

FIGURE 3 (Backcover) The proved connections to Saint Andrew's Well. Swallet holes in blue and the connections as black lines.

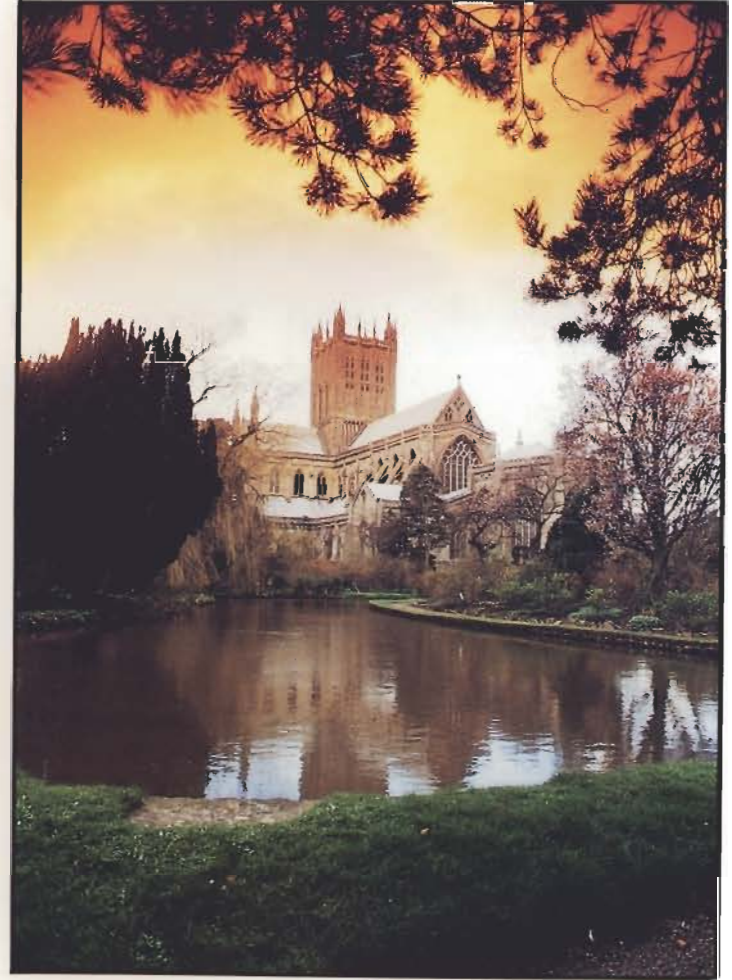
Reproduced from Ordnance Survey, 1982, 1:50000 map, with permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright.

Printed at St Andrew's Press of Wells, Somerset. Cover Picture Roger Perry

WELLS NATURAL HISTORY and ARCHAEOLOGICAL SOCIETY

(Affiliated to the Somerset Archaeological & Natural History Society)

1987 and 1988 Reports



Centenary Issue

WELLS NATURAL HISTORY
AND
Archæological Society.

PRESIDENT: The LORD BISHOP of BATH & WELLS.

VICE-PRESIDENT: DR. LIVETT.

HON. SECRETARY: MR. W. J. HIPPISELY.

HONORARY MEMBERS:

RT. REV. BISHOP HOBHOUSE,

VERY REV. THE DEAN OF WELLS.

COMMITTEE:

MR. ABRAM

REV. CANON CHURCH

DR. FAIRBANKS

MISS LIVETT

MISS MOLYNEUX

HON. FRANCES SUGDEN.

The

FIRST EVENING MEETING

Of the above Society will be held at the

CATHEDRAL GRAMMAR SCHOOL-ROOM,

ON

THURSDAY, DEC. 13TH,

At EIGHT o'clock, when an

INAUGURAL ADDRESS

will be delivered by

THE PRESIDENT,

and a Popular

Lecture on Entomology.

Will be given by

DR. LIVETT,

Fellow of the Entomological Society of London.

Only Members admitted; but any Member may bring
a Non-resident Friend.

Persons wishing to join this Society may send their names to the
Hon. Sec., or to either of the Committee, on or before the 13th
instant. The Annual Subscription is 5s.; or for any other member
of the same family, 2s. 6d.; Junior Members (under 18 years), 1s.

**THE ANCIENT SPRINGS, STREAMS
AND UNDERGROUND WATERCOURSES OF THE
CITY OF WELLS**

W. I. Stanton

The city of Wells, in Somerset, was founded beside a group of 'flowing wells', or springs. Five large springs and many smaller ones burst forth in the gardens between the Bishop's Palace and the Cathedral Church of Saint Andrew – Wells Cathedral. The springs have from ancient times borne the collective name of Saint Andrew's Well, and part of the adjacent grounds is named after the country of which Saint Andrew is patron, Scotland.

It is said that King Ina of Wessex founded a Saxon religious college beside Saint Andrew's Well in 705 A.D. There are larger springs not far away at Cheddar and Wookey Hole, but in King Ina's day they abutted onto great undrained marshes: the Somerset Levels. Saint Andrew's Well had plenty of good farmland all around, and the communication routes to Glastonbury, a religious centre already several centuries old, were unhampered by surrounding swamps.

A charter of 766 A.D. refers to 'the minster near the Great Spring at Wells'.

Today the springs rise through the bed of an artificial pond. The situation was different in King Ina's time. One of the King's hunters, wading up the Saint Andrew's Stream from the marshes, through mixed woodland and cultivated ground, pausing at intervals to examine his wickerwork fish traps, would have had to stop where the stony river course widened suddenly into a clear pool. The pool was deep; only a swimmer could cross it.

On the hunter's left as he stood facing the pool, the river bank receded in a bay or cove. In its marshy floor, several overflowing pools at progressively higher levels gave birth to lesser streams running down to the river. Beyond them, some 150 paces from the big pool, were the low buildings of the new college. The hunter could hardly have imagined the immense Cathedral that would stand, 500 years later, in their place (Plate 1).

A mere trickle of water entered the pool from the valley on its upstream side. In dry summers the trickle dried up, but the pool still sent forth a copious clear stream. The hunter, as he faced the pool, would have realised that the true source of the river lay in its invisible depths.

The Somerset historian John Collinson, writing in 1791, referred to 'Saint Andrew's Well, vulgarly *Bottomless Well*, a remarkable spring rising near the Episcopal Palace'. After more than 1000 years of man-made modifications the big

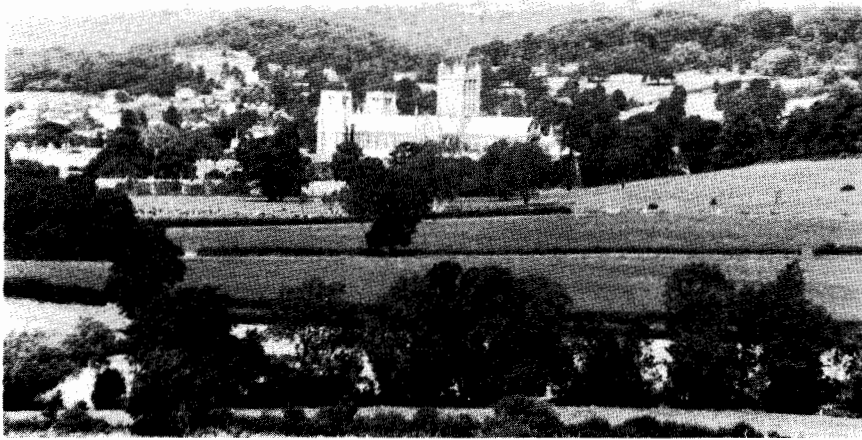


Plate 1. Wells Cathedral and the Mendips, from Dulcote Hill.

pool was still so deep that it seemed bottomless. But only 33 years later the modern pond was constructed and great changes took place. When Wells' most celebrated antiquarian described the springs in 1925 he called the main source 'the great and falsely reputed bottomless well'. Herbert Balch continued: 'Bishop Kennion told me that he had dived into this spring and touched bottom with his head'. Nowadays, in dry weather, little if any water flows from the Bottomless Well.

