

# BALANCING SECURITY AND AESTHETICS: THE EVOLUTION OF MODERN BANKNOTE DESIGN

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THE Bank of England has one overriding objective in banknote matters: to maintain public confidence in the currency.<sup>1</sup> This means that the public must be able to access its banknotes on demand; no trivial task given that today it has over three billion notes in circulation with a total value of around £58 billion. And the public must have confidence in the integrity of their banknotes; that they are genuine. This means that the Bank's banknotes must be instantly recognisable and yet hard to copy. And their integrity depends in turn significantly on their design.

The Bank of England's contemporary banknotes follow a well-developed design blueprint; a common approach to the use of raised lettering; a picture of Her Majesty the Queen on the front; a promise to pay signed by the Chief Cashier; and on the back of each note there is an image of a historical figure. Together, these aesthetic elements provide consistent recognisability for Bank of England notes and will be retained when the Bank moves the £5 to polymer in 2016 and the £10 around a year later. Each denomination then has its own unique features: its own standard size and predominant colour, and with each new version of a particular denomination, say a £50 note, a new historical figure, or figures, to help distinguish the new-style note from its predecessors. Finally, underpinning this outward appearance is a detailed research and development process to integrate new security features, such as micro-lettering and successive generations of holograms, into the overall design to make the note hard to counterfeit.

One consequence of this approach is that the Bank's notes today share a distinctive aesthetic quality. Indeed one could view our notes as having become everyday pieces of art, which perhaps are seen first-hand by more people than any other in the country, and which have become a quiet part of our shared identity.

This blueprint is relatively modern and would fail to varying degrees to describe accurately the characteristics of the notes that the Bank issued in the nearly 300 years before the 1970s. In fact, the design, aesthetics and security features of the Bank's notes have changed markedly over that period. In large part these changes have been the natural result of technological progress. But they also reflect how the use of banknotes has evolved, from their beginnings as a novel financial instrument to an everyday tool which we collectively use to fund around 20 billion purchases per year.<sup>2</sup> And in part they simply reflect changes in the Bank's attitudes towards design. Collectively, then, they provide a historical record of how the Bank has responded to the economic requirements and technological possibilities in the eras of their issuance.

The architect of the Bank's contemporary approach to banknote design was Harry Eccleston, who sadly passed away in April 2010. As lead designer Harry was responsible for the development of the D series, introducing the blueprint that the Bank still follows and ushering in a more unified approach to banknote design. To set Harry's contribution in context we will set out first how the design of the Bank's banknotes has developed over time, and second

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<sup>1</sup> This article is adapted from a speech given by Chris Salmon, then Executive Director of Banking Services and Chief Cashier, at the British Numismatic Society, Warburg Institute, London, on 25 October 2011, with revisions. Chris was appointed Executive Director – Markets with effect from 1 June 2014 and Victoria Cleland, previously Head of Notes Division, was appointed Chief Cashier, also with effect from 1 June 2014.

<sup>2</sup> Payments Council 2013, 74.

how it has taken forward this heritage with the latest £50. I will then touch on the Bank's ongoing work for its forthcoming new £5 and £10.

### Banknote evolution

The Bank has been issuing banknotes, or 'running cash notes', as they were first known, since it was founded in 1694. These first notes were effectively receipts for deposited coin and were generally the preserve of wealthier individuals: in 1696, the value of notes in circulation was just over £2 million. There were no fixed denominations and a note could be 'written down', or part-paid out, if a portion of the note's full value was withdrawn. A note was valued and dated by hand by one of three cashiers who also signed the note.

The Bank has faced the challenge of designing and producing banknotes which are secure against counterfeiting since its inception. In 1694 the question was whether the notes should be mainly handwritten or at least partly standardised through printing. In considering this question, the Bank went as far as commissioning printing plates (Fig. 1) which, with the benefit of hindsight, we can see anticipated the future design of its printed notes, notably by including a vignette of Britannia which the newly-formed Bank had incorporated into its corporate seal. But the Bank almost certainly never used these plates, preferring predominantly handwritten notes. Why? Although part-printing offered clear production benefits, the Bank seems to have taken the view that predominantly handwritten notes would be more secure. Although that may seem a strange judgement from today's perspective, we should remember that while the printing technology of the time was far behind today's, the artistic quality of the calligraphy of the early cashiers was high, so the judgement may well have been correct. Indeed, when the Bank did produce eight denominations of printed notes a year later, the forgeries of Daniel Perrismore forced it to return to predominantly hand-written notes within months.<sup>3</sup>

