

# Moon Music: A Composition of Art and Science in Dialogue

*Edvin Østergaard*

In 2006 I composed a piece for choir a cappella, *The Two Moons*, which was first performed by The Netherlands Radio Choir on the occasion of their composition competition in 2007 [1]. It was written as a musical reflection on different ways of perceiving the moon. I was fascinated by Leonardo da Vinci's astronomy texts, in particular his descriptions of light falling on and being reflected by the moon. The composition is also deeply influenced by the German physicist and science educator Martin Wagenschein. In his essay "Die beiden Monde," he elaborates on the scientist's and the poet's divergent depictions of the moon [2]. *The Two Moons* has two sources of inspiration—Leonardo and Wagenschein—and two intentions: As a musical composition it is an attempt to reformulate different relations to the moon in a sonic form, and as an artistic idea it is a focal point for discussing the potential of artistic and scientific forms of sense-making. My composition process was accompanied by observations and deliberations in the form of a structured, focused notebook. Here I ponder on the realization of the piece and how the idea gradually took the form of music; the inspirations, the influences and the decisions. The questions I address in this article are as follows: (a) What characterizes the scientist's and the poet's descriptions of the moon, and how do these relate to Leonardo's descriptions? (b) What are the challenges of translating different man-moon relations into music? (c) How can art and science be regarded as different but complementary forms and endeavors of making sense of the world? In this article the main focus is neither the moon itself nor different representations of it, but rather a discussion of multifaceted relations between moon and humanity, expressed in artistic and scientific forms of sense-making.

## CONCEPTION OF *THE TWO MOONS*

In the winter of 2006 I learned about an international composition competition for a piece for large choir. At that time I had neither an idea nor a suitable text, nor did I believe that I would find the time to compose such a piece. The idea—and with it the inspiration—came to me on 13 June 2006, when I first encountered Leonardo's descriptions of the light falling on the moon, depicted in an autobiography by Martin Wagenschein [3]. In my notebook from that day I made the following entry:

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In these texts I find the dialectics between art and science which is mirrored in today's artistic and scientific texts. I wish to put them up against a natural scientific text and a poetic text: On the one hand da Vinci's texts (no dichotomy: art vs. science, subject vs. object), on the other a poetic text and a scientific text, all three describing the moon [4].

The idea of a composition taking the form of a triangle of positions from which the moon is described occurred thus almost simultaneously with my encounter with Leonardo's moon texts. His texts did not appear to me as merely of historical interest; above all I was fascinated by their unique blend of artistic and scientific languages. I soon decided on the two additional texts: facts from a textbook on astronomy and a poem by Denise Levertov. Comparing Leonardo's texts to the descriptions of the moon from the textbook and the poem, I found in Leonardo an attempt to express "the relation between the heavenly bodies sun, moon and earth *without losing the human focus*" [5]. The astronomical descriptions of the moon are very precise but lack any reference to lived human experience. The poem, on the other hand, reveals so much of lyrical ambiguity and human emotion that the moon itself seems to be of less importance. How could this triangle of contradictory man-moon positions be transformed into choral sound?

After having chosen the texts I began approaching the actual notation of the score and on 28 September 2006 I started to sketch the piece. A week later, on 3 October, I had decided on three movements and how to arrange the text, using Leonardo's texts both in the original Italian and in an English translation. Well into the writing of the score I began pondering the title of the piece. During my reading of the works of Wagenschein I had discovered his essay "Die beiden Monde," written in 1979 on the occasion of the 10th anniversary of the moon landing. While reading this text, I was struck by his careful examination of the spaces of meaning that are created through the scientists' and the poets' depictions of the moon. Might not *The Two Moons* be a possible title for the piece, a metaphor for the two hemispheres of art and science and at the same time an homage to Wagenschein's creative piece of writing? During the process of completing the piece, I found that the composition eventually blended with the title.

