Chapter 2
The Power of Real-World Observation

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Seeing comes before words. The child looks and recognizes before it can speak. But there is also another sense in which seeing comes before words. It is seeing which establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact that we are surrounded by it. The relation between what we see and what we know is never settled. Each evening we see the sun set. We know that the earth is turning away from it. Yet the knowledge, the explanation, never quite fits the sight.

John Berger, Ways of seeing, 1972 [1]

Introduction

Scientific observation is an expert form of observation that takes place in several contexts: in the laboratory or in the natural environment, with or without experimentation. This observation also has the meaning of surveillance, of examining

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O. Varsou (ed.), *Teaching, Research, Innovation and Public Engagement*,
New Paradigms in Healthcare, https://doi.org/10.1007/978-3-031-22452-2_2

phenomena, but also of formulating the findings and conclusions that result from it. It is different from psychological, sociological, or even the participatory observation in the field of anthropology.

There is a constant interaction and exchange between the observer and the environment during the process of identification of the object of observation. Thus, the ability of the observer to apprehend the environment is important since it affects the observability of the object.

In the history of science, "observation" has been linked to "experimentation" and thus to the quest of objectivity and exactitude [2]. The experiment is a structured active observation where the researcher is also the observer. This association is well anchored in our intellectual *habitus*, at risk of forgetting that observation is a skill in itself. This skill is very important to the practice of medicine.

Observation is fundamental in medical training and practice and includes inspection, clinical, macroscopic and microscopic examination. Accurate clinical observation provides insight to physical and behavioural information, the very first clues to accurate diagnosis [3].

Observation can be cultivated, and recently relevant training has been included in medical curricula via the introduction of Medical Humanities [4–8]. The inclusion of arts and visits to art museums has been shown to increase empathy, encourage reflection and improve observation skills [9–14].

The Paradigm of Simonides' Method of the Loci

The poet Simonides (556–469 BC) is famous, among others, for the mnemotechnic method of the "loci", that he invented in the course of a tragic event: Allegedly during a symposium, just as Simonides was leaving, the building collapsed, leading to the death of all guests, whose corpses were unidentifiable. The poet was able to identify everyone by associating each person with his sitting place [15][1]. This is his method about what he calls *"artificial memory"*, which includes locations and images: *"By locations I mean such scenes as are naturally or artificially set off on a small scale, complete and conspicuous, so that we can grasp and embrace them easily by the natural memory—for example, a house, an intercolumnar space, a recess, an arch, or the like. An image is, as it were, a figure, mark, or portrait of the object we wish to remember"* [15].

Regarding memory, Simonides examines in fact the way our visual faculties are associated with the ability to give meaning to what we see. By paraphrasing his quotation, we can distinguish two kinds of procedures, *"one natural, and the other the product of art"* [15]. The natural one *"is imbedded in our minds*, *born*

[1] The story is related on three surviving works from the Roman period: the De Oratore by Cicero; Ad C. Herennium, by an unknown author (although in the Middle Ages it was attributed to Cicero); Coidilianus' Institutio oratorio.

simultaneously with thought", while the artificial *"is strengthened by a kind of training and system of discipline"* [15].

This mnemonic technique, the method of loci, has been used for centuries, in the Antiquity and the Middle Ages, as the key for the rhetoric, the principal intellectual activity giving birth to *logos*, the reasoning. The most important point to consider is whether the visual skills and the use of images, real or imaginary, constitute the essence in organising perceptions and produce a meaning.

The Impact of Image in Medicine

The medical specialties where diagnosis heavily relies on images are pathology, radiology and dermatology [16–20]. The first step in medical expertise in these fields is accurate observation [21–23]. Appreciation of morphology is important in pathology diagnosis [24]. Attention to details is important but before that exercise in appreciation of size, shape and colour is necessary. Image pattern recognition is one of the most important cognitive steps to pathology diagnosis, and traditionally residents follow "apprenticeship" training, particularly in the first years of training [21, 25]. Known visual traps include illusion of size, perception of brightness, colours and hues, lateral inhibition and inattentional blindness [26].

In the medical students' teaching process, observation of the real world using natural images not only can enable the detection of significant details that easily go unnoticed, but can also enable the understanding of the complexity and the power of the milieu. In other words, the challenge for medical students is to learn to dissociate "loci" from images, enabling their visual autonomy and simultaneously acknowledge the importance of the whole. The system "observer—object—milieu" is a dynamic interacting complex system. This practice is more than a visual exercise, along the lines and beyond Simonides' method.

