Instrument makers, shops, and expertise in eighteenth-century London

This chapter explores the living, working, and commercial spaces of London's instrument makers across the long eighteenth century. An unlikely body of sources - the records of London's principal criminal court - gives insights into a heterogeneous, and highly significant occupational group in England's metropolis. This discussion focuses upon the organisation of space within households and businesses, the typical working conditions and social relationships within workshops, and methods of display within artisan-retailers' shops. This paper also attempts to uncover the broad outlines of languages of expertise, knowledge, and ownership employed by retailers, craftsmen, and journeymen in these multifunctional sites. I take here a purposefully broad definition of instrument makers, to include mathematical, optical, philosophical, and surgical instruments, and also evidence about clocks and globes.

Pioneering works by E.G.R. Turner, M.A. Crawforth, D. J. Bryden, and Gloria Clifton, among others, have outlined the key features of the booming trade in optical, mathematical, and philosophical instruments in early modern London.[1] The overall narrative of change is now a familiar story. In sixteenth-century London aristocratic and royal desire for instruments was met by importing objects and skilled immigrant workers from Continental Europe; but by the eighteenth century, the city had a growing international reputation for the quality of its instruments, and the high specialisation and innovation of its makers. The manufacture and sale of instruments was spread across eighteenth-century London, with the most successful makers of optical and philosophical instruments lining 'the important retail corridor of Fleet Street, Ludgate, and St Paul's Churchyard'; mathematical instrument makers predominated in the eastern side of the metropolis.[2]

Beyond this broad outline of the geography of the trade, we know precious little about the urban spaces within which instruments were made, marketed, and sold. In a discussion of wealthy foreign travellers shopping for instruments in seventeenth and eighteenth century London, Jim Bennett raised the intriguing prospect that the shops of renowned makers operated not simply as commercial sites, but also as spaces for the exchange of knowledge and skills.[3] Using a very different body of sources, and engaging with a much wider social profile of maker and consumer, this chapter aims to expand our knowledge and understanding about spaces of scientific instrument manufacture and retail.

* I am very grateful to the Leverhulme Trust for funding the research upon which this chapter is based.

[1] E.G.R. Turner, *The mathematical practitioners of Hanoverian England, 1714-1840* (Cambridge, 1966); M. A. Crawforth, 'Instrument makers in the London guilds', *Annals of Science*, 44 (1987), pp. 319-77; D. J. Bryden, 'Evidence from advertising for mathematical instrument making in London, 1556-1714', *Annals of Science*, 49 (1992), pp. 301-336; Gloria Clifton, *Directory of British scientific instrument makers 1550-1851* (London, 1995).

[2] Alexi Baker, 'Symbiosis and style: the production, sale and purchase of instruments in the luxury markets of eighteenth-century London', in A.D. Morrison-Low, Sara J. Schechner, and Paolo Brenni, eds, *How scientific instruments have changed hands* (2016), pp. 1-20, at p. 5.

[3] Jim Bennett, 'Shopping for instruments in Paris and London', in Pamela Smith and Paula Findlen, eds, *Merchants and Marvels* (London; New York, 2002), pp. 370-395, at p. 372.

Conceptually it frames 'space' as an active framework, simultaneously produced by spatial practices (such as work, food preparation, and sleep), representations of space (such as maps and plans), and representational spaces (including symbolic associations, like customary links to skill and innovation).[4] I also pay close attention to the materiality of physical space in influencing human behaviour and identity.[5] This chapter thus elucidates the material, social, and symbolic meanings of diverse artisanal spaces in order to deepen our understanding of the culture and society of instrument makers in eighteenth-century London.

The primary sources that form the basis of this study include the Proceedings of the Old Bailey, and inventories from the City of London's Court of Orphans. Certainly, these are sources which are more familiar to social or cultural historians of the metropolis, than scholars of the history of science. Testimony from the court room - given by instrument makers as prosecutors, witnesses, and defendants - offers rare insights into the workings and complexities of the trade. In the process of giving criminal evidence, instrument makers, and those living in their households, and employed in their businesses, reveal significant details about their working lives and spaces. These sources also allow us to recapture something of the artisanal experiences of those who existed on the margins of the trade; individuals like mathematical instrument maker Samuel Bellinger, who testified in the 1730s that: 'I am a Mathematical Instrument-Maker, and no House-keeper; I live with my Mother'.[6] Existing studies of instrument makers focus almost exclusively upon established and highly successful producers, those with the most elite contracts, and clientele. This chapter attempts a broader social scope.

