构或模具成型的云朵形状菌丝体漂浮物分布在其中。

Background: Polystyrene foam is a buffering material predominantly composed of polystyrene resin and various additives, including a blowing agent. It is the most widely used buffering material. Its lightweight nature, especially in its expanded form, and its low residual value make it challenging to recycle. In marine farming areas such as Dongshan, Fujian, polystyrene foam was once extensively utilized as a buoyant

container for cultivating seaweed and shellfish, though it is now replaced by hollow plastic buckets. It also serves as a material to increase buoyancy on rafts, leading to significant marine pollution. The non-biodegradable fragments of polystyrene foam not only mar the marine landscape as white trash but also infiltrate the human body through seafood as microplastics.

Research: We envision replacing polystyrene foam with fungal mycelium for future aquaculture suspension buckets. Mycelium, the root system of mushrooms, forms a dense network when mixed with a fungal growth substrate. By carefully selecting fungal species and reinforcing them with robust plant fibers, we can create a mycelial material that is antimicrobial, fire-resistant, insulating, and waterproof.

Experiment: We will sequentially attempt bamboo weaving and mold shaping to obtain mycelium with a unique form. Once formed, the mycelium is dried to deactivate it, preventing further spore growth, thus creating a material akin to expanded polyurethane or polystyrene foam. In this experiment, we have chosen a cloud-like shape. Should the experiment be successful, we anticipate obtaining solid mycelium in cloud shapes. It could be produced during mushroom cultivation, floating on the sea surface as a substitute for polystyrene foam, used for seaweed and shellfish farming, and simultaneously creating a marine farming landscape dotted with white clouds on the sea.

Production: Ovoid marine debris polystyrene foam, collected from Dongshan Mountain, accumulates at roof and ground corners like clouds, with some used for plant cultivation. Cloud-shaped mycelium floating objects, formed by weaving structures or molds, are distributed within.

Polystyrene foam soilless cultivation: Liu Shunyi
聚苯乙烯泡沫无土栽培：刘顺意

Crystal cultivation on polystyrene foam: Ma Qiuzi
聚苯乙烯泡沫上的晶体养殖：马秋子

Mycelium experiment leader: Wang Mengru
菌丝体实验负责人：王梦茹

Mycelium experimental technical support: Peng Changrui, Liao Zhimin, Peng Shi Mushroom Industry Company, Shanghai
菌丝体试验技术支持：上海彭世菇业公司彭长儿、廖志敏





Nº 14

HYDROSTATIC PRESSURE
海压

Plastic Foam balls
塑料泡沫球

Variable
Dimensions
尺寸可变

背景：“海压”通常指的是海水对水下物体产生的压力。随着水深的增加，海压也随之增加。理解海压的概念对于潜水、潜艇设计和海洋工程等领域非常重要。海压主要由水的深度和水的密度决定，每增加 10 米的深度，海压大约增加 1 个大气压（约 101,325 帕斯卡）。海水密度受温度、盐度和压力影响，在不同深度和地理位置有所变化。深度越大，压力越高。科学家们通过实验室模拟和深海探测器研究海压对物质和生物的影响，以深入了解深海环境的特征和潜在资源。

厦门大学的嘉庚号海洋科考船配备了先进的科研设备和实验室，能够执行多种海洋科学考察任务。包括海洋地质调查：利用多波束测深系统、浅地层剖面仪等设备进行海底地形和地质结构的调查。海洋物理研究、海洋化学分析、海洋生物研究、海洋声学研究和大气科学研究等。

研究：声悬浮（Acoustic Levitation）是一种利用声波产生的压力将物体悬浮在空中的技术。这种技术利用的是声波的物理特性，通过产生驻波来形成压力节点，使得物体能够悬浮在这些节点上。通常采用对置扬声器或者反射面形成驻波场，保证在特定区域内形成稳定的驻波节点。为了实现稳定悬浮，系统需要精确控制声波的频率、相位和幅度，并需要实时调整以适应环境变化和物体移动。

操作：

- 1，将多根不锈钢针穿透一组泡沫球体。
- 2，将这些泡沫球体交给厦门大学“嘉庚号”科考船放进海里。在不同深度的海压之下，泡沫被压缩变形受挫。不锈钢针外露，整个球体变成多刺的球体。
- 3，按照深度顺序将这些压缩程度不一的球体纵向悬挂成一串，每个球对应不同的海水深度。
（目前由于“嘉庚号”科考船正在海洋科考途中，5 月底返航后将可以执行艺术家所委托的海压试验。展厅里展出的这些泡沫球将在未来两个月内置换为于“嘉庚号”科考船释放的深潜器带入海底不同深度的球体）。
- 4，旁边设置一个声悬浮装置，用声波使数滴来自不同深度的海水悬浮成纵向的一串，悬停在空中。

Background: The term “hydrostatic pressure” denotes the force exerted by seawater on submerged objects. This pressure intensifies with increasing depth. Grasping the concept of hydrostatic pressure is crucial for diving, submarine design, and marine engineering. Hydrostatic pressure is primarily determined by water depth and density, with an approximate increment of one atmosphere (about 101,325 pascals) for every 10 meters of depth. Seawater density varies with depth,

geographical location, temperature, salinity, and pressure. The deeper the water, the greater the pressure. Scientists investigate the effects of sea pressure on matter and life through laboratory simulations and deep-sea probes to better understand the characteristics and potential resources of the deep-sea environment.

Xiamen University's JiaGeng research vessel is equipped with state-of-the-art scientific research equipment and laboratories, capable of conducting a variety of marine scientific expeditions. This includes marine geological surveys: utilizing multibeam echo sounders, sub-bottom profilers, and other equipment to investigate the seabed topography and geological structures. Additionally, it covers fields such as marine physics research, marine chemical analysis, marine biological research, marine acoustical research, and atmospheric scientific research.

Research: Acoustic levitation is a technique that uses the pressure generated by sound waves to levitate objects in the air. This technology leverages the physical properties of sound waves, creating standing waves to form pressure nodes that allow objects to hover above these nodes. Opposing speakers or reflective surfaces are typically used to generate standing wave fields, ensuring the formation of stable pressure nodes in specific areas. To achieve stable levitation, the system requires precise control over the frequency, phase, and amplitude of the sound waves, with real-time adjustments to adapt to environmental changes and object movements.

Procedure:

1. Pierce a series of foam spheres with stainless-steel needles.
2. Entrust these spheres to Xiamen University's JiaGeng research vessel to be submerged at sea. Under varying pressures at different depths, the foam is compressed and deformed. The stainless-steel needles protrude, transforming the entire sphere into a spiky structure.
3. Suspend these spheres, with varying degrees of compression, in a vertical sequence according to depth, with each sphere representing a distinct depth of seawater. (Currently, as the JiaGeng research vessel is en route for a marine expedition, the artist-commissioned hydrostatic pressure experiment will be conducted after its return at the end of May. The foam spheres on display in the exhibition hall will be replaced in the next two months with spheres taken to different depths by the submersible deployed by the Jiageng research vessel.)
4. Set up an acoustic levitation device nearby to levitate several drops of seawater from various depths into a vertical string, suspended in the air.

Scientific Guidance: Provided by Professor Wang Hailin of the Jiageng research vessel, College of Ocean and Earth Sciences, Xiamen University

科学指导：厦门大学海洋学院“嘉庚号”科考船，王海黎教授

TAcoustic Levitation Experiment: Conducted by Li Xiaotong

声悬浮实验：李晓彤

静

静



静



Nº 15

WE ARE INSECTS
我们是虫子

yellow mealworms,
3D-printed sculptures
黄粉虫、3D 打印雕塑

Variable
Dimensions
尺寸可变

背景：聚苯乙烯经久耐用，不能生物降解，常被用作一次性饭盒、咖啡杯和包装绝热材料，在土壤、河流湖泊及海洋等环境产生了普遍严重的“白色污染”。

概念：科幻小说《三体》中，地球人在三体人领先的科技面前，感觉自己就像是虫子。但是小说中的“大史”从蝗虫的历史中领悟到：“我们是虫子，但是虫子从来没有被打败过”。这也是作品标题的由来。

研究：北京航空航天大学杨军研究组和美国斯坦福大学吴唯民高级研究员、深圳华大基因公司赵姣博士等在国际环境科学与技术领域权威期刊《Environmental Science and Technology》上发表了题为《啮食塑料黄粉虫对聚苯乙烯的生物降解和完全矿化作用：1. 化学与物理特性和同位素失踪试验》和《啮食塑料黄粉虫对聚苯乙烯的生物降解和完全矿化作用：2. 肠道微生物的作用》两篇姊妹研究论文，首次以全面证据揭示了黄粉虫啮食降解聚苯乙烯、将其完全降解矿化为二氧化碳、并利用同化为虫体脂肪，同时证明是其肠道微生物起主导作用，并且分离鉴定了一株降解聚苯乙烯的细菌。此研究成果为解决废弃塑料污染环境的问题提供了崭新的思维。

黄粉虫又名面包虫，拉丁学名 *Tenebriomolitor*。一般长 20-25 毫米，成虫为黑色甲虫，是一种仓库害虫，原产北美洲，现已被人工大量饲养用作动物饲料或者提取化工原料。在北航和斯坦福的实验表明，产自中国和美国的黄粉虫幼虫都啮食塑料，仅仅靠啮食泡沫塑料能存活一个月以上，最后发育成甲壳成虫。聚苯乙烯泡沫塑料在黄粉虫幼虫肠道停留时间短于 24 小时。进食泡沫塑料 16 天后，黄粉虫可以将大约 48% 的聚苯乙烯转化为二氧化碳。碳-13 同位素示踪实验证明，聚苯乙烯被黄粉虫完全降解矿化为二氧化碳和利用其转化为虫体脂肪。（资料引自北京航空航天大学网站：<https://news.buaa.edu.cn/info/1006/30573.htm>）

操作：3D 雕刻聚苯乙烯泡沫成三体飞船造型。

养殖黄粉虫啮噬聚苯乙烯泡沫雕塑，拍摄延时视频，展示视频。

被黄粉虫吃过的三体飞船残骸放在玻璃盒子中展出。

另外从网络视频中剪辑出一部《异食癖》短片，展示世界各地的怪人们啃噬玻璃、铁钉等异物的画面。

Background: Polystyrene is durable and non-biodegradable, frequently used in disposable food containers, coffee cups, and as insulation in packaging materials, resulting in widespread and severe “white pollution” in soil, rivers, lakes, and oceans.

Concept: In the science fiction novel *The Three-Body Problem*, humans feel like insects when confronted with the superior technology of the Trisolarans. However, the character Da Shi realizes from the history of locusts: “We are insects, but insects have never been defeated.” This realization is the origin of the work’s title.

Research: A research group led by Yang Jun from Beihang University, in collaboration with Senior Researcher Wu Weimin from Stanford University and Dr. Zhao Jiao from BGI Shenzhen, published two sister research papers in the authoritative journal *Environmental Science and Technology*, titled “Biodegradation and Complete Mineralization of Polystyrene by Plastic-eating Larvae of the Mealworm (*Tenebrio molitor*): 1. Chemical and Physical Properties and Isotopic Depletion Experiments” and “Biodegradation and Complete Mineralization of Polystyrene by Plastic-eating Larvae of the Mealworm (*Tenebrio molitor*): 2. The Role of Gut Microorganisms.” These papers, for the first time, provide comprehensive evidence that mealworms can biodegrade and completely mineralize polystyrene into carbon dioxide and assimilate it into their body fat, with the gut microbiota playing a leading role. They also isolated and identified a bacterium that degrades polystyrene. This research offers a novel perspective on addressing the environmental pollution caused by discarded plastics.

The mealworm, also known as the flour beetle, with the Latin name *Tenebrio molitor*, typically grows to 20-25mm in length, and the adult is a black beetle. It is a warehouse pest, originally from North America

and now extensively bred artificially as animal feed or for the extraction of chemical raw materials. Experiments at Beihang University and Stanford University have shown that larvae from China and the United States both feed on plastic and can survive for over a month solely by consuming foam plastic, eventually developing into adult beetles. Polystyrene foam remains in the gut of mealworm larvae for less than 24 hours. After feeding on foam plastic for 16 days, the mealworms can convert about 48% of the polystyrene into carbon dioxide. Carbon-13 isotope tracing experiments have proven that mealworms completely degrade and mineralize polystyrene into carbon dioxide and assimilate it into their body fat. (Source: Beihang University website <https://news.buaa.edu.cn/info/1006/30573.htm>)

Procedure: Utilizing 3D carving techniques, polystyrene foam is sculpted into the iconic form of a spacecraft from The Three-Body Problem.