Real-World Observation

As Simonides states *"the natural memory must be strengthened by discipline so as to become exceptional, and, on the other hand, this memory provided by discipline requires natural ability"* [15].

It is very didactic to engage medical students and young residents in the art of observation by using real-world nature images, as they can easily relate to natural scenes and these can be used for stressing the importance of observation and draw attention to potential pitfalls. Careful observation of real-world images can introduce students to the ideas of complexity and diversity, namely the many different "layers" of each "image", the role and interactions with the surrounding world (background) and of details that might be hidden or cryptic. There is not only one interpretation of the image applicable, but also different explanations and causes corresponding to differential diagnoses in medicine. Moreover, the accurate interpretation of an image depends on the image resolution and limitations of the means or technology used (e.g. the eye potential differs in the 10× and 100× microscope lens magnification). By analogy a sub-microscopic detail could escape due to the resolution limitations of the diagnostic method used [27, 28].

In medical practice, the background that often adds or even changes the picture might be a carefully taken and detailed family or patient history including lifestyle (nature and nurture). A person's phenotype and putative pathology are the result of the interaction of the individual genome's architecture (e.g. genetic background, presence of protective or deleterious risk alleles) with environmental triggers (lifestyle, diet, stress, pollution, etc.). Therefore, two individuals with the same mutation could present with different clinical phenotypes [29–34].

Paradigms

The paradigms below are from nature and resemble situations encountered during microscopic evaluation of human tissues for pathology diagnosis, which can lead to pitfalls. All of them have been photographed as they were found, without any intervention/staging. Herein, they are grouped in nine paradigms.

Paradigm 1: The key feature, the important clue to diagnosis, may be partly hidden and/or difficult to discriminate from the environment (Fig. 2.1).

Paradigm 2: The key feature may be visible, but only in higher magnification (Fig. 2.2).

Paradigm 3: The important clue to diagnosis is the dissimilar feature (Fig. 2.3).

Paradigm 4: Brightness, particularly at the object's edges, interferes with perception (Fig. 2.4).

Paradigm 5: Perception of size varies according to the surrounding objects (Fig. 2.5).

Paradigm 6: Careful observation of the environment provides clues to the nature and origin of objects (Fig. 2.6).

Paradigm 7: Detailed scanning of the image is necessary, particularly when the finding is unexpected, and as such it might be overlooked (Fig. 2.7).

Fig. 2.1 (**a**) A cat partly hidden between tree branches. (**b**) A peacock behind trees. (**c**) A lizard on an ancient rock. (**d**) A grasshopper hidden in a basil plant. (**e**) A caterpillar on a plant branch. (**f**) A yellow butterfly on the red geranium. (**g**) A butterfly on the bush. (**h**) A starfish on the seabed. (**i**) A medusa swimming. (**j**) A crab on the lower left quarter of the image

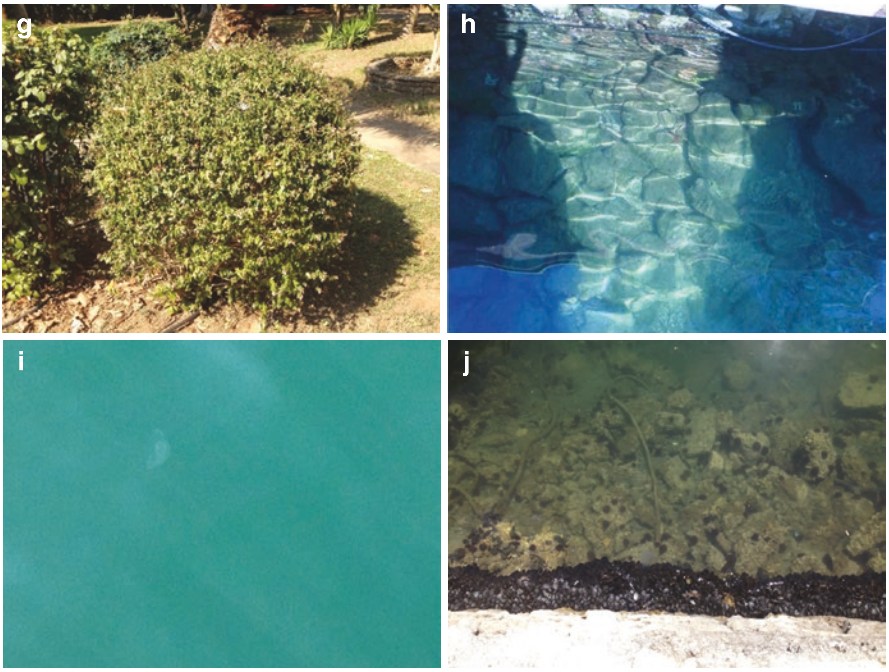

Fig. 2.1 (continued)