Organisation of space

Testimony from court cases, especially narratives concerning robberies of shops, and also rare inventories, together shed light upon the basic organisation of spaces inhabited by instrument makers. What emerges from the sources is a varied picture of working environments and experiences. A fluid boundary between domestic, working, and commercial spaces was the common experience for most metropolitan instrument makers across the long eighteenth century.[7] Households were highly complex in London, often containing - in addition to the householder and his family - servants, apprentices, and lodgers.[8] Typically, there was no clear spatial demarcation between the working and domestic lives and activities of householders. From the second half of the eighteenth century, the most exclusive instrument

[4] Henri Lefebvre, *The production of space*, trans. by Donald Nicholson-Smith (Oxford,1991).
[5] Peter Arnade, Martha Howell and Walter Simons, 'Fertile spaces: the productivity of urban space in northern Europe', *The Journal of Interdisciplinary History*, 32 (2002), pp. 515-548, at p. 541.
[6] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), January 1738, trial of John Birt (t17380113-12).
[7] Peter Guillery, *The small house in eighteenth-century London* (New Haven, CT, and London, 2004), pp. 66.
[8] Amanda Vickery, 'An Englishman's home is his castle? Thresholds, boundaries and privacies in the eighteenth-century London house', *Past and Present*, 199 (2008), pp. 147-73, at p. 150. It is likely though that multiple occupancy was a stronger trend in west and central London, than in south and east eighteenth-century London. See Guillery, *The small house in eighteenth-century London*, pp. 34-35.

makers, normally involved in the design and creation of large apparatus, did enact a gradual separation of domestic, working, and trade activities. This experience at the top end of the market was however atypical. We begin here with the spatial layout and character of the homes and working environments of the vast majority of makers and sellers of instruments, before moving onto an examination of the exclusive minority who created a spatial distinction between making and selling.

As was customary, those compiling the late seventeenth-century inventory of clockmaker Thomas Wise made no spatial distinction between his working and commercial sites; they listed all the goods found 'in the shop and worke shop'.[9] At the Old Bailey, watch maker John Lambert spoke of how 'in the evening, the prisoner and another person came together into my shop […] the prisoner sat down upon the seat where I generally work'.[10] A court case of 1770 reveals that mathematical instrument maker John Mollison in Blackfriars had, within the same building, domestic and working spaces: domestic activities were located towards the rear of his house, commercial activities at the street side. This had been the typical organisation of artisanal and trade spaces since the late-medieval period. Mollison explained to the court that: 'My wife was alarmed by the noise of breaking the beaufet [cupboard or sideboard] between one and two in the night, in the lower parlour fronting the street, close by the window: we lay, in the back parlour.' Following the robbery, and with the thief having fled from the scene, Mollison 'found my bureau and book-case open, which were shut over night, but not locked; all the drawers were taken out: they had taken away a silver watch, capped, and jewel, a coral, set in silver, two guineas, a pair of knee-buckles.'[11] It is not unlikely that Mollison's 'lower parlour' was used for entertaining more privileged consumers, as was common practice in eighteenth-century commercial/domestic sites. Typical too was 'storing 'shop goods' in rooms throughout the house'.[12] The inventory of clock maker Thomas Taylor shows that this artisan kept workshop tools in his kitchen, and raw materials in the cellar.[13]

A grand larceny case tried at the Old Bailey in September 1768 concerning the theft of property belonging to watch maker William More, is highly revealing of the multifunctional nature of sites of instrument making and selling. In his statement to the court More explained that 'I live in Moorfields, and am a watch maker; we keep two different shops, I a watch-maker's shop and my wife a chandler's shop'. Further testimony from More and his daughter-in-law, Sarah Cope, established the spatial organisation of his home and work spaces in more depth. Situated on 'the corner of Crown-alley', there was one street entrance to both shops, and a kitchen lay between the two commercial sites. Cope

[9] Court of Orphans, LMA, CLA/002/02/01/2246.
[10] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1780, trial of John Bailey (t17800913-3).
[11] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), May 1770, trial of John Underwood William Wharton (t17700530-23).
[12] Jon Stobart, Andrew Hann, and Victoria Morgan, *Spaces of consumption: leisure and shopping in the English town, c. 1680-1830* (London, 2007), p. 117.
[13] Court of Orphans, LMA, CLA/002/02/01/2127.

explained that: the [watchmaker's] shop lies on one side of the kitchen, we go through the kitchen into the shop'. Later she elaborated: 'no body can go out of the chandler's shop to the shop where the watches are kept without coming through the kitchen'.[14] Multi-trade households were not at all unusual.[15] As prosecutors and witnesses in court, men and women often spoke of spaces from which multiple trades were conducted; 'I am a mathematical instrument maker, and my wife keeps a hoiser and haberdasher's shop'.[16] Joseph Ihon of East Smithfield was both a publican and a watch-maker, practising both trades within his 'dwelling house' on Nightingale Lane. Describing the robbery of his property in the summer of 1789, Ihon explained that on the ground floor of the house in 'a back room' he had a bar, and 'up one pair of stairs, in a small room adjoin to a sleeping room' he constructed watches. Pretending to be a customer at his bar, a thief purportedly crept up the stairs of Ihon's property and stole watches 'hanging on hooks, on a work board' in the small first storey room.[17]

