M.C. ESCHER A MINI-RETROSPECTIVE

Simons Center for Geometry and Physics Stony Brook University, NY



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October 11 – November 19, 2021

Curated by Lorraine Walsh

Simons Center for Geometry and Physics Stony Brook University, NY



Stony Brook University

M.C. Escher: A Mini-Retrospective Simons Center for Geometry and Physics Stony Brook University, SUNY Stony Brook, NY 11794-3636

Published by the Simons Center of Geometry and Physics on the occasion of the exhibition *M.C. Escher: A Mini-Retrospective*, October 11 – November 19, 2021

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Thank you to Timothy Young, SCGP Systems Administrator, and to all the SCGP staff: Maria Guetter, Joshua Klein, Claudia Landgrover, Jason May, Brigid O'Connor, Janell Rodgers, and Melissa Wessler.

It is with sincere gratitude we extend thanks to Rock J. Walker, Salvatore laquinta, Michael Sachs, and thank you to Doris Schattschneider.

We are grateful to Mark Veldhuysen and the M.C. Escher Foundation for all their support.

Thanks also to the Stony Brook University students who assisted in the exhibition and editorial material: Dhaval Bagal, Katie Chen, Valerie Farrugia, Anastasia Meleshko, Ronit Shamtoob, Iryna Shkurhan, and Kevin Tabora.

Finally, this exhibition would not be possible without Jim and Marilyn Simons, to whom we offer our deepest appreciation.

M.C. Escher: A Mini-Retrospective Catalogue

Art Direction: Lorraine Walsh, Simons Center for Geometry and Physics

Design and Graphic Production: Ellen Lynch, Warm River Studio, NY WarmRiverStudio.com

Printed by New Horizon Graphics

ISBN: 9780578316987

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ESCHER AT THE SIMONS CENTER

Luis Álvarez-Gaumé Director, SCGP SUNY at Stony Brook

With his characteristic conciseness. Jim Simons sent an email message on February 6th, 2019, with the text: What do you think? He appended a message from his friend Carol Baron, a pianist and musicologist at Stony Brook, with a passion for M.C. Escher, who had just visited the exhibit dedicated to Escher at Industry City, Brooklyn. Carol offered the suggestion to bring the exhibition to the Simons Center.

After consulting with the SCGP Art Director, Lorraine Walsh, we decided to pursue this project. Needless to say, I was blessed with ignorance on the many difficulties lying ahead in ventures of this caliber. It has been a rollercoaster ride for the last year and a half, with many unexpected difficulties, but finally we have a splendid sampling of the work by this unique artist at the Simons Center gallery. An exhibition we all hope you will enjoy.

This exhibit was made possible by the generosity of Jim and Marilyn Simons,

SELF-PORTRAIT, 1929 Lithograph 10 3/8 x 8 in.

along with the continued support of the university in many ways. Both of whom are gratefully acknowledged. The lion's share in accomplishing this complex and demanding task was taken by Professor Lorraine Walsh, whose expertise, dedication and determination have made it possible to offer this remarkable exhibit to our community. The excellent staff of the Simons Center is also to be thanked. They always rise to the challenge efficiently, and they are essential in making all of our activities a success.

The artistic views of Escher epitomize the essence of the Simons Center-a vision of geometry, physics and art portrayed with unequalled elegance of execution and depth of understanding. Joining artists from the Renaissance and the beginning of the 20th century, Escher resonates with the profound mathematical discoveries of his time.

AN INTRODUCTION: M.C. ESCHER AND PRINTMAKING Lorraine Walsh Art Director and Curator, SCGP

When offered the opportunity to curate a M.C. Escher exhibition at the Simons Center, I was delighted. His work exemplifies discovery at the nexus of geometry, physics, and art —a perfect fit for the Center.

The mini-retrospective also offered the occasion to expand the SCGP outreach initiative for the Stony Brook community at large and Stony Brook students. And as a curator, printmaker, and an artist who loves drawing, it provided a personal and professional inquiry for a broader understanding of Escher's art.



initial enthusiasm was challenged during the process. As SCGP Director Luis Álvarez-Gaumé suggests in his foreword, the difficulties were many and the surprises plentiful. Nevertheless, it has been a fruitful experience with a

Admittedly, this

SYMMETRY DRAWING 94, 1955 Watercolor

most welcome outcome: a deeper knowledge about Escher's art.

Before this project commenced, Escher was the mathematical artist who produced clever, albeit masterly, prints often peppered with optical trickery. However, in the course of curating this exhibit, I have had the distinct pleasure of seeing much of Escher's art firsthand, including watercolors, drawings, and textiles, thus broadening my purview and deepening my esteem.

Discoveries abounded in my Escher journey. His application of color on fabric and in watercolor is outstanding. The hues are in subtle and sophisticated secondary and tert



CASTROVALVA, ABRUZZI, 1930 Lithograph

secondary and tertiary shades, rendered in golden olive, burnt oranges verging into deep red umbers, and soft blues used sparingly. They are all the more magical since one commonly associates Escher with black and white.

Equally amazing is Escher's early art known as the Italian period. He lived in Italy from 1922 to 1935, travelling the countryside to draw. These studies yielded enigmatic prints of hillside towns, winding roads, and architectural interiors, often from distinctive vantage points with unique perspectives. This work reveals bold contrasts, as well as myriad shades of greys found in miniscule renderings of foliage on mountainsides.

While Escher was an excellent draftsperson who worked in varied media, at heart he was

a printmaker. He primarily worked in three traditional printmaking methods: linocut, woodcut and wood engraving (relief), lithography (planographic), and mezzotints (intaglio). All produce prints by the process of transfer from a surface to paper.

Relief printmaking is a process in which a piece of linoleum or wood is carved and the surface is inked with a brayer (roller) and printed. Escher's earliest print is a linocut of his father created in 1916. Shortly thereafter he began working in wood, which became his most widely used technique.

Woodcuts require the artist to cut with the grain. This is distinct from wood engraving where a dense wood allows for incisions across the grain to achieve more details (see pages 40-41). And multiple colors can be used by inking different blocks, such as in *Day and Night*—a woodcut in black and grey printed from two blocks.



DAY AND NIGHT, 1938 Woodcut printed from two blocks

Lithography, a planographic print method, is a process that allows for delicate shifts of tones as seen in Escher's *Castrovalva, Abruzzi.* An image is drawn with a greasy medium (crayon or liquid) on a smooth stone or metal plate. After the prepared surface is washed with water, the ink applied adheres only to the drawing. Essentially it relies on the immiscibility of oil and water.

