# The Calanques: a land of science and source of inspiration - Feedback on artist-researcher collaboration

## Les Calanques : territoire de science et source d'inspiration - Retour d'expérience sur la collaboration artiste-chercheur

Shanta Rao[1], Justine Gadreaud[2], Guillaume Marchessaux[3,4]

[1] Artist, Paris, France, contact@shantarao.net
[2] Aix Marseille Univ, Univ Avignon, CNRS, IRD, IMBE, Marseille, France, justine.gadreaud@gmail.com
[3] Aix Marseille Univ, Univ Toulon, CNRS, IRD, MIO, Marseille, France, guillaume.gmarchessaux@gmail.com
[4] Université de Franche-Comté – Laboratoire Chrono-Environnement, UMR CNRS/UFC6249, F-25211 Montbéliard cedex, France.

**ABSTRACT.** During the residency The Calanques, a land of science and source of inspiration, visual artist Shanta Rao explored the world of jellyfish, whose increasingly frequent occurrence on the beaches of the Calanques National Park (Marseille region, southern France) raises the question of otherness, of the links between humans and other animal species. Based on a collaborative experiment with marine biology researchers Justine Gadreaud and Guillaume Marchessaux (Aix-Marseille University), the artist's research into the biological transformism specific to certain jellyfish has given rise to works at the crossroads of painting and sculpture, as well as photographic and video images that juxtapose the apparatuses of artistic and scientific research. Following a first exhibition at the end of the residency at the Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art in Marseille (2018), the initial project has continued to develop with the creation of new works and exhibitions, notably at the Edouard Manet institutional gallery (Gennevilliers/FR, 2019), the Joseph Tang gallery (Paris/FR, 2019), the Shimmer art space (Rotterdam/NL, 2019) and the Nest contemporary art center (The Hague/NL, 2020).

**RÉSUMÉ.** Lors de la résidence *Les Calanques, territoire de science et source d'inspiration*, l'artiste plasticienne Shanta Rao a exploré l'univers des méduses dont la présence grandissante sur les plages du Parc national des Calanques (région de Marseille, sud de la France) repose la question de l'altérité, des liens entre l'humain et les autres espèces animales. Expérience collaborative avec les chercheurs en biologie marine Justine Gadreaud et Guillaume Marchessaux (Aix-Marseille Université), les recherches de l'artiste autour du transformisme biologique spécifique à certaines méduses ont donné lieu à des œuvres à la croisée de la peinture et de la sculpture ainsi que des images photographiques et vidéographiques mettant en parallèle dispositifs de recherche plastique et scientifique. Suite à une première exposition de fin de résidence au Fonds Régional d'Art Contemporain Provence-Alpes-Côte-d'Azur à Marseille (2018), le projet initial a continué de se déployer par la réalisation de nouvelles œuvres et leur exposition notamment à la galerie institutionnelle Edouard Manet (Gennevilliers/FR, 2019), à la galerie Joseph Tang (Paris/FR, 2019), à l'espace d'art Shimmer (Rotterdam/NL, 2019) et au centre d'art contemporain Nest (La Haye/NL, 2020).

**KEYWORDS.** Shanta Rao, Camargo Foundation, Jellyfish, Artist in residence, relation between art and science, OSU Pytheas, Calanques National Park.

**MOTS-CLÉS.** Shanta Rao, Fondation Camargo, Méduses, Artiste en résidence, relation art et science, OSU Pythéas, Parc national des Calanques.

## A transdisciplinary meeting between artists and scientists

### *Research and creation residencies, a place of exchange*

The residencies offer time, means and space, in a privileged environment, to think, create and exchange ideas. Some of them encourage interdisciplinary approaches by promoting links between scientific research and artistic creation.