The sources from London's principal criminal court suggest that towards the end of the eighteenth century, for the most successful and affluent instrument makers, there was the development of a much clearer demarcation of space, and separation of varied working practices. Benjamin Messer's description of the robbery of his property in Bell-dock, Wapping in the 1780s, reveals a deliberate separation between 'work' and 'sale' spaces.[18] Messer told the court of how 'on 17th November last, about half past eight, the maid rang the bell from the sale-shop to the work-shop; before I went down to see if any thing was wanted, the bell rang again'.[19] From the relative isolation of the workshop Messer was unware of the events unfolding in his distinct commercial space. The internal structure of Messer's building, and the concomitant separation between making and selling, must have had the effect of separating the mechanical (and potentially noisy and noxious) processes of making, from the rather more polite and refined experience of shopping.[20] Like the exclusive instrument makers discussed by Jim Bennett in his analysis of seventeenth-and eighteenth-century travellers' accounts of London, these artisans had the unusual luxury of 'A shop [as ...] an intermediate space between the street and the workshop'.'[21]

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[14] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1768, trial of John Farrow (t17680907-20).
[15] Amanda Flather, 'Space, place, and gender: the sexual and spatial division of labour in the early modern household', *History and Theory*, 52 (2013), pp. 344-360, at p. 358-59.
[16] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), December 1789, trial of James Mann (t17891209-27).
[17] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), October 1789, trial of Nicholas Rogers (t17891028-1).
[18] This was a trend across eighteenth-century luxury trades. See Kathryn Morrison, *English shops and shopping*: *an architectural history* (New Haven; London, 2003), p. 36.
[19] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), December 1787, trial of Samuel Harding William Archer (t17871212-87).
[20] This was a common trend within luxury shops, see Claire Walsh, 'Shop design and the display of goods in eighteenth-century London', *Journal of Design History*, 8 (1995), pp. 157-76, at p. 160.
[21] Bennett, 'Shopping for instruments In Paris and London', p. 388.

The case of the burglary of John and Edward Troughton's property (by a small group of men) in 1802 is clear evidence that these immensely successful instrument makers had fully separated their domestic site and activities, from workshops and commercial spaces. This spatial layout was evidently a response to an increased demand from government, institutional, and independent customers, and a reflection of the sheer size of the projects undertaken, and instruments assembled. Edward Troughton told the court that at 'No. 136, Fleet-street; my brother John and I sleep and live there, but we have another house in Peterborough-court [adjacent to the aforementioned property], which is only for work-shops and ware-rooms, and an errand boy only sleeps there for the purpose of letting the men in'.[22] It is notable that the Troughton's domestic space, No. 136 Fleet Street, which they had inhabited since 1782, had previously been occupied by both Benjamin Coles (father and son), and before them, Thomas Wright, all renowned and highly successful instrument makers.[23] This succession of instrument makers at the top of their profession occupying the same premises must have been well-known to contemporary institutional and private customers, and offers the distinct possibility that not just certain neighbourhoods (the West End), or streets (Fleet Street), but particular commercial spaces acquired symbolic notoriety for being sites of skill and innovation in the instrument making trade.

What are we to make of the evidence of the spatial organisation of artisan dwellings presented so far? First, physical separation between the activities of instrument manufacture, general domestic duties, and commercial practices, was a rarity. Second, since instrument-makers typically inhabited un-separated spatial sites of work and domestic and family life, observation and knowledge of a broad range of instruments, and demonstrations of such things, must have been everyday sights in early modern households across the metropolis. Thus it was not simply as display pieces in the homes of England's 'better sort' and gentry, that 'scientific instruments' were visible and accessible. Third, the range of activities undertaken within a single household suggests that some rooms in instrument-making premises must have taken on a different character - for example, as a working space, a shop, a site of instrumental demonstration, food preparation, or socialising - depending upon the time of day, the persons present, and the activities undertaken.[24]

Workshops and working practices

It is a frustration for historians interested in all artisanal practices that few sources allow us to uncover the manufacturing process. This lacuna is largely a reflection of the embodied and tacit nature of workshop learning and innovation, and the craft culture of the 'mystery', the collective secrets of the