Mezzotints, intaglio printmaking, are typically more complex than relief or planographic methods. The image is incised into a metal plate with a sharp etching tool or tradition-



EYE, 1946 Mezzotint

ally with acid (which 'bites' away the metal). The cut lines hold the ink and the surface is wiped clean. It is a complex procedure that achieves extreme gradations of grey and intense darks, as seen in *Eye.* It is also a labor intensive process, which may be why Escher created only eight mezzotints during his career.

Escher's masterly expertise evidence an artist with a passion for printmaking, technical virtuosity, and enduring patience. It is no wonder that he once stated: *I could fill an entire second life with working on my prints. ...*



ASCENDING AND DESCENDING, 1960 Lithograph 14 x 11 1/4 in

ENCOUNTERS WITH MAURITS C. ESCHER

Roger Penrose

My very first acquaintance with the work of Maurits Escher was in Amsterdam in 1954. when I was a second-year Cambridge graduate student in pure mathematics. During that occasion, I remember seeing one of our Cambridge lecturers (Shaun Wiley), on a bus, carrying the catalogue of an exhibition he had been attending at Amsterdam's Stedelijk Museum, showing the work of some artist I had never heard of before.

The catalogue featured a most unusual paradoxical picture on the cover, which completely caught my attention. This was Escher's very remarkable Day and Night, and Wiley recommended that I must attend this extraordinary exhibition showing the work of a Dutch artist called M.C. Escher, and that I would find it fascinating. I did indeed, and I remember being completely stunned by the ingenuity, the artistry, the mathematical understanding and precision, the toying with contradiction, and the sheer boldness of originality exhibited by these pictures. They created a lasting impression on me and I remember particularly the caterpillarlike creatures crawling up the stairs which wound around in weird ways (House of Stairs) and especially the one called *Relativity* where gravity was pulling in three different directions at once, and there were men walking up and down the stairs and standing up in impossibly different directions.

I came away thinking that I would like to try drawing something impossible myself, perhaps of a kind which I had not seen exactly illustrated in the exhibition, and I tried to

draw pictures with bridges, railway tracks, rivers, and the like, that fitted together in an impossible way as a whole but for which the picture made sense locally. After several barely successful attempts, I simplified what I was trying to do and pared it down to the impossible triangular structure now often referred to as a *tribar.* (I had been unaware of earlier drawings of this kind by the Swedish artist Oscar Tribar Reutersvärd and other pictures by previous artists illustrating similar types of things.) I showed this picture of an impossible triangle to my father who was sufficiently intrigued to develop it into various impossible buildings, and finally a continuous staircase which went around going down all the way around in one direction and up all the way around in the other direction.

My father made a model of an actual object, which looked like such an impossible staircase, when viewed from the appropriate angle. We wrote a short paper on these things, with illustrations, but were unable to think of what the subject was and to what journal it could be sent. But then my father mentioned that he knew the editor of the British Journal of Psychology, and thought he could persuade him to accept it, so we decided that the subject was psychology. The paper was duly accepted, appearing in 1958¹. We acknowledged Escher's influence and referred to the catalogue of the Amsterdam exhibition that Shaun Wiley had shown me.

After the article was published, we received reprints and sent a copy to Escher. Following that, he and my father entered into a significant correspondence, and Escher sent my father one of his prints as a gift. As it happened, between the time of Escher's Amsterdam exhibition and the writing of our paper, Escher had himself produced Belvedere, which illustrates the same kind of impossibility but in a slightly different way, though I had not seen anything guite of this nature in Escher's Amsterdam exhibition. Escher subsequently produced *Ascending* and Descending, which was to some extent inspired by the staircase picture in our article, and a little later on he produced Waterfall, which had been influenced by the impossible triangle. In both cases Escher was very generous in his acknowledgment and referred to our paper.

My father never actually met Escher, but when I was travelling in the Netherlands by car, in I believe 1962, with my then wife Joan, I found that we were in the area of Amersfoort, not far from Baarn, where Escher lived. I had Escher's telephone number from his correspondence with my father, so I phoned Escher, and he suggested that we visit him for tea. This we did, and we found him very friendly. I had been rather expecting that he lived in some extraordinary place with staircases going out of the windows, but instead it was a very neat and well-organized modern building with large picture windows. He had his work very well structured in neat piles and he allowed me to choose one of his less well known prints, which he generously gave me as a gift.

As some kind of exchange, I gave him a set of wooden puzzle pieces that I had made, all of

identical shapes, which could be assembled in a way which would cover the entire infinite plane if you had an infinite supply of such pieces, all identical. However, for this particular tile shape, the tiling of the plane would be necessarily what is called nonisohedral. This means that although the pattern would be periodic, the individual tiles would fall into more than one class, where no symmetry of the pattern could carry pieces of one class into pieces of the other class. There were many different ways that the pieces would individually fit together, so it would not be at all obvious how to assemble them into a repeating pattern that would cover a whole plane. Some several days later, Escher wrote to me enclosing a diagram with a solution of the puzzle but expressing some surprise that the solution might be, as I had asserted, unique.

Now I have always been a poor-or, at best, erratic-correspondent. I believe it may have been a year or so before I replied, or very possibly longer. In my response I explained the principle on which the design of the wooden pieces had been based. I also illustrated this principle with a roughly bird-like shape which would tile the plane only according to this scheme (and therefore only nonisohedrally). Some while later Escher wrote back in reply, explaining that he had not been well, but enclosed a copy of the modified shape that now appears in his (only nonisohedral) beautiful final picture. He was rather apologetic about it and referred to it as his "little ghosts."²

I had already published with my father an example of a shape which would tile a plane only according to this scheme.³ Other nonisohedral shapes have been known since around 1935, when Heinrich Heesch found such a

polygon. This provided a counter example to the second part of the eighteenth of the famous list of problems proposed by the great mathematician David Hilbert in a famous lecture given at the turn of the twentieth century.⁴

It seems clear to me that the organizers of the 1954 Escher Exhibition in Amsterdam must have taken the opportunity to stage their display at that time because of the location and timing of the International Congress of Mathematicians. There is a clear affinity between much of Escher's work and the interests and aesthetic appreciations of many mathematicians. Indeed, the outstanding geometer H.S.M. Coxeter became acquainted with Escher's work at that time and subsequently informed Escher of mathematical ideas that he thought Escher might make use of. Most particularly, there was the beautiful conformal representation of the hyperbolic plane found by Eugenio Beltrami (and subsequently rediscovered by Henri Poincaré), which Escher subsequently made brilliant use of in his Circle Limit series. This greatly extended the scope of Escher's

1. Penrose, Lionel S. and Roger Penrose, "Impossible Objects: A Special Type of Visual Illusion," British Journal of Psychology (1958), pp. 31-3. 2. Schattschneider, M. C. Escher: Visions of Symmetry, pp. 229. 318-19, no. 137. The work is inscribed by Escher: Made following the system of R. Penrose's jigsaw puzzle Laren. V'-71. Drawn while Escher was living at the Rosa Spier House in Laren, this is the last-known work he created

before his death on March 27, 1972

3. In "Puzzles for Christmas," New Scientist (Dec. 25, 1958), pp. 1580-81, 1597. [The particular example to which Prof. Penrose refers appears on p. 1581, no. 6, figs. 8-9; the solution to the puzzle is found on p. 1597.]