The conception of *The Two Moons* was sudden, an abrupt appearance of inspiration and idea, whereas the phase of realization and seeking after sonic expression entailed days of hard

## ABSTRACT

Leonardo da Vinci's careful descriptions of the reflection of light by the moon inspired the author to compose a piece for choir on ways of perceiving the moon. In *The Two Moons*, Leonardo's words are contrasted with two additional texts: facts from a textbook on astronomy and a poem by Denise Levertov. The author discusses the challenge of transforming text and idea into musical sound. Further he discusses exploring natural phenomena by means of parallel efforts in art and science.

work. From the beginning of October 2006 until the piece was completed on 20 December, I made several notes about compositional decisions in the piece. These notes comprise for the most part musical-technical aspects of the composition process, but also broader lines of philosophical thought. Before going into actual descriptions and discussions of the piece I will dwell on the three text sources and their different qualities of turning to the moon.

### LEONARDO TURNING TO THE MOON

Leonardo da Vinci (1452–1519) was among a handful of Western artists prior to the breakthrough of science in the 17th century who carefully studied the moon and made representations of it in paintings, drawings and text [6]. These artists' interest in studying the moon was not due to its mythological dimensions, expounded for centuries in numerous poems and writings. Their concern arose from a deep interest in nature and the observable phenomena of the world. In contrast to colleagues of previous periods and "their more stylized, formulaic depictions of Earth's nearest neighbour," Leonardo and his contemporaries rendered the moon based on actual observations [7]. The moon had been represented from early times, for example on Babylonian clay tablets (before 800 BC), in a highly stylized manner. These early representations of the moon feature the pre-Copernican Ptolemaic system, in which earth was positioned at the center of the universe. Whereas the moon for centuries was usually pictured in its most easily recognizable form, as a crescent, and less frequently as full, Italian renaissance artists began portraying the moon with a frontal face. These portrayals demonstrate that artistic and scientific visual acuity belongs to the empiricism of the 14th, 15th and 16th centuries that eventually developed into modern astronomy [8].

Throughout his life Leonardo used notebooks in which he scribbled down ideas and thoughts—personal, scientific, philosophical, artistic—as they occurred, frequently accompanied by explanatory sketches. In his notebooks there are many verbal and visual explorations of the heavenly bodies. Leonardo concentrated almost entirely on questions concerning their visual appearance. Also in regard to the moon, he was more concerned with its physical appearance than with observing and measuring its behavior [9]. I use excerpts of these observa-

Fig. 1. Measures 67 to 70 from the first movement, *The Two Moons*, 2006/2007. (© Edvin Østergaard)

tions, for example his description of the illumination of the moon, as a textual basis for the composition:

The moon has no light in itself; but so much of it as faces the sun is illuminated, and of that illumined portion we see so much as faces the earth. And the moon's night receives just as much light as is lent it by our waters as they reflect the image of the sun, which is mirrored in all those waters which are on the side towards the sun [10].

He describes the earth seen from the moon in the following manner:

And anyone standing on the moon, when it and the sun are both beneath us, would see this our earth and the element of water upon it just as we see the moon, and the earth would light it as it lights us [11].

Leonardo shows in all his astronomical analyses that he was committed to the geocentric theory and the idea of the world as the center of the universal orbits [12]. However, when describing the earth as the center, he uses metaphoric

words: "The earth is not in the centre of the Sun's orbit nor at the centre of the universe, but in the centre of its companion elements, and united with them" [13]. He also expresses wonderfully in one sentence—the only text in the last movement of *The Two Moons*—the idea of man as the central point: "Each man is always in the middle of the surface of the earth and under the zenith of his own hemisphere, and over the centre of the earth" [14].

In these texts I find both precise observations and aesthetic characterizations of nature, the first marked by an exact language, typical for scientific observations, the latter by a poetic language. Here are scientifically precisely formulated observations, such as "so much of it as faces the sun" and "illumined portion," phrases that might be found in astronomical texts written today. These observations are interwoven with lyrical phrases, like "the moon's night" and "as is lent it by our waters." The expression "each man is always . . . under the zenith of his own

hemisphere” would today most probably be regarded as an expressive metaphor, used by poets rather than astronomers.