THE SPRINGS TODAY

Visitors to the beautiful grounds of the Bishop's Palace are drawn by the sound of rushing water behind the Palace to a wooden footbridge across the Moat. Here a stream enters the Moat in a waterfall the height of a man, and another stream, much bigger but totally concealed, runs into the Moat through a tunnel built under the bed of the visible stream.

Both streams take their water from a large pond or small lake, shaped like an L, which with its fringing trees and shrubs provides the visitor with incomparable reflected views of Wells Cathedral (Front cover). The pond was made in 1824 or thereabouts to enclose Bottomless Well and some of the springs of the ancient cove. Its neat stone walls are based in puddle clay that prevents leakage. Because water level in the pond is now higher than ground level on its east side, pipes have been laid underground by some benefactor that supply troughs in the nearby allotments, so that gardeners can fill their watering cans from an unfailing supply.

Four of the five large springs rise through gravel and sand in the bed of the L-shaped pond (Fig. 1). Their positions are marked by conical depressions in the gravel, locally known as 'pots'. The northern pot is smallest, about a metre deep; the central pot at the bend of the L is 2 metres deep and the eastern pot, occupying the full width of the pond, is 3 metres deep.

The eastern pot is the old Bottomless Well. Its steep sides are composed of coarse gravel, dug from a pit in the Palace grounds, that has been tipped into it to prevent the spring action undercutting the stone walls of the pond. Thus the Bottomless Well is less deep than it was and the upwelling water, finding its exit impeded, has sought other outlets. Next to the Bottomless Well is a wide shallow pot which, according to Balch, was in an early stage of development in 1925; possibly the restriction on flow from the Bottomless Well was responsible.

In the wide shallow pot the sandy bed of the pond can often be seen 'boiling' in constant motion as the water rises through it.

In dry weather when spring output is reduced, not much water boils up through the sand in the pots. However, a strong flow enters the pond in all weathers from beneath the bank at its north end. This flow comes from high-level springs that rise beneath the lawns east of the Cathedral and are piped to the pond. If the sluices are

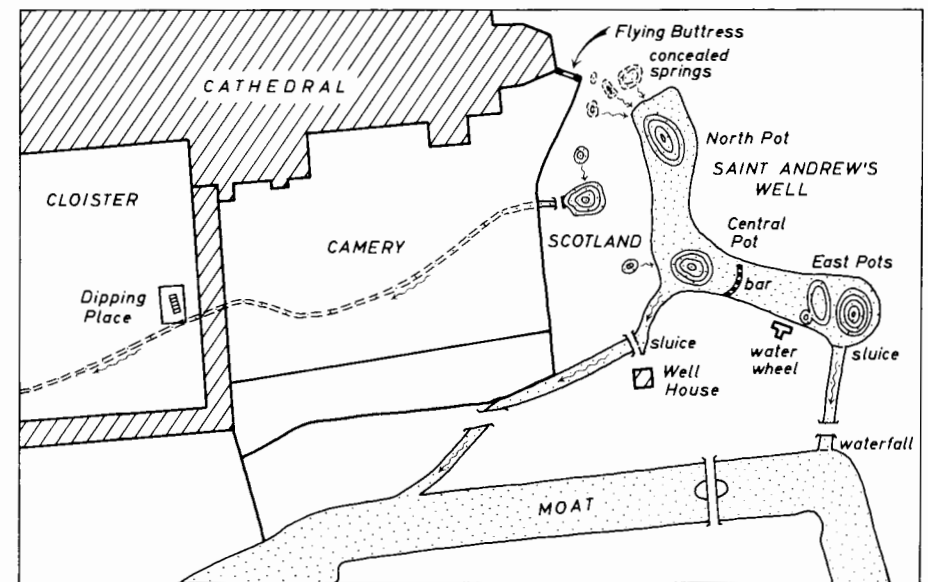


Figure 1. Saint Andrew's Well in 1989.

opened and the pond is drained the northern springs still flow, albeit with reduced output, at a level half a metre higher than the water surface in the Bottomless Well.

The narrow strip of ground known as Scotland contains several pools isolated from the main pond. In the smaller ones the standing water level is slightly higher than that of the pond. Flood water overflows from them into the pond. The one large spring in Scotland wells up from a deep sandy funnel like a pot on dry land. Unlike all the other springs, which feed the pond and then the Moat, the Scotland spring gives rise to a stream that flows in the opposite direction, taking an underground course beneath the Graveyard and Cloisters.

The Scotland spring has been incorrectly referred to as Saint Andrew's Well. It ceases to flow if the pond is drained after a long spell of dry weather.

Water tracing studies, described later, have shown that the springs all have the same chemical composition, thus they must all come from the same body of underground water. How is it, then, that they can break out at different levels? The answer is simple. Beneath Saint Andrew's Well there is an underground river, like the River Axe at Wookey Hole Cave, that finds its way to daylight through many clefts in the solid rock (Fig. 2). The lower clefts are packed with gravel and sand that has slipped down into them from alluvial deposits in the valley floor above, and the upwelling water, thus partly impeded, overflows at higher levels through other clefts that are also partly choked.

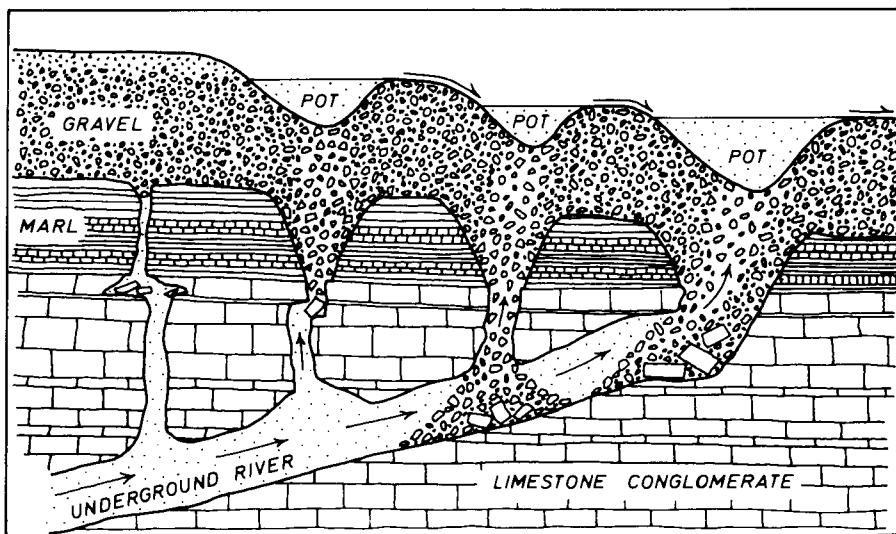


Figure 2. Geological section (diagrammatic) through the springs.

The volume of water flowing from the springs has been gauged by more or less sophisticated means. One of the latter involved partly emptying the Moat by opening the sluices and then measuring the time taken for it to refill. We now know that the average daily output is about 4 million gallons (18000 cubic metres). At high flood the daily output is about 40 million gallons, and in extreme drought it is only about 1 million gallons.

THE WATER GATHERING GROUNDS

Long ago the farmers of Thrupe, a little hamlet on the top of Mendip east of Wells, knew that when they threw waste chaff from their corn threshing floors into a swallet hole (where the local stream sinks into a deep limestone cave) it would wash for 3 miles underground to reappear at Saint Andrew's Well. Another connection was proved about 1934 by Herbert Balch, who poured a powerful green dye, fluorescein, into a swallet hole on the Wells Golf Course. Two days later it reappeared at the Well in such strength that the whole moat turned green, and ducks and swans left the water in protest.