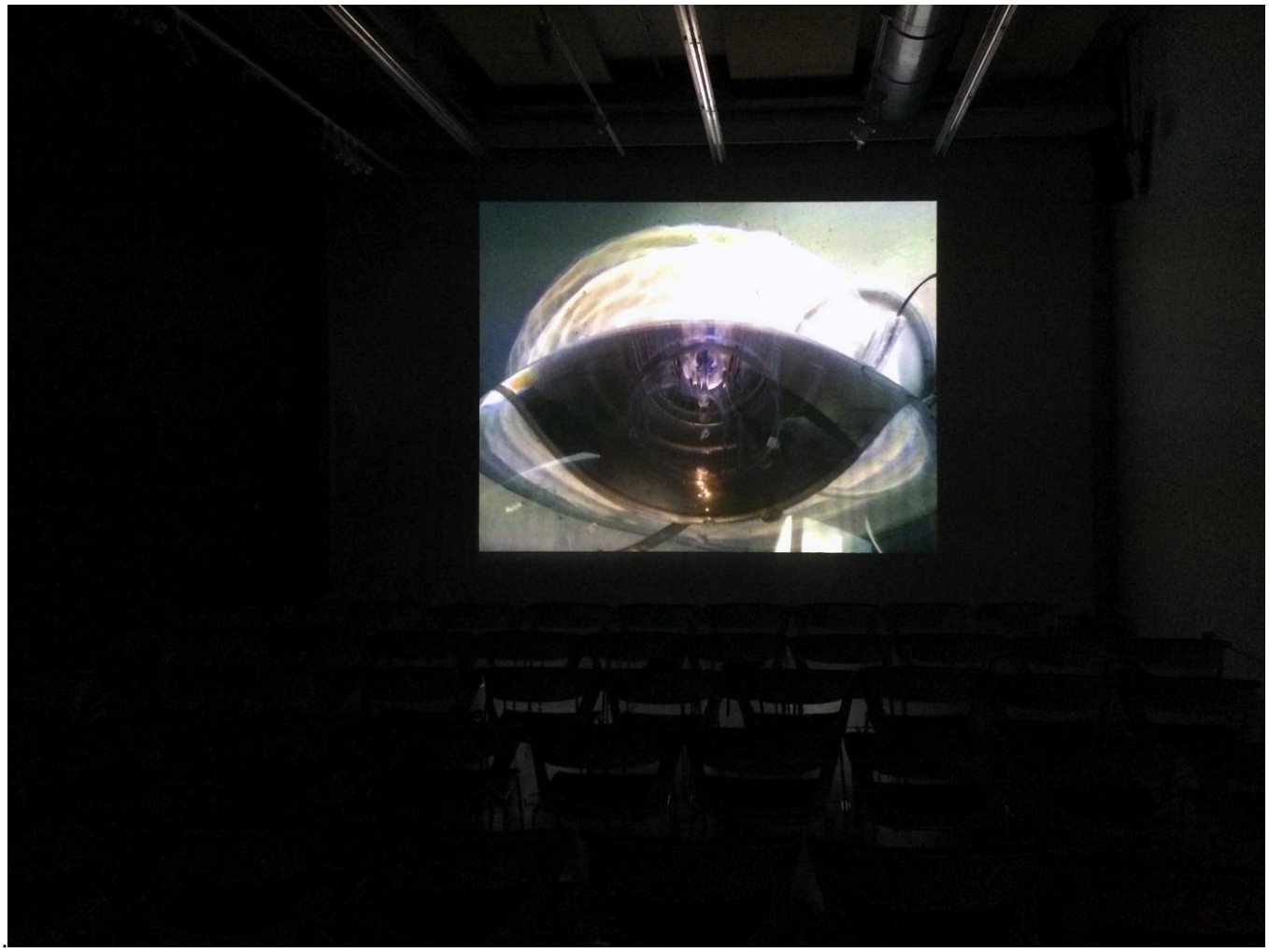
In January 2018, the Calanques National Park, the OSU Pythéas Institute, with more than 1200 researchers focusing on the major themes of Earth, Environmental and Universe sciences, and the Camargo Foundation, an American foundation which, for almost fifty years, has been hosting artists and researchers from all over the world at its Cassis campus in the south of France, invited eight international artists to reflect - together with landscape architect Gilles Clément - on Human/Nature links in the outstanding environment of Europe's only urban national park, the Calanques National Park. During five weeks, eight unique visions were enriched by exchanges with the territory and with those who live it - researchers, park agents, local inhabitants - and sketched out ideas and artistic proposals that were given form during an exhibition at the Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art (Marseille, France), at public events and in an edition of the magazine SEMAINE (weekly magazine for contemporary art, paper edition).

*[1] Shanta Rao, work-in-progress, 2018, Open Day at the Camargo Foundation, Cassis, France*

During this residency, the artist Shanta Rao and the researchers Justine Gadreaud and Guillaume Marchessaux were able to exchange ideas, through their interest in gelatinous organisms and more particularly jellyfish, on questions of morphogenesis and metamorphism, soft matter or complex fluids, ductility and mutability of forms, themes common to art and science.

In the specific context of this residency, the exchanges between the artist and the researchers, both discursive and intuitive, were made possible by enhancing awareness of the respective fields of investigation according to different approaches, iconographic, textual and haptic, during meetings in

research laboratories or at the Camargo Foundation campus, overlooking the Calanques National Park's waters.



*[2] View of the projection and public talk of Shanta Rao and Guillaume Marchessaux as part of the exhibition The Calanques: a land of science and source of inspiration, 2018*
*Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art, Marseille, France*

## *Presentations*

**– Shanta Rao –** Hertzian frequencies are transformed into *soft matter*; ink plates phagocyte matrix images; musical compositions perforate siliconized blades; digital drawings expand, meteorize; gestures unfold into diagrams and then into electronic landscapes; literary texts are magnetized; photographs disintegrate into grains, stains and coagulate on rubbery surfaces; pixels emboss copper plates; geometric figures mutate into musical scores that are impossible to play.

All my works invoke a transformist world, in perpetual mutation. They draw their origins in the concrete of physical and biological phenomena, or in the abstraction of algorithms borrowed from contemporary music, or from computer science. Through an approach that blurs or invalidates genealogies, object-sources mutate, hybridize and reappear in another field than the original one, in new forms. Changes in language, form, matter, they are transfugal works, a shaping of entropy. The transformative continuum of the works does not stop at their creation, but also extends during their exhibition, where they borrow variable presentations, evolving according to the context and the interactions with the curators. Some of them even pursue a post-exhibition evolution, through new transformations. According to this metamorphic approach, the works can be embodied in a wide variety of plastic manifestations, autonomous or integrated into installations. The most recent of

these manifestations, sculptures made exclusively of paint, belong to the vast field of *soft sculpture* and its visual, material, and temporal issues.

