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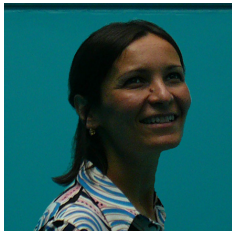

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La rappresentazione della Natura tra Arte e Scienza
The Representation of Nature between Art and Science

Obiettivo di questo numero di "DISEGNARECON" è raccogliere contributi, esperienze e risultati di ricerche che testimoniano il ruolo centrale della osservazione della realtà all'interno del processo cognitivo e creativo.
Il tema della osservazione e della rappresentazione del dato naturale è stato scelto in analogia a quanto accadde a partire dal Rinascimento, quando la messa a punto di nuovi strumenti per l'osservazione della realtà aprirono dibattiti le cui conseguenze andarono al di là delle contingenze e misero in discussione un intero sistema culturale.
Negli ultimi decenni, grazie alla disponibilità di nuovi e sofisticati strumenti e metodi di indagine, l'interesse verso il dato naturale e la sua osservazione è stato rinnovato e ha al contempo suggerito interessanti applicazioni in campi differenti. Lo studio della Natura, delle sue forme, funzioni e principi che regolano l'evoluzione e l'equilibrio fra gli esseri viventi e l'ambiente suggerisce sperimentazioni in ambiti come, ad esempio, quelli del design e della progettazione architettonica dell'ambiente antropizzato che sono attualmente chiamati a fornire risposte al problema del rapporto fra l'uomo e l'ambiente naturale.

The current issue of "DISEGNARECON" collects examples of works, researches and experiments able to testify the central role that the observation of reality plays within the knowledge and creative process in several fields.
Similarly to the Renaissance, when the introduction of new instruments for observing reality suggested considerations whose consequences went beyond contingencies and called into question an entire cultural system, in recent decades, thanks to the availability of new sophisticated tools and methods of investigation, we witnessed a renewed interest in Nature and its observation that has suggested applications in different fields.
The study of Nature, of its forms, functions and principles that rule the evolution and the balance between living creatures and the external environment proposes experimentations in fields such as, for example, architecture and design of the environment, which are actually called to provide answers to the problem of the relationship between man and the natural environment.

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For centuries Nature has been a source of inspiration for several disciplines, ranging from those related to scientific research up to the artistic ones. As a consequence, this connection has supported a long debate upon the relationship between Art and Science.
Recently, in particular, thanks to the availability of new sophisticated tools and methods of investigation, the interests towards Nature and its observation have been renewed and have suggested applications in different fields.
The study of Nature, of its forms, functions and principles that rule the evolution and the balance between living creatures and the external environment proposes experimentations in fields such as, for example, architecture and design of the environment, which are actually called to provide answers to the problem of the relationship between man and the natural environment.
Similarly to what happened about five centuries ago with the growing of attention to scientific investigations that led to important discoveries and to deep ideological and cultural consequences, this renewed interest towards Nature has been made possible by the availability of tools that allow the observation of reality from different points of view that are until now unthinkable.
Investigations through digital instruments allow to broaden the repertoire of images that can be obtained thanks to the observation of reality at different scales and from different points of view, that can be infinitely far, or inside, or very close to the object of our interest.
Some examples of these different tools and images can range from satellite maps of the Earth, to electron microscopes, to visualization techniques mainly used in medicine for diagnostics that allow three-dimensional visualization and also, in some cases, tactile interaction with the body part in the digital environment.
In addition to these aspects, thanks to the recent discoveries in the field of digital technology, we have been able to produce and manipulate images that achieved an unprecedented realism, and we have been able to strengthen the ability to communicate of scientific illustrations.
There is a wide range of scientific drawings that are not mere representations of what is already known or understood, but are, on the contrary, the results

