

MAKING KNOWLEDGE
IN EARLY MODERN EUROPE

Practices, Objects, and Texts, 1400-1800

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These new values appeared unmistakably at this time among a "nouveau riche" nobility of ambitious merchants. In this fluid situation a more pragmatic approach to life was emerging, with eyes on the street and everyday reality. These new attitudes spread within and outside city walls through all the strata of society, whether nobility, clerical hierarchy, international merchants, or guild master craftsmen. A new power, based on personal skill and business acumen, soon openly competed with the traditional authority of the sovereign powers.³⁶

It is misleading to suppose that all was new in the city. The middle-class virtues mentioned previously were certainly not "invented" in the city. Individualism, hard work, and making a career were not exclusively traits of urban society, even though they often were paraded as new in the cities themselves. A substantial number of the qualities derived from classical antiquity, many of them could be found at court, and nearly the entire list was already present in the earliest monastic environments. In every case we are confronted with overlap, for the primary characteristic of this mentality is that it adapts to and combines with other attitudes. In brief, the classical authors presented the dictates of reason and control of the emotions as guidelines for earthly life, together with instructions for the careful running of a household (*oeconomia*). The monastic orders emphasized hard work, discipline, and the related need for efficiency in measuring time. Self-sufficiency could also be found in this milieu. Finally, the individual adventurer who goes out to challenge the world and vie with fate (Fortuna) was first portrayed in the chivalric literature of courtly culture.

What was unique about the late medieval and early modern city, however, is that a highly original set of virtues appeared, forged from the classical, biblical, and medieval traditions. Urban dwellers borrowed from vernacular, as well as elite, traditions, from old and new, and were continually in search of useful elements that could be adapted to reinforce, embody, and foster the city's own interests and ambitions. And this passion for annexation and adaptation was presented in terms of novel knowledge, novelty, and renewal, particularly in the literature produced in new institutions such as the *rederijkers'* chambers, which assembled, tested, and propagated this new collection of urban virtues.³⁷



CHAPTER SIX

Watches, Diary Writing, and the Search for Self-Knowledge in the Seventeenth Century

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The word "revolution" is often used to describe the development of science in the sixteenth and early seventeenth centuries. This may be an adequate term, but this revolution did not take place in isolation. Like its political equivalents, the Scientific Revolution was embedded in a broader process of cultural change. In this essay, one essential aspect of the Scientific Revolution, the great improvement in techniques to measure time, is linked with an important cultural development, the invention of the modern diary. While the search for knowledge of the outer world intensified around 1600, there was also a growing need for knowledge of the inner world. Although by no means the work of great individuals alone, the Scientific Revolution is associated with famous thinkers like Galileo and Isaac Newton. Likewise, the growing interest in self-knowledge had a broad basis but is also linked to some famous authors, of whom the most important was Michel Montaigne. His essays set a new standard for self-analysis. The autobiography of Benvenuto Cellini and the diary of Samuel Pepys are among the most famous landmarks in the development of new literary tools for researching the self. Producing knowledge and producing self-knowledge clearly went hand in hand, and the two cannot easily be separated. In egodocuments like those by Cellini and Pepys, the authors not only tried to learn more about themselves but also described and analyzed their immediate environment. Like astronomers, they sought to describe and explain reality. There even was a direct link between both developments: the invention of new timekeeping devices directly influenced the development of the modern diary, in which the author kept track of his or her life.

Stuart Sherman has recently drawn attention to the connection between the birth of the modern diary and the invention of the first accurate

clock, relating the way in which Samuel Pepys kept his diary to the introduction of the pendulum clock, which was invented by the Dutch mathematician and astronomer Christiaan Huygens.¹ In the seventeenth century daily writing became a common practice, and this new diurnal form would influence culture in various ways, contributing to the development of, for example, the shipping journal and the daily newspaper. The link between the revolution in time measurement and the rise of the modern diary can be found within the Huygens family itself, as can be learned from an analysis of the extensive diary kept by Christiaan Huygens's brother Constantijn Jr. The Huygens brothers embodied the technical and cultural renewal of the seventeenth century. Science and culture, as is clear in their case, sprang from the same source—the wish to know the world. While technical devices like the pendulum clock contributed to knowledge of the material and public world in general, diaries—kept in growing numbers—produced an ever-increasing amount of knowledge about the mental and private worlds of their authors.

The Huygens Family

Three generations of the Huygens family have played an important role in politics, culture, and science in the Dutch Republic. The father of the brothers, Constantijn Huygens Sr. (1596–1687), held the prominent post of secretary to the Prince of Orange. He was a key figure in Dutch culture of the Golden Age and well known as a poet, classicist, musician, composer, and connoisseur of art; he also took great interest in natural science. In 1627 he married his cousin Susanna van Baele. Their eldest son, Constantijn Jr. (1628–97), also was appointed secretary to the Prince of Orange; after the Glorious Revolution of 1688, when Prince William of Orange became king of England, he usually spent winters in London, summers in Holland, and during the spring was often on military campaigns with the king. Huygens's second son, Christiaan, devoted himself full time to natural philosophy. The youngest son, Lodewijk, was the least scientifically gifted of the three and held a government post in a Dutch town. There was also a daughter, Susanna.

