

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

JOHN RUSKIN (1819-1900) & HENRY WILLETT *né* CATT (1823-1905), AND WATER; AND BERNARD PALISSY (c. 1510–c. 1589), AUTHOR OF *ON WATERS AND SPRINGS* TRANS. FROM THE FRENCH AND PUB. BRIGHTON, 1876, by E.E. WILLETT, H.W.'s DAUGHTER EDITH ELIZABETH [CATT] WILLETT (1853-?)

Henry Willett of Arnold House, Montpelier Terrace, Brighton, was not *né* Willett but Catt (East Sussex Record Office AC 4299 from records previously held at Brighton Museum):

ELIZABETH WILLETT CATT (1797-1863), Henry's sister, was born shortly after her parents' marriage; she never married, and kept house for her father William and looked after her younger siblings after the death of her mother in 1823. In 1851 she was living with her father at Tidemills in Bishopstone, together with William's nephew John Catt (aged 31).

Elizabeth inherited the Denton Estate under the terms of William Catt's will (TNA PROB 11/2170). She died at Rome on 4 April 1863, and under the terms of her will all legatees, except her married sister Hannah or her children, and married daughters of any deceased brother, should by royal licence change their names to Willett and bear the arms of the Willett family by Royal Licence, assuming that it can be obtained, within twelve months as a condition of inheriting.

This provision was contentious, and legal opinion was sought. It was discovered that the branch of the Willett family of Elizabeth's grandmother, who were yeoman farmers, were not entitled to bear arms. The outcome was that although John, Henry, Edmund and William Catt changed their name and notices duly appeared in *The London Gazette* in 1863, the remaining legatees did not make the change.

HENRY WILLETT (FORMERLY CATT), 1823-1905, was the youngest son of William Catt and Hannah Dawes of Brighton. He joined his father as a partner in Vallance Catt and Company, the Brighton brewers, and continued with the business after it was incorporated as the West Street Brewery in 1895. He inherited £21,000 under the terms of his father's will.

Born at Bishopstone, Henry married Frances Jane Coombe, the eldest daughter of George Augustus Coombe of East Preston near Littlehampton on 10 June 1851. In 1863 the couple took the surname Willett in accordance with the provisions of the will of Henry's sister, Elizabeth Willett Catt. In 1871 they were living at The Manor House, Findon.

Henry was described as a brewer and occupier of 90 acres of parkland; Frances Jane (then aged 39) was born in Burpham; their children, who had all been born in Brighton, were Ernest Henry, Edith Elizabeth (17), Florence 'Minnie' Marion (16), Edgar William, Percy Arnold, and Margaret Laura (11). By 1881 they were living at Arnold House, Montpelier Terrace, Brighton, and their sons Edgar William (a medical student, aged 24) and Percy Arnold (a brewer, aged 23) were living at home.

Henry died at Arnold House, Montpelier Terrace, Brighton on 24 February 1905, and was buried at Hangleton; his will was proved by his sons Edgar William Willett, surgeon and Percy Arnold Willett, brewer and his son-in-law Russell Belfrage Reid, Ceylon planter, on 20 March 1905 when the estate was valued at £213,954 13s 3d.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

Subsequently Henry Willett represented his brother George Catt's widow, Emily, in reaching an agreement with the Commissioners of Sewers regarding sea defences for Tidemills.

<http://www.nationalarchives.gov.uk/a2a/records.aspx?cat=179-tamplins&cid=1#1>

<http://rpmcollections.wordpress.com/2011/06/10/personality-of-the-month-henry-willett-1823-1905/>

The local beer industry left a significant legacy in Henry Willett, one of the founders of the Brighton Museum & Art Gallery, who made much of his fortune through brewing: the West Street Brewery was a family firm, which later became the Vallance and Catt brewery acquired by Smithers & Co.

In 1892, when Charles William Catt, Henry Willett's brother, decided to trade independently, he took a large number of licensed houses as his share of the dissolution, which in 1899 he sold to Tamplin's.

A 1920s photograph of the Shepherd and Dog pub shows a Tamplins (sold to Watney Mann) sign where the lettering now is.

At his family home in Upper North Street, Brighton, Willett cultivated the acquaintance of writers and thinkers such as John Ruskin, the American Oliver Wendell Holmes; and Sir Augustus Franks, an influential curator at the British Museum who helped Willett to develop his ideas on collecting.

[From another *National Archives* article: William Catt's son, Henry] Willett—he had to change his name in order to inherit—was a friend of Cobden and Ruskin, an admirer of Gladstone, a member of the Sussex Archaeological Society from its foundation in 1846, and a fellow of the Geological Society. He helped to initiate and found Brighton Museum, and donated pottery and fine pictures to its collection.]

Willett's first collecting passion was for chalk fossils, which he excavated from the Sussex Downs. He also collected natural history specimens, archaeology [sic], local products such as iron fire-backs and Sussex pottery as well as artefacts from other cultures. Most of the important paintings he collected [like what?] were later sold to international collections.

Willett, a keen collector with interests ranging from fossils to fine art, supported the museum's earliest displays. Some of these collections were later donated to the museum, and remain on display today, both in the gallery that bears his name and elsewhere.

[East Sussex County Records Office, from records formerly held at Brighton Museum.]

JOHN RUSKIN

From Cynthia J. Gamble, [copyright permission to quote/attribute not yet applied for] New European Publications 2008 ISBN 978-1-872-410-68-5 *John Ruskin, Henry James and the Shropshire Lads*, re Ruskin's Christchurch College, Oxford, and thereafter associations with the Pritchards [a family connection formed when R. was a student at 'The House'] and the Rev. Osborne Gordon [tutor and friend; Hon. Canon], at Easthampstead.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

[rough notes] R. took Gordon to Langdale, untouched by industrialisation, to show him its system of waterworks and sluices, powerful cascades and forces that could be used to provide natural energy for the villages.

On the Brantwood estate a “deep and steep water-course, a succession of cascades [...] over hard slate rock served as a [?] laboratory for R’s ecological observations concerning erosion and riverbeds. Clean, bacteria-free water was a most precious commodity and R. gave considerable thought to a distribution system.

In Switzerland in 1869 harnessing the snow waters of the Alps had been one of his preoccupations for agricultural purposes (c.f. at Fulking, R. “was instrumental in...”).

...

John Pritchard’s fountain was equally important to the people of Broseley, Shropshire. Ruskin and the Pritchards were friends and had travelled to Switzerland together. JP listened to JR’s lectures on Gothic architecture [comp. design of Fulking’s ‘Primrose’ fountain] and commissioned from the local architect Robert Griffiths an elaborate well, now demolished, in the style known as Venetian Gothic popularised by Ruskin. Broseley had a poor water supply... a major difficulty was not having sufficient access to supplies of water even though the Severn was close... and by the mid nineteenth century still relied on two wells. Unfortunately due to its situation in the Shropshire iron fields the water had a high iron content and was undrinkable.

R. was a supporter of an objection to creating Thirlmere as a reservoir to supply Manchester with its water.

[c.f. R’s concern re the plight of the working class... [Joyce Donoghue](#), Friends of Brantwood Newsletter 1995/96: “Fulking was extremely impoverished from the time of the Enclosures onwards with an exceptional proportion of labourers on Poor Law Relief.”

Ruskin was concerned with the ill effects of burning coal, and argued that factories should be run by water power rather than by steam.