*[3] Shanta Rao, Untitled, 2019, polymer paint, 98 x 67 x 33 cm*

**– Guillaume Marchessaux –** I have always been passionately interested in academic research. Early in my academic career I took a particular interest in the study of plankton, small organisms drifting here and there with the currents. Within this very diverse planktonic compartment, ranging from phytoplankton cells to crustaceans, I was fascinated by the gelatinous zooplankton. These apparently very primitive organisms are in reality fascinating in their ingenuity and capacity and adaptability. During my PhD, I worked on a species of invasive ctenophore, *Mnemiopsis leidyi*, in Berre Lagoon and in the Camargue in the south of France. This invasion by a gelatinous organism has had an important socio-ecological impact ranging from disturbance of the proper functioning of the lagoon ecosystem to major hindrance for small-scale fishing and bathing. My work consisted in

quantifying this ecological and sociological impact as a basis for proposing management measures. Today, as a research scientist, I am working on the invasion by a freshwater jellyfish, *Craspedacusta sowerbii*, native to China, proliferating in lakes, rivers and continental basins. My research is focused on the reproductive cycle of this fascinating jellyfish and its distribution in metropolitan France.

**– Justine Gadreaud –** I have been passionately interested in underwater life since childhood, and I studied at school then at university up to a PhD. Beyond this fascination for these seemingly infinite underwater spaces and this variety of organisms, understanding the impact of human activities on the functioning of these ecosystems has always interested me. And it was the scientific discipline of ecotoxicity that particularly caught my attention. The aim of ecotoxicology research is to identify, quantify and predict the impact that xenobiotics can have on living organisms and their ecosystems. More broadly, it is based on the political will to prevent risks in order to protect the environment and to public health issues. The discovery of the jellyfish model was made within this framework. My research consists in testing the impact of manufactured nanoparticles (silver and titanium) on the development of the jellyfish *Aurelia aurita* through experiments in an exposure laboratory. It is within this framework that my knowledge of the biology of these gelatinous organisms has continued to grow, and my fascination with it: the fragility of their form (98% water) associated with their physiological resistance, their adaptability and the resilience of their populations, their life cycle and their very particular methods of reproduction.

## Artist-researcher dialogue: From biology to visual arts, protocols and diversions

**– Shanta Rao –** Originally, especially during a first residency at the Camargo Foundation, my interest in jellyfish was purely theoretical, I saw it as a tool for reflection complementing my artistic perspective, my interest in the evolution and mutability of forms. The first jellyfish that aroused my curiosity was the *Turritopsis nutricula*, exemplary for its ability to change shape during its existence, sometimes returning to the primary stage of undifferentiated cells, somehow shapeless or rather protoform. During my visits to the laboratories where you were working, I was able to get to know "your jellyfish", sometimes even haptically, and discover these remarkable organisms. *But how can we apprehend these gelatinous beings and more generally a fluid environment where our perceptive patterns linked to the earthly world, to gravity, to a reduced dimensionality - we do not see beneath us - are often inoperative? What are the tools and methods you use to look at and study this specific environment that disturbs our perceptions?*

**– Justine Gadreaud –** My apprehension of our environment, its observation and my understanding of the mechanisms that govern it is based on science. Science brings together a set of disciplines that use a panoply of methods; methods that have proven their effectiveness in describing and understanding the world in which humans live. Experimentation, statistics, modelling, etc. are all tools of the scientific process that are used to test hypotheses. The results obtained are compared, discussed and written up in peer-reviewed and validated articles. Science is thus a discipline that is constantly developing new tools, and where the results - knowledge - are constantly being called into question. My research work is based on different but complementary scientific disciplines: chemistry, aquariology, molecular biology and imaging, among others. Each of these disciplines has its own tools - the equipment (test tube, aquarium, pipette, measuring tools, etc.) - and its own methods (experimental designs, statistics, modelling, etc.) for testing hypotheses. Of course, our apprehension "of the world" our science-based apprehension of the world is limited by our technical and technological means of measurement and analysis. In my opinion, these are limits from which we are totally freed in the experience of artistic thought.

**– Guillaume Marchessaux –** One of the preliminary issues to tackle this common field of investigation is the need to transpose, to transfer our terrestrial reading to the physis of the marine

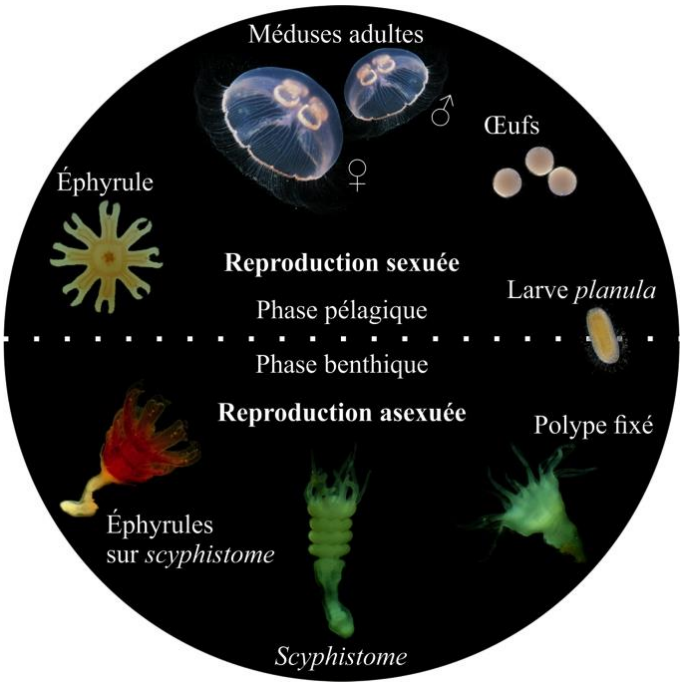
environment. The ocean is a vast environment, the most extensive: we should remember that planet Earth is 71% covered by water. The ocean stretches as far as the eye can see, it is unpredictable, almost inaccessible, a limitless expanse. The ocean is a world in three dimensions. It includes in its horizontal plane the movements of water masses, created by surface currents but also by bottom currents due to temperature and/or salinity differentials: this is the thermohaline circulation. On the vertical plane, the ocean is divided into several layers arranged in sheets between the bottom and the surface, each with its own chemical, physical and biological characteristics. These characteristics condition the development of life and the taxonomic composition.

