

# TRANSMISSION



from VICTORIANS DECODED: ART AND TELEGRAPHY

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Designed by Olivia Alice Clemence

BACK AND FRONT COVER:

James Tissot, *The Last Evening*, 1873 (details), The Guildhall Art Gallery, Corporation of London.



**Institute of Making**

TRANSMISSION

# CLARE PETTITT

DISPERSED CONSCIOUSNESS: EVELYN DE MORGAN'S *MOONBEAMS  
DIPPING INTO THE SEA*



Fig. 1, Evelyn De Morgan, *Moonbeams Dipping into the Sea* (1900), Courtesy of the De Morgan Foundation.

Painted at the very end of the nineteenth century, Evelyn De Morgan's *Moonbeams Dipping into the Sea* shows three linked female nudes reaching down from one source of energy, the moon, to another, the sea. Like others of her paintings of linked bodies (*The Sea Maidens* [1885-1886] and *The Captives* [1900-1919]) all the women in *Moonbeams* look very similar to one another, their features barely differentiated, and their eyes downcast. The nude forms are gigantic but graceful, the series unspooling in a luminous, almost iridescent space. The flat surface of the sea into which the third maiden dips her legs and trails her fingertips is shimmering with accents of purple and green like spilt petroleum. The dominant blues and purples of the sky above are contrasted with the copper colour of the girls' flowing hair. Elise Lawton Smith has noticed the way that the 'diaphanous drapery...coils around the figure of the moon and flows along the bodies of the two other women who are also connected to her by the gentle linking touch of their hands'.<sup>1</sup> The painting asks us to think about transmission, about energy, about connectivity, and about the force created by the positionality of bodies.

Like her husband, the ceramic artist, William De Morgan, and her mother-in-law Sophia De Morgan, Evelyn De Morgan was a committed Spiritualist.<sup>2</sup> The London weekly spiritualist journal *Light* defined spiritualism at this time as, 'a belief in the existence and life of the spirit apart from and independent of the material organism, and in the reality and value of intelligent intercourse between spirits embodied and spirits discarnate'.<sup>3</sup> De Morgan's work is always intensely interested in the relationship between the 'embodied' and 'discarnate'. In her painting, her intense sculptural interest in the flesh and solidity of the human form is always in tension with movement, fluidity and connective forces that move through and beyond the limits of the body.

From their early married days Evelyn and William De Morgan always set aside a little time every evening to experiment with automatic spirit writing. One would hold a pen, the other would lay their hand gently over their partner's and they would await the messages from the spirits. The spirits were not always communicative, and the connection was fragile: '[there] followed long intervals of highly unsatisfactory writing; sometimes accounted for as "the wires having got wrong", or else by the physical condition of the "mediums" making it impossible'.<sup>4</sup> 'The wires having got wrong' is an important metaphor and one that reappears often in the writing about spiritualism in this period. The connections and transmissions between the spirit world and this 'embodied' world were often described with electrical and telegraphic imagery. The American medium, John Murray Spear, for example, described the 'spirit-telegraph' as 'a connection, a telegraphic communication, by means of what may be termed an Electric chain'.<sup>5</sup>

The linked figures in *Moonbeams* create a kind of 'electric chain' or telegraphic cable, their bodies forming the cable core: and the metallic gleam of the paint surface suggesting the

conductivity of metals – the copper of their hair, the silver of the sky and the salt water of the sea all replete with possibilities for electrical transmission. The components are in fact close to those of a Leyden Jar, or a battery, and the legs and arms of the figures create a circuit from sea to moon and back again. The greenish coppery coloured drapery is coiled around the bodily core but it seems to flow like a liquid or a gas rather than hang and fold like a fabric. It answers to the description of ectoplasm, the ‘semi-luminous thick vapour’ which sometimes appeared from the orifices (often the mouths) of mediums at spiritualist séances, and which was also known as ideoplasm or teleplasm.<sup>6</sup> Indeed, if we read this substance as ectoplasmic in De Morgan’s painting it seems less a conventionally Victorian veil of modesty covering the genital areas of the women and appears instead as a substance which flows through and out of their bodies and threads them together through their bodily openings. Marina Warner has written that ‘[a] medium’s body became a porous vehicle as the phenomena exuded from mouth, nose, breast and even vagina: she acted as a transmitter, in an analogous fashion to the wireless receiver, catching cosmic rays whose vibrations produced phantoms and presences’.<sup>7</sup> In William De Morgan’s first novel, *Joseph Vance* (1906), the Swedenborgian character, Dr. Thorpe, realizes that, ‘there are two distinct classes of people in the world; those that feel that they themselves are in a body; and those that feel that they themselves are a body, with something working in it. I feel like the contents of a bottle, and am very curious to know what will happen when the bottle is uncorked’.<sup>8</sup> Evelyn De Morgan seems to have shared this curiosity and her late work uncorks and opens up the body in order to plug it into the larger energy flows around it. Much later, in the twentieth century, the media theorist, Marshall McLuhan would describe a ‘media sensorium’, where the ‘central nervous system’ is ‘outered’ to become a technological field.<sup>9</sup> De Morgan seems to be visualising such a possibility in paintings in which the ‘inside’ of the body becomes outered and forms a sensory circuit with its environment.

Physicists, chemists and biologists in search of ‘protoplasm’ or the ‘strange, elusive, protean, all-pervading substance’ which would unlock the composition of the material world took the idea of ectoplasm seriously.<sup>10</sup> Warner notes that it was thought that, ‘[d]arkness was essential for the phenomena to appear...William Crookes, the great Victorian experimental chemist, preferred moonlight, and reported excellent results by this pale illumination’.<sup>11</sup> While De Morgan was creating the impression of ‘pale illumination’ in paint in *Moonbeams*, physicists were beginning to shift towards a new quantum view of the universe. In the 1890s, scientist Oliver Lodge had moved towards radiotelegraphy with his experiments in wavelengths, while remaining a wholly committed member of the Society for Psychical Research.<sup>12</sup> His theory was that ectoplasm was identical to the substance he called ‘Ether’ which he defined as ‘the *tertium* quid, the essential intermediary’ and ‘the vehicle of both matter and spirit’. The Ether was ‘the seat of all electric forces, and indeed the sole transmitter of force’, and it could ‘transmit vibrations from one piece

of matter to another'.<sup>13</sup> Lodge was not alone. Many scientists maintained an idea of the ether as 'a transparent universal medium that permeated the spaces between particles, thus acting as a transmitting device (for electromagnetic waves, as one nineteenth-century theory proposed, or, on another level, for messages from the spirit world)'.<sup>14</sup> And at the turn of the century Guglielmo Marconi's breakthrough work on wireless technology showed that the air itself could carry signals, without the need of cabling or wiring. Wireless was hailed as 'a new sense' which could provide 'not the ghostland of the heated imagination cultivated by the Psychical Society, but a real communication from distance based on true physical laws'.<sup>15</sup> Jeffrey Sconce claims that wireless 'heralded a radically different vision of electronic presence, one that presented an entirely new metaphor of liquidity in telecommunications by replacing the concept of the individuated "stream" with that of the vast etheric "ocean"'.<sup>16</sup>

Evelyn De Morgan's later work offers a visualisation of dispersed media, or what Joe Milutis calls the 'electric sensorium' of the ether in an attempt to define 'a space of collective sensation'.<sup>17</sup> In the De Morgans' automatic writing, the ideal of a collective dispersed consciousness returns again and again: '[s]tretch out a hand and grasp the wealth that is lavished on all who will have it, and listen to the music that sounds through creation, till personal aches and miseries are drowned in the great chorus of rejoicing'.<sup>18</sup> In her painting De Morgan dissolves the individual into a series and, by this replication of the body, she fantasises the perfect telepathic transmission. Michel Serres points out that '[e]very system is a set of messages; in order to hear the message alone, one would have to be identical to the sender...As soon as we are two, there is a medium between us, the light ray is lost in the air, the message is lost in the interceptions, there is only a space of transformation'.<sup>19</sup> But the beams of moonlight are not lost in the air in De Morgan's image. Because the figures are perfect copies of one another, the message is reproduced without distortion. Her late work tries to eliminate the noise and interference of the media in order to restore transparent transmission. There is a gendered purpose here too, as the ethereal environment she creates for the naked female bodies in her paintings removes them from the social and political force-fields that constrained women in late nineteenth-century society. The disjunction from the social which is common to all of her late work perhaps also explains the much-noticed lack of erotic charge to her nude female figures. Without the mediation of an eroticised context these women's bodies become affectless solid matter.<sup>20</sup> The affect in De Morgan's work is transmitted elsewhere, into the atmosphere, into the ether.

As the full electromagnetic spectrum was slowly being discovered and described in the late nineteenth century, it was already becoming clear that we might be able to locate ourselves electromagnetically: 'a time would come when if a person wanted to call to a friend he knew not where, he would call in a small electro-magnetic voice ... "Where are you?" ...

A small reply would come, “I am at the bottom of a coal mine, or crossing the Andes, or in the middle of the Pacific”.<sup>21</sup> This new-wave ‘ether’ was understood as both a medium and an environment, so that we could locate ourselves in it and use it to communicate. As Marshall McLuhan pointed out, electricity is, importantly, not about containment, but rather about relation and positionality between bodies: ‘[a]gain, as more is known about electrical “discharges” and energy, there is less and less tendency to think of electricity as a thing that “flows” like water through a wire, or is “contained” in a battery. Rather, the tendency is to speak of electricity as painters speak of space; namely, that it is a variable condition that involves the special positions of two or more bodies’.<sup>22</sup> Evelyn De Morgan expresses space in her painting by the positioning of bodies to create atmospheric energy. Her aesthetics are the aesthetics of an emerging teleworld in which human subjects become networked objects in a complex field of energies.

1. Elise Lawton Smith, *Evelyn Pickering De Morgan and the Allegorical Body* (London: Fairleigh Dickinson University Press, 2002), p.132.
2. Sophia De Morgan, Evelyn De Morgan's mother-in-law, was enthusiastic about the beliefs of Emanuel Swedenborg (1688-1772) and she wrote and published Swedenborgian treatise: Sophia De Morgan, *From Matter to Spirit: The Result of Ten Years' Experience in Spirit Manifestations* (London: Longmans and Green, 1867).
3. Arthur Conan Doyle, *The History of Spiritualism*, vol. 2, ch.10. Quoted Lawton Smith, *Evelyn Pickering De Morgan* (2002), p.41.
4. Evelyn De Morgan and William De Morgan, *The Result of an Experiment* (London: Simpkin, Marshall, Hamilton, Kent, 1909), 'Preface' by the editor, pp. xii-xiii.
5. Alonzo E. Newton, ed., *The Educator, Being Suggestions Theoretical and Practical, designed to Promote Man-Culture and Integral Reform, with a View to the Ultimate Establishment of a Divine Social State on Earth, Comprised in a Series of Revelments from Organized Associations in the Spirit-Life, Through John Murray Spear* (Boston, MA: Office of Practical Spiritualists, Fountain House, 1857). Quoted in Bret E. Carroll, *Spiritualism in Antebellum America* (Bloomington and Indianapolis: Indiana University Press, 1997), p.69.
6. Arthur Conan Doyle, *History of Spiritualism*, Volume Two (1926) (Great Britain: Psychic Press Ltd., 1989), p. 89. Conan Doyle describes ectoplasm as 'ooz[ing] from the side or the mouth of a medium', p. 89.
7. Marina Warner, 'Ethereal Body: The Quest for Ectoplasm', *Cabinet Magazine*, Issue 12 (Fall/Winter 2003), <http://tinyurl.com/3ygc09l> (consulted 27 August 2016).
8. William De Morgan, *Joseph Vance: An Ill-Written Autobiography* (London: William Heinemann, 1908), p.372. Quoted in Elise Lawson Smith, *Evelyn De Morgan* (2002), p.45. Emphasis original.
9. Marshall McLuhan, 'Automation: Learning a living', in *Understanding Media: The extensions of man* (Cambridge: MIT Press, 1994), p.347.
10. Arthur Conan Doyle, *History of Spiritualism* (1989), p. 121.
11. Marina Warner, 'Ethereal Body', (2003).
12. The Society for Psychical Research (SPR), founded in 1882 by a group of prominent intellectuals, was the first learned society with the purpose of scientifically investigating psychic phenomena. For a recent collaborative research project on Oliver Lodge based at Birmingham University, see <http://www.oliverlodge.org/> (consulted 27 August 2016).
13. Oliver Lodge, *Ether and Reality: A Series of Discourses on the Many Functions of the Ether of Space* (1925) (Cambridge: Cambridge University Press, 2012), p.20, p.174, p.154.
14. Lawson Smith, *Evelyn Pickering De Morgan* (2002), p.164.
15. Professor William R. Ayrton, quoted during a discussion after a paper given by Marconi at the Royal Society, in Guglielmo Marconi, 'Syntonic Wireless Telegraphy', *Journal of the Society of Arts*, vol. 49 (17 May 1901), p.516 and pp. 516-517.
16. Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television* (Durham and London: Duke University Press, 2000), p.14.
17. Joe Milutis, *Ether: The Nothing that Connects Everything* (Minneapolis: University of Minnesota Press, 2006), p.78 and Jennifer Gabrys, 'Atmospheres of Communication' in *The Wireless Spectrum: The Politics, Practices, and Poetics of Mobile Media*, ed. by Barbara Crow, Michael Longford, Kim Sawchuk (Toronto: University of Toronto Press, 2010), p. 57.
18. Evelyn and William De Morgan, *The Result of an Experiment* (1909), p.19.
19. Michel Serres, *The Parasite* (1980) (Minneapolis: University of Minnesota Press, 2007), pp. 69-70.
20. Jeffrey Sconce makes this point: '[f]or many women of the period, telegraphic presence was an important electrical space that dissociated the gendered body from the patriarchal realm of thoughts and ideas, thereby making possible new forms of political expression'. Jeffrey Sconce, *Haunted Media* (2000), p.14.
21. Professor William R. Ayrton, in Guglielmo Marconi, 'Syntonic Wireless Telegraphy' (1901), p.516.
22. Marshall McLuhan *Understanding Media: The Extensions of Man* (1994), p.347.

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# CAROLINE ARSCOTT

ELECTRIFYING THE LITERAL: TOPHAM'S *RESCUED FROM THE PLAGUE*

Fig. 1, Frank William Warwick Topham, *Rescued from the Plague, London, 1665*, 1898, Guildhall Art Gallery, City of London Corporation.