4. Hilbert's two-part eighteenth problem, as it appeared in the printed form of the lecture he presented at the Second International Congress of Mathematicians in Paris on August 8. 1900, was: (a) "Is there a polyhedron that admits only an anisohedral tiling in three dimensions?" (b) "What is the densest sphere packing? In other words, is it possible to build spaces with congruent polyhedra, and how dense could that space be?"

5. The impression of Circle Limit III included in the exhibition was sent by Escher to Coxeter as a gift; it is inscribed: To Proffessor [sic] H. S. M. Coxeter, with gratitude, M. C. Escher XII-'59.

original plane tessellations that he is famous for. Already, Escher had been inspired to make his amazing tessellations of birds, lizards, fish, etc., by the wonderful illustrations of the seventeen plane symmetry groups in the Alhambra Palace in Spain, and he had been helped in his understanding of these things by the Hungarian mathematician George Pólya. Coxeter's influence allowed Escher to extend this understanding in new ways.⁵

Escher had claimed that he had been an indifferent pupil in mathematics at school. Yet it is clear that his understanding of geometry went very deep. Perhaps the lack of recognition of his talents in his early schooling says more about the unthinking way in which mathematics is so often taught than it does about Escher's mathematical abilities, the latter being clearly very substantial. It is this depth of understanding, together with his outstanding artistic abilities, that has made his work so fascinating not only to mathematicians and to other scientists, but also to the public at large.



CIRCLE LIMIT III, 1959

Woodcut in second state, printed from five blocks 16 3/8" Diameter

A MATHEMATICIAN VIEWS ESCHER Doris Schattschneider

The graphic work of the Dutch artist M.C. Escher has always held the fascination of mathematicians. Escher's work fairly bursts with cunningly planned visual surprises. At first glance, a print may seem ordinary, or just a bit curious, yet at second glance, the seemingly plausible may be seen to be impossible, and the viewer is drawn to look closely to discover the many hidden surprises the work contains.

Escher was a genius of playful imagination and a skilled craftsman in the graphic arts, but the key to many of his surprising effects is mathematics. Not the mathematics of numbers and formulas that most of us envision, but **geometry** in all aspects, both classical and modern. Escher could imagine the fantastic effects he wished to express, but geometry was a necessary tool to capture these effects. For this reason, he read technical works and corresponded with mathematicians and crystallographers (who in turn, sought him out). He constantly disclaimed his ability to understand mathematics, yet his visual expressions give clear proof of his deep intuitive understanding of the vital principles he needed.

In the introduction to his book, *The Graphic Work of M.C. Escher.* the artist wrote that his works

... were made with a view to communicating a specific line of thought. The ideas that are basic to them often bear witness to my amazement and wonder at the laws of nature that operate in the world around us.

He who wonders discovers that this is in itself a wonder. By keenly confronting the enigmas that surround us and by analyzing the observations that I had made. I ended up in the domain of mathematics. Although I am absolutely innocent of training or knowledge in the exact sciences. I often seem to have more in common with mathematicians than with my fellow artists.

Far more striking than Escher's use of mathematics to create his works is the use by mathematicians of Escher's work to visualize abstract ideas. Scientists from almost every field of inquiry-chemists, physicists, mathematicians, crystallographers, biologists, psychologists, to name a few -have embraced Escher's prints for their clear depiction in visual metaphor of many concepts central to these fields. The old adage "a picture is worth a thousand words" is especially apt when trying to explain a theoretical concept that cannot be illustrated by a simple photo or figure. Abstract concepts are often ephemeral, and have many realizations, and so metaphor is one of the best ways to come to understand them. The concepts of symmetry, duality, relativity, reflection, recursion (self-reference), dimension, **metamorphosis** (topological change), and infinity are a few of the central mathematical and scientific concepts that Escher depicts in his prints.

A little-known fact that Escher did not reveal to the scientific world was that he himself was a (secret) mathematical researcher. Although

he had no formal mathematical credentials, he did possess a deep mathematical curiosity, tenacity, and ultimately, understanding of a large body of mathematical knowledge. He was obsessed with creating periodic (repeating) patterns of interlocking shapes. His investigations were to answer his own questions about what he called "regular divisions of the plane"—what today are called tilings or tessellations. He also did pioneering work in "color symmetry," an active area of study by mathematicians and crystallographers today. In his preface to a book on color symmetry by crystallographer Caroline MacGillavry, Escher wrote

In the beginning I puzzled quite instinctively, driven by an irresistible pleasure in repeating the same forms, without gaps, on a piece of paper. These first drawings were tremendously time-devouring because I had never heard of crystallography. ... Many years later, in 1935, I came for the first time in contact with crystallographic theories, which I seriously tried to understand. But they were mostly too difficult for my untrained mind, and on the other hand, they took no account of the shade contrasts [adjacent figures required to have contrasting colors] which for me are indispensable. So in 1942 I came to formulate a personal layman's theory on color symmetries which I illustrated with many explanatory figures.

Intended only for his use, Escher's 1942 notebooks were examined by mathematicians only recently, and published for the first time in 1990, in the book *M.C. Escher: Visions of Symmetry.* His research findings recorded there show that he explored many questions unasked by the official scientific world, and created a system of classification for his colored periodic drawings (of which he produced over 150). One of these drawings is depicted in his lithograph *Reptiles*. In the introduction to her book that reproduced over 40 of Escher's drawings, Professor MacGillavry remarked about Escher's notebooks, "the possibilities of the polychromatic groups were explored, and their symmetry elements marked, before official crystallography even thought about them."