Fig. 2.2 (**a**) A bee on a flower. It is easily discernible due to its size and adequate magnification. (**b**) Marble exterior. There are three red bugs, almost undetectable in this magnification. (**c**) One of the red bugs, easily spotted in higher magnification

Fig. 2.3 (**a**) A blue pansy among the white ones. (**b**) Purple bougainvillea flowers among the white ones

Fig. 2.4 (**a–c**) A brown butterfly on a leaf, in low and high magnification, under different light

Fig. 2.5 The lilliputian plant at the upper left quarter of the image makes the normal sized sea urchin look gigantic

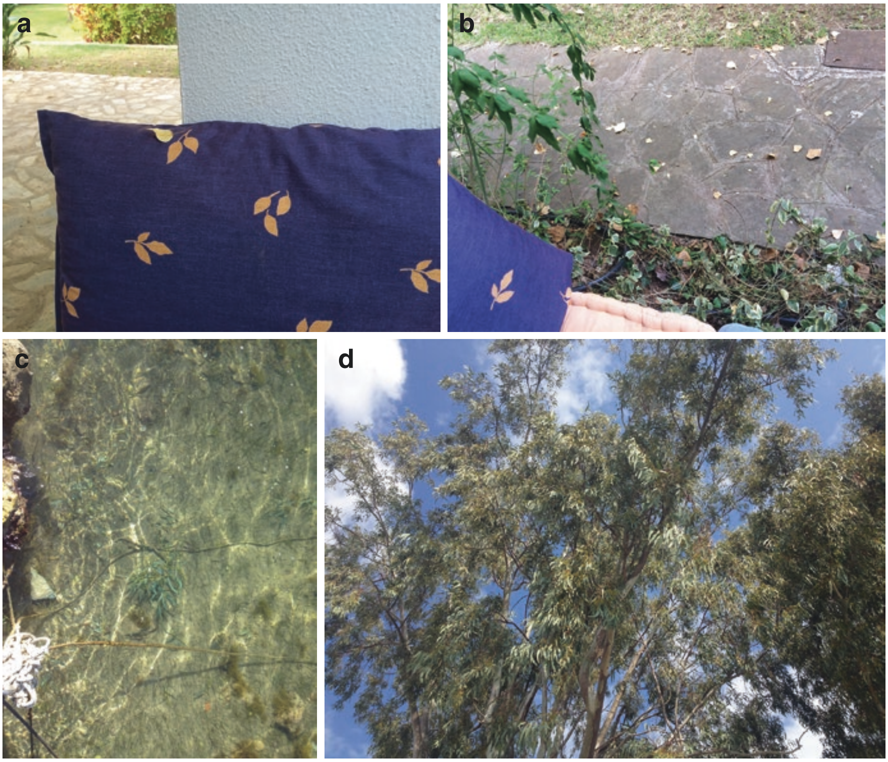

Fig. 2.6 (**a**, **b**) The real yellow leaf on the left upper area of the blue pillow with the printed yellow leaves (**a**) can be easier spotted if one notices that in the surrounding there are plenty of fallen yellow leaves (**b**), presumably from a tree above. (**c**, **d**) The eucalyptus branch on the seabed (**c**) does not make any sense, unless one notices that just above the harbour grows a Eucalyptus tree (**d**). (**e**, **f**) The snail on the pavement (**e**) is easier identified, if under the proper magnification and light its trail becomes visible (**f**). (**g**, **h**) The flying object in **g** is not a bird, it is a kite. This can be easily perceived, if one notices the hand holding the string at the lower left quarter of the image. Very helpful is also the rounded observation of the horizon, where one can see several more kites (**h**)