In the 1970's eight more underground streams feeding Saint Andrew's Well were traced by researchers using fluorescent dyes. The tracings proved what Balch and others had suspected: the Saint Andrew's Stream drains all the south side of the Mendip Hills from Pen Hill above Wells to Beacon Hill above Shepton Mallet (Fig. 3, backcover). In very wet weather, water from the most remote swallet, at Windsor Hill, reaches the Well in 24 hours. In drought the travel time is a week or more.

The dyed water emerged from all the springs, including the Scotland spring, at the same concentration. This fact proves that they are all fed by a single underground river, the water in which, though derived from many sources, is thoroughly mixed.

THE FIRST 1000 YEARS OF WATER USE

The Scotland spring, which in King Ina's day was the highest spring and closest to the religious buildings, was at a very early date diverted to flow beside the latter. An archaeological excavation in the Camery (the graveyard east of the Cloisters) directed by Dean Buckle in 1894 uncovered a watercourse that carried the Scotland spring water alongside the Saxon 'Lady Chapel by the Cloister' and then on, presumably, to the Market Place and High Street. It was enclosed within a stone-built culvert in the 13th century, probably after centuries of existence as an open channel. Ever since the very earliest days, it seems, the Scotland spring water has been separate from the main Saint Andrew's Well.

On the east side of the Market Place, close to the present site of the Post Office, the Bishop's Mill was established at an early, perhaps even Saxon, date. There, according to Balch, 'the Bishop's tenants and probably many other citizens came to have their corn ground'. A weir was built across the Saint Andrew's Stream where

it left the Bottomless Well and a leat or millstream constructed along the north bank to carry as much water as the miller required. The weir need not have been so high (half a metre would have been enough) that the higher springs were submerged. At the Bishop's Mill the water turned a wheel, then returned to the natural stream course.

In the 13th century, while the modern Cathedral was under construction on the north side of the Saint Andrew's Stream, Bishop Jocelin built himself a Palace on the south side where there was ample open space. It was finished in 1242. The Great Hall and Chapel were added later in the same century and Bishop Ralph, between 1329 and 1363, fortified the whole complex with walls, moat, drawbridge and gatehouse. (Herbert Balch records 'that the citizens of Wells had previously sought and obtained powers to put a wall and moat round the town, but at the instance of the Bishop the charter to enable them to do so was revoked two years later'. The Bishop's moat was a practical proposition, whereas it is hard to see how the citizens' proposal could have been achieved unless it excluded many of the ecclesiastical buildings, which might not have pleased the Bishop.)

Before the moat was built the Saint Andrew's Stream flowed across what is now the inner lawn of the Palace. The Palace itself, the Chapel and the Great Hall looked down on the city across the river and would have been reached by crossing a bridge. Bishop Ralph spanned the old river course with his moat, taking the latter almost to the Bishop's Millstream on the north bank but enclosing much more open ground on the south bank. He filled in and levelled the old river bed within the Palace walls, so that in the following century Bishop Beckington was able to raise the North Block of the Palace where the Saint Andrew's Stream once ran.

Bishop Beckington was perhaps the most imaginative exploiter of the waters of Saint Andrew's Well. In 1451 he erected his Well House beside the springs and laid lead pipes from it to the Market Place and the Palace. He granted to the master and burgesses of the city and their successors for ever '*a water conduit with reservoirs, vents and other engines above and below ground, for taking and leading a portion of the Bishop's water springing within the precincts of his Palace of Wells from a spring called Saint Andrew Welle, upon a spot appointed by the said Bishop, whereon he has built such head at his own cost, sufficient for lead pipes 12 inches in circumference . . . so that the water may flow as far as the high cross in the city market and other places . . . provided that the first head and reservoir be round, of 10 feet diameter within the walls, built of stone, lime, or other material at his cost, with one round cistern of lead 5 feet in depth and 4 feet in diameter, and pipes attached . . . half the water to be led towards the city, half to flow to the Palace*'.

Having thus arranged his own water supply at the Palace, the Bishop decreed in the same grant that the headworks should be cleansed twice a year, that the water should be diverted to help refill the moat when the latter was emptied for scouring, and that the master and burgesses should visit the Bishop's tomb in the Cathedral

once every year to pray for his soul. Herbert Balch commented in 1925 that the citizens of Wells were not keeping their side of the agreement, but since 1983 prayers of thanksgiving have been offered at the Chantry Chapel of Bishop Beckington on January 15 each year. The little square Well House still stands, partly buried by later earthworks, on the south bank of the L-shaped pond, with water entering through a little hatch on its way to the Market Place (Plate 2). The lead pipe, 255 metres long, fed the original Conduit which was rectangular, with a tap on each side delivering water into a stone trough. It appears on an old print of the Market Square. By 1835 a new edifice stood in its place and was illustrated by Phelps in his 'History of Somerset'. The present structure dates from the late 19th century.



Plate 2. The Well House, built in 1451.

Another great project of Bishop Beckington was the construction of his so-called 'New Works', the row of elegant houses forming the north side of the Market Place, which took place about 1460. Until then the stream from the Scotland spring had, after serving ecclesiastical needs, arrived at the Market Place where it was no doubt used for washing down when required. Eventually it would have drained to the Millstream. The Bishop diverted it at Penniless Porch to run beneath the cellars from end to end of the New Works. Herbert Balch believed, when he described this arrangement in 1925, that it allowed each householder to dip water for domestic use without going outdoors, but the 1978-79 excavations in the Camery by Warwick Rodwell discovered that the Bishop laid another of his lead pipes to supply the New Works with water from the Scotland spring. Thus it seems that the stream flowing beneath each cellar may have served as a very early water closet, as well as washing away household rubbish.

It was at about the time of the Bishop's gift of the Conduit to the citizens that the number of stylised wells shown on the Coat of Arms of Wells was increased from 2 (perhaps representing the Scotland and Saint Andrew's streams) to 3.

Bishop Beckington also decreed, in his grant of the Conduit, that *'the waste water shall flow into the bishop's great mill stream'*. The Bishop's Mill, already mentioned, was one of several early mills powered by the St. Andrew's Stream. Next downstream was the Town Mill in Slaughter House Lane (now Mill Street) where the water dropped 4 metres. It was driven by water from two sources, the Millstream itself, including the water from Scotland, and the discharge from the Bishop's Mill. If the Millstream existed before the Moat was constructed it might have been no more than that discharge, or it could have been augmented via a lead from a short way downstream of Bottomless Well. The Town Mill was grinding corn well into the present century, but it is now closed and converted to a private residence.

At Saint John's Bridge the brethren of Saint John's Priory had a mill, according to Balch. The Millstream (called Saint Andrew's Stream on modern maps) continued to Sheldon's Mill on West Street where, ground level having fallen 2 metres, it turned a breastshot wheel of which the remains can be seen in the entrance to Sheldon Jones' offices. It passed through yet another mill at Keward before joining the south branch of Saint Andrew's Stream which, consisting only of water that was not required elsewhere, had an irregular and unreliable flow and drove no important mills.

THE PALACE MOAT

Bishop Ralph's 14th century moat surrounds the Palace and a large part of the grounds. Its surface area is 2 acres and, before silting brought it to its present shallow condition, it was 2 to 3 metres deep and held some 4 million gallons of water. Now the volume is only a quarter of that amount and the depth seldom exceeds half a

metre. All the silt has come from Saint Andrew's Well, but only during floods, for at other times the spring water is perfectly clear. Balch recorded that 8000 loads of sediment were dredged from the Moat in 1933, but now the authorities seem to have abandoned the expensive struggle.

The fortified wall on the inner edge of the Moat has, opposite the Moat Walk, a series of what appear to be walled-up stone arches at water level. They do not mark old watercourses or springs, as has been suggested, but are the arched foundations, appropriate to soft ground, of the great wall.