The mealworms are bred to consume the polystyrene foam sculpture, with time-lapse videography capturing their progress, which is then exhibited in video format.

The desolated remains of the Three-Body spacecraft, post-consumption by the mealworms, are displayed within a glass enclosure.

In addition, a short film, Pica, is curated from internet videos, highlighting peculiar individuals globally indulging in the act of consuming foreign objects such as glass and iron nails.

Production of the video depicting mealworms
consuming polystyrene foam: Li Xiaotong
黄粉虫啃噬聚苯乙烯泡沫视频制作：李晓彤

Creation of the Pica short film: Xu Chumeng
《异食癖》短片制作：徐楚蒙



Nº 16

THE LIQUID
METAL SERIES
液态金属系列

liquid metal,
dry heat module
液态金属、干热模块

Variable
Dimensions
尺寸可变

背景：液态金属是指在常温和常压下呈液态状态的金属。常见的液态金属包括汞（Hg），也就是水银。汞是唯一一个在标准条件下（室温和常压）就是液态的金属，而其他金属则在较高的温度下可以达到液态。液态金属的特性包括高的导电性、热导率和流动性。这些特性使得液态金属在一些特定的应用中非常有用，由于一些液态金属的毒性或者其他不良特性，它们在一些应用中也受到限制。

相关研创：2010 年以来，国外数位艺术家利用液态金属特征创作了作品，如迈克尔·弗林 Michael Flynn、儿玉幸子 Sachiko Kodam、金允哲 Yunchul Kim 等人的作品。包括市面上的铁磁流体玩具，主要利用了磁力控制性能。多为黑色铁磁流体。

实验动机：中科院理化所刘静教授团队在 2017 年取得技术突破，制备了镓铟合金液态金属，在常温下就可以达到液体状态的同时又保持了水银质感的外观，发现了液态金属的多种机理。本系列实验的目标是发掘液态金属的更多可能性及其艺术表现可能。

16·1，《液态金属走迷宫》：迷宫中的液态金属，利用液态金属的电致运动性质，液态金属会向负极集中，正极驱赶，负极吸引，电压影响速度。在迷宫的不同出口反复通电，让液态金属走迷宫。
实验中发现液态金属只能在电机驱动下进行点对点直线运动，因此必须在迷宫的每个折角安装电极，起到“向导”作用。这样液态金属显得并非自己走迷宫，非常不“智能”。
因此设想将电极的控制权交给观众，使之成为一件互动作品，由观众来引导液态金属走迷宫。但由于液态金属的不可控性很强，电压、电流、迷宫形状都会影响到液态金属的“行走”，所以此次展览暂时只展示实验过程及数据。

16·2，《金属潮汐》：用磁铁驱动金属运动，通过电流改变磁场大小，使磁流体产生不同纹理，

出现毛刺。在容器底座下安排旋转的磁铁，让毛刺不断旋转。

第一次实验，旋转的磁铁固定了毛刺的造型，等于是悬臂举着固态化的金属转动。无法体现液态金属的流动性。尝试让旋臂通过电流中断或强弱改变磁场，但要设计如何不重复国际艺术家已经完成的工作。进一步研究发现多数艺术家采用圆周旋转。

16·3，《液态金属星空》：液态金属的性能包括通过通电改变表面张力，会由平摊变为球体。需要在容器（盘子）底部安装很多电针，电针需要上下穿透整个盘子，下部可以连接电源。电针布局为全天星图。

理想的设想是，观众第一眼看到平坦的一片液态金属镜面状态，也就是断电的状态。观众靠近时触发感应器，电针通电，这时铁镓合金银色液体由摊开的薄膜状集中成小球状，变成球状星空。人离开时为镜面，人靠近时为星空。经与科研团队探讨，该设想暂时不可行。决定暂停实验。

16·4，《躁动的章鱼》：用液态金属复合材料制作一条章鱼容器底座安装电路控制的加热模块，不同部位交替加热，让不同的部位不断交替加热液态金属复合材料受热后，章鱼在底板上蠕动伸缩触手，能移动最理想。

16·5，《忐忑》：液态金属加入纳米氧化铜后会膨胀形成多孔结构，用这个材料翻铸造一个人类心脏雕塑。

Background: Liquid metal denotes metals that are in a liquid state at room temperature and atmospheric pressure. Prominent examples of liquid metals include mercury (Hg), also referred to as quicksilver. Mercury stands alone as the sole metal that is in a liquid state under standard conditions—room temperature and atmospheric pressure—when other metals liquefy at higher temperatures. The attributes of liquid metals, such as high electrical and thermal conductivity and fluidity, render them exceptionally useful in specific applications. However, the toxicity of certain liquid metals or their other adverse properties can limit their applicability in some domains.

Related research and creation: Since 2010, a number of international artists have leveraged the unique

characteristics of liquid metals to craft their works, including pieces by Michael Flynn, Sachiko Kodama, and Yunchul Kim. The popular ferrofluid toys available in the market are designed predominantly to utilize magnetic control properties, with most being black ferrofluids.

Motivation: In 2017, Professor Liu Jing's team at the Institute of Physics and Chemistry of the Chinese Academy of Sciences achieved a technological breakthrough in the production of gallium-iron alloy liquid metal, which retains the appearance of mercury texture and has unveiled various mechanisms of liquid metals. The objective of this series of experiments is to uncover further possibilities and artistic potentials of liquid metals.

16-1, Liquid Metal Maze Runner: Within a labyrinth, the liquid metal, due to its electrokinetic properties, is drawn towards the cathode, repelled by the anode, and attracted back to the cathode, with the voltage influencing its velocity. Electricity is applied repeatedly at various exits of the maze, guiding the liquid metal through the labyrinth.

During the experiment, it was observed that the liquid metal could only perform point-to-point linear motion under the actuation of an electric motor. Consequently, electrodes had to be installed at every turn of the maze to serve as “guides.” As a result, the liquid metal did not appear to navigate the maze autonomously and lacked a sense of “intelligence.”

Thus, the concept was envisioned to hand over the control of the electrodes to the audience, transforming it into an interactive artwork where participants would direct the liquid metal through the maze. However, liquid metal is strongly uncontrollable; factors such as voltage, current, and the shape of the maze would all impact the “movement” of the liquid metal. Therefore, the exhibition only presents the experimental process and data for the time being.

16-2, Metal Tides: The motion of the metal is actuated by a magnet, with the electric current modulating the magnetic field's intensity, thereby inducing diverse textures in the ferrofluid and the formation of spikes. A rotating magnet positioned beneath the container's base sets these spikes into a continuous rotational motion.

In the initial experiment, the rotating magnet solidified the shape of the spikes, effectively acting as a cantilevered arm that revolved the solidified metal. This did not demonstrate the fluidity characteristic of liquid metals.

Attempts were made to alter the magnetic field by interrupting the current or varying its strength through the rotary arm, but it was necessary to design in a way that avoids replicating what international artists have already accomplished. Further research revealed that the majority of artists have employed circular rotation.

16-3, Liquid Metal Starry Sky: The properties of liquid metal include the ability to alter surface tension upon the application of electricity, after which it transits from a flat state to a spherical one. The installation of numerous electrified needles is required at the base of the container. The needles must penetrate the entire dish with the lower end connected to a power source. The configuration of the electrified needles resembles a celestial map.

The ideal vision was for the audience to initially perceive a flat expanse of liquid metal in a mirror-like state, which is the power-off state, upon first glance. As spectators approach, a sensor is triggered, electrifying the needles, causing the silvery liquid of the iron-gallium alloy to transit from a spread-out film to a configuration of small spheres, resembling a starry sky. When people leave, it reverts to a mirror; as they approach, it becomes a cosmos.

After consultation with the scientific research team, it was determined that this concept is temporarily unfeasible. The decision was made to halt the experiment.

16-4, The Restless Octopus: A composition of liquid metal composites is fashioned into an octopus. A heating module, controlled by a circuit and installed at the base of the container, alternately heats different parts of the octopus, enabling it to undulate and extend its tentacles upon the base for optimal mobility.

16-5, Agitation: The addition of nano-copper oxide to the liquid metal causes it to expand, forming a porous structure. Utilizing this material, a human heart sculpture is cast using the lost-wax casting method. With electrodes introduced at the base and subjected to repeated stimulation, the heart sculpture pulsates.

Scientific Guidance for Liquid Metal: Provided by Professor Liu Jing and PhD students like Gao Jianye, Wang Hongzhang, Wang Ju, and Zhou Yingxin from the Institute of Physics and Chemistry, Chinese Academy of Sciences.

液态金属科学指导：中科院理化所刘静教授及高建业、汪鸿章、王居、周颖欣等博士生

Circuit Programming: Handled by Tang Renxiang, Wang Peng, Xu Zhengxu, and Li Ruiqi

电路编程：堂仁翔王鹏、许正旭、李睿琦

Liquid Metal Experimentation and Integration: Executed by Wang Mengru

液态金属实验及整合：王梦茹





Nº 17

CLASSICAL INFINITY COLUMN 1: CARVED 古典无穷柱 1·雕琢

Stone Carvings
石雕

55x55x600cm

背景：现代主义雕塑大师布朗库西的《无穷柱》（Infinity Column）是他最著名的作品之一。无穷柱是一种独特的雕塑，由重复的元素构成，形成了一个看似无限延伸的柱体。“无穷柱”也开启了极简主义，并因为向上延伸的意志而具有精神性和宗教感。

概念：“无穷柱”的前提是重复和极简，我想要一根繁琐而不重复的无穷柱。

操作：在河北曲阳定制一批石雕罗马柱头，必须可以上下嵌套连接，互相擦起来成为繁琐的无穷柱。其中爱奥尼式柱头，呈现从逐步雕琢的和精心雕琢的，完成品和半完成品，形成渐变。

Background: The *Infinity Column* by modernist sculptural maestro Constantin Brancusi is among his most celebrated works. The Infinity Column is a unique form of sculpture, comprised of repetitive elements that coalesce to create the illusion of an infinitely extending column. This piece has also been seminal in the advent of minimalism and possesses a spiritual and religious gravitas due to its upward-reaching aspiration.

Concept: The "Infinity Column" is predicated on the principles of repetition and minimalism. The aim here is to craft an Infinity Column that is intricate yet non-repetitive.

Procedure: A collection of stone-carved Romanesque capitals is specially ordered from Quyang, Hebei, designed to interlock and stack vertically, forming an elaborate rendition of the Infinity Column. The Ionic capitals showcase a gradient from the progressively chiseled to the exquisitely sculpted, representing both finished and semi-finished states.

Production: Quyang Anda Sculpture
制作：曲阳安达雕塑

Supervised by: Lan Lan and Wang Di Liang
监制：兰兰、王迪亮

Experimental Materials: Stone Sculpture
实验材料：石雕



Nº 18

CLASSICAL INFINITY COLUMN 2: ERODED BY WIND 古典无穷柱 2·风蚀

Stone Carvings
石雕

55x55x600cm

背景：布朗库西的《无穷柱》考虑的是纵向空间的延伸性。但雕塑还在时间中存在，时间从来都是雕塑的强大的塑造力量。钟乳石是时间中增材制造的自然形式。钟乳石是时间中增材制造的自然形式，而风蚀地貌中的风蚀窗、风蘑菇、风蚀作用对岩石的不均匀侵蚀形成的孤立岩柱或成群的岩柱群石林等则是时间的雕刻。

操作：把一批刻好的柯林斯柱头石雕分别放进喷砂箱处理，模仿不同程度的风蚀状态，使得其造型细节模糊，形成渐变。这些柯林斯柱头互相擦起来成为风蚀程度不等的无穷柱。

Background: Brancusi's *Infinity Column* is built based on the concept of vertical spatial extension. However, sculpture also exists within the dimension of time, which has always been a potent shaping force. Stalactites are a natural result of additive manufacturing over time, while wind-eroded landscapes featuring wind caves, mushroom rocks, and groups of isolated or clustered stone pillars shaped by uneven erosion are the sculptures of time.

Procedure: A collection of meticulously carved Corinthian capital stone sculptures is individually subjected to sandblasting processes, emulating various stages of wind erosion, which obscure the sculptural details and create a gradient of weathering. Stacked together, these capitals form an infinite column that exhibits varying degrees of erosion.