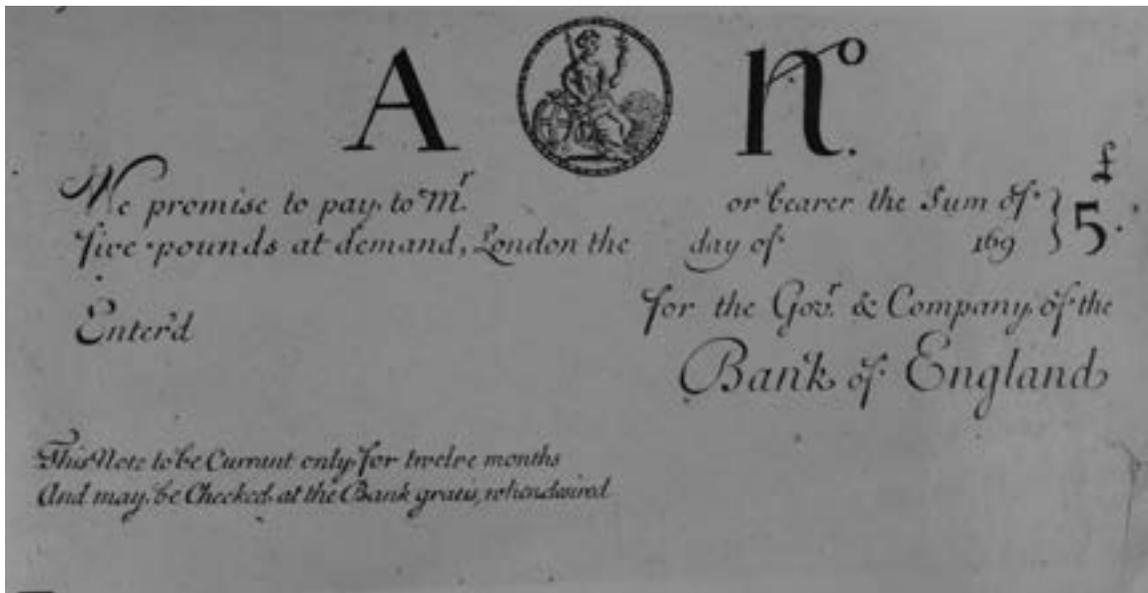


Fig. 1. Original printing plate, 1694. (© Bank of England.)

One week after the return to handwritten notes the Bank decided that a 'mould be made for making Ten reames of paper' and a special committee was set up to 'consider of the forme of the Mould.'<sup>4</sup> This was the genesis of the watermark in Bank of England notes, a security feature which survives today. Prior to this, watermarks had only been used by printers to indicate

<sup>3</sup> Byatt 1994, 13.

<sup>4</sup> Mackenzie (1953), 8.

the size of paper, and the inclusion of, by the standards of the day, a unique and sophisticated watermark greatly strengthened the security of the Bank's notes. Because of this, in July 1697 the Bank was sufficiently confident to return to part-printing its notes, using a new design, enabling it better to reconcile production and security considerations than it had previously been able to (Fig. 2).



Fig. 2. Part-printed £150 note, 1700. (© Bank of England.)

In these founding years the Bank also confronted the need to complement secure design with effective deterrence. In 1697, after lobbying by the Bank, Parliament made forgery of the Bank's notes a felonious act, which eventually became punishable by death.<sup>5</sup> Deterrence, albeit with more modern sentencing standards, remains an important part of today's anti-counterfeiting strategy.

In 1725, standardized denominations were introduced, with the £20 and £50 denominations appearing for the first time. To try to stop forgers changing a banknote's value, the 'sum block'—an elaborate value-based design feature—was introduced in 1743 (Fig. 3). Coupled with an improved vignette of Britannia, this helped to raise the technological barrier against counterfeiters and in addition helped to make both the issuer and the denomination more recognisable.