**– Shanta Rao –** Cubomedusa, lobate ctenophores, upside down jellyfish, goddess of brackish waters, body of fire, purple stinger, lion's mane, flying saucer jellyfish, Portuguese man o' war, belts of Venus girdle, immortal jellyfish, floating prisms, this field of the living world is in itself a history of forms and the metamorphism of some of these jellyfish, which have long defied taxonomic ordination, raises questions. I cannot help evoking the philosophical paradox of Theseus' boat and its questions of identity(ies) through time, which underlies all my research. According to legend, when Theseus returned to Athens after his victory over the Minotaur, the Athenians kept his ship. But over time, to preserve the symbol of their victory through the centuries, they had to replace the damaged planks one by one to the point that no original planks remained. *Is it still Theseus' boat or another boat? Does identity persist in form, in matter or in some other way? The paradox of Theseus' boat opens the question of the Same and the Other, of the spatio-temporal continuity of beings and things. But what about those jellyfish that question the linearity of biological time and its unidirectionality, capable of 'backwards' evolution, rejuvenating, cloning or embodying themselves in such diverse forms? How do these so-called primitive organisms have the genetic ability to assume different fleshly forms while we have only one? How does science explain these phenomena?*

**– Guillaume Marchessaux –** Jellyfish and other gelatinous organisms may be considered primitive when we know that they appeared more than 600 million years ago. There are thousands of species of gelatinous organisms ranging from cnidarians to ctenophores to tunicates. Jellyfish are composed of a dermis made up mainly of collagen and very powerful striated muscle cells providing propulsion. Jellyfish have no organs as such (i.e. lungs, heart, brain, etc.). They are made up of a complex network of nerve cells and fibers that perform vital functions (propulsion, extension of tentacles and filaments, etc.). Gelatinous organisms breathe without lungs, but by means of gas exchanges between dermal cells and water. The main organs observed in jellyfish are the gonads and the stomach, all connected to a mouth. This mouth, which is directly connected to the gastric cavity, is in the extension of the tentacles or mouth arms. The tentacles, which can expand up to 10 times their size, are lined with stinging cells. These poison-filled cells can be used to capture prey that is brought back to the mouth by means of the contractile movements of the mouth arms. The prey is digested in the gastric cavity and the mash is distributed directly to the whole body through the vast network of radial canals.

In jellyfish, the life cycle consists of two stages: pelagic sexual reproduction and benthic asexual reproduction. The pelagic jellyfish stages are sexual. Both males and females generally release their gametes into the surrounding environment. After fertilization, a ciliated larva called planula develops and dives to the depths to attach itself to rocks, bivalve shells, etc. The development of this larva gives rise to a polyp consisting of a stalk and several dozen tentacles. The polyps are sexed, so there are males and females. But they reproduce by asexual budding, each individual is thus a clone, giving rise to immense colonies. These polyps then give birth by strobilation or budding to new larvae of pelagic jellyfish. The cycle is thus completed. There are a multitude of reproductive cycles in other gelatinous organisms. Some, such as ctenophores, are hermaphroditic and have a pelagic life cycle only. Others, such as tunicates, pelagic barrel-shaped organisms, have a reproductive cycle alternating hermaphroditic and asexual sexual phases.