Escher's graphic work divides into two distinct periods. In 1922, after finishing his studies in the graphic arts, Escher lived in Italy, and work from this early period shows his masterful depiction of Italian villages clinging to hillsides, stepped alleyways of ancient towns, rooftop views, contrasting architectural details, and minute details of nature. With the rise of Fascism, he and his family left Italy in 1935, first settling in Switzerland, then for a brief time in Belgium, and finally, in 1941, settling permanently in Baarn, Holland. His work then concentrated more on "the interpretation of personal ideas." There are many elements to be appreciated in each work, and viewers will delight in their own discoveries. Here I highlight some of the mathematical aspects of these works.

Symmetry is both a mathematical and aesthetic concept that has many manifestations in Escher's work. In both his early and later work, symmetry as balance is readily seen in his compositions. Symmetry as regular repetition of congruent or similar figures is central in his periodic tessellations, and fragments of these interlocking designs are used in many of his prints. Escher used the economy of rotation symmetry in producing some of his prints: he would carve a woodblock that was only a sector of the full print, then print that sector, rotate the block and print again (once, or twice, or even three times) to complete the print. His last work, *Snakes,* is a symmetric masterpiece of interwoven circles. Symmetry is also apparent in the many polyhedra that he admired and used in his prints. In *Double Planetoid,* a star-like form is composed of two tetrahedral worlds (one untouched by man, and one transformed by man); the worlds are unaware of each other, yet penetrate each other.

Duality is a central concept in the sciences, and also in the world of perception. In mathematics, every logical statement has a negation, every set has a complement; there are dual functions, dual spaces, dual particles. In art and perception, we speak of figure and ground. These opposites define each other: if you know one, you know the other. Escher gives visual realization to the concept of duality in many of his prints—he often spoke of his "dualistic nature." Sun and Moon captures two pictures in one; each view serves as ground for the other. Try this test of your perception: focus intently on the dark birds and you will see the sun bursting behind them. Now let that view fade, and concentrate on the light birds, trying to pull them away from the print. You will see they fly against a night sky with crescent moon, stars, and a comet. Escher's use of interlocking motifs with contrasting colors is ingeniously successful in portraying duality (note also his "dual" titles). Sky and Water, Day and Night, Verbum, and *Circle Limit IV* all illustrate duality.

Relativity is a concept that bridges scientific theory and human perception, difficult to explain in words. Escher captures relativity in delightful ways, forcing us to ask ourselves "Is what I perceive really what it seems to



RELATIVITY, 1953 Lithograph

be?" *Convex and Concave* plays tricks with our perception: what we see is relative to our viewpoint. Scanning from the top down on the left side of the print, we view from above stairs that a woman is about to descend, and on the landing, there is a concave bowl carved into the floor. However, scanning from the bottom up, at the right side of the print, we see the stepped underside of an archway, and at the base of that archway is a ceiling, decorated with a convex fluted plaster ornament. The concave bowl and convex plaster ceiling ornament are one and the same—what we perceive is relative. Other prints that depict relativity are *Relativity, Cube with Magic Ribbon,* and *Other World.*

Reflection has mathematical and scientific importance both as an image-reversing transformation and as an indirect view of an object that cannot be viewed directly. In *Puddle*, we first see muddy tracks and footprints, but then "see" the reflected night sky and trees above. Escher was fascinated with reflections, and these are featured in many of his prints. **Recursion,** or self-reference, is a concept that has grown in importance with the pervasiveness of computers. "This sentence is short" is self-referential; many computer programs depend on the logic of recursive commands. Douglas Hofstadter's book, *Gödel, Escher*, Bach: An Eternal Golden Braid, uses many of Escher's visual metaphors of self-referential loops to explain concepts from artificial intelligence. Escher's Drawing Hands epitomizes self-reference, as does Fishes and Scales.

Dimension, that concept which clearly separates point, line, plane and space, fascinated Escher. He wrote, "I cannot help mocking all



BELVEDERE, 1958 Lithograph

our unwavering certainties. It is, for example, great fun deliberately to confuse two and three dimensions, the plane and space..." Many of his prints depict creatures or objects emerging from a two-dimensional drawing to gain life and freedom as three-dimensional forms. The prints Reptiles, Encounter, Liberation, Magic Mirror, and Drawing Hands are a few examples. His prints of "impossible objects" also explore the ambiguities of representing what look like three-dimensional objects on a two-dimensional surface: Waterfall, Ascending and Descending, and Belvedere all are based on geometrical structures that can be easily drawn on paper, but cannot be built to connect as they appear to.

Metamorphosis, or topological change, is a central idea in many of Escher's prints. His first print to utilize a fragment of one of his tessellations was Development I, and Escher explained that the print depicted both development of form and development of contrast (from gray squares at the outer edges, to black and white squirming reptiles at the center of the print). For him, these were essential ideas. In his 7 meter-long "story" print Metamorphose, he performs an almost endless series of metamorphoses, with flat squares morphing to reptiles, then to hexagon tiles which become a beehive releasing bees, which encounter fish, and emerge as birds that morph to flying fish that, transforming their shape, move through boats, then horses, and emerge as birds that change to triangles, flying envelopes, then again to birds of three species; these seamlessly deform into stacked blocks that become the town of Amalfi, with a little bridge whose castle pier is on a chessboard of squares, completing the story where it began.

Infinity is a mathematical concept that we all intuitively accept, yet it is fiendishly difficult to represent. After all, everything we can count (even all the atoms in our solar system) is only finite. Escher wanted to capture infinity, and met the challenge in a variety of ways. First, each of his tessellations, although only covering a small piece of paper, or a small fragment of a print, suggests the possibility of extending infinitely in all directions, covering an endless plane. Second, many of his prints show a finite number of figures marching, flying, walking, or otherwise making a cycle, which suggests an infinite procession. Horseman, Swans, and *Reptiles* are three such prints. Escher felt that a better approach to capturing infinity was to depict interlocking figures that diminished in size ad infinitum. Smaller and Smaller was an early attempt: he was more pleased with his later *Circle Limit* prints that truly contained all of an infinite tessellation, this time in the hyperbolic plane. (He learned of this kind of tessellation

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from a diagram in an article by mathematician H.S.M. Coxeter.) Square Limit was based on a geometric construction that he devised himself.

Using mathematics and depicting abstract mathematical concepts was for Escher an incredible challenge-at times he felt completely alone in his work. Yet he derived great satisfaction from striving to convey his personal ideas.