Around the turn of the nineteenth century, things became more complicated. To counter the rapid depletion of the Bank's gold reserves caused by fear of an invasion, the Bank was instructed by Parliament to cease paying out gold on presentation of its notes.<sup>6</sup> This was the so-called Restriction Period, and it lasted from 1797 to 1821.

To compensate for the absence of sufficient coin, lower denomination notes were issued, increasing the Bank's note circulation from just under £10 million in 1797 to over £16 million in 1801.<sup>7</sup> This led to hastily-prepared notes reaching the hands of people who were often illiterate and unfamiliar with genuine banknotes— an opportunity that counterfeiters seized upon. This prompted a concerted legal response. In a period of around 20 years, some 300

<sup>5</sup> Byatt 1994, 18, 26.

<sup>6</sup> Byatt 1994, 35.

<sup>7</sup> Clapham 1944, 5.



Fig. 3. The sum block. (© Bank of England.)

people were capitally convicted on forgery-related charges, compared to just three over the preceding decade or so.<sup>8</sup> But it was also clear that the Bank had to strengthen the security of its notes, and to that end the Bank invited the public to submit forgery-resilient note designs.<sup>9</sup> Almost 400 suggestions were received over roughly 20 years: some were workable, some infeasible (such as the suggestion of banknotes ‘wrought in silk’) and some were ahead of their time, like the suggestion that ‘a Portrait of the King, engraved in the line way, by the best Engraver, should be printed on all Bank Notes’.<sup>10</sup> And there were design submissions, such as that of Perkins, Fairman & Heath, in which complex artistic scenes and geometric patterns were combined to yield a strikingly graphical modern design (albeit less integrated than Eccleston’s designs some years later).<sup>11</sup> But the Bank in that period preferred simplicity: a wavy line watermark was added in 1801 as a result of the suggestions received, and printed serial numbers and dates followed in 1809. These more simple innovations did prove effective and were hard to forge, which coupled with the decision to cease issuing £1 and £2 notes, led to a decline in counterfeiting at the start of the nineteenth century.

In 1838 the Bank went as far as commissioning a pictorial note specimen. Judging again that it was harder to counterfeit a well-designed, simple banknote than a complex one, it rejected the note design for looking like ‘a picture with a note in the middle.’<sup>12</sup> Instead, the Bank stuck with the basic design of its white notes, incrementally adding new security features during the century including a shaded watermark and a new Britannia vignette in 1855. As a result, to the casual observer, a note from the 1690s would not look entirely dissimilar to those whose legal tender status was ultimately withdrawn in 1961 (Fig. 4).<sup>13</sup>

In making these judgements the Bank seems to have factored in the ability of the public to recognise a genuine note, and to have been concerned that counterfeiters would find it easier to pass off forgeries of complex designs than simple ones. Although we might reach a different judgement today, the Bank continues to consider the ease with which its notes can be authenticated when developing new designs.

<sup>8</sup> Byatt 1994, 43.

<sup>9</sup> Hewitt 1987, 47.

<sup>10</sup> Hewitt 1987, 47–8.

<sup>11</sup> See Hewitt 1987, 49, for an example.

<sup>12</sup> Hewitt 1987, 110.

<sup>13</sup> Much of this summary where not specifically referenced is condensed from Byatt 1994 and Hewitt 1987.



a



b

Fig. 4. Comparison of £5 notes: (a) 1793 and (b) 1947. (© Bank of England.)

From 1928, with the advent of Series A (Fig. 5), the Bank's notes took the first significant step towards contemporary note design with the inclusion of colour printing and printing on both sides of a note, albeit only in denominations of up to £1.



a



b

Fig. 5. A Series notes: (a) £1 and (b) 10 shillings. (© Bank of England.)

With the onset of World War II the pace of change was again forced by external factors: the production of high-quality counterfeits of the higher value white notes by Germany.<sup>14</sup> Although the German plot was not successful and relatively few of the counterfeits entered circulation, the Bank responded by retiring the remaining white notes: those above £5 were withdrawn in 1943. The white £5 note was updated with a thread in 1945 and those without it were withdrawn in

<sup>14</sup> Byatt 1994, 146.