From: [Howard Hull](#), Director of the Ruskin Foundation & Brantwood Trust, introductory essay included in: *Of Truth of Water*, edited by John Woodman, 2010 Unipress, Cumbria—1843 pub. as Vol. 1, Section V, of five-volume *Modern Painters* [H.H./Woodman/Unipress permission to quote not yet applied for]

...his first bedroom in Hunter Street, Ruskin’s earliest sense of wonder opens upon the daily visits of the water cask filled to overflowing from a giant pipe: his image of innocent liquid abundance.

...damming his stream in his garden at Herne Hill—playing in stream and pond of the family acres of Denmark Hill.

Ruskin eulogises the dirty puddle on the edge of an industrial town.

He invites his students to Brantwood [purchased in 1871] to stand knee deep in the lake building his harbour while translating Xenophon’s *Economist*.

In his Lake District home, Ruskin has moved to the place where water is a sacrament. He engineers a complex system of reservoirs gathering the moorland rains into a series of becks

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

that feed his experimental terraced gardens. A cascade runs to order to greet guests by the front door.

In honour of his mother Ruskin tried to restore a spring of water between Croydon and Epsom, and he erected a tablet at the spot, bearing the following words:

In obedience to the Giver of Life, of the brooks and fruits that feed it, of the peace that ends it, may this Well be kept sacred for the service of men, flocks, and flowers, and be by kindness called MARGARET'S WELL. This pool was beautified and endowed by John Ruskin, M.A., LL.D.

Endowing a fund for the perpetual upkeep of the spring itself, he sought to protect at least the source, the pure headwaters, of the fragile stream that even now makes its way through blackened and polluted culverts into the arteries of the great city where he was born and raised. His project failed.

Its challenge has not gone away.

BERNARD PALISSY

Palissy's fame as a ceramic artist would have appealed to Willett; and Willett's pro-active participation in the far-reaching South-Wealden Exploration Project, would have drawn on Palissy's 'practical theories' on water; in the same way as it is clear Willett and Ruskin shared a preoccupation with the subject.

[Re below; see also, Léonard Amico, *Bernard Palissy in Search of Earthly Paradise*]

Bernard Palissy ?1510–1589 was a Renaissance French Huguenot Protestant potter, hydraulics engineer and craftsman, portrait painter, glass painter, cartographer, philosopher, writer, savant, lecturer, naturalist, ardent dissenting religionist, scientist, discoverer, author.

He was one of the first Europeans to pronounce on the correct theory of the origin of fossils.

Palissy struggled for sixteen years in poverty to replicate Chinese porcelain, and failing: he burned his furniture and floorboards to feed his furnaces.

He became famous at the French Court, an artisan to kings, and was patronised by the High Constable, de Montmorency, the most powerful figure in France under the King. [St Bartholomew's day massacre of Huguenots in 1572] de Montmorency interceded with Catherine de Medicis, Queen Mother (son, Charles IX) and patron of the arts. After Henry III in person visited the Bastille where he had been imprisoned as a dissenter, having been condemned to death when he was nearly 80, Palissy refused to recant, and died in the Bastille of malnutrition and vermin-borne disease.

Palissy was mentioned by Marcel Proust, Vol. 3, *The Guermantes Way*:

... and a fish cooked in a court-bouillon was brought in on a long earthenware platter, on which, standing out in relief of a bed of bluish herbs, intact but still contorted from having been dropped alive into boiling water, surrounded by a ring of satellite shell-fish, of animalcules, crabs, shrimps, and mussels, it had the appearance of a ceramic dish by Bernard Palissy.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

In the 19th century, Palissy's high relief enamelled earthenware lead-based ceramic porcelain, using materials intermixed in the manner of jasper, became the inspiration for Thomas Minton & Sons Victorian majolica, which was exhibited at the Great Exhibition of 1851 under the name 'Palissy ware'; which was characterised by patterns of snakes—coiled vipers—slinking lizards, frogs, shells, scaly fish, insects, leaves, ferns, water flora in a pond setting.

As an avid traveller who studied naturalism, alchemy, geothermy, and underground streams and wells, Palissy's ideas of springs and underground waters were published in his *Discours admirables, de la nature des eaux et fontaines, tant naturelles qu'artificielles, des metaux, des sels et salines, des pierres, des terres, du feu et des [e]maux* (Paris, 1580). His practical application of Alexandrian theoretical works on hydraulics to the social issue of delivering public water to cities, were far in advance of the general knowledge of his time.

Marcus Vitruvius (17 B.C.) introduced the present-day concept of groundwater originating as precipitation and returning to earth in a continuous cycle. This theory gained little acceptance until pronounced independently by Leonardo da Vinci and Bernard Palissy in the sixteenth century. These have been followed by several theories after the understanding of the hydrological cycle during the seventeenth and eighteenth centuries.

During the Renaissance (16th century), Leonardo da Vinci (who died when Palissy was 9 years old) had previously linked stream flow to precipitation.

The year 1856 marked the birth of groundwater hydrology as a quantitative science. Henri Darcy, a French hydraulic engineer, published the results of a series of experiments on percolation of water through filter sand. The Darcy equation remains the basic expression describing flow through a confined aquifer. See also Montgolfier.

A Treatise on Waters and Springs by Bernard Palissy (1510?-89), 1557:
Translated by E.E. Willett [With an introduction by H. Willett]. Pub. W. J. Smith, 1876,
Brighton.

Practique.

Si i'estois homme de village, & que mon habitation fut en pleine campagne, i'aurois espoir de trouver moyen de faire quelque fontaine pour la prouision de ma famille.

If I were a villager and my dwelling in the depths of the country, I should hope to find means of making a fountain for the provision of my family.

**BERNARD PALISSY, *Discours admirables, de la nature des eaux et fontaines, tant naturelles qu'artificielles, des metaux, des sels & salines, des pierres, des terres, du feu & des emaux....*
Paris, 1580**

Viewed on site at the British Library. Folded Xeroxed copy held offsite at Boston Spa, 48 hour prior notice for delivery at St Pancras. Identifier: System number 002753541. Shelfmark: General Reference Collection 7106.c.1.(13) UIN: BLL01002753541. It transpires that there is

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

also a copy held at St Pancras, I didn't find this in the online catalogue, one-hour prior order delivery, which might be copyable; desk confirmed public domain. A facsimile of the original is available online from several sources.

Re the identity of the E.E. Willett who translated the captioned Palissy work: In addition to Henry's daughter Edith Elizabeth [Catt] Willett there was also an Ellen Emily Catt, daughter of Henry's brother George.

Edith Elizabeth, daughter of Henry [Catt] Willett and Frances Jane 'Fanny' *née* Coombe was born 29th April 1853. She married Harry Johnson c. 1875. Children were: Millicent (1877), Pleasance, Ursula.

In addition to her translation of Palissy's work, E. Willett is recorded as author of 'Notes on a Mammalian jaw from the Purbeck beds at Swanage 1881'.

FROM THE PREFACE (which precedes the INTRODUCTION) TO THE PALISSY WORK, WRITTEN BY PRESUMED TRANSLATOR EDITH ELIZABETH WILLETT—Henry's daughter, who in 1876 was 23 years old:

"In the original treatise, the Natural Sources of Water Supply were explained by Palissy in the form of a Dialogue between THEORY and PRACTICE—*Théorie et Pratique*."