For Constantijn Huygens Sr. and Jr., writing was a profession, and as secretaries to the Princes of Orange they wrote enormous numbers of letters, memoranda, and other official papers. In writing, they also maintained contact with friends, artists, and scholars throughout Europe. Several members of the family wrote and published poems and plays. There was also a tradition of private writing within this family.² Constantijn Sr.

was a prolific writer of all kinds of egodocuments. He kept a diary, of which only a fragment has survived.³ He wrote travel journals and made notes in his almanacs, which are now in the Dutch Royal Library.⁴ His tendency toward self-observation is also revealed in a well-drawn self-portrait. He kept extensive notes on his children, which contained acute observations from their birth onward. When he was a mere thirty years old, he wrote an autobiography to serve as an example for his children.⁵ When he was in his eighties, he produced another autobiography, again written in Latin verse.

Constantijn Huygens Sr. stopped writing notes on his children when—as he wrote—he regarded them to be old enough to keep their own diaries. It is indeed very likely that his three sons obeyed their father. However, only the diary of the eldest son, Constantijn Jr., has survived. He started writing a travel journal during his grand tour in 1649 and 1650.⁶ Thereafter, his diary covers long periods during the years from 1673 to 1683.⁷ Some earlier parts of the diary may have been lost, but we still have a continuous text, in which he made daily entries, starting in 1688 and ending in 1696, the year before his death. Christiaan wrote much, mainly scientific tracts and letters [his complete works number twenty-two volumes], but unfortunately only two short travel journals have survived.⁸ The youngest brother, Lodewijk, left two surviving travel journals.⁹

The Huygens Family and Science

Technology, practical mathematics, and natural philosophy flourished in the Dutch Republic.¹⁰ The invention of the telescope and the microscope, which improved the measurement of space and time, and the subsequent advancements in the art of cartography were all symptomatic of the cultural shift that took place in the republic. Constantijn Huygens Sr. was a *homo universalis* who was skilled in many arts and sciences and followed new developments keenly. He combined the two spheres in his poetry, for example, in his laudatory poem to Antoni van Leeuwenhoek, in which he praised Leeuwenhoek's "glass keys"—his microscope—which "unlocked the secrets of nature."¹¹ Elsewhere he praised the telescope: "what a small ball shall the whole world become!" In another poem he compared the human body to a clock and the rhythm of the heartbeat to the ticking of clockwork ("Balance Wheel"). Huygens was an admirer of contemporary inventors and practical mathematicians of his time, such as Cornelis Drebbel, who had developed a craft that supposedly sailed underwater in the Thames, and Simon Stevin, who built a cart with a sail that is reported to have reached high speeds on the beach of Scheveningen.

An indication of the family's appreciation for technology is to be found in a 1668 portrait by Caspar Netscher of Geertruyd Huygens, Constantijn Huygens's sister, posing with a watch in her hand. It was customary to allude to time passing in portraits as a *memento mori*, usually by the depiction of an hourglass.¹² Mechanical watches, invented in the mid-sixteenth century, were still a rare possession at the time. The watch in the portrait could have a religious meaning. However, since this symbolism is already expressed in the portrayal of Father Time in the background, it is likely that the watch was included as a technical showpiece.

The portrait that Constantijn Huygens Sr. commissioned in 1627 from Thomas de Keyser also has a telling detail. Huygens is portrayed in his function of secretary, handing over a letter to a messenger. His desk is crowded with paper, inkpot, a quill pen, and, on closer observation, also an open timepiece. At that time watches were not part of the usual equipment of a secretary. Title pages of instruction manuals for secretaries, already widespread by then, only showed the writer with pen, inkpot, and paper. Twenty-five years later, on the frontispiece of *Secretaris d'à la mode*, for the first time a watch is added to these paraphernalia (fig. 6.1).¹³

Their father was quick to realize that his two eldest sons possessed great capacities. Constantijn Jr., born in 1628, picked up Latin quickly. After his studies in Leiden, he was appointed secretary to the Prince of Orange, just like his father. He was known as an authority on art, wrote Latin verses, and was an excellent draughtsman.¹⁴ He also had a great interest in the investigation of nature and assisted his brother regularly with experiments. Being very adept at grinding lenses for telescopes and microscopes, he customized them for his brother and at a later age wrote a treatise on the art of grinding lenses.