Production: Quyang Anda Sculpture
制作：曲阳安达雕塑

Supervised by: Lan Lan and Wang Di Liang
监制：兰兰、王迪亮

Experimental Materials: Stone Sculpture
实验材料：石雕



背景：每个文化都发展出了自己的腌制食品的技术和发酵技术。食物的变质、腐败由微生物导致，但人类也建立起和微生物的合作关系来保存和加工食物。腌制和发酵食品的制作是变化的典型过程。化学是变化之学，也是等待之学。

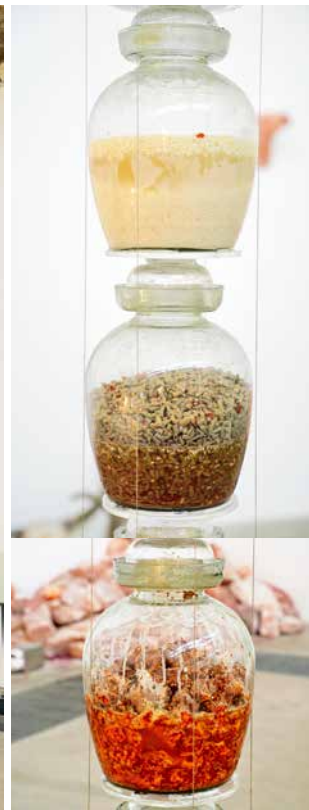
实验：原设想玻璃罐子外部用电致变薄膜，安装红外感应，观众走近时整根玻璃罐子的高柱子一起变为金色。进一步探讨了解到目前的电致变技术仍需要在整个罐体内关注电解质液体，而这些液体必然导致管制中制作的泡菜不可食用。因此设想落空。

操作：购买一批玻璃罐子，纵向堆积成无穷柱。每个玻璃罐子中都在发生一种食物的化学变化。如炮制萝卜、辣椒组成的各种泡菜；制作麦芽糖、豆腐乳，柑橘皮陈化形成的陈皮等。

Background: Every culture has developed its own techniques for pickling and fermentation. Microorganisms cause food to spoil and decay, but humans have also established a cooperative relationship with them in preserving and processing food. The production of pickled and fermented food is a quintessential process of change. Chemistry is the study of change and the art of waiting.

Experiment: The original concept involved applying electrochromic films to the exterior of the glass jars, with infrared sensors that would trigger the entire column of jars to change to gold when an observer approaches. Further investigation revealed that current electrochromic technology necessitates the presence of electrolyte liquid throughout the interior of the jars, which would inevitably render the pickled products within inedible. Thus, the initial concept was not feasible.

Procedure: A collection of glass jars is purchased and stacked vertically to form an infinite column. Within each jar, chemical transformations of one kind of food is taking place. This includes the pickling of various vegetables like radishes and peppers, the creation of malt sugar, fermented bean curd, and the aging of citrus peel into dried tangerine peel, among others.



Production: Lanlan, Zhang Yijie
制作：兰兰、张逸洁

Nº 20

THE ELIXIR
INFINITY COLUMN
药酒无穷柱

Glass Jars,
medicinal liquor
玻璃罐、药酒

25x25x600cm

背景：不只是中国人，世界各国的人都泡制各种奇葩药酒。

中国人的蛇酒将活蛇或蛇干浸泡在白酒中。据说具有祛风除湿、通经活络、增强免疫力等功效。韩国人用雄蜂或蜂蛹浸泡在酒中，被认为有助于提高男性性功能和增强体力。日本人则相信蜂酒可以提神醒脑、增强体力和提高免疫力。泰国蜈蚣酒据说具有解毒、止痛、抗炎等功效。在泰国的一些传统市场上可以找到，通常作为民间疗法使用。越南海马酒被认为有助于增强男性性功能、补肾壮阳、抗疲劳。印尼鹿角酒具有滋补强壮、补肾阳、提高免疫力等功效。秘鲁广泛流传的蛇药酒（Macerado de Serpiente）被认为有助于治疗关节炎、风湿病和提高性功能。巴西大蚂蚁酒（通常是子孙蚁）具有强身健体、抗菌消炎的作用。

研究：药酒通过酒精的溶解能力提取药材中的活性成分，并利用酒精的物理和化学特性来增强药效。这是有道理的，酒精能够溶解多种有机化合物，包括许多植物和动物的活性成分，如生物碱、挥发油、酚类、糖苷等。酒精本身有一定的药理作用，如活血化痰、抗炎等，与药材的成分产生协同作用，增强整体疗效。

操作：购买一批玻璃罐子，纵向堆积成无穷柱。玻璃罐子中浸泡各种材料构成的药酒：海马、雪蛤、人参、灵芝、土龙及各种中药材。

Background: Not only the Chinese but people from countries around the world brew a variety of curious medicinal liquors.

Chinese snake wine involves soaking live snakes or dried ones in white spirits. It is said to have benefits such as dispelling wind and dampness, promoting circulation through the meridians,

and enhancing immunity. Koreans soak male bees or bee larvae in alcohol, which is believed to help improve male sexual function and increase physical strength. Japanese people believe that bee wine can invigorate body and mind, and boost immunity. Thai centipede wine is said to have detoxifying, analgesic, and anti-inflammatory effects. Such brews can be found in traditional markets in Thailand and are commonly used as folk remedies. Vietnamese seahorse wine is believed to help enhance male sexual function, nourish the kidneys and yang, and combat fatigue. Indonesian antler wine is known for its nourishing and strengthening powers, kidney yang replenishment, and immune-boosting effects. Peru's widely circulated snake medicinal wine (Macerado de Serpiente) is believed to help treat arthritis, rheumatism, and improve sexual function. Brazil's "big ant wine" (usually the offspring ants) has body strengthening properties, and antibacterial and anti-inflammatory effects.

Research: Medicinal liquors extract active ingredients from medicinal materials through the dissolving power of alcohol and utilize the physical and chemical properties of alcohol to enhance the efficacy of the medicine. This makes sense as alcohol can dissolve a variety of organic compounds, including many active ingredients from plants and animals, such as alkaloids, essential oils, phenols, glycosides, etc. Alcohol itself has certain pharmacological effects, such as promoting blood circulation and removing blood stasis, anti-inflammatory effects, etc., which synergize with the ingredients of the medicinal materials to enhance the overall therapeutic effect.

Procedure: A collection of glass jars is purchased and stacked vertically to form an infinite column. The jars are filled with medicinal liquors infused with various materials: seahorse, snow frog, ginseng, Ganoderma lucidum, earth dragon, and a variety of traditional Chinese medicinal herbs.

Production: Lanlan, Zhang Yijie

制作：兰兰、张逸洁





概念：本作品探索柠檬果酒酿造过程中的物质形态演变和各种元素的不同功效。果酒的酿造过程包括发酵和陈酿两个主要阶段。主要包括糖分转化为酒精、酸度的变化、酚类物质的聚合、香气物质的复杂化以及酒体的澄清和稳定。这些变化共同决定了果酒的风味、口感和品质。

操作：

- 1，首先准备大量柠檬，在一个杜尚瓶上安装满柠檬。每个柠檬中都插入铜片，使之成为电池，点亮一个小灯泡。电能耗尽后将用过的柠檬榨汁。
- 2，一套定制的铜质果酒酿造设备，放入柠檬汁及其他搭配的果汁，现场酿造柠檬果酒。
- 3，部分果酒经过蒸馏过程成为柠檬白兰地。
- 4，榨汁过后的柠檬，使用碱（如氢氧化钠）处理切碎的柠檬皮，以去除果胶、半纤维素和其他非纤维素物质，获得柠檬皮纤维，用于制作手工纸。

Concept: This artwork explores the material transformation and different effects imposed by various elements during the fermentation process of lemon wine. The brewing process of the wine mainly involves two stages: fermentation and aging. To be more specific, it entails the conversion of sugars into alcohol, changes in acidity, polymerization of phenolic compounds, complexification of aromatic substances, and clarification and stabilization of the liquid. These changes collectively determine the flavor, texture, and quality of the wine.

Procedure:

1. Firstly, prepare a large quantity of lemons and place them over a Duchamp bottle rack. Insert copper plates into each lemon to turn them into batteries, which will light up a small bulb. Once the electricity is depleted, extract juice from the used lemons.
2. Utilize a customized copper wine brewing apparatus to ferment the lemon juice along with other complementary fruit juices, producing lemon wine on-site.
3. Some of the wine turns into lemon brandy after undergoing a distillation process.
4. Shredded lemon peels will be treated with some base (such as sodium hydroxide) to remove the pectin, hemicellulose, and other non-cellulosic substances. Lemon peel fibers will be attained to produce handmade paper.



Production: Lanlan, Zhang Yijie
制作：兰兰、张逸洁



Nº 22

NOTHING NEW
UNDER THE SUN
阳光下无新事

Bamboo Poles, Bedding,
Clothes, Sausages, Ham,
Bacon, Sauce-braised duck
竹竿、被褥、衣服、香肠、
火腿、腊肉、酱板鸭

Variable
Dimensions
尺寸可变

背景：人类晾晒行为多种多样，晾晒服装、被褥等的目的除了去除潮气和湿气还因为阳光中的紫外线具有一定的杀菌作用，晾晒被子可以将被子暴露在阳光下，有效地杀灭被子表面的细菌和微生物，减少感染和传播疾病的风险。晾晒鱼干和虾干是一种常见的食品加工方法，主要是为了去除水分，增加保存期限，同时提升口感和风味。晾晒过程中经常发生结晶：盐结晶常见于海鱼晾晒过程中，一些富含糖分的食物，如水果、果干会出现糖分结晶；某些水果或蔬菜，其中的维生素 C 可能在水分蒸发的过程中结晶，形成微小的晶体。人们把晾晒的原理用于形成图像，如古典摄影工艺中的蓝晒技法。英国摄影先驱安妮·阿特金斯（Anna Atkins）在 19 世纪初期首次开发并应用于摄影艺术中。蓝晒技法的原理基于铁盐的光敏性。通常使用的化学品是铁铵铁 (III) 氰化铁（也称为铁铵铁氰化物），它在光的照射下会发生化学反应，形成蓝色的铁氰化铁 (III)。

概念：《阳光下无新事》用一组竹竿上晾晒的不同物品，集合并混淆了晾晒、脱水等各种行为。竹竿上分别晾晒着衣服、被子、裤子等，同时也晾晒海带、鱼干、火腿、腊肠等食物。只是这里发生了各种错位：被子上长出了晶体，被子上晒出了蓝晒的植物图像……

操作：这套竹竿上晾晒了多种材料，成为生态材料的集中展示平台。既有晾晒薄胎瓷烧制的假衣服，也有数件塑化海带制作的生物塑料皮革衣服。竹竿上悬挂玻璃容器，内部生长化学花园，竹筒之间用玻璃管、塑料管连接成循环系统，安装蠕动泵驱动水循环。

Background: There are diverse ways for human to tap into sunlight for drying. Apart from removing moisture and dampness, sun-drying garments and bedding also benefit from the germicidal properties of ultraviolet rays in sunlight. For instance, exposing sun-drying quilts to sunlight, which can effectively kill bacteria and microorganisms on the surface, thus reducing the risk of infection

and disease transmission. Sun-drying fish and shrimp is a common food processing method aimed at moisture removal, extending shelf life, and enhancing texture and flavor. During the sun-drying process, crystallization often occurs: in the sun-drying process of sea fish, the forming of salt crystals can be observed, while sugar-rich foods like fruits and dried fruits may exhibit sugar crystallization. Additionally, certain fruits or vegetables, particularly those containing Vitamin C, may undergo crystallization as water evaporates, forming minute crystals. The principle of sun-drying has even been employed in image formation, such as the classical photographic technique known as cyanotype, which is developed and applied by English photography pioneer Anna Atkins in the early 19th century. Cyanotype relies on the photosensitivity of iron salts, with the most commonly used chemical being ammonium iron (III) citrate (also known as ammonium ferric citrate), which undergoes a chemical reaction when exposed to light, resulting in the formation of blue ferric ferrocyanide (III).

Concept: *Nothing New Under the Sun* showcases a collection of items hung on a set of bamboo poles, encompassing and blurring various actions such as sun-drying and dehydration. The bamboo poles bear an assortment of articles, including sun-dried clothes, quilts, trousers, as well as seaweed, dried fish, ham, sausages, and other food. However, a series of juxtapositions occurs: crystals grow on the quilts, botanical images emerge through cyanotype on the quilts...

Procedure: The set of bamboo poles serves as a platform of spotlight for showcasing ecological materials. It features sun-dried garments made of thin porcelain and bio-plastic leather crafted from plasticized seaweed. Glass containers hang from the bamboo poles, housing a chemically grown garden. The bamboo tubes are connected through glass and plastic tubing, constituting a circulating system which is driven by a peristaltic pump for water circulation.