... the main object has been to retain the Author's quaintness of style, while avoiding many obsolete expressions found in the original;—to give rather the mind of the Author, than a literal rendering. The difficulties met with in the endeavor to comprehend the ideas of the Author on a subject entirely new to the Translator, and written in old French, will be kindly considered, and an apology accepted for the unavoidable errors, which will readily be found by an unsparing critic.

FROM THE PALISSY WORK'S EPIGRAPH BY THE AUTHOR

Nothing in this world is perfection, except the work of the Almighty; therefore taking pattern by the beautiful laws which He has given us, let us proceed to imitate them.

[Compare H.W. selections for inscription and dedicatory text on ram-house and fountain. See below.]

FROM HENRY WILLETT'S INTRODUCTION

The subject of "Waters and Springs" has still an importance and an interest which it would be difficult to overestimate.

Although the health and longevity of every individual depend so largely on the ample supply of water, much ignorance, and more indifference, exist on the subject.

"What is everybody's business is nobody's business;" and the water supply, not only of the poor man's cottage, but of many large towns, is relegated in a "happy-go-lucky" style to CHANCE, and to the variations of rainfall in "wet and dry

seasons.” Great and unnecessary suffering from alternate excess and scarcity, follow as a matter of course.

In so many country districts there is no supply of water at all; and periodic fever (arising from polluted sources of water supply in ponds and dip-holes by the road-side) is looked upon as “an arrangement of Providence.” Which it would be almost infidel to doubt.

The intermittent floods and droughts of the Thames Valley are nearly as bad as if the country were uninhabited.

Large Towns are built and the population increases on sites in which the supply of water is the last thing thought about. Some years ago, Harwich had no water at all, except what was brought in casks. The needs of Hastings are outstripping its resources; and all this happens in a country where the annual rain-fall is abundant. Truly, God’s Providence and man’s improvidence seem to go hand in hand.

In the hope that interest may be awakened and that the remedies suggested in this treatise may be useful in tending to abate an evil, which, like many others

“Is wrought
“By want of thought
“As well as want of heart,”

it has been translated at the request of, and printed by,
HENRY WILLETT

Arnold House, Brighton,
August, 1876

From the opening of E.E. Willett’s Palissy translation:

THEORY

Some time ago, while walking through the fields, I felt very thirsty and, going through a certain village, I enquired where I could find a good spring of water in order to refresh myself and quench my thirst. I was told that there was not one in the place; that the wells were all dried up by reason of the drought and that there was only a little muddy water at the bottom of them. This troubled me a good deal and I was much astonished at the difficulty the inhabitants of the village were in on account of water. I then remembered a promise you made me long ago to shew me how to construct fountains in places where water was most scarce.

[from the PALISSY]

Aqueducts
Filters
Fountains
Pipes
Pumps
Reservoirs
Springs
Tide Mills

Wells

... before speaking of fountains of my own invention... I always feel convinced, both from theory and practice, that [many men's] pumps have very little durability, on account of the violence of their action, caused as much by the quick movement of the water as by the air which rushes through the tubes; and it is certain that violent action is very disruptive.

I do not condemn the invention of pumps; on the contrary I have great respect for them; whoever invented them is worthy of great esteem. For, I am well aware that the water which rises in the pipes only rises by the attraction of the air caused by the valve; this having given place to exhaustion, or to the suction of the air caused by the handle of the pump, a quantity of air enters the tube; the valve returning to its place shuts in the water and the air which are enclosed in the pump, and are alternately stopped and impelled by the action of the handle, which forces the water to rise; but this is not to be done without a great expenditure of force.... I regard the invention of these pumps as something wonderful, and know that they are always in request... there are many persons...who have had these pumps constructed at a great expense, and at last have been obliged to relinquish them because of the frequent necessary repairs.

THEORY: ...how will you know what to say about natural fountains? As they are natural, you cannot say anything against them...for if you presume to speak against natural fountains, you speak against the GOD who made them.

PRACTICE: I know well that the sources of natural springs are made by the hand of God, for which reason I cannot find fault with the mistake people make in trying to get water from natural sources. But the fountain-makers who bring the water by tubes, canals and aqueducts from the source up to houses, towns and castles, may makes great mistakes.

The effects of imprisoned water are marvellous. Few would believe that water which fills and occupies a tube of two inches in diameter [Amberley Museum & Heritage Centre, Arundel, hydro curator of the pump stations, Mr David Burgess, suggests 4" more appropriate; also beware bursting frozen pipes if restoration/reactivation of ram is for infrequent demonstration purposes only], being violently impelled by wind or other waters, would become so contracted that it would go through a pipe of the diameter of one inch.

[aqueducts]

"...there are few good houses in Rome in which there are not fountains, supplied by aqueducts built high in the air;...it is only necessary to examine a picture of Rome...where you will perceive a reservoir elevated to a great height, and of a large size. This reservoir contains such a quantity of water that it supplies the greater part of the city.

[many threats of contamination and poisoning of output from the Creator of natural resources] [cf. present-day concerns on South Downs re polluting agricultural-effluent seepage and leaching into ground- and run-off water; and £80,000 grant to analyse and quantify the problem. (GJMG.)]

Salt, salt of vitriol, copper, alum, saltpetre, bitumen, petroleum oil from rock, clay, metals, sulphur, iron, lead, silver, antimony, coal...

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

[cf. hydraulic ram]

I tell you as a general and certain rule, that water never rises higher than the source from whence it proceeds...there are more springs in mountainous districts than in valleys...

You must steadfastly believe that all water which now exists, has existed, and will exist, was created from the beginning of the world and God, not willing that anything should be left in idleness, commanded the waters to go, and come, and bring forth life, which they do without ceasing.

[Viz. *supra*: Willett's Fulking pump-house inscription: HE SENDETH SPRINGS INTO THE VALLEYS WHICH RUN AMONG THE HILLS—OH THAT MEN WOULD PRAISE THE LORD FOR HIS GOODNESS

Also, Willett's dedicatory inscription on Fountain: TO THE GLORY OF GOD AND IN HONOUR OF JOHN RUSKIN +++PSALM LXXVIII+++ THAT THEY MIGHT SET THEIR HOPES IN GOD AND NOT FORGET BUT KEEP HIS COMMANDMENTS WHO BROUGHT STREAMS ALSO ++ OUT OF THE ROCK ++]

...if you will consider that since the creation of the world springs, streams and rivers have continually issued from the hills...I know truly that from these clefts in the rock a marvellous quantity of water gushes out...you can see why springs and rivers take their rise more among the mountains...the water, falling on the hills which are full of crevices and cracks, descends continually, and meeting with no obstacles until it reaches some cavity in the stone or rock, it then collects at the bottom of this cavity, until, having found a channel or opening, it issues in springs, streams or river, according to the size of the opening and the receptacle; and, as this spring naturally cannot ascend the hills, it descends into the valleys.

If I were a villager and my dwelling in the depths of the country, I should hope to find means of making a fountain for the provision of my family.

THE SUB-WEALDEN EXPLORATION PROJECT

[SUB WEALDEN EXPLORATION PROJECT, Henry Willett, *Brighton Guardian*, 24th April 1872; also *Brighton Guardian*, 15th May 1872]
cf: W. Topley F.G.S.: *Memoir of Weald*

The first boring for purely scientific purpose ever attempted in England.