For centuries the Moat served as a reservoir or millpond to the mills in the city. Balch recorded that late in the 19th century there was a large hatch at the northwest corner of the Moat that fed the Millstream by an oblique channel until, about 1900, it was moved to make the present outlet some 30 metres further south. In latter years while the mills were working the millers claimed the right to open and close the Millstream hatch, so that in dry weather the Palace had little control over water level in the Moat.

The Moat had, of course, another outlet to cope with excess water not required for milling. This, the so-called flood hatch, was situated half way along the Moat Walk and gave birth to the south branch of Saint Andrew's Stream which in the 19th century flowed along the north side of the Recreation Ground. Early in the present century this hatch was moved to its present position at the southwest corner of the Moat and an overspill or 'letterbox' weir added. The overflow entered the ancient channel of the Chilcote stream (which had never been allowed into the Moat, probably because it was liable to pollution from the East Wells and Tor Street areas) and went away past Islington. Herbert Balch considered that this diversion of the flood hatch from where the Moat was deepest to where, he said, it was shallowest halted the natural scouring process and accentuated the silting problem.

Although many religious houses had their own fishponds (for example the Abbot's Fish House at Meare served Glastonbury Abbey) there seems to be no record of the Moat being reserved for this purpose. For at least a century swans have lived on the Moat. One pair after another have been taught, originally by the daughter of Bishop Hervey (1863-1894) to pull with their beaks a cord on the Gatehouse that rang a bell, after which they might be fed. Children were brought from far away to 'see the swans ring the bell'. Now in 1989 the lawns at the northwest corner of the Moat are worn bare by the press of people feeding the ducks which inhabit the Moat in large numbers. Some are introduced rare species. Dense populations of water birds tend to foul the water on which they live, and the Moat is no longer characterised by clear water with green water plants, sticklebacks and minnows.

The Moat is a 5-sided figure with 4 bold angles and one gentle one on the north side where it comes closest to the Cathedral precincts. Looking at the plan view it seems possible that Bishop Ralph originally intended having a 4-sided moat with a

corner close to the Bishop' Eye gatehouse, but subsequently chose the more open approach afforded by the outer green which was also crossed, in those days, by the 'bishop's great mill stream'.

THE UNDERGROUND STREAM FROM SCOTLAND

The Scotland spring is a round pool of which the sandy floor is in a state of constant turmoil as the water boils up through it. In wet weather water also enters the pool from the north through a tiny culvert. The only exit from the pool is a stone-lined stream channel leading west among ferns and mosses to the wall of the Camery. In ancient times the pool extended as far as this wall, where it funnelled in to a sluice gate that pre-dates the wall, which is built over it. Warwick Rodwell's excavations in 1979 showed that this wall was constructed in the early 13th century.

The next 8 metres of the watercourse, now buried beneath the Camery Lawns with only one access manhole, was open to the sky until quite recently. There is a second sluice gate with grooves for boards cut into blocks of Douling Stone, 3 metres downstream of the Camery wall, and a third similarly formed 6 metres downstream again. They can only be examined by entering, through the manhole, the stone-built rectangular channel roofed over with flat stone slabs and crawling on hands and knees in the stream. At the third sluice the channel suddenly shrinks to become a square masonry culvert less than half a metre high, only passable by lying at full stretch in the water. The channel roof slabs are laid over the grooves of the third sluice and over the roof slabs of the culvert, showing that the channel was covered over last, and in fact it appears, unroofed, on Carter's map of 1794.

The Scotland stream continues on its way beneath the Camery, encased in stone, at first following the 'old' (Anglo-Saxon) building alignment and then looping to the south to avoid Stillington's Chapel. Bishop Stillington's diversion of the older watercourse round his chapel, built about 1488 on the 'new' (Cathedral) alignment, only to be pulled down in 1553, was clearly exposed in Rodwell's excavation of 1979. The diverted culvert rejoins the Saxon one 2 metres before reaching the East Cloister.

The stream is next seen in the so-called 'Dipping Place' in the Palm Churchyard (Plate 3), where a flight of deeply worn steps on the 'old' alignment descends 3 metres into a stone-built chamber with the stream emerging from a low pointed arch on one side, crossing the floor and vanishing into a similar arch on the other (Plate 4). On both sides of the Dipping Place the culvert is barrel vaulted, a neater form of construction than the slab-roofed channel.

At the south end of the West Cloister the Scotland water can be seen at the bottom of a deep drain hole. It then departs from the 'old' alignment by turning west and passing under an old garden to Penniless Porch. Somewhere beneath the garden, Balch records, a shaft now filled up gave access to the stream. Its function was unknown; Balch opted for a dipping well whereas Jim Hanwell, who wriggled along



Plate 3. The so-called Dipping Well in the Palm Churchyard.



Plate 4. The stream from Scotland inside the Dipping Well.

the culvert with other cave explorers in the 1970's, argues from the presence of extensive rubbish deposits that it was, at some period, a latrine and waste disposal point.

From Penniless Porch, as has been mentioned, the stream was diverted from its original course by Bishop Beckington to run beneath his New Works and wash away the residents' refuse. Just before reaching Sadler Street the watercourse turns sharp left and passes under the Market Place close to the Conduit, from where it runs beneath the Red Lion yard. Here at 2 places the flow of water in its narrow masonry culvert is visible through drains that let surface storm water down to join it. At the bottom of the yard it joins the much greater flow in the covered Millstream.

THE HIGH STREET GUTTERS

Wells is almost unique in having streams of clear water permanently flowing down the gutters on both sides of the High Street. They began when Bishop Beckington granted his free supply to the city in 1451. Then, the powerful overflow from the Conduit in the Market Place must have been welcome, for while other towns had to send water carts to occasionally flush the streets of rubbish, Wells enjoyed a constant copious flow. In earlier years, of course, the Scotland stream may have run down the High Street before the Bishop led it beneath his New Works, but records are lacking.

The Conduit overflow is smaller now than it was. Balch, in 1925, lamented that *'Of late years the overflow has been much restricted through its water being used in the lower parts of the city . . . I do consider that the flow to the Conduit should not have been interfered with until after its escape at that point; it could as well have been taken afterwards as before . . . and I think even now it should be restored. To see the rush of water as it flowed over the conduit fall was always a great joy to visitors, typifying, as it did, the name of Wells'*.

Balch was referring to a pipe that taps into Beckington's lead pipe just before it reaches the Conduit. He well understood human reactions to the sight of falling water: a trickle is hardly worth noticing, but a rush of water demands attention. The modern 'wishing well' on the Conduit in no way restores the dignity of the structure.

The Conduit overflow is piped to the north side only of the High Street. It runs down the gutter into Saint Cuthbert's Street. At the far end of the latter it dives underground to join the drain from Chamberlain Street (the old Ludbourne) which reappears in Priory Gardens and enters the Millstream.

The gutter on the south side of the High Street is fed by a pipe from the Moat, passing beneath the Market Place where once it supplied two dipping wells. The pipe was installed in 1803 by subscription of the citizens. Once in the gutter it flows down into Broad Street, swings into Saint John's Street and falls into the Millstream through a grating in Saint John's Bridge.

The older sections of both gutters are made of tooled slabs of Blue Lias limestone. Long years of corrosion by the flowing water have etched a channel into the stone marked by a notch at the water's edge. Unfortunately, within the last two decades the increasing weight of traffic in the High Street has so damaged the stone gutters that many slabs have been replaced by shaped massive concrete blocks – more utilitarian but less evocative of the passage of Time.

THE MILLSTREAM (SAINT ANDREW'S STREAM NORTH)

This ancient watercourse runs through the city from the Moat to Keward where it rejoins its sister southern branch of the Saint Andrew's Stream. In its heyday it was the industrial corridor of Wells, driving at least 4 water mills. In this it was surpassed by the River Yeo at Cheddar which in 1575, according to Christopher Saxton's map of Somerset, drove 12 mills within a quarter-mile of its source under Cheddar Cliffs.