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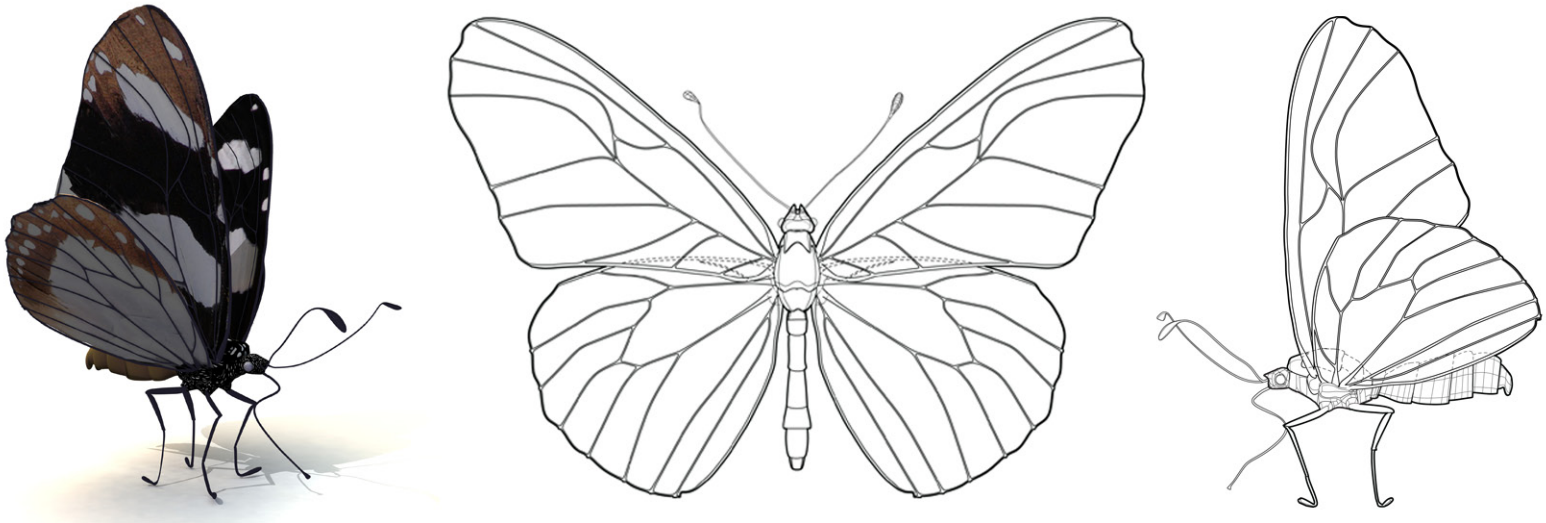

Fig. 1. Views of the 3d digital model of an Amauris Ochlea (credits: Paul J. Mecomber)

of those research processes that use picture making as a tool for knowledge and are not just a matter of observation. For the scientific illustrator of the seventeenth century, the drawing was a tool that could reveal something about the structure of matter and of the world, a way to record experiences and classify reality in terms of what was already known.
For centuries these kinds of images, as well as still life have been the opportunity for scientists and artists to grapple with active exercises; they have been the instruments for illustrators to *understand* what they *represented*, rather than *paint* what they *saw*. This is the reason why, for example, for a novice designer, it is often easier to re-produce a drawing done by others rather than represent the reality as it is perceived through the senses.
This knowledge process is then related with the adopted communication codes. A wide variety of scientific illustrations are able to involve within a single image a content of information which can be more complete, complex or focused than the one that can be transmitted, for example, using photographs.
The recent availability of sophisticated digital instruments that allow acquiring real data and reproducing it in digital forms, adds to scientific illustrations an unprecedented realism.
This verisimilitude is often used as a very efficient way to communicate information about a reality which has intrinsic three-dimensional characteristics and whose visual similarity with reality can replace other communication channels, such as oral or written explanations, which can be easily spread and understood by an audience which is familiar with images.
In addition to these aspects, the current trend towards likelihood is now being reinforced by the shift of interest towards the involvement of other sensory aspects (like, for example, touch and hearing) that, in fact, are changing our relationship with the direct experience with our surroundings.
The possibility to create digital models that can represent reality as we perceive it through the senses and in which we can make sensory experiences, multiplies our possibilities of knowledge and channels of investigations.

The purpose of the current issue of "DISEGNARECON" is to collect examples of works, researches and

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Fig. 2. From left to right: Siproeta Stelenes (credits: Liu Xiaoqiang), Zethera Musa (credits: Pil Sun Ham), Graphium Mendama (credits: Lee Jun Sun)