Christiaan Huygens, one year younger, was active in many areas of natural investigation.¹⁵ He constructed telescopes and discovered Saturn's rings and one of its moons. With his microscopes, he experimented with air and vacuum and was one of the first mathematicians to work on the calculus of probability. In particular, he made a great contribution to the improvement of the technology of time measurement. Until the middle of the seventeenth century, clocks remained inaccurate instruments because, among other problems, stored energy could not be transferred efficiently to the moving hand by means of weights and pulleys. In 1659 Huygens designed a clock in which the transport of energy was regulated by the constant movement of a pendulum. (The patent for building pendulum clocks according to this principle went, however, to a clockmaker in The Hague, Salomon Coester, in 1659.) For the first time a clock could have

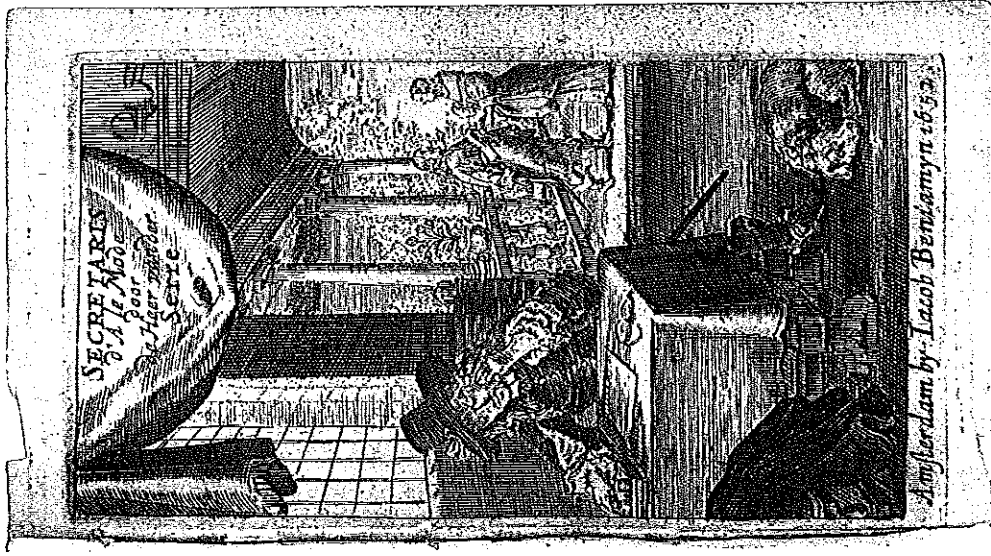


Fig. 6.1. Frontispiece of Jean Puget de la Serre's *Secretaris d'à la mode* (Amsterdam: Jacob Beniamyn, 1652).

a minute hand that worked with precision. Huygens published his findings in *Horlogium oscillatorium*, and his father promptly wrote a poem praising his son's invention.¹⁶ On a portrait from around this time, Christiaan was painted with his pendulum clock, as a parent would have himself painted with a child, and in a letter to his brother Lodewijk, he wrote that he viewed his inventions as children of the mind (fig. 6.2).

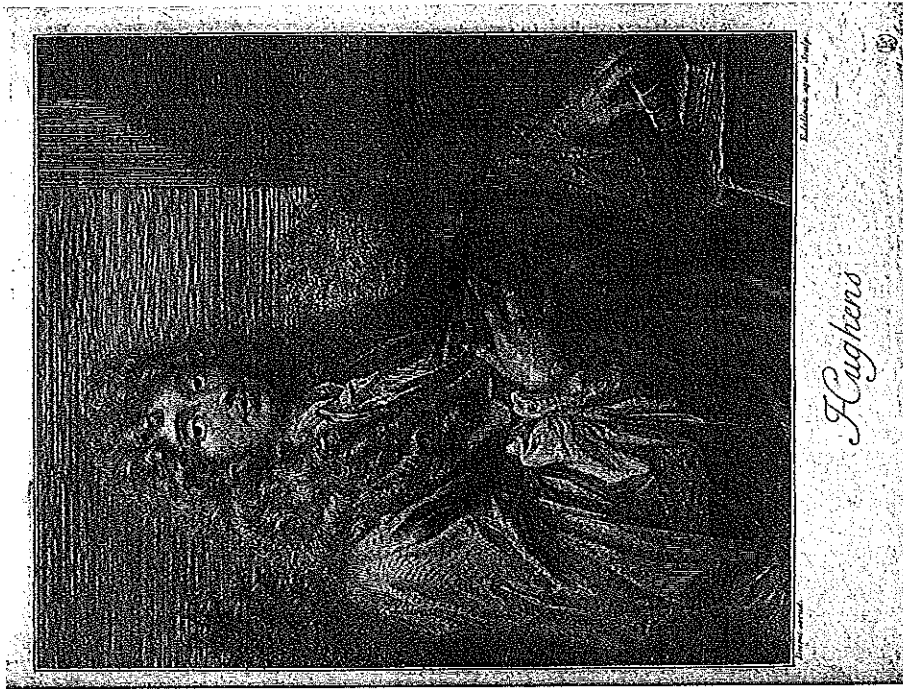


Fig. 6.2. Christiaan Huygens, engraving by C. Edelinck, 1686; Huygensmuseum, Hofwijck. Huygens's inventions, his books and clock, stand on the table to his left.

