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Engineers as Artists – Artists as Engineers

The Reproduction of Art Objects at the World's Fairs

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Abstract

"The Great Exhibition of the Industry of all Nations", held at the Crystal Palace in London in 1851, hosted an array of objects that testified to both artistic and technical virtuosity, while their display served as a spectacle for the public. This paper takes up the rich history of mechanical technologies in the service of art using the example of the machine for reproducing sculptures, which was presented as a cutting-edge innovation at the Great Exhibition. Drawing on the history of early photography and in particular the historical context of various techniques of three-dimensional reproduction (such as the 'photo-sculpture' introduced later in 1862), the process of reproducing and displaying works of art on a small scale will be explored. The study of mechanically minded sculptors, who celebrated the almost magical qualities of their machines and the demonstration of the production processes, reveals their ambition to join the ranks of the great inventors, alongside the situation of the pioneers of early photography. The presentation of sculptures, reliefs and *objets d'art* in the milieu of technical knowledge, industry and manufacture at the universal exhibition of 1851 is thus put up for discussion, also with a view to subsequent international exhibitions.

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"Misfit objects"? - An introductory exploration

[1] The essence of the 19th-century world's fairs was the comprehensive collection and display of objects from all corners of the world, regardless of their nature. The first of its kind, "The Great Exhibition of the Industry of all Nations", held in London in 1851, showcased art and artefacts alongside domestic and industrial products, new technologies, and inventions. Inside London's Crystal Palace, visitors were captivated by an array of spectacles, including a demonstration of "James Nasmyth's steam hammer" or "the great Ross telescope and some photographic apparatus".[1] The exhibition featured a range of objects that demonstrated both artistic and technical virtuosity: Manufacturing machinery and tools were decorated with architectural elements, such as a 'Gothic' style engine by W. Pope & Sons of London, or the cotton gin by B. Hick & Sons of Bolton, which incorporated motifs from ancient Egyptian culture, including a winged scarab and ornate columns.[2] Technological progress, particularly as it related to art and its reproduction, reached a high point at the first world's fair. Not only did industrial and technological achievements merge with art, but within the realm of art itself, the traditional academic hierarchy seemed to be circumvented for the first time: "The relationship between the arts was given a further fluidity by the display of figurative sculpture in close relationships to quite other artefacts."[3]

[2] Unsurprisingly, Nikolaus Pevsner later described the apparent mixture as a "bastardization of period styles". Among the exhibits, the spectator could discover a "four feet tall" vase, "not of silver as it would at first appear, but electro-plated".[4] Designed by the physician and sculptor William Beattie for the British firm of Elkington & Mason, the vase was made by using the recently invented manufacturing process of electrotyping "to represent the triumph of Science and the Industrial Arts in the Great Exhibition". On the vase, the figures of Shakespeare for poetry, Bacon for philosophy, Newton for astronomy and James Watt for mechanics appeared as representatives of a new era and modern allegory, while on the four reliefs "between the figures, the practical operations of Science and Art are displayed, and their influence typified by the

[1] Charles Ryle Fay, *Palace of Industry, 1851: A Study of the Great Exhibition and its Fruits*, London 1951, 1. See also Anthony Hamber, ed., *Photography and the 1851 Great Exhibition*, New Castle/Delaware/London 2018, 229 and 263-264.

[2] Nikolaus Pevsner, *High Victorian Design: A Study of the Exhibits of 1851*, London 1951, 7-8.

[3] Giles Waterfield, *The People's Gallery, Art Museums and Exhibitions in Britain 1800–1914*, New Haven/London 2015, 89.

[4] Pevsner (1951), 4.

figures on the base".[5] In the manufacturing inventions displayed at the Great Exhibition of 1851, Pevsner observed an "elevation of mechanics and applied science to the level of philosophy and the fine arts".[6]

[3] Already in his 1843 article on "Photogenic Drawing", Sir David Brewster, who "invented the first really useful form of the lenticular stereoscope in 1844", classified the newly developed technique of electrotyping as one of the "imitative arts".[7] In two essays, Patrizia Di Bello draws attention to the fact that Brewster linked this electrical process to early photography as well as to mechanical inventions such as "the art of multiplying statues machinery",[8] which could be identified with Benjamin Cheverton's machine for reproducing sculpture (Fig. 1). All of these "engines of the fine arts"[9] were presented to an international audience at the Great Exhibition of 1851 and subsequent world's fairs. The shifting notions of the relationship between art, industry and science led to a certain ambiguity as to whether the specific objects on display should be considered artistic, mechanical or scientific – or all of the above. In the case of the 1862 London International Exhibition, for example, Di Bello not only finds a "rich case study for exploring the relations between sculpture and photography", but also points to the ambivalent perception of reproduction techniques at the time: "Its systematic inclusion of the Fine Arts galvanised public discussion of the status of photography as a fine or mechanical art."[10]

[4] Although the exhibits' commonality was that they were made using a wide variety of reproduction techniques, some of them nevertheless had a controversial status in the exhibition, as they could not be easily integrated into any one section. Mirjam Brusius explores this difficulty of "objects without status" in the specific colonial context of archaeological objects and photographs from Mesopotamia displayed at the 1851 world's fair and subsequent exhibitions.[11]

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[5] Quoted according to Authority of Royal Commissioners, eds., *Official Descriptive and Illustrated Catalogue: Great Exhibition of the Works of Industry of all Nations*, vol. 3, London 1851, 672, and plate 11, DOI: https://doi.org/10.3931/e-rara-21827. For another illustration of the vase and a description of the process, see: *The Illustrated Exhibitor, a Tribute to the World's Industrial Jubilee; Comprising Sketches, by Pen and Pencil of the Principal Objects in the Great Exhibition of the Industry of all Nations 1851*, London 1851, 57, DOI: https://doi.org/10.11588/diglit.1401 (accessed August 4, 2021).

[6] Pevsner (1951), 4.

[7] Sir David Brewster, "Photogenic Drawing", in: *Edinburgh Review* 76 (January 1843), 309-344: 312, cited in: Patrizia Di Bello, "'Multiplying Statues by Machinery': Stereoscopic Photographs of Sculptures at the 1862 International Exhibition", in: *History of Photography* 37 (2013a), no. 4: *The Sculptural Photograph in the Nineteenth Century*, 412-420: 412, DOI: https://doi.org/10.1080/03087298.2013.780750; Sheridan Muspratt, *Chemistry: Theoretical, Practical, and Analytical, As Applied to Arts and Manufactures*, vol. 2, London/Glasgow/Edinburgh 1860, 712.

[8] Brewster (1843), 312, cited in: Patrizia Di Bello, "Editorial", in: *History of Photography* 37 (2013b), no. 4: *The Sculptural Photograph in the Nineteenth Century*, 385-388: 385, DOI: https://doi.org/10.1080/03087298.2013.851908.

[9] Brewster (1843), 312, cited in: Di Bello (2013b), 385.

[10] Di Bello (2013a), 412.

[11] Mirjam Brusius, *Fotografie und museales Wissen. William Henry Fox Talbot, das Altertum und die Absenz der Fotografie*, Berlin 2015, 19, 139.

Contrary to what might appear at first glance, it was in fact precisely the inclusion of such "misfit objects"[12] that determined the impact of world's fairs. According to Georg Maag, the significance of universal exhibitions was "constituted by relatively accidental objects, which – more than the image of technical progress as a whole – became the essential content of the experience".[13]

[5] The notion of the 'misfit' or 'accidental' object as a defining feature or pars pro toto of the 1851 world's fair is best illustrated in the field of reproduction technologies and their material output: objects from both the fine and mechanical arts, such as photographs, lithographs, stereoscopes, pictorial motifs minted on coins, and small copies of sculptures, drifted like 'multiples'[14] along the boundaries between art, technology, and science. The range of techniques and materials used in the reproduction processes was impressive. In the 'Print' category of the Austrian section, it included

> *[x]ylography, engraving, type-founding, stereotyping, whether by plaster moulds or by means of gutta percha and the galvano-plastic process, electro-metallurgy, by which fossil fishes and animals buried in the antediluvian era are reproduced upon paper; galvano-graphy, galvanotype, chymitype […]*.[15]

In the reports of the "Great Exhibition of the Works of Industry of All Nations" of 1851, this variety of multiplying techniques, used in a great many disciplines such as archaeology, biology, engineering etc., was considered an achievement of the two fields of art and science. Both were considered to have a common destiny:

> *[A]ll those new appli-cations [sic] of art and science which dimly foreshadow an unknown future, are represented here; and lithography, that new sister of typography, also appears, with the new adjuncts of chromotypy [sic] and chromo-lithography […] and has accelerated the progress of the art by numerous experiments of all kinds*.[16]

[6] It is worth noting that the term 'experiment' is used in this passage in the context of the interaction between fine art and industrial products, which together vaguely hint at an unknown future. This refers to the potential of mechanical inventions to support the arts, which the text places in the future rather than the past, aligning with the 19th-century concept of 'progress' at

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[12] Mirjam Brusius, "Misfit Objects: Layard's Excavations in Ancient Mesopotamia and the Biblical Imagination in Mid-Nineteenth Century Britain", in: *Journal of Literature and Science* 5 (2012), no. 1, 38-52. The term as it is used in the title of her essay does not occur further in the text. Brusius is currently researching "Objects without Status between Middle Eastern Excavation Sites and Europe's Museums", see: URL: https://www.ghil.ac.uk/research/project-brusius (accessed March 1, 2022).

[13] Maag (1986), 78 [unless otherwise stated, all translations are mine].

