

## A digital imagination: When is cyan real?

A small river full of tears flows in Sicily. The mighty nymph Cyane caused it when Pluto stole Proserpina and the nymph unsuccessfully stood up to him. Full of grief for her friend, she wept until she dissolved. The river Ciane can still be seen today. Although its origins have been revealed for two millennia, its colour remains a fleeting mystery: cyan.

«I THOUGHT I HAD FOUND IT.

IN THE PROCESS OF COLOUR DECOMPOSING AND RECONSTRUCTING MANY SMALL PHOTOGRAPHS, I ENCOUNTERED AN INTEREST IN THE "UNKNOWN" AND "UNPREDICTABLE" THAT HAD NEVER EXISTED IN ME BEFORE. PHOTOGRAPHY DOES NOT END WHEN THE PICTURE IS TAKEN, BUT IS CREATED THROUGH THE PROCESSES OF DEVELOPING AND PRINTING.»<sup>1</sup>



In his photography series «C/M/Y»<sup>2</sup>, artist Yuji Hamada describes the relationship between static colour and colour as a flowing, intuitive element that he does not see, but feels. In these pictures, Hamada shows the viewer how he perceives the invisibility of colours. He experiments with the removal and addition of the three colour planes cyan, magenta and yellow, which for decades has been a common

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<sup>1</sup> 「見つけた」と思った。

たくさんの小さな写真を色分解して再構築する中で、今までに自身の中になかった”わからない””予測がつかない”というおもしろさと出会えたからだ。写真は撮影して終わりではなく現像、プリントの過程を経てできている。この過程の中でいくつもの喜びを感じ、時に暗室の中でアイデアが固まってくることもあった。今回のこの作品は撮影後の過程が特殊で仕上がりが特に偶発的に変化するため、衝動と直感で進めていくことがもっとも重要だった。夢の断片のように不確かな輪郭の重なりから完全な答えを導き出すのではなく、それらを受け入れて見ることで画像の呪縛から解放された気がした。

[http://hamadayuji.com/Yuji\\_Hamada.html](http://hamadayuji.com/Yuji_Hamada.html)

<sup>2</sup> fig. 1: Yuji Hamada (2014) [http://hamadayuji.com/CMY\\_Yuji\\_HAMADA/CMY\\_waterfall10.jpg](http://hamadayuji.com/CMY_Yuji_HAMADA/CMY_waterfall10.jpg)

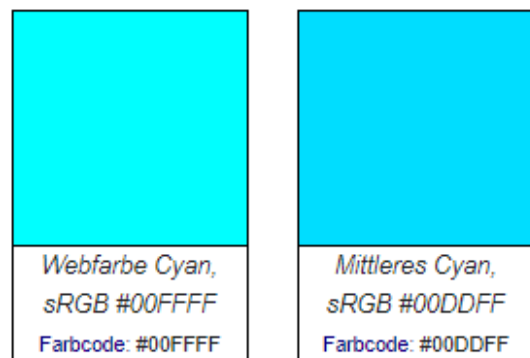
(albeit unreliable) standard colour model in the printing of pictures.<sup>3</sup> Cyan is the main subject of this text. As a suddenly static "web colour", this blue-green (actually fluid) colour combination has a special status.

In fact, cyan is close to a so-called "impossible colour". Such colours are not visible to the human eye. They are created, for example, by mixing two complementary colours.<sup>4</sup> So why is cyan close to this category? First of all, cyan is often referred to as sky blue or as a colour that appears when light refracts in the sky, water or ice in a certain way.<sup>5</sup> And here lies the problem: cyan is not a static colour. The colour is so closely linked to light that a slight flicker is enough to disturb our sensory perception of it. It is not without reason that there is a big difference between the print cyan (analogue cyan) and the web colour cyan (digital cyan).<sup>6</sup> On digital screens, which offer constant light, cyan finally finds a static form. This is no coincidence, as the colour has its origins in the light reflections of weapons and glassware from ancient Greece.

The adjective *κύανεος* is often used in Homeric texts to describe dark blue metal. However, Homer (and Virgil in the Aeneid) is not trying to describe

the actual dark blue, but the light blue shimmer (cyan) that occurs when a certain light falls on it. Osborne [2003, 279] writes in connection with the richly decorated shield of Achilles in the Illiad:

«THE SHIELD SEEMS TO HAVE BEEN COMPOSED OF LAYERS OF HIDE WITH METALS, GOLD, TIN, AND KYANOS, INLAID ON A THIN BRONZE PLATE. TWO EXPLANATIONS HAVE BEEN GIVEN OF KYANOS, THAT IT IS TEMPERED STEEL, FOR THE ART OF HARDENING IRON WAS KNOWN IN HOMERIC TIMES, OR THAT IT IS



<sup>3</sup> Parraman, Carinna. "Color in the Age of Digital Reproduction." *Art in Print* 3, no. 3 (2013): 28–33. <http://www.jstor.org/stable/43045556>.