More precise time measurement was essential to position finding on ships at sea. A clock that could give precise local time during the journey made calculation of longitude more accurate. The problem with longitude determination had impeded the exploration of the world for centuries, and in 1610 the Dutch States General announced a reward of 15,000 guilders to the person who could solve the problem. Huygens had built his pendulum clock for use at sea, hoping to receive the reward. Initially, his clocks were tested at sea with success. In 1665 Huygens published a manual for his

sea clocks, *Kort onderwys aengaende het ghebruyck der horologien tot het vinden der lenghte van Oost en West*.¹⁷ The clocks were not good enough during bad weather, however. To solve this problem, Huygens invented the spiral spring as an alternative to the pendulum, a discovery for which he received a patent in France in 1675. The spiral spring could also be used in watches, improving the reliability greatly. Initially, watches were considered jewelry rather than instruments, but now they were functional as well.¹⁸ Christiaan Huygens came to be considered the first great horologist. And that was great praise, especially in a time when God came to be viewed as the great watchmaker of the universe.

The Diary of Constantijn Huygens Jr.

The diaries of Constantijn Huygens Jr. and of Samuel Pepys have much in common, if only because both wrote often about sex.¹⁹ Constantijn Jr., however, mainly wrote about the sexual adventures of others, particularly Dutch regents and courtiers of the Prince of Orange. His diary is full of gossip and a gold mine for the history of sexuality.²⁰ He also wrote much about his wife and son, as well as about his domestic servants.²¹ The reader is informed of his professional practice as secretary in a manner that would not have been possible using only official documents.²² Moreover, Huygens wrote of many other subjects, from feasts and games to magic and witchcraft.²³ He was generous with the trivia that give a diary local color. His diary, now kept at the Dutch Royal Library, is in his own handwriting; it comprises seven volumes, with entries that cover the period between 1673 and 1683²⁴ and daily entries from 1688 to 1696.²⁵ In the years before 1682 Huygens usually wrote in French, after 1688, mainly in Dutch. The diary was, like that of Pepys, private and not meant for others to read. Once in a while, he would use a letter code, which, since he was a secretary, took very little effort, and once he used a cipher code (9 July 1689). This is another similarity to Pepys, who used the shorthand in which he was skilled. Nevertheless, Constantijn Jr. took great care to ensure that no one would read his diary. Once he noticed that there was a section missing and feared it had fallen into the wrong hands. A few days later he found the missing pages, to his great relief, as he noted in his diary. Constantijn Jr. kept his diary in a locked writing cabinet that also served as a traveling desk, which he took with him when he accompanied the king during military campaigns. It was solidly built and had a secret drawer for money (12 September 1694). Once, he lost his key and could not get to his papers and a locksmith had to be called to open the cabinet (12 February 1691).

Like Samuel Pepys, Constantijn Huygens Jr. made daily notes with great regularity. Over the entire nine-year period between 1688 and 1696 he missed only 25 days. In all those cases he would later note that he had forgotten to write (see, e.g., the entry for 28 November 1694). We have this type of information because he wrote his diary first as a draft, which he would write out in a clean version at set times. Then he would notice these omissions. It is only the final version that has survived. Once in a while he would mention in his diary that he took his draft notes to write out a clean copy. On 4 June 1694 he wrote, "In the evening I wrote a part of these notes, to catch up," and on 26 March 1696: "I copied a part of this journal this morning." Constantijn Jr. had a well-trained memory. As secretary to Prince William he frequently had to memorize dictated letters, without being allowed to make notes, to write out later. Only once does he mention that he had to return to the king to inquire about a forgotten detail. At another time, he wrote in his diary that he had forgotten the names of two members of a certain party (24 February 1690). On another occasion he later added to a story he had noted down: "This turned out not to be true" (27 July 1696). Once he also corrected the chronology and added in the margin that a certain meeting had taken place a day later (19 March 1694). Additions at a later date, such as on 9 June 1693, are rare. The diary served in the first place as an *aide-mémoire*, and once he describes in detail a room in which he was lodged "simply for the sake of memory."