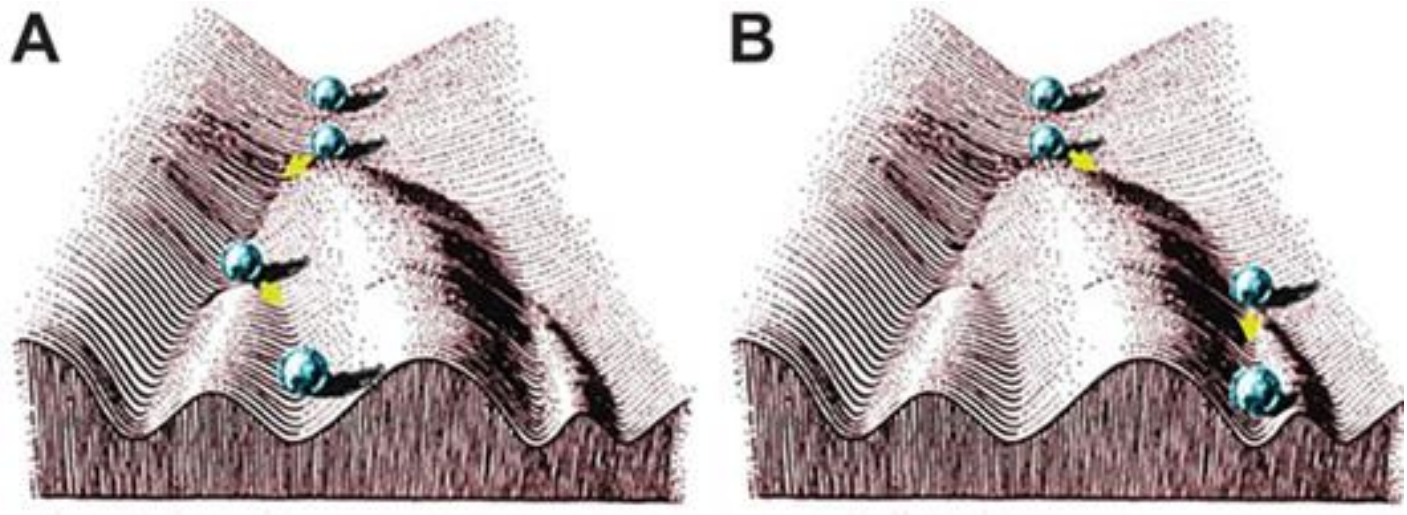
 




*[4] Life cycle of the moon jellyfish Aurelia aurita.*

**– Justine Gadreaud –** As described by Guillaume above, the life cycle of jellyfish, and in particular that of the scyphozoan class, includes a variety of developmental forms: the larva planula, the polyp, the ephyrae, and finally the jellyfish.

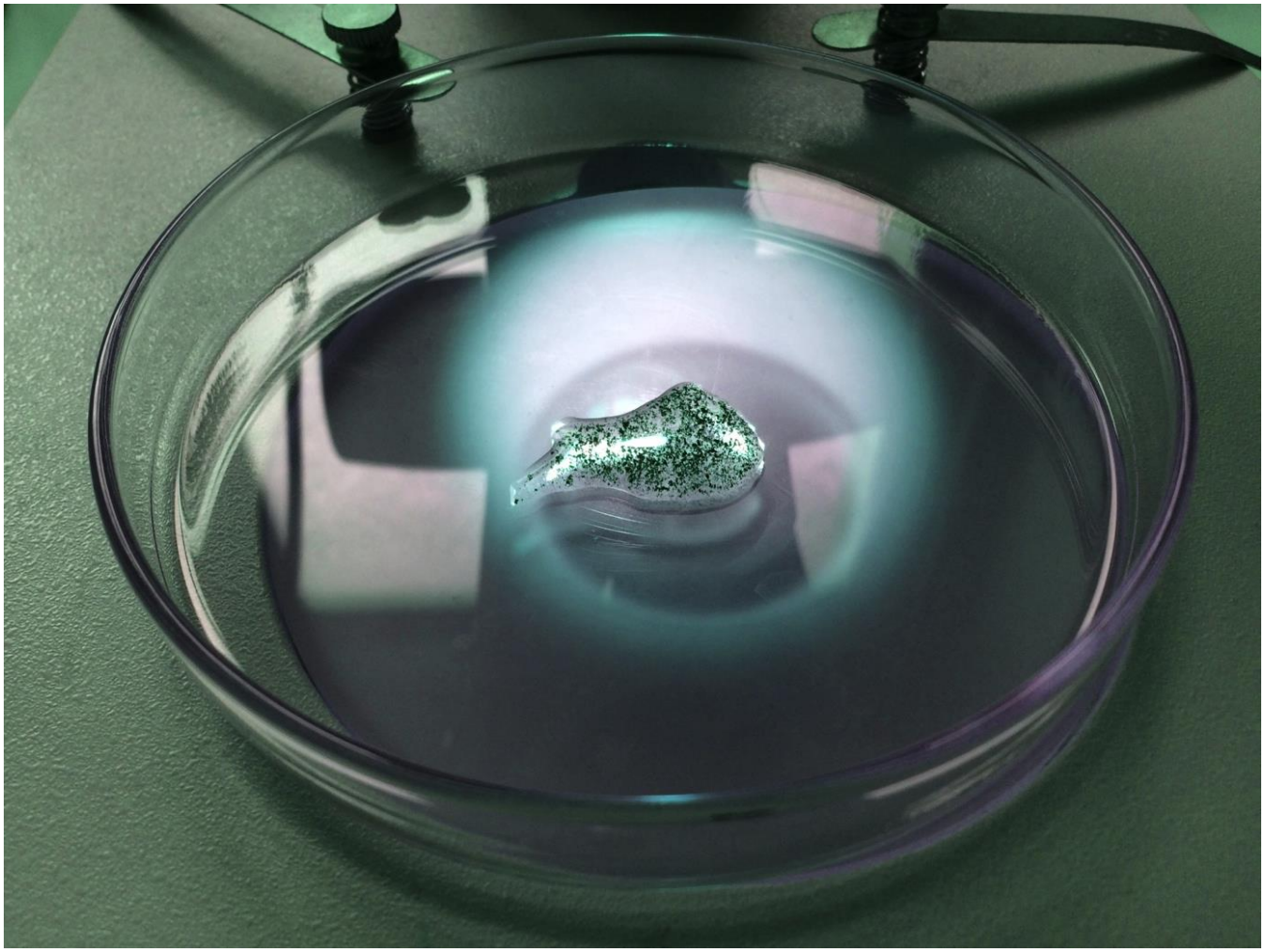
All these forms result from periods of morphogenesis and development encoded by a set of genes that are expressed in a cascade. Our scientific knowledge on the specific genes of morphogenesis in jellyfish is recent: the first complete transcriptome of the different stages of development of *Aurelia aurita* was first produced in 2014 by Fuchs et al.. Long before the acquisition of these data of these detailed data on the genes coding for the morphogenesis of the different life stages of jellyfish, breeders and scientists knew that the environment influenced the triggering of these changes in shape: variation in water temperature and salinity and the quantity of food available, for example. Epigenetics is the discipline in biology that studies the nature of the mechanisms that reversibly, transmissibly, and/or adaptively modify gene expression without changing the gene code. Many avenues remain to be explored to understand the reproduction and morphogenesis of jellyfish.