A highly ambitious and fruitful project [ref. at one point to a quarter mile of iron and steel tubing] with the Diamond Rock Boring Company engineering and boring to ascertain the thickness and identity of: (in no order) the chalk, chalk marl, upper greensand, lower greensand, weald clay, gault, Tunbridge Wells sand, Wadhurst clay, Kimmeridge clay, Hastings sand/beds, Purbeck beds, coral, rag, of the various strata at different depths.

From: Henry Willett, Esq., F.G.S.'s quarterly *Record of the Sub-Wealden Exploration Project* (Motto: "Two Thousand Feet; or Palaeozoic Strata"), pub. 1878 by W.J. Smith, 43

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

North Street, Brighton. 8vo, price 3s. 4d. [10th and 12th Quarterly Reports held at British Library.]

Compiled by Henry Willett, Esq., F.G.S., Hon. Sec. & Treasurer, Arnold House, Brighton:

From London to St Leonard's through the Tottenham Court Road and Sub-Wealden borings.

Willett wrote in the Third Quarterly Report, Arnold House, Brighton, May 28 1873: 'It is the prerogative of modern science not only to be deterred by difficulty, but to look with laudable unbelief at the facts every time the word "Impossible" is pronounced. It believes (as Professor John Ruskin eloquently asserts) "that all things are possible to well-directed labour" while it reverently acknowledges that it can only conquer by obeying Nature's powers.... "Two Thousand feet; or Palaeozoic Strata" is our motto.'

Printed and offered to the Patrons, to the Committee of Reference, to the Subscribers, and to all friends and well-wishers of Scientific Enterprise...

....

Steam engine; boring hole; big cog wheel in its massive frame; stout chain in a drum up to top of scaffolding where it is rove through a pulley and weighted with 2 heavy iron balls. A spindled hook upholds a 20-foot length of square iron rod, which is screwed onto another that goes through the platform covering the bore hole.

To the bottom of the lower rod is fixed a boring augur, and rotation is given to the rods and augur by a shaft and beveling wheels, moved by an endless strap working from a drum in the machinery frame.

Every time the boring tool is lowered, more than fifty joints have to be accurately screwed together.

During the boring a man has his hand constantly on the boring rod and experience enables him to tell whether the augur is biting properly or whether the power of the moving machinery is twisting one of the lengths of iron rod below—a not uncommon circumstance near to the boring. Some temporary wooden houses have been put up, so that the labourers and foremen will be always upon the spot.

Henry Willett visited the works accompanied by Mr Docwra, who proposed the Diamond Rock Boring Company to do the work.

[cf. Fulking ram] "Mr Willett...has instructed [Mr X] to purchase the necessary machinery, to find experienced workmen, and to commence the undertaking as soon as materials can be supplied and possession of the site obtained. [on-site inspections]

The Members also considered the feasibility of a Channel Tunnel.

Patrons and Subscribers of the Sub-Wealden Exploration Project, in no order of precedence, included:

-- The Duke of Devonshire £550.0.0.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

- The Duke of Norfolk £75.0.0.
- The Duke of Argyll
- The Duke of Richmond
- The Earl of Ashburnham
- The Earl [?] of Ashbourne-- ?Edward Gibson, 1st Baron Ashbourne
- The Earl of Ducie
- The Earl of Chichester, Lord Lieutenant of the County of Sussex: presumably Henry Pelham, 3rd Earl of Chichester).
- The Earl of March
- Earl Delaware
- Lord Leconfield £200.0.0.
- The Geological Professor at the University of Oxford
- The Chief Inspector of Crown Mines
- The Royal Society
- The [President of the] Geological Society
- The Chancellor of the Exchequer (£100 for every 100' explored)
- The Lord Commissioners of the Treasury £900.0.0.
- His Imperial Majesty the Late Emperor of the French, Louis-Napoléon Bonaparte (Napoleon III, nephew of Napoleon I) £5.0.0.
- Lady Mary Egerton (I presume the daughter of the Earl of Derby, and wife of the 2nd Earl of Wilton, Thomas Grosvenor, later surnamed Egerton by sign manual)
- The Speaker of the House of Commons
- The British Association for the Advancement of Science, 22 Albemarle St.
- Charles Darwin, Esq., MA, FRS, FLS, Beckenham, Kent (must be Down House) £30.0.0. [The 13th Quarterly report of the Sub-Wealden Exploration Project reports a subscription from Darwin, C., Esq., LL.D., F.R.S., F.G.S. &c.]
- Erasmus Darwin (I presume Charles' brother Erasmus Alvey Darwin, 1804-1881) £5.0.0.
- G.H. Darwin, Esq., Beckenham, Kent (I presume 1845-1912, Charles' son George
- Howard Darwin, who in 1883 became Plumian Professor of Astronomy and Experimental Philosophy at the University of Cambridge. He studied tidal forces involving the Sun, Moon, and Earth, and formulated the fission theory of Moon formation.) £1.0.0.
- Horace Darwin, Esq. (I presume 1851-1928, Charles' young son, became a civil engineer.) £3.0.0.
- W.E. Darwin, Esq., Beckenham, Kent (I presume 1839-1914, Charles' son William Erasmus Darwin.) £4.0.0.

Also the Rev. John Goring of Wiston Park, Steyning—a shaft was sunk at Steyning in 1878 'by H. Willett': F. Dixon, *Geology of Sussex*, Ed. 2, pp.115-117 (Goring—this one?—planted Chanctonbury Ring, took water up by hand to water the seedlings).

One meeting was attended by the British Association of the Advancement of Science.

The Royal Society contributed to funds after, on Saturday April 26th a series of cores were exhibited by H.W. at the soirée of the Royal Society in Burlington House.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

Other members of Henry Willett (*né* Catt) family who subscribed to the Project were John Catt; George Catt; Alfred Catt; E.H. Willett; Edgar W. Willett, Percy A. Willett; C.V. Willett, George W. Willett; Henry Willett; John Willett, Lewes.

Contributions included assessments as deeper levels were attained: viz. the Treasury granted £100 pounds for every 100 feet. Devonshire was to contribute £2000 upon reaching 1500 ft.

Willett's Quarterly Reports detail the amount of core brought up, and the work done each day.

14th February 1876 Willett commits to pay the whole cost of boring 2,000 feet if palaeozoic rocks can be found by this process.

...1,546 feet... 21st December 1875, 1,823 feet; 12th April 1876 1905, 1,905 feet.

He reported that on February 11th 1875 the Diamond Rock Boring Company reached 2,000 feet—"the last 500 in 14 days!"

Meeting at Arnold House 30 Nov 1872 [?Did Ruskin attend any of the meetings at Arnold House], from the Quarterly Reports:

Mr Willett will have the great satisfaction of exhibiting at the forthcoming Brighton Meeting of the British Association specimens of strata.

...

Almost as a matter of course, absurd rumours and unfounded statements are afloat. One of the most prevalent in East Sussex is that Mr Willett is acting as the agent of some inchoate Limited Liability Company!

Mr H. Willett was next called upon to address the assemblage, and on rising was greeted with sustained applause.

"...he is a tyro in science. Still, if anything was to be done in this country, it could only be done by perseverance, and he had to take up this project with as determination to persevere with it. (Cheers) Having neglected science for many years he was now almost in the position of a gentleman who had resolved to change his manner of life and had commenced to again coquet with an old love."