Frank William Warwick Topham's *Rescued from the Plague*, shows an incident described in the seventeenth-century text, Pepys' *Diary*, in which a couple have lost all their children but one to the plague. They are confined to the house and their door is barred in accordance with the regulations in place to control the disease. In order to save their last child they arrange for a friend to come and take the little girl, stripped naked so that there is no chance of disease being passed on by contaminated clothing. The little girl is handed down from an upstairs window into the receiving arms of the friend; his little companion stands by with fresh clothes. The painting was described in the *Art Journal* as 'a picture with a strong human motive animating its inception'.<sup>1</sup> A motive force (human interest) is indicated as being there at the inception; this leaves it moot as to whether the animation follows through into execution of the work and its reception. Did the viewer feel the urgent emotional charge?<sup>2</sup> Could Topham's picture effectively transmit that human motive force? The reviewer has selected his or her terms with care because expectations were low where Topham was concerned.

The parallel indicated above between the delivery of the picture to the art world and the transfer of the child within the picture is carefully worked through. The story sees the force of parental love impelling the child outwards, to be received by the friend, but whether for future life or for death is not known. The strange, near-horizontal position of the child aligns her with recumbent nudes from the academic tradition of western art from Titian's *Venus of Urbino* to Cabanel's *The Birth of Venus*.<sup>2</sup> There are also echoes of renaissance scriptural subjects prompting meditations on life, death and immortality: the vertical format recalls Rubens's *Descent from the Cross*, the cradled figure Raphael's figure of Christ in *The Deposition*.<sup>3</sup> All this is at the core of a scene that is strongly reminiscent of seventeenth-century Dutch genre painting both in the spatial arrangement and the details of dress and buildings.<sup>4</sup> The most revered and elevated elements of high art are wrapped around by the neutral, truth-telling capabilities of the Dutch genre tradition.

The child is attached to the mother by their shared fond gaze, by the mother's cradling hands that have not yet released her, and also by the grasp of this child on the neck-ribbon of the mother. The friend on the street reaches up to cradle her in turn; his hand overlapping that of the mother. The burden (the message) passes between the mother and the friend. The precious child, scion of an apparently doomed family is the sole chance for the transmission of the family name and family line. Her curved body hanging on to the vertical neck tie exactly echoes the shape of the carved anchor set over the doorway of the house. This makes her an emblem of hope like the anchor. The slumped female figure in the doorway to the right shows that the outcome is not certain. In place of the pearly nakedness of the child we see a rusty-red shawl and bodice, red flowers appear in her headdress like wounds. The pale stone of the anchor has its sinister echo in the smeared, downwards-drifting cross daubed in red paint on the door. It has been put

there to indicate the presence of the plague. It hangs over the seated female figure who is an image of despair and perhaps of vice. The element transmitted in this case is disease rather than life and lineage.

Topham worked in both oil painting and watercolour. He exhibited regularly at the Royal Academy from 1876 and at the New Water Colour Society (NWS) from 1879.<sup>5</sup> He was elected as a member of the successor to the NWS, the Royal Institute in Water Colours, in November 1896. W. W. Topham's work was generally discussed in fairly scathing terms in art criticism of the 1890s. His emulation of 'a sumptuous Venetian manner' in 1891 was botched, it was thought.<sup>6</sup> His *Jack Ashore*, RA 1896 (no. 638) was summed up in the *Athenaeum* as lacking 'freshness or strength ... eminently respectable without being sincere or solid'.<sup>7</sup> In 1895 the same publication had half-heartedly praised work that was 'neat, pretty as a whole, and more deftly as well as correctly drawn, and more crisply touched than most of the artist's rather amateurish works'.<sup>8</sup> An article on modern religious art in 1898 emphasised the strong religious feeling and emotional strength of a number of artists including William Holman Hunt and Ford Madox Brown. When it came to Topham however the religious subjects were said to be illustrative rather than imbued with devotion and religious feeling; 'they contain no lessons in themselves: they fulfil their intention in turning our minds to the original stories'. Topham was said to paint 'illustrations of facts and incidents recorded in Scripture, and only intended as such. In saying this there is no detracting of their merits suggested'.<sup>9</sup> The example given is his *Naaman's Wife* (RA 1888): 'it is an illustration of an incident made as true to facts as the artist could arrive at them'.<sup>10</sup> Baldly literal, at best carefully composed and crisply executed, the anecdotal paintings were liable to deaden rather than to intensify emotion.

In the case of *Rescued From the Plague* Topham's anecdotal or illustrative method is recognised. The *Art Journal* critic who had commented on the powerful initiating human motive also commented on the rather out-of-date mode 'it is interesting to reflect on the change of fashion in art, and to recall how prolific was the output in historical and anecdotal genre twenty years ago'.<sup>11</sup> However Topham has selected a new source for his anecdote here. He is venturing, in this picture on tapping in to the power that came from the unique document that is Pepys' *Diary*. Pepys' *Diary* was well-known, but until the 1890s it had not been fully translated from shorthand and published. Until the appearance of the 1890s edition readers had 'been defrauded of nearly one-fifth of his delightful prattle' said *The Bookman*.<sup>12</sup> Once published in its entirety (barring some passages omitted for the sake of decency) commentators were astounded afresh by its directness and human qualities.<sup>13</sup> No rhetoric was apparent because it was evidently written for himself. The record was unique, it was said, because it contained no generalisations or reflections on destiny or the implications of deeds. In this respect he was considered as an opposite to Shakespeare

To Shakespeare the world was “full of strange noises; “ men and women were on a journey from eternity to eternity, and their loves and hates, ambitions and failures were imbued with the enchantment of destiny, so that, while all they do or say seems proper to them as individuals, it is but the manifestation of a power or process of which they are the unwitting mediums. To Pepys they are comprehensible men and women, with no other matter of destiny about them than birth and death. These mysteries he makes no pretence to solve, or dilate upon; they are mere memoranda for him, like the pickled herrings he dines off at Greenwich. The world for Pepys is most effectually real.

Topham attempts to refresh his art by selecting a source that transmits humanity and the real in the purest possible way. Encrypted in the Pepys manuscript diary (in shorthand and in Pepys’s own private code), or fully deciphered in the 1890s edition, was to be found, it seemed, the real. Topham believed the motive source of human experience was intact and available. In *Rescued From the Plague* he attempts to use Pepys like a battery or power source to electrify the literal and deliver his art to the public.

In the context of this exhibition the gambit is akin to the technique of increasing the voltage when sending a message down a long cable. The telegraph message was animated at its inception by an electrical charge. If transmission was successful the charge passed down the cable and was discernible at the far end as a distinct element of a message. Some telegraph engineers believed that the best way to ensure a clear signal was to maximise the voltage. Eventually this method was discredited on the basis that it damaged the line and reliance was placed instead on instruments that were responsive to faint signals.<sup>14</sup> Topham’s selection of Pepys’s Diary for his anecdotal painting was not necessarily going to ensure the favourable reception of his work by the critics and public of the 1890s.

1. *Art Journal* (June 1898), p. 174.
2. Titian, *Venus of Urbino*, Florence, Uffizi, 1538; Cabanel, *The Birth of Venus*, 1863, Paris, Musée d'Orsay.
3. Peter Paul Rubens, *The Descent from the Cross*, 1612-14, Antwerp, Cathedral of Our Lady; Raphael, *The Deposition*, also known as *The Entombment*, 1507, Rome, Galleria Borghese.
4. For instance Johannes Vermeer, *The Little Street*, c. 1657-58, Amsterdam, Rijksmuseum.
5. He was the son of genre painter and illustrator Francis William Topham (1808-1877).
6. *Saturday Review* (9 May 1891), p. 559.
7. *Athenaeum* (6 June 1896), p. 753.
8. *Athenaeum* (2 Nov 1895), p. 612.
9. The Author of "A Pictorial Life of Christ", 'Religion In Modern Art', *The Quiver* (Jan 1898), p. 394.
10. F. W. W. Topham's work was sometimes engraved for the religious press; engravings of his RA pictures appeared in 1888 and 1889 in *Sunday at Home*. For this purpose his illustrative approach prompting recall of the original story may have been advantageous. *Sunday At Home* (Nov 1888), p. 697; *Sunday At Home* (Nov 1889), p.15.
11. *Art Journal* (June 1898), p. 174.
12. *The Bookman*, vol. 5, no. 25 (October 1893), p. 24.
13. The Henry B. Wheatley edition appeared in 8 volumes plus 9<sup>th</sup> and 10<sup>th</sup> volumes containing index and addenda. The final portion of the diary was in vol. 8 published in 1896. Henry B. Wheatley, *The diary of Samuel Pepys, transcribed from the shorthand manuscript in the Pepysian library Magdalene college, Cambridge, by The Rev. Mynors Bright, with Lord Braybrooke's notes; edited with additions by Henry B. Wheatley*, 10 vols. (London: G. Bell & sons; Cambridge: Deighton Bell & co., 1893-1899).
14. For a critical assessment of the role of elevated voltage in the damage to the 1858 transatlantic cable see D. de Cogan, 'Dr E. O. W. Whitehouse and the 1858 trans-Atlantic Cable', *History of Technology*, Vol. 10 (1985), pp. 1-15.

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# CAROLINE ARSCOTT

GRIM SPECTRES: LOGSDAIL'S *THE NINTH OF NOVEMBER, 1888*

Fig. 1, William Logsdail, *The Ninth of November, 1888*, 1890, Guildhall Art Gallery, City of London Corporation.

The Lord Mayor's Show passes in front of the Royal Exchange. Puny footmen in elaborate livery are striding forward on the damp roadway, ahead of the Lord Mayor's coach. This was the shortest Lord Mayor's procession of the century; as an economy measure it had been scaled down. The show of traditional pomp in modern times is shown as awkward. The picture's theme is on one hand the effort to maintain transmission and on the other the forces that thwart transmission.

William Logsdail's *The Ninth of November, 1888* was exhibited at the RA in 1890 (no. 1028) and was the only picture Logsdail showed in that exhibition.

This painting of the annual Lord Mayor's Parade gave Logsdail the opportunity to depict a central London location in a topographically accurate way, to indicate a representative crowd of modern city types, gathered as onlookers, and to elaborate a series of figures and vehicles representing the make-up of the parade. It sets up a striking contrast between the brilliant colours and shiny gold trimmings of the parade and the dull, largely monochrome appearance of crowd and street. The architecture is somewhat misted over in the cloudy atmosphere of a raw November day but the eight Corinthian capitals and the portico sculpture of the Royal Exchange are carefully depicted as the main backdrop for the procession.<sup>1</sup> The picture shows the view from the junction of Threadneedle Street

and Cornhill. Looking past the Royal Exchange to the left, along Threadneedle Street, Logsdail shows the buildings of the Bank of England. One roofline is punctuated by a regular row of ornamental urns, but the roof nearest to the picture's foreground is topped by figures of ladies and gentlemen, silhouetted against the sky, human equivalents to the stone vases.



Fig. 2, Portico sculpture (detail) The Royal Exchange, <http://tinyurl.com/gur5rq8> photograph by Robert Freidus.

The allegorical figure of commerce is shown in its position at the centre of the Royal Exchange portico. The portico sculpture was made by Richard Westmacott the younger; the group to the left of Commerce shows city officials including a Lord Mayor in his robes. By centring the picture on this building Logsdail is invoking the city as a nexus of regulated trading: prosperity and authority may be expected to support each other in the rational spaces of modernity. The building, designed by architect William Tite, was opened with great ceremony on 28th October 1844.

It is interesting to compare the format of a lithograph made of that ceremony with the composition of Logsdail's painting. The equestrian sculpture of the politician and military hero Wellington can be made out in Logsdail's picture as a shadowy horseman behind the horses drawing the Lord Mayor's coach. By contrast, in 1844, it was shown as a towering presence in amongst an ornamental display of parading horses and marching troops and lines of ceremonial carriages. In that image shadows are crisp and the ground is clear and bright between the lines of participants. The onlookers in 1844 are shown as minute,



Fig. 3. Newcombe after G. R. Smith, *The Opening of the Royal Exchange by Her Gracious Majesty, on the 28<sup>th</sup> October 1844*, lithograph, published by Ackermann & Co., 1844, City of London Corporation.

gathered in their thousands like ants on the street and in the stands constructed for the day. In the 1844 view confidence in the grand city as a bright, clean, secure and comprehensible locus for an upbeat demonstration of power and prosperity is intact. This gives way in Logsdail's picture, nearly fifty years later, to a more ambivalent view.

Logsdail shows us prosperous citizens but poverty is evident, mingled in among the array of smart bonnets, neat jackets and silk hats. On the right an urchin retrieves a top hat that has been knocked into the wet street, either intending to purloin it or to return it. To the side of him an elderly woman with sunken cheeks, sharp features and rough shawl holds something white that has been drawn out of her cloth bag. Could it be bread? The plaintive look of the youngster at her side is directed at the viewer of the picture as if in appeal. This figure has his/her hand gripping the body close to the waist, deep shadows under the eyes and downturned sensitive mouth. These three figures are grouped together thematically as 'poor and needy', yet their looks and actions do not work in concert. They

are the most prominent of the 'onlookers' but they give no more indication of delight and admiration in relation to the occasion than the dog who has strayed onto the route of the procession. That dog sways and shivers in an open space where reflections of the gilded coach shimmer confusingly on the road surface.

On the other side of the road well-dressed young women are shoulder to shoulder with working families. One gentleman (to be seen between the second and third groom at the front of the procession) has his top hat ignominiously crushed by the hand of a ruffian behind him. An urchin steals oranges from the basket of a street vendor right under the elbow of a policeman in the left foreground while the policeman is spreading his arms, trying to hold the crowd back.

The markers of authority in Logsdail's picture are not aggrandised and indisputable like the figure of Wellington in Ackerman & Co.'s lithograph. For all the gold-thread embroidery, braid and fringing, the footmen and groom at the forefront of the procession are anti-heroic types, short in their stature. Receding chins, puffy eyes and callow faces make their grandiose gestures ridiculous. Logsdail even goes so far as to rhyme their movements with the most degraded and absurd components of the scene. The dog's hind legs match the footman's attempt at contrapposto. The outstretched banjo of a black-face musician on the far pavement, and his scruffy white get-up, echo the outstretched ceremonial staffs and white knee-breech liveries of the Lord Mayor's entourage. The police whether mounted on right or on foot on left do not fully control the scene, as we have seen. As for the mayor, he is just visible, rather pale and shrunken inside the bulbous, gold encrusted carriage.