1946. One official at the Bank described the episode as ‘the most dangerous ever seen’ and it had a clear impact on its approach to note design. Finally, the B series £5 note (Fig. 6), designed by Stephen Gooden, enabled the last of the white notes to be withdrawn in 1961.



Fig. 6. B series £5 note. (© Bank of England.)

During the early 1960s, Series C (Fig. 7), designed by Robert Austin (10/-, £1) and Reynolds Stone (£5, £10),<sup>15</sup> brought the reigning monarch’s portrait to the front of the Bank’s banknotes, as had been suggested over a century earlier, and where it has remained ever since. When looking back at series A to C it is clear that an increasing number of the features we see in modern banknotes had begun appearing. But it was the D series of notes, designed by Harry Eccleston and first issued between 1970 and 1981, that truly heralded the arrival of the Bank of England’s modern approach to aesthetics.

### Harry Eccleston’s contribution

Harry Eccleston had been a lecturer in illustration and printmaking and had served in the Royal Navy during the Second World War. Employed by the Bank from 1958, he started as an assistant to Austin and became the Bank’s first full-time banknote designer and the first to design an entire series. This was a significant change for the Bank. Before Harry joined the Bank, each note was designed on contract by an artist following a competition. This meant that no one individual had overall responsibility for the production of the note: the artist submitted a design which, if accepted by the Bank, would be turned over to the printing works to industrialise. Moreover, different artists could be responsible for particular denominations, as with the C series. Harry, by contrast, was a full-time employee of the Bank, responsible for a whole series, and reportedly described his work as industrial design to defeat forgery.<sup>16</sup>

Harry brought great technical expertise to the task. He once said that the designs for the D series (Fig. 8) were ‘a blending together of several different designs into a single piece of

<sup>15</sup> Introduced in 1961, 1960, 1963 and 1964 respectively. The Bank’s *Old Lady* magazine, Spring 1979, 197, records that Harry initially worked on the 10/- note’s detailed design when he joined the Bank under Austin, who had previously been Eccleston’s professor at the Royal College of Art.

<sup>16</sup> Goodacre 1982. Readers may wish to know that a note dated 26 May 1981 from G.L. Wheatley to then-Chief Cashier David Somerset, currently in the Bank’s archive, confirms that Harry was heavily involved in this extensive article prior to publication.



a



b



c

Fig. 7. C series notes: (a) £5, (b) £1, and (c) 10 shillings. (© Bank of England.)



Fig. 8. D series notes: (a) £50 and (b) £5. (© Bank of England.)

artwork so that you can hardly tell, for example, where the geometric lathe work ends and the hand-engraving begins'.<sup>17</sup> The back of the £50D is the result of such an approach, where a geometrically-lathed sky, augmented with astronomical symbols, was blended harmoniously with a hand-engraved image of a cityscape, dominated by St Paul's Cathedral. He also demonstrated exceptional attention to detail. Harry estimated that he undertook some three months of research and three months of drawing for portraits and scenes that were used on each of the notes (Fig. 9).<sup>18</sup>

<sup>17</sup> Kranister 1989, 25.

<sup>18</sup> Kranister 1989, 25-6.