Characteristic of Huygens's diurnal temporality are the many observations made on the spot. "Looking out of the window I saw boys throwing snowballs at carriages passing by," he writes on 16 February 1692. Or, on campaign, he notes that he saw a lizard walk through his tent or that he found a louse in his coat (26 August 1695). Another characteristic of Huygens's diurnal temporality is that each day contains an entry even on the days when nothing of note happened, such as "I didn't have visitors the entire day" (24 February 1693) or "I was not out and nothing happened" (29 November 1695). On 22 May 1691 he wrote: "I did not get out in the afternoon, got to reading." Constantijn Huygens Jr. wrote, just as Pepys did, to the rhythm of time measured with the newest technology. His daily notes always followed a strictly chronological pattern. Usually he used the labels "morning," "noon," and "evening." The flow of time in the diary is uninterrupted and even. It recalls the linear, objective notion of time that was introduced by Newton and replaced the traditional, cyclic notion of time.²⁶ Occasionally, Constantijn Jr. gave a more precise indication of time, for example, when he awoke at one o'clock in the morning and could not fall back asleep (8 September 1695), or when he spoke to someone

for "three quarters of an hour" (19 July 1694). In short, the connection between the Huygensian chronometry and the diurnal form of writing can be made between the two Huygens brothers. Christiaan, the horologist, and Constantijn Jr., the diary writer, were dealing each in his own way with a new notion of time they themselves were producing.

The connection between diary and newspaper, suggested by Stuart Sherman, is also traceable to Constantijn Huygens Jr. He regularly made note of what he read in the newspaper. On 12 November 1695, after his arrival in Holland, he states that his return from London is mentioned in Dutch newspapers: "My return is reported in the newspapers." It is the first diary entry in which the writer reacts to being mentioned in the newspapers. None of his almanacs have survived, but presumably he made as much use of this type of printed work as had his father. It is certain that he provided Queen Mary with almanacs, for on 1 May 1691 he received a visit from a lady-in-waiting, Miss Vijgh, who, on behalf of the queen, thanked him for the almanacs he had had delivered to her.

The well-organized diary of Huygens stands in contrast with many earlier diaries, like that of the Frisian farmer Dirck Jansz, one of the earliest examples in the Netherlands. Jansz was born in 1578 or 1579 and kept a diary between 1600 and 1636, but very irregularly. He made dozens of notes each year, but not in chronological order, and he obviously possessed a different attitude toward time.²⁷

Constantijn Huygens Jr. and Science

In his diary Constantijn Jr. regularly shows interest in the investigation of nature, and it turns out that he had quite a reputation in this area. On 18 July 1692 he wrote that the king had said to a visitor about him: "il est le plus grand astronome du monde!" It is one of the few times he uses an exclamation mark. On several occasions he mentions meetings with like-minded persons and conversations about science. For example, on 18 October 1690 he was visited by the daughter of Cornelis Drebber, the famous inventor who was admired by his father. She told him many details about his legendary submarine, for instance, that a "pipe with quicksilver" provided the air supply.

Only a few days after his arrival in London during the Glorious Revolution of 1688, Constantijn Jr. received a visit from someone who said he had known his brother in Paris and offered to introduce him to natural philosophers such as Boyle, Newton, and Wallis (8 January 1688). Then the conversation turned to a long discussion of the merits of Chinese astronomy.

Two weeks later, Christiaan himself arrived in London and introduced his brother to members of the Royal Society of London for Improving Natural Knowledge. The society had been founded thirty years before, with Christopher Wren and Robert Boyle among its first members and Robert Hooke as its curator. The society met weekly to discuss the investigation of nature. Christiaan Huygens had been chosen as a member in 1663 and had since been in contact with English members. The brothers' father, Constantijn Sr., also corresponded with the society, apprising them of his son's discoveries.

Constantijn Jr. maintained regular contact with the society. On 16 January 1692, for example, he described a dinner with eight to ten members in an inn, Pontac, as the society did not yet have its own housing. Among those present were President Robert Southwell, Vice President Thomas Henshaw, Hans Sloane, Patience Ward, and William Stanley. During this dinner Huygens raised a question: why was the *Philosophical Transactions* published by the society "so meager and small" of late? They told him that once the war with France was ended, it would be thicker again. The lack of interest shown by the editors Hale and Hooke was also blamed. On 18 December 1696 Constantijn Jr. attended a meeting at which Halley lectured for no less than two hours. Once in a while Constantijn Jr. would drop in on the bookshop of the printer of the *Transactions*, Smith [as on 3 and 4 March 1694 and 26 December 1695]. He always bought copies when they came out, as he did with other books on natural topics. When on 20 February 1693 Stanley showed him the recently published *History of the Air* by Robert Boyle, he "promptly sent a servant to buy the book in the city," as he noted that same evening in his diary. His scientific interest was great, but often he was too busy to attend meetings. On 3 December 1690, for example, he mentioned that Stanley had forcibly tried to take him to a Royal Society of London dinner, for which he had no time and no desire.