[14] For the anachronistic use of this term see Buket Altinoba, "Das 'Multiple' im 19. Jahrhundert: Von Skulpturmaschinen, Techniktraktaten und Porträt-Miniaturbüsten", in: *kritische berichte* 48 (2020), no. 3: *Figuren der Replikation*, eds. Buket Altinoba and Maria Männig, 67-80.

[15] Authority of Royal Commissioners, eds., *Exhibition of the Works of Industry of All Nations, 1851. Reports by the Juries on the Subjects in the Thirty Classes into which the Exhibition was Divided*, 2 vols., London 1852, vol. 1, 399.

[16] Authority of Royal Commissioners (1852), vol. 1, 399.

its best. The first half of the 19th century witnessed the convergence of optical, mechanical, chemical, and electrical processes, leading to the proliferation of reproduction technologies. Given such diversity, it is essential to provide more contextual depth to some of these forms of reproduction and to elaborate on their interrelationships.

[7] The purpose of this paper is to analyse machines that incorporated at least one of these processes, such as the machine for reproducing sculpture (Fig. 1) presented by Benjamin Cheverton at the Great Exhibition of 1851,[17] or that combined several reproduction processes, such as the "photo-sculpture" demonstrated at the "International Exhibition of Arts and Manufactures" in Dublin in 1865 and the "Exposition universelle d'art et d'industrie" in Paris in 1867. These exhibits, consisting of two- and three-dimensional reproductions such as photographs, stereoscopes, machine-made profiles or sculptures, raised questions about the use of chemical and mechanical processes to reproduce art. How did these cross-border works fit into the categorising systems of the exhibitions and, more importantly, how did they relate to each other?

[8] Until now, reproduction techniques have been largely neglected in the literature on world's fairs, and the visual arts have been discussed separately from industrial products.[18] The following pages draw on more recent studies such as Jasmine Allen's on stained glass[19] and explore the development of sculptural objects in the milieu of technical knowledge, industry, and manufacture at the Great Exhibition of 1851.[20] The subsequent international exhibitions, for which the Great Exhibition served as a model, are important sites for reflecting on the relationship between art, industry, and commerce in 19th-century visual culture, as Kate Nichols and Rebecca Wade have shown.[21]

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[17] Paul Atterbury and Maureen Batkin, eds., *The Parian Phenomenon: A Survey of Victorian Parian Porcelain Statuary and Busts*, Shepton Beauchamp 1989, 18.

[18] This latest publication is an important exception: Kate Nichols and Rebecca Wade, "Art versus Industry? An Introduction", in: *Art versus Industry? New Perspectives on Visual and Industrial Cultures in Nineteenth-Century Britain*, eds. Kate Nichols, Rebecca Wade and Gabriel Williams, Manchester 2016, 1-19.

[19] Jasmine Allen, *Stained Glassworlds: Stained Glass at the International Exhibitions 1851–1900*, PhD thesis, University of York 2013, https://etheses.whiterose.ac.uk/3991/.

[20] This text draws in some respects on the findings of previous articles of mine, see: Buket Altinoba, "Das 'Multiple' im 19. Jahrhundert: Von Skulpturmaschinen, Techniktraktaten und Porträt-Miniaturbüsten", in: *kritische berichte* 48 (2020), no. 3: *Figuren der Replikation*, eds. Buket Altinoba and Maria Männig, 67-80; and Buket Altinoba, "'Curious Machines': Reproducing Sculpture via Machine and Its Modus of Display in the Nineteenth Century", in: *The Sculptural in the (Post-)Digital Age*, eds. Mara-Johanna Kölmel and Ursula Ströbele, Berlin 2023, 37-57. On the topic of reproduction and the world's fairs see: Di Bello (2013a and b); Michele Bogart, "Photosculpture", in: *Art History* 4 (1981), no. 1, 54-65; Gabriel Williams, *Industry and the Ideal: Ideal Sculpture and Reproduction at the Early International Exhibitions*, PhD thesis, University of York 2014, https://etheses.whiterose.ac.uk/8287/; and Isabel Hufschmidt, *Die Kleinplastiken von James Pradier. Skulptur im industrialisierten Kunstbetrieb des 19. Jahrhunderts*, Stuttgart 2011.

[21] Cf. Nichols and Wade (2016), 8.

Art and its reproduction on display

[9] While the Great Exhibition of 1851 in London divided the British section into "a thirty-point class system",[22] the classification of objects remained somewhat ambiguous. Categories of engineering, science, manufacturing and artistic practice ran through the exhibition, with art as the 'leitmotif'. As a representation of contemporary interpretations of industrial 'progress', the exhibition was organised into six main sections, which were subdivided into classes, then divisions and finally groups:

> *1. Raw Materials (Classes I. to IV.), 2. Machinery (Classes V to X), 3. Textile Fabrics (Classes XI to XX), 4. Metallic, Vitreous, and Ceramic Manufactures (Classes XXI. to XXV.), 5. Miscellaneous Manufactures (Classes XXVI to XXIX), and 6. Fine Arts (Class XXX)*[23]

The classification system thus represented the course of industrialisation, starting with the raw material as the basis, progressing through the use of machines to create the product, to the stage of refinement, with art and artefacts forming a final category.[24] This hierarchical system, enriched by several subdivisions, laid the foundations for all future international exhibitions.[25] The process from raw material to processed product was also evident in the evaluation of the exhibits in the Fine Arts section. A distinction was made not only between art and industry, but also between the 'mechanical arts' and the 'useful arts', on the one hand, and the 'polite arts' and the 'liberal arts', on the other, in relation to a large number of industrially produced objects in the arts. The latter two terms – which can be traced back to Sir Henry Cole, who played a key role in the Great Exhibition and also established art and design education in Britain – eventually gave way to the term 'fine arts'.[26]

[10] In his handbook *The Exposition of 1851*, Charles Babbage distinguished between "the Fine arts and the Industrial arts" on the grounds that the "fine arts idealize nature by generalizing from its individual objects: the industrial arts realize identity by the unbounded use of the principle of copying".[27] By emphasising the benefits that could be gained in the industrial sector through the application of new copying technologies, and in the field of art through the use of reproduction techniques – namely for its dissemination – , Babbage envisioned the

> *union of the two, enlarging vastly the utility of both, [which] enables art to be appreciated and genius to be admired by millions whom its single productions would never reach; whilst the producer in return, elevated by the continual presence of the*

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[22] Jonathon Shears, *The Great Exhibition, 1851. A Sourcebook*, Manchester 2017, 57.

[23] *The Illustrated Exhibitor* (1851), pp. xli and 6; see also 22-24.

[24] Hermione Hobhouse, *The Crystal Palace and the Great Exhibition*, London 2002, 40.

[25] Allen (2013), 66; see also Williams (2014), 28.

[26] For these and further definitions see Waterfield (2015), 199-200.

[27] Charles Babbage, *The Exhibition of 1851 or Views of the Industry, the Science, and the Government of England*, London 1851, 48-49.

> *multiplied reproductions of the highest beauty, acquires a new source of pleasure, and feels his own mechanical art raised in his estimation by such an alliance*.[28]

[11] The exhibition site thus promoted the medium of sculpture, "prompting the production of new and ambitious works, while also providing a competitive environment in which sculptural production assumed special significance".[29] The commissioners chose to exhibit only sculpture and architecture because they evaluated both based on "the execution of their details on mechanical dexterity", and therefore judged these media, like all the other objects on display as part of the "production of Industry".[30] Painting, as a fine art, was therefore excluded from the exhibition altogether; while sculpture was given a privileged status in the so-called Sculpture Court of the Crystal Palace, and stood out "independently and relatively solitary in its representation of the fine arts".[31] In his dissertation *Industry and the Ideal: Ideal Sculpture and Reproduction at the Early International Exhibitions*, Gabriel Williams, quoting Patricia Mainardi, highlights the decision to present "sculpture as the 'creative' work of individual artists, rather than foundries or ateliers". With regard to the previous practices of industrial and commercial exhibitions in France, the new concept promoted at the London fair was a turning point: "'Considered half-art, half-métier, sculpture would occupy an ambiguous position throughout the nineteenth century; but here, for the first time in an industrial exposition, its [sculpture's] creative aspect was recognised.'"[32] According to *The Illustrated Exhibitor*, visitors could see classical statues alongside new techniques and materials used for reproductions in two and three dimensions:

> *Fine Arts. —Sculpture in gold and silver, copper, iron, zinc, lead; compound metals, such as bronze, electrum, &c.; simple minerals, as marble, stone, gems, clay, &c.; artificial materials, as glass porcelain, &c.; wood and animal substances, such as ivory, bone, &c. Productions in die sinking and in intaglios, such as coins, models, gems, and seals; architectural decorations; mosaics and inlaid work, enamels, encaustic and fresco painting; ornamental printing, lithography, zyncography, and models in architecture, topography, and anatomy*.[33]

[12] In the case of photography, the committee considered two different display sections, reflecting their own uncertainty about the medium's place within the taxonomy of the exhibition. While the vast majority of photographs and photographic equipment were exhibited in the

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[28] Ibid.

[29] Martina Droth, Jason Edwards and Michael Hatt, "Sculpture Victorious", in: *Sculpture Victorious. Art in an Age of Invention, 1837–1901*, eds. Martina Droth, Jason Edwards and Michael Hatt, exh. cat., New Haven/London 2014, 15-55: 21.

[30] Authority of Royal Commissioners (1852), vol. 1, 691.

[31] Paula Murphy, "British Sculpture at the Early Universal Exhibitions: Ireland Sustaining Britain", in: *The Sculpture Journal* 3 (1999), no. 1, 64-73: 64.