These prints (none of them by the way, ever having been wrought with an eye to making "something beautiful") are nothing less than brain-wracking. That is another reason why I never feel at home among my colleagues in graphic art: they are striving primarily for "beauty" (a notion that, even for them has undergone a great change since the 17th century!). Perhaps I am striving exclusively after wonder, endeavoring thus only to induce wonder in my onlookers.



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M.C. ESCHER A MINI-RETROSPECTIVE

Simons Center for Geometry and Physics Stony Brook University, NY



THE BORGER OAK, 1919 Linocut 3 7/8 x 3 1/4 in.

Fractal trees are set against the cosmic backdrop of a black sky with a glowing celestial body fitfully illuminating the scene. The limbs of the tree become a simple recursive pattern against white hills. Already the themes that would dominate Escher's life work are apparent: the recursive patterns of mathematical sequences are apparent. Living things and the laws of space are both part of an overarching pattern.

FLOR DE PASCUA (Right) 19 Woodcuts Each print approx 4 3/4 x 3 1/2 in.

Escher created these woodcuts as illustrations for a small booklet titled *Flor de Pascua (Flowers of Easter).* He was only 23 years old and these images foreshadowed future work.



HEART, SUNFLOWER, BLUEBELLS, ALARM CLOCK



THE SCAPEGOAT





MADONNA

THE LONELY ONE





THEOSOPHY

THE WEATHERCOCK





THE SPHERE

NEVER THINK BEFORE YOU ACT

M.C. ESCHER A MINI-RETROSPECTIVE

M.C. ESCHER A MINI-RETROSPECTIVE



CONVENTION



THE GHOST



PERFUME



BEAUTIFUL



FULFILLMENT



LA PENSÉE



WHORE'S SUPERSTITION



LOVE



SELF-PORTRAIT, 1929 Lithograph 10 3/8 x 8 in. **SELF-PORTRAIT IN SPHERICAL MIRROR, 1950** Woodcut 3 1/4" Diameter





SELF-PORTRAIT, DESIGN FOR A CERAMIC PLATE, 1969 Watercolor 14" diameter.

HAND WITH REFLECTING SPHERE (SELF-PORTRAIT IN SPHERICAL MIRROR), 1935 Lithograph 12 1/2 x 8 3/8 in.

A mirrored sphere held by the artist reflects Escher seated in the living room of his house on the Via Poerio in Rome. Perhaps the image can be seen as a metaphor of artistic creation: the artist's hand holding up the artist himself and his whole world. On one level, the sphere simply reflects the artist and his living room. But on another level, the question arises: what is the actual reality? Is the artist sitting in his living room or is the sphere reflecting the artist sitting in his living room? Or perhaps the artist's hand is holding up a drawing of himself in his living room. And is the artist viewing his reflection or is the reflection viewing the artist? Representing this in two-dimensions creates an illusion in itself. The sphere warps reality-an idea that very much appealed to Escher-as did changing the dimensionality of the world around him.







THE BRIDGE, 1930 Lithograph

21 1/8 x 14 7/8 in.

TOWER OF BABEL, 1928 Woodcut

24 1/2 x 15 1/4 in.

CASTROVALVA, ABRUZZI, 1930 Lithograph 20 7/8 x 16 5/8 in.

Escher visited Italy in 1923, and lived there from 1924 to 1935. During those years, known as his Italian period, he created a large portfolio of drawings, lithographs, and wood engravings. *Castrovalva*, made in 1930, is generally regarded as one of Escher's finest lithographs from that time. It was created just seven months after his first lithograph (*Goriano Sicoli*). Escher wrote: "I spent nearly a whole day sitting drawing beside this narrow little mountain path. Up above me there was a school and I enjoyed listening to the clear voices of the children as they sang their songs." And Escher's earliest major critic, G.J. Hoogewerff wrote in 1931, "In our judgment the view over Castrovalva in the Abruzzi (the name of the region was changed to Abruzzo in 1963) can be regarded as the best work Escher has so far produced. Technically it is quite perfect: as a portrayal of nature, it is wonderfully exact; yet at the same time there is about it an air of fantasy. This is Castrovalva viewed from without, but even more so it is Castrovalva from within. For the very essence of this unknown place, of this mountain path, these clouds, that horizon, this valley, the essence of the whole composition is an inner synthesis, a synthesis which came into being long before this work of art was made." Today that stretch of road is called "Curvone Escher."







STREET IN SCANNO, ABRUZZI, 1930 Lithograph 24 3/4 x 17 in.

CASTLE IN THE AIR, 1928 Woodcut 24 5/8 x 15 1/4 in.

M.C. ESCHER A MINI-RETROSPECTIVE

LA CATHÉDRALE ENGLOUTIE (THE DROWNED CATHEDRAL), 1929 Woodcut 28 3/8 x 16 3/8 in.

Escher was a passionate music lover. And according to Escher's son George, the artist was inspired to create this print after hearing a performance of Claude Debussy's prelude, *La Cathédrale Engloutie (The Drowned Cathedral),* in Rome, presumably in late 1928. The prelude itself was inspired by the ancient Breton (culture of Brittany) story of the city of *Ys,* which sank into the sea. According to legend, the city's cathedral rises from the sea on clear mornings, and the sounds of bells and the organ can be heard, slowly fading away as the church slips back underwater after the sun sets. It appears that Escher represented the cathedral sinking back into the sea, since here the scene is set at evening. "Father then saw suddenly something in the music that he didn't see before, and pictured it here, which is the moment that the cathedral slowly disappears into the sea with its bells ringing," wrote George Escher in his diary. Escher's precise preparatory drawing clearly shows that the cathedral in the print is based on the one at Chartres, which Escher and his bride Jetta visited in 1924. It is easy to imagine that listening to Debussy's prelude must have brought to mind his visit to Chartres and the drawing he made of the cathedral more than four years earlier.







PENTEDATTILO (PANORAMA), CALABRIA, 1931 Woodcut 12 5/8 x 9 1/8 in. **SCILLA, CALABRIA, 1931** Lithograph 11 3/4 x 8 7/8 in.



GORIANO SICOLI, ABRUZZI, 1929 Lithograph 9 3/8 x 11 1/4 in.

The hilltop city Goriano Sicoli in the Abruzzo region of Italy was the subject of Escher's first lithograph. The buildings appear stacked on top of one another in a pyramid form. Twenty-five years later, near the end of Escher's fascination with platonic solids, he created a tetrahedron shaped planet–a stacked city floating in space. Almost the same image can be created by reflecting *Goriano Sicoli* on itself.





(ROOFS OF) SIENA, 1922 Woodcut 12 3/4 x 8 5/8 in.