It may be that we should read his presence as benign, however, given the special circumstances of the Lord Mayor's procession that Logsdail has chosen to portray.

The ceremony of 1888 was not like every other Lord Mayor's parade that had been held annually on 9<sup>th</sup> November since the sixteenth century. This is due to the fact that the incoming Mayor in 1888, Sir James Whitehead, had chosen to reduce the scale of the event drastically, enabling him to divert funds to the poor and needy in the East End. Instead of one centralised spectacle in the form of the annual parade, Whitehouse wanted to remove what he termed 'the circus element' and serve nourishing beef soup to thousands of impoverished east enders. He was a Liberal merchant who had operated in Yorkshire, and was associated closely with the democratising effects of the Penny Post, erecting a statue to Rowland Hill, and in 1879 founding a charity, the Rowland Hill Fund, for postal workers and their dependents in need. Such a link with a networked communications technology is relevant for a discussion of the pictured parade in terms of this exhibition's themes. The exhibition 'Victorians Decoded' has a focus on telegraphy and this particular



Fig. 4. Walery, *The Rt Hon The Lord Mayor* (Sir James Whitehead, 1st Bt), carbon print (London: Sampson Low & Co., October 1889), NPG Ax38303 © National Portrait Gallery, London

section of the exhibition highlights 'Transmission'. Whitehead undertook a whole range of democratising activities. He founded the 'penny-a-week' collections in factories as part of the Hospital Saturday Fund to enable the poor to access metropolitan hospitals; he encouraged education in fruit and orchid growing for cottage gardens. He served on the boards of asylums and hospitals.

We can envisage the procession itself as a transmission system for tradition. Evidence of mercantile splendour (prosperity linked to authority) is at its core, to be carefully insulated from the surrounding urban fabric and folk by a doughty police cordon. We can recognise that Whitehead was trying to puncture the insulation. He wanted the gold to seep out. To express this in terms of a telegraphic metaphor, the traditional message may not have been conveyed so effectively, but the charge could accumulate in the wider environment of the city. Whitehead's experiment was not repeated. The press reports were mainly critical of the slimmed-down parade. 'Opinions differ as to the advisability of the step the new Lord Mayor has taken in curtailing the annual November Show of so much of its attractiveness' said one rather starchy.<sup>2</sup> Logsdail's picture shows the leakage and arguably endorses it. That black-face minstrel is surely a reference to the 'circus' that Whitehead was seeking to displace. The minstrel's inclusion is a critique of the trappings of the traditional parade and a demonstration that the barriers between show and audience were permeable. The piece of bread held by the old woman perhaps alludes to the charitable dole offered by Whitehead.

The prominent presence of the poor and the depiction of active police alongside the City of London participants in the parade keys us into another aspect of this historical moment. In the period from late 1887 to late 1888 the police, particularly the commissioner of the Metropolitan Police Charles Warren, and the Home Office were under extreme pressure due to high visibility of the unemployed and the fallout following violent action against socialist demonstrators in Trafalgar Square where orchestrated attacks on demonstrators by 2000 police and 400 troops resulted in two demonstrators receiving mortal injuries on November 13<sup>th</sup> 1887, the day that came to be called Bloody Sunday, and the slaughter in a follow-up demonstration of protestor Alfred Linnell.<sup>3</sup>

The newspaper *The Star*, in November 1888 spoke bitterly of the incompetence of Sir Charles Warren and Home Secretary Henry Matthews, saying 'We remember Trafalgar-square, and the danger of fresh assaults on the unemployed this winter'. What really stoked up anger against the police in 1888 was that during 1888 as many as five murders had been carried out in the East End and the police had failed to catch the murderer known as Jack the Ripper. Whitehead went ahead and offered a reward for the capture of the Ripper whereas the police and Home Office were criticised for refusing to offer a reward. Sir Charles Warren, reportedly excessively proud of his



Fig. 5, Herbert Rose Barraud, *Sir Charles Warren*, carbon print (London: Richard Bentley & Son, 1888), NPG Ax5432. © National Portrait Gallery, London

gold-embroidered dress uniform and preoccupied with providing military-style clothing and equipment for the police, was accused of failing to search the crime scenes promptly and failing to deploy bloodhounds, reportedly losing the hounds at one point. The stray dog in Logsdail's picture is not a bloodhound but may tangentially allude to the question of police competence or incompetence. According to *The Star*, at the Lord Mayor's parade of 1888 there was a general condemnation of the police: 'there is but one cry from Tory and Liberal - "WARREN must go." At the Show yesterday his name was execrated from Aldgate to Pall Mall. He has become impossible. He is doomed'.<sup>4</sup>

The particular reason that his name resonated in this way on the day of the parade was that the Whitechapel murders were ongoing and unsolved. One mounted official in elaborate red uniform was wrongly taken to be Charles Warren and was mobbed for the length of the parade. Indeed a fifth victim of Jack the Ripper had been found in her home in Spitalfields on the morning of 9<sup>th</sup> November 1888. Long-term frustration with the lack of progress in the investigation bubbled over. Warren did in fact resign just prior to the murder but the fact had not been reported. Poignantly Mary Kelly, the victim, had said that she hoped the weather would be good the following day because she aimed to go to the Lord Mayor's parade.<sup>5</sup> *The Star*, having invoked Bloody Sunday and railed at police incompetence offered a chilling suggestion. Perhaps the murderer staged this Mary Kelly murder as a deliberate counter-demonstration to the pomp of the Lord Mayor's Show.

So he decided to get up a counter-demonstration to the LORD MAYOR'S Show. If that was his intention he succeeded beyond all expectation. He got his sensation. While the well-stuffed calves of the City footmen were being paraded for the laughter of London, his victim was lying cold in a foul, dimly-lighted court in Whitechapel. Whitechapel is once more to the fore - a grim spectre at our shows and banquets.<sup>6</sup>

We can look at Logsdail's picture and see the group to the right as just such a spectral presence, 'Whitechapel to the fore'. On the opposite side of the road the minstrel's applied black face-paint and frilled costume is the abject correlative of the respectable but false glitter and pomp. Just to the left of the minstrel is another painted face that reinforces the idea that Logsdail's picture, despite offering a contrast between ceremonial and quotidian aspects, subversively allows for leakage between these categories. This painted face is that of a young woman with too much rouge. On the 9th November 1888 such a figure might well suggest the presence of a prostitute, indeed it can be taken as the spectral presence of Mary Kelly who sadly never had the chance to attend the Lord Mayor's Show.

1. It had rained overnight, was overcast by 11.00 am and maximum temperature was 46.3 degrees F. Casebook: *Jack the Ripper*, <http://tinyurl.com/2escw6> (consulted 8 September 2016).
2. *St. Stephen's Review* (10 Nov 1888), p. 15.
3. Bloody Sunday reported on by William Morris 'London In A State of Siege', *Commonweal*, volume 3, no. 97 (19 November 1887), pp. 369-70, reprinted in William Morris, *Political Writings: Contributions to Justice and Commonweal 1883-1890*, ed. and intr. by Nicholas Salmon (Bristol: Thoemmes Press, 1994), pp. 302-6. See also John Charlton, 'London, 13th November 1887' *Socialist Review*, Issue 224 (November 1997), <http://tinyurl.com/jqv174v> (consulted 8 September 2016).
4. 'Another awful tragedy in the East-End', *The Star* (10th November 1888), n.p. [p. 2].
5. 'Mrs. Prater, who occupies a room in 26 Dorset street, above that of the deceased stated that she had a chat with Kelly on Thursday morning. Kelly, who was doing some crochet work at the time, said, "I hope it will be a fine day tomorrow, as I want to go to the Lord Mayor's Show." "She was a very pleasant girl," added Mrs. Prater, "and seemed to be on good terms with everybody. She dressed poorly, as she was, of course, badly off". *Daily News* (10 Nov 1888), <http://tinyurl.com/jjca4rg> (consulted 8 September 2016).
6. *The Star* (10 Nov 1888), n. p. <http://tinyurl.com/hpeczun> (consulted 8 September 2016), also referenced in L. Curtis, *Jack the Ripper and the London Press* (London and New Haven: Yale University Press, 2008), p. 192.

TRANSMISSION

# CAROLINE ARSCOTT

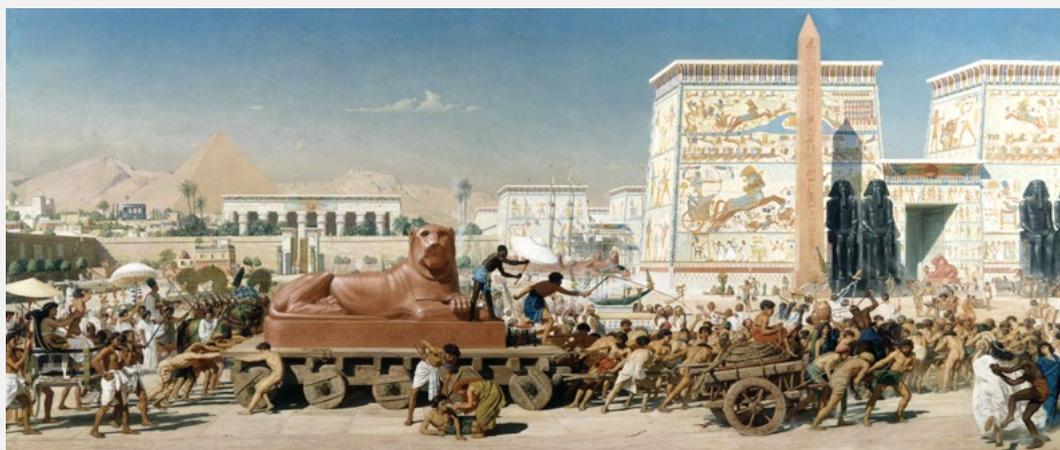
ENGINEERING AND ORATORIOS: POYNTER'S *ISRAEL IN EGYPT*

Fig. 1, Edward John Poynter, *Israel in Egypt*, 1867, Guildhall Art Gallery, City of London Corporation.

Edward John Poynter's *Israel in Egypt*, exhibited at the Royal Academy in 1867 (no. 434) shows a team of captive Israelites shifting a vast sculpted lion by means of a wagon. They are taking the sculpture, representing Sekhmet, the Egyptian goddess of destruction (by tradition a blood-coloured and ferocious lioness) into the enclosure. The sculpture will be set alongside other identical sculptures.<sup>1</sup> The Israelites are driven on with whips by the overseers under the guiding eye of the Egyptians who have enslaved them.

The painting was exhibited with an abbreviated Biblical text:

Now there arose up a new King over Egypt which knew not Joseph, and he set over Israel taskmasters to afflict them with Burdens. And the Egyptians made the children of Israel to serve with rigour. All their services wherein they made them serve was with rigour.

Exodus, I: 8-14

In creating a work on such a large scale with a Biblical text attached, Poynter demonstrated his ambition to make highly serious art that established a dialogue with the category of history painting. The picture can in some ways be seen as a work of historical genre rather than history painting proper because it shows an everyday scene set in a historical period, rather than a key historical juncture, such as a battle or recorded act of heroism. This is in conformity with his painting *The Catapult*, exhibited at the Royal Academy one year later in 1868 (Newcastle, Laing Art Gallery). That picture partly reprises the figure of the nude Israelite placed against the back wheel of the vast wagon in its figure of a nude Roman soldier bracing his knee against the wheel of the siege machine. The Israelite pulls at the wagon with his arms and pushes with all his strength against the ground with his outstretched leg. The Roman soldier pushes the crank, or windlass, of the siege machine upwards with his right arm and pulls down on another spoke with his left

arm, obtaining leverage via his knee. In each case the nudity of the figure is a knowing invocation of academic history painting's focus on the ideal male nude. Poynter establishes some distance from that tradition though by making his athletic nudes anonymous and part of a collective effort where individuals contribute their energies to a great orchestration of forces.<sup>2</sup> The mechanical devices and expenditure of physical effort being shown in each of these pictures generalise the subject to work itself in its scientific definition: the transfer of force through distance.<sup>3</sup> Indeed Poynter first developed the composition in a drawing society project where the designated topic was 'Work'.<sup>4</sup>

The relationship of the individual unit to the system, or the particle to the field was an important aspect of the scientific investigation of energy. The popular work on energy theory, William Robert Grove's *The Correlation of Physical Forces*, was reissued in a revised fourth edition in 1862. If mechanical movement can be discussed in terms of work done against resistance through a certain distance (for instance raising a 15-stone Egyptian man on a rope against the force of gravity for a distance of forty foot) then -- according to mid-Victorian theories of energy -- heat, light, sound, magnetism and electricity should also be explained in terms of 'motions of ordinary matter'. Grove discusses the vibrations of molecules and their re-spacing in instances of heat, the reconfiguration of crystalline structure in response to pressure, the mobility of molecules in instances of chemical decomposition as well as the wave motion in particles that can be inferred in the case of sound, light and electricity. He concludes that each form of energy can be converted to another form and that the occurrence of one form of energy can be accompanied by the arising of other forces simultaneously, as in the case of electricity and magnetism where 'when electrified a substance becomes magnetic in directions at right angles to the lines of electric force'.<sup>5</sup> Field theory, in physics, saw lines of forces extending through three-dimensional space and attended to the phenomenon of criss-crossing lines associated with different forms of energy.

For the purposes of telegraphy, particularly, it was important to establish standardised ways of measuring current and resistance. The Edinburgh-based physicist William Thomson made a break-through in 1853 when he constructed a machine for measuring current based on the assumption that, as Crosbie Smith puts it in *The Science of Energy*,

The mechanical effect given out or taken in by an electrical system was precisely analogous to the work done or work absorbed by a waterfall or heat engine. In the electrical case, potential was analogous to the height of a waterfall or the temperature of a boiler, while quantity of electricity was analogous to mass of water or quantity of heat.<sup>6</sup>

Just as physicists investigating electricity and magnetism looked to models of machines to facilitate an understanding of non-mechanical forces, so Poynter could look to a primitive mechanical device (a waggon dragged by means of ropes) to elaborate a vision of work and energy as manifest in the modern world. Poynter shows us that work depends on concerted effort. Individual morality does matter (an individual act of mercy is shown in the foreground where a drink is being given to a fallen Israelite, the force of goodness barely fending off the savage intervention of the lowering overseer) but individuality is subordinated to the overall play of forces.<sup>7</sup>

In the modern world democratic systems and popular culture could be imagined as consolidating the many into a singular entity. In the modern world all kinds of physical substance were known to be susceptible to being put into motion by forms of energy. There was found to be a pervasiveness of matter and 'democratic' unity between solids, liquids and gases wherever you looked in the universe. Modern energy theory proposed that distinct forms of energy could be swapped about, as heat was changed into light for instance, or vice versa. In the modern world the transmission of telegraphic messages by means of electricity appeared to shrink distance and bring separated entities together instantaneously.