[32] Patricia Mainardi, *The Art and Politics of the Second Empire: The Universal Expositions of 1855 and 1867*, New Haven 1987, 25, cited in Williams (2014), 28.

[33] *The Illustrated Exhibitor* (1851), 9.

Machinery Hall of Section II (Classes V-X), and here in the division of "Philosophical Instruments, and Processes Depending Upon Their Use, Musical, Horological, and Surgical Instruments" (Class X), a small group of "seven British photographic exhibitors"[34] were placed in Section VI, "Fine Arts" (Class XXX), and specifically in the last division of this class, which comprised "Sculpture, Models and Plastic Art, Mosaics, Enamels, &c.".[35] The classification of photography, which was considered to be an object of both art and science, raised taxonomic questions: Partly displayed in the "Fine Arts" section, partly under "Machinery", photography was awarded three "Council Medals" in the category of "Scientific Instrument".[36] The duality of the medium was expressed in the Jury's *Reports*, which detailed its advantages and usefulness in the fields of industry and the fine arts.[37] The aforementioned "seven British photographic exhibitors", whose visual products were displayed separately from the other photographs and photographic equipment on view in the Machinery Hall, were located near the Sculpture Court, where the sculptural objects were arranged according to national schools. In his *Companion to the Official Catalogue*, scientist Robert Hunt provides an insight into this area of the exhibition, serving as a guide and illustrating the physical proximity of the Machinery Hall to both the Sculpture Court and the Colonial Department.[38]

[13] This is interesting on two different levels: Firstly, there are instances that draw attention to the critical engagement with the reproduction of sculpture, exemplified by Hiram Powers' *The Greek Slave*, a topic recently discussed by Tess Korobkin.[39] Secondly, within the broader taxonomic and structural framework of the fair, the jury not only focused on sculpture and the plastic arts in an industrial context, limited to the consideration of "works by [only] living or

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[34] Robin O'Dell, *Photography as Exhibited in the Great Exhibition of the Works of Industry of All Nations, 1851*, Master's thesis, Toronto Metropolitan University, 2013, 16,
DOI: https://doi.org/10.32920/ryerson.14660988.v1.

[35] *The Illustrated Exhibitor* (1851), viii.

[36] "Of the thirty Council Medals awarded for scientific instruments, sixteen were won by Britain. Three of these were for photography." Anthony Hamber, ed., *Photography and the 1851 Great Exhibition*, New Castle, Del./London 2018, xiii.

[37] Authority of Royal Commissioners (1852), vol. 1, 244, 274-276; O'Dell points out that there is no reference to photography in the introduction to the Fine Arts section of the catalog and all photographs are classified under Machinery, Class 10; however, the complex relationship between science and art in photography is discussed at length in the jury reports; O'Dell (2013), 22.

[38] "In the bays abutting on the Nave, passing east, we shall find carriage manufacture, furs and leathers, ornamental stone manufacture, furniture, paper and fine arts. We then purpose passing into the North and Central North Galleries, and examine the works of our potters and our glass manufacturers, naval architecture, engineering, musical instruments, and philosophical apparatus, and pass to the Southern Galleries, where the precious metals, tapestry, silk, shawls, &c., and the vegetable produce and chemical manufactures are arranged; then descending by the southern stairs, we proceed through the Sculpture Room and enter into our Colonial departments." Robert Hunt, *Companion to the Official Catalogue. Synopsis of the Contents of the Great Exhibition of 1851*, London 1851, 11.

[39] R. Tess Korobkin, "*The Greek Slave* and Materialities of Reproduction", in: *Nineteenth-Century Art Worldwide* 15 (2016), no. 2, URL: http://www.19thc-artworldwide.org/summer16/korobkin-on-the-greek-slave-and-materialities-of-reproduction (accessed September 7, 2023).

recently deceased exhibitors",[40] but also positioned them in close proximity to the fair's Colonial Department. This juxtaposition reinforces the impression that sculpture and its reproduction served the aims of British colonial policy in the Victorian era. At a time when the British Empire was competing with other major European powers for cultural supremacy, "[s]culpture, with its superlative capacity to embody at once accrued achievement and relentless progress, thus stood for industry's claims to culture".[41] The Royal Commissioners' use of industrialised sculpture to represent the modern state's flourishing industry and commerce went hand in hand with simultaneous efforts to establish a British school of sculpture capable of competing with the classical art centres of Paris and Rome. Beyond the neoclassical understanding of sculpture at the time, and despite the tradition of the Royal Academy of Arts (RAA), the display of sculpture and its reproductions at the Great Exhibition illustrated the need to produce the 'work of art' as an 'industrial object'. As Roberto C. Ferrari writes, "at an international fair that celebrated the craft of sculpture as technological innovation, it was ultimately equated to a form of the industrial arts and not a fine art".[42] This promotion of art through 'British sculptures', plaster casts, and mechanically produced copies of ancient or Renaissance sculptures, rather than through the medium of painting, is remarkable.[43] In the monumental exhibition catalogue *Sculpture Victorious* (2014), Droth, Edwards, and Hatt summarise the role of 'industrialised' and 'mass-produced' sculpture in the context of imperialism as follows:

> *As is often noted, the early international exhibitions included sculptures while excluding paintings, a telling dichotomy that immediately affirms sculpture's place within the industrial world. As a physical art that involved the transformation of raw materials into refined forms through human ingenuity, sculpture both symbolized and embodied the overarching objectives of the early exhibitions – the victorious announcement of the nation's material wealth and technical progress – thus explicitly involving it in the realization of a larger imperial agenda*.[44]

[14] It is important to note that in addition to commissions for public buildings and public spaces in the Empire, Victorian sculpture was often used in colonial settings, including as an educational tool at exhibitions and fairs.[45] The programmatic and didactic aims of such events were in line with those of the Royal Commission for the Great Exhibition of 1851, which called for new industrial means of production for the arts while supporting social issues. More recently, in her article "The Ethics of Making: Craft and English Sculptural Aesthetics c. 1851–1900", Martina Droth argues that the Great Exhibition's recognition of the potential for mass production of sculptural objects raised hopes not only of stimulating the commercial trade in sculpture, but also

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[40] Williams (2014), 60.

[41] Droth, Edwards and Hatt (2014), 20.

[42] Roberto C. Ferrari, "John Gibson, Designer: Sculpture and Reproductive Media in the Nineteenth Century", in: *Journal of Art Historiography* no. 13 (December 2015), 1-50: 26-27.

[43] Williams (2014), 28.

[44] Droth, Edwards and Hatt (2014), 20.

[45] Ibid.

"about the educational benefits that would be spread through society".[46] The Art Union of London, for example, offered reproductions of John Gibson's (1790–1866) *Narcissus* as part of the organisation's first Parian ware lottery, with the aim of bringing art to the masses in order to "improve the minds, morals and taste of all those who looked upon them".[47] Droth goes on to analyse this as a "commitment to intellectual principles on the one hand, and a desire to take a share in emergent aesthetics and new commercial opportunities on the other".[48] As a result, both the process of mechanical and chemical reproduction (e.g. electrotyping) and new materials such as Parian ware[49] not only illustrated a wide range of production processes, but also inspired fashion trends for a growing commercial market in bourgeois interiors and domestic items. As Droth writes:

> *Celebrating the convergence between commerce and the plastic arts, it represented art-making at both the high and the low ends of the market, with sculptural objects that ranged from mass-produced 'Parian' and ceramic statuettes, zinc figures and electrotypes to more expensive bronze casts, gold and silver work, hand-carved ivory figurines and marble statues*.[50]

[15] A reproduction of James Pradier's (1790–1852) *Leda and the Swan*, presented to great acclaim at two world's fairs, one in London in 1851 and the other in Paris four years later, demonstrates a blend of high-quality materials in which the original was "reproduced as an exquisite statuette in ivory, silver, turquoise and bronze by the goldsmith Émile Froment-Meurice [1837–1913]".[51] The award of a prize to another version of Pradier's small-scale sculptures at the Great Exhibition in London in 1851 also illustrates the value of the new means of mechanical reproduction, particularly in the use of surrogates and substitute materials. For the quality of his patinated reproduction of James Pradier's *Sappho debout*, Victor Paillard (1805–1886), who experimented with silvering, gilding and the colour effects of patina for the French company Christofle & Cie, was awarded a prize medal by the jury of the Great Exhibition.[52] However, with regard to other exhibits in the category "French Sculpture" (Class XXX), "Small Scale Sculpture",

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[46] Martina Droth, "The Ethics of Making: Craft and English Sculptural Aesthetics c. 1851–1900", in: *Journal of Design History* 17 (2004), no. 3, 221-235: 226.

[47] Roger Smith, "The Art Unions", in: *Atterbury and Batkin* (1989), 26-39: 28, cited in: Ferrari (2015), 31.

[48] Droth (2004), 226.

[49] See Paul Atterbury and Maureen Batkin, "The Origin and Development of Parian", in: Atterbury and Batkin (1989), 9-21: 9-10; and Robert Copeland, *Parian: Copeland's Statuary Porcelain*, Woodbridge 2007, 23-37.

[50] Droth (2004), 225.

[51] Droth (2004), 226.