Production: Ma Qiuzi, Zhang Yijie, and Fang Jing

制作：马秋子、张逸洁、房静



背景：多数观赏植物经过了培育和优化，以满足人们对植物美感和功能的需求。这种培育优化包括传统的人工选择和育种方法，以及现代的基因工程技术。改良植物的性状，改变植物的花色、叶色等颜色特征，延长或者调整植物的花期，改良植株的结构和形态，等等。可以说，观赏植物本身就是一种雕塑。在某些精心修剪的园艺中，植物更是呈现为雕塑造型。

人类很早就介入了植物的循环系统，如通过滴灌管道代替传统的灌溉方式；使用注射器或者其他专用工具将药液或者营养溶液注入到植物的茎木中，用于个别植物或者重要植物的治理。

概念：传统花园中经常会出现雕塑，但植物自身也是一种雕塑。植物是一套循环系统，钢管脚手架是另一套循环系统。在这个作品中，两个循环系统被人为接通。这里，判断不断分岔，所以这是一座博尔赫斯笔下的小径分岔的花园。

操作：

- 1，将一批著名的欧洲古典雕塑石膏像请河北曲阳石雕工匠重新雕刻大理石。内部掏空。
- 2，翻转的大理石雕像悬挂在脚手架结构上，在其内填土种植仙人掌、吊兰、龟背竹等各种植物，使雕塑成为花盆。
- 3，输液给药系统穿插在植物之间，循环系统也穿插在钢管的脚手架之间，安装蠕动泵驱动水循环。

Background: Most ornamental plants have undergone optimal cultivation and refinement to meet people's aesthetic and functional needs. Such endeavors involve traditional methods of artificial selection and breeding, as well as modern genetic engineering techniques. By modifying plant characteristics, such as altering flower or leaf colors, extending or adjusting the plant's flowering

period, and improving its structure and form, ornamental plants can be considered as sculptures in their own right. In meticulously pruned gardens, plants are shaped into artistic forms, further enhancing their sculptural beauty.

Human intervention in plant circulatory systems celebrates a long history. Traditional irrigation methods have been replaced by sophisticated drip irrigation systems, ensuring optimal water supply. Additionally, injectors and other specialized tools are utilized to administer medicinal or nutrient solutions directly into the stems of particular plants, providing targeted care and nourishment.

Concept: Sculptures frequently adorn the landscape in traditional gardens, yet the plants themselves embody a sculptural quality. Plants comprise an intricate circulatory system, while steel pipe scaffolding represents an additional interconnected system. In this artwork, these two systems are deliberately intertwined. Here, the paths continually diverge, evoking a garden reminiscent of Borges' depiction of branching paths.

Procedure:

1. Commission a group of skilled stone carvers from Quyang, Hebei, to re-sculpt renowned European classical sculpture plaster statues into marble. The statues should be hollowed out internally.
2. Suspend the inverted marble sculptures onto the scaffold structure, filling the interior with soil for planting various plants such as cacti, spider plants, and lucky bamboo, thus transforming the sculptures into planters.
3. Integrate the intravenous infusion system among the plants and position the circulating system within the scaffolding's steel pipes. Install peristaltic pumps for water circulation.

Marble sculpture planter: Quyang Anda Sculpture
大理石雕像花盆制作：曲阳安达雕塑

Planting and circulation system: Lan Lan, Fang Jing
植物种植和循环系统：兰兰、房静



背景和研究：

- 1，人类制作平板玻璃的历史比想象中要困难。玻璃这个材料适合吹制成球体，古罗马人通过将玻璃块拉平或者流动成片的方法尝试制作平板玻璃。19 世纪初平板玻璃辊压机出现。浮法玻璃生产技术由法国人发明，通过将玻璃原料浇入熔融的锡池中，使玻璃在锡池上浮起并形成平整的表面，这一技术极大地提高了玻璃的生产效率和质量。
- 2，浮法玻璃生产技术让人想起红茶菌膜。这层膜实际上是由菌群中的微生物共同作用而形成的，主要由酵母菌和乳酸菌组成。它看起来像是一块浮在发酵液表面的厚实、坚韧的凝胶状物质。食用红茶菌膜在某个时期曾经风行一时，被认为有益身体健康。近年来，红茶菌膜被用来制作生物皮革。
- 3，人类为了获得平面的竹制品如竹席，也需要把圆筒状的竹子“摊开”，办法是把竹筒分解为竹篾，再重新编制成平面。而平面编织的竹席和竹编的簸箕，是人们摊开晾晒药材、食物的主要工具。竹帘又成为人们制作手工制捞纸的工具。
- 4，浮萍（学名：Lemna）是一类小型的漂浮在水面上的植物，浮萍的分裂繁殖能力强，往往能够迅速扩张并覆盖水面。浮萍通常通过无性生殖的方式进行繁殖，其中分裂是其主要的繁殖方式之一。浮萍通常会形成一组叶片紧密连接在一起的植株，这个植株称为“个体”。在个体生长的过程中，通常会从边缘或者叶腋部分裂出新的小植株，这些小植株逐渐生长并形成新的个体。当新的小植株生长到一定大小时，它们通常会与母体个体分离，独立成长。
- 技术支持: 深圳先进技术研究院合成生物学家杨贞标的研究团队的改性浮萍，实现了迅速分裂。

概念：这个作品探讨平面延展、蔓延的概念。混淆了浮萍的生长、造纸、浮法平板玻璃的制作、多孔材料的表面积摊开、红茶菌膜的生长。

操作：

- 1，竹编的簸箕和竹箩筐安装在脚手架结构上，互相层叠，但可以转动展示。在竹簸箕上晾晒笋干、茶叶、虾干、鱼干、海带、紫菜等食物及各种中药材。
- 2，圆形平板玻璃上放置不同大小直径的玻璃器皿，玻璃器皿内培养细菌绘画、太湖水华（藻类）等。
- 3，培养红茶菌膜，及用用红茶菌膜制成的生物塑料。
- 4，用竹帘子捞纸浆获得的手工纸。手工纸中掺入海带、浮萍等材料。
- 5，改性浮萍的实物展示和分裂过程视频。

Background and research:

1. The history of human producing flat glass has been more painstaking than one might fathom. Glass, as a material, is naturally suited for being blown into spherical shapes. The ancient Romans attempted to create flat glass by stretching or flowing glass blocks into sheets. In the early 19th century, the advent of the glass rolling process machine facilitated the production of flat glass. The float glass technique, invented by the French, involves pouring molten glass onto a tin bath. The glass would then float and form a smooth surface. This technique remarkably improved the efficiency and quality of glass production.
2. The float glass technique brings to mind the kombucha SCOBY (symbiotic culture of bacteria and yeast) membrane. The membrane is formed through the collective interaction of microorganisms within the SCOBY, primarily yeast and lactobacillus. It appears as a thick, resilient gel-like substance floating on the surface of the fermentation liquid. Consumable kombucha SCOBY membranes once gained popularity due to their perceived health benefits. In recent years, it has been used for creating biodegradable leather alternatives.
3. To obtain flat bamboo products such as bamboo mats, one needs to “unfold” cylindrical bamboo stems. The process involves disassembling the bamboo stem into thin strips and then reweaving them into a flat surface. Flat woven bamboo mats and bamboo sieves serve as essential tools for spreading and drying medicinal herbs and food. Bamboo blinds have also been used as tools for handcrafted papermaking.
4. Duckweed (scientific name: Lemna) is a type of small floating plant that thrives on the water's surface. Duckweed possesses strong reproductive abilities through fragmentation that allows

it to rapidly expand and cover the water surface. It reproduces by asexual reproduction, with fragmentation being one of the primary approaches. It forms a group of interconnected leaf blades known as an “individual.” During its growth, small new plants usually split from the edges or leaf axils, gradually growing and forming into new individuals. When the new plants reach a certain size, they often separate from the parent individual and grow independently.

Technical Support: The research team led by Dr. Yang Zhenbiao, a synthetic biologist from the Shenzhen Advanced Technology Research Institute, has developed modified duckweed that exhibits rapid fragmentation.

Concept: This artwork delves into the concepts of flat expansion and proliferation, blurring the boundaries between duckweed growth, papermaking, float glass production, the surface area expansion of porous materials, and the growth of kombucha SCOBY membranes.

Procedure:

1. Install the bamboo woven sieve and bamboo basket on a scaffold structure, stacking them on top of each other for rotational display. Air-dry bamboo shoots, tea leaves, dried shrimp, dried fish, seaweed, nori, various food items, and medicinal herbs on the bamboo sieve.
2. Place glass containers of different diameters on a circular flat glass surface and cultivate bacteria paintings, Taihu algae blooms, and other organisms within the glass containers.
3. Cultivate kombucha SCOBY membranes, which produce biodegradable plastics.
4. Attain handmade paper using a bamboo blind to scoop paper pulp, incorporating materials such as seaweed and duckweed into the paper.
5. Display samples of modified duckweed and showcase a video depicting the process of fragmentation.

Technical Support for Modified Duckweed: Research team led by Yang Zhenbiao, a synthetic biologist leading the Shenzhen Advanced Technology Research Institute

改性浮萍技术支持：深圳先进技术研究院合成生物学家杨贞标的研究团队

Cultivation of Modified Duckweed and Video Production: Barry Yun, Ph.D. candidate in Technological Arts at the Central Academy of Fine Arts

改性浮萍养殖和视频制作：巴瑞云，中央美院科技艺术博士生

Operator: Zhang Yijie
操作人：张逸洁





研究：海螺是一种螺类软体动物，其结构复杂且精妙，螺壳通常呈螺旋形。螺壳由碳酸钙构成，起到保护内部柔软身体的作用。由海螺的外套膜细胞分泌的物质逐渐积累并硬化形成。外套膜细胞分泌碳酸钙（主要以方解石和文石的形式存在）和有机基质（如壳角质素、蛋白质和多糖）。这些物质在外套膜下方的空间中逐渐沉积，形成新的壳层。这些细胞在螺壳生长过程中，沿着一个螺旋路径逐渐增加壳的面积和厚度。形成了一个由内向外增量生长的过程。

不同的海螺，不管是长而尖的钉螺、层次分明的塔螺、拥有完美的斐波那契数列曲线的鹦鹉螺，是同一结构的不同部位变形的结果。

概念：如果海螺螺壳受损，外套膜细胞会迅速分泌新的材料填补受损部位，进行修复。这一点和竹编十分相似。一个海螺生长的过程和一个篮子编织的过程是相似的。

操作：用竹子编织海螺骨架一套，展示各种海螺品种的变形过程。须从里向外延展编织，展示其内部结构。在安吉就地找蚕农，让蚕在竹编结构上吐丝从内向外逐渐蔓延。完成的蚕丝海螺上分布着很多蚕茧。

Research: The seashell is a type of mollusk with a complex and exquisite structure, typically spiral in shape. The shell, composed of calcium carbonate, serves to protect the soft body within. It is formed by the gradual accumulation and hardening of substances secreted by the mantle cells of the seashell. The mantle cells secrete calcium carbonate (primarily in the form of calcite and aragonite) and organic matrices (such as conchiolin, proteins, and polysaccharides). These substances gradually deposit in the space beneath the mantle, forming new shell layers. The cells, during the growth of the shell, incrementally increase the area and thickness of the shell along a spiral path. This results in an accretionary growth process from the inside out.

Different species of seashells, whether it be the elongated and pointed spindle shell, the distinctly layered tower shell, or the nautilus with its perfect Fibonacci sequence curve, are the result of deformations of the same structure.

Concept: If a seashell is damaged, the mantle cells immediately secrete new material to fill in and repair the damaged area. This is similar to bamboo weaving. The process of a seashell's growth is akin to the process of basket weaving.

Procedure: Weave a set of seashell skeletons from bamboo, showcasing the transformation process of various seashell species. The weaving must extend from the inside out, displaying its internal structure. On-site in Anji, find silk farmers and have silkworms spin silk on the bamboo structure, gradually spreading from the inside out. The completed silk seashells are adorned with numerous silk cocoons.