In those years Constantijn Huygens Jr. kept track of Isaac Newton. On 10 July 1689 he wrote that his brother Christiaan went to the king with Newton to "recommend him for a vacant regency for a college in Cambridge." They did not succeed. In 1694 he heard from Christiaan that Newton had gone mad for a while and had suffered from "phrenesia" for eighteen months. Whether or not Constantijn Jr. ever met Newton himself remains unclear. Presumably he did know Robert Boyle personally. He tells several stories about him in his diary, such as on 10 September 1690, when he had heard from someone that Boyle had ingested enough arsenic to kill a hundred people, but that he, with a drop of a preparation, had vom-

ited it all out and felt fine again. On 1 July 1689 Constantijn Jr. visited one of the founding fathers of the society, Christopher Wren. He spoke most frequently with the mathematician Nicolaas Fatio de Duilliers, as courtier and his equal, who, among other things, improved the watch with the use of diamonds. On 3 September 1689 Constantijn Jr. went to Greenwich to visit the famous observatory and to meet the director, John Flamsteed. This entry is probably the first reference to the word "observatorium" in the Dutch language.²⁸ It is also fairly certain that the diary contains the oldest mention of the word "laboratorium" (3 December 1690) in Dutch.²⁹

Constantijn Huygens Jr. was always enthusiastic when he met others with an interest in natural matters, as he was on 3 March 1690, when a Scottish lord asked him during the king's *concher* if his brother or his father was the inventor of the pendulum. He also received visits from inventors and technicians who hoped that he would put in a good word for them with the king. For example, on 1 February 1690 he received a visit from an engineer who wanted to introduce fire engines in London. On 24 January 1692 Constantijn Jr. heard Halley, known mainly as an astronomer, tell of his "ability to stay under water for an hour and longer, having an invention to let the used air out of his diving-clock as new air from a container is piped back in." On 4 February 1695 he received a visit from an engineer named Tompson who said he was working on a new "invention" by which a diver could get air through a pipe and then go to a depth of twenty fathoms, "but that from there the pressure of the air was so great that one couldn't stand it." Such vivid stories speak to the imagination.

Natural investigation and alchemy were strongly related, as shown by a note made on 20 June 1689, when Constantijn Jr. heard from his brother Christiaan that Robert Boyle had received a visit from a man "who, in front of him, made an ounce of gold from lead with a powder that was red and clear." Constantijn Jr. noted in the same entry that he had heard that the man was later arrested in France. A little after that, on 5 July 1689, Constantijn Jr. heard a similar story, about making gold from quicksilver. The inventor—or alchemist—had passed away in the meantime and had taken his secret with him to his grave. Then there was an old friend from the army with whom he spent much time, the engineer Willem Meester, who produced explosives to blow up forts and prepared ships that could blow up enemy ships and coastal works (3 September 1694).³⁰ Meester also made fireworks for parties (11 April 1694), but this apparently did not appeal to Constantijn Jr., who seemed to show more interest in their utility (as he noted often in his diary) than their potential for entertainment.

Clocks and Watches

The measurement of time occupied Christiaan Huygens for his entire life, and this interest was shared with his brother Constantijn. After Christiaan had invented a well-regulated spring for watches in 1675 while staying in Paris on a pension from King Louis XIV, the French king soon received a particularly fine specimen. Soon after, such a watch was made for the Dutch stadtholder William of Orange, despite the ongoing war between France and the Dutch Republic. In April 1675 Christiaan wrote a letter to his brother with instructions on how the prince should carry the watch, namely, in a sachet on his belt and not in the pocket of his trousers. Two months later the watch was sent from France.³¹ Constantijn Jr. made a note of its arrival in his diary on 17 July 1675: "At eight o'clock in the evening Mr. Boreel arrived with the mail from Paris. His Highness immediately asked if he had not brought his watch. He said yes and gave him the small box containing it. Willem Meester and I got it moving and His Highness showed how happy he was with it and received great pleasure from watching it move." In those years William III and Louis XIV fought against one another on the battlefields, and it is remarkable to learn that one brother was instructing the stadtholder while the other was instructing the king in the use of this new instrument.

Constantijn Jr. wrote much about his watches—he possessed several—in his diary over the years from 1688 to 1696. Having barely arrived in London with the stadtholder, Constantijn Jr. paid a visit to clockmaker Lownes on 13 January 1688 to have his watch repaired. He was clearly impressed with the English clockmakers and noted: "He made 'repeating watches' small and large, the large ones very neat and handsome." A few days later, on 22 January, he and his friend Meester paid a visit to the best clockmaker in England, Thomas Tampion: "Went to see Tampion, the watchmaker, with Meester in the morning. He showed me a repeating pocket watch." In the following years Tampion remained the clockmaker with whom Constantijn Jr. maintained regular contact for the purchase and repair of clocks and watches, but also to have an occasional conversation. Constantijn Jr. was important to Tampion because he could recommend him to the court. On 10 March 1688 Constantijn Jr. wrote that he had picked up a pocket watch from Tampion that "sounded on the hour and quarters" to show it to the king.