[Willett on coal] "When people made donations to the fund he did not ask their motives. They might be induced by a pure love of science; or they might be induced by the prospect that they or their children might get their coal 1d. or 2d. a scuttle cheaper."

...three hearty cheers were given for Mr Henry Willett. [Port after dinner?]

"An Irish pupil is reported to have replied, in answer to the question, 'How many kinds of motion are there?'—"The progressive, the retrograde, and the *standstill motion*.' This latter is, alas! too descriptive of our work for the past quarter."

"...the Sunday's rest intervened; and I fear that 'the sermons in stones' absorbed more mental attention than was quite becoming in one who has lately been addressed as 'The Reverend Henry Willett'".

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

On March 31 1875: 'I do not complain. I experience the pleasurable truth so eloquently described by Ruskin, viz., that "the real animating power of knowledge is only in the moment of its being first received, when it fills us with wonder and joy—a joy for which, observe, the previous ignorance is just as necessary as the present knowledge. *That man is always happy who is in the presence of something which he cannot know to the full, but which he is always going on to know.*'

[\[http://www.lancs.ac.uk/users/ruskinlib/eSoV/texts/vol11/vol11p65.html\]](http://www.lancs.ac.uk/users/ruskinlib/eSoV/texts/vol11/vol11p65.html)

Willett resigned as Hon. Sec. 1st May 1876, and said he would resign as Treasurer at the next meeting. Money had run out; but there was also some hint of umbrage at attention having been drawn to his charging of travelling expenses, after he had contributed over £500 to the Project. In a letter dated 22 Feb. 1877 he cited overwork, bronchitis, failing health, increased duties, and the illness of his brother and son. [But not that he was resigning to pursue other interests.]

Although Willett signed on again as Hon. Sec. Treasurer, the end of the Project was announced in the 9th June 1877 Report, citing: Receipts £6,257/17/1, Expenditure £6,257/17/1.

THE FULKING VILLAGE RAM, DEDICATED BY HENRY WILLETT TO JOHN RUSKIN (as he did the "RUSKIN PLOT" in Oxfordshire which HW purchased on behalf of the Ashmolean Natural History Society to form a nature reserve):

RE: E. Willett, 'Family Grocer Draper Baker' of Fulking village shop, which used to be situated at the E. Willett residence, The Old Bakehouse, Fulking.

Suggestion that Ruskin used to stay at The Old Bakehouse, widely circulated, pending evidence is assumed to be apocryphal and attributable to the duplication of surnames. Nor is there evidence of blood congeniality or acquaintance between Brighton Willett (né Catt) and Fulking Willett; nor that Ruskin stayed late enough in the day to admire the sunset as he is also alleged to have done (see below, possible and understandable confusion of diary entries).

Professor Stephen Wildman, Director and Curator of the Ruskin Library and Research Centre at Lancaster University says [e-mail 28 May 2013]:

...

I know of no evidence, however, that he [Ruskin] "occasionally visited the district", nor that he "used to stay at The Old Bakehouse". The chronology of Ruskin's life records a visit "to Brighton and back" on 1 January 1876, and two visits to a former pupil near Arundel in 1875 and 1876, but there seem to be no other diary entries. Certainly he knew Henry Willett, of Arnold House, Brighton, from the mid 1870s—although I can't tell you when they first met—but again I know of no documentary evidence of Ruskin's staying with him there.

John Ruskin became interested in fresh water supply following visits to the Swiss Alps in the 1860s, where for a time he nurtured an idea of living, and at Brantwood, Coniston, from 1871 onwards he conducted experiments on a small scale using streams coming off the hills above the house; these involved sluices but not pumps. I do feel that his remark on civil engineering being his true bent was more than a little ironic. The comment that "[not] the slightest honour was owing to me in the matter" suggests to me that Willet had far more to do with the practicalities (and probably, all of them!). There are no known drawings relating to Fulking, as far as I know.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

....

I don't think anyone has looked in detail into Ruskin and Willett, although I do remember someone at Brighton Museum was interested some years ago. Anything you come up with will be of interest!

Good luck with the restoration campaign.

In the three-volume edition of the Diaries, Selected and Edited [?any relevant excisions] by Joan Evans & J.H. Whitehouse, Ruskin enters [copy notes here possibly inaccurate] for 12 July 1841: "After being in Brighton...". Similarly, 22 September 1856 cites Brighton. Friday 1 October 1875 [cf. circulation of story that Ruskin 'loved the sunsets at Fulking']—R. was staying with the Hilliards—: LUCASTER. "Saw entirely beautiful white cirri sky at sunset; would fain draw and write memory of it—but must attend to Sheffield business." Saturday 2 October 1875. LUCASTER. Utterly black, rain, after utterly sunless entire day at Brighton yesterday." [?] For 1st January 1876, "To Brighton and back." Sunday 2nd January 1876, "Slept well, after good encouragement from sweet 'Auntie' [who she?] at Brighton."

Ruskin Diary entry 9th Jan. 1876, "Fearfully cold and bitter black wind in walk to Arundel."

From Joyce Donoghue (an acquaintance of the family of the writer) *Friends of Brantwood* article of ?1995/1996 (supplied by Mr Paul Dawson, Editor of the *Friends of Brantwood* Newsletters, and author of his own study on the subject):

I was interested to discover where Ruskin stayed on his visits to Fulking, and by a lucky chance we asked the right man. "In my house!" he replied. We were taken to see the Old Bakery and told that Ruskin used to stay there with his friend Willett, the village baker and formerly the cobbler.

...

Unfortunately, the current Guide tells us that the Henry Willett who 'arranged the water supply together with John Ruskin' was the gentleman benefactor who established the Brighton Museum and 'loved the village of Fulking'; not that he lived there.... The 19th century [Fulking] Willetts were evidently an energetic family: music lovers, schoolteachers, founders of the first village shop, carter's business, etc.

How did Ruskin get to know these Willetts, if indeed he did? Did he really stay at the bakery? Could it be that Ruskin's respect for the noble artisan was the basis of a friendship spanning twenty-odd years? He surely did not return to Brighton after sundown, for Fulking was scarcely accessible by day in the mid-eighteenth hundreds. I cannot readily visualise the rather grand Ruskin coach bumping and squelching along those narrow ill-kept tracks; the road was not made up until well into this century, for Fulking was extremely impoverished from the time of the Enclosures onwards with an exceptional proportion of labourers on Poor Law Relief. It was then a far from idyllic village.

Fulking spring Ordnance Survey Grid Ref. TQ2471131. From F. Dixon, *Geology of Sussex* Ed. 2, pp. 67, 83, 85, 115-117; see also *Brighton Gazette* 17th April 1862: "To the west of Brighton in the aquifer the sources at Mile Oak, Mossy Bottom and Shoreham are used conjunctively in

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

'storage and leakage' mode." Closest bores of Willett *et al's* Sub-Wealden Exploration Project were at Steyning 1878; Henfield; Upper Beeding.

Eastward to this [Upper Beeding] in April 1904 I went along the foot of the South Downs, from the neighbourhood of Edburton to that of Plumpton...for the purpose of seeing the chief springs over a course of about eight miles as the crow flies, and of a good deal more along the winding range of hills.