When William Simes drew the first map of Wells (Plate 5) in 1735 the Millstream was open to the sky throughout its course. It left the Moat through a hatch and met the discharge from the Bishop's Mill to form an ill-defined pool in what was then open space between the Moat and the street that is now Townhall Buildings. The Millstream branched off the northern part of this pool and ran, becoming increasingly embanked and raised, past the back gardens of houses in the High Street. Several lanes and footbridges including the 'Back way to the Red Lyon' and the 'Back way to ye Christopher (now the north half of South Street) and ye Bell' crossed it before it reached Slaughter House Lane and the Town Mill.

When the Town Mill was not working some or all of the Millstream water spilled away down a steep little channel alongside Slaughter House Lane to the junction with South Street, which then bore the curious name 'No Where'. Here the water spread out into Law Pool, with a ford and footbridge for pedestrians, before joining the south branch of the Saint Andrew's Stream in its old course across the Sports Ground (then Bell Close field).

From Saint John's Bridge and the Priory water mill the Millstream flowed on through open fields and orchards to Sheldon's mill and then the mill at Keward.

Now, 250 years later, much is changed. The Millstream still leaves the Moat, but it is covered over to near Mill Street. Cave explorers have entered it there and crawled on hands and knees along the stream bed of fine sand, against the powerful current, beneath first a flat roof of reinforced concrete, then a masonry arch. Pipes of diverse sizes cross the way and must be climbed over or ducked under, among bottles, sticks, tins and other flotsam. Halfway to the Moat the stream from Scotland comes in on the left from a much smaller tunnel, and water also enters from a variety of minor culverts and pipes, too small for human access. During rain, street runoff pours down through gratings in the gutters overhead. About 50 metres short of the Moat the original tunnel has been walled off and a smaller tunnel rises more steeply to the Moat sluice, where it is sometimes possible to peer out over the water and see

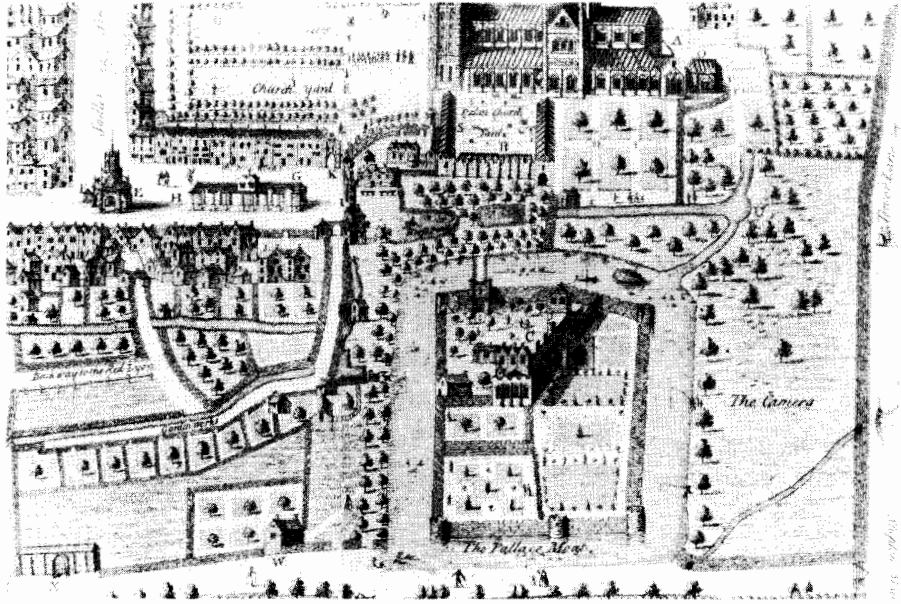


Plate 5. Part of Simes' map of Wells, 1735.

the big copper beech tree in the Palace garden. Eels, ducks, ducklings and duck eggs have been found by cave explorers in this covered section of the Millstream.

From the Old Mill House in Mill Street the waterway is covered again for half the distance to Saint John's Bridge. Standing on the Bridge beside the Rose and Crown one can espy through a clay drainpipe set in the wall a seemingly forgotten stretch of Millstream, rippling over stones, still uncovered but isolated by high masonry walls from litter and the outside world. Then from the Ancient Priory of Saint John the water runs concealed beneath Priory Road, the Regal Cinema and the Old Bus Station. It emerges from 3 large concrete pipes to flow among untidy business yards to the hatches above the old Sheldon's Mill, that closed down about 1970 to become Sheldon Jones' animal feed works. This section of waterway is elevated and the Christmas 1985 floodwaters spilled over the banks when the hatch screens were blocked by floating rubbish.

At Sheldon Jones' the Millstream divides. The main flow goes straight ahead to appear for a brief spectacular moment inside the office doorway, where the deep circular grooves carved into the wall by the breastshot wheel are still preserved (Plate 6), and then runs under West Street and along an undistinguished channel to

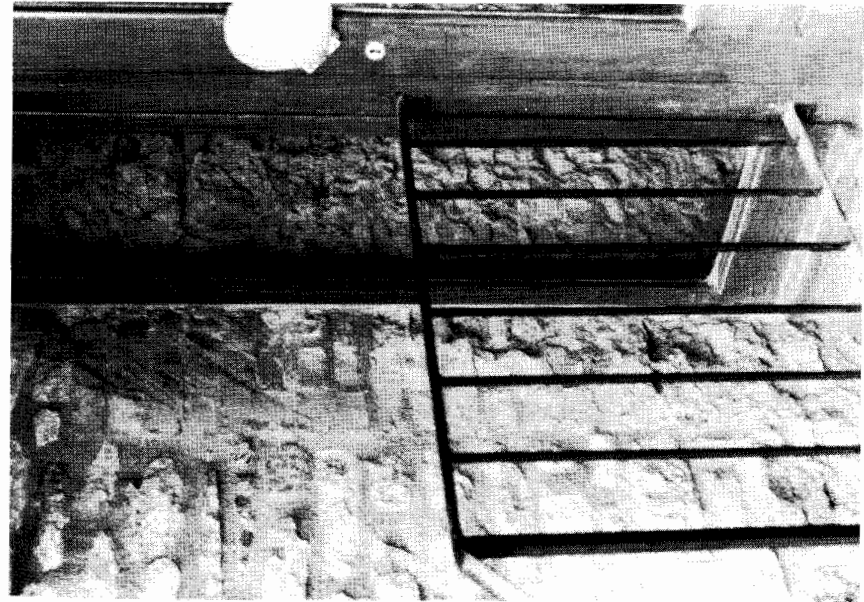


Plate 6. The waterwheel grooves at Sheldon Jones'.

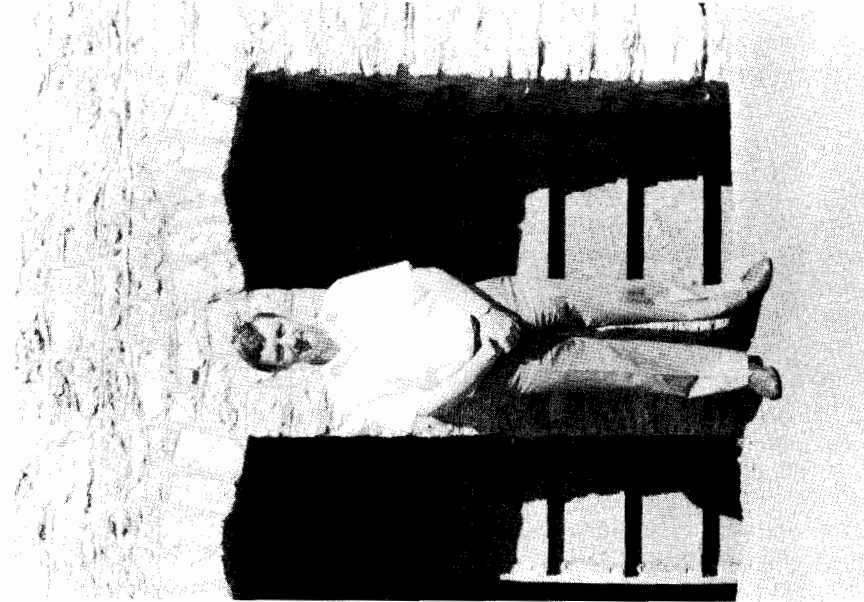


Plate 7. The waterwheel at Keward Mill.

beyond the old railway line. Here it is joined by the diverted flow which is entirely concealed beneath Sheldon Jones' premises except on the east side of West Street, where the powerful current occupies a position more appropriate to a formal flower bed.