*[5] Conrad Hal Waddington's Epigenetic Landscape Model and Cell Fate*

**– Shanta Rao –** Speaking of becoming, I take as exemplary the representation by the biologist Waddington of his own concept of epigenetic landscape evoking the non-linearity of the program, of the destiny to which living beings are subjected. *We see a set of possible* trajectories *of a stem cell that reaffirms the pluripotency of the living and its plasticity. But beyond a diachronic reading of life, Justine, you evoked the variable geometry of certain jellyfish within a sometimes very short time in your own laboratory. What about that?*

**– Justine Gadreaud –** The jellyfish's ability to change its morphology according to the quality of its environment is also surprising. Several personal observations have shown that a jellyfish in a confined space, with little food and without the optimal physical and chemical conditions for its development and growth, shrinks enormously, being able to go from 20 cm in diameter to less than 3 cm in diameter in a few days, but to survive, like a man losing weight under the same conditions for several weeks. This capacity further enhances the fascination that these organisms evoke in me, precisely in view of their 600 million years of existence, their morphology, which is so unique in the living world, and their great environmental tolerance.



*[6] Shanta Rao, Untitled, 2018, digital print, variable dimension*
*Polyps of jellyfish Aurelia sp. and their substrate*
*Institut Méditerranéen de Biodiversité et d'Ecologie - IMBE, Marseille, France*

**– Shanta Rao –** Born from our discussions and studio at the Camargo Foundation campus, the corpus of works initiated during the residency *The Calanques: a land of science and source of inspiration*, draws its sources from the biological singularities of certain jellyfish: their extreme metabolic plasticity which enables them to undergo transformations ranging from simple adjustments that slightly alter their original shape (change of scale, regeneration of body parts) to

radical transformations of shape and even matter; their changes of territory according to the stage of their life cycle which induces a pelago-benthic or, to put it another way, fluid-solid duality; their matter which seems singular to humans but which nevertheless constitutes more half of the organic matter on the planet, a *soft matter* belonging to the field of complex fluids and which often escapes from sight or when grasped; their anisotropic colors, varying according to the direction from which they are perceived.

Some artists began to use natural or synthetic soft materials as early as the 1960s and gave rise to a new field of sculpture, *Soft Sculpture*. They opened up this field of artistic experimentation notably thanks to the new materials with complex molecular structures coming from the petrochemical industry, but for them it was above all a matter of questioning the existence of a superior force that would dominate matter (Human, artist, God) and the top-down thought of a certain sculpture where forms pre-exist their material incarnation. Instead, these artists welcome the inherent plasticity of the materials they use in an approach that is coalescing with the physical world of which we are all a part.

The works discussed in this article are for the most part *soft sculptures* that have the specificity of being made exclusively of paint. Like all of my works, they develop in several stages, in a continuum of transformations that testify to a world in permanent evolution.

Their manufacturing process is similar to the life cycle stages of some jellyfish. Like the jellyfish, the works have a beginning of existence linked to a solid substrate, a kind of matrix, to which the paint will be applied in successive layers. These matrices, fragments of automobile carcasses, evoke the growing presence in the marine environment of solid elements of human origin responsible for the increase in the jellyfish population.

Like planktonic collagen, the paint used to create the works is a polymer belonging to the field of complex fluids and exhibiting a wide variety of behaviors between solid and liquid states. The pigments used have optical properties similar to the opalescent colors of the marine world. Technically imprinted, it will then be detached from its matrix and released from its referent: the work begins its existence as a *soft sculpture* to be activated within exhibitions.

One of the first *soft sculptures* was presented during the exhibition *The Calanques: a land of science and source of inspiration* at the Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art in Marseille in 2018, as part of an installation proposal whose title, *The Color out of space,* is borrowed from a work by H.P. Lovecraft. It was exhibited there in an evolutionary phase - slightly detached from its still-present matrix -, on a bed of iridescent draperies evoking sea-atmosphere interactions. An aquarium-ball as well as a slide show diffused in an undulating movement on a monitor were also on display; seascapes, kinetic machines simulating the perpetual movement of Mediterranean currents, plastic experiments, a station for the study of the mechanics of oceanic fluids, organisms or artworks in gestation, these images testify as much to the connection between mankind and nature as to the experimental devices and machines that enable them to prolong, within the artificial microcosms that are the scientific laboratories and artists' studios, the movements of its organic or inorganic matter. *Guillaume, you said that scientific experimental machines were spokespersons?*