At Fulking a set of springs in the same geologic position [as Upper Beeding in the valley of the Adur, between Beeding Court and Castle Town] and also marked on the Ordnance Map (Sussex, Sheet 52) occurs a little southwest of the hamlet. We saw another spring at the southern side of the road a little northwest from the above.

At Poynings the spring forming the head of the stream is about 530 yards SSE of the church, in the bottom of the smaller branch of the forked valley, just as it joins the longer branch, the Devil's Dyke.

From records held at County Hall, Chichester: the original 1886 ram may have been installed by Allwin Ockenden & Sons; was ?replaced in the early 1950s by Duke & Ockenden, which became/had become Dando of Littlehampton—see Dando sign on wind turbine water generating exhibit at Amberley Museum. However there is said to be no record of this in the D&O material held at Littlehampton Museum.

The Fishbourne, Steyning, Henfield (July 1895) boreholes were 'communicated' on behalf of Willett *et al's* Sub-Wealden Exploration Project by Messrs Duke & Ockenden in 1895. Fishbourne site: 'Bored and communicated by Messrs Duke & Ockenden.'

The system bears the mark of C.A. Wells 'Etna Ironworks' of Lewes c.1874-1900.

?Consult Cathedral Works Organisation, Chichester.

All elements of the water system were connected with 2" cast iron pipes. David Burgess at Amberley Museum says a system with a 4" gauge pipe would produce one part water for every seven parts pumped.

Cast iron lever pumps mounted over brick-lined reservoirs, were fed by gravity from the reservoir (query now filled with cement) behind the fountain.

Overflow was piped to the house and outbuildings at Perching Manor.

From the *West Sussex Gazette* 6th August 1896, i.e. during Ruskin's lifetime, the Ram House is known as the "Stream basin and Conduit House".

It is at present a Grade II Listed Building, Ordnance Survey map ref. TQ 2411 27/17—?Should be promoted to Grade I.

An application to the Department of National Heritage, to raise all the elements of the water system (Ram House, Fountain, Pumps and Reservoirs/Balancing Tank) to the same level of protection was granted on 26th May 1995.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

The fabric but not the functionality of the 'Primrose' Fountain—surplus water had originally been culverted to a stone trough for animal drinking and then by drain to return to the spring stream—was restored and refurbished ?1995—cost £7,900—and ?opened by Joan Perkis, Derek Hancock, ?Parish Council Chairman at the time, ceremony attended by certain villagers still resident, with grant aid from ?English Heritage; West Sussex County Council; Mid Sussex District Council (MSDC was approached for granting through the Rural Community Provision Scheme); Sussex Rural Community Council; "Rural Action", and South Downs Conservation Board, approved. 15% of cost raised locally including from Mr and Mrs W. Frost of The Fulking Club, also known as the Bonfire Group. The Drinking Fountain Association wrote with their blessing but no money.

Work including replacement stone/stone filler was done by H.D. Tribe Ltd., Stonemasonry, 26 South Street, Lancing BN15 8AG Tel.: 0(1)903-764426. Work started 8th April 1995.

See Fulking Parish Council Record prepared by Mrs Annette Mills, then Clerk to the Parish Council, June 1995. Did not qualify for funds from Sussex Heritage Trust (why not). County Hall Record Par 346/54/1.

1991 question was raised as to possible adoption by the National Trust, owner of Fulking Escarpment, also now of Saddlescombe Farm. Fulking is in the newest National Park, the South Downs National Park.

Theories exist that, either, in consideration of Ruskin's 1887 objection to Willett that "the inscription made my name far too conspicuous" was responsible for the removal from the original of "and in honour of John Ruskin", and its replacement with plain brown tiles; or, that the first tiles had excessively deteriorated. As part of the restoration they were replaced as original.

See *West Sussex Gazette* 6th August 1896: John Ruskin was "appealed to by some friends of Fulking [Henry Willett was described as a 'lover of Fulking'] who were anxious as to its water supply."

John Ruskin *Collected Works* XXXIV p. 719 George Allen 1908. ??

The system supplied Fulking with its water, cost 6s. 4d. per household, until mains water replaced it in 1951.

It was said that samples of both waters were ?privately sent for chemical analysis, and the spring water was adjudged the purer.

Ruskin, Henry Willett, the Darwin family, Leonardo da Vinci, Bernard Palissy; Edith Elizabeth Willett

--Letter, 19th April 1874, Charles Darwin to Henry Willett, from Down House, 'F.M. Balfour is in Naples...' [comments on rate at which sea eats back the land, as given in early editions of *Origin*]. Darwin Correspondence Project, letter 9420 CUL DAR 148.359. Copy not available online.

--2nd letter from Darwin to Willett, also 1874, no details.

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

--Letter, Ruskin Library and Research Centre ?1876 from Ruskin to Willett, Inventory number 1996L01024, Vol. B13, p. 42: "Your most interesting letter on sea-encroachment..."

Nature 10, 220-221 (23 July 1874) doi:10.1038/010220a0

The Sub-Wealden Exploration

A. G.

If the word *romance* were to be imported into scientific literature there could surely be no more fitting application of it than to this recent crusade into the bowels of the earth among the woods and lanes of Sussex. Down in that southern part of the country, some hundreds of miles away from the great centres of our mineral industry, with no prospect of any pecuniary reward or of any immediate economic advantage, men are found willing to subscribe money to the extent of thousands of pounds for the purpose of settling definitely some important questions in the geology of the south-east of England, viz. at what depth from the surface the secondary strata are underlain by a ridge or platform of old Palæozoic rocks, what are the nature and age of these bottom rocks of the district, and what is the arrangement of the strata lying between them and the surface.

It has long been a problem of much interest to geologists to discover whether or in what manner the great series of Jurassic rocks, which stretches across our island from the coasts of Dorsetshire to those of Yorkshire, passes south-eastward underneath the chalk. That series has been found to grow thinner towards the south-east.

On the French side of the Channel it reappears in the Boulonnais, coming out from under the Cretaceous strata and resting against a ridge of Palæozoic rocks which rise to the surface between Boulogne and Calais. Nearly twenty years ago Mr. Godwin Austen drew attention to the probable extension of this ridge underneath the later formations of the south-east of England and its connection with the Carboniferous tracts in our south-western counties.

It was a point of great interest in any attempt to reconstruct a map of the physical geography of western Europe during Palæozoic times. Hence, at intervals since the publication of Mr. Austen's great memoir, renewed attention has been given to the subject, until at last the idea took shape that a bold attempt should be made to settle some portion at least of the problem by putting down a bore and keeping it going, if possible, until all the Secondary rocks should be pierced and definite information should be obtained as to what lies below them.

Advantage was taken of the meeting of the British Association at Brighton in 1872 to organise the scheme. For so purely scientific a project it was of course natural to look for help mainly to such well-wishers to science as attend the Association meetings, rather than to the general public. Subscription lists were opened and money came in, not in overflowing abundance indeed, but yet in quantity sufficient to enable the operations to be begun. Further donations have been given, and the work has now been carried down to a depth of more than 1,000 ft.