Bamboo Weaving: Master Huang Daqing from the Anji Daqing Bamboo Art Studio, Zhejiang.
竹编制作：浙江安吉大青竹艺工作室黄大青师傅

Supervision: Song Zhen
监制：宋振



概念：植物的树枝在空中伸展，互相避让，根系在泥土中伸张，毛细血管在体内伸张，河流在出海口的平原形成冲积扇，珊瑚在水下建造礁石，闪电在空中展开，这些事物沉成为什么形态，取决于一系列要素：有多大的能量？有多少资源？携带多少材料？有多大的空间或缝隙让它们展开，让它们填充？出发点和终点之间势能差有多大？气压、温度、应力、材料的强度、韧性等等，这些要素如同无形的模具，塑造了世界的形态。

研究：Fractal Wood Burning，也称为 Lichtenberg 木刻或 Lichtenberg 烧灼，是一种利用高压电流在木材表面上烧出复杂、分形图案的艺术和技术。其原理是利用高压电流通过湿润的木材表面时，电流会沿着电阻较低的路径流动，烧出图案。

实验：我们用改装后的汽车电瓶供电，用小苏打和可乐调和成导电溶液，增强其导电性。实现了木料上的闪电图案烧灼。

操作：收集一批树根和藤根，在树根上用 Lichtenberg 烧灼出闪电纹理。
树根上放置铝制蚂蚁窝灌注雕塑、放射状的珊瑚礁、养殖在玻璃器皿中的根系发达的水生植物等。另行制作一批用烧灼法制作的平面木板绘画，以及用吹颜料的方式制作的中国画扇面。

Concept: The branches of a plant stretch out in the air, avoiding each other, while the roots extend in the soil, capillaries spread within the body, rivers form delta fans at the estuary, corals build reefs underwater, and lightning unfolds in the sky. The form these entities take depends on a series of factors: How much energy is there? What resources are available? How much material is carried? What is the space or gap for them to spread and fill? What is the potential energy difference between the starting point and the endpoint? Air pressure, temperature, stress, material strength, toughness, and so on, these factors act like invisible molds, shaping the forms of the world.

Research: Fractal Wood Burning, also known as Lichtenberg Wood Burning or Lichtenberg Figure, is an art and technique that uses high-voltage electricity to burn out complex, fractal patterns on the surface of wood. The principle is to use high-voltage electricity to flow through the moist surface of the wood, where the current follows the path of lower resistance, burning out patterns.

Experiment: We use a modified car battery for power supply and mix baking soda with cola to create a conductive solution to enhance its conductivity. This has enabled the burning of lightning patterns on wood.

Procedure: Collect a batch of tree and vine roots and burn out Lichtenberg patterns on the roots with lightning textures.

Place aluminum ant nest pouring sculptures, radial coral reefs, and root-developed aquatic plants cultivated in glass containers on the roots.

Additionally, create a series of flat wooden board paintings made by burning and Chinese painting fan surfaces made by blowing pigments.

Lichtenberg Burning Experiment: Qiu Zhijie, Ma Qiuzi
烧灼实验：邱志杰、马秋子







背景：自古以来绘画材料大量从矿石和植物、动物中获得染色剂。古代青金石の珍贵导致了群青成为稀缺而昂贵的色彩，而古罗马为了获得紫色则需要上万个骨螺。现代化学工业发展以来各种合成燃料层出不穷。1856 年英国化学家威廉·亨利·佩兰（William Henry Perkin）偶然发现了紫色染料 mauveine，即奎因。随后人工品红、普鲁士蓝等纷纷登上历史舞台。20 世纪中叶，一些化学家开始尝试将丙烯酸和其他化合物结合，制造一种新型的丙烯颜料，今天已经被广泛用于艺术创作、建筑装饰、工业涂料等领域。

动机：这个系列的绘画将探索尽可能地使用生态材料来构造画面。这有三方面的追求：1，确保所使用的所有材料可生物降解，材料使用尽可能廉价和方便获取，尽可能实现废物利用，因此类似于丙烯酸乳胶、聚苯乙烯泡沫之类难于降解的好用材料被刻意回避了。2，确保生产过程尽可能低能耗，因此像普通硅酸盐水泥（Portland Cement）这样方便的材料，甚至于玻璃这种材料虽然可回收利用，但制备过程消耗热能过高，也刻意回避了。3，确保最后的作品除了绘画的美感能够兼具生态职能。

实验：为此我们研究了一系列材料的制备方法。作品中需要有一定塑性的材料来制造厚度和质感，我们尝试了一系列生态混凝土材料：分别使用牡蛎壳和鲍鱼壳粉、虾壳粉末、茶叶渣、咖啡残渣、果皮、粉煤灰、矿渣、硅粉或稻壳灰等作为基材；分别用植物淀粉、海藻提取物海藻酸钠和海藻酸钙作为黏合剂来制备。从木材和植物纤维中提取的天然高分子化合物地衣素（Lignin）因为过于昂贵而未尝试。在成型工艺上我们尝试了模具铸造、模拟造纸过程的混凝土纸张的制作、以及“手动 3D 打印”我们用电动玻璃胶枪改造了一把“手动增材制造打印枪”，用来挤出生态混凝土。

我们很愿意尝试直接使用生物材料，如龙须菜、紫菜和海带，但为了确保作品的持久坚固，我们用甘油和醋作为塑化剂将其改造为海藻皮革。部分绿色元素我们使用了永生苔藓。画干透后部分颜色变粉了，经研究使用了天然蜂蜡上光恢复色泽。

Concept: Since ancient times, minerals, plants, and animals have been providing dyes to painting materials. As

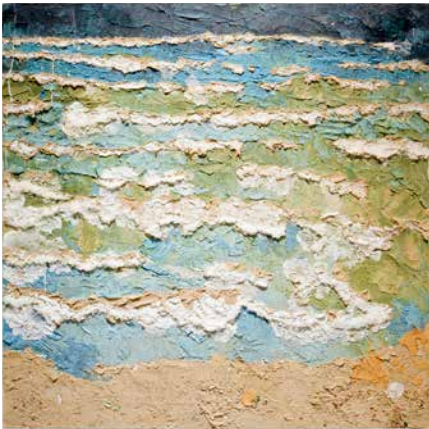
lapis lazuli then was almost priceless, ultramarine became a scarce and exorbitant colour. In ancient Rome, it took thousands of spiny shells to produce the purple dye. The advancement of the modern chemical industry nurtured countless synthetic pigments. In 1856, British chemist William Henry Perkin accidentally discovered the purple dye mauveine, also known as mauve. Subsequently, artificial magenta, Prussian blue, and other pigments emerged. In the mid-20th century, chemists managed to combine acrylic acid with other compounds, and a new type of acrylic pigment was thus produced. It now enjoys wide application in artistic creation, architectural decoration, industrial coatings, and other fields.

Motivation: This series of paintings aims to fully tap into ecological materials to create artworks. There are three main objectives: 1) Ensuring that all materials used are biodegradable, inexpensive, readily available, and promoting waste utilization. To this end, materials like acrylic latex and polystyrene foam, which are difficult to degrade, are avoided. 2) Ensuring that the production process has minimal energy consumption. To this end, materials like Portland cement and even glass, although recyclable, are avoided due to the high energy consumption required during their manufacturing process. 3) Ensuring that the final artworks not only possess aesthetic value but also serve ecological functions.

Experiment: For this purpose, we have designed a wide range of material preparation methods. Our artworks demand materials with some level of malleability to create thickness and certain texture. We have experimented with a series of eco-friendly concrete materials, utilizing oyster shells and abalone shell powder, shrimp shell powder, tea residue, coffee grounds, fruit peels, fly ash, slag, silica powder, or rice husk ash as base materials. Plant starch, sodium alginate extracted from seaweed, and calcium alginate have been employed as binders. However, lignin, which is a naturally derived high-molecular-weight compound, extracted from wood and plant fibres, due to its high cost, is not considered upon. Regarding the shaping process, we have tried mould casting, concrete paper, the production of which resembles papermaking, and “manual 3D printing”, modifying an electric caulking gun into a printing tool for additive manufacturing.

We remain open to biological materials such as dulse, nori, and kelp. However, to ensure the durability of the artworks, we have transformed them into seaweed leather using glycerol and vinegar as plasticizers. For some green elements, we have used preserved moss. The “manual 3D printing gun” is capable of creating porous structures, which we soak in materials that can remove formaldehyde so that the product can purify indoor air. Following the same approach, we have utilized materials like bamboo charcoal. Since the paintings tended to become powdery drying, we decided, after careful consideration, to apply natural beeswax for polishing.

Experimental Materials: Natural Wax, Shell Powder, Fish Bones, Seaweed, and Other Materials
实验材料：天然蜡、贝壳粉、鱼骨、紫菜等综合材料



Waves Ecological concrete made from powdered seashells and sodium alginate gel is used to create wave-shaped patterns adopting a trowel. The blank spaces will be filled with white crystals fostered by sea salt, resembling frothy wave crests. The powdered abalone shell has a subtle iridescent sheen that sparkles.

《海浪》贝壳粉末和海藻酸钠凝胶做成的生态混凝土：用瓦刀抹出大块海浪造型。留白的地方将用海盐培养白色晶体作为波峰的白色浪花。鲍鱼壳粉末有细小的珍珠光泽在闪亮。



Cave The basic structure is shaped by extruding ecological concrete using a small printing pen. Subsequently, calcareous stalactites are formed directly by dripping a solution of calcium bicarbonate. Calcium carbonate, commonly found as calcite or limestone, is used in this process. Hence, calcite is embedded in specific sections of the artwork.

《溶洞》用生态混凝土以小打印笔挤压成型制作基本造型后，用碳酸氢钙溶液滴落法直接形成石灰质钟乳石。碳酸钙（calcium carbonate），通常以方解石（calcite）或者石灰石（limestone）的形式存在。所以在画面中局部镶嵌了方解石。



Whirlpool Ecological concrete made from powdered seashells and sodium alginate gel is used to create large blocks of wave and arc shapes adopting a trowel. The arc represents both the whirlpool in the sea and the spiral arms or rotating nebulae of the Milky Way. Black patches are created through blending bamboo charcoal powder with sodium alginate. Artificial pearls of various sizes are embedded, conjuring up the image of the welkin filled with countless sparkling stars.

《漩涡》贝壳粉末和海藻酸钠凝胶做成的生态混凝土用瓦刀抹出大块海浪和圆弧造型。这个圆弧既是海中的漩涡，也是银河系的旋臂或旋转的星云。黑色斑块为竹炭粉末调和海藻酸钠，嵌入大大小小不同颗粒度的人造珍珠，造成满天繁星的感觉。



Underwater The blue-black portion is made of ecological concrete using powdered seashells and sodium alginate gel, with the addition of phycocyanin (algae blue protein) and bamboo charcoal powder. Fish bones, coral fragments, shell pieces, and artificially cultivated pearls are embedded. Kelp, plasticized purple seaweed, plasticized kelp, and other seaweeds are processed into leather-like materials using glycerol and acetic acid. Authentic coral fragments and volcanic rocks are adopted as underwater coral and underwater volcanoes.

《水下》蓝黑色部分用贝壳粉末和海藻酸钠凝胶做成的生态混凝土，掺入藻蓝蛋白和竹炭粉末。嵌入鱼骨头、珊瑚石、贝壳碎块、人工养殖珍珠等。用甘油和醋酸作为塑化剂将海带、塑化紫菜、塑化龙须菜等海藻加工为皮革生物。水下的珊瑚和海底火山使用了真的珊瑚碎片和火山石。



Forest The trunks and bark of the trees are created through material extrusion. The material composition consists of sawdust, sugarcane residue, and ecological concrete made from sodium alginate gel. The base is embedded with materials such as plasticized kelp. After the tree trunks have dried, moss, reishi mushrooms, and other plants are implanted. Beehives are embedded between the trees.

《树林》用材料挤出的方式制作树木的枝干和表皮。材料成分为锯末、甘蔗渣、海藻酸钠凝胶做成的生态混凝土。底板嵌入塑化龙须菜、塑化海带等材料。树木干透后在其上培植苔藓、灵芝等。



Mine Pit Kelp is processed into leather-like material using glycerol and acetic acid as plasticizers. Various biological materials, such as powdered seashells, tea leaf residue, coffee grounds, and crushed corn husks, are transformed into composite paper. The aforementioned materials are dyed using natural dyes, and the differently colored materials are cut and recombined. Carbonized silicon, pyrite, and other ores are directly embedded between the layers of ecological concrete. Various small springs are inserted to imitate the stress distribution between geological layers.

《矿坑》用甘油和醋酸作为塑化剂将海带加工为皮革生物。用贝壳粉、茶叶末、咖啡渣和玉米碎屑制作各种生物材料合成纸张。使用生物染料染色将以上材料染色，把不同颜色的材料进行剪贴重组在生态混凝土堆积成的岩层间直接嵌入碳化硅、黄铁矿等矿石。嵌入各种小型弹簧，呈现地层之间的受力状态。



Estuary The artwork takes inspiration from the estuary of the Ganges-Brahmaputra-Meghna river system. The deltaic land of the estuary is formed by ecological concrete that combines shrimp shell powder and seaweed. The upper half of the artwork is sprinkled with pink Himalayan mineral salt particles, which turn pale after drying, creating a texture reminiscent of salt marshes. The red ocean surface is dyed using a solution commonly known as "red blood salt," which contains potassium ferricyanide.