[52] Authority of Royal Commissioners (1852), vol. 1, 516; Hufschmidt (2011), 70. After successfully exhibiting abroad, Paillard was appointed a member of the jury of the 1855 world's fair in Paris.

the jury criticised the quality of the reproductions in relation to the requirements of fine art.[53] Beyond this remark on the aesthetics of replicas, the notion of reproduction was "far from being read as a move to 'degrade sculpture into a trade'", but rather "as a vehicle for 'the diffusion of good taste'".[54] The economic potential of reproductions, such as small-scale copies of antique statues or sculptures with more recent themes, Parian ware and electroplated objects made of copper with a wafer-thin precious metal coating, met an already established market for collectors' items in plaster casts.[55] The new market, facilitated by stores and catalogues, was not only present at the Great Exhibition, but also poised to reach a wider clientele, as had been the case for the aristocracy a century earlier:

> *Statuary porcelain, also known as Parian-ware, had been another success of the 1851 Great Exhibition. Cheaper and stronger than the bisque porcelain used when the taste for collecting sculptures began to spread from the aristocracy to the gentry in the eighteenth century, Parian boosted the fashion for collecting statuettes amongst the middle classes*.[56]

[16] The middle classes and bourgeoisie constituted a growing audience for small-scale sculpture, both in Britain and abroad, where sculptors such as John Bacon I (1740–1799) or John Flaxman (1755–1826) had been working with manufacturers and entrepreneurs to commercialise their designs since the late eighteenth century.[57] In France, sculptors and bronze casters, known as *fondeur éditeurs,* worked closely together to produce series of art objects. An important example is the French company Maison Barbedienne, which sent some of its reproductions to the London Fair in 1851. The producers of *bronze d'art*, small copies of ancient or modern statues, benefited from new techniques and processes of reproduction and distribution, notably the improvement of casting and the invention of the *réducteur*.[58] The machine, built in 1836 by the inventor Achille Collas (1795–1859) and based on the dual principles of the diagraph and the pantograph, was capable of reproducing three-dimensional objects in different scales and materials.[59] A mechanical mind, Collas, dubbed the "Gutenberg of statuary"[60], achieved his first

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[53] "In other bronzes we find copies from the works of celebrated sculptors, such as Rude, Duvet, and Pradier; these are often very well executed. A Daphnis and Chloe after Gaylard, deserves special notice. But a great number of these specimens do not rise above the very level of very pretty ornaments executed without much style, and a notice of them here would occupy too much space." Authority of Royal Commissioners (1852), vol. 1, 701.

[54] Droth (2004), 226.

[55] On the market for collectors' plaster casts in the 18th century and its impact on the understanding of reproduction in the 19th century, see Charlotte Schreiter, *Antike um jeden Preis. Gipsabgüsse und Kopien antiker Plastik am Ende des 18. Jahrhunderts*, Berlin/Boston 2014.

[56] Di Bello (2013a), 416-417.

[57] Williams (2014), 24, mentions in this context Eleanor Coade, Josiah Wedgwood, and Matthew Boulton.

[58] Hufschmidt (2011), 51-52.

[59] Theodore Child, "Ferdinand Barbedienne. Artistic Bronze", in: *Harper's Magazine* 73 (1886), no. 436, 489-504: 492.

[60] Child (1886), 492.

success with a two-fifths reduction of the ancient Greek statue of the *Venus de Milo*, available in four different sizes to suit different budgets.[61] Only a few years later, this success was recognised internationally by various commentators at the London world's fair:

> *Great encouragement bestowed by the French, as a nation, on the fine arts, […] Beneficial results arising therefrom, ib. Notices of the principal works of art contributed by France: – viz., Sculpture on a large scale, […]. Sculpture on a small scale, in metal, […]. Sculpture in ivory, ib. Sculpture in wood, ib. Process of M. Collas for reducing sculpture by machinery*.[62]

[17] Di Bello also highlights the connection between the "boom of statuary porcelain",[63] the use of the sculpture-reducing machine and the machine's success at the Great Exhibition. The British sculptor Benjamin Cheverton (1794–1876), who "perfected" his version of a machine for reproducing sculpture, worked – like his counterpart Collas – with manufacturers such as Minton's Pottery and Elkington & Co to produce replicas in Parian ware, plaster, alabaster, electro-bronze, and ivory.[64] Cheverton's experimentation with different materials and techniques won him the Class XXX medal for his alabaster copy[65] of "*Theseus*, as exemplifying the reduction by machinery of statues".[66] Another copy of this figure, "from the original in [the Elgin collection at the] British Museum", is mentioned in the catalogue as having been made "for the Arundel Society, in electro-bronze",[67] whose aim was to "promote a greater knowledge of art through […] reproductions".[68] The official reports of the 1851 Great Exhibition introduce both Collas and Cheverton in connection with their respective inventions of machines for reproducing sculpture:

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[61] Peter Frieß, *Kunst und Maschine: 500 Jahre Maschinenlinien in Bild und Skulptur*, Munich 1993, 212.

[62] Authority of Royal Commissioners (1852), vol. 1, 790.

[63] Di Bello (2013a), 417.

[64] Droth, Edwards and Hatt (2014), 67. Multiple sources provide different dates for the creation of this machine. According to the London Science Museum, the sculpture reproducing machine was built in 1826, see https://collection.sciencemuseumgroup.org.uk/objects/co47993/machine-for-reproducing-sculpture-machine (accessed June 1, 2022); according to Atterbury and Batkin (1989), 18, and Frieß (1993), 210, it was built in 1828.

[65] Authority of Royal Commissioners (1852), vol. 1, 694.

[66] *The Civil Engineer and Architect's Journal* 14 (1851), 557; see also Authority of Royal Commissioners (1852), vol. 1, cxvii.

[67] Authority of Royal Commissioners (1851), vol. 2, 672.

[68] Victoria Button, "The Arundel Society – Techniques in the Art of Copying", in: *Conservation Journal* no. 23 (April 1997), URL: http://www.vam.ac.uk/content/journals/conservation-journal/issue-23/the-arundel-society-techniques-in-the-art-of-copying/ (accessed August 7, 2021).

> *Prize medals were awarded*
> *To Mr. B. Cheverton, of London, for his process of reducing sculpture by machinery, as exemplified in the Theseus. (No. 194).*
> *To M. A. Collas, of Paris, for his process of reducing sculpture by machinery, as exemplified in the Gates of the Battisterio at Florence, and other works. (France, No. 1709.)*[69]

[18] It is remarkable not only that both Collas and Cheverton used their machines to reproduce classical statuary on a small scale, but also that their constructions made the process visible. This fact, while ensuring the fame of these subjects outside of connoisseur circles, also fuelled a potential rivalry between the two. The committee honoured both of them for the resulting sculptures as well as the processes that generated them. The award-winning exhibits were noted to have been made "by the mechanical process of M. Collas, in France, and of Mr. Cheverton, in England".[70] In addition, the jury honoured the "superior engravings by Collas' tracing machine",[71] while also recognising the means of "Galvanoplastic Deposit. – A process by which sculpture may be reproduced with accuracy and at a reasonable cost".[72] Despite the low cost and time-saving aspects of these processes, which were described "the two most valuable and original inventions",[73] the jury found the results to be aesthetically pleasing.

> *The cheapness with which the noblest works of Art can be multiplied by means of these inventions cannot but tend to the more general development of a feeling for the Beautiful. Such then are some of the results of the connexion between Industry and the Fine Arts*.[74]

[19] Given the relationship between sculpture and industry, it is obvious that certain objects, especially if they won a prize, lent themselves to reproduction in different materials and sizes. In addition to the alabaster reduction of *Theseus* mentioned above, which was also reproduced as an electro-bronze and plaster cast,[75] John Bell's *Eagle Slayer* was commissioned by the

[69] Authority of Royal Commissioners (1852), vol. 4, 1542.

[70] Authority of Royal Commissioners (1852), vol. 1, 691: "To the present age are also due two most valuable and original inventions, by which works of sculpture may be reproduced, in the one case by means of Galvanoplastic deposit, in the other by the mechanical process of M. Collas, in France, and of Mr. Cheverton, in England."

[71] Authority of Royal Commissioners (1852), vol. 1, 451.

[72] Authority of Royal Commissioners (1852), vol. 1, 791.

[73] Authority of Royal Commissioners (1852), vol. 1, 691.

[74] Ibid.

[75] Authority of Royal Commissioners (1852), vol. 1, 672; see also *The Proceedings of the Royal Dublin Society*, vol. 90: *from July 1, 1853, to June 30, 1854*, Dublin 1854, xc.

Coalbrookdale foundry in bronze, and also in iron.[76] Droth explains how smaller copies of sculptures were included in the sales stands of manufacturing firms, providing another example that highlights the subtle connection between sculpture and its reproductions:

> *John Gibsons's life-size marble group Hunter and Dog […] attracted acclaim in the sculpture court […] much less noticeable were the miniaturized copies of his statues in Parian porcelain, mass-produced by the commercial ceramic firm Copeland*.[77]

[20] Another example is the sculptor John Henry Foley (1818–1874), who "[e]xhibited his work regularly at the RA between 1839 and 1859" and whose neoclassical "work in Parian is associated particularly with Copeland".[78] At the Great Exhibition, he presented two versions of his *Youth at a Stream*,[79] one in plaster and one in bronze,[80] in the group "Sculpture on a large Scale". As Williams notes,

> *Various plaster and marble statues in the 'Fine Art' court re-appeared on manufacturer's stands in the form of metal or porcelain statuettes. In some cases different firms displayed versions of the same statue (referred to as such through its title and the original sculptor's name), in different materials, colours or scales*.

Williams argues that the intersections of

> *classical sculpture and industry were staged not merely through spatial or rhetorical dialogues between statues in the 'Fine Art' category and exhibits outside it, but also in the reproduction of ideal statues amongst those latter exhibits*.[81]

Therefore, in the context of seriality, this striking aspect of repetition, redundancy, and juxtaposition of copies needs to be analysed beyond Droth's assumption of a merely subtle aesthetic choice.