Poynter paints a picture where the role of individuals is minimised. He also compiles a number of recognisable topographical features from different locations and different periods of Egyptian history. The Great Pyramid from Giza, the Temple and other buildings from Philae, the Obelisk from Heliopolis sit alongside the Pylon gateway from Edfu. Items from the British Museum collections are brought together with some suggested by the Egyptian Court at the Crystal Palace Sydenham.<sup>8</sup>

The long narrow format of *Israel In Egypt* emphasises the shifting of the burden in a lateral direction. The action is lateral in the main, like the frieze histories of battle and gods and rulers painted on the pillars of the gateway. Indeed the overall colouration, and the discrepancy in scale between humans and sculpted lions, makes the scene of struggling Israelites seem like one of those paintings on the pylon gateway come to life. The horizontal emphases are complemented by vertical obelisk, pillars, poles and palm trees. Far in the background painters of the colourful wall decorations descend from the parapet on ropes to complete their work. This inclusion might be thought of as a playful form of self-reference for Poynter's own three-year labours on this vast work. The geometry of the whole picture is completed by criss-crossing orthogonals: peacock fans cut regularly across spears on the left, setting up the pattern; workers' limbs and crosspieces on wheels distribute this pattern across the picture. The handle of the little whip held by the Egyptian noblewoman's boy in the sedan chair on the left closely matches the orthogonals of the whip handles held aloft by overseers further forward in the train.

That boy seems to be internalising (through playful imitation) the cruelty of the enslaving forces, growing up to be a cruel Pharaoh in his turn. However the Biblical context also invites us to identify the woman as Pharaoh's daughter Bithiah in which case the boy represents the infant Moses rescued by her from the Nile.<sup>9</sup> His raised rod should be understood as a foretelling of vengeful reprisal then, against the Egyptians. He will visit plagues on the Egyptians and raise his rod to part the Red Sea only for it to crash down and drown the pursuing Egyptians. Poynter produced illustrations for wood engravings in *Dalziel's Bible Gallery* in 1881, many featuring Moses, including a violent scene where Moses seizes a hammer to stove in the head of the overseer at the Egyptian brickworks.<sup>10</sup> The overseer's head has been hurled onto the stack of bricks, and is almost buried in the structure, smashing through individual bricks even before the hammer is deployed. We should not expect the boy Moses to be shown by Poynter as a gentle and forgiving figure.

The title of the picture *Israel In Egypt* would have been well-known to Victorian viewers as the title of the Handel oratorio composed in 1738 (revised 1756). The phrases from the Bible verses reproduced by Poynter correspond closely to the words used by Handel in the oratorio. In the Victorian period Handel's *Israel In Egypt* was performed regularly on the third day of the Triennial three-day Handel festivals at the Crystal Palace, Sydenham.

These hugely popular, large-scale festivals were established in this form in 1859. *Israel In Egypt* followed *Messiah* which was performed on the first day and a Handel selection presented on the second.<sup>11</sup> There were 4,000 performers in 1865 and the audience for the event numbered up to 100,000.<sup>12</sup> Since participants were assembled from over 120 towns and cities across the country it was lauded as an unprecedented feat of organisation and coordination. It was a marvel when the loyal words were uttered in unison:

how, with such military discipline, they were at a given moment marshalled in regular order within an enclosed space?—how, in obedience to the signal from a solitary conductor's stick (even though that conductor was Mr. Costa), they instantaneously and simultaneously shouted "God Save the Queen" as though they had been shouting it in concert from time immemorial.<sup>13</sup>

The dispersal (and potential for opposition) of geographically separated entities was replaced with ideologically reassuring, simultaneous presence. Thanks to railways, postal services and the military precision of Michael Costa the far-flung came together to deliver thunderous choruses. The thrill produced by the festivals' condensation of time and space echoes the fantasies attaching to a world transformed by telegraphy.

I suggest that with his painting Poynter had the oratorios in mind and sought to achieve grandeur and stunning scale comparable to that of the Handel festivals. The Handel piece itself spans the years of enslavement, the plagues unleashed by God on the Egyptians via Moses, the miraculous crossing of the Red Sea and the destruction of the pursuing forces. It astounds listeners with the might of a punitive God. It ends with dancing and praise to the Lord by Miriam, together with other Israelite women, bearing timbrels or tambourines.<sup>14</sup> Poynter includes figures who, I suggest, stand for this group in the right foreground of his picture.<sup>15</sup>

The *Art Journal* commentary on this picture in 1869 comments on the ‘pull’, ‘pluck’ and ‘spirit’ of the figures and the ‘action’, ‘motion’ and ‘force’ depicted.<sup>16</sup> Poynter’s picture was itself a rousing performance. With some adjustments to satisfy the technical calculations made by the purchaser (with respect to the number of men required to pull such an object) the painting of Ancient Egyptian labour went into the collection of the engineer Sir John Hawkshaw, actively involved in modern-day Egypt as a consultant and keen advocate of the construction of the Suez Canal. The final phase of construction was from March 1864 - November 1869, coinciding with the period in which Poynter worked on the picture and its initial reception in the art world. Hawkshaw was President of the Institution of Civil Engineers in 1862. In his address of 1862 he claimed outright that, with the railways, electric telegraph, and steam navigation, modern engineering had annihilated both space and time. This exhibition shows that such claims were commonly made. Such achievements depended on multiple skill sets, Hawkshaw argued: both science and art were important, but along with these specialisms, not to be forgotten were the ‘strength and skill’ of a ‘great variety of workmen’.<sup>17</sup> Many commentators on the Suez Canal and on the telegraph links of the world compared them in scale and significance of Egyptian building projects.<sup>18</sup>

The ideology of mass participation marked the enthusiasm for the Handel festivals. Such an ideological position is a defining feature of Poynter’s picture too. Energy transmission and the collapse of time and space could be adopted as topics for a history painting in view of the definitions of work and energy emerging from the physics and engineering in the 1860s. A close reading of Poynter’s idiosyncratic history painting indicates that with the enthusiasm for modern communications came a focus on the common man, as one unit repeatable thousands of times, but essential en masse as components for the transfer of force.

1. *Athenaeum* (11 May 1869), p. 628 mentions that the lions were the ones brought to Britain from Nubia by Lord Prudhoe in 1828. They have been located in the British Museum since 1835. The pair of red granite lions from the period of Amenhotep III were studied by Poynter; the British Museum holds a blue chalk sketch by him of one of the lions, <http://tinyurl.com/h9acfln> (consulted 10 September 2016).
2. I have argued that *The Catapult* effectively constitutes a force field as understood in the emerging science relating to the interaction of electrical force and magnetism. The scientist Michael Faraday's proposal that lines of force extend through space was systematised by the physicist James Clerk Maxwell in a four-part publication 'On Physical Lines of Force' 1861-2 which imagined spinning of cells on axes, interspersed with particles acting like idle wheels or ball bearings in a mechanism. He used this idea to establish the difference between the effects of electricity on conductors, where the 'idle wheels' moved freely, and non-conductors where the 'idle wheels' simply rotated in place. His model allowed him to establish that electricity, magnetism and light were related phenomena all acting with wave motion. Caroline Arscott, 'Poynter and the Arty' in E. Prettejohn (ed.) *After the Pre-Raphaelites* (Manchester: Manchester University Press, 1999), pp. 135-151. For a summary of Maxwell's argument see Basil Mahon, *The Man Who Changed Everything: The Life of James Clerk Maxwell* (Chichester: Wiley, 2013), pp. 90-110.
3. 'Work done varies as the resistance overcome and the distance through which it is overcome conjointly', 'ENERGY', *Encyclopaedia Britannica*, 1911 edition, ed Hugh Chisholm (Cambridge: Cambridge University Press, 1910-22), vol. 9, p. 398. For the significance of emerging literature on energy referencing P. G. Tait 'Historical Sketch of the Science of Energy' (1868) and W. Garnett in 9<sup>th</sup> edition of *Encyclopaedia Britannica* (1879) see Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (Chicago: University of Chicago Press, 1998), p. 2.
4. Poynter first devised the subject when the theme 'Work' was proposed at the Langham Sketch Club in 1866, Cosmo Monkhouse, *Sir Edward J. Poynter His Life and Work* (London: J. S. Virtue, 1897), p. 10.
5. William Robert Grove, *The Correlation of Physical Forces* (1846), 4<sup>th</sup> edition (London: Longman, Green, 1862), p. 242.
6. Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (Chicago: University of Chicago Press, 1998), p. 273.
7. Another bearded figure is dispensing drinking water to the suffering Israelites. He is positioned at the far side of the work gang at the turning point of the procession. This faintly-depicted figure resembles a figure of Christ. The left-to-right trajectory within the elongated picture might therefore be considered to be from Mosaic law to Christian redemption. The picture compresses Biblical time.
8. These identifications were made by Patrick Conner in the Introduction to *The Inspiration of Egypt: its influence on British artists, travellers and designers, 1700-1900*, exh. cat. (Brighton: 1983). The reviewer in *Art Journal* (June 1867), p. 139 registers that the lions were found 400 miles from the Great Pyramid.
9. This is the identification offered in the short web article by Nathan Karp, 'Sir Edward John Poynter's *Israel in Egypt*: Experimenting with the Orient' (2007), <http://tinyurl.com/hgebvzx> (consulted 10 September 2016).
10. After E. Poynter, 'Moses Slaying the Egyptian', engraved by Dalziel Brothers for *Dalziels' Bible Gallery* (New York: Scribner and Welford, 1863-81), <http://tinyurl.com/zl4rs45> (consulted 10 September 2016).
11. <http://tinyurl.com/jsrugd6> (consulted 10 September 2016).
12. <http://tinyurl.com/zyxyfd> (consulted 10 September 2016).
13. 'Never was vast undertaking so admirably organised. The 4,000 singers and players seemed to get in and out of their places,—day after day, at the rehearsal and at the three successive performances,—as if by magic. We wonder if any among the thousands attracted on each occasion asked themselves how and by what means such a formidable host of executants ever came together?—how, with such military discipline, they were at a given moment marshalled in regular order within an enclosed space?—how, in obedience to the signal from a solitary conductor's stick (even though that conductor was Mr. Costa), they instantaneously and simultaneously shouted "God Save the Queen" as though they had been shouting it in concert from time immemorial? Upwards of 120 towns and among them 32 cathedral or collegiate cities sent delegates to the Handel-Festival Orchestra, which both in its vocal and instrumental departments was the largest and most splendid ever assembled. Had their united performance been merely tolerable there would have been sufficient cause for surprise; that it was for the most part admirable trenches on the marvellous', *The Tablet* (5 Jul 1862), p. 13.
14. 'And Miriam the prophetess, the sister of Aaron, took a timbrel in her hand; and all the women went out after her with timbrels and with dances. And Miriam answered them:— Sing ye to the Lord, for He hath triumphed gloriously; the horse and his rider hath He thrown into the sea.' The words of the Oratorio are attributed to Charles Jennens, <http://tinyurl.com/z9kw5up> (consulted 10 September 2016).
15. This represents another act of temporal compression within Poynter's canvas from the infancy of Moses to the liberation of the Israelites.

16. *Art Journal* (June 1867), p. 139.
17. Sir John Hawkshaw address 1862 reported in *Leisure Hour* (28 Aug 1875), p. 559.
18. For example: 'The *Great Eastern* has just been engaged in successfully laying a cable through the Red Sea, which has thus witnessed one of the great wonders of modern civilisation even as it did in Pharaoh's day, one of the greatest of ancient times'. *Albion* (12 March 1870), p. 9.

## TRANSMISSION

## CASSIE NEWLAND

## TELEGRAPHIC COPPER

Before the advent of the telegraph, copper wire was produced solely for mechanical purposes. The main consumer was the women's hat-making industry.<sup>1</sup> To avoid sharp ends sticking through the expensive and delicate fabrics, the wires were closely wound in silk or cotton thread. These wrapped wires were known as 'bonnet wire'. When the early electrical engineering pioneers, for example Charles Wheatstone or Michael Faraday were looking for sources of insulated wire they turned to readily available bonnet wire.<sup>2</sup> The existing hand-wound bonnet wire industry was initially able to meet demand but as the electrical engineering sector grew a larger scale solution was required. William T. Henley was an early pioneer who had set up shop as a maker of electrical equipment using bonnet wire. Recognising the growth in demand for wrapped wire Henley developed a 'six head wire covering machine' which he patented in 1837: the same year as Cooke & Wheatstone's first telegraph line was laid. Henley was not the only scientific instrument maker cashing in on the demand for bonnet wire. Mills notes that the respected instrument firm Watkins & Hall were also advertising bonnet wire in their 1838 catalogue.<sup>3</sup>

Early telegraph wires, such as that manufactured at Henley's Telegraph Works, had an irregular, elliptical cross section.<sup>4</sup> This is an artefact of the process of making wire. A rod of cold copper is pulled through a hole in a metal plate of smaller diameter, stretching it, rounding it and reducing it in size. This is done several times using ever smaller holes to achieve the thickness of wire required. If the plate is not entirely perpendicular to the direction of pull the resulting wire is slightly oval in cross section. Unbeknown to early telegraph engineers an elliptical cross section impacts badly on the carrying capacity, frequency, working distances, insulation requirements and electrical performance of a wire. The first attempts to explore these erratic performances came in the 1850s when the stakes were raised by the largest-scale telegraph project of them all: the Atlantic Cable.

In 1857 Professor William Thomson gave a lecture to the Royal Society in which he identified the purity of copper as a potential source of problems. When Thomson analysed the copper cable being produced by four leading manufacturers he found that even the worst performing wire was over 99.75 per cent pure and concluded that 'very slight deviations from perfect purity must be sufficient to produce great effects on the electric conductivity of copper'.<sup>5</sup> After Thomson's investigations, impurities in copper were widely blamed for the variable performance of telegraph and other electrical equipment. Thomson was so convinced of the connection between small impurities and falls in conductivity that in the late 1850s he led a call for copper smelters to improve the purity of their product. He succeeded in having a minimum standard for the purity of copper written into the specification for the 1865 and 1866 Atlantic cables. After the success of the operation 'high conductivity copper' became standard on all new cable schemes.