《河口》画面造型以恒河三角洲入海口为原型。河口的三角洲陆地由虾壳粉末与海藻结合的生态混凝土堆积而成，画面上半部分撒了粉红色的喜马拉雅矿盐颗粒，干透后泛白，呈现盐碱地的质感。红色的海洋水面由俗称赤血盐铁氰化钾溶液染色。



Volcano Ecological concrete made from powdered seashells and sodium alginate gel constituted the structure of the volcano. Folded kelp leather and seaweed leather serve as distant mountains, which are embedded with volcanic rock fragments, silicon carbide, and fossils of plants and animals. The red lava is obtained through crystal cultivation. The dense smoke emitted by the volcano is achieved by mixing bamboo charcoal powder with calcium alginate.

《火山》贝壳粉末和海藻酸钠凝胶做成的生态混凝土形成火山的基本结构。褶皱的海带皮革和龙须菜皮革填入作为远山。嵌入火山石碎屑、碳化硅、动植物化石等。红色岩浆用晶体培养的方式获得。火山冒出的浓烟用竹炭粉混合海藻酸钙获得。



Nº 28

THE COSMIC RAY IGLOO:
A TRIBUTE TO MARIO MERZ
宇宙射线冰屋子 - 向马里奥·默茨致敬

Domed wire-framed
tent, Screen, Fossil
specimens
圆拱铁架帐篷、屏幕、化石标本

diameter 6 m
直径六米

背景：宇宙线亦称为宇宙射线（Cosmic ray）、宇宙辐射（Cosmic radiation），是来自外太空的带电高能亚原子粒子。它们可能会产生二次粒子穿透地球的大气层和表面。大约 89% 的宇宙射线是单纯的质子，10% 是氦原子核（即 α 粒子），这就占了 99%，其余 1% 的绝大部分是孤独的电子（像是 β 粒子）， γ 射线和超高能中微子只占极小的一部分。宇宙射线被地球大气层影响，对地面的个别人的天然本底辐射仅为 0.3-0.4 mSv/y。在大气层外，每秒约有一个质子或更重的原子核穿过指甲大小的面积。当宇宙线接近地球时，便开始与大气层气体中的原子核撞击。在大气簇射的过程中，这些碰撞产生很多 π 介子和 K 介子，这些很快会衰退为不稳定的 μ 子。由于与大气层没有强烈的感应以及时间膨胀的相对论性效应，许多 μ 子能够到达地球表面。 μ 子属于电离辐射，从而可以轻易被许多粒子探测器检测到（资料来自维基百科）。

深圳帧观德芯公司开发的宇宙射线接受芯片，用算法将 α 粒子表达为较大的圆形斑点；将 β 粒子显示为狭窄的波浪线，像是蠕虫；让 γ 射线产生小点或斑点；将 μ 子表达为长直线。

操作：

- 1，制作一个马里奥·默茨式样的冰屋子框架。其上方安装透明显示屏。
- 2，宇宙射线接受芯片图像递给显示屏，找一种可以显示的透明膜，
- 3，冰屋子框架下部的石板，每块标明辐射数值。连接仪表显示其数值。

Background: Cosmic rays, also known as cosmic radiation, are charged high-energy subatomic particles originating from outer space. They can generate secondary particles that penetrate Earth's atmosphere and surface. Approximately 89% of cosmic rays are simply protons, 10% being helium nuclei (alpha particles). The remaining 1% consists mostly of solitary electrons (beta particles for instance), gamma rays, and a tiny fraction of ultra-high-energy neutrinos.

Influenced by Earth's atmosphere, cosmic rays contribute only 0.3-0.4 mSv/year to the natural background radiation of individuals on the ground. Outside the atmosphere, there is approximately one proton or heavier atomic nucleus passing through an area the size of a fingernail every second. When cosmic rays approach Earth, they begin to collide with the nuclei of atmospheric gases. During the process of air shower, these collisions produce many pions and kaons, which quickly decay into unstable muons. Since there lacks strong interactions with the atmosphere and as the time dilation effects from relativity set in, many muons are able to reach the Earth's surface. Muons are ionizing radiation and can be easily detected by various particle detectors (from Wikipedia).

The cosmic ray detection chip developed by XPECT Vision(Shenzhen) represents alpha particles as larger circular spots through algorithms. Beta particles are displayed as narrow wave-like lines resembling worms, while gamma rays produce small dots or spots. Muons are presented as long straight lines.

Procedure:

- 1. Construct a frame of Mario Merz-style igloo with a transparent display screen installed above it.
- 2. Transmit the images from the cosmic ray detection chip to the display screen using a transparent film capable of displaying them.
- 3. Attach radiation value indicators to the stone slabs beneath the frame of the igloo, connecting them to a meter for display.

Cosmic ray detection chip: XPECT Vision (Shenzhen)
宇宙射线接受芯片提供：深圳帧观德芯公司

Technical guidance: Yao Lei
技术指导：姚磊

LED flexible transparent film display screen
supplier: REEFILM (Guangdong)
LED 柔性透明薄膜显示屏供应商：广东雷翼光电
科技有限公司

Experimental Materials: Circular Arch Iron Frame
Tent, Screens, Fossil Specimens
实验材料：圆拱铁架帐篷、屏幕、化石标本



背景和研究：黑茶上的金花菌，学名为冠突散囊菌（Eurotium Cristatum），是一种对茶叶发酵过程至关重要的有益微生物。金花菌在黑茶中形成的孢子囊呈金黄色，肉眼可见，故称“金花”。金花菌在黑茶的发酵和陈化过程中起着关键作用，尤其是安化黑茶中的茯砖茶，以其独特的金花菌含量而闻名。金花菌的存在对茶叶的品质和风味有显著影响，还赋予黑茶一定的保健功能。

操作：我们设计了成对的左右眼睛的模具，由合作的“上下”品牌定制一批眼睛形状的茶砖。在房间中构建一个简洁的茶砖冥想空间。本次装置使用普洱生茶，由新鲜采摘的茶叶经高温蒸压后快速干燥而成，再经历长时间存放使其自然发酵。

后期我们在眼睛茶砖上的眼角放置培养盐晶体。砖茶在西藏新疆地区广泛饮用，饮茶加奶加盐是一种传统习惯。同时眼角的盐晶也是泪水的意象。

Background and research: The golden flower mold on dark tea, scientifically known as Eurotium Cristatum, is an essential beneficial microorganism in the fermentation process of tea. The spore sacs formed by the golden flower mold in dark tea are golden yellow and visible to the naked eye, hence the name “golden flower.” The golden flower mold plays a key role in the fermentation and aging process of dark tea, especially in the Fuzhuan tea of Anhua dark tea, which is famous for its unique content of golden flower mold. The presence of golden flower mold has a significant impact on the quality and flavor of the tea and also endows dark tea with certain health benefits.

Procedure: We designed a mold for left and right eyes for tea imprinting. A batch of eye-shaped tea bricks was customized by SHANG XIA in cooperation. A simple meditation space of tea bricks was constructed in the room using Pu'er tea, which was freshly picked, rapidly

dried at high temperature, then fermented naturally over time.

Later, we cultivated salt crystals at the corners of the eye-shaped tea bricks. Brick tea is widely consumed in Tibet and Xinjiang, and it is a traditional habit to drink tea with milk and salt. At the same time, the salt crystals at the corners of the eyes are also a metaphor for tears.

Collaboration: SHANG XIA
合作机构：上下



背景：在福建德化，人们有在陶罐中储存老茶的传统。这里展示的这批老茶，茶叶罐集中在清朝中晚期，罐底皆有款式。有的封住茶叶罐的纸张上还残留清代文书。这种罐装老茶一般被视为包治百病的药物。茶叶品种一般为乌龙茶，也有本地出产的老白茶。

近年来，福建美术界一群朋友从收藏釉色各异的老茶罐开始，重新发现了这批散落在民间各地的老茶。他们产生了饮用这批百年老茶的想法。经福建农科院的专家鉴定，建议采用煮食方式。倒掉第一道茶汤之后，可以饮用。由此，他们成立了“闽省三山老茶会”，兴起了喝老茶的风气。

研究：在福建，从闽北的武夷山到最南端的诏安，人们都有将茶叶塞入柚子皮中储存的习惯。诏安柚子茶经过整颗柚子烘焙，风味更为浓郁。其原理和安溪苦瓜铁观音相似：陈年铁观音放入苦瓜内，通过烘焙工艺进行加工制作，不仅具有铁观音的醇厚，还具有苦瓜的下火作用。

虫屎茶又名“龙珠茶”，是由化香夜蛾、米黑虫等昆虫取食化香树、苦茶等植物叶后所排出的粪粒。虫茶的营养价值高于普通茶叶，含有 18 至 19 种氨基酸，一定量的粗蛋白、粗脂肪、糖类、单宁、维生素等营养成分，还含有人体所需的微量元素。著名的虫屎茶有广西六堡黑茶龙珠茶、云南的马料茶等，日本的虫屎茶，也叫做 Tencha（転茶）。

昆虫在食用植物（例如茶叶）后，通过其消化系统进行消化和代谢。在这个过程中，昆虫的消化酶和微生物群落会对植物的成分进行分解和转化，茶多酚、儿茶素等成分被转化为具有更高生物活性的化合物。昆虫肠道中的微生物对茶叶进行类似于发酵的过程，产生有益的代谢产物，如短链脂肪酸、维生素和抗氧化物质。

操作：墙上安装书架，放福州老茶会的茶叶罐和说明，出示科研机构的检测报告。同时展示金花茯砖茶、诏安柚子茶等老茶。

桌面上放置电子显微镜等仪器，观众可以操作仪器观察这些老茶的样品。

Background: In Dehua, Fujian, there is a tradition of storing old tea in pottery jars. The old tea displayed here, with tea jars mainly from the mid-to-late Qing Dynasty, all have styles at the bottom of the jar. Some of the papers sealing the tea jars still have Qing Dynasty documents on them. This kind of jarred old tea is generally regarded as a cure for all diseases. The tea variety is generally oolong tea, and there is also locally produced old white tea.

In recent years, a group of friends in the Fujian art circle have rediscovered this batch of old tea scattered among the people, starting from collecting old teapots with different glazes. They have come up with the idea of drinking this century-old tea. After appraisal by experts from the Fujian Academy of Agricultural Sciences, it is recommended to cook and drink it. After pouring out the first pot of tea soup, it can be consumed. As a result, they established the Fujian SanShan Old Tea Association and started the trend of drinking old tea.

Research: In Fujian, from the Wuyi Mountains in the north of Fujian to the southernmost Zhao'an, storing tea in pomelo peels is a common habit. Zhao'an pomelo tea, after being baked in the pomelo, has a richer flavor. The principle is similar to that of Anxi bitter gourd Tieguanyin: aged Tieguanyin is placed inside the bitter gourd and processed through baking, which not only enjoys the mellowness of Tieguanyin but also celebrates the fire-lowering effect of the bitter gourd.

Insect poop tea, also known as “dragon ball tea,” is made from the feces of insects such as the moth and rice black beetle after they eat and digest the leaves of plants like the fragrant tree and bitter tea. The nutritional value of insect tea is higher than that of ordinary tea, containing 18 to 19 amino acids, a certain amount of crude protein, crude fat, sugars, tannins, vitamins, and other nutrients, as well as trace elements needed by the human body. Famous insect teas include the Liubao dark tea dragon ball tea in Guangxi and the Ma Liao tea in Yunnan, and the insect tea in Japan, also called Tencha.

Insects, after eating plants (such as tea), digest and metabolize them through their digestive system. In this process, the digestive enzymes and microbial communities of insects break down and transform the components of the plants like polyphenols, catechins, and other components into compounds with higher biological activity. The microorganisms in the insect intestine perform a fermentation-like process on the tea, producing beneficial metabolites such as short-chain fatty acids, vitamins, and antioxidants.

Procedure: Install bookshelves on the wall, place the tea pots of the Fuzhou Old Tea Association and explanations, and present the test reports from scientific research institutions. At the same time, display old teas such as Jinhua brick tea and Zhao'an pomelo tea.

Electronic microscopes and other instruments are placed on the table, and the audience can operate the instruments to observe samples of these old teas.