MORANO, CALABRIA, 1930 Woodcut 9 1/2 x 12 5/8 in.

NOCTURNAL ROME: COLONNADE OF ST. PETER'S (PORTICO OF BERNINI), 1934 Woodcut 12 1/4 x 9 in.

Escher's *Rome by Night* series consists of a dozen experimental prints, each utilizing a specific woodcutting technique for shading. The preliminary chalk drawings were made at night by torchlight. Then he explored different cutting techniques to recreate the images as woodcuts. The use solely of diagonal cuts yields not just shading, but the illusion of lighting from a directional source.





PORTA MARIA DELL'OSPIDALE, RAVELLO, 1932 Wood Engraving 10 5/8 x 8 1/4 in.



COVERED ALLEY IN ATRANI, COAST OF AMALFI, 1931 Wood Engraving 12 1/8 x 8 7/8 in.

M.C. ESCHER A MINI-RETROSPECTIVE





INSIDE ST. PETER'S, 1935 Wood Engraving 9 3/8 x 12 1/2 in. **OLD OLIVE TREE, CORSICA, 1934** Wood Engraving 12 5/8 x 9 1/2 in.

M.C. ESCHER A MINI-RETROSPECTIVE

M.C. ESCHER A MINI-RETROSPECTIVE



DEVELOPMENT I, 1937 Woodcut 17 1/4 x 17 1/2 in.

Escher's trip to the Alhambra (Granada) and La Mezquita (Cordoba) in 1936 had a profound influence on his art for the rest of his life. It renewed his interest in tessellations, something first explored ten years earlier. As Escher explained: the prints entitled *Development* are showing two developments essential to his prints: the development of *form* and the development of *contrast.* The outer part of the print shows ghostly geometric shapes in a checkerboard; then as one moves towards the center of the print, the shapes gradually change form until they become stark black and white squirming lizards.



SKY AND WATER II, 1938 Woodcut 24 1/2 x 16 in.



DAY AND NIGHT, 1938 Woodcut printed from two blocks 15 3/8 x 26 5/8 in.

Day and Night is arguably one of Escher's key prints and considered by some to be a masterpiece of 20th century printmaking. It is an intriguing work of art that masterly depicts symmetrical opposites. The left side of the print portrays an aerial view of a daytime scene with a long, winding canal running through a small city that turns into night on the right side of the Dutch landscape. The composition has a unique positive-negative geometry with beguiling tessellations of white and black birds. Recognized as a great work early on, Escher printed approximately 650 prints of *Day and Night*—all by hand.



METAMORPHOSIS II, 1939-1940

Woodcut printed from 20 blocks on three combined sheets 7 1/2 x 153 3/8 in.



REPTILES, 1943 Lithograph 13 1/8 x 15 1/8 in.

Escher combined great imagination, technical virtuosity and humor to produce *Reptiles*, which he explained as a lizard bored with no dimensions. The print depicts a desk with a drawing of a tessellated pattern of reptiles and hexagons. The lizard escapes the paper, climbs across a zoology book, across a dodecahedron and down and around to re-enter the paper. The critic Steven Poole commented that one of Escher's "enduring fascinations" was "the contrast between the two-dimensional flatness of paper and the illusion of three-dimensional volume that can be created with certain marks" when space and flatness exist side-by-side and are "each born from and returning to the other, the black magic of the artistic illusion made creepily manifest."¹ 1. Poole, Steven "The impossible world of MC Escher," *The Guardian*. Retrieved 2 November 2015. (20 June 2015).





SMALLER AND SMALLER, 1956

Woodcut with Wood Engraving in center, printed from four blocks 15 x 15 in. **REGULAR DIVISION OF THE PLANE I, 1957** Woodcut 9 1/2 x 7 1/8 in.

M.C. ESCHER A MINI-RETROSPECTIVE

M.C. ESCHER A MINI-RETROSPECTIVE





REGULAR DIVISION OF THE PLANE VI, 1957 Woodcut 9 1/2 x 7 1/8 in.

REGULAR DIVISION OF THE PLANE IV, 1957 Woodcut 9 1/2 x 7 1/8 in.



WHIRLPOOLS, 1957

Woodcut and Wood Engraving printed from two blocks 17 1/4 x 9 1/4 in.



FISH AND SCALES, 1959 Woodcut 14 7/8 x 14 7/8 in.

M.C. ESCHER A MINI-RETROSPECTIVE



SUN AND MOON, 1948 Woodcut printed from four blocks 9 7/8 x 10 5/8 in.

Birds are a recurring subject for many of Escher's tessellations, alongside fish and reptiles. He also frequently combined dualities. As seen in his famous woodcut *Day and Night* (1938) two worlds are combined in *Sun and Moon*. Escher used four blocks to create this print of two interlocked flocks of birds—each flock serves as the background for the other. The background for the white birds is a night sky, while the background for the blue birds is a sun-filled sky. Escher used four blocks to create this print. The mathematician Doris Schattschneider writes: "There is no metamorphosis of images here; the scene of light colored birds against a deep blue starry night sky must be blinked away and the eyes refocused in order to see the second (simultaneous) scene of dark birds against a brilliant gold sun. If one tries to see the composition as a whole, only a flat pattern of birds is evident; neither background, that of sun or of moon, is seen as a backdrop for a lively flock of birds."²

2. Schattschneider, Doris, "M.C. Escher Visions of Symmetry," publisher W.H. Freeman and Company, NY. 1990, p. 265.



SYMMETRY DRAWING 94, 1955 Watercolor 9 1/2 x 8 7/8 in.



FISH VIGNETTE, 1955

Woodcut 3 1/2 x 3 in.

Escher created many drawings and watercolors, often with an underlying grid on which he made notes for patterns, color and form. These unique studies in color and geometry, at times with tessellation and plane divisions, were frequently investigations for possible future prints. For example, *Symmetry Drawing 94* (1955) served as the inspiration for the woodcut *Fish Vignette (1955)*, pictured on the left and above.





FISH AND SKATES, 1943 Woodblocks printed on silk 13 1/4 x 13 1/4 in.

Escher hand-printed the pattern of red and green fish on silk (at right) with the individual six blocks shown above. The two species interweave in a meander, with the red fish beginning at the lower right corner and weave their way to the upper left corner, while the skates begin their journey at the lower left corner and weave up and down to finally reach the upper right corner. Escher made several versions of these woven fish prints on silk, varying the two colors and also the number of rows and columns traveled by the fish.