## SCIENTIST AND POET TURNING TO THE MOON

The dimensions of exact descriptions and aesthetic depictions of the moon are also found in texts written 500 years later, but here they appear divided into an external viewpoint and a from-within view. The descriptions of the moon from a textbook on astronomy are factually oriented, emphasizing the moon as a physical object in time and space: “The Moon is the Earth’s natural satellite, orbiting at a mean distance of 384 400 km; its diameter is 3.475 km. . . . The Moon’s orbit around the earth is noticeably elliptical, with a mean eccentricity of 0.055” [15].

Here, we find no traces of an observer, a participant or a living being; the moon is described in terms of mere numbers and neutral measures. What is presented is unambiguous and indisputable. This is quite different from the poem by Denise Levertov (1923–1997), “Everything that Acts Is Actual.” From the very first moment the reader encounters an individual, almost private impression of the moon. The moon is not an object up in the sky, it is something one can turn to and ask for advice:

From the tawny light  
from the rainy nights  
from the imagination finding  
itself and more than itself  
alone and more than alone  
at the bottom of the well where the  
moon lives,  
can you pull me  
into December?

In astronomy the tides of the ocean are explained as the result of gravitational forces between the earth and the moon. In the poem we also find gravitational forces, but of a qualitatively different kind:

The flawed moon  
acts on the truth, and makes  
an autumn of tentative  
silences.

There exist numerous poems about the moon; I chose this particular one by Levertov because of how she articulates a strong request for truth:

We are faithful  
only to the imagination. *What the  
imagination seizes  
as beauty must be truth.* What holds you  
to what you see of me is  
that grasp alone [16].

The astronomical and poetic descriptions are clearly of two different kinds, the one object oriented and the other subject oriented, representing different spaces of meaning. Whereas the poetic text is ambiguous, metaphorical and open for interpretation, the scientific text is fact oriented and impersonal. Here, we recognize two distinct approaches to the world: Whereas science strives toward objective knowledge about the world, art seeks to express personal impressions of the world. The astronomer insists, “This is *the* moon!”; the poet, “This is *my* moon!” I would like to proceed now to the question of how I related these approaches to the musical expression.

## TO COMPOSE PERCEPTIONS OF THE MOON

By choosing texts representing different relations to the moon, I intended *The Two Moons* to be a dialogue between voices insisting on true forms of knowledge and meaning. In arranging this I divided the large choir into three groups—I: a mixed choir group; II: a female choir group; III: a male choir group. The singers are placed around the audience in a large circle. The trinity is further expressed in the form:

First movement: Text by Leonardo:

“The moon has no light . . .”

(Eng/It)

Second movement: Levertov poem/  
astronomic facts (Eng)

Third movement: Text by Leonardo:

“Each man is always . . .” (Eng/It)

In the *first movement* the whole choir sings Leonardo’s texts describing the light falling on the moon (see excerpt in

Fig. 1). From a beginning in unison the texture evolves into a dialogue between the male and female group on the one hand, performing the text in its original Italian, and the mixed group on the other hand, singing the English translation. Both musical lines and harmonies are shared between the three groups in a continuous flow of intertwined participation. The *second movement* is formed as an attempt to discuss meaningful understandings of the world (see excerpt in Fig. 2). Group III expresses the scientist’s voice, with its claim to universality and True Knowledge. The singers partly speak, partly shout and partly chant forcefully their text lines. They embody a *matter of fact* attitude, expressed both in the music and in the scientific language. Against this, the poet’s voice in groups I and II insists on Personal Knowledge while emphasizing each individual as the fixed point from which the rest of the world is experienced. The singers in groups I and II continue their exchange of musical gestures from the first movement. They embody an *I am the center of the universe* attitude, not less powerful and insistent, however, than science’s proclamation of what is legitimate knowledge. The scientist’s and poet’s voices occasionally meet in a dialogue that is more confrontational than cooperative. The *third movement*, the shortest of the three, is formed as a “melody with the sun,” a circling motion of sound around the audience (see excerpt in Fig. 3). Leonardo’s ambiguous text about each person being “in the middle of the surface of the earth and under the zenith of his own hemisphere” is brought forward in slowly flowing movements, interrupted