Acknowledgements: Huang Zhongjie and Li Yumin from the Fujian SanShan Old Tea Association

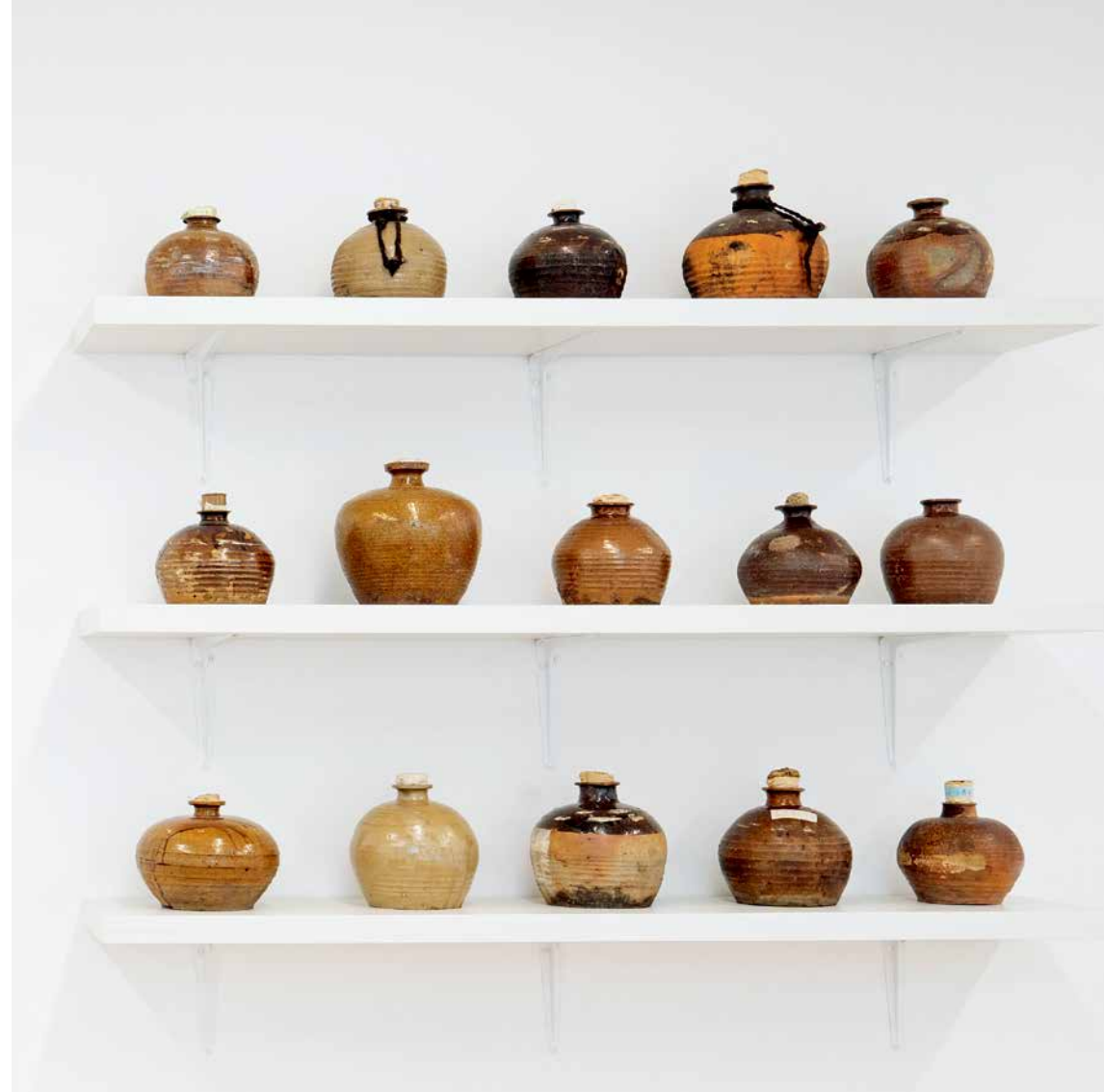
鸣谢：“闽省三山老茶会”黄忠杰老师、李豫闽老师

Appraisal Report: Fujian Hengzheng Testing Technology Co., Ltd.

鉴定报告：福建恒正检测技术有限公司

Operator: Li Zheng

操作人：李峥





No 31

THE DANCE OF SHIVA:
ROLY-POLY TOY WET
AND DRY
湿婆之舞·干湿不倒翁

Sealed glass cabinet,
mixed-media sculptures
密封玻璃柜、综合材料雕塑

Variable
Dimensions
尺寸可变

动机：我的原始想法是用小金属雕塑和吸湿材料制作不倒翁雕塑；潮湿时下部的吸水材料吸水变重，雕塑站立；干燥时下部的吸水材料脱水，雕塑头重脚轻而翻倒；制作一个密封玻璃柜，交替启动烘干机和加湿器，使雕塑们反复站立和倾倒。

重要的是铜像与下面的 3D 打印水滴形摇摆部件之间的重量配比。先制作铜像，要确保下面的水滴部分放上吸湿性材料之后比铜像轻，这样整个不倒翁头重脚轻，不吸收水分的时候，不倒翁是倒在地上的。当里面放着的吸湿性材料吸收了空气中的水分之后，它慢慢变重，不倒翁站起来。

目前采用何种吸湿性材料需要进行实验。可能采用高分子树脂、水凝胶、花泥、工业活性炭等等多种材料。不同的种吸湿性材料及数量多少影响到轻重配比。

研究：纸尿布之类用的高吸水性树脂是要直接接触到水。而我要做的是从空气中吸收水分，所以应该是要找吸湿性的材料。我看到美国和新加坡都有人研究出凝胶从空气中吸收水，MIT 的超吸水性水凝胶则是在水凝胶中加入氯化锂。德克萨斯大学奥斯汀分校的还有一种设计的成分是热响应纤维素，加热时具有疏水作用，有助于立即释放收集到的水，就是能在吸水和脱水之间比较快的切换，看起来是最理想的。他们的做法是把魔芋葡甘露聚糖、羟丙基纤维素和氯化锂（LiCl）三种材料成分混合做成薄膜。

这种超吸水水凝胶的巨大潜力可能是实现更加可持续的水资源收集和节能行为的关键。

从干燥的沙漠到潮湿的城市，所有空气中都含有水汽，全球估计有 3,100 立方英里（1.29 万立方千米）的水以湿气的形式漂浮在我们周围的空气里，水量多于北美最大的湖泊苏必利尔湖（Lake Superior, 1.16 万立方千米），或者差不多相当于 5 个维多利亚湖（Lake

Victoria，非洲最大湖泊，2700 立方千米）。2019 年，新加坡国立大学的一个团队开发了一种新的水凝胶，它能够有效地捕获海洋上空空气中的水分，然后将其作为淡水释放出来。如果新出现的“空气水”设备能够破解这个难题，将会在解决世界淡水问题上大有作为。

推进与实验：我们联络了正在 MIT 做博士后研究的郭猷弘博士，她现在在 MIT 读博士后，以前在德克萨斯大学奥斯汀分校材料科学与工程专业跟着余桂华教授做研究。研究领域是大气集水技术，她用魔芋葡甘露聚糖、羟丙基纤维素和氯化锂（LiCl）三种材料成分来设计可快速吸水的轻薄膜材料。相关论文题为《用于干旱环境中水分采集的超吸湿聚合物薄膜》（Scalable super hygroscopic polymer films for sustainable moisture harvesting in arid environments），已发表在 Nature Communications 上。

具体制备快速吸水的轻薄膜所需的设备，得到了中科院理化所刘静教授团队的支持。目前的问题是实验室制备能力不足。难于满足大量制造的要求，以及成本问题。

操作：

- 1，在实验室制备快速吸水和脱水的轻薄膜。
 - 2，3D 打印不倒翁壳体。制作湿婆之舞雕塑。
 - 3，制作封闭箱子时，需要研究烘干机、加湿器、切换开关，感应装置等。
 - 4，潮湿时下部的吸水材料吸水变重，雕塑站立，干燥时下部的吸水材料脱水，雕塑头重脚轻而翻倒交替启动烘干机和加湿器，使雕塑们反复站立和倾倒。
- 未来推进设想：如果不人为地切换干湿环境，这个雕塑可以作为空气湿度计。如果参考相关技术，实现空气中收集淡水，并用水龙头输出收集到的淡水，则成为实用的装置。那才是真正的“湿婆之舞”！

展望：今后实验成熟后，制备能力提升，考虑整个不倒翁用德化白瓷做“滴水观音”造型。观音脚下站的海浪和云朵内置吸湿性材料，收集空气中的水分。净瓶中不断地流出水来。把这尊观音像放到缺水的陕北、新疆和中东、非洲沙漠，即时装置，也是饮水机，那会是真正的救苦救难观世音菩萨！

Motivation: My original idea was to create a roly-poly toy sculpture using small-sized metal and moisture-absorbing materials. When it's humid, the moisture-absorbing material at the bottom absorbs water and becomes heavier, allowing the sculpture to stand upright. When it's dry, the material would dehydrate, making the sculpture top-heavy and causing it to tip over. I planned to construct a sealed glass cabinet where a dehumidifier and humidifier would alternately function, causing the sculptures to repeatedly stand and topple.

The crucial aspect is the weight ratio between the copper statue and the 3D-printed teardrop-shaped swinging component beneath it. The copper statue needs to be made in a way that ensures the teardrop section, with the moisture-absorbing material, is lighter than the component on top. In this configuration, the entire roly-poly toy sculpture would be top-heavy. When moisture is not absorbed, it would rest on the ground. As the absorbing process begins, it gradually becomes heavier and eventually stands up.

The choice of moisture-absorbing material needs experimentation. The possible solution lies in polymer resins, hydrogels, floral foam, industrial activated carbon, etc. Types and quantities of the materials will affect the weight balance.

Research: Materials such as superabsorbent polymers used in diapers are designed to come into direct contact with water. However, for my project, the aim is to absorb moisture from the air, so I need to identify hygroscopic materials. I have come across research conducted in the United States and Singapore on gels that can absorb water from the atmosphere. MIT has developed a superabsorbent hydrogel by incorporating lithium chloride into the gel. Additionally, researchers at the University of Texas at Austin have designed a material consisting of temperature-responsive cellulose, which exhibits hydrophobic properties when heated, enabling immediate release of the collected water. This material enables rapid transitions between water absorption and dehydration, and hence becomes the most promising option. The production involves combining konjac glucomannan, hydroxypropyl cellulose, and lithium chloride (LiCl) to form a thin film.

The tremendous potential of these superabsorbent hydrogels could be the key to achieving more sustainable water collection and energy-saving practices.

From the arid deserts to the humid cities, water vapor exists ubiquitously in the air. It is estimated that around 3,100 cubic miles (12,900 cubic kilometers) of water, in the form of moisture, float in the air around us, surpassing the volume of North America's largest lake, Lake Superior (11,600 cubic kilometers), or approximately equivalent to five Lake Victorias (Lake Victoria being Africa's largest lake, with a volume of 2,700 cubic kilometers). In 2019, a team from the National University of Singapore developed a novel water-absorbing hydrogel capable of effectively capturing moisture from the air above the oceans and subsequently releasing it as freshwater. If the emerging technology of "air-to-water" devices can overcome challenges lying ahead, it would boast substantiate potential in solving the global freshwater crisis.

Progress and experiment: We have reached out to Dr. Guo Youhong, a researcher currently affiliated with MIT. She is pursuing her postdoctoral studies after previously conducting research under the guidance of Professor Guihua Yu in the Department of Materials Science and Engineering at the University of Texas at Austin. Her research focuses on atmospheric water harvesting technology, utilizing a combination of konjac glucomannan, hydroxypropyl cellulose, and lithium chloride (LiCl) to design lightweight, rapid water-absorbing thin films. Relevant paper titled "Scalable super hygroscopic polymer films for sustainable moisture harvesting in arid environments" has been published in Nature Communications.

To address the specific requirements for the equipment to fabricate fast water-absorbing thin films, support has been provided by the research team led by Professor Liu Jing at the Institute of Chemistry, Chinese Academy of Sciences. However, the current challenge lies in the laboratory's limited manufacturing capacity, which leads to incompetence in large-scale production and high cost.

Procedure:

1. Fabricate in the laboratory lightweight thin films capable of rapid water absorption and desorption.

2. Employ 3D printing technology to create the body of the Roly-poly Toy. Produce the “Dance of Shiva” sculpture.
3. In the construction of the enclosed casing, extensive research is required on the integration of a drying machine, humidifier, switching mechanism, and sensing devices.
4. In high humidity, the water-absorbing material in the lower section will become saturated, causing the sculpture to stand upright. Conversely, when the air turns dry, the material will undergo desorption, resulting in an imbalance where the sculpture's head becomes heavier than its feet, leading to a tipping motion. This alternating cycle of standing and tipping will be facilitated by the activation of the drying machine and humidifier. The sculpture will continuously switch between the two states.