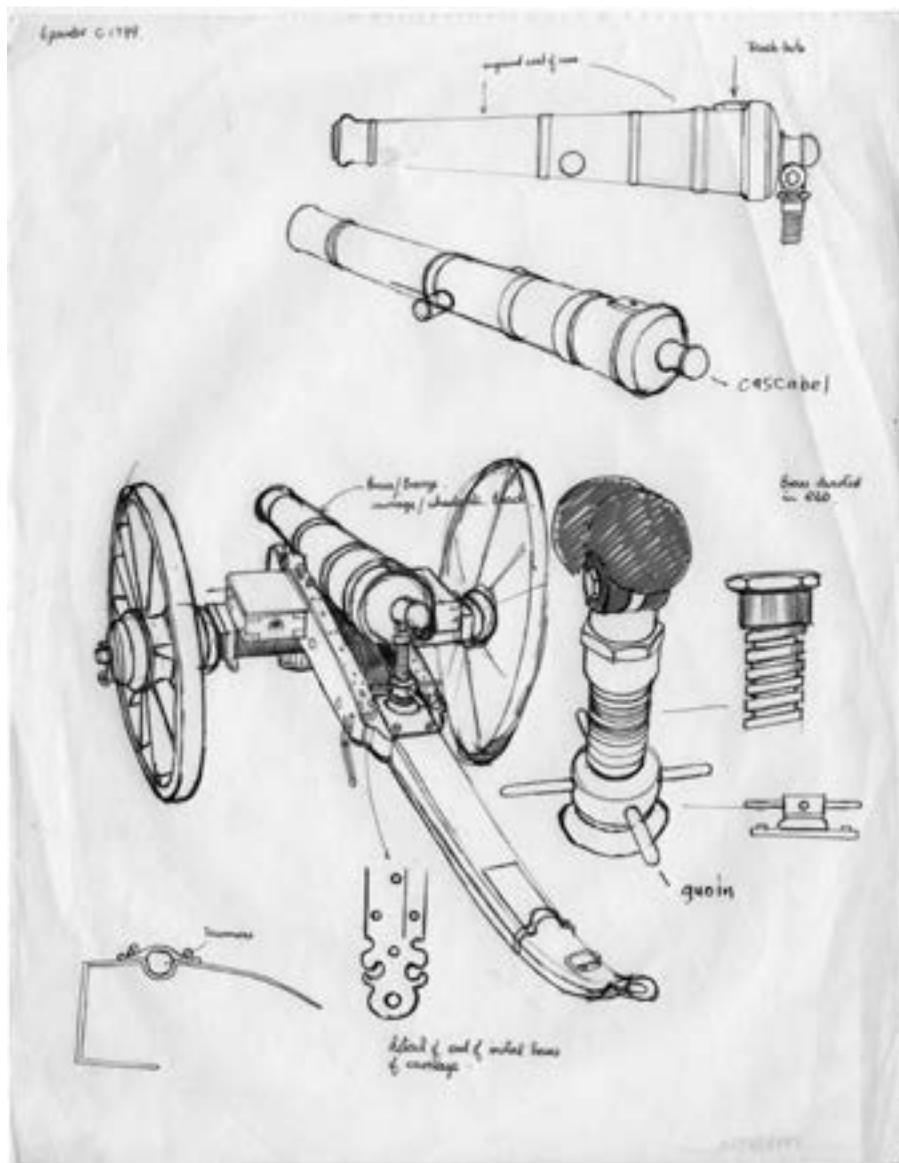


Fig. 9. Preliminary drawings and notes for 'Wellington' £5D note. (© Bank of England.)

The overall result was that, at a time when commercially available printing equipment was becoming more sophisticated, Harry's highly-detailed designs and use of colour ensured that all but the most refined counterfeits could be recognised as imitations, even before checking for the watermark or other features.<sup>19</sup> Looking back, we think it is clear that his detailed and aesthetically balanced design succeeded in supporting the security of the note.

Harry's responsibility for the whole series also resulted in the Bank's first aesthetically-consistent family of banknotes, establishing the common elements of the blueprint that we described earlier. The D series was the first of the modern series to contain the now-commonplace £20 denomination and the £50.<sup>20</sup> His approach meant that one could know what to expect from the composition of a D series £5 note having seen a £50 of the same series

<sup>19</sup> Security and aesthetics evolved in tandem in the £50D: it was the first Bank of England banknote to use multicolour intaglio printing and the first to incorporate a laser-cut, contoured thread (Bank of England press release, 19 March 1981). The latter was updated again in 1988 to a windowed thread. See also [http://bankofengland.co.uk/banknotes/Pages/denom\\_guide/nonflash/50-series.aspx](http://bankofengland.co.uk/banknotes/Pages/denom_guide/nonflash/50-series.aspx).

<sup>20</sup> Issued in 1970 and 1981 respectively.

– something that was not the case previously. If the Bank deserves credit for giving Harry Eccleston the remit to produce an entire series of banknotes, it was his artistic style and technological understanding that enabled him to introduce such a step change in the design of its notes.