The purest copper in the world was smelted in Chile and was shipped in the form of best 'picked' or 'selected' 'chili bars' (sic). The 'chili bar' had been established in the 1840s to provide an international standard product for export. They were six inches long by two inches square (15 x 5.8cms) and of a standard purity.<sup>6</sup> It was the engineers' product of choice, consistently of 'high quality and abundance'.<sup>7</sup> Chili bars could be bought at 96-97 or 99 per cent fine copper.<sup>8</sup> Only copper with the highest purity available was used in the manufacture of telegraph wire. Chile had been exporting processed copper since the 1830s when reverberatory furnaces had been introduced from Swansea.<sup>9</sup> Copper must be smelted (baked but not melted) to remove other minerals from the desired metal. The copper of found in Chile had a particularly easy composition to smelt and few stubborn impurities. Smelting of chili bars in Chile itself really took off in 1842 when trade tariffs made the export of raw, un-smelted ore uneconomic.<sup>10</sup> From these beginnings Chile rose to become one of the world's biggest exporters of copper exploiting many mining districts and establishing an increasing number of copper smelting operations.

The Chilean smelting industry was dominated by a few, large factories. Smelting operations were established in the 1840s and 1850s at Guayacán, Coquimbo and Tongoy, and Tamaya in the north; and at Lirquén and Lota in the south.<sup>11</sup> The refineries at Guayacán and Tongoy were owned by the Urmeneta Y Errázuriz Company (hereafter known as Urmeneta), which by 1860 had become established as Chile's largest smelting concern. Urmeneta's 'chili bars' were considered to be of the very highest quality. When the market price for 'good' 'chili bars was £67 per ton, those smelted at Urmeneta commanded £68.<sup>12</sup> Guayacán, in particular, concentrated its efforts on supplying a greater percentage of the highest quality bars for use in the telegraph industry.<sup>13</sup>

Chile's access to the world copper market was mediated by international brokers and commission houses who exercised substantial control over the industry. They bought Chilean copper and set the market rate. They exported the copper and charged commission on all copper sold. They also filled the role of financiers, lending money to the smelting firms, with repayments to be made in copper for export. Interest rates appear to have been between eight and twelve per cent per annum.<sup>14</sup> The London-based commissioning house of Gibbs & Co contracted the Urmeneta company to supply them with copper on an exclusive basis.<sup>15</sup> Gibbs & Co exported Urmeneta 'chili bars' to the UK in Barques. Barques were ships specially built for the Cape Horn run between the UK and Chile, and known colloquially as 'Cape Horners' or simply 'Horners'. A typical copper barque, such as *The Zeta*,<sup>16</sup> was fully rigged, constructed of iron and (from the 1870s) fitted with a steam engine.<sup>17</sup> Like all barques, *The Zeta* was designed to cope with the densely heavy copper cargoes it would carry and was fitted out to operate in Chile's basic coastal ports. On the outward journey, anthracite coal was exported from Swansea to Chile to be used in smelting. The barque would then make the return journey carrying raw ore for processing

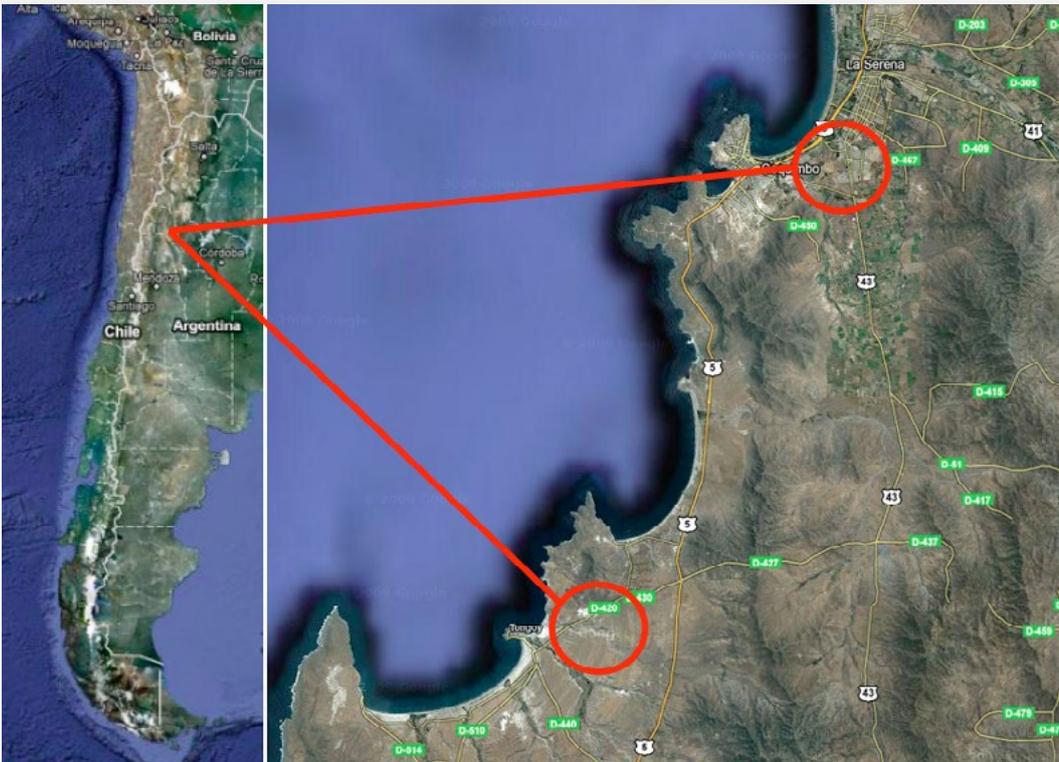


Fig. 1, Map of Chile showing location of smelting works at Guayacán (top) and Tongoy (bottom). Google Maps, 2010, with overlay by author.

at Swansea and fully refined ‘chili bars’.

Once the high purity ‘chili bars’ hit the shore they would be bought up by one of the leading companies in the emerging field of conductivity copper, such as the Birmingham based firm of Bolton & Sons. Bolton & Sons were asked to manufacture the copper core for the first cross-channel cable in 1851. The copper core was revolutionary: the first attempt to manufacture wire in continuous, 500 yard lengths (80 yards was standard). Indeed, Moreton notes that when the factory foreman was notified of the order he responded ‘does the man take me for a fool?’.<sup>18</sup> The Atlantic cable succeeded on the second attempt and this event appears to have inspired the managing director’s son, Alfred Bolton, to rebuild and re-equip the factory with the plant necessary to supply the great lengths required by the burgeoning telecommunications industry. A year later Alfred Bolton took on a large site in the Churnet Valley: Oakamoor.<sup>19</sup> It was at this site that Moreton argues ‘the main contributions to copper-making and the electrical industry were made’.<sup>20</sup>

Business boomed and in the first five months of the Oakamoor factory opening it had manufactured 55 tons of copper wire exclusively for the telegraph industry. Many of the larger cable orders, such as that for the Atlantic cables of 1865 and 1866, required such

huge lengths of cable in such short order that collaboration between several companies appears to have been fairly standard across the industry. Alfred Bolton's close working relationship with the noted telegraph engineer William Preece did much for the firm's reputation and ensured that Bolton & Sons remained at the leading edge of telegraph copper making.<sup>21</sup> It was at their manufactory at Oakamoor where the next big breakthrough in high conductivity copper was made.

The conclusions that Thomson had made back in 1858 - that small impurities have large electrical effects - although true, was not the whole story. As copper smelters and wire manufacturers strove for ever greater purity of copper, their wires still failed to live up to their mathematically projected conductivity. In 1861 the government commissioned a report from respected chemist and physicist Augustus Matthiessen. Matthiessen carried out extensive tests which supported Thomson's observations on purity and conductivity but also highlighted a previously unknown problem: oxygen contamination. During the drawing process, where wire is pulled through successively smaller holes, oxygen bubbles from the air become trapped inside the metal. These bubbles increased its porosity and greatly reduced its conductive properties. Bolton & Sons rebuilt the machinery at Oakamoor to take advantage of Matthiessen's new discoveries. Air was excluded from copper in a molten state, and rolling - rather than drawing - was used to turn the of cut strips of copper into wire, greatly reducing the amount of oxygen introduced into the metal. The introduction of inert gas atmospheres for wire drawing at the very beginning of the twentieth century solved this problem permanently.

The composition of wires tells us more about an artefact than just a date (approximate or otherwise). The 'bonnet wires' of early, experimental telegraphy can, for example, be seen as reflecting a period of great transition in manufacturing. The large variations in physical appearance displayed by early cables were characteristic of early-Victorian engineering systems where products were never identical, and tolerances expressed in hundredths of inches. The embryonic telegraph industry, in contrast, required an attention to detail more characteristic of the precision scientific instrument industry. Telegraphic instruments were one-off pieces crafted by men in workshops.<sup>22</sup> These two industrial traditions clashed in the development of larger, long-distance telegraphy systems. Precision-engineered materials were required on an industrial scale and there was simply no industry capable of supplying them. The internal structures and chemical compositions of the wires speak volumes about the state of contemporary knowledge in chemistry, physics and electrical engineering and about the dialogue between the theoretical and the technical within these fields. Detailed physical analysis allows us to eavesdrop on the conversation between people and materials as they negotiate new relationships on microscopic - if not invisible - scales.

1. A. A. Mills, 'The Early History of Insulated Copper Wire', *Annals of Science*, vol. 61, no. 4 (2004), p. 456.
2. T. Martin (ed.), *Faraday's Diary of Experimental Investigation*, Vol. 1 (London: Royal Institution of Great Britain, 1932), p. 367.
3. Mills, 'Copper Wire' (2004), pp. 456-7.
4. *Ibid.*, p. 460.
5. William Thomson, 'On the Electrical Conductivity of Commercial Copper of Various Kinds', *Proceedings of the Royal Society* (1857), p. 552.
6. W. Culverand, R. Cornel, 'Capitalist Dreams: Chile's Response to Nineteenth-Century World Copper Competition', *Comparative Studies in Society and History*, vol. 31, no.4 (1989), p. 736.
7. *Ibid.*, p. 736.
8. L. Valenzuela, 'The Copper Smelting Company "Urmeneta y Errázuriz" of Chile: An Economic Profile, 1860-1880', *The Americas*, vol. 53, no. 2 (1996), p. 236.
9. *Ibid.*
10. S. Collier & W. F. Sater, *A History of Chile 1808-2002* (Cambridge: Cambridge University Press, 2004), p.79.
11. *Ibid.*, p. 80.
12. Mineral Statistics, 'Mineral Statistics of the United Kingdom of Great Britain and Ireland for the Year 1871' (1871).
13. Valenzuela, 'Copper Smelting Company' (1996), p. 243.
14. *Ibid.*, p. 255.
15. *Ibid.*, pp. 255-256.
16. The Zeta was the first ordinary trading ship to run the Straights of Magellan. Its engines also came in handy when blockade running during the War of the Pacific (1879-84) (Burrow n.d.). It was also the ship that Catherine Zeta Jones is named after. Her great grandfather was the ship's captain.
17. Lloyd's Register for Ships (1875), <http://tinyurl.com/jdm2xed> (accessed 22/08/2016).
18. J. Moreton, 'Thomas Bolton & Sons and the rise of the electrical industry', *Engineering Science and Education Journal* (Feb 1999), p. 6.
19. Legend has it that his father Thomas had sent him up to buy some plant but he returned having bought the entire factory.
20. Moreton, 'Bolton & Sons' (1999), p. 7.
21. William Preece, 'On Electrical Conductors', *Minutes of the Proceedings of the Institution of Civil Engineers*, Vol. 75 (1883), pp. 67-8.
22. P. Israel, *From Machine Shop to Industrial Laboratory: Telegraphy and the Changing Context of American Invention, 1830-1920* (Baltimore: John Hopkins University Press, 1992).

## CATALOGUE ENTRY T1 | TRANSMISSION

JAMES CLARKE HOOK (1819 – 1907)

**CAUGHT BY THE TIDE, 1869**

68 X 108 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



This is one of several pictures by James Clarke Hook in the Guildhall Art Gallery collection. Four examples have been included in this exhibition. This painting was exhibited at the RA in 1869 (no. 332). At the same exhibition Hook showed two other pictures: *Cottagers making cider* (no. 124) and *The boat* (no. 217).

Hook was known for his sea scenes described as ‘wholesome, ably painted sea pieces’ by the *Art Journal* on the occasion of the Royal Academy winter exhibition retrospective exhibition of his work.<sup>1</sup> F. G. Stephens described the way that his pictures restored jaded city viewers by bringing them in imagination to the sea, offering ‘vigorous and wholesome provisions of the sunlight and the shores.’<sup>2</sup> His coastal scenes were set in Scotland, Yorkshire, Devon, Cornwall and Scilly as well as Holland, Brittany and Norway. He was known for the poignant moods that he evoked and for what was described as the ‘super-subtle’ registration of local colour, atmospheric conditions and the effect of light, giving a specificity to whichever locale he selected.<sup>3</sup>

The picture shows a message being transmitted. The boy has attached a rag to a crab hook and waves it like a flag to attract the attention of a fishing boat out at sea. The children have been trapped by the incoming tide and hope that the boat will rescue them. They have a basket of crabs that they have gathered: showing their industriousness and their contribution to their humble community’s breadwinning efforts. Optical signalling was the precursor to the electrical telegraph. In common with other works by this artist the

picture explicitly addresses themes of communication over distance, for instance he had approached this theme in 1857 with two works exhibited in that year at the RA: *A Signal on the Horizon*, “*Her Union-Jack is at the Fore*” (no. 160) and *The Shipboy’s Letter* (no. 545).

In this 1869 picture the fear and discomfort of the boy’s sister and smaller sister (or brother) is shown in the way that they huddle, barefoot as they are, for shelter in the lee of the rock, the sister’s hair and neckerchief swept sideways by the fierce wind. The boy, by contrast, stands stoutly. His sense of family responsibility, masculine duty, bravery, confidence and ingenuity are the heart-warming aspects of the picture. The positive ethical and emotional connotations of the boy’s stance and action are associated by Hook with the telegraphic mode of communication. The picture is wholesome in its evocation of the healthy atmosphere of the coast, but also in the exemplary behaviour of this rustic child. That wholesomeness of the motif transfers across to the idea of the telegraph being beneficial and humane in the way that it overcame obstacles to enable human contact.