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[76] Authority of Royal Commissioners (1852), vol. 3, 685, 707; for further information see: "To Mr. John Bell, of London, for his plaster statue of Viscount Falkland, no Prize Medal was specially awarded, as he had already received one for his 'Eagle Slayer', in bronze. (North Transept, No. 28, p. 847)", cited in: Authority of Royal Commissioners (1852), vol. 3, 685.

[77] Droth (2004), 226.

[78] Atterbury and Batkin (1989), 261.

[79] The original had been exhibited in Westminster Hall, London, in 1844. At least one scaled-down version in lead and a copy for the Royal Horticultural Society (1864) are also known. *A Youth at a Stream*, URL: https://www.metmuseum.org/art/collection/search/205708 (accessed June 21, 2021).

[80] "John Henry Foley, of London (p. 848, and Illustration). A Youth at a Stream: of this cast in plaster, and another in bronze, were exhibited." See also "Section A. - 3. In Minerals simple, as Marble, Stone, Gems, Clay, &c. The following Prize Medals were awarded in this section: […] To Mr. J.H. Foley, of London, for his plaster statue of Youth at a Stream: also for his plaster group representing Ino and Bacchus in plaster (North Transept, No. 47, Sculpture Court, No. 19, pp. 848 and 844)." Authority of Royal Commissioners (1852), vol. 1, lxxxiii, 685 and 692.

[81] Williams (2014), 29.

A sort of inventor: the gentleman artist vs. the labouring craftsman

[21] The intersection of sculpture, industry and reproduction at the Great Exhibition of 1851 is exemplified by the sculptural work of Benjamin Cheverton and Achille Collas. Their demonstrations are particularly relevant when their machine-made sculptures are compared with the work of other artists, craftsmen and manufacturing companies showcased at the exhibition. Working with new technologies and reproducible materials, some British sculptors were listed as "inventors" or "designers" in the 1851 exhibition catalogue.[82] In his essay "John Gibson, Designer: Sculpture and Reproductive Media in the Nineteenth Century", Roberto C. Ferrari points out that Gibson was the "only sculptor who displayed work at the Great Exhibition to identify himself in the official published catalogue as a 'Designer', not a 'Sculptor'".[83] Gibson designed his works in various materials and later reproduced them in different media, starting with pieces in "plaster, marble, cameo, and porcelain at the Great Exhibition of 1851, and immediately thereafter with the publication of a selection of his designs as facsimile prints".[84] While Gibson still emphasised the notion of drawing and working by hand as a designer, Benjamin Cheverton, listed as an "inventor" in the same catalogue, challenged the common definition of craftmanship by demonstrating new ways of reproduction through working with machines. Without the use of human hands, he claimed to create "[s]tatuettes, busts, and bas-relief, in ivory, alabaster, marble, and metal; carved by a machine from originals of a larger size".[85] Cheverton, a sculptor, used a machine that he advertised in collaboration with engineers, so he is best remembered "as an accomplished engineer".[86] As we can read in the jury reports of the Great Exhibition, Cheverton promoted this machine (Fig. 1) for making copies of famous sculptures as a cutting-edge invention in the "Sculpture, Models and Plastic Art, Mosaics, Enamels, &c." division (Class XXX):

> *In concluding this notice of works of sculpture of the United Kingdom, I must mention the machine invented by Mr. B. Cheverton, of London (194, p. 832), for the reproduction, either on the same or on a smaller scale, of works of sculpture. The figure commonly known as the Theseus, in the Elgin collection of the British Museum, has been reduced by this process in alabaster, for the purpose of casting in plaster, with an accuracy which leaves the most fastidious critic nothing to desire*.[87]

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[82] Authority of Royal Commissioners (1851), vol. 3, 706: §72; and 832: §194.

[83] Ferrari (2015), 3.

[84] Ferrari (2015), 3. On the topic of British sculptors in Rome and the reception of Canova in Great Britain, see Anna Frasca-Rath, *John Gibson & Antonio Canova. Rezeption, Transfer, Inszenierung*, Vienna/Cologne/Weimar 2018.

[85] Authority of Royal Commissioners (1851), vol. 3, 832: §194.

[86] Atterbury and Batkin (1989), 19.

[87] Authority of Royal Commissioners (1852), vol. 1, 694 and vol. 2, 1555.

[22] Together with his mentor, the engineer John Isaac Hawkins, who, after James Watt, was the first to build a machine that made it possible to produce copies of sculptures,[88] Cheverton developed a device that combined both machines that Watt invented between 1804 and 1809: one for reproducing sculptures to the same size and the other for reducing them proportionally. Cheverton was thus able to reproduce sculptures of the same size or scale them down proportionally with a single machine.[89] At the British Association's seventh meeting in 1837, Hawkins had already demonstrated this machine that relied on the use of an "engine lathe". Following this demonstration, *The Literary Gazette* wrote enthusiastically about the two inventors and the machine's features, highlighting the fact that not "a single touch from the artist" was required to produce reduced versions of marble busts:

> *Mr. John Isaac Hawkins exhibited a small marble bust, sculptured entirely by machinery invented by him, and improved by Mr. Cheverton. Mr. Hawkins stated that the machine, by which this exquisite work of art was copied from the antique, without a single touch from the artist, is a species of engine lathe, in which the bust to be copied, and the block of marble to be sculptured, are placed in a frame, capable of almost universal motion, so that the block to be cut may be applied in all directions to a cutter in the lathe, while all the parts of the model are brought successively in contact with an index, fixed at such a distance from the cutter, as are the corresponding parts of the model and of the block*.[90]

[23] According to Rebecca Wade, references to the reliability and high precision of machine-made replicas can be found later in Matthew Digby Wyatt's statement "for the opening of an exhibition of the Arundel Society at the Crystal Palace in 1855": Taking the example of "Theseus, Ilissus [*sic*] and slab 47 of the Parthenon Frieze", reduced in size by Cheverton's machine, the architect and art historian marvelled that the high-reliefs were "reproduced microscopically, almost magically … so as to bring down faultless models of the very best class of works of art to the level of the pockets of the great majority among us".[91] In the first half of the 19th century, the process by which replicas were made became a spectacle in its own right, and the reproduction of famous works of art from antiquity served "as hooks for publicising new processes of reproduction".[92] Di Bello elaborates on the technical aspects and the precision of the reproductive process:

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[88] On the topic see Jane Insley, "James Watt and the Reproduction of Sculpture", in: *Sculpture Journal* 22 (2013), no. 1, 37-65, DOI: https://doi.org/10.3828/sj.2013.4; see also J. G. Pollard, "Matthew Boulton and the Reducing Machine in England", in: *The Numismatic Chronicle* 11 (1971), 311-317.

[89] See Frieß (1993), 210.

[90] *The Literary Gazette, and Journal of Belles Lettres, Arts, Sciences &c.* [London], vol. 21, no. 1078 (16 September 1837), 593.

[91] Matthew Digby Wyatt, quoted according to Rebecca Wade, *Domenico Brucciani and the Formatori of 19th-Century Britain*, Bloomsbury 2018, 52. And further: "The Daily News also noted the 'truthfulness with which the dilapidated condition of the latter is depicted' and praised the utility of the reproduction for those who had not studied the marble original in the British Museum."

[92] Williams (2014), 29.

> *In Watt's and Cheverton's machines, original and copy are clamped to plates connected by geared arrangements that keep them in the correct spatial relationship as they rotate to carve new portions of the copy, layer by layer. This enables the manufacture of exact copies in different sizes but in the right proportion, which is impossible with moulding and casting alone*.[93]

The design of Cheverton's machine for reducing busts and statues to small copies was based, like its predecessors, on a mechanical arrangement with two arms: the pantograph. While one arm scanned the original object, the other, equipped with a rotating cutting device, removed material from a block. The illustration (Fig. 1) shows the two elements, the feeler and the cutter, mounted on a rod at a distance from each other and calculating the desired reduction bar, since a cardan joint allows them to be brought into any position needed. According to Peter Frieß, the novelty of Cheverton's device was that it eliminated the need to rotate the blank during milling.[94] The machine's design not only enabled Cheverton to make "much more accurate" copies, but also to use the sculpturing machine commercially after its success at the Great Exhibition.[95] As mentioned above, there was a growing demand for reproductions of works of art in various materials, a demand that was encouraged by institutions such as the Art Union and the Arundel Society.

[24] Sir David Brewster also saw a growing commercial interest in his portable lenticular stereoscopes, and the inventor "claimed that half a million prism stereoscopes had been sold"[96] within a few months of the close of the Great Exhibition. While Brewster's optical device, which transformed two-dimensional photographs into a three-dimensional visual experience, amazed the audience, Cheverton enjoyed success with his true-to-scale "plaster versions of the marble sculptures"[97] by ancient and famous British sculptors, including those of Sir Francis Leggatt Chantrey. The latter was known for his experiments with the pointing machine and for his role as an active member of the British scientific community, a network of 'gentlemen' that included James Watt and Benjamin Cheverton, with whom he worked.[98] In contrast to Chantrey, who used the pointing machine mainly in his workshop practice, Cheverton's aim was to demonstrate the technological advances in the production of sculpture as part of a wider field of innovation in mechanical engineering and to make the constructive processes visible.

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[93] Patrizia Di Bello, "Photographs of Sculpture: *Greek Slave*'s 'complex polyphony', 1847–77", in: *19. Interdisciplinary Studies in the Long Nineteenth Century* no. 22 (2016), 1-26: 9, DOI: https://doi.org/10.16995/ntn.775 (accessed May 1, 2021).

[94] Frieß (1993), 210.