### Recent developments in banknote design

Naturally, there has been further evolution since Harry's time. In one particularly notable change, the portrait of the Queen was standardized in the E series and enlarged across the denominations,<sup>21</sup> based on photographs taken by Harry's successor as artist designer, Roger Withington, who had worked with Harry on the D series and ably took forward his legacy. But more profoundly, advances in technology have revolutionized the mechanics of the design processes. The era of pen and ink design is increasingly being replaced by computer-based processes.<sup>22</sup> And, nowadays, such is the rate of technological innovation that the Bank's specialist research team constantly has to investigate the merits of new banknote security features and examine the opportunities that new technologies afford to counterfeiters. To give one relatively recent example of the latter, in preparation for the launch of the E series £5 in 1990, the team developed a palette of twenty-three colours to negate the risks associated with the greatest threat then imaginable – a computerized colour laser photocopier from Japan: a copying tool requiring no expertise.<sup>23</sup>

Despite these developments, the approach that Harry Eccleston established still exerts a strong influence over the Bank's approach to design today. In particular, the basic blueprint for the layout remains unchanged, and the Bank strives to match the commitment he showed to including a detailed depiction of the historical figures. Indeed, the most recent F series notes, the 'Adam Smith' £20 launched in 2007 and the 'Boulton and Watt' £50 issued on 2 November 2011 (Fig. 11), share some detailed design similarities with Harry's 1978 £1 'Newton' note (Fig. 10) – the bold use of colour and of white space and the placement of the Britannia vignette.

Perhaps Harry's own words best sum up the many interrelated design and security features which had to be harmoniously woven into his notes – comments which are just as true for the £50F:

"The "canvas" is ridiculously tiny, and there is no normal "frame" to your picture [...] Add to that all the words you are obliged to include for statutory purposes, and then the restrictions that printing from an engraved plate impose on the monarch's portrait, which we have also to include [...] I haven't even mentioned the various features one includes to try and make the forger's job more difficult, things like microlettering, machine engraving and hand engraving, close register backgrounds, "white line" and "black line", vignettes [...] On top of all that, the design has to be capable of mass reproduction on high-speed presses so that notes printed years apart look identical when placed side by side."<sup>24</sup>

This is a good point at which to discuss the design and security features of the £50F which seek to follow the philosophy outlined above while embracing the latest technology.

### The £50F and its features

Just as the £20F was the first Bank of England note to feature a holographic strip, the £50F (Fig. 11) also brings several firsts. Perhaps most striking is that it is the Bank's first note to have twin portraits on the back, Matthew Boulton and James Watt. Ever since Eccleston's D series, the Bank has given close consideration to those individuals it has portrayed on its notes. This is an excellent opportunity to commemorate those who have made great achievements.

<sup>21</sup> Issued first on the E series £5 in 1990 and thereafter on all series and denominations.

<sup>22</sup> For example, banknotes bearing Chris Salmon's name were manufactured using new printing technology, which involves the manufacture of printing plates directly from computer-generated graphical information, known as 'Computer to Plate' technology. This circumvents the chemical processes previously used to accomplish this transference.

<sup>23</sup> Bower 1990, 28.

<sup>24</sup> Kranister 1989, 25.



Fig. 10. D series £1 note. (© Bank of England.)

Public interest in the individuals chosen for the Bank's banknotes has always been strong and in December 2013 the Bank announced a more formalized process for choosing historical characters. The process increases transparency and public engagement while underscoring the principles which have long guided the Bank's decisions in this area: choosing individuals who have made a lasting contribution to a wide range of skills and fields; a contribution which is widely recognised and has had enduring benefits; recognising contributions from individuals from a wide range of backgrounds; and avoiding characters who would be unduly divisive.<sup>25</sup>

Set against those criteria, Boulton and Watt individually deserve consideration; Boulton's work in revolutionizing the production of coin brought security in the form of uniformity to Britain's coinage, something which the Bank had yet to achieve for its notes in the eighteenth century. And the contribution of Watt was immortalized by the decision to name the unit of power after him. However, the banknote focuses on their collaboration, starting in 1775 and lasting for a quarter of a century, to develop and market steam engines, initially for the mining and textile trades but eventually for a multitude of industries in the UK and abroad. When

<sup>25</sup> More information on both the principles and the process announced in December 2013 can be found at [http://bankofengland.co.uk/banknotes/Pages/current/security\\_50.aspx](http://bankofengland.co.uk/banknotes/Pages/current/security_50.aspx).