Further improvement: Without human intervention in the transition between dry and humid environments, the sculpture could serve as an air humidity gauge. After referencing relevant technologies and achieving the collection of fresh water from the air, which can be dispensed through a faucet, it would become a practical device. That would truly be the “Dance of Shiva”! Once the experiment matures and manufacturing capabilities improve, we envision constructing the entire figurine in the form of a “Dripping Water Guanyin” using exquisite Dehua porcelain. The waves and clouds at Guanyin's feet would be embedded with moisture-absorbing materials to collect water from the air. Continuous water flow would emanate from her kalasa (purifying vessel). We can then display this Guanyin statue in water-scarce regions such as northern Shaanxi, Xinjiang, the Middle East, and deserts in Africa, both as an immediate installation and a water dispenser. The compassionate spirit of Guanyin, the Bodhisattva who relieves suffering and aids those in need, would be utterly showcased.

Production and Acknowledgements: Dr. Guo Youhong, Massachusetts Institute of Technology; Professor Liu Jing and her research team, Institute of Chemistry, Chinese Academy of Sciences; Professor Yuan Zhihao, Dean of the School of Materials Science and Engineering, Tianjin University of Technology

制作和鸣谢：麻省理工学院郭猷弘博士、中科院理化所刘静教授团队、天津理工大学材料学院院长袁志好教授

Experimental operation:
Wang Mengru

实验操作：王梦茹





背景：1895 年，德国物理学家伦琴在研究阴极射线时偶然发现了 X 光。X 光的发现很快引起了医学界的关注。到 1896 年，X 光已经开始在医学诊断中使用，主要用于骨折、异物检测和牙科检查。20 世纪初，X 光技术迅速发展，新的 X 光管和设备不断改进，图像质量和安全性逐步提升。X 光广泛用于医疗诊断，如胸部 X 光检查、骨折检测、牙科 X 光等。它能够清晰显示骨骼结构和某些软组织情况。人们也使用 X 光引导进行的微创手术，如心脏导管插入术和血管成形术。高剂量的 X 光用于治疗癌症，通过破坏癌细胞的 DNA 来杀死肿瘤细胞。

在工业领域，X 光用于检测金属和焊接件的内部缺陷，如裂缝、空洞和不均匀性。通过 X 射线荧光光谱（XRF）分析材料的成分。机场和其他安全场所使用 X 光扫描仪检查行李和包裹中的物品。科研中 X 射线晶体学用于确定晶体结构，包括复杂的生物分子如蛋白质和 DNA。X 射线天文学研究宇宙中的高能天体，如黑洞、中子星和超新星遗迹。

研究：X 光是一种电离辐射，能够破坏细胞中的 DNA，导致细胞死亡或突变。长期暴露可能增加患癌症的风险。极高剂量的 X 光辐射会导致急性辐射病，表现为皮肤灼伤、脱发、恶心、呕吐和器官损伤。在医学成像中，医生会尽量使用最低有效剂量的 X 光，以减少对患者的辐射暴露。

深圳栢观德芯公司研发的一系列医用 X 光仪器采用了先进光学技术和算法，其光子计数型 X 射线探测器及其整机系统的开发与生产制造具有零暗噪声、高空间分辨率、高动态范围、高线性度、可实现能量分辨等诸多优势，实现了 X 光机的小型化和实时化。我们在这里使用的实时 X 光机以极低的剂量照射小动物，可以连续数小时观测保持存活的小动物，并呈现为漂亮的彩色实时图像。我们在画面中除了可以观测海马、青蛙、小鼠、金鱼等动物的心跳等，更重要的是可以观测给药后药物的扩散流程。

Background: In 1895, the fortuitous discovery of X-rays by German physicist Wilhelm Conrad Roentgen while studying cathode rays sparked immediate interest within the medical

community. By 1896, X-rays had been employed for medical diagnostics, primarily in the detection of fractures, foreign objects, and dental examinations. The early 20th century witnessed rapid advancements in X-ray technology, with continuous improvements in X-ray tubes and equipment, leading to enhanced image quality and safety. X-rays boast widespread application in medical diagnosis, including chest radiography, fracture detection, and dental X-rays. They can provide clear visualization of skeletal structures and certain soft tissues. Additionally, X-rays are utilized as guidance during minimally invasive surgeries, such as cardiac catheterization and angioplasty. High-dose X-rays are employed in cancer therapy, aiming to destroy tumor cells by damaging their DNA.

For industrial application, X-rays are employed for the detection of internal flaws within metals and welded components, including cracks, voids, and inhomogeneities. X-ray fluorescence spectroscopy (XRF) is utilized for the analysis of material composition. Airports and other venues demanding a high level of security deploy X-ray scanning machines to inspect the contents of luggage and packages. For scientific research, X-ray crystallography is employed for the determination of crystal structures, encompassing complex biological molecules such as proteins and DNA. X-ray astronomy delves into the study of high-energy celestial bodies within the cosmos, including enigmatic entities such as black holes, neutron stars, and supernova remnants.

Research: X-rays are a type of ionizing radiation that can cause damage to the DNA within cells, leading to cell death or mutations. Long-term exposure to X-rays may increase the risk of developing cancer. When exposed to extremely high doses of X-ray radiation, individuals may experience acute radiation syndrome, which can manifest as skin burns, hair loss, nausea, vomiting, and organ damage. In medical imaging, healthcare professionals strive to utilize the lowest effective dose of X-rays to minimize radiation exposure to patients.

A series of medical X-ray instruments developed by Shenzhen Xpect Vison Company incorporate advanced optical technology and algorithms. The photon-counting X-ray detectors and overall system exhibit numerous advantages, including zero dark noise, high spatial resolution, wide dynamic range, high linearity, and the ability to achieve energy resolution. These advancements have led to the miniaturization and real-time capabilities of X-ray machines. In the case of our real-time X-ray machine, small animals can be observed for several hours while staying alive after being irradiated with extremely low doses. The observations are presented in beautiful real-time color images. In addition to monitoring the heartbeat of animals such as hippocampi, frogs, mice, and goldfish, the most crucial aspect is the ability to observe the diffusion process of drugs after administration.

Operation: Several LCD screens are mounted on the wall, displaying real-time color X-ray images. They are connected to an X-ray machine.

操作: 墙面悬挂几个液晶屏, 播放彩色 X 光实时图像。连接 X 光射线机。

Technical Support: Shenzhen Xpect Vison Company
技术支持: 深圳栢观德芯公司

Operator: Li Bo
操作人: 李博



Nº 33

THE X-RAY SAND TABLE SERIES X 光沙盘系列

Sand table, moss, mushrooms,
X-ray machine (non-hazardous)
沙盘、苔藓、蘑菇、X光射线机(无危害)

Variable
Dimensions
尺寸可变

背景：伦琴拍摄了世界上第一张 X 光照片，那是他妻子的手，清晰地显示了她的骨骼和戒指。X 光从诞生之初就引起艺术家的注意，很多艺术家使用它的黑白反转的图像。

概念：我们在这里把 X 光作为事物另一个概念层面的显现技术。在普通视觉上的沙盘，在 X 光图像中成为带有文字的地图。

实木底板作为沙盘的托板，沙盘上集合了石膏、矿石晶体、金属粉末、天然海绵、聚苯乙烯泡沫板、永生苔藓等多种材料。内部预埋金属线切割组成的文字、金属丝、锡纸、金属粉末等能够在 X 光显示中留痕的物质。

Background: Wilhelm Conrad Roentgen captured the world's first X-ray photograph, which depicted his wife's hand, revealing the intricate details of her bones and even her ring. Since then, X-rays have captivated the attention of artists: Black-and-white inverted images have gained wide popularity.

Concept: we use X-rays as a technique to reveal a different conceptual aspect of objects. A regular sand table becomes a map with texts when viewed through X-ray images.

The sand table is built upon a solid wooden base and contains various materials like plaster, mineral crystals, metal powder, natural sponges, polystyrene foam boards, and everlasting moss. Inside, we embed materials that retain visible marks in X-ray images, such as metal wires in the shape of letters, metal threads, tin foil, and metal powders.

Operation: Simultaneously display the physical
sandbox and the X-ray images

操作：同时展示沙盘实物和 X 光图片

Technical Support: Shenzhen Xpect Vison Company
技术支持：深圳桢观德芯公司







邱志杰：1969 年生于福建省漳州市，1992 年毕业于浙江美术学院版画系。现任天津美术学院院长、中央美术学院教授。创作涉及科技艺术、生态艺术、书法、水墨绘画、摄影、录像、装置、剧场等多种方式。曾出版《总体艺术论》、《影像与后现代》、《给我一个面具》、《自由的有限性》、《重要的是现场》、《摄影之后的摄影》、《剧透》、《无知者》、《实验主义者》、《失败者》等艺术理论著作。主要作品集有《万物有灵》、《邱志杰：无知者的破冰史》、《时间的形状：邱志杰的光书法摄 2/2 影》、《莫愁：邱志杰近作》、《记忆考古》等。曾在国内外美术馆举办几十次个展，并参加过数百个群展。策划了 1996 年中国最早的录像艺术展《现象与影像》，以及 1999 年到 2005 年之间推介青年一代艺术家的“后感性”系列展览。2012 年第九届上海双年展“重新发电”总策展人。2017 年度威尼斯双年展中国馆策展人。2003 年以来投身于当代艺术教育。其“总体艺术”理念以文化研究为基础，发展出一种将观察、造物、现场、事件、写作和策展等糅合于一体的实践，寻求艺术与人生、艺术与社会、艺术与科学的贯通。近年来致力于实验艺术教育体系尤其是社会性艺术和科技艺术的构建。2017 年在中央美术学院创立了 EAST 科技艺术教育国际联盟。

Qiu Zhijie: Born in 1969, in Zhangzhou, Fujian Province, China, Qiu graduated in 1992 from the Printmaking Department of Zhejiang Academy of Fine Arts (now China Academy of Art, CAA). He is the president of Tianjin Academy of Fine Arts and Vice President and professor of the Central Academy of Fine Arts. As an artist, Qiu Zhijie is known for his science and technology art, ecological art, calligraphy, ink painting, photography, video, installation, and performance works. As an art writer, Qiu Zhijie has published dozens of books including *On Total Art*, *The Image and Post-Modernism*, *Give Me a Mask*, *The Limit of Freedom*, *Post-Photography Photography*, *Experimentalist*, *How to Become a Loser*, *How to Become Ignorant*, *The Spoiler*, etc. Catalogs of his work include *Breaking Through the Ice*, *The Shape of Time*, *Archeology of Memory*, etc. He held dozens of solo exhibitions in art museums both domestically and internationally and participated in hundreds of group exhibitions. He was also the curator of the first video art exhibition "Phenomena / Image" in China in 1996. He curated a series of "Postsense Sensibility" exhibitions between 1999 and 2005 promoting the young generation of Chinese artists. In 2012 he was the chief curator of the 9th Shanghai Biennale "Reactivation", in 2017 he was the chief curator of the Chinese Pavilion of the 57th Venice Biennale. Qiu has been engaged in contemporary art education since 2003. His concept of Total Art is based on cultural research, from where he developed a practice that integrates observation, creation, scene, event, writing, 2/2 and curation, seeking a thorough connection between art and life and art and society. In recent years, he has been committed to the construction of an experimental art education system, especially for social and technological arts. In 2017, he established the EAST International Alliance for Sci-Tech Arts at the Central Academy of Fine Arts.

EXHIBITION PRODUCTION AND COORDINATION

展览制作与协调

Mario Cristiani 马里奥·克里斯蒂阿尼

Lorenzo Fiaschi 洛伦佐·飞亚斯奇

Maurizio Rigillo 莫瑞西欧·瑞哥罗

Luna 彭咏仪

Giulia Contri 朱莉娅·康特里

Shen Yan 沈燕

Lisa Zhang 张世英

Valerie Wei 魏嘉

Michelangelo Zhao 赵煜周

Yuting Tian 田雨婷

Angela Ren 任柏玉

Yongxing Yang 杨勇行

Zhiyong Yang 杨志勇

Hongwei Li 李红卫

TEXTS 文章

Qiu Zhijie 邱志杰

TRANSLATION 翻译

Michelangelo Zhao 赵煜周

Angela Ren 任柏玉

DESIGN 画册设计

Lina 刘丽娜

PHOTO BY 图片拍摄

LITTLE DINOSAUR FILM & VISUAL STUDIO 小恐龙影像工作室



www.galleriacontinua.com

T.+86 10 59789505

beijing@galleriacontinua.cn

常青画廊出品

圣吉米那诺／北京／穆琳／哈瓦那／罗马／圣保罗／巴黎

此画册出版于邱志杰个展《生态实验室》

2024 年 12 月

中国印刷

GALLERIA CONTINUA

SAN GIMIGNANO/BEIJING/LES MOULINS/HABANA/ROMA/SAO PAULO/PARIS

This catalog was published on the occasion of “Eco-Lab” , Qiu Zhijie' s solo show at Galleria Continua

Beijing, December 2024

Printed in China