[95] Droth, Edwards and Hatt (2014), 67.

[96] Hamber (2018), 40.

[97] Droth, Edwards and Hatt (2014), 67.

[98] See Greg Sullivan, "Sir Francis Chantrey's Plaster Models, their Use in his Practice, and his 'improved pointing instruments'", in: *Il valore del gesso come modello, calco, copia per la realizzazione della scultura*, eds. Mario Guderzo and Tomas Lochman, Crocetta del Montello 2017, 223-235: 226.

[25] In the context of the fair's organisation, Cheverton's individual approach becomes apparent when we consider the jury's instructions and the commissioners' request for sculptors to "represent themselves with 'ideal' works of their own design, though not portrait busts".[99] Although he was a "sculptor in his own right",[100] he preferred to reproduce "[t]he figure commonly known as Theseus, in the Elgin collection of the British Museum [which Cheverton] reduced by this process in alabaster, for the purpose of casting in plaster, with an accuracy which leaves the most fastidious critic nothing to desire."[101] By reducing the figure of Theseus "elegant[ly]",[102] Cheverton also allowed the audience and the jurors to concentrate on the technique and the working of different materials, which earned him the prize medal and the recognition of the jurors, who agreed that: "The benefit which all lovers of Art, and more particularly artists themselves, will derive from this discovery, are so obvious, that I need not further insist on them here. Prize Medal."[103]

[26] As mentioned above, the exhibits from the Sculpture Court "re-appeared"[104] in scaled-down format on the sales stands of the manufacturing firms present at the exhibition. While Minton's stand featured Cheverton's copy of the Elgin *Theseus* in alabaster,[105] Elkington & Co.'s stand, categorised under "Hardware",[106] showcased "statuettes in the 'Precious Metals' division of 'Manufactures' […] (alongside an electro-bronzed statuette modelled by John Bell) [and] an electro-bronzed copy of the marble 'Theseus' reduced by Mr. Cheverton from the original in the British Museum'".[107] Thus the equestrian figure of Theseus, initially reduced in alabaster by Cheverton from the original in the Elgin Collection, was reproduced in electro-bronze, and finally copied in Parian as a commodity for sale. These sculptural exhibits not only reflected the eighteenth-century tradition of classicism by capitalising on the popularity of ancient themes, but also echoed the entire economy of sculpture-making at the time. Eighteenth-century sculpture production relied on a complex system of, in Malcom Baker's words, "chains of replication",[108] which contributed to the fashion for busts in the Roman antique style, which were mainly produced in Britain.[109] The popularity of the portrait bust in different materials and as copies of

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[99] Williams (2014), 28.

[100] Atterbury and Batkin (1989), 19.

[101] Authority of Royal Commissioners (1852), vol. 2, 1555.

[102] *The Athenaeum. Journal of English and Foreign Literature, Science, and the Fine Arts* [London] no. 1335, 28 May 1853, 648.

[103] Authority of Royal Commissioners (1852), vol. 2, 1555; see also *The Illustrated Exhibitor* (1851), xl.

[104] Williams (2014), 29.

[105] Authority of Royal Commissioners (1852), vol. 1, 791.

[106] Williams (2014), 73.

[107] Ibid., 29.

[108] Malcolm Baker, "A Genre of Copies and Copying? The Eighteenth-Century Portrait Bust and Eighteenth-Century Responses to Antique Sculpture", in: *Das Originale der Kopie. Kopien als Produkte und Medien der Transformation von Antike*, eds. Hartmut Böhme et al., Berlin/Boston 2010, 289-312: 294.

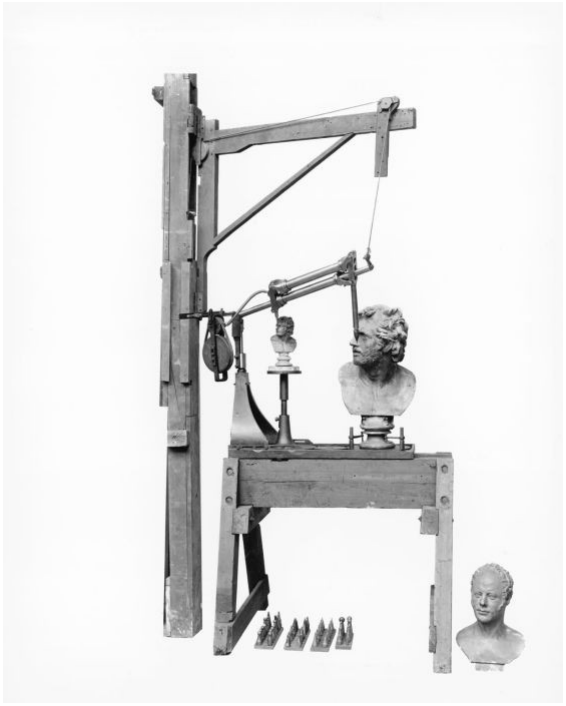
[109] Baker (2010), 306.

copies (on the one hand as a copy of the antique, on the other hand as a copy in various materials from terracotta to marble to porcelain) increased with the technological advances that began as early as the eighteenth century. These developments not only facilitated industrialisation, but also contributed to a broadening of the exhibition discourse through the exploration of new technical and material possibilities.

Magical staging. Intertwining sculpture and photography

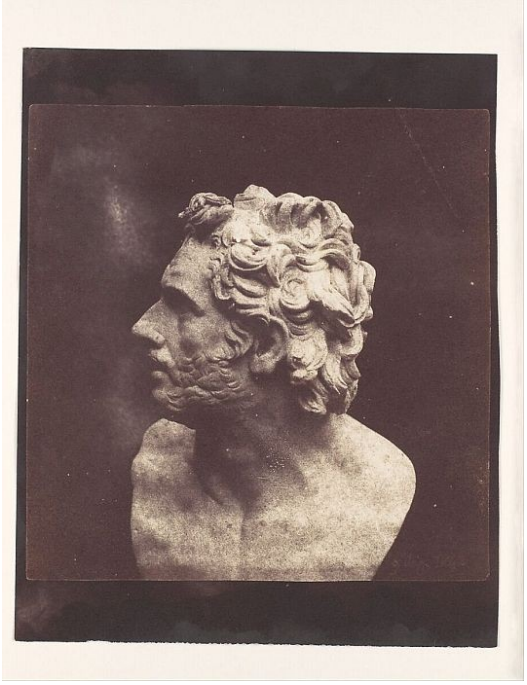
[27] In the absence of photographs or postcards capturing the display of certain machines at the Great Exhibition of 1851, our focus turns to a photograph, presumably taken in 1924, showing Cheverton's machine in operation (Fig. 1). It employed a block and tackle mechanism linked to a foot pedal to supply the necessary leverage for adjusting the pantograph within the machine. The pantograph was an integral part of the system that distinguished it from conventional lathes, while retaining the system's rotational capabilities to achieve a high degree of accuracy in reproducing a sculpture.[110] In order to capture every detail, the arms of the pantograph moved along multiple axes, using drills to delicately carve the alabaster or ivory blank according to the measurements and shape the contours outlined in the template. The photograph provides a glimpse of the wooden machine, behind which no human operator is visible. The image shows both the 'original' object, a plaster cast of an antique bust, and its smaller replica, both mounted vertically. Apart from a few tools and the bust lying on the floor, no other elements of the reproduction process or setting are visible in the photograph. In fact, the background of the image is empty. In this respect, the staging creates a sense of magical spectacle, as Cheverton's machine appears to carry out the reproduction process itself – embodying the concept of an object created seemingly 'without the use of human hands'. However, the presence of the sculptor himself is evident in the form of a self-portrait: Upon closer examination, the bust on the floor, acting as a sculptural stand-in, confirms Cheverton's presence as the inventor of the machine (Fig. 2).

[110] The photograph was probably taken in 1924, when the machine entered the collection of the Science Museum in London (acc. no. 1924-292). Thanks to curator Ben Russell for this information and for explaining how the machine works.



1 Benjamin Cheverton, Machine for reproducing sculpture, 1826 or 1828, cast iron, oak, plaster and wrought iron, 245 × 150 × 74 cm. Science Museum Group Collection, London, no. 1924-292 (photo © The Board of Trustees of the Science Museum, London)

2 Portrait bust of Benjamin Cheverton, plaster, 1830. Science Museum Group Collection, London, inv. no. 1924-293 (photo © The Board of Trustees of the Science Museum, London)



3 William Henry Fox Talbot, *Bust of Patroclus* (showing Talbot's plaster cast of a Hellenistic marble now in the British Museum, London), salted paper print from paper negative, dated August 9, 1843, 14.9 × 14.5 cm. The Metropolitan Museum of Art, New York, acc. no. 1988.1159, Gift of Hans P. Kraus Jr., 1988 (photo: The Met)

[28] In view of the recurring topos of the classical artist, it is probably no coincidence that the bust mounted here for reproduction (Fig. 1) is none other than a plaster copy – made and photographed by William Henry Fox Talbot (1800–1877) in 1843 (Fig. 3) – of a Roman marble bust then known as *Patroclus* and kept in the British Museum in London. It would be interesting to determine whether Cheverton – as the photograph from 1924 (Fig. 2) tentatively suggests – reproduced this ancient subject with his sculpturing machine, and, if so, when. Indeed, in the Thompson Collection at the Art Gallery of Ontario in Toronto, which comprises numerous of Cheverton's miniature ivory busts, there is a similarly scaled-down bust entitled *Patroclus*, which has a smooth surface; this particular piece is inscribed on the reverse below the right shoulder "Cheverton Sc. 1840".[111]

[29] According to Geoffrey Batchen, who has analysed Talbot's renowned plaster bust of *Patroclus* (Fig. 3) in the context of his early photographic experiments, the ancient tale of heroic self-sacrifice would have been familiar to contemporary audiences acquainted with Homer's *Iliad*. In the battle for Troy against Hector, Patroclus dutifully took the place of his companion Achilles and tragically met his demise. Batchen suggests that this particular form of rhetorical substitution culminates in an unending series of media substitutions: "the plaster bust stands in for a human figure, a photograph for the plaster bust, and the bust for the original marble carving (now in the

[111] Benjamin Cheverton, bust of *Patroclus*, 1840, ivory, 27.5 × 17 cm, The Thomson Collection at the Art Gallery of Ontario, Toronto, no. AGOID.107153. See also Conal Shields, ed., *Ken Thompson the Collector. The Thompson Collection at the Art Gallery of Ontario*, exh. cat., Toronto 2008.