Fig. 2. Measures 59 to 63 from the second movement, *The Two Moons*, 2006/2007. (© Edvin Østergaard)



Fig. 3. Measures 21 to 24 from the third movement, *The Two Moons*, 2006/2007. (© Edvin Østergaard)

only by two short commenting stops. In contrast to the two previous movements, here the choir is one large unit. Only the one sentence “Each man is always . . .” is performed in both Italian and English.

In *The Two Moons*, Leonardo’s texts are articulated in the first and third movements, before and after the rather stropy poet-scientist dialogue. By using Leonardo to frame the art-science dispute, I intend to highlight two dimensions of his astronomy texts: one of a historical value, the other of a future potentiality. The interpretation of these 500-year-old texts as exact and at the same time aesthetic expressions of the moon is first of all meaningful from today’s point of view. They are more than mere historical documentations of an Italian Renaissance genius’s spirit of inquiry: They are modern in the sense of merging artistic and scientific expressions. This tension between the historical and at the same time innovative dimensions of Leonardo’s texts is mirrored in *The Two Moons* by the choice of the a cappella

ensemble—maybe the most archetypal form of musical expression—to express modern-sounding, non-tonal gestures in ever-changing harmonic constellations.

### TRANSLATING IDEAS INTO MUSICAL FORM

There are no obvious ways of translating a text into sonic form. There are (at least) two reasons for this: First, music is a genuine form of expression, distinctively different from other forms. When texts, both lyrical and scientific, are transformed into music, new embodiments emerge. The link between textual and musical embodiments is not foremost a causal one, but rather transformative and intuitive. Art is art, and every artistic piece of work depends on its own mode of expression, as Tonie Stolberg argues in his reflection on a dance-drama performance about the carbon cycle [17]. *The Two Moons* is therefore not a direct “auralization” of Leonardo’s visual vocab-

ulary, the astronomical facts or the poem by Levertov. The fact that Leonardo inspired me to write this piece does not imply that it is music about Leonardo. Due to its musical language, the composition represents an expression beyond the mere illustrative function of different conceptions of the moon. I have deliberately chosen an expression meant to avoid the two pitfalls of naked displays of emotions on the one hand and of hard facts on the other. Secondly, the process of translating a text or an artistic idea is simultaneously an act of interpretation. The choices and the decisions are all mine. Some of them I can account for, others not: I could at certain moments in the process document that I had made a decision without stating exactly *why* just this decision was made. The result necessarily has to bear the markings of my personal interpretation. *The Two Moons* is but one of numerous possible realizations of these texts and of the idea of different perceptions of the moon. When listening to the piece I “hear” neither Leonardo nor Levertov nor astronomy. Nor do I actually “hear” different meaningful perceptions of the moon. What I sense is a contrapuntal stream of voices seeking ways to meet, merge and communicate. In this polyphonic sound pattern meaningful words and articulated phrases occasionally come through—“. . . anyone standing on the moon . . .”; “. . . we are faithful . . .”; “. . . each man is always in the middle . . .” It is part of the compositional decisions to let such phrases come through more or less audibly to the listener. However, the experience of meaning can, of course, never be predicted. The act of translation continues as the listeners participate in making music, texts and idea meaningful for themselves.