The picture changed hands several times in the decade from 1869, being bought by the dealer Agnew’s for the considerable sum of 1,020 guineas at the sale of Jonathan Nield of Dunster House Rochdale (Christie’s 3 May 1879) under the title *Overtaken By the Tide*.<sup>4</sup> Hook was elected to be ARA in 1850 and RA in 1860.

CA

1. ‘Passing Events’, *Art Journal*, (February 1908), p. 58. Nineteen paintings by the artist were shown.

2. F. G. Stephens, ‘English Artists of the Present Day. XXXII, James Clarke Hook, R.A.’, *Portfolio*, (January 1871), p. 181.

3. *Ibid.*, p. 186.

4. William Roberts, *Memorials of Christie’s: A Record of Art Sales from 1766 to 1896*, vol. 1 (London: G. Bell & Sons, 1897), p. 306.

CATALOGUE ENTRY T2 | TRANSMISSION

JAMES CLARKE HOOK (1819 – 1907)

# THE BONXIE, SHETLAND, 1873

74 X 112 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



This is the final picture by Hook in this exhibition. For viewers in 1873 it was strongly reminiscent of an earlier picture by Hook of a boy going down a cliff face on a rope, *The Coast Boy Gathering Eggs* RA 1857.<sup>1</sup> That picture where the descending lad hung perilously over gleaming water was fondly remembered as a highlight in Hook's career. It included a motif of signal-making since the boy indicated his altitude and signalled to his rope-holding companion with a makeshift flag on a long stick. The consistency of Hook, year after year, in presenting absorbing human activity and variegated coastal light effects was admired. In this picture, *The Bonxie*, reviewers noted the clever treatment of water, saying that the light and colour of the sky is partly reflected in the 'multitudinous mirrors' of the sea's surface and partly absorbed by the 'deep green and glass-like fluid' of the water.<sup>2</sup>

The children have formed a human chain, in order to reach the gulls' eggs on the cliff. The smaller boy is being held by his sister by the waist-band of his trousers as he leans over to seize the eggs from the nest built on a ledge. We see their egg basket, already nearly full, on the cliff top beside them. The older boy described by *The Times* as 'a gallant laddie' facing the skua gull (or bonxie) fends off the angry gull with a knife on a stick with a bonnet to protect his hand.<sup>3</sup> The telegraphic signal passed from atom to atom in the conducting core: not a human chain but a chain of copper atoms. The cable core had to be defended with insulating layers.

This picture was exhibited at the RA in 1873 (no. 254). At the same exhibition Hook showed three other pictures including *The fishing haven* (no. 20) and *Fishing by proxy* (no. 227). The *Art Journal* considered that in the course of his career he had arrived at perfection in depicting ‘the breezy, bracing brinyness of a fishing coast’.<sup>4</sup> The vivacity of his style was attributed to the combination of a systematic workmanlike approach to oft-repeated pictorial components and the ability to vary his painted touch to convey the particularity of substance, whether ‘the semitransparent undulation of a wave, the jag of a rock or the creamy curl of a wave-crest’.<sup>5</sup> In this account, dating from 1907, it is claimed that particular paint marks were devised for different phenomena. It is said that paint marks were adapted by Hook to produce ‘analogies’ to natural phenomena. This makes the work one of transmission of the real, not by means of a homogeneous description but by means of a series of discrete signals. The linkage of human actors in communication across distances or in cooperative activity (as in this painting) was the social aspect of transmission that appealed to him given his liberal political stance.<sup>6</sup> The technical aspect of his craft also involved linkage of separate points of perception in his pictorial synthesis of improvised touches.

CA

1. Etched in 1867 for the Etching Club, described P. G. Hamerton, *Etching and Etchers* (London: Roberts, 1876), p. 343; reproduced in a wood engraving, *Portfolio*, Jan 1888, p. 41.

2. ‘The Royal Academy: I’, *Graphic*, (17 May 1873), p. 467; *Athenaeum*, (3 May 1873), p. 569.

3. *The Times*, (3 May 1873), p. 12.

4. ‘Home With the Tide’, *Art Journal*, (October 1894), p. 318.

5. ‘Mr. J. C. Hook, R.A.’ *Athenaeum*, (20 April 1907), p. 482.

6. His biographer A. H. Palmer discussed his championing of working people and sympathy for the poor but felt it necessary to describe him as a ‘hearty Liberal’, adding categorically ‘anything approaching a Socialist he is not’, in ‘James Clarke Hook, Conclusion’, *Portfolio*, (January 1888), p. 169. Palmer also rejected the idea that the surface or facture of Hook’s work – or indeed that of any artist – was important, preferring instead to characterise pictures as windows on nature, *Ibid.*, p. 169.

CATALOGUE ENTRY T3 | TRANSMISSION

EVELYN DE MORGAN (1855-1919)

# MOONBEAMS DIPPING INTO THE SEA, 1900

99 X 70.8 cm

COURTESY OF THE DE MORGAN FOUNDATION



Evelyn De Morgan trained at the Slade School of Art. She exhibited at the Grosvenor Gallery from 1877 and later in the New Gallery. De Morgan produced a second smaller version of this picture in 1918 (Knightshayes Court, Devon, National Trust).

The transmission of messages was of special interest to Evelyn De Morgan due to her belief in the reality of spirit messages. Her art imagines chains of figures connecting through space and between heavenly and earthly realms. In this picture she is envisaging the phenomenon of light in terms of three life forms. The three naked female figures collectively represent a moonbeam travelling from the moon down to the sea. Rather than imagining one single allegorical figure of Luna or Lux she shows multiplied, identical figures linked together in a chain for the transmission of energy.<sup>1</sup> Light touches the surface but also passes through the liquid substance of seawater, so the toe of the lower-most figure is shown as immersed in the water.

Evelyn De Morgan was strongly influenced by the spiritualist beliefs of her mother-in-law Sophia De Morgan who had published an account of her investigations into spirits *From Matter To Spirit* in 1863.<sup>2</sup> Convinced by the religious tenets of Swedenborgianism, Evelyn De Morgan considered that efforts should be made to establish communication with spirits. She and her husband the Arts and Crafts potter and novelist William De Morgan used the techniques of automatic writing to channel the spirit messages. The couple published a compilation of spirit messages they had received. The following message was included in the book:

Loud above all earthly strains sounds the ringing music of the spheres. Pierce upwards through the dim world of undeveloped spirits, grasp the Angel hands that stretch out to you across the grey world of matterful spirit, and rise to the knowledge of growth and the Heavens of burning light.<sup>3</sup>

It indicates the way that sound waves, light rays and spirit energy were thought to combine in the communication channels between heaven and earth. The physicality of Swedenborgian ideas of the afterlife shaped the imagining of spirit communication, linking the brain fibre of the spirit with the brain fibre of the receiving earthly being.

Sophia De Morgan wrote that spiritualism was an extension of physical science: she adduces as comparative examples engineers' studies of the effects of friction on the motion of railway trains and Newton's hypotheses concerning gravity.<sup>4</sup> She alludes to the study by physiologists of the linkage between 'electric, magnetic and nervous forces'.<sup>5</sup> She repeatedly references the way that the nerves or brain fibres work like telegraphic cables.<sup>6</sup> At the core of the nerve she says is a thread 'a telegraphic cable for the transmission of the refined electricity which conveys the messages between spirit and body'. This make the entire human body into what she terms 'the human electric telegraph'.<sup>7</sup> She documented rays of light being seen passing from the hand of the person acting as a medium into

vessels of water, seeming to make the water boil or to electrocute insects in the water.<sup>8</sup> Water was special in this way, she claimed, because it could receive the spiritual current.<sup>9</sup>

This picture by Evelyn De Morgan shows the chain of allegorical figures as a conduit for a quasi-electrical spiritual force that can manifest its nature when it passes into water or into the mind of the humans on earth seeking enlightenment.

CA

1. She did on other occasions devise singular allegorical figures for the moon and light, eg *Luna* (1885, De Morgan Foundation) and *Lux In Tenebris* (1895, De Morgan Foundation).

2. Sophia Elizabeth De Morgan, *From Matter to Spirit: The Result of Ten Years' Experience in Spirit Manifestations. Intended As a Guide to Enquirers*. By C.D. with a Preface by A. B. [Augustus De Morgan] (London: Longman, Green, Roberts, & Green, 1863). See Judy Oberhausen, 'Evelyn De Morgan and Spiritualism' in C. Gordon (ed.), *Evelyn De Morgan: Oil Paintings* (London: De Morgan Foundation, 1996), and Judy Oberhausen, 'Evelyn Pickering de Morgan and Spiritualism: An Interpretative Link', *Journal of Pre-Raphaelite Studies*, New Series III, Spring 1994.

3. Evelyn and William De Morgan, *The Result of An Experiment* (London: Simpkin, Marshall, Hamilton, Kent, 1909), p. 77. The same passage is quoted in relation to this painting in Lois Jane Drawmer, 'The Impact of Science

and Spiritualism on the Works of Evelyn de Morgan, 1870-1919', Unpublished PhD, Buckinghamshire Chilterns University College, 2001, p. 216.

4. Sophia Elizabeth De Morgan, *From Matter to Spirit*, (1863), pp. xviii-xvix; p. xxiii. Introduction written by Erasmus De Morgan.

5. *Ibid.*, p. 96.

6. *Ibid.*, pp. 25, 33, 98, 114, 276.

7. *Ibid.*, p. 276.

8. *Ibid.*, p. 46.

9. *Ibid.*, p. 96. Sophia De Morgan notes that water is the only substance that can be acted on like this by spiritual currents, whereas many different substances can be affected by earthly electrical devices.

CATALOGUE ENTRY T4 | TRANSMISSION

FREDERIC LEIGHTON (1830 – 1896)

## *THE MUSIC LESSON, 1877*

93 X 95 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



A mother or older companion teaches her young charge, cosily nestled up against her, to play a kind of guitar, a Turkish instrument called a 'saz'. She tunes the instrument with one hand and squeezes the girl's forefinger gently between her own forefinger and thumb.<sup>1</sup> The malleability of anatomy and extreme softness of flesh that Leighton depicts here is modelled on the painting of Jean Auguste Dominique Ingres (1780-1867). The setting is based on buildings that Leighton observed on his visit of 1873 to Damascus. The rhythmic patterns in the pillars and inlaid marble present the visual equivalent of a spaced-out sequence of notes. The dangling legs of parent and child as well as the vertical bands of white marble on the front face of the ledge also suggest the succession of notes on a staff. The transmission of knowledge is to be achieved by steady pulsing of music backed up by the ornamental features in the environment, something like the telegraph key tapping to

transmit a message. However Leighton is as interested in the merging of identities as in the separation and repetition of elements that are essential to rhythm and ornament.

Because the adult's ankles are crossed, and due to the colour match between the adult's pale-gold baggy trouser leg and the child's similarly-coloured trouser leg, the viewer, at first glance, registers the child's left leg as belonging to the mother. The child's other trouser leg is covered over by the blue garment. This produces an unsettling suggestion of a three-legged composite figure. The effect is repeated in the arms. The intermingling of fingers and nesting of forearms draws the adult and child's right hands together as if one limb, giving the pair a total of three arms. There is a subtle play of similarity and difference in the textiles arranged along the ledge: peachy linings for gold and white silken garments, gold striped and pale golden trousers, creamy linings for the blue overgarment, toning darker blue in a golden-fringed rug just visible at the right. Various elements participate in a continuum as the colours progress from peach on left to blue on right. The peach is keyed in to the red of a flower lying on the ground to the left in the manner of the Aestheticist artist Albert Moore (1841-1893). This formal colour progression pays no heed to separation of persons or substance.

This picture was exhibited at the RA in 1877 (no. 209). At the same exhibition Leighton's most discussed exhibit was the sculpture *Athlete Wrestling with a Python* (no. 1466).<sup>2</sup> His career was thriving; acclaim for his work and its careful finish, emphasis on drawing and respect for classical academic values led to his election as President of the Royal Academy the following year. Vastly different in mood from the 'pretty charm' and delicate softness of *The Music Lesson*, his 1877 sculpture showed extreme physical effort expended in a life-and-death struggle.<sup>3</sup> A heroic male nude grasps the snake, digging his fingers into its neck to stifle it. The snake in turn, coils itself tightly around ankle and thigh of the athlete and attempts to grip and squeeze the athlete's trunk. Leighton offers a parallel between the muscular system of the athlete's right arm and the muscular organization of the snake's body that runs along it. Snake and man become a composite being like the adult and child of *The Music Lesson*. In terms of the combat they are opposites but, as they interact, the difference becomes minimal.

In telegraphy the clarity of signalling depended on maintaining a rhythm and tempo that kept elements separate, but due to the process of transmission the patterns could become delicate or muffled. Instruments were devised to register extremely small variations. Leighton in *The Music Lesson* appears to be meditating on minimal difference and the borderline between maintenance of identity and the merging of identity.

1. For a discussion of the two figures see Caroline Arscott, 'Leighton: The Artist as Artificer'; in T. Barringer and E. Pettejohn (eds.), *Frederic Leighton: Antiquity, Renaissance, Modernity, Studies in British Art 5* (New Haven and London: Yale University Press, 1999), pp. 3-17.
2. Frederic Leighton, *Athlete Wrestling with a Python*, bronze, 1877, London, Tate, <http://tinyurl.com/hs8xzz> (consulted 15 September 2016).
3. M. H. Spielmann, 'The Leighton Exhibition', *Graphic* (9 January 1897), p. 38.