The remade Millstream, now dignified on Ordnance Survey maps by the name 'St. Andrew's Stream', flows sedately on past the Priory Gardens estate where the Ludbourne tributary from Chamberlain and Saint Cuthbert Streets comes in on the right. Thereafter it is bounded by neat lawns on the north side behind the houses on Keward Avenue, and by hedges and trees on the south side adjoining the Infants School and the Mendip Foods store. This stretch of Millstream gradually climbs up the northwest bank of the natural valley, so that the Millstream bridge on Jocelyn Drive is at a level more than 2 metres higher than the bridge over the sister stream in the natural channel 150 metres further south.

Keward Mill ceased working about 1970, but the hatch, spillway and mill intake are preserved. The steel breastshot wheel 5 metres in diameter can still be seen, with some of the mill machinery, through arches in the wall (Plate 7). Beyond, by the grounds of Keward House, the Millstream rejoins the southern branch of Saint Andrew's Stream and the combined waters flow south to merge with the rivers Sheppey and Brue, finally entering the Bristol Channel at Highbridge, 30 kilometres from Wells.

THE UNUSED STREAM (SAINT ANDREW'S STREAM SOUTH)

Where a millstream leaves its parent river at a weir or dam the unwanted water continues down the old channel. While the industrial flow is controlled and varies within defined limits, the natural channel carries torrents in flood times and mere trickles or no water at all in droughts. The south branch of Saint Andrew's Stream follows the natural channel fairly closely. Being unreliable as a source of power it was not used by industry, but the millers were probably required to leave a small flow in it at all times, for amenity, public health and farming purposes.

Herbert Balch in 1925 argued that the ancient Saint Andrew's Stream, before it was harnessed by Man, flowed from the Bottomless Well across the present site of the Palace lawns to the Recreation Ground, then down South Street and Southover to Gate Lane and Keward. Certainly the lie of the land is such as to require flow in this general direction. All the lower part of the city, from Tor Street to Keward and Tucker Street to Park Wood, stands on ground that is essentially flat but slopes very gently to the southwest. On geological maps this area is shown as an 'alluvial cone' formed of gravel, sand and stones washed down in great floods from the Chilcote, Horrington and Walcombe valleys. Teeth and bones of Mammoth and Woolly Rhinoceros, indicative of a sub-arctic climate, have been dug from the gravel beneath Wells, showing that some of the gravel-depositing floods were caused by sudden melting of the Mendip snow cap in the Ice Age, 20,000 years and more ago.

Under such conditions the Saint Andrew's Stream could have had no fixed channel. It would have meandered over the surface of the alluvial cone, changing its course with every flood. William Simes' map shows the course of the unused stream, no doubt already modified by the citizens, in 1735. It left the same ill-defined pool beside the Moat as the Millstream, but at its south end, and flowed alongside a track known as Garden Works with allotments and orchards on either hand, where today is the north boundary of the Recreation Ground. Then, passing between an orchard on the north and Bell Close field on the south (now merged to form the Sports Ground) it arrived at Law Pool and the ford at No Where. Having received any unwanted water from the Town Mill it turned sharp left and followed the west hedge of Bell Close to Silver Street (part of which was then called Behind Walls) which it crossed at a gated ford with footbridge. Here it joined the little Chilcote stream which had been kept out of the Moat, as previously described. The combined waters ran along the south sides of Silver Street and Southover, turned south towards Gate Lane, and left Simes' map.

When the Recreation Ground was established the unused stream was at first allowed to continue in its channel along the north side (Plate 8). However, Balch records that 'its flood caused difficulties for little children, and the loss of footballs, etc.', so that about 1900 the hatch was moved to its present position at the south corner of the Moat, the Recreation Ground was rendered dry and the Sports Ground created. The Silver Street ford was filled up a little later on the occasion, Balch remarks, 'of a great show that was held in the Bishop's Park'.

Today the Saint Andrew's Stream south branch runs beside Silver Street and behind the houses in Southover as a rather overgrown untidy watercourse that almost gives the impression of being unwanted, of being more trouble than benefit to its neighbours. Certainly this is true at times when its many bridges and arches off



Plate 8. Path along the north side of the Recreation Ground (1989), once the course of the unused stream.

Southover cannot cope with the flood and the water rushes out over the roads and into ground floors and cellars to the Glastonbury road and beyond.

When, however, the stream has passed beneath the old railway line, few restraints on its passage remain. The channel is open though still untidy, a town watercourse, beside Gate Lane. The first stretch of real river, meandering among fields, begins at the high arched bridge under Gate Lane, but all too soon it enters a double culvert emplaced in 1986 beneath the Unigate factory extension. From the main Glastonbury Road bridge it passes among the houses of old Keward and through the Mendip Foods grounds to Keward and the confluence with the Millstream.

HIGH WATER LEVELS AT THE SPRINGS

Around the Mendip Hills there is no spring of any size that has not been dammed back to raise a head of water, usually to improve the efficiency of one or more water wheels. Water power was, of course, the main source of energy in Britain before the steam engine was invented.

Saint Andrew's Well was no exception to the rule. In mediaeval times water for the Bishop's Mill was obtained from the natural high-level springs, but other mills in the town (and probably the Bishop's Mill in dry weather) would have been fed by a precursor of the Millstream beginning at a weir or dam just downstream of the Bottomless Well before the Moat was dug.

We know what the water levels were in 1451 when Bishop Beckington built his Well House near the head of the 'bishop's great mill stream'. In the L-shaped pond, concealed beneath silt and waterweed more than half a metre below the water surface (but high and dry when the sluices are opened) is a weir built of shaped blocks of Douling Stone. Flat-topped and gently curved, its ends set in puddled clay, it is an obvious adjunct to the Well House for which it would have maintained a constant head of water from the upper springs. Unwanted water flowed over this weir (Beckington's Bar) and rushed down a stony channel to the Bottomless Well which was about half a metre lower. Logs are still in position pegged down across this channel to prevent erosion. Overflow was intermittent, however, for a tree grew in the channel and its stump is still there.

The top of Beckington's Bar at 45 metres O.D. is about 1.5 metres above the level of Bottomless Well in King Ina's day, as reconstructed from existing stream gradients. In 1451, therefore, none of the springs had been dammed back by more than one metre.

William Simes' map of 1735 marks Saint Andrew's Well in diagrammatic fashion. There is a round pond with a northern extension and 2 outlets. One falls into the Moat and the other is the Bishop's mill stream which crosses the outer green of the Palace, where there is a large horse pond, to the Bishop's Mill (Plate 9).



Plate 9. The outer green of the Palace (1989), where in 1735 there was a large horse pond.