Did *The Two Moons* in any way add new dimensions to the man-moon relationship, dimensions neither expressed by the scientific and poetic texts nor in Leonardo’s notebook descriptions? The music itself did not provide me with any knowledge about the moon that I did not already possess. However, while working with the interaction between music and Leonardo’s moon texts, having mankind’s various relations to the moon in mind, I became increasingly aware of the world as *sounds*. While repeatedly pondering how to express the moon-man relation in a sonic form, I eventually came to the question of how to *listen*. In the act of listening the world reveals itself as an arena of changes and time-dependent occurrences that are heard as sounds. These are, in the words of John Dewey,

“immediate manifestations of changes brought about by the struggle of forces” [18]. The sounds of the world emerge out of the flow of time and the complexity of time-space interwoven. This flow is perceived in the immediate experience; it is perceived due to our ability of sense perception. Hearing and listening might be two totally different things. The experience might be enriched due to intentional cultivation of the ability of rich sensing. Or, contrarily, experience might be “cut short from maturing by excess of receptivity” [19]. Leonardo’s verbal and artistic expressions of phenomena in nature are pervaded with a remarkable ability of *seeing*. Composing music is a continuous practice of the ability of careful *listening*. In this sense a composer is someone who critically and intentionally conveys the ability of listening. The challenge of practicing sense perception is of profound importance when it comes to enriching the experience of nature and our surrounding lifeworld. As Bo Dahlin metaphorically notes: “It is as if nature has a hundred languages, but we have become deaf to ninety-nine of them. In order to (re)discover these languages, we have to intentionally and attentively explore all aspects of sense experience” [20]. This position is in line with the phenomenological project of returning to “things as they are” by reinstating the value of immediate experience [21]. I think of *The Two Moons* as an exercise in attentive listening to the multiple voices articulating a relation to the moon.

*The Two Moons* emerged out of what I refer to as a “musical reflection” on different ways of perceiving the moon. I might add that this is foremost a process of self-reflection, as I seek to express music revealed through personal reflection. A musical reflection is at the same time process and product: It is both the act of reflecting and the sounding manifestation of this act. It is “a quality of doing and of what is done” [22]. Further, I would characterize this act of musical creation as a *reflection-in-composing* because reflection is an integral part of the process, not merely something performed *after* the composition is completed [23]. Reflection-in-composing is characterized by the reciprocity of convergence and divergence—the structuring of (vague and amorphous) ideas while they are emerging. It is a process of deciding how to nurture ideas and bringing them to expression by simultaneously narrowing them down to fit the concrete form. As such, reflection-in-composing encompasses scientific and

aesthetic methods; the first being more structured and rational, the latter more intuitive and erratic.

## TWO MOONS—OR ONE?

Martin Wagenschein’s essay “Die beiden Monde” is an elaboration on mankind’s turning to the moon. His two moons represent distinctly different orientations: There is the moon as a celestial body, the object on which the astronauts put their feet. Then there is the poets’ moon, a moon to turn to, in love and affection. Whereas it is merely 40 years since mankind for the first time set foot on the moon, for thousands of years the moon has been praised in mythology and numerous poems and stories. Wagenschein describes the poets’ moon as emerging out of our *Zuwendungsmöglichkeiten*, our “possibilities of affective attention” [24]. The German word *Zuwendung* is the noun for *zuwenden*, which can be translated as turning to, directing one’s attention toward or addressing oneself to. *Zuwendung* can be translated to attention and mindfulness, but it also denotes gratitude, devotion and love. If the moon represents all our “possibilities of affective attention,” this ought to encompass a manifold of different, non-excluding approaches to meaningful understanding of the moon. I read his essay as more than a critique of a split world: It is an invitation to investigate the two moons as two markedly different aspects of human sense-making. It is an invitation to explore not only different approaches to the moon but the moon itself. It is Wagenschein’s point that there is, in spite of these two approaches and our multifaceted interpretations, but one moon.