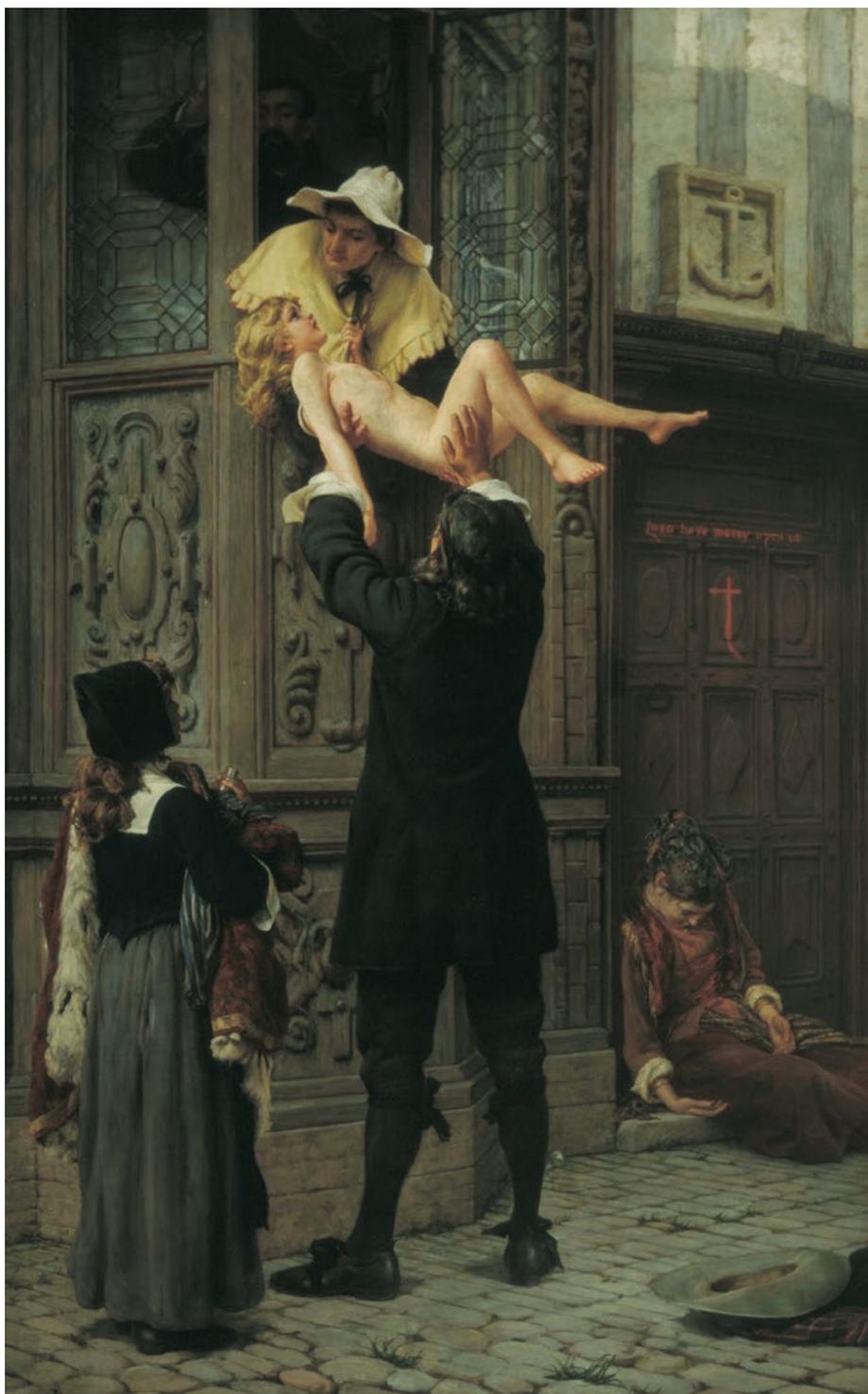
CATALOGUE ENTRY T5 | TRANSMISSION

FRANK WILLIAM WARWICK TOPHAM (1838 – 1924)

# *RESCUED FROM THE PLAGUE, LONDON, 1665, 1898*

183 X 114 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



This picture was exhibited at the Royal Academy in 1898 (no. 636) with the following quotation in the catalogue:

“It was the child of a very able citizen of Gracious Street, a saddler, who had buried all the rest of his children of the plague, and himself and wife now being shut up in despair of escaping did desire only to save the life of this little child; and so prevailed to have it received stark naked into the arms of a friend.” – Pepys’ *Diary*.

Gracious Street, or Gracechurch Street, is in the City of London. The saddler’s little girl is handed down from an upstairs window into the receiving arms of the friend; his little companion stands by with fresh clothes. Within the first-floor room the father can be seen, steadying himself with one hand, forcing himself to watch the relinquishment of the girl. The mother is the more active figure, leaning out and passing the child on to the friend below. Pepys’ *Diary* for 3<sup>rd</sup> September 1665 goes on to recount the reception of the child at Greenwich where the friend lived; a complaint was made but it was decided that she would be allowed to remain. It is not known whether she remained healthy. A watercolour version of this picture is in the collection of the Arts Club, Dover Street London, donated by Romer Topham.

F. W. W. Topham worked both in oils and in watercolour. He studied informally under his father, the illustrator and genre painter, primarily watercolour painter, Francis William Topham (1808-1877). He studied formally at the Royal Academy Schools and under the academic painter Charles Gleyre in Paris. He became RI (Member of the Royal Institute of Painters in Water Colours) in 1879. He regularly exhibited at the Royal Academy from 1860 to 1904, favouring scenes from Shakespeare and Walter Scott, from classical and renaissance history and from the Bible.

His selection of a scene based on an incident in Pepys’ *Diary* reflects a resurgence of interest in Pepys following the first ever publication of a complete deciphering of the coded diaries in the 1890s. Pepys had always been popular but the 1890s saw a fresh appraisal of the directness of his account and the way that the diaries offered apparently unmediated access to his experience. With *Rescued From the Plague* Topham sought to channel the vigour and spirited nature of Pepys’ approach. His own work was regularly criticised for lacking ‘firmness of touch’ or ‘spirit and artistic purpose’.<sup>2</sup>

The picture shows that a young life can be protected and transferred from a place of death to a place of safety if a chain of participants acts together to make the transfer. The life of the young girl represents the family line which can be continued if she is rescued. The chain of people resembles the cable through which the electrical signal passes. The picture is also concerned with another kind of transmission, the transmission of disease. An abject

female figure begging on the doorstep reminds the viewer of the deadly alternative to the transmission of life.

CA

1. The Henry B. Wheatley edition appeared in 8 volumes plus 9<sup>th</sup> and 10<sup>th</sup> volumes containing index and addenda. The final portion of the diary was in vol. 8 published in 1896. Henry B. Wheatley, *The diary of Samuel Pepys, transcribed from the shorthand manuscript in the Pepysian library Magdalene college, Cambridge*, by The Rev. Mynors Bright, with Lord Braybrooke's notes; edited with additions by Henry B. Wheatley, 10 vols. (London: G. Bell & sons; Cambridge: Deighton Bell & co., 1893-1899).

2. *Athenaeum* (21 May 1892) p. 671; *Athenaeum* (2 June 1894), p. 716.

CATALOGUE ENTRY T6 | TRANSMISSION

WILLIAM LOGSDAIL (1859 – 1944)

# THE NINTH OF NOVEMBER, 1888, 1890

187 X 272 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



This painting of the annual Lord Mayor's Show depicts a central London location in a topographically accurate way, indicates a representative crowd of modern city types, gathered as onlookers, and elaborates a series of figures and vehicles representing the make-up of the parade. It sets up a striking contrast between the brilliant colours and shiny gold trimmings of the parade and the dull, largely monochrome appearance of crowd and street.

Logsdail exhibited at the RA from 1877. This picture was exhibited at the RA in 1890 (no. 1028) and was the only picture Logsdail showed in that exhibition. He had recently returned to London after a seven year sojourn in Venice.

The architecture is somewhat misted over in the cloudy atmosphere of a raw November day but the eight Corinthian capitals and the portico sculpture of the Royal Exchange are carefully depicted as the main backdrop for the procession.<sup>1</sup> The picture shows the view from the junction of Threadneedle Street and Cornhill. Looking past the Royal Exchange to the left, along Threadneedle Street, Logsdail shows the buildings of the Bank of England.

Footmen in elaborate livery are striding forward on the damp roadway. Horses, one ridden

by a liveried groom, follow; they are pulling the Lord Mayor's coach driven by the coachman. The annual procession, linked to the swearing in of the new Lord Mayor was of medieval origin. The gilded coach shown in the picture, used every year, was commissioned in 1757 and designed by the architect Sir Robert Taylor. It is now kept in the Museum of London. The new Lord Mayor for 1888-9, Sir James Whitehead is barely visible inside the coach. The bulky mace, a symbol of office projects from the window of the coach.

In his memoirs written 1925-27 Logsdail records his method of making studies of individual figures from actual participants (coachmen and footmen invited after the event to his Primrose Hill studio); people whom he locates in the crowd as colourful types (an Irish orange woman also brought to the studio from her pitch on the streets of London) and painter friends and other acquaintances who put on costumes or wore their own habitual hats and coats to model as policemen or onlookers.<sup>2</sup>

This was the shortest Lord Mayor's procession of the century; as an economy measure it had been scaled down. It occurred at a moment of high tension and outrage at police inefficiency on the day that a new murder by Jack the Ripper had been discovered.<sup>3</sup> The show of traditional pomp in modern times is shown as awkward. The leading footmen are slightly ridiculous in their extravagant outfits. Some figures on the pavements are impoverished. The police pin back the crowd but do not prevent acts of pilfering. Logsdail presents a ceremony that declares, as is traditional, power and authority (transmitting tradition). However he also shows the forces in the modern world that thwart transmission.

CA

1. It had rained overnight, was overcast by 11.00 am and maximum temperature was 46.3 degrees F. *Casebook: Jack the Ripper*, [www.casebook.org](http://www.casebook.org) (consulted 8th Aug 2016).

2. *William Logsdail, Reminiscences* (unpublished, written 1925-27), Coll. Logsdail family. Cited in *William Logsdail, 1859-1944, a distinguished painter*, exh. cat., Usher Gallery, Lincoln, (Lincoln: Usher Gallery, Lincolnshire County Council Recreational Services, 1994).

3. Mary Jane Kelly's murder was reported in the evening papers of 9th November 1888. <http://tinyurl.com/3ly6y5> (consulted 25th August 2016).

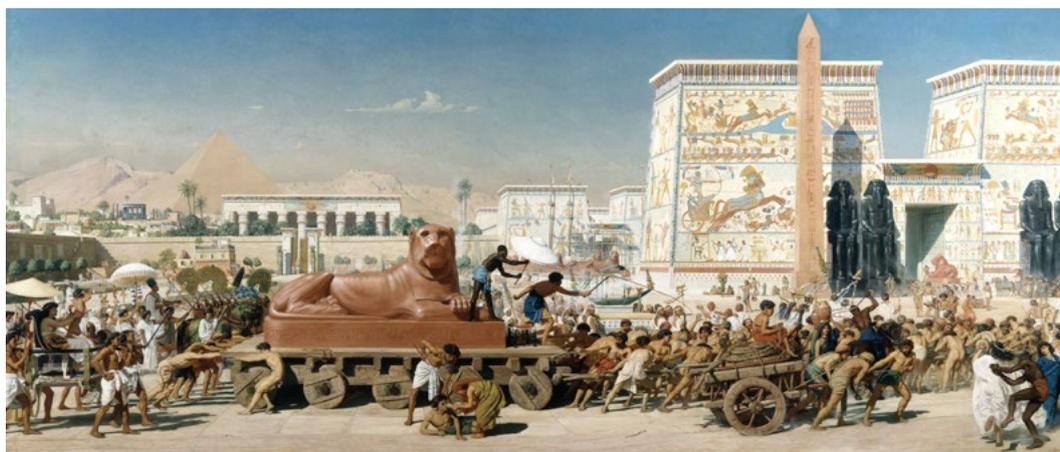
## CATALOGUE ENTRY T7 | TRANSMISSION

EDWARD JOHN POYNTER (1836 – 1919)

*ISRAEL IN EGYPT, 1867*

137 X 317 cm

GUILDHALL ART GALLERY, CITY OF LONDON CORPORATION



We see Egypt in the time of the Pharaohs. The picture displays careful study of archaeological finds but does not reconstruct one particular site, as *Blackwood's* put it 'he has violated the known topography of Egypt'.<sup>1</sup> Poynter brings together famous monuments assembled from different sites: for instance the temple and other buildings from Philae and the obelisk from Heliopolis. The pylon gateway from the Temple of Horus at Edfu was easily recognizable for Victorians from David Roberts's lithographic illustrations and the aquatints in the volume by Hector Horus.<sup>2</sup> The central red granite lion on the wagon was based on 18<sup>th</sup>-dynasty lions from the British Museum and the arrangement of double rows of lions adopted at the Egyptian Court in the Crystal Palace Sydenham. We can see the Great Pyramid of Giza in the background. The huge black granite figures are adapted from the granodiorite statue of Amenhotep III at the British Museum.<sup>3</sup> Poynter focuses on the play of physical forces and the march of time.

The picture was exhibited at the RA in 1867 (no. 434) with verses from the Bible taken from Exodus:

Now there arose up a new king over Egypt which knew not Joseph, and he set over Israel task-masters to afflict them with burdens. And the Egyptians made the children of Israel to serve with rigour. All their services wherein they made them serve was with rigour. Exodus, I: 8-14.

The Israelites are shown to be suffering in captivity. They are dragging a giant figure of the lioness Sekhmet, goddess of destruction, and are driven on with whips by Egyptian overseers. The feat of transferring this burden can be compared to the sending of a pulse down the cable.

The picture attracted a great deal of attention, some admiration for the evident labour expended in the learned details of the painting and some objections to the prominent gigantic lion, like a large painted plaster figure or pantomime lion made of cloth.<sup>4</sup>

In line with their standard practice of adapting fine art images for political cartoons, *Punch* reworked it in June 1867. Poynter was to be elected as ARA two years later in 1869 and as RA in 1876.<sup>5</sup> Chalk studies for figures pulling a rope are held at the Guildhall Art Gallery, London and at the Victoria and Albert Museum, London. Studies are also held in the Prints and Drawings collection at the British Museum. A watercolour of this composition 20 cm x 42 cm (signed and dated 1862) was sold at Sotheby's 19 October 1989 (no. 421).<sup>6</sup> The picture was reproduced as a wood engraving (with signature of engraver W. L. Thomas) in the *Illustrated London News*, 25 January 1868, pp. 84–85.