A map made by John Carter in 1794 shows in detail the complex system of channels that must have existed in Simes' day (Fig. 4). The higher (north and middle) springs are diverted by Beckington's Bar into the Bishop's mill stream, with a distributary entering the Well House and, when surplus water is available, the Moat. In the southeast the great Bottomless Well feeds the Moat, with a side channel that can when required supplement the Bishop's mill stream, passing under an aqueduct beside the Well House. The Scotland spring is, as ever, entirely separate. A network of surface ditches, possibly taking runoff from the Liberties and beyond, can be directed into either level of the springs.

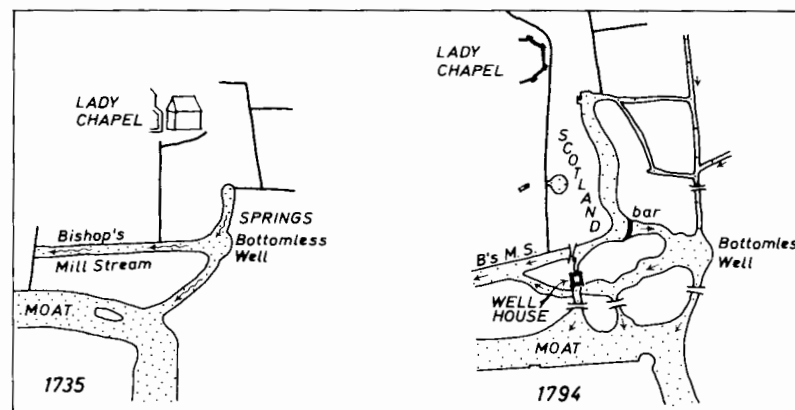


Figure 4. Saint Andrew's Well in the 18th century.

In 1794, then, Saint Andrew's Well was much as Bishop Beckington had left it in 1451. The great change was to come 30 years later.

In 1824, give or take a few years, the present L-shaped pond was created, together with the waterwheel pit on its south side which still contains the rusty remains of a little iron wheel that pumped water to a tank in the roof of the Palace. The pond's unknown designer brilliantly managed to combine usefulness (head of water to drive the little wheel) with ornamental beauty. The Bottomless Well was enclosed within the pond, an action that raised its level by one metre. The higher springs, also within the pond, were raised by about half a metre. The flood level of all the springs was now some 2.5 metres higher than the natural overflow level of Bottomless Well as King Ina knew it.

The forming of the L-shaped pond involved building up the ground between it and the Moat. The Well House had earth banked up against its north wall. However, the mound that now exists on the north side of the pond in the angle of the L, now planted with shrubs and roses, appears to be younger than the pond and may be a heap of silt dredged out of it.

No great modifications have been made to Saint Andrew's Well since 1824, but the raised water levels have caused unexpected problems and even fears for the stability of the Cathedral.

THE 'IMPETUOUS TORRENT' – A THREAT TO THE CATHEDRAL?

The east end of Wells Cathedral is formed by the Lady Chapel, which rises from the same lawns that enclose Saint Andrew's Well on its north and west sides. The Lady Chapel is only 12 metres away from the northwest corner of the L-shaped pond. Normally the pond, lawns and Cathedral present a beautiful and tranquil picture, but after exceptionally heavy rain the scene is different. Then, Balch wrote in 1937, the springs emit '*a torrent bursting up and even heaping sand above its level, making in gardens gaping holes out of which the water gushes, at times leaping into the air, overflowing lawns and, with impetuous torrent, doing its best to sap ancient foundations*'.

Beneath the green lawns are concealed springs, that are led along pipes or culverts to the north end of the L-shaped pond. They flow constantly, even when the pots in the pond are static. In flood time their output exceeds the capacity of their culverts, and the turf of the lawns erupts into great water-filled blisters that swell and burst to leave spreads of sand and gravel on the grass.

So much gravel was washed out from under the lawns between 1895 and 1933 that the L-shaped pond encroached some 9 metres northwards towards the Vicars' Hall. During the same period new blisters and ground subsidences formed within 6 metres of the Lady Chapel wall. Not surprisingly, those responsible for looking after the Cathedral became alarmed. If the encroachment continued, it seemed only a matter of time before springs developed against the Lady Chapel foundations.

A big reclamation exercise to halt the advance of the springs was carried out between 1940 and 1948 by Bert Wheeler, then Clerk of Works at the Cathedral. He tipped porous rubble into the L-shaped pond until it was 6 metres shorter, piped all the known springs to the pond, levelled the whole area and converted it to lawn again. This work inevitably constricted the outlets of the concealed springs, as was proved when a new spring developed in a previously 'dead' area of the pond. It is now the north pot. The way that the pond wall curves around it points to it being an old spring, now rejuvenated, that had been superseded by the springs under the lawns. The lawns still erupt in flood times, but less than before.

The encroachment and the apparent threat to the Cathedral are caused by the various works that have raised the level of Saint Andrew's Well, especially the last one, the forming of the L-shaped pond in 1824. The extra depth of water above the pots creates a back pressure reacting against the pressure of spring water that has to lift several metres of gravel (making it 'boil') to escape. In consequence the underground river has been able to develop new outlets beneath the lawns that are less or not obstructed by gravel, and the pots are only active when water pressure is high during floods.

The neat inversely conical shape of the eastern pot (the Bottomless Well) suggests that a great deal of gravel has been tipped into it since 1824, probably to support the pond walls. If so, the outflow from the greatest individual spring suffered additional restriction. Herbert Balch, in 1925, recalled that springs erupting by the Lady Chapel had been channelled to the pond about 1890. Some curious old records exist that point to major works having been carried out earlier still.

In 1863 William Sanford informed the Somerset Archaeological and Natural History Society that Saint Andrew's Well constantly threw up pebbles of coal and cinder which came underground, it was thought, from old lead mines on the Mendips. Sixty years later Balch was still able to aver that whereas flood waters from the Bottomless Well were always brown, those from the Lady Chapel springs were blackish, throwing up coal, and he thought that they must drain a different part of the Mendips. We now know, thanks to the water tracing studies described earlier, that a single underground river feeds all the springs; thus the coal dust, coal and cinder must be picked up at the Lady Chapel springs themselves. Therefore it is supposed that eruptions began immediately after the pond was built in 1824, and that the ground was backfilled with local domestic waste, mainly coal ash and clinker. By 1940 the supply was used up, for then as now all the springs ran brown in flood.

It is possible that the builders of the Lady Chapel in 1325 feared that they might be approaching too close to Saint Andrew's Well. Bert Wheeler argues that the little flying buttress which appears to prop up the Lady Chapel on the Scotland side was erected to give early warning of subsidence. He found by excavation that its foundations are shallow, it is of relatively fragile construction, and it may well be simply a perfect example of a mediaeval architect's tell-tale (Plate 10).

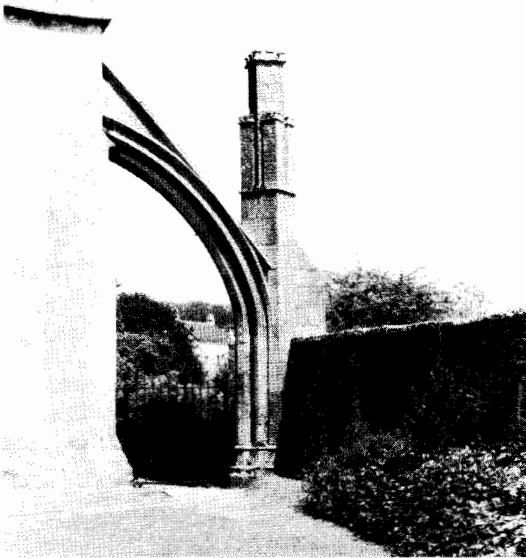


Plate 10. The flying butress.

THE CITY'S DRINKING WATER

The first occupants of King Ina's minster and the associated dwelling houses would have drawn water from Saint Andrew's Well, the Scotland spring, and the issuing streams. In due course as the settlement expanded, the streams, which then even more than now were expected to wash away all kinds of refuse, became seriously polluted. Balch quotes a Cathedral record of 1322 complaining of pollution in the Scotland stream.