ANOTHER WORLD (OTHER WORLD), 1947

Woodcut and Wood Engraving printed from three blocks 12 1/2 x 10 1/4 in.



DREAM (MANTIS RELIGIOSA), 1935 Wood Engraving 12 5/8 x 9 1/2 in.

PHOSPHORESCENT SEA, 1933 Lithograph

12 7/8 x 9 5/8 in.

Throughout his life, Escher went on countless voyages on freighters and had a profound connection with the sea. This passion for the ocean is evident in the lithograph *Phosphorescent Sea* (1933). Minimalist in style and masterly printed, the work depicts waves rolling silently toward the shore with bioluminescent algae that make the crest of the waves phosphorescent. Stars pepper the black sky —look closely and see the Big Dipper in the distant sky.







THREE WORLDS, 1955 Lithograph

14 1/4 x 9 3/4 in.

RIPPLED SURFACE, 1950 Linoleum Cut printed from two blocks 10 1/4 x 12 5/8 in.



CONCENTRIC RINDS (CONCENTRIC SPACE FILLING/REGULAR SPHERE DIVISION), 1953 Wood Engraving 9 1/2 x 9 1/2 in.



CIRCLE LIMIT III, 1959

Woodcut in second state, printed from five blocks 16 3/8" Diameter





CYCLE, 1938 Lithograph 18 3/4 x 11 in.

THREE SPHERES II, 1946

Lithograph 10 5/8 x 18 1/4 in.



HOUSE OF STAIRS, 1951 Lithograph 18 5/8 x 9 3/8 in.



HIGH AND LOW (UP AND DOWN), 1947 Lithograph 19 3/4 x 8 1/8 in.

RELATIVITY, 1953 Lithograph 10 7/8 x 11 1/2 in.

In one of Escher's most iconic prints, the artist creates a world that defies the laws of gravity. Here, he unites at least eight different worlds, each with its own gravitational force at play, within a single architectural construction. The virtually identical, featureless, ovoid-headed inhabitants of this structure are shown going about their mundane routines: working, walking, reading, eating, and looking on. Although the normal rules of gravity are applied for the inhabitants of each individual world, it is inconceivable that the sixteen figures could coexist in the same world. As Escher described, "Contact between them is out of the question because they live in different worlds and therefore can have no knowledge of each other's existence."³ These are the kinds of puzzles or "brain games" Escher enjoyed presenting to us in his prints. His play with perspective calls to mind the part of Einstein's theory that declares that the universe has no stationary or set frame of reference. Relativity is among a group of works created during the late 1940s and early 1950s that challenged and tweaked basic perceptions like "up/down" and "in front of/behind." As the artist progressed in his explorations, the works that developed from them became increasingly sophisticated.

3. Escher, Maurits Cornelis, "Grafiek en Tekeningen M.C. Escher," Originally published 1959 (Zwolle).





PRINT GALLERY SOLVED, 2003 Solution by Hendrik Lenstra

PRINT GALLERY, 1956 Lithograph 12 1/2 x 12 1/2 in.

Print Gallery depicts a gallery with a visitor viewing a print of a seaport. Among the various buildings is the gallery in which he is standing, making use of the Droste effect: a visual recursion of a picture appearing in itself.

The lithograph has attracted discussion in both mathematical and artistic contexts. Dr. Hendrik Lenstra studied the print and found his attention returning again and again to that central patch, puzzling over the reason Escher had not filled it in. With students and colleagues in Leiden, he began a two-year side project, resulting in a precise mathematical version of the concept Escher seemed to be intuitively expressing in his picture.



BELVEDERE, 1958

Lithograph 18 1/4 x 11 5/8 in.

At first glance, it appears that Escher has created a plausible belvedere building-a structure built to take advantage of a scenic view. The image seems to be reasonable until one notices that the ladder goes up from inside to outside, and that the second story is turned ninety degrees with respect to the ground floor. If the upper portion is covered, the remaining image appears to be normal. Similarly, if the lower portion is covered the upper is not problematic; but as a unity it is impossible. In a three-dimensional world simultaneous front and back is an impossibility and so cannot be illustrated. Yet it is quite possible to draw an object which displays a different reality when looked at from above and from below. The figure sitting on the bench holds just such an impossible cube in his hands. He gazes thoughtfully at this incomprehensible object and seems oblivious to the fact that the belvedere behind him has been built in the same impossible style.







WATERFALL, 1961 Lithograph 15 x 11 3/4 in.

ASCENDING AND DESCENDING, 1960 Lithograph 14 x 11 1/4 in.





STILL LIFE WITH MIRROR, 1934 Lithograph 15 1/2 x 11 1/4 in.

EYE, 1946

Mezzotint 5 1/2 x 7 3/4 in.

M.C. ESCHER A MINI-RETROSPECTIVE





STUDY FOR DRAWING HANDS, 1948 Pencil 9 13/16 x 12 3/4 in.

DRAWING HANDS, 1948 Lithograph

11 1/8 x 13 1/8 in.

MÖBIUS STRIP II, (RED ANTS), 1963 Woodcut in red, black, and grey-green, printed from three blocks

printed from three blocks 17 7/8 x 8 1/8 in.

Escher was intrigued by the idea of perpetual motion and explored different ways to express it in his work. In *Möbius Strip II*, the ants appear to be crawling on two separate sides of a single surface, but each one actually travels the entire length of the one-sided surface on which they crawl. The paths are endless here. In 1961, between creating *Möbius I* and *Möbius II*, Escher completed *Waterfall* (p. 79), which shows perpetually flowing water that keeps the water wheel turning indefinitely. Yet another example of his interest with motion.



SNAKES, 1969 Woodcut printed from three blocks 19 5/8 x 17 5/8 in.

Escher's final work, and arguably one of his finest, portrays a snake weaving in and out of infinity. The rings are linked together in "dynamic progression" by changing in size from one band to the next. In some ways, it is his only double "limit" print, achieving the infinite at both the center and the periphery of the print. The ringed matrix could be the ideal home for an ouroboros, a snake eating its own tail. Instead, Escher gives us three snakes linked to each other and also to the world in which they live.

Escher's health was failing, and he feared he would not be able to finish it. At the same time, he was immensely proud of his creation but did not show the preliminary drawings to his friends out of fear that if they showed disappointment It would dissuade him from finishing. Escher insisted his works had no deeper meaning, but one wonders if he broke that rule for his final masterpiece; it would be just like him to bend the principles of the reality we expect from him.