Leonardo da Vinci (1452-1519) [Palissy 1510-1589] and Water:

<http://www.guardian.co.uk/artanddesign/jonathanjonesblog/2011/nov/23/leonardo-da-vinci-earth-geology>

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

Centuries before Darwin, Leonardo da Vinci guessed through his study of rocks and fossils that the world is far older than Genesis claims. Rocks pile and gather and disintegrate in mountains, caves, strata and screes in his paintings and drawings. The two versions of his picture *The Virgin of the Rocks* in the National Gallery's exhibition of his art glory in two different imaginary caverns, each with its own rich earthscape of stone perforated and sculpted by wind and water. [c.f. also geologic features in: *The Baptism of Christ, The Virgin of the Rocks, and The Virgin and Child and St Anne and St John the Baptist (The Burlington House Cartoon)*]

As a geologist, Leonardo anticipated the scientists of the 18th and 19th centuries who were to prove that the Earth is far older than it says in the book of Genesis. When scientific pioneers around 1800 recognised fossils as traces of ancient animals—and analysed the processes that create and erode rocks, they quickly reached a set of conclusions that led to Darwin's theory of evolution and a crisis of Christianity.

[The *Notebooks*: sedimentary geology, sedimentation geology, sedimentation stratification, fossils.]

Leonardo believed that shells that appear on mountain tops and fish bones in caves must be the remains of animals that long ago swam in these places when they were covered in sea.

When Leonardo lived in Milan he went walking in the Alps and climbed to the top of Monte Rosa. He writes in his notes about exploring a mountain cave where he found massive fossil bones, and reveals that he was famous for this interest in rocks and strange forms hidden within them: one day, he says, some peasants brought him a sack full of seashells they had found in the mountains. Leonardo's recognition that fossils tell the true story of the Earth would be rediscovered by science and this insight would overturn religious views of creation. But Creationists who still try to argue against the evidence of the rocks should know that it was not Darwin who struck the first blow against biblical views of nature.

<http://witcombe.sbc.edu/water/artleonardo.html>

Leonardo da Vinci examined the motion of waves and currents, and was the first to postulate the principle of erosion: 'Water gnaws at mountains and fills valleys. If it could, it would reduce the earth to a perfect sphere. (*Codex Atlanticus*, 185v)

Leonardo studied water also with the view to learning how to control it. Throughout his life, Leonardo was obsessed with a fear of a great watery cataclysm. In his drawings and in his writings he describes terrible floods and inundations and great storms.

Perhaps as a result of these events, and as a way of dealing with his fears, Leonardo devoted a lot of energy to developing ways or devices to control and move water around.

He also designed locks and canal systems, and invented machines for excavating canals.

One large scale but never realized plan was for a navigable canal linking Florence to the sea (*Codex Atlanticus*, f. 4v). The scheme included cutting a series of giant steps with locks to enable ships to sail up into the hills. The water would be raised from one level to the next by a huge siphon. In Milan, he worked on a system of locks and paddle wheels for washing the streets. He also had plans for draining the unhealthy marshes of the Val di Chiana.

<http://www.ucmp.berkeley.edu/history/vinci.html>

Leonardo knew well the rocks and fossils (mostly Cenozoic mollusks) found in his native north Italy. No doubt he had ample opportunity to observe them during his service as an engineer and artist at the court of Lodovico Sforza, Duke of Milan, from 1482 to 1499: Vasari wrote that 'Leonardo was frequently occupied in the preparation of plans to remove mountains or to pierce them with tunnels from plain to plain.'

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

He made many observations on mountains and rivers, and grasped the principle that rocks can be formed by deposition of sediments by water, while at the same time the rivers erode rocks and carry their sediments to the sea, in a continuous grand cycle. He wrote: 'The stratified stones of the mountains are all layers of clay, deposited one above the other by the various floods of the rivers. In every concavity at the summit of the mountains we shall always find the divisions of strata in the rocks.'

Leonardo appears to have understood the law of superposition, which would later be articulated fully by the Danish scientist Nicolaus Steno in 1669: in any sequence of sedimentary rocks, the oldest rocks are those at the base. He also appears to have noticed that distinct layers of rocks and fossils could be traced over long distances, and that these layers were formed at different times: '...the shells in Lombardy are at four levels, and thus it is everywhere, having been made at various times.' Nearly three hundred years later, the rediscovery and elaboration of these principles would make possible modern stratigraphy and geological mapping.

In Leonardo's day there were several hypotheses of how it was that shells and other living creatures were found in rocks on the tops of mountains. Some believed the shells to have been carried there by the Biblical Flood; others thought that these shells had grown in the rocks. Leonardo had no patience with either hypothesis, and refuted both using his careful observations. Concerning the second hypothesis, he wrote that "such an opinion cannot exist in a brain of much reason; because here are the years of their growth, numbered on their shells, and there are large and small ones to be seen which could not have grown without food, and could not have fed without motion—and here they could not move."

There was every sign that these shells had once been living organisms.

What about the Great Flood mentioned in the Bible? Leonardo doubted the existence of a single worldwide flood, noting that there would have been no place for the water to go when it receded. He also noted that 'if the shells had been carried by the muddy deluge they would have been mixed up, and separated from each other amidst the mud, and not in regular steps and layers—as we see them now in our time.'

He noted that rain falling on mountains rushed downhill, not uphill, and suggested that any Great Flood would have carried fossils away from the land, not towards it. He described sessile fossils such as oysters and corals, and considered it impossible that one flood could have carried them 300 miles inland, or that they could have crawled 300 miles in the forty days and nights of the Biblical flood.

How did those shells come to lie at the tops of mountains? Leonardo's answer was remarkably close to the modern one: fossils were once-living organisms that had been buried at a time before the mountains were raised: 'It must be presumed that in those places there were sea coasts, where all the shells were thrown up, broken, and divided.... Where there is now land, there was once ocean. It was possible, Leonardo thought, that some fossils were buried by floods—this idea probably came from his observations of the floods of the Arno River and other rivers of north Italy—but these floods had been repeated, local catastrophes, not a single Great Flood. To Leonardo da Vinci, as to modern paleontologists, fossils indicated the history of the Earth, which extends far beyond human records.

Leonardo wrote, 'Since things are much more ancient than letters, it is no marvel if, in our day, no records exist of these seas having covered so many countries.... But sufficient for us is the testimony of things created in the salt waters, and found again in high mountains far from the seas.'

"Water": 'Waves, rivers, streams and geysers: new sounds online' www.bl.uk/sounds

HENRY WILLETT AND FOSSILS

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

<http://archive.org/details/cataloguecretac00willgoog>

http://www.brighton-hove-rpml.org.uk/HistoryAndCollections/aboutcollections/naturalsciences/Documents/published_type_catalogue_Sept2010.pdf

Probably the most significant collection to be made in the Brighton area at any time was that of Gideon Mantell (1790-1852), the well known Lewes surgeon and geologist. His collection became feted whilst still in his house in Lewes in the 1820s and by the time he moved to Brighton in 1833 was of international significance (Dean 1999). His fame was based largely on his discoveries of large terrestrial vertebrates—especially Iguanodon and Hylaeosaurus, as well as the fresh insights he made into the geological origins of the Weald, made known by his many publications and public lectures.

Mantell's collection never formed the basis for a permanent Sussex scientific institution as he had hoped (though for 5 years it attracted many thousands of visitors to his Mantellian Museum on the Old Steine in Brighton). His lack of success as a practising general practitioner, combined with the failure of an enterprise to sell shares in such an Institute, meant that he eventually had to sell his entire collection to the British Museum in 1838.

See: Dean, D.R., 1999 *Gideon Mantell and the Discovery of Dinosaurs*, CUP.