Constantijn Jr. was impressed by this clockmaker, whose workplace looked like a factory, as is apparent in the entry dated 30 September 1690: "I went to see Tampion during the morning, and had him make a silver

watch and repair my golden one. I noticed he had at least 20 apprentices, each in a room, all working for him and he provided for all of them." The store was a meeting place for those interested in technology. On 18 July 1689 Constantijn Jr. and his brother Christiaan stopped by to purchase a "ring-sundial." A sundial was still an important instrument among the arsenal of time measurers and was essential for setting clocks. On 12 December 1690 at Tampion's shop he met Flamsteed again, the director of the observatory in Greenwich, who was also a regular visitor there.

Smooth-running clocks were of great importance, especially for determining longitude at sea. As did the Dutch Republic, the British government offered a reward to the one who could solve the problem. In all of Europe clockmakers were trying to claim the reward promised by the London Admiralty with the perfect clockwork to measure the hour. Constantijn Jr. received firsthand information about the attempt made by the French clockmaker Thuret: "In the morning I received a visit from Dr. Stanley, who told me, having been at the Royal Society meeting as a member, . . . that Thuret, watchmaker from Paris, had also been there, claiming to have the invention of the longitudes" (29 November 1689). The Frenchman's clock could not, however, withstand the test. It would take many decades before the first reliable sea clock was made.

Another favorite theme of conversation among clockmakers was patents for different findings and improvements. Christiaan Huygens had already had problems with obtaining the patent for the pendulum, and later he would have trouble over the English patent for the spiral spring. Inventors and clockmakers were in competition with one another frequently and were not above stealing ideas from each other. In 1675 a conflict broke out about the English patent on the spiral spring between Christiaan and Robert Hooke, who claimed to have made the discovery earlier. The Royal Society of London intervened but were not able to bring the two men to an agreement. On 9 December 1690 Constantijn Jr. made his rounds to the London clockmakers once again. First he visited Lownes, where he had seen a "repeating clock" that would run for eight days and sound every hour, it cost sixteen pounds sterling. Then he went to see Daniel Quare, where he saw a similar clock said to cost twenty-eight pounds. He also saw a "repeating pocket watch" that cost sixty pounds. This watchmaker told him all about the conflict he had had with Tampion about the patent for the "repeating pocket watch."

These clockmakers also made other instruments, such as barometers. On 14 December 1694 the king summoned his secretary to show him his new barometer, made by Quare, which was—and this was new—portable.

Tampion could not let such a success by the competition go unmatched. On 14 April 1695 he visited Constantijn Jr., who noted he was carrying a portable barometer. Tampion was on his way to the king to ask for a patent similar to the one Quare had received. On 6 June 1695 Constantijn Jr. visited Tampion's store and saw the instrument: "He showed me his newly made barometers."

When Constantijn Huygens Jr. was in the Netherlands, he went to see Dutch clockmakers, such as Van der Cloese in The Hague (23 and 25 November 1693). He had taken a clock from Oosterwijck with him to England, as he noted on 27 October 1695: "Went by Tampion and retrieved my pocket watch. Sent him my standing clock made by Oosterwijck, which needed some repairs." In October 1694 Constantijn Jr. was in Holland and visited his brother Christiaan at the family country house in Hofwijk "and saw there his newly invented pendulum clock" (8 October 1694, 21 May 1694). Christiaan worked with several clockmakers and constantly invented improvements.

Constantijn Huygens Jr. had an ever-changing arsenal of standing and hanging clocks, pendulums, watches, and sundials. He was constantly purchasing new clocks and watches and exchanging old ones. All of these continually had to be readjusted and repaired. There were periods in which Tampion and Constantijn Jr. saw one another weekly, such as in the winter of 1691-92 when Constantijn Jr. had bought a new "pulling clock." Sometimes Tampion came by to adjust the clock, and on other occasions Huygens brought his clock to the store. A series of such entries ends on 27 February 1692: "In the morning I went to Tampion, under the impression that my pulling clock was not working properly, but found her to be wound down completely." ("Pulling clock" is the English term used by Constantijn Jr., who in his diary now and then throws in some English phrases.) Constantijn Jr. possessed a watch with a key, a detail that personalized this type of clock, but such a small key could easily get lost. On 1 June 1691 he noted: "I bought a new key for my pocket watch, having lost the old one."