<sup>4</sup> Michael Newall: *Perception* 50(2), 2021, 129–39.

<sup>5</sup> Norbert Welsch, Claus Chr. Liebmann: *Farben. Natur – Technik – Kunst*. 2. Auflage. Spektrum Akademischer Verlag, München 2004, ISBN 3-8274-1563-2, 78.

<sup>6</sup> Fig. 2: <https://de.wikipedia.org/wiki/Cyan>

THE DARK BLUISH ENAMEL WHICH HAS COME TO LIGHT ON THE DAGGER BLADES FROM MYCENAE. HOWEVER THAT MAY BE, THE KEY TO THE EPITHET IS [...] THE SUGGESTIVE PHRASE *κυάνεοι δράκοντες ἱρυσίν ἐοικότες* - 'RAINBOW-LIKE', 'IRIDESCENT'. THUS THE GLEAM OF LIGHT ON HARD STEEL OR A LIKE SUBSTANCE (THE ENAMEL IS A BLUE GLASS PIGMENT AND COPPER OXIDE) IS DESCRIBED BY THE ADJECTIVE *κυάνεος* AND, AFTER IT, 'CAERULEUS'. [...] 'STEEL-DARK' IS A POSSIBLE RENDERING OF THE PASSAGE QUOTED ABOVE, BUT THE ROOT IDEA IS A RADIANCY COMMON TO SWORD-BLADES, STORM CLOUDS, GLOSSY HAIR, AND THE SQUAMEA SPIRA OF THE SNAKE.»<sup>7</sup>

This dark blue, which is the basis for the light blue shimmer, should not be dismissed as an everyday phenomenon or as pure fiction.

Glass was first produced in Greece during the Mycenaean period (1400 to 1100 BC). At that time, the material still enjoyed a similar value to gold. And most glass objects in the Mycenaean period were all blue in colour. This is why glass was simply called *κύανεος*.<sup>8</sup> Mostly worn as jewellery, the blue glass was also used for ceremonial purposes [Haevernick 1963, 192 – 193]: «[...] THIS WAS OBVIOUSLY A PARADE HELMET AND NOT INTENDED FOR WAR OR EVEN FOR HUNTING. THE SAME APPLIES TO A SWORD HILT OF BLUE GLASS WHICH WAS FOUND ON THE ACROPOLIS OF MYCENAE. OBVIOUSLY A GLASS SWORD HILT COULD BE USED ONLY FOR A SWORD WHICH WAS CARRIED ON STATE OCCASIONS.»<sup>9</sup> It can be assumed that many of these glassware items were actually light blue in colour, as the first glass was produced in Egypt several centuries earlier [Keyser 1990, 357]: ONE OF THE EGYPTIAN RECIPES FOUND ITS WAY INTO THE GRECO-ROMAN TRADITION AS CAERULIUM: SAND, GREEN MALACHITE, CHALK AND SALT WERE FUSED AT JUST THE RIGHT TEMPERATURE TO PRODUCE A SKY-BLUE

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<sup>7</sup> Margaret Osborn. "A Latin Epithet." *Mnemosyne* 2, no. 4 (1935): 278–80.  
<http://www.jstor.org/stable/4426744>.

<sup>8</sup> Stern, E. Marianne. "Ancient Glass in a Philological Context." *Mnemosyne* 60, no. 3 (2007): 388.  
<http://www.jstor.org/stable/27736150>.

<sup>9</sup> Haevernick, Thea Elisabeth. "Mycenaean Glass." *Archaeology* 16, no. 3 (1963): 190–93.  
<http://www.jstor.org/stable/41670372>.

GLASSY STONE [...].»<sup>10</sup> And Homer also uses the term *caerulium* in the description of Achilles' shield. This suggests that a similar cyan glow was also perceptible in - at least some - glassware. It can therefore be assumed that the colour was continuously associated with valuable objects.