As Mantell's discoveries of large vertebrate fossils became more widely known, so more people began to collect fossils. Henry Hoper (1788-1858), Vicar of Portslade and a contributor to Mantell's 1822 *Geology of the South Downs* formed a significant early collection of Chalk fossils, the fate of which is unknown.

Frederick Dixon (1799- 1849) of Worthing built up a large collection of Chalk and Tertiary fossils some 4500 in number, which his widow sold to the British Museum. His collection was the basis for his posthumously published *The Geology and Fossils of the Tertiary and Cretaceous Formations of Sussex* (1850). This publication also reprinted plates from Mantell's *Fossils of the South Downs*.

Also featured in that publication were fossils from the collection of Henry Catt (1823-1905) later to be known as Henry Willett, who, he records, met Gideon Mantell when "quite a boy". Known principally as a collector and benefactor to Brighton Museum, founded 1861, of porcelain and fine art, he [Henry Willett] also donated his extensive fossil collections, especially his Cretaceous fossils which formed the first donation to the Brighton Museum when inaugurated in 1861. His catalogue of this collection (1871) contains the quote: 'If the inspection of this collection should help one young man to find his pleasure, and to spend his spare time in this direction, rather than to waste it in billiards or idleness, it will not have been formed nor presented in vain.' In 1852, only six weeks before he died, Mantell visited Henry Catt '...to look over his splendid fossils'.

Catalogues of Cretaceous fossils, a number of them named after Willett, are categorised under various headings including sponges, molluscs (including ammonites), fish; and a tiny asteroid:

Glyphea willetti, cf. *Meyeria willetti*

For his chalk collection, Clayton was a productive site

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

Fish:

Nomoeodus willetti;
Elasmognathathus willetti
Elasmodectes willetti

In the Charles Potter Collection

Tomognathus lelodus with both jaws

Triconodon mordax was discovered at Clayton by E. Willett, presumably HW's daughter Edith Elizabeth accompanied her father on some of his forays.

E. Willett also wrote "Notes on a mammalian jaw from the Purbeck Beds at Swanage 1881: Q.J.G.S. 37 pp. 376-380 with an introduction by Henry Willett, FGS

A splendid cranium was found near Cuckfield of a crocodilian skull: *Goniopholis crassidens*

Also near Cuckfield: ?*Goniopholis megalosaurus* very fine and v. small, left ramus of a very young saurian.

<http://www.sussexias.co.uk/articles/tidemills.htm>

The principle of tide mill operation was to impound the water at high tide and then to release it as the tide fell, driving undershot water wheels that provided power to the stones. The heyday at Bishopstone was between 1803 and 1853 when William Catt headed a somewhat feudal community and the mill had 16 pairs of stones, with 20 acres of storage ponds, and a 16 hour working capability producing 1,500 sacks of flour a week. The repeal of the Corn Laws in 1846 allowed cheaper foreign grain to be imported and the development of the railway system allowed flour to be easily distributed nationwide from the newer steam driven roller mills. The competition was just too great and in 1879 the complex was sold to the Newhaven Harbour Company. The mill and granary were demolished in 1901; the village cottages were finally condemned in the 1930s due to a lack of mains drainage. Deterioration and use for target practice during WW II left only a few walls and foundations.

Acknowledgements & Sources

--28th May 2013 information and comments furnished by Stephen Wildman, Professor of the History of Art, and Director and Curator of the Ruskin Library and Research Centre, Lancaster University. [Willett knew Ruskin from the mid-1870s...]

The ?29 or so letters/clipping (likely incomplete list at foot of this document and/or attached), held at the Ruskin Library at Lancaster University, may shed further light on the relationship; seek permission to view; and one would be interested to know if Mr Paul Dawson might be able to share anything further on the subject; as of course we will anything additional we may come up with.

See separate full list of items held at Lancaster c/o Prof. Wildman; ?also Whitehouse Collection at Brantwood; including

- **Title:** [Newspaper] [n.d.].

HENRY CATT WILLETT TRUST, FULKING, WEST SUSSEX, FOR THE RESTORATION AND MAINTENANCE OF THE HYDRAULIC RAM, RAM HOUSE, FOUNTAIN, AND PUMPS, DEDICATED BY WILLETT TO JOHN RUSKIN

- **Inventory number:** 2003C03440
- **General note:** Mr [Henry Willett](#)
Vol 7, pg 100
- **Subjects:** Mr [Henry Willett](#) has donated land to the Ashmolean Natural History Society of Oxfordshire in memory of John Ruskin, "The Ruskin Plot"
- **Language:** English
- **Is part of:** (UkLaUL)000013879RUS01-Aleph Collection of newspaper cuttings dated 1902 - 1904
- **Snippet:** Mr [Henry Willett](#) has donated land to the Ashmolean Natural History Society of Oxfordshire in memory of John Ruskin, "The Ruskin Plot"
- **Link to parent record:** [DN9920016640001221](#)
- **Source record number:** 2162899050001221

--GJMG, Fulking

--Information supplied by [Paul Dawson](#), Esq., Editor, Friends of Brantwood Newsletter
[Paul Dawson](#), *John Ruskin in Sussex: Ruskin, Fulking and the Water Supply*, 1995, Friends of Brantwood Newsletter

--[Joyce Donoghue](#), *Looking into Ruskin's Sussex Connection* Friends of Brantwood Newsletter
?1995/6

--William Whitaker, FRS & Clement Reid: *The Water Supply of Sussex from Underground Sources* (ref. GJMG), Geological Survey Office, Jermyn Street, 1910 (held by University of California).

--1910 Geological Survey Office's Supplement to the above (also held by the University of California).

--*Ruskin's Spring: from Springs, Spouts, Fountains and Holy Wells of the Malvern Hills* © 2013 SPAS Research Fellowship (see terms and conditions)

--Edmunds F. H. 1928. *Wells and Springs of Sussex*, Geological Survey Memoirs, HMSO, see IV/3

--Robinson et al, 1964. *Records of Wells in the Area of the New Series One-Inch* (Geological) Brighton 318 Sheet. Geological Survey, Dept. of Scientific and Industrial Research.

--American essayist Oliver Wendell Holmes, H. Willett acquaintance, "Our Hundred Days in Europe" pp. 196-199, who stayed in Brighton the last week of July 1886?with his daughter as Willett's guest. O.W.H. and his daughter toured the district, weather terrible, observations derogatory.

Sources referenced in attached articles and compilations, including that of Howard Hull, Esq., Director of the Ruskin Foundation & Brantwood Trust, and © author of essay referenced below, permission not yet applied for, nor from *Of Truth of Water*, edited by John Woodman, 2010 Unipress, Cumbria, which contains Mr Hull's essay.

Items held at Records Office of West Sussex County Hall—this and other records copied Courtesy of Archive Repository of West Sussex County Council, Chichester—of the Indenture between the Crown Commissioners and the Rev. Frances Gell, Rector of the Parish of Edburton, on 28th April 1886 (Fulking Parish Council subsequently took over the licence), was signed in the presence of Henry Willett, Arnold House, Brighton, also by Gell, and Robert Nigel Fitzhardinge Kingscote C.B. the Commissioner of Her Majesty's Woods Forests and Land Revenues in charge of the Lands and Premises...acting under the powers of the Acts tenth George Fourth Chapter 50....