British Museum)."[112] Whoever staged this scene for the photograph of Cheverton's machine in 1924 undoubtedly made a connection to Talbot's early photographic endeavors. In 1844, the same year that Cheverton was granted a patent for his machine, Talbot published the world's first 'photo book' and manifesto, *The Pencil of Nature*, which featured the same plaster bust of *Patroclus*: plates V and XVII show *Patroclus* from different perspectives. A year later, in 1845, the Royal Society exhibited some of Cheverton's mechanically-produced ivory copies, including a bust of Queen Victoria, made from the original by Sir Francis Leggatt Chantrey. This exhibition not only attracted prominent figures including Prince Albert, but also featured "a number of works of art and manufactures […] set out on tables to be admired by 'men of every rank and profession in the higher walks of life'".[113] Given these circumstances, it is reasonable to assume that Talbot and Cheverton were acquainted with each other. It is very likely that the two men crossed paths at society events on scientific topics, where they presented their technological innovations and discussed them with the audience. Di Bello evokes this as follows:

> *In London, machine carvings, electrotypes, daguerreotypes, and Talbotypes were seen and compared at the events organized by the Royal Society throughout the 1840s and 1850s, where Benjamin Cheverton's ivories, 'mechanically sculptured' using his reducing machine, a perfected version of Watt's proto-types, could be admired next to displays of 'excellent [. . .] Talbotypes', or 'M. Claudet's photographic specimen'*.[114]

[30] Each of these intersections and connections between the cultures of display, mechanical reproduction, and classical art is remarkable: it is not by chance that the plaster bust of *Patroclus*, borrowed from the British Museum, became a popular subject both in Talbot's photographs and, presumably, in the utilisation of Cheverton's sculpturing machine. It seems plausible that the inventors actively engaged in a network of scholars and scientists who shared a mutual fascination with copying and reproduction, encompassing both mechanical automation and chemical photography.[115] Both techniques show remarkable parallels in their application to the reproduction of portraits, reflecting the common desire to reproduce remarkable profiles. Questions about the precision of these machines indicate the importance placed on the accuracy of the reproductions; the assessment was particularly applied to facial features, as the human face was an excellent subject for such study.

[31] Recent observations on the history of photography have pointed out that pioneers such as Louis Jacques Mandé Daguerre (1787−1851), William Henry Fox Talbot and Hippolyte Bayard

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[112] Geoffrey Batchen, "An Almost Unlimited Variety: Photography and Sculpture in the Nineteenth Century", in: *The Original Copy: Photography of Sculpture, 1839 to Today*, exh. cat., ed. Roxana Marcoci, New York 2010, 20-26: 23.

[113] Droth, Edwards and Hatt (2014), 67.

[114] Di Bello (2016), 9.

[115] See Matthew C. Hunter, *Painting with Fire: Sir Joshua Reynolds, Photography, and the Temporally Evolving Chemical Object*, Chicago/London 2019, especially chapter 3, which examines the replication of oil paintings by Watt, Boulton, and Eginton, as well as the chemistry behind Watt's copy press and other related initiatives from the 1770s and 1780s, and chapter 4, which looks at Watt's ambitions in the 1860s with regard to photography.

(1801−1887) collected both modern and classical sculptures, including plaster casts and *moulages*, and arranged them in various configurations for their photographic experiments.[116] Less well known is that engineers such as James Watt, John Hawkins and his successor Benjamin Cheverton, and, to some extent, Sir Francis Leggatt Chantrey, not only built machines but also maintained collections of sculptures and plaster casts and had a profound interest in antiquity. In addition, contemporary written sources from the first half of the nineteenth century publicly discussed the relationship between photography and sculpturing machines, such as David Brewster's 1843 essay on *Photogenic Drawing*. Di Bello quotes from it in her editorial introduction to the 2013 issue of *History of Photography*:

> *the new medium [of photography] in the context of other 'great inventions and discoveries in the arts and sciences [that] either abridge or supersede labor' […] such as 'The art of multiplying statues by machinery, which we owe to the celebrated James Watt', and 'the splendid process of copying all sorts of sculpture, by the voltaic deposition of metals from their solutions'*.[117]

Robert Hunt's series of essays on various reproductive processes, published for the Art Union, followed a similar sequence: "Electrotype" in April, "Photography" in May, and "Carving by Machinery" in June 1847.[118]

[32] As mentioned above, Brewster, who attended the 1851, 1862 and 1865 exhibitions, was adept at discussing photography as a method that surpassed all competing reproduction techniques. Brewster's own 1844 invention, the stereoscope, took full advantage of the complexities inherent in both the photographic and sculpturing processes. This can be illustrated, as Di Bello notes, by the example of Raphael Monti's bust *The Bride*: A statuette that was believed to be a reduction of an original full-length statue was further reduced through the photographic process, effectively converting it from a three-dimensional form into two dimensions. The resulting two slightly different flat prints, when viewed through Brewster's stereoscope, possessed the remarkable capability to converge and form a convincing three-dimensional image.[119] By exploiting the serial nature of photography, Brewster's invention transformed static two-dimensional photographs into dynamic, immersive three-dimensional scenes to simulate an object in its actual dimensionality. This notion of complexity and seriality is regarded as an essential aspect of Brewster's process, which encompassed "a complex series of re/productive processes, using sculpturing machines, moulds and casts; and then lenses, negative plates and positive prints".[120]

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[116] See Anthony Hamber, *'A Higher Branch of the Art': Photographing the Fine Arts in England, 1839–1880*, Amsterdam 1996; Stephen Bann, ed., *Art and the Early Photographic Album*, Washington, D.C./New Haven/ London 2011.

[117] Brewster (1843), 312, cited according to Di Bello (2013b), 385-386.

[118] Di Bello (2016), 10.

[119] Di Bello (2013a), 413.

[120] Di Bello (2013a), 413.

[33] Closely associated with the stereoscope is the notion of magic and the paranormal. As Jonathon Shears highlights, the Victorians had a penchant "for new scopic experience and optical drama. The nineteenth century saw a craze for magic lantern shows, phantasmagoria and camera obscura, and advancements in the technology". Referring to the spectacle of illusion known as the phantasmagoria, Shears describes, in the context of glass production, the captivating sensations created by machine-made materials and surfaces that were capable of "enshrining fantastical possibilities".[121] Probably aware of the optical qualities of his apparatus and the material process, Cheverton not only "demonstrated the machine at the Great Exhibition in 1851"[122] but also showcased the "busts and reductions carved on-site using his machine".[123] According to the Jury reports, the "Inventor" exhibited his small "[s]tatuettes, busts, and bas-reliefs, in ivory, alabaster, marble, and metal; carved by a machine from originals of a larger size"[124] in the section "Sculpture, Models, and Plastic Art, Mosaic, Enamels & Co. of Class XXX". An additional comment, "[t]hose in ivory and marble, [were] not finished by hand", underlines that, under the sign of mechanical innovation and the technical application of materials, the presentation of 'automation' by machines served both as an experimental arrangement and as a form of magical entertainment for the audience.

[34] A decade later, François Willème pushed the boundaries of fantasy and showmanship to new heights by hiding his apparatus from the audience during demonstrations.[125] This deliberate secrecy served to heighten the sense of wonder, as described by Théophile Gautier: "qui ne contient aucun instrument, aucun appareil, comme pour mieux fair ressortir la merveille, qui va suivre".[126] The latest innovation to appear was Willème's photosculpture, described as "a form of photographically derived sculpture".[127] This unique process combined elements of both reproduction techniques, utilising the pantograph system and photography. Developed by Willème himself in 1859, the pioneering technique, entitled 'Anglo-French Skilled Work',[128]

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[121] Shears (2017), 60-62.

[122] Atterbury and Batkin (1989), 19.

[123] *Morning Chronicle*, 18 July 1851, 2, cit. in: Di Bello (2016), 16.

[124] Authority of Royal Commissioners (1852), vol. 1, 832.

[125] For more detailed information and a description of the apparatus, see: Buket Altinoba, Alexandra Karentzos and Miriam Oesterreich, "*Gesamtkunstwerk* World's Fair. Revisioning International Exhibitions. Introduction to the RIHA Journal Special Issue", *RIHA Journal* 0300 (14 May 2024), para. 19-20, DOI: https://doi.org/10.11588/riha.2024.2.97563. See also William F. Engelmann, "Photogrammetry Applied to Making Sculptured Portraits", in: *Internationales Archiv für Photogrammetrie* 12 (1956), no. 4, 84-92; Beaumont Newhall, "Photosculpture", in: *Image: Journal of Photography and Motion Pictures of the George Eastman House* 7 (May 1958), 100-105.