However, cyan seems to be more strongly associated with metal than with glass -> So back to the metal, or more precisely to azurite: This is a mineral whose pigments were often used in the Bronze Age in rituals surrounding funerals, scattered in bowls, vases or caskets. Azurite is dark blue in low light - so in the context of such grave goods, there is probably no flickering cyan to be found.

Things get interesting as soon as copper comes into play, because azurite gets formed right next to copper deposits [Brecoulaki 2014, 6]: «THE ASSOCIATION OF AZURITE —A WEATHERED PRODUCT OF COPPER ORES— WITH THE TECHNOLOGICAL PROCESSES OF EARLY METALLURGY AND THE TRANSFORMATIVE CREATION INVOLVED IN THE ACT OF MAKING BRONZE OBJECTS MAY WELL HAVE CHARGED IT WITH SYMBOLIC OVERTONES.»<sup>11</sup> The processing of metals was still a complicated endeavour at that time, which clearly outweighed the processing of other types of materials in terms of time and effort [Saunders 2002, 209 – 226]: «WHEN METALWORKING FIRST APPEARS IT MAY HAVE POSSESSED A SIGNIFICANCE BEYOND MODERN DEFINITIONS OF ECONOMICAL AND TECHNOLOGICAL EFFICIENCY. BY COMPARISON WITH EXISTING TECHNOLOGIES OF WOOD, BONE AND STONE, METALLURGY IS A TIME-CONSUMING AND TECHNOLOGICALLY COMPLEX PROCESS WHOSE ADVANTAGES OVER EXISTING TECHNOLOGIES WERE POSSIBLY RELATED TO SPIRITUALITY, RITUAL AND DISPLAY.»<sup>12</sup> Whether cyan

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<sup>10</sup> KEYSER, PAUL T. "Alchemy in the Ancient World: From Science to Magic." *Illinois Classical Studies* 15, no. 2 (1990): 353–78. <http://www.jstor.org/stable/23064297>.

<sup>11</sup> Brecoulaki, Harikleia. "'PRECIOUS COLOURS' IN ANCIENT GREEK POLYCHROMY AND PAINTING: MATERIAL ASPECTS AND SYMBOLIC VALUES." *Revue Archéologique*, no. 1 (2014): 3–35. <http://www.jstor.org/stable/24751260>.

<sup>12</sup> N. J. SAUNDERS, "The Colours of Light: Materiality and Chromatic Cultures of the Americas." JONES, MACGREGOR (2002): 209-226.

was closely linked to technical forestry progress, however, remains a matter for further research.

In addition to metal and glass, cyan can also be found in descriptions of hair.

However, I would first like to emphasise again that cyan, at least in the Greek-antique context, is not a static colour, but a flicker that only manifests itself in a brief moment. Another word that evokes cyan just as much as **κύανεος** is *caerulus*, which I have already briefly touched on. It usually describes the shimmering reflection that takes place in the waves of the sea, but not only: [Osborne 2003, 278]:

«THE WORD IS USED OF SEA AND SKY (VERGIL AND OVID PASSIM.), OF ICE (VERGIL G. I. 236), OF SNAKES (VERGIL G. IV. 452), OF THE NYMPH CYANE'S HAIR (OVID M. V. 732), OF MOUNTAIN TOPS (OVID M. XI. 158), AND OF THE EYES OF GERMAN FOLK (TAC. GERMANIA 7), WHERE BLUE AS A TRANSLATION WILL NOT DO, AND 'SEA-GLEAMING' IS SOMETHING OF AN EVASION. THE COMMON ELEMENT IN ALL THE USAGES OF THE WORD IS 'IRIDESCENCE', THE EFFECT OF VIBRANT LIGHT IN PLAY UPON A SURFACE. WE ARE AT ONCE REMINDED OF THE GREEK EPITHET **κύανεος**, WHOSE USES ARE CLOSELY PARALLEL»<sup>13</sup>

In this respect, cyan may also be an iridescence rather than a colour, as Osborne suggests in relation to *caerulus*. Precisely this adjective can be found in the story of Cyane's metamorphosis, when Ovid describes the nymph's hair ("*caerulei crines*") as it dissolves under her tears. The proximity to water and hair is doubled in this case.

In general, colours in ancient Greek literature are not fixed quantities, but rather a scale. The Greek word for white ("**λευκός**"), for example, can also simply mean bright. In the case of **κύανεος** this means [Hoeppe 2007, 14]: «IT WAS MUCH MORE IMPORTANT TO THEM THAT BLUE BORDERED ON BLACK OR DARK, AND THAT BOTH OF THEM CONSTITUTED THE

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<sup>13</sup> Margaret Osborn. "A Latin Epithet." *Mnemosyne* 2, no. 4 (1935): 278–80.  
<http://www.jstor.org/stable/4426744>.