There are numerous reasons for considering a confluence of art and science. It is certainly a characteristic of postmodern society that the borders between them have become increasingly permeable. In 1959, Charles P. Snow proclaimed a fundamental mistrust between the cultures of arts and humanities on the one side and the sciences on the other. He argued that there is a profound suspicion and lack of understanding between the two cultures [25]. About 50 years later, Zigmunt Bauman describes a society marked by liquidated structures: Whereas modern society in its earlier stages was characterized by predictability and solid boundaries, in the liquid stage “all distinctions become fluid, boundaries dissolve, and everything can just as well appear to be its opposite” [26]. This transformation has certainly also affected the relation between Snow’s two

cultures. There is growing interest in efforts to connect artistic and scientific methods and expressions. The emerging field of “artscience” is characterized by a fused method, “at once aesthetic and scientific—intuitive and deductive, sensual and analytic, comfortable with uncertainty and able to frame a problem” [27]. I used this method in my project on Einstein’s 1905 physics: By “composing” his theories I worked “artscientifically,” revealing both musical expression and science-based knowledge of the characters of art and science [28]. One of the outcomes of this work was the awareness of art and science as complementary, not mutually exclusive, dimensions of human comprehension. Wagenschein notes that appropriately understanding the physical moon will enrich and not correct or even sober our intuitive and personal relation to the moon [29]. When exploring the moon the scientist’s approach appeals to another dimension of our comprehension than does the artist’s. At a time of cross-disciplinary dialogue, art/science otherness is regarded as more fruitful and productive than problematic. When juxtaposing music and science, as is my intention in *The Two Moons*, their unique characteristics become clearer and possible reciprocities can be articulated. Compared to Snow’s characterization of cultures of mutual distrust, art and science today live in a much more fertile, if not always harmonious, coexistence.

In his depictions of the moon, Leonardo neither reduces the observations of nature to bare mathematical, abstract relationships nor transforms them to mere personal impressions. Martin Kemp argues that art and science became one in Leonardo’s mind because he combined an “incredible sensitivity for nuances of natural form” with the ability to extract rules from nature to “remake nature in his own works as the ultimate confirmation of natural truth” [30]. This suggests that Leonardo in nature found the sources for both his scientific and artistic expression and that for him the laws of nature apply for both forms of expression. In his scientifically and aesthetically accurate depictions of natural phenomena, Leonardo reached beyond the mere sum of artistic and scientific efforts of expression. When we argue, however, for a coalescence of art and science, the argument is of course a distinctly contemporary one. Leonardo, by contrast, was the archetypal Renaissance man, working simultaneously with art, science and engineering. Leonardo is frequently cited as the epitome of the conciliation of art and science. However,

as his works arose in a time when the division between art and science did not exist, by implication the lessons learned from the great master cannot be applied to our time. What can be learned, however, is this innovative way of exploring and rediscovering nature phenomena by means of parallel efforts of science and art. Here, there is no division between the scientist's and the artist's moon—it is one.

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## LEONARDO ANNOUNCES

# Leonardo/ACM SIGGRAPH Special Issue Featuring SIGGRAPH 2010 Art Papers and Juried Art Gallery

*Guest Editor: Lira Nikolovska*

SIGGRAPH 2010, in collaboration with Leonardo/ISAST, honors not only artists and artwork, but also the process of making art and its place in society. We are pleased to announce a forthcoming special issue of *Leonardo*, presented in collaboration with SIGGRAPH 2010, which will feature SIGGRAPH 2010 Art Papers and the SIGGRAPH 2010 Juried Art Gallery, “TouchPoint: The Haptic Exchange Between Digits.”

Art Papers present excellent ideas in accessible ways. They inform artistic disciplines, set standards and stimulate future trends. This special issue of *Leonardo* will feature papers and artworks that illuminate and explore how people understand the changing roles of artists and art-making in our increasingly networked, multi-sensory, online world.

The “TouchPoint: The Haptic Exchange Between Digits” exhibition, chaired by Richard Elaver, will showcase work involving touch in the experience, production, or creation of the work; unique physical interfaces in the creation, generation, and/or manifestation of the work; experience design engaging multiple senses; kinesthetic intelligence and/or physical memory; and haptics as the subject of the work, addressing physical relationships with others, with technology or both. Artworks selected for the Juried Art Gallery will also appear in the special issue.

Publication of the special issue, *Leonardo* Volume 43, Issue 4 (July 2010), will coincide with the SIGGRAPH 2010 conference in Los Angeles, California (25–29 July 2010).