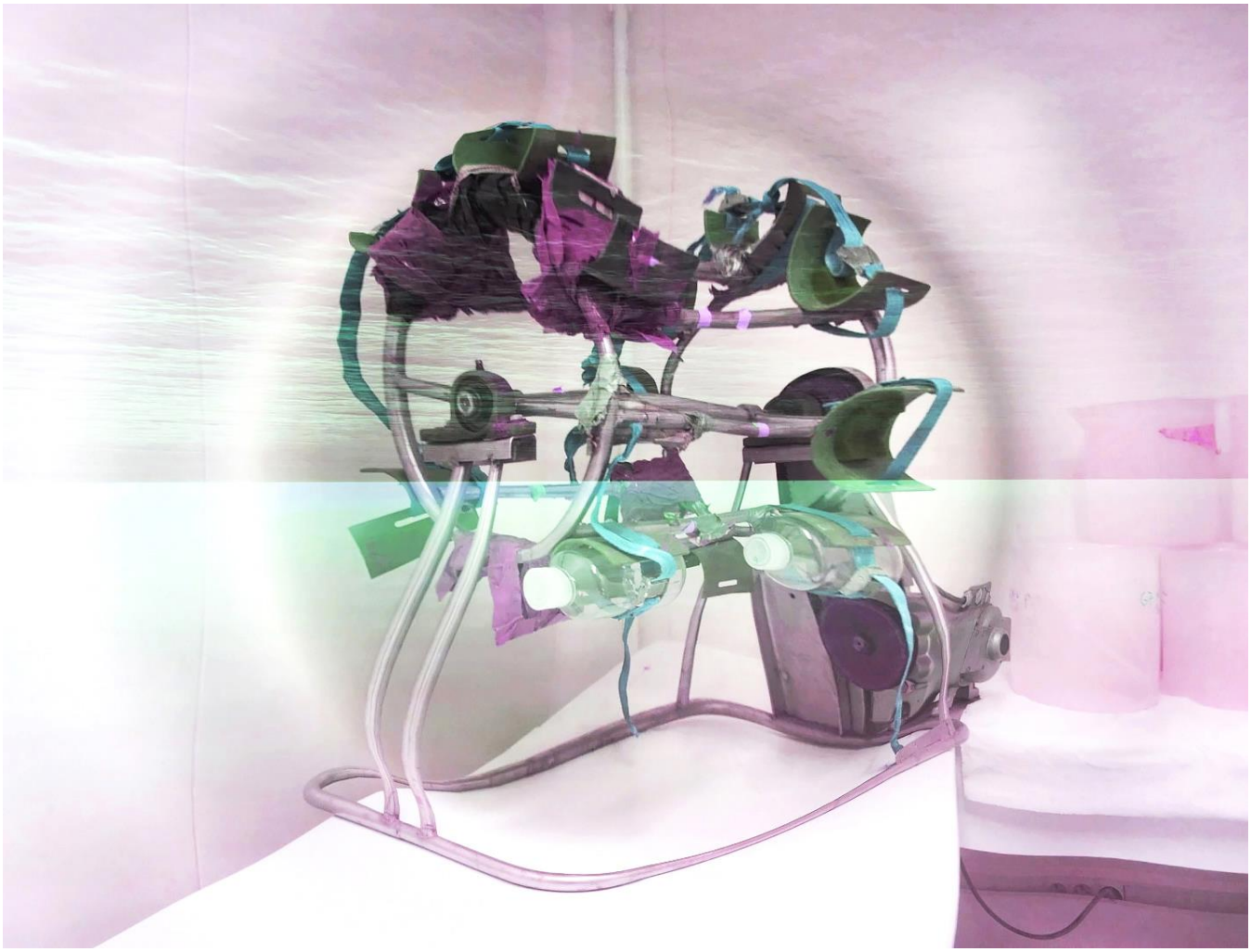
**– Guillaume Marchessaux –** In our field of research, oceanography, we carry out various measurements. First of all, our approach consists of asking questions about an observed phenomenon, for example how are jellyfish blooms caused and what is the socio-ecological impact ? Then we go out into the field and collect and measure chemical, physical, biological and ecological parameters using probes, bottles and nets. In my case, it's a matter of understanding the temporal dynamics of zooplankton, jellyfish and other gelatinous organisms in relation to environmental parameters.

Since we cannot be in the field full-time, we recreate the environmental conditions in the laboratory. This enables us to modulate the parameters (temperature, salinity, amount of food, etc.) as we wish and quantify the physiological rates of the model species studied. From this we can determine the optimal parameters for the development of the model species studied and thus couple these laboratory measurements with those collected in the field.

*[7] Shanta Rao, Untitled, 2018, polymer paint, 200 x 20 x 17 cm*
*PULPE, two-person exhibition with Mimosa Echard, curated by Raphaël Brunel*
*Galerie Edouard Manet (institution), Gennevilliers, France*
*Collection Centre national des arts plastiques - CNAP*