CHRONOLOGY

1898 Maurits Cornelis Escher is born June 17 in Leeuwarden, Holland, the third son from the second marriage of George Arnold Escher to Sarah Gleichman.
1903 The family moves to Arnhem in the Netherlands.
1912-18 Escher attends secondary school in Arnhem.
1916 His first graphic work is produced: a linoleum cut portrait of his father.

1917 The family moves to Oosterbeek. Here Escher produces his first etching: *Railway bridge across the Rhine at Oosterbeek.*

1919-22 Escher attends the School for Architecture and Decorative Arts in Haarlem, but switches to graphic lessons from Samuel Jessurun de Mesquita. He creates his first woodcuts.

1921 The booklet *Flor de Pascua* by A.P van Stolk, illustrated with woodcuts by Escher, is published.

1922 From April to June, Escher journeys through northern Italy, then travels to Tarragona, Spain by freighter in September. After his first visit to the Alhambra, an ancient Moorish palace, he travels back to Italy where he stays in Siena from mid-November. He produces his first tessellation: *Eight Heads*.

1923 March to June, Escher stays in Ravello, Italy, where he meets Giulia Umiker (Jetta). In June, he returns to Siena where his first solo exhibition is held in August. Escher moves to Rome in November.

1924 His first exhibition held in Holland. Escher and Jetta marry on June 12 in Viareggio. He travels throughout the Netherlands, Paris and Brussels.

1925 The Eschers settle in Rome in October.

1926 Escher's fame begins to grow, and an exhibition is held in Rome. His first son George is born July 23.

1927-35 Annual spring trips are made throughout the countryside of Italy: Abruzzi, Corsica, Calabria, Amalfi Coast and Sicily. The sketches made during

these trips are used later for prints. He often travels with the artist Giuseppe Haas-Triverio.

1928 Escher's second son Arthur is born December 8.

1932 The book *XXIV Emblemata,* with woodcuts by Escher, is published by his friend G.J. Hoogewerff.

1933 The book *De vreeselijke avonturen van Scholastica* is published, with woodcuts by Escher.

1934 Escher works on the series *Nocturnal Rome*. His lithograph, *Nonza Corsica*, is awarded third prize at a Chicago exhibition. In December, his work is displayed at the Dutch Historical Institute in Rome.

1935 In July, the Escher family moves to Switzerland.

1936 Escher goes on a three-month ocean journey along the coasts of Italy and France to Spain, visiting the Alhambra for the second time, as well as the mosque in Córdoba. This inspires him to further explore tessellations, shifting away from landscapes.

1937 In August, the Eschers move to Brussels, Belgium. Escher's half-brother Berend, a geologist, provides him with publications about crystallography. Escher produces the first *Metamorphosis*.

1938 Escher creates *Day and Night*, a woodcut that becomes very popular, and *Sky and Water I*. His third son Jan is born on March 6.

1939 Escher begins Metamorphosis II.

1941 Following the German invasion of WWII, the family relocates to Baarn, in the Netherlands.

1944 Escher's former teacher S. Jessurun de Mesquita is taken by the Germans. His death moves Escher deeply. He takes Mesquita's works to the Stedelijk Museum in Amsterdam.

1946 Escher creates his first mezzotints, allowing him to obtain extremely subtle gradations of light and dark.1951 Articles on Escher are published internationally in *The Studio* (UK), *Time and Life* (USA) magazines.

1953 Escher creates the iconic *Relativity*.

1954 Escher has a major solo exhibition at the Stedelijk Museum in Amsterdam in conjunction with an International Mathematical Conference. His work is later on exhibit in the Whyte Gallery, Washington, D.C.

1955 He produces five new prints, including *Three Worlds.* On April 30, Escher is knighted.

1956 Escher creates *Print Gallery.* He commences correspondence with Bruno Ernst, (a.k.a. Hans de Rijk), a mathematics teacher who would publish a book about Escher's work twenty years later.

1958 Impossible Objects: A Special Type of Visual Illusion, by Lionel and Roger Penrose, is published in The British Journal of Psychology. Regelmatige vlakverdeling (The Regular Division of the Plane), written and illustrated by Escher is published. Escher creates his famous lithograph Belvedere.

1959 *Grafiek en tekeningen M. C. Escher (The Graphic Work of M. C. Escher)* is published.

1960 In August, Escher lectures and exhibits at a conference of crystallographers in Cambridge, England. October, he speaks at MIT in Cambridge, MA.

1961 An article on Escher by E. H. Gombrich is published in *The Saturday Evening Post* on July 29.

1962 Escher designs a tessellation for a pillar in the Provinciale Waterstaat building in Haarlem. In April, Escher is admitted to the hospital for an emergency operation. He cancels his trip to the USA and Canada.

1964 In October, Escher and Jetta fly to Canada, where he falls ill and undergoes another operation.

1965-1970 Escher's work increases in popularity. Stanley Kubrick approaches him about a fourdimensional film. Mick Jagger asks him whether one of his works can be used for an album cover by the Rolling Stones. Both are declined. **1965** Escher is awarded the cultural prize of the city of Hilversum. In August, *Symmetry Aspects of M. C. Escher's Periodic Drawings* by Caroline H. MacGillavry, a crystallographer, is published. An article on Escher appears in *Jardin des Arts.*

1966 *Scientific American* publishes a long article on Escher in its April issue.

1967 Escher is made an Officer in the Order of Orange-Nassau, an award for longstanding meritorious service to society.

1968 Escher exhibits in Washington, D.C. at the Mickelson Gallery and the Kunstmuseum in The Hague in honor of his 70th birthday. The M.C Escher Foundation is established to preserve, promote and protect his work. At the end of the year Jetta leaves for Switzerland to live with her son Jan.

1969 In February, the 48-meter-long wall painting *Metamorphose III* is unveiled at the main post office in The Hague. In July, Escher creates his last graphic work, the woodcut *Snakes*.

1970 In the spring, Escher is readmitted to the hospital for another major operation. In August, he moves to the Rosa Spier House in Laren, a retirement community for artists and scholars. A film about Escher's work is shown at the world exhibition in Osaka, Japan.

1971 *De werelden van M. C. Escher (The World of M.C. Escher)* by J.L. Locher is published.

1972 Escher dies on March 27 in the hospital in Hilversum at the age of seventy-three.

1976 *De Toverspiegel van M.C. Escher (The Magic Mirror of M.C. Escher)* by Bruno Ernst is published.

1981 Leven en werk van M.C. Escher (M.C. Escher, His life and complete graphic work) by J.L. Locher is published. It provides the first complete catalogue of Escher's work.

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