DARK END OF A SCALE OF COLORS. [...] IN A BOOK ON PRECIOUS STONES, ARISTOTLE'S PUPIL THEOPHRASTUS DESCRIBES THE (BLUE) LAPIS LAZULI AS KYANOS-COLORED. HOMER'S ILIAD, ON THE OTHER HAND, COULD DESCRIBE NOT ONLY THE COLOR OF STEEL BUT ALSO THE (PROBABLY BLACK) HAIR OF KING PRIAM'S SON HECTOR AS KYANOS.»<sup>14</sup> As a result, it cannot always be assumed that **κύανεος** actually means shimmering cyan.

Theophrastus, the naturalist and student of Aristotle mentioned in the quote, states in this sense that we can never recognise colours in their natural purity, but only in the interplay of light and shadow. For him, three factors play a role in colour vision: light, density and other adjacent colours. Theophrastus explains this using the example of air: air is transparent at close range because there is no density. It is completely dark when there is no light. It is blue (**κύανεος**) when it gathers a particular deepness - meaning the sky. The sky can only be blue and no other colour, because the density increases with depth and so does the darkness. (After all, **κύανεος** borders on the colour black on the colour scale used by Theophrastus).<sup>15</sup>

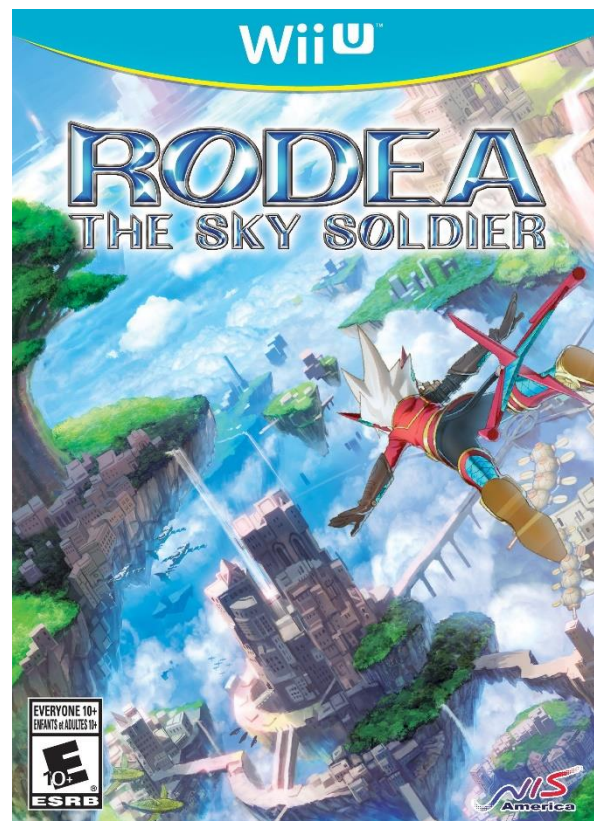
In ancient Greece, cyan was therefore perceived as a light blue shimmer, particularly in connection with metal, glass, hair, water and the sky. Whether cyan was also seen as the colour of technical progress requires further analysis. In today's digital popular culture, the ancient Greek understanding of cyan is certainly reproduced and also allows the connection to technical progress.

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<sup>14</sup> Götz Hoeppe. "Why the Sky Is Blue: Discovering the Color of Life." (2007): 29-30. <https://assets.press.princeton.edu/chapters/s8369.pdf>.

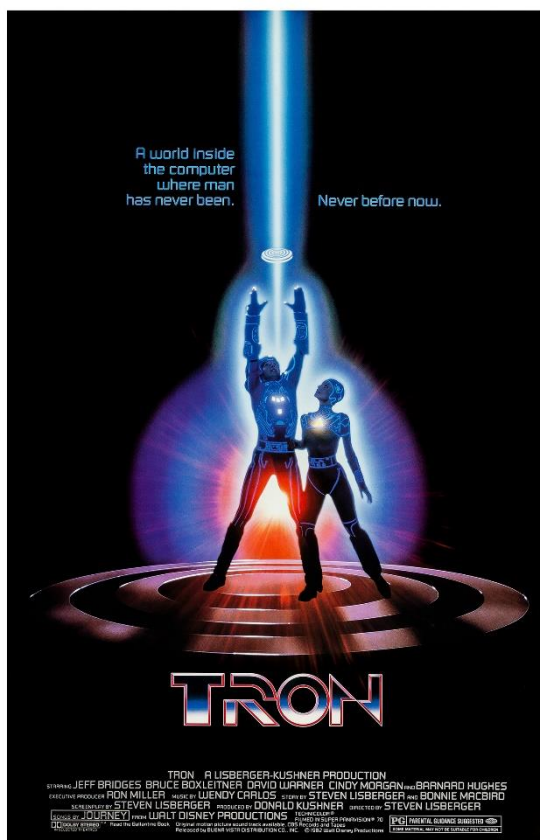
<sup>15</sup> Siehe oben.