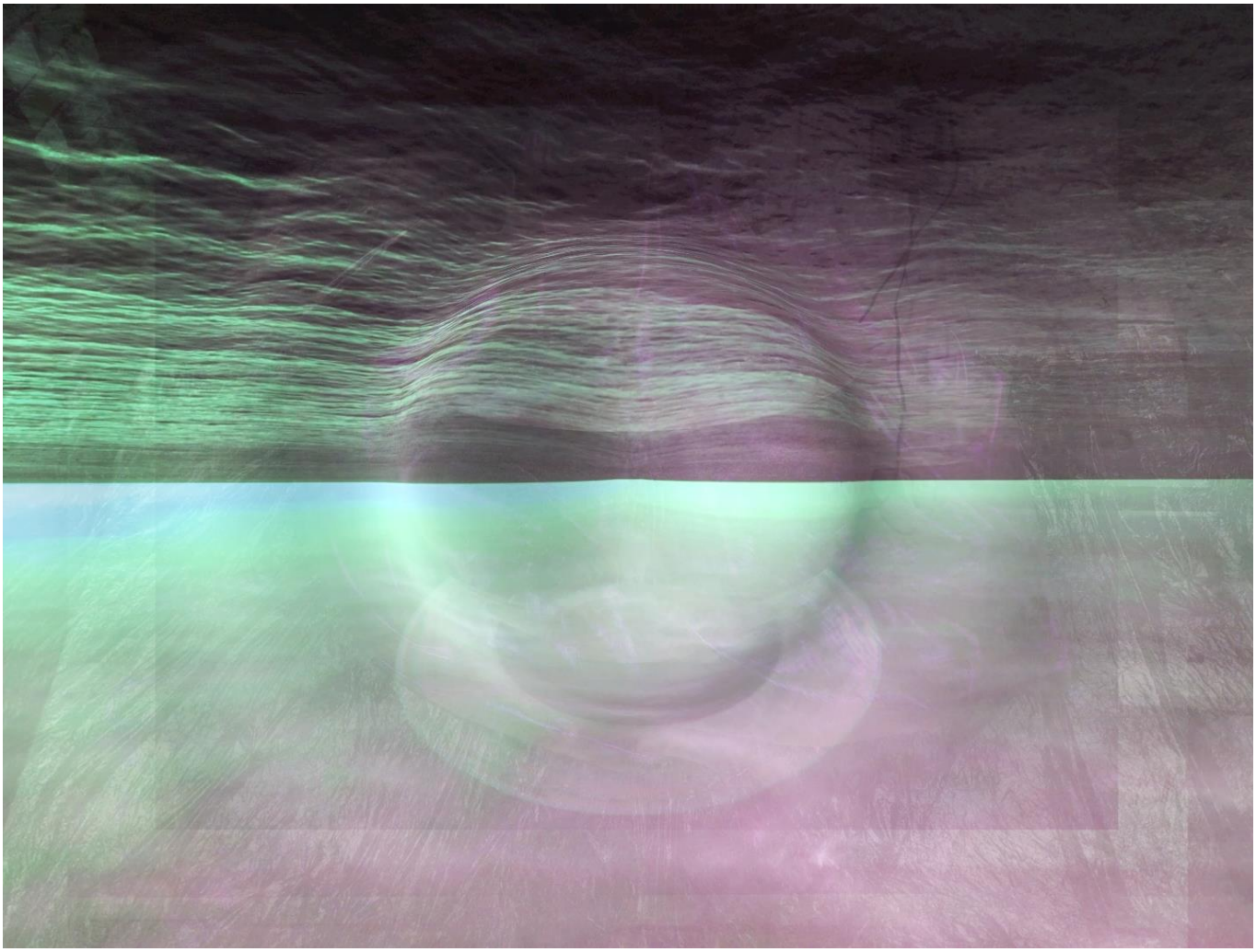
Plankton is defined as all the organisms that drift along with the currents. These organisms are unable to maintain themselves alone in suspension in the water column, they are dependent on water movements, the currents. In the case of the study of plankton in the laboratory, we use several kinetic machines. The main task of these machines is to artificially create a small water movement to keep the plankton and jellyfish in suspension during the experiments. These machines are an integral part of my daily plankton work. These machines, both anthropogenic and artificial, are ultimately spokespersons for the natural processes that we are trying to show.



*[8] Shanta Rao, The Color out of space, 2018, slideshow*
*Exhibition The Calanques: a land of science and source of inspiration*
*Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art, Marseille, France*
*Based on a photograph of a kinetic machine taken in the laboratory of Guillaume Marchessaux*
*(Mediterranean Institute of Oceanography - MIO, Marseille, France)*

**– Shanta Rao –** You said that our collaboration between artists and researchers had renewed your fascination and perception of these organisms, that a reading through the prism of art had increased the time dedicated to their contemplation and also opened up fields of scientific inquiry that you had not or had barely explored until then, such as questions of origin or morphology. And that in the end, scientific and artistic approaches were often very close. This collaboration has, for my part, allowed me to approach models freed from any idea of finitude, formal but also in the very definition of life - what is alive is born and dies - here challenged by the biological immortality of certain jellyfish. It was also an invitation to think of a more fluid and coalescent world in which it would be possible to rethink the relationships that unite us to the living and the non-living. What would be the language of the future if the abandonment of mastery (of the illusion of mastery) led us

to engage in a dialogue and not a war with what surrounds us and which, strangely enough, we call "environment"? as the landscape architect Gilles Clément wrote[1].



*[9] Shanta Rao, The Color out of space, 2018, diaporama*
*Exhibition The Calanques: a land of science and source of inspiration*
*Provence-Alpes-Côte-d'Azur Regional Found for Contemporary Art, Marseille, France*
*Based on a photograph of an aquarium-ball taken in the laboratory of Justine Gadreaud*
*(Institut Méditerranéen de Biodiversité et d'Ecologie - IMBE, Marseille, France)*

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[1] opening text of the residency program *The Calanques: a land of Science and Source of Inspiration,* 2017

 

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## Further information

Shanta Rao website | http://shantarao.net/

Guillaume Marchessaux website | https://guillaume-marchessaux-94.webself.net/

The residency program *The Calanques: a land of Science and Source of Inspiration* https://camargofoundation.org/fr/programmes/les-calanques/

 