experiments able to testify the central role that the observation of reality plays within the knowledge and creative process in several fields.
Similarly to the Renaissance, when the introduction of new instruments for observing reality, such as, for example, optical microscopes and telescopes for observing micro-scale details and the solar system, suggested considerations whose consequences went beyond contingencies and called into question an entire cultural system, in recent decades, thanks to the availability of new sophisticated tools and methods of investigation, we witnessed a renewed interest in Nature and its observation that has suggested applications in different fields.
In particular, within the current issue, the contribution of Annina Ruf shows how the observation of micro-scale of Nature and its translation into images using a specific language is an indispensable tool in order to iteratively verify the understanding of reality; it allows to compare what is observed with the cultural and experience background and therefore allows to understand what is unknown or what hasn't been directly experienced before.
The passage of scale allows observing details which are invisible to the naked eye, allows to understand the mechanisms of interaction between the elements and to check possibilities of movement, evolution and interaction within space and with the surrounding context. Images obtained using precise techniques and methods of representation reflect an accurate observation of natural elements, of their shapes, spatial arrangement, of the relationship between forms and movements, in order to test the possibilities to protect, interact or use the external agents, continuously looking for a balance for survival.
In addition to the study of geometry and spatial relationships, the analysis of color, of bio-mimetic effects, of surface permeability to light and water, suggests information on the density of matter and on the strength of the enveloping in relation to form and provides information upon protection or exploitation strategies of the external environment. These observations represent a crucial part of these analyses.
The papers by Gagliardini (Gargliardini C. and De Console D.) and Morigi (Morigi M. P. et al.) show the peculiar characteristics of tools for acquiring three-

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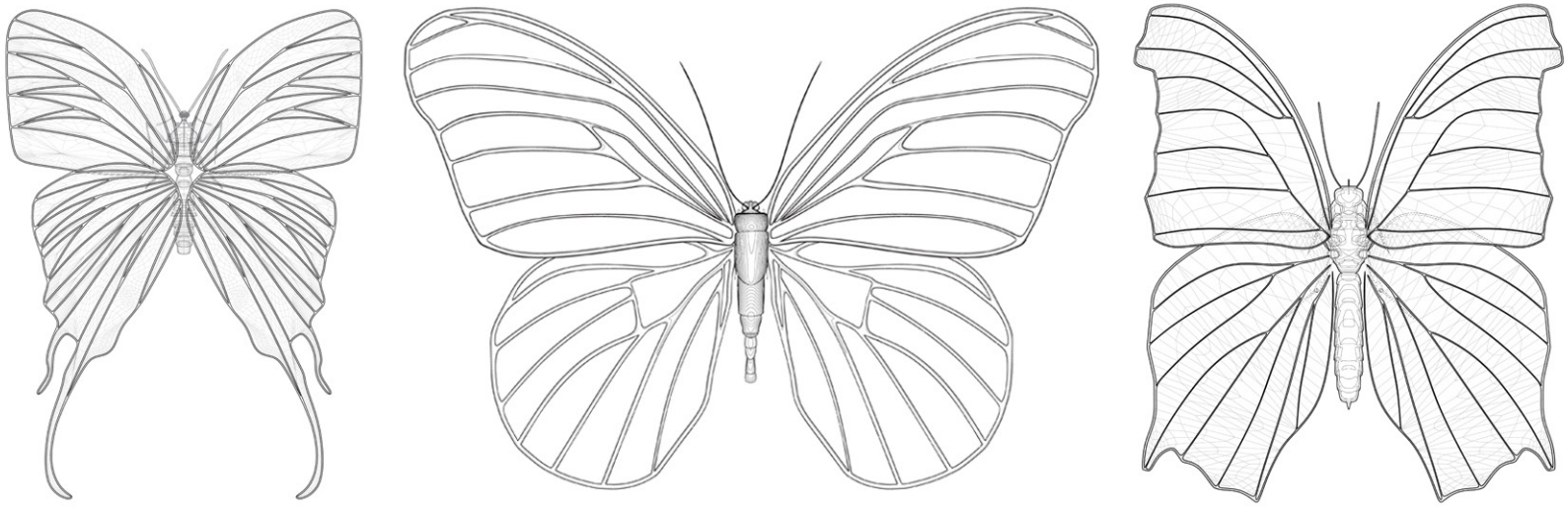

Fig. 3. From left to right: Jacoona Amrita (credits: Yang Chia-Ching), Zethera Incerta (credits: Hardy Laine), Salamis Anacardii (credits: Lu Jiahao)

dimensional geometric information related to the inner matter and application possibilities in different fields.
Tools like three-dimensional computer tomography allow to acquire information about the inaccessible matter and its density and are able to return information that are extremely detailed in terms of metric accuracy.
This possibility to observe reality opens new chances of investigation, similarly to what happened in the sixteenth century, when explorations inside of the human body led to the publication of the first treatises of human anatomy and to the first three-dimensional wax models, and, four centuries later, the discovery of X-rays led to the first images representing the human body and its transparent organs.
Actually, these digital tools, which are mainly used in the medical field and that can detect information on the inside of the matter using non-destructive techniques, can suggest interesting applications in different fields related, for example, to design, architecture and cultural heritage (Morigi M. P. et al.).