At the royal court Constantijn Huygens Jr. was known as the expert on watches. During his campaign in 1690 King William sent a servant to borrow Huygens's watch when his own broke: "The king had sent Baersenburg in the morning to borrow my watch, his being out of order" (20 July 1690). During the military campaign in the southern Netherlands the following year, King William appealed to his secretary again: "I was in the dining room in the afternoon when the king seated himself, spoke to me about his watch, and borrowed mine again" (8 August 1691). In return the king

showed his secretary his newest acquisitions, as on 14 December 1694: "He said he had a repeating watch from Quare which was better than that of Tampion."

Finally, it was Constantijn Huygens Jr. who introduced the phrase "time management" into the Dutch language. On 1 September 1690 he said to Queen Mary that she "managed her time better than I do." This was a polite compliment, and not completely true. In his diary it is apparent that Constantijn Huygens Jr. carefully managed his time, making a report of his activities at the end of each day. The two Huygens brothers, Christiaan and Constantijn Jr., were in fact both specialists in time management in their own ways: one as an inventor of clocks and the other as a modern diary writer.

Conclusion

Christiaan and Constantijn Jr. Huygens were both original and creative in their own right, but their innovations are also part of the Dutch culture of the seventeenth century. The modern diary and the precision clock both resulted from more general changes: the rise of modern time awareness and the diurnal form. There are several similar developments, for example, the change in character the almanac underwent around 1650. Almanacs had been printed for more than a century but now became more practical books with useful information, such as market hours, travel times, and departure times of towboats and mail carriages. Blank pages for notes were added. Furthermore, the circulation was much larger than before. Almanacs from then on played a more and more important role for more and more people in planning their lives.³²

The rise of the shipping journal also occurred in the middle of the seventeenth century. On the ships belonging to the Dutch East India Company, the skipper and the helmsman were required to keep a daily register. Starting in 1650, lined journals with preprinted columns were handed over to them at departure and were to be returned on their arrival. Such journals were implemented on warships not much later. In the archives of the Dutch East India Company and the Dutch Navy the number of journals increases from the middle of the seventeenth century. After 1670 helmsmen of the fleet kept journals. Journals were probably kept less frequently in the merchant fleet, but there, too, more and more seamen kept some sort of journal.³³ In a sense, Constantijn Huygens Jr.'s diary had the same purpose as a ship's log, in his case determining his own position within the turbulent world of the royal court.

These developments around 1650 fit within the cultural climate of the republic as a whole in the first half of the seventeenth century. Investigating, recording, and describing are also reflected in Dutch painting, as Svetlana Alpers, among others, has shown.³⁴ A favored subject of Dutch painters in this time was the still life in which both writing instruments and watches are depicted, with a diary often added to the scene as well. Such a still life was painted in 1668 by Maria van Oosterwijck (plate 2), whose art Constantijn Huygens Sr. praised in a laudatory poem. All the objects in her painting are replete with religious symbolism, but they can also be interpreted as a reflection of the close connection between time measurement and diary writing that arose during this time. This painting, the numerous diary entries surveyed in this essay, as well as the very act of keeping a diary, speak to the ways in which all the objects of timekeeping depicted by Maria van Oosterwijck structured not only individual lives but also large-scale enterprises of overseas commerce and empire. But more than this, timekeeping, in all its written and mechanically measured modes, shaped understandings of the individual self at the same time that it helped form a new picture of the cosmos.



The Moral of the Story: Children's Reading and the Catechism of Nature around 1800

ARIANNE BAGGERMAN

No! Go on: it is something else to know that there is some unknown, planets and stars, mock suns and mock moons, water and land, sea and rivers, humans and animals, birds and fish, insects and plants; something else to contemplate all these carefully in the prescribed manner. To observe, dear pupil! has great advantages over hearing and reading. You must, whenever possible, see everything."¹ With these words the eighteenth-century author J. F. Martinet exhorted his young readers to lay aside their books and go outdoors to see nature, to feel, smell, taste, and—armed with microscopes, telescopes, and other equipment—test it. Wisely, he only did so at the conclusion of the roughly 1,600 pages of his *Katechismus der natuur* (Catechism of the Natural World), when all of creation, from a grain of sand to the human body, had been duly described. In the preceding text the author was less drastic, but he repeatedly encouraged his readers not to limit themselves to reading his book. Their book knowledge should be supplemented by active research out-of-doors. And the actual reading of the book could also be regarded as a walk. It was written in the form of a dialogue in which, during a long hike through various regions of the Netherlands, the master drew the attention of his pupil to the natural world in all its aspects—from the structure of snowflakes, birds' feathers, and grains of sand to the formation of sand dunes, the disposition of the stars, and the structure of the human body.

This encyclopedic knowledge, in combination with the way it was presented, served to foster an awareness of the miracles of creation in young readers, to enrich them with the power of amazement at the natural world, to enable them to enjoy it, to find peace there, but especially to learn a wise lesson. Whether it was the ebb and flow of the tides, the way in which spiders weave their webs, or the path of the earth around the sun,