Many households in the early days would have obtained a more convenient source of purer water by digging wells on their own premises, into the gravels or, higher up the slopes, into the Red Marl and Dolomitic Conglomerate rock.

There were also public wells and springs like Jacob's Pump, an ancient well situated where the High Street turns into Broad Street, marked on Simes' map of 1735 and in use until about 1880. At Keward was the Little Well, said to be good for the eyes, and there were springs at the top of Saint Thomas' Street that supplied a pump and a dipping well and, about 1900, were led into storage tanks that fed hydrants, used for street flushing, lower down the hill.

Wells was not sewered until late in the 19th century. Before then most houses had cess pits or closets, and as the city expanded, so the pollution of wells by underground seepage increased.

When, about 1880, the Wells Water Company was formed, domestic wells in the lower parts of the city were condemned as unfit for use. The Company bought Holes Ash Spring, which rises from limestone shales beside the Old Bristol Road on Rookham Hill, one and a half miles north of the Cathedral. They built a reservoir to store 300,000 gallons, or 2 days average spring output, and laid mains from it to all parts of the city.

By 1925 the growing population needed more water than Holes Ash Spring could supply, and the Company looked for new sources. Saint Andrew's Well was too polluted for public use, and it was Balch's attempt to prove where the pollution came from that turned the Moat green, as related above. The River Axe at Wookey Hole was fully used for industry, so the Company drilled a borehole at Rookham in the valley below their spring. It was 175 metres deep and provided an extra 70,000 gallons daily from limestone and sandstone strata.

Another borehole was drilled on the Rowdens Road Athletic Ground, on the south edge of the city, in 1929. It was 61 metres deep and yielded 50,000 gallons daily from Red Marl and Dolomitic Conglomerate. In 1952 it became polluted by waste liquids from a nearby gasworks, and was replaced in 1954 by a 91 metres deep borehole on the south side of the Athletic Ground which yields 220,000 gallons daily. These supplies were adequate until after the Second World War when, about 1950, Bristol Waterworks Company incorporated the Wells sources into its own regional network. Now water comes to the city through a grid of mains from as far away as Cheddar and Frome.

SURFACE DRAINAGE AND FLOODING

Wells is particularly vulnerable to the effects of great rainstorms because it lies at the confluence of 3 valleys: Walcombe, Biddlecombe and Chilcote Combe. Normally the drainage from these valleys sinks underground into limestone caves, reappearing at Saint Andrew's Well, so there is no obvious need to provide open channels for it through the city. But occasionally, perhaps once in 20 years, an exceptional storm so overloads the cave passages that floods sweep down the valleys and into the streets. Balch, in 1925, recalled two occasions when 'every cellar in the main streets had to be pumped out'.

As Wells expands (and it has doubled in size since World War Two) instant rainwater runoff from paved areas (roads, houses, pavements etc.) increases. Low lying parts of the city, especially on either side of the Glastonbury Road, become ever more liable to 'flash' flooding, which seems to happen almost every year. The floods of Christmas 1985 were made worse by rubbish of various kinds that had accumulated in or beside the two branches of Saint Andrew's Stream and their tributaries, which jammed in culverts and under bridges.

The growth of population also increases the volume of effluent leaving the city's sewage works. However good the treatment, the river quality is bound to

deteriorate, at least locally, as the proportion of effluent increases.

More intensive use of the surrounding countryside for recreation and farming exposes bare earth. This is eroded by heavy rain, especially in winter, and washed into the rivers, which have to be cleared more often. Jim Hanwell calculates that 5 tons of soil were eroded from a single large field on Milton Hill during the rainstorms of Christmas 1985.

In mediaeval times when Wells was small the streets were drained by open gutters, sometimes quite large ditches, that presumably doubled as sewers. The drainage from Walcombe came down New Street and turned down Chamberlain Street where in 1256 the channel was known as the Ludbourne. Each house had its own bridge over the stream, and the west end of Chamberlain Street was then called Brigg (bridge) Street. Throughout the old city similar streetside drains existed and were in course of time, as traffic increased, roofed over. Some still serve their original function and can be seen, on occasions when the roof gives way under the weight of modern juggernauts, to be built in stone, usually rather less than one metre in width and height.

Some street drains remained unroofed until quite recent times. Balch records that an old man he knew had shot snipe on the open Ludbourne in Tucker Street (there called the Mudketch) in the 1850's. This watercourse still flows open to the sky as it leaves the new houses of Clements Close, Priory Gardens, to join the Millstream.

A LAKE AT WELLS?

There are no natural lakes near Wells, but in 1979 Somerset County Council proposed to create an 'amenity lake' to add to the city's attractions. This was to be achieved by expanding the County's Underwood Quarry on the western outskirts of Wells, removing Milton Hill and Round Wood, and extracting limestone to deep below the natural water table. Then, in about 2010, the pumps would be stopped and the lower part of the vast crater would slowly fill with water.

Not surprisingly there was strong public opposition to this plan to destroy ancient landmarks in the setting of the city. After much agitation the idea was abandoned and the quarry closed in 1984.

On the other side of Wells the potential for creating a lake still exists. Long-established quarrying has removed the greater part of Dulcote Hill. As there is no depth limit on the workings they can, if encouraged, be deepened to the point where, when quarrying ceased, a deep lake would form. With a rocky cliff behind and suitable landscaping, the attractions of such a lake would compensate in some degree for the partial loss of the hill.

WELLS RECREATION GROUND

Jean Imray and Mary Henbury

1988 sees another centenary in Wells, the opening of the Recreation Ground. The following history of the Recreation Ground has been one of the topics studied by the Wells Local History Workshop at the Museum.

HOW THE RECREATION GROUND CAME INTO BEING by Jean Imray

At the Mayoral banquet on 9 November 1886, the newly elected Mayor, J. G. Everett, discussed with his guest, the Bishop, Lord Arthur Hervey, how the City should mark Queen Victoria's Golden Jubilee in 1887. A fortnight later the Bishop wrote to the Mayor saying that he had been giving the matter a good deal of thought. It seemed to him that, apart from a dinner for the poorer inhabitants, no more appropriate celebration could be devised than the presentation to the City of Wells of a piece of ground for a playground and public walk. His idea was to allocate one area for cricket in the summer and football in the winter and another area laid out with gravel walks, trees, flower beds and seats for the free use of the people of Wells. 'Summer evenings passed in the beautiful open air', he wrote, 'with the amusement of looking on at the cricket, and perhaps with a band of music occasionally, would promote an innocent cheerfulness of spirit which is almost a step towards godliness'.

The Bishop suggested that the ideal site would be Bell Close, with an extension eastwards to the Moat walk. It was readily accessible to the inhabitants of both St. Cuthbert's and St. Thomas' parishes and was close to open countryside. The Bishop's Barn could be used as a kind of summer house and provide shelter in case of rain. The land belonged to the see and the Bishop thought the Ecclesiastical Commissioners could be persuaded to sell for a reasonable price. He hoped, too, that the leaseholder of Bell Close would be co-operative, considering the end in view. As an opening gesture the Bishop offered to subscribe £100 towards the cost.

The Mayor greeted the Bishop's proposals with enthusiasm and arranged to call a public meeting on 21st December to discuss the whole question of the Jubilee celebrations. The meeting agreed that it was desirable to set aside a piece of land dedicated to the public for a pleasure ground, 'as a means of promoting healthful recreation and amusement for all Classes'. A committee was appointed to raise money for this and for other Jubilee celebrations and to make all the necessary arrangements. On 30th December the committee set up a sub-committee, comprising the Bishop, the Mayor, Canon T. D. Bernard, Alderman William Vonberg and Mr Edwin Hippisley, to collect information about possible sites, including the cost of maintenance.