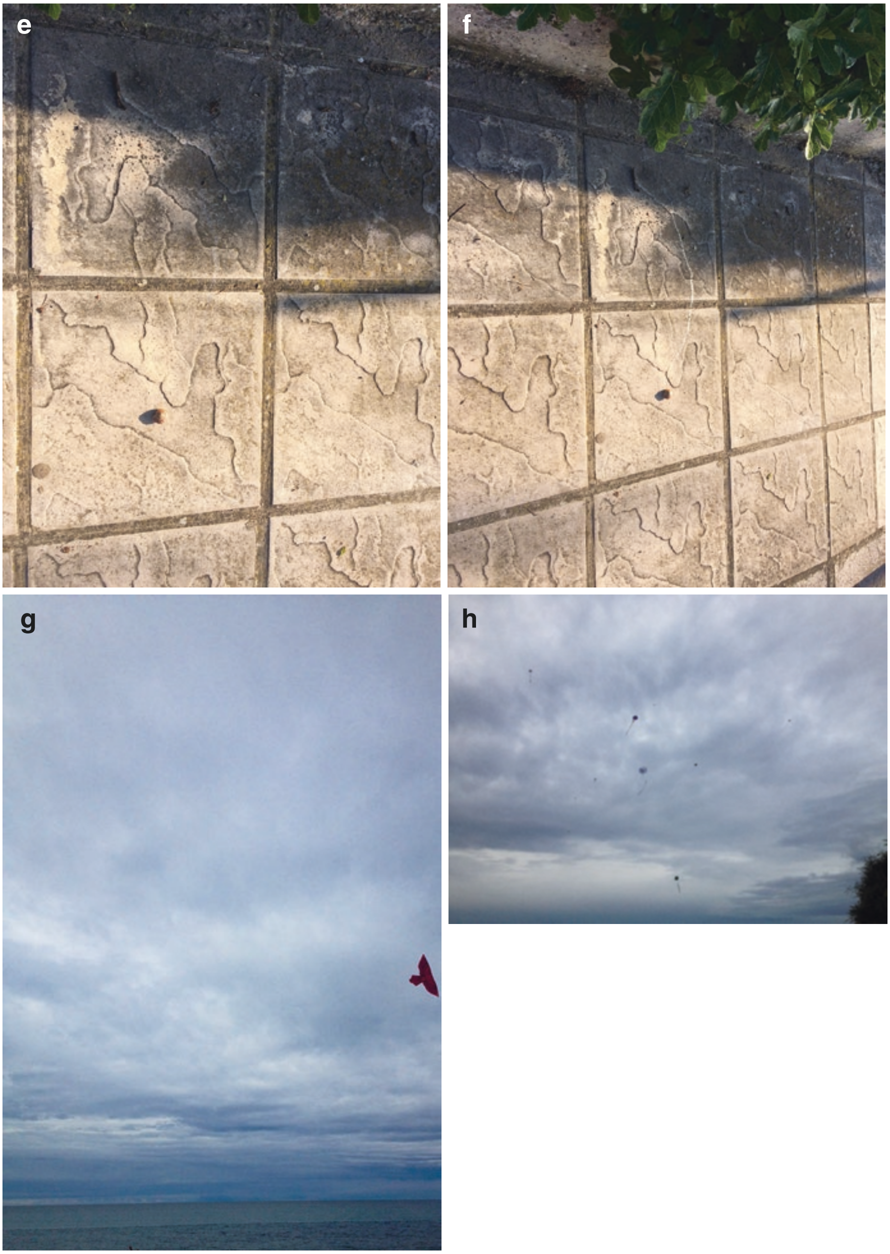

Fig. 2.6 (continued)

Fig. 2.7 (**a**) Watermelon peel at the seashore. It can easily be overlooked, if one admires the beautiful scene. (**b**) A yellow pencil situated within a seaside rock indentation. (**c**) A bird nest on a tree. (**d**) Wild goats on a cliff. (**e**) A stork in its nest

Paradigm 8: Imagination and intuition are important, particularly when interpreting images without an immediately apparent meaning (Fig. 2.8).

Paradigm 9: Occasionally, the image makes sense, since it is related to previous memorised similar images, but the interpretation is impossible (Fig. 2.9).

Fig. 2.8 (**a**, **b**) The dim light in the dark (**a**) proved to be a firefly caught in a spider web at the stairs leading to the basement of a house, when the lights were turned on (**b**). (**c**, **d**) The white material on the sides of the road is not snow, as it might seem in lower magnification. It is the fluff from the poplar trees growing in the area. (**e**, **f**) The painting on the cut tree trunk draws the attention, thus one may fail to observe the numerous ants

Fig. 2.9 (**a**) A horse on the pavement? (**b**) A person within the trunk of the tree in the middle? (**c**) A sea-lion?

Epilogue

Herein, we suggest a new pedagogical approach to an issue that is traditional and familiar and calls for reconsideration. There is further meaning, when looking at things for a second time, that are considered self-evident. Modern world and technological advances distant us from natural skills, that are necessary and enhance our medical performance. The real world can teach us the art of observation that can be applied to real-world diagnosis.

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