The problem of representing the invisible matter introduces the topic of the representation of other natural phenomena that, for other reasons, it is not possible to assign to a repertoire of known elements. These phenomena have spatial characteristics that cannot can be described using encoded and therefore widely shared methods.
For example, the representation of time - the fourth dimension - which has its own evidence in processes that continuously evolve, rather than in elements that can be described in terms of spatial relationships, is the subject with which Luca Poncellini has recently conducted investigations. The aim of his experiments is to find a code of representation that can translate the fourth dimension into two-dimensional images.

The possibility to investigate the micro-scale of natural elements using accurate three-dimensional digital models, reveals the process of understanding the structure of matter that goes through the recognition of elementary geometry and their recurrent sequences.
Thanks to the re-composition of constitutive elements following rules that are different from the original natural ones, it is possible to lead analysis that allow

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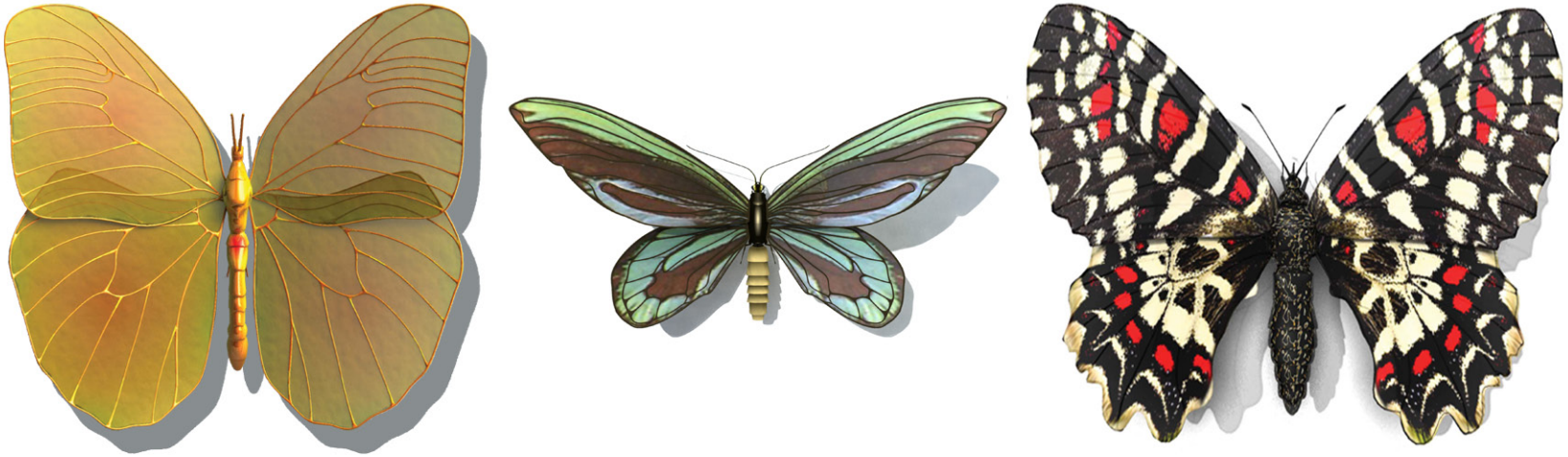

Fig. 4. From left to right: Phoebis Avellaneda (credits: Mike Gladchenko), Ornithoptera Alexandrae (credits: Kim Lagercrantz), Zerynthia Rumina (credits: Ryan Bostic)

evaluations about the structure of matter and of its possible evolution in relation to the context in which they appear.
The translation of these digital manipulations into physical 3D models that are built using synthetic materials and procedures that are in contraposition with the original organic ones, represents both a testing ground of formal and material understanding of natural reality and an occasion for creative suggestions (Manferdini A. M. and Manferdini E.).
The observation of natural phenomena and studies led by biologists and botanists aimed to a deep understanding of the mechanisms of evolution of living organisms, highlights similarities that it is possible to observe at different scales and that can therefore suggest interesting applications in contexts that affect anthropized environment at different scales, from the architectural (Dollens D., Erioli A., Mazzoleni I.) to the urban one (Garagnani S. and Bravo L.).

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