Fig. 11. F series £50 note. (© Bank of England.)

considering the contribution of their steam engine technology to the Industrial Revolution, we are in no doubt as to their worthiness for portrayal. Moreover, it is hoped that the design the Bank has chosen, depicting both the steam engine and the Soho manufactory where it was assembled, matches up to Harry's exacting standards for aesthetics and historical accuracy.

As well as a first for the Bank's banknote art, and being the first to bear the signature of the new Chief Cashier, the £50F delivers a significant update in security features, carrying eight features for cash users compared to the five of its predecessor. Perhaps the most notable among these features is a technology which is new for the Bank, called motion thread. Woven directly into the paper, the motion thread is a green lenticular feature with five windows along its length which contain images of the £ symbol and the number 50. When a note is tilted from side to



Fig. 12. Public consultation polymer £5 and £10 note designs. (© Bank of England.)

side, the images move up and down.<sup>26</sup> And when the note is tilted up and down, the images move from side to side and the number 50 and £ symbol switch. The thread, in combination with the other security features, reflects the Bank's intention to design a secure note.

### The Bank's decision to print on polymer

As mentioned above, the next changes to the Bank's issuance will be at the other end of the denominational spectrum: the £5s and £10s we use every day and which are primarily transactional notes and those with the shortest average life. The move to polymer, which is a more durable substrate than paper, should result in the new notes lasting at least two and a half times longer than cotton paper notes. As well as being more cost-effective over their life, polymer notes also deliver security and environmental benefits.<sup>27</sup>

The Bank did not enter into the decision to print on polymer lightly. Having investigated the potential benefits of polymer, a two-month public consultation was announced in September 2013 to gauge the public's reaction to polymer: notes are a part of people's daily lives and it is important that they feel comfortable with the change. This consultation included providing members of the public the opportunity to handle mock up notes of the current design £5 and £10 on polymer, with clear windows where the watermark would usually be. The feedback was overwhelmingly positive: 87 per cent of the 13,000 respondents were in favour, 6 per cent were opposed and 7 per cent were neutral. And encouragingly, those that had seen the example notes in person were 20 per cent more likely to be in favour of polymer than those responding online.

Much work remains to launch the new £5 in 2016 and the £10 around a year later. While they will retain the traditional look of the Bank's notes, with Her Majesty the Queen on the

<sup>26</sup> For more information see [http://bankofengland.co.uk/banknotes/Pages/current/security\\_50.aspx](http://bankofengland.co.uk/banknotes/Pages/current/security_50.aspx)

<sup>27</sup> These benefits are enhanced by reducing the size of the £5 and £10. They will be more in line with the size of those in other countries and the larger denomination notes will be easier to fit into wallets and purses. There are also advantages in storage and transport. The existing format of tiered sizing will be maintained, i.e. the higher the denomination, the longer the height and the length of note. Information on the recent polymer announcement can be found at <http://bankofengland.co.uk/banknotes/polymer/Pages/default.aspx>.

front and historic characters on the bank, they will also open a number of aesthetic options to the Bank which were not previously feasible on cotton paper, such as clear windows and different security features. Managing the aesthetics of these elements into a single, harmonious design will be as important as the extensive work the Bank will undertake with the cash industry to prepare for the launch and circulation of these notes.

## Conclusions

For over 300 years the Bank has been issuing banknotes and has confronted the challenge of securing their integrity. Unsurprisingly, over such a long period the design of the Bank's notes has evolved considerably, from the original black and white designs introduced in the 1690s, to the contemporary notes which owe many of their characteristics to the designs and concepts introduced by Harry Eccleston. Banknote design is complemented by a broader strategy to support integrity which has also evolved considerably, particularly in recent years as technological change has revolutionised the way in which cash is handled.

There are many lessons from the Bank's issuance history, including the need for the Bank to be continually alive to emerging threats to the security of its notes. So, while the £50F represents a significant advance in the aesthetic design and security features in the Bank's notes, it is already preparing to issue the new £5 and £10 on an entirely new substrate for the first time in over 300 years. But like all the changes the Bank makes this advance will enable it to better deliver its unchanging objective in the years ahead: maintaining confidence in the currency.

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