On the boxart of Skies of Arcadia Legends (2002, GameCube), the hero holds a sword towards the viewer, which shimmers prominently from white to cyan to dark blue. On the boxart of Rodea the Sky Soldier (2015, Wii U), the letters of the title look like shimmering blue glass or gemstones. Again, on the boxart of Shin Megami Tensei V (2021, Switch), the hero wears long wavy blue hair, which the developers explain in an interview with personacentral.com: «THE HAIR, WHICH IS THE MOST EYE-CATCHING FEATURE, IS ALSO A MANIFESTATION OF NAHOBINO’S LIFE FORCE. THIS IS BECAUSE HAIR HAS BEEN CONSIDERED SACRED SINCE ANCIENT TIMES, SAID TO BE THE SOURCE OF VITALITY WITH TRANSCENDENT ABILITIES. ALSO, FOR REASONS I CAN’T EXPLAIN IN DETAIL YET, THE LONG HAIR IS ALSO COMPARED TO THE FLOW OF WATER. THE BLUE LINES ON THEIR BODY ALSO REPRESENTS THE FLOW OF WATER, AND I THINK WE CAN CONSIDER THEIR CONNECTION TO WATER.»<sup>16</sup>



<sup>16</sup> personacentral.com (2021), <https://personacentral.com/smt-v-character-designs-interview-originally-2020>.

On the poster for the sci-fi film *Tron* (1982), the two heroically staged protagonists are shrouded in a shimmering blue aura and wear glowing blue suits. The cover of *Xenoblade Chronicles X* (2015, Wii U) features a large mecha whose metal plates are surrounded by glowing, light blue lines. In all these examples, parallels to the ancient examples such as the shield of Achilles, the hair of Cyane, the glass sword hilt and the copper-related azurite are recognisable. A strong reference to the sky and technical progress can also be seen in the contemporary examples.





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«IN THE COURSE OF THE WORK, I RECALLED HOW EXCITED I WAS AS A CHILD WHEN I PAINTED, WHEN COLOURS AND COLOURS MIXED IN DOTS, LINES AND PLANES, AND CHANGED INTO NEW COLOURS AND SHAPES. THE COLOURS AND SHAPES THAT I HAD SEEN AT FIRST SHOULD HAVE DETERMINED MY IMPRESSION OF THE OBJECT, BUT AS I LAYERED THE LAYERS, A NEW IMAGE APPEARED ON THE SURFACE, AND IT WAS NO LONGER THE ONE I HAD SEEN BEFORE.»<sup>17</sup>

What Yuji Hamada experienced in the course of his photography series "C/M/Y"<sup>18</sup> is the reality for the colour cyan. As a shimmering and fleeting phenomenon, cyan is always one step ahead of our perception.

As a colour on digital screens, technical progress has been able to make cyan tangible. But if Hamada is right and photography only becomes reality during the development of photographs, then perhaps our perception of colour is also an ever-flowing process rather than a static observation. In that case, the web colour cyan would just be a false copy of a shimmer.



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<sup>17</sup> 制作を進める中で、子供の頃に絵を描くときに色と色が点や線や面で混ざり合い、新たな色やかたちに変化することに興奮したのを思い出した。最初に見た色とかたちがそのものの印象を決めていたはずなのに、画層を重ねることでひとつの新たなイメージが表層に現れて、さっきまで見ていたものではなくなる。 [http://hamadayuji.com/Yuji\\_Hamada.html](http://hamadayuji.com/Yuji_Hamada.html)

<sup>18</sup> fig. 3: Yuji Hamada (2014) [http://hamadayuji.com/cmy\\_waterfall\\_PGI\\_jpg/WF03.JPG](http://hamadayuji.com/cmy_waterfall_PGI_jpg/WF03.JPG)