[126] Théophile Gautier, "Photosculpture", in: *La Presse*, 15 January 1866, cited in: Bogart (1981), 55 ("which contains no instrument, no apparatus, as if to better highlight the wonder that is to follow").

[127] Robert A. Sobieszek, "Sculpture as the Sum of Its Profiles: François Willème and Photosculpture in France, 1859–1868", in: *The Art Bulletin* 62 (1980), no. 4, 617-630: 618; see also Bogart (1981) and Newhall (1958).

[128] Anonymous, "Anglo-French Skilled Work at the Crystal Palace", in: *The Art-Journal* 4 (1865a), 284: 284.

premiered at the Dublin International Exhibition of 1865 and two years later at the Paris Universal Exhibition, where it garnered considerable attention.[129] The impact of Willème's photosculpture was further accentuated by the presence of a small photosculpture pavilion at the 1867 *Exposition universelle*, "giving employment to some three hundred hands, and provided with electric or magnesium lights, so as to be enabled to work night and day".[130]

[35] However, as in 1851, there was uncertainty regarding the classification of photography-based media within the Dublin exhibition taxonomy. *The Art-Journal* reported in 1865: "The exhibitions of photography in 1862 and now in 1865 go far to support its claims to be ranked among the Fine Arts; and we think the observations of the reports of the jury on this question well worthy of being quoted."[131] As Michele Bogart has pointed out, Willème aimed to bring his invention closer to the technical miracle of photography:

> *Photosculpture is discoursed as if it were a three-dimensional photograph rather than a laborious, multi-step, sometimes manual transcription process. […] In photosculpture the artist and the machine were virtually one and the same.*[132]

The historical discourse surrounding photo-sculpture at the time, which focused on the interplay between the human body and the machine, was characterised by an oversimplified view that bordered on the childlike. In an 1863 article for the *Moniteur*, Paul Dalloz downplayed the aesthetic significance and complexity of "the sculptural process by suggesting that even a child could work with photosculpture equipment."[133] Despite the erroneous nature of this perspective, certain characteristic features of photo-sculpture align with the magical qualities associated with photography itself. These include the suddenness of the effect, the playful ease with which it occurs, and its relative independence from human intervention. The automatic nature of the photographic process conveys the illusion of a sculpture being created almost instantaneously, as expressed in the statement: "L'automatisme du procédé photographique véhicule ici le fantasme d'une sculpture quasi instantanée."[134]

[36] The publication of *The Pencil of Nature*, in particular, reflects a concurrent fascination with the concept of automatism. In this historical context, the desire to reproduce sculptures – whether in two dimensions as photographs or in three dimensions as replicas, or even in a kind of 'inter-dimensional' sense as stereoscopes or photo-sculptures – may help explain why

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[129] Anonymous, "The Dublin International Exhibition, 1865", in: *The Art-Journal* 4 (1865b), 345-346: 345.

[130] Anonymous, "Photosculpture", in: *Scientific American*, March 16, 1867, cited according to Bogart (1981), 57.

[131] *The Art-Journal* (1865b), 346.

[132] Bogart (1981), 59.

[133] Bogart (1981), 59.

[134] Jean-Luc Gall, "Photo/sculpture. L'invention de François Willème", in: *Études photographiques* 3 (1997), URL: http://journals.openedition.org/etudesphotographiques/95, cited in: Albert Kümmel, "Körperkopier-maschinen: François Willèmes technomagisches Skulpturentheater (1859–1867)", in: *Skulptur – zwischen Realität und Virtualität*, ed. Gundolf Winter, Munich 2006, 191-212: 196.

reproduction became the subject of both symbolic and semantic discourse during that era. Yet the engineer-artists and inventors were not only interested in the practical utility of reproduction for artistic purposes. They likely sought to incorporate the ideals of art and antiquity into the technical reproduction.[135] It's crucial to emphasise the common thread in this narrative—the common ethos and the common apparatus: the machine.

Conclusion

[37] This article has recast the emerging concept of industrialised art and the mass-produced reproductions of artistic sculpture, particularly in the context of the Great Exhibition of 1851. The profound impact of this world's fair subsequently led to the founding of the Victoria & Albert Museum and to the establishment of postgraduate schools dedicated to design and applied arts in Britain "in order to familiarise the industrial class with the objets d'art".[136] One of the notable changes during this period was the shift in exhibition venues for sculpture away from traditional institutional settings such as art museums, private sculpture galleries and academic exhibitions. Instead, sculpture found itself prominently displayed at international fairs, where it was "treated as part of the industrial spectacle".[137] The social and cultural value of reproductions and copies of artworks that served the idea to educate the taste of the masses, had never been so prominently demonstrated as at the world's fairs, where "[s]culpture, craft, and industry [were] considered as interconnected spheres".[138] The processes discussed in this article, the use of various devices and materials to reproduce works of art, exemplify this transformation. These pioneering examples foreshadowed a significant shift in artistic style that would also manifest itself in the later years of the century with the emergence of new art movements. The New Sculpture movement, for example, was "an aesthetic which increasingly drew sculpture together with decorative art and design".[139]

[38] The article also underscored the pivotal role played by scientists, engineers and sculptors who experimented in support of the arts and showcased their innovations at universal exhibitions. Meanwhile, the concepts of the new 'artisan-sculptor', the skilled craftsman, the man of science, and the *artiste industriel* (or even merchant) shaped the ongoing discussions. A more detailed exploration of the origins and precise meanings of these terms was not the aim of this text. However, it is important to recognise their meaning of the "value of British craft traditions in

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[135] For the topic of the incorporation of antiquity through material appropriation see Charlotte Schreiter, "Bildhauerische Technik und die Wahrnehmung antiker Skulptur: Francesco Carradoris Lehrbuch für Studenten der Bildhauerei von 1802", in: *Wissensästhetik. Wissen über die Antike in ästhetischer Vermittlung*, ed. Ernst Osterkamp, Berlin/New York 2008, 239-266: 240.

[136] Helen Bocard, "Great Exhibition of the Works of Industry of all Nations, Crystal Palace, Hyde Park (1851)", in: *Encyclopedia of Nineteenth-Century Photography*, ed. John Hannavy, vol. 1, New York 2008, 614-617: 616.

[137] Droth (2004), 226.

[138] Droth, Edwards and Hatt (2014), 18.

[139] Ibid.

the modern industrialized world".[140] In this context, Benjamin Cheverton focused on reproducing scaled-down busts or statuettes using innovative materials and techniques such as Parian ware and electrotypes. His experiments also contributed to the development of new materials and processes, for example, a process for obtaining artificial ivory, for which he was granted a patent in June 1850.[141] Despite his ability as a sculptor, Cheverton deliberately chose to reproduce works by established fellow artists such as Sir Francis Chantrey, and ancient works of art, such as the ivory copy of the plaster cast of the Hellenistic bust of *Patroclus*. The reason for this decision may be twofold: Firstly, it alludes to James Watt, the eminent 'inventor' of the machine for reproducing sculpture, who also worked closely with Chantrey in the mechanical reproduction of some of his busts.[142] Secondly, it makes evident Cheverton's ambition to achieve the 'perfect' reproduction and to position himself within this historical lineage by surpassing the earlier methods. Research by Greg Sullivan informs us that Chantrey himself refined a pointing machine in his workshop for making serial sculptures, adding further depth to the theme.[143]

[39] In this historical context, it is reasonable to assume that these different individuals operated under similar circumstances. By presenting the machine for reproducing sculpture as an image-producing device alongside other groundbreaking inventions, Cheverton implied that he also wanted to take his place in the history of the great inventors. In an attempt to position himself artistically and technically on a par with the pioneers of photography, the first "artist engineer" of the modern era speculated that his "perfect copies" of sculptures, exemplified by small ivory busts like *Patroclus* with its flawless surface, or intended to surpass the often "damaged" originals, such as in the case of *Theseus*,[144] would gain widespread dissemination through serial production, essentially becoming multiples.

[40] After presenting the historical context in which this scientific network was located in the artistic and technical milieus, it becomes possible to highlight the common denominator, the ethos, and the apparatus at play: the machine. In this framework, the aim was not only to identify the similarities and differences between the sculpturing machine, engraving and embossing techniques, and early forms of photography and print media, but also to explore why mechanical methods of reproducing and multiplying three-dimensional objects emerged simultaneously with the invention and development of chemical photographic processes. The two techniques share

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[140] Droth, Edwards and Hatt (2014), 23. As the Authority of Royal Commissioners (1852), vol. 1, 691, stated: "Among the many good results which we may venture to anticipate from this Exhibition, it may not be too much to hope for a fuller revival of that happy alliance between the Fine Arts and Industry which subsisted in the middle ages, when the artist was more of a craftsman – the craftsman more of an artist – than is the case at present."

[141] Authority of Royal Commissioners (1852), vol. 1, 630.

[142] For more on this topic see Insley (2013); see also Pollard (1971), 312-317.

[143] Sullivan (2017), 226.

[144] On the significance of the machine for reproducing sculpture in the restoration of the Elgin Marbles, see Emma M. Payne, *Casting the Parthenon Sculptures from the Eighteenth Century to the Digital Age*, London/ New York 2021, 21 and 81.

crucial characteristics: on the one hand, both processes are mainly applied to portraying people; on the other hand, both serve the desire to reproduce the medium of sculpture.

[41] Contrary to earlier assessments that Cheverton's interest was of a purely commercial nature, it is more likely that he intended to join the ranks of inventors as an artist, a fact that is in keeping with the contemporaneous mandate that the Great Exhibition of 1851 also set forth for British sculptors: With his 'manifesto-like' concern, Cheverton celebrated the union of art and technology.

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