CA

1. *Blackwood's Edinburgh Magazine* (July 1867), p. 83.
2. David Roberts, *The Holy Land, Syria, Idumea, Arabia, Egypt and Nubia*, 3 volumes (London: F. G. Moon, 1842–49); Hector Horeau, *Panorama of Egypt and Nubia* (Paris: self-published, 1841).
3. These identifications were made by Patrick Conner in the Introduction to *The Inspiration of Egypt: its influence on British artists, travellers and designers, 1700–1900*, exh. cat. (Brighton: 1983). Statue of Amenhotep in British Museum catalogue, <http://tinyurl.com/hanuajs> (consulted 15 September 2016).
4. Detail admired, including the 'accurate ... mural decorations on the propylaeum' in *London Review* (8 June 1867), p. 649; 'painted plaster or canvas', *Art Journal* (June 1867), p. 139; 'buckram lion', *Blackwood's Edinburgh Magazine* (July 1867), p. 83.
5. Cartoon by Tenniel featuring Disraeli, *Punch* (15 June 1867), pp. 246–7; see Janice Carlisle, *Picturing Reform In Modern Britain* (Cambridge: Cambridge University Press, 2012), pp. 195–7.
6. Information from Object File, Guildhall art Gallery.

CATALOGUE ENTRY T8 | TRANSMISSION

# A THOMSON-STYLE REFLECTING ASTATIC GALVANOMETER MADE BY ELLIOTT BROTHERS [1860-1870]

KING'S COLLEGE LONDON ARCHIVES. K/PP107/11/1/21



In 1858 the first telegraph cable connection was made between Ireland and Newfoundland. It was a decided flop. Messages sent down the line were, for the most part, unintelligible. It took 16 hours to send the 98 words of Queen Victoria's message and the line failed after just three weeks. Engineers struggled not only with manufacturing problems but also with a mystery phenomenon which scrambled the messages they were attempting to send.<sup>1</sup>

Sir William Thomson, 1<sup>st</sup> Baron Kelvin, is today one of the best remembered scientists of the Victorian era, credited with the first and second laws of thermodynamics and the determination of Absolute Zero. Back in 1854, plain William Thomson was a rising star of physics working on Michael Faraday's calculations for a possible Atlantic telegraph cable. He noted that the cable would be subject to the effects of induction. When a voltage is passed down a very long, thin wire it builds up a charge, much like a battery. This charge then interferes with the message signals being sent. The bigger the charge the longer it takes to clear the line and the more slowly the letter signals can be sent. Thomson concluded that the core of the proposed cable needed to be of greater diameter than planned to overcome this. As this was in opposition to the ideas of the Atlantic cable company's own chief engineer, Wildman Whitehouse, he rapidly came to the attention of the company. In 1856 they brought Thomson on board as scientific advisor for the first Atlantic cable laying attempt.

Whitehouse and Thomson soon found themselves at loggerheads over the best way to solve the message scrambling problem. Whitehouse saw it as a problem of resistance, which could be overcome with higher voltages to force the message through. Thomson argued that they must minimise induction effects and use only very small voltages and very sensitive equipment. Thomson went away and designed the mirror galvanometer to test this.

The mirror galvanometer uses an electrical phenomenon to detect very slight electrical signals. When a current passes down a wire it sets up a magnetic field. Thomson's galvanometer detects this and registers a message signal in the wire. Inside the galvanometer is a small mirror suspended by a silk thread. A tiny magnet is attached to the back. A spot of light is reflected off the mirror onto a cardboard scale some distance away. When a signal enters the wire and a magnetic field is generated it pulls the magnet towards it. The mirror moves on the thread and moves the spot of light on the scale. If a positive current is sent it moves the mirror in one direction. If a negative current is sent it moves in the other. Positive and negative deflections can therefore be used as a 'dot' and 'dash' to send messages by Morse code.<sup>2</sup>

Thomson was proved right; low voltages detected with the mirror galvanometer proved to be the only way to send signals down the short-lived 1858 Atlantic cable. Queen Victoria's

congratulatory greeting to President Buchanan was sent via mirror galvanometer at ever decreasing speeds on the failing cable until the signal finally gave out forever. Thomson used the knowledge he had gained through the failure, to campaign for better cable design. Thanks in large part to Thomson, the successful cables of 1865 and 1866 had copper conductors of far higher purity with greater cross-sectional diameter and heavier, more perfect insulation. William Thomson was knighted in November 1866 for his contributions to the trans-Atlantic telegraph and went on to be made Baron Kelvin for his contribution to science.

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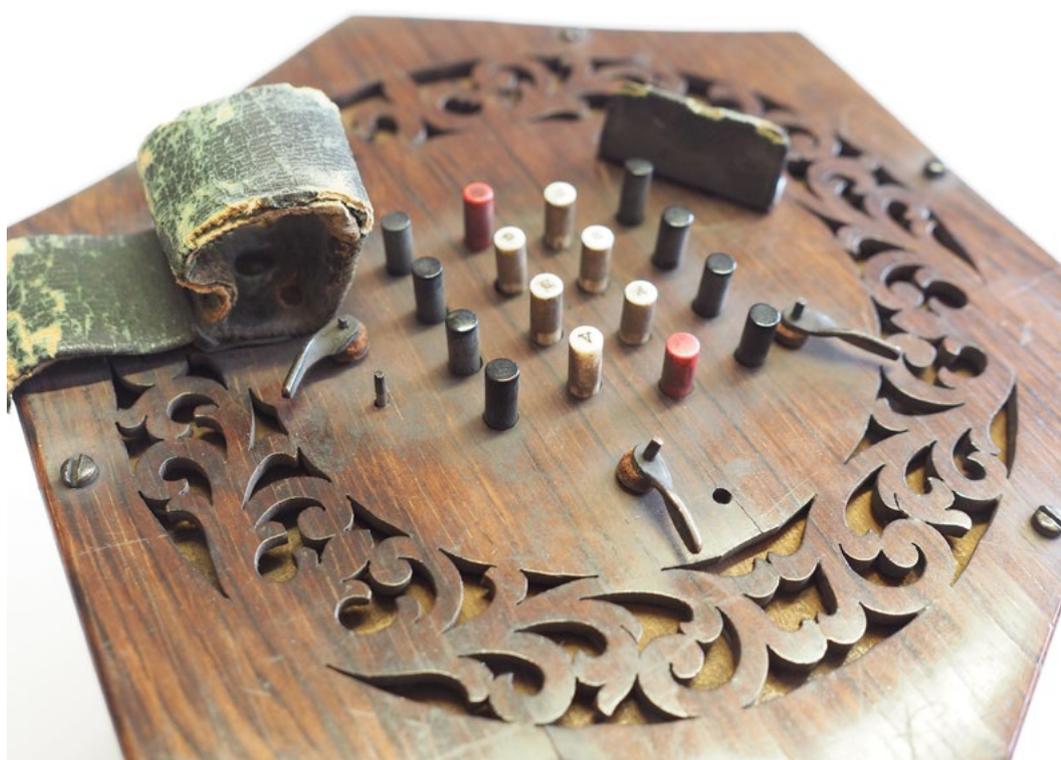
1. H. M. Field, *History of the Atlantic Telegraph to the Return of the Expedition of 1865* (printed only for private distribution, 1866).

2. M. Trainer, 'The Patents of William Thomson Lord Kelvin', *World Patent Information*, vol. 26, Elsevier Ltd, <http://tinyurl.com/hv4c2lk> (consulted 7 September 2016).

CATALOGUE ENTRY T9 | TRANSMISSION

# CONCERTINA AND TELEGRAPH TRANSMITTER

KING'S COLLEGE LONDON ARCHIVES. K/PP107/11/5/1 AND K/  
PP107/11/1/7



Charles Wheatstone leads an amazing double life. In one he is a pioneering hero of the telegraph, in the other he is the precocious inventor of musical instruments; the finest and most famous of these being the Wheatstone Concertina. These lives are not so separate as might be imagined and the cross-over between his work with sound, his work with electricity and his flair for engineering instruments and machines is very clear. In the exhibition two instruments illustrate this very clearly the concertina and the prototype telegraph transmitter.

Wheatstone began his professional career at the age of 14 when he was apprenticed to his uncle, a musical instrument maker. The rural Gloucestershire lad moved to London to begin work in Uncle Charles' workshop on the Strand. In the day he works in the shop and workshop. In the evenings he prowls the many bookshops, buying up volumes on natural philosophy. The young Charles builds a home-made physics laboratory, complete with his self-designed version of the Voltaic pile (an early battery) built from salt water, blotting paper and pennies.<sup>1</sup>

At the age of 20 in 1822 he comes to the attention of the public with the first of his several

acoustic ‘shows’ featuring the *Acoucryptophone* (translation: ‘hearing a hidden sound’) or *Enchanted Lyre*, an instrument which appeared to play ‘of itself’. The *Enchanted Lyre* – now housed in the Horniman Museum – was a small, ornately decorated harp, suspended by a steel rod which passed through the ceiling above. In the room above, the rod was connected to the soundboards of a piano forte and a dulcimer. The Lyre appeared to play through sound conduction and the sympathetic resonance of strings.<sup>2</sup>

The Enchanted Lyre was a research experiment as well as a publicity stunt for the family firm, and Wheatstone went on to publish his findings on frequency, resonance and the conducting of sound in Thomson’s *Annals of Philosophy* and the *Transactions of the Royal Society*. He soon became firm friends with fellow Royal Society member and physicist, Michael Faraday, who frequently delivered Wheatstone’s lectures for him at the Royal Society (Wheatstone being famously shy when it came to public speaking). He continued to publish throughout the 1820s until his work led to his appointment in 1834 as the first Professor of Natural Philosophy (what we now call physics) at King’s College London.

Wheatstone, like Faraday, was concerned with the scientific principles behind phenomena. Where he was exceptional was that he then took that newly acquired knowledge and designed new instruments – be they musical or scientific – that exploited that knowledge. This was the case with the discovery of resonant frequencies that led to the invention of the concertina in the late 1820s and the experimental measuring of the speed of electricity that led to the design of the first practical system of telegraphy.

Wheatstone continued to have an interest in the family music business, and indeed a lifelong ‘admiration’ for music.<sup>3</sup> Not only did his work in physics produce such instruments as the concertina and harmonium but his skill in, and connections with, precision instrument manufacturing fed directly into the design of the first telegraph transmitters. The sales ledgers from Wheatstone’s commercial musical instrument workshop (digitised and available from the Horniman Museum) show that they were building experimental electrical apparatus for use at King’s from the 1850s.<sup>4</sup>

The visual similarity between the concertina and prototype telegraph key is striking. But the polished mahogany, turned ivory buttons, delicate springs-loaded keys, and finely milled brass fittings underline much deeper connections between Wheatstone’s passions: understanding and invention, music and physics, craftsmanship and engineering.

1. B. Bowers, *Sir Charles Wheatstone FRS, 1802-1875*, IEE History of Technology Series, vol. 29 (London: The Science Museum, 2001).
2. N. Wayne, 'The Invention and evolution of the English Concertina', *Journal of the Galpin Society*, Vol. LXI (2009).
3. Wayne, 'English Concertina' (2009).
4. *Wheatstone & Co. Concertina Ledgers, 1839-1891*, <http://www.horniman.info/> (consulted 7 September 2016).

CATALOGUE ENTRY T10 | TRANSMISSION

# WHEATSTONE AUTOMATIC 'JACQUARD' TELEGRAPH TRANSMITTER [1858-1867]

KING'S COLLEGE LONDON ARCHIVES. K/PP107/11/1/8



Charles Wheatstone launched the Automatic or Jacquard telegraph in 1858 as part of his Universal Telegraph Company system. Where the ABC, or Universal Telegraph was designed to bring the telegraph into every home, the Automatic was designed to massively increase signalling speeds. Wheatstone had been experimenting with an automatic system for some time because, on land lines at least, the signalling speeds achieved by even the best telegraph operators were a long way below the maximum capacity of the lines. There was unexploited potential to increase traffic with the right machine.<sup>1</sup>

The Automatic system consisted of one (or several) Perforators, a Transmitter and a Receiver. Perforators were manually operated hole punches into which the operators punched holes, either to the left of the strip or the right, to stand for the dots or dashes of the message. The speed of the passage of the tape through the machine was controlled by the punching action. The tapes were then taken and threaded into the Automatic Transmitter. As the strip passed through the machine it passed underneath two delicate metal wires, one on the left for the dots, one on the right for the dashes. The metal wires were sprung so each time they passed over a hole in the tape they made contact with the

metal surface beneath. Wheatstone used this contact to complete an electrical circuit and send either a dot or a dash down the line. At the other end were two pens, one operated by the dash signal and the other by the dot, which inked another continuous tape.

The Transmitter and Receiver could be run at up to 120 words per minute on landlines. Several telegraph clerks could be employed simultaneously perforating the message strips to be fed into one Automatic Transmitter, making the system five times faster than anything known at the time. The Automatic system was put to use in the very busiest of long-distance circuits, such as that between London and Manchester. It has been claimed that ‘after the initial invention of the telegraph, the most important step in its development ... was the introduction of the Wheatstone automatic system’.<sup>2</sup>

Wheatstone had been working on the design of the Automatic Telegraph since around 1850. The machine he launches with fanfare in 1858 is the product of several ideas and influences. As the name suggests it was particularly inspired by the Jacquard Loom, invented in 1801 by Joseph Marie Jacquard as a way of automating the weaving of complex patterns. The loom was the first programmable machine; it automatically pulled a chain of punch-cards through a reader to set each individual line of the weave. Alexander Bain’s Mechanical Telegraph, though mechanically very different, is the acknowledged forerunner of the idea of every automatic telegraph. There is some debate over whether this complex device is a machine or a contraption.<sup>3</sup> Patented in 1841, Bain’s machine used pulses of electricity to start and stop a clockwork type-wheel.

There is, however a third possible (and unexplored) source of inspiration in Charles Babbage’s second difference engine; the Analytic Engine. The engine, like Jacquard’s loom, used chains of cards as a way to create continuous loops of operations but it was also able to punch its own cards as a way of feeding back results. Babbage detailed this two-way operation in the mid-1830s and continued to work on the design for the machine into the late 1850s.<sup>4</sup> As Babbage and Wheatstone were contemporaries, both members of the Royal Society, and - through their respective lectures at the Royal Institution - keenly aware of each other’s work, it seems likely that this exchange of ideas influenced both men’s work.

CN

1. S. Roberts, *Distant Writing* (2012), <http://tinyurl.com/grf3p2j> (consulted 22/08/2016).

2. B. Bowers, *Sir Charles Wheatstone FRS, 1802-1875*, IEE History of Technology Series, Vol. 29 (London: The Science Museum, 2001), p.183.

3. S. Roberts, *Distant Writing* (2012)

4. J. Essinger, *Jacquard’s Web: How a hand-loom led to the birth of the information age* (Oxford: Oxford University Press, 2004).