[22] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), February 1802, trial of William Bean (t18020217-70).
[23] Anita McConnell, 'From craft workshop to big business - the London scientific instrument trade's response to increasing demand, 1750-1820', *The London Journal*, 19 (1994), pp. 36-53, at p. 41.
[24] A parallel argument about the flexibility of space in relation to eighteenth-century homes and leisure spaces is made in Benjamin Heller, 'Leisure and the use of domestic space in Georgian London', *The Historical Journal*, 53 (2010), pp. 623-45, at p. 628.

trade. Certainly by the late seventeenth century there is also the added complication of subcontracting, which enabled flexible access to specialist skills, and involved very complex networks of manufacture which are hard to map or trace with any accuracy.[25] But unusually crime records do shed light upon working conditions and relationships, within, and between, urban workshops. In describing the circumstances in which products and tools were stolen from his workshop in 1779, for example, Jesse Ramsden outlined the working practices in his workshop in Piccadilly, and the sheer scale of his business operation: 'I am a mathematical and optical instrument-maker; I employ a great many workmen, and each workman has his own private drawer where he keeps his tools locked up.'[26] Ramsden's large workforce was necessary for undertaking the design and construction of observatory and surveying apparatus; and as Anita McConnell has shown, at least thirty-five men were at some stage employed by this maker.[27] From the Old Bailey sources three key themes relating to working practices emerge. First, the high-turnover of workers in large and medium-sized instrument-making establishments; second, the processes and networks through which subcontracting was carried out, and third, the working experiences of those engaged in subcontracting work.

The Old Bailey records give us an indication of the high turn-over of workers within the shops of established makers, and by implication the diffusion of often highly specialized skills throughout the metropolis. Passing comments made by instrument makers about their employees shed light upon craftsmen whose economic survival and social capital was rather more precarious than their own. Edward Troughton spoke of one William Bean who 'had been in my service five or six months, and had quitted it about a month or five weeks; he knew the house near as well as I did'. It was Bean's intimate knowledge of the working and commercial space which aided his burglary of Troughton's shop.[28] Jesse Ramsden mentioned a man who 'had been with me this last time, about six months, as a foreman. He lived with me before, about a year and a half'. Earlier in the century, 'Philosophical Instrument Maker' David Barclay spoke of a man in his workshop who had 'been out of Business; on the 11th May he work'd for me […] he [then] went away from me […] He has work'd with me since; the 27th of October was the last Time'.[29] Speaking of an alleged thief, John Brasset watch-maker claimed that 'this lad had three masters before he came to me, I employ many journeymen and apprentices, and

[25] Giorgio Riello, 'Strategies and boundaries: subcontracting and the London trades in the long eighteenth century', *Enterprise and Society*, 9 (2008), pp. 243-280.
[26] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), January 1779, trial of Peter Kelly (t1779013-15).
[27] Anita McConnell, *Jesse Ramsden (1735-1800): London's leading scientific instrument maker* (Ashgate, 2007), Ch. 4.
[28] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), February 1802, trial of William Bean (t18020217-70).
[29] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), December 1737, trial of Abraham Davenport (t17371207-24).

can hardly keep my payments'.[30] Here we get glimpses of individuals who moved in and out of employment in the premises of more established artisan-retailers.

Turning to the processes and networks of sub-contracting, and describing the prosecution of an alleged theft of materials from his workshop, mathematical and optical instrument maker Edward Navine outlined the method of subcontracting through which brass, the key material for instruments, came to his workshop. Navine 'produced a book' in court, and explained that the volume 'is carried to the founder; and when he sends a parcel of cast brass, he enters it in this book'. Evidently the casting of instrument parts was subcontracted, and Navine's particular patterns were kept by the founder. In other cases heard at the Old Bailey founders also recognised the work of different masters by sight in court. So far, this process seems straightforward enough; but Navine was suspicious that the parcel of brass from the founder was underweight, and searching the room of journeyman David Macauly 'I found one of the pieces cast from my pattern'.[31] Watchmaking in particular was a trade dispersed into multiple parts, skills, and techniques. John Perkins, living on Snow-Hill, stated that 'I am a watch-maker, and sell the various materials that compose a watch, and tools that watch-makers use'. Later in his testimony Perkins tellingly admitted that he could not swear that the object presented in court came from his own shop because 'the movement goes through so many alterations in finishing'.[32]

Crime records occasionally reveal the life experiences of those engaged in subcontracting; often at the margins of the commercial instrument market. These men lacked the status of a retail space of their own at a good London address. Renting a single room in a house, without his own household or business, James Stansbury appears to be just such a craftsman. Accused and found guilty of violent theft, in the course of questioning, Stansbury asserted that 'I am a clock-maker', I lodged there [a house in Whitechapel] and work'd in the garret'. Despite what appears to be a relatively marginal socioeconomic position, Stansbury firmly asserted his professional identity (and expertise). Stansbury stressed that 'My father was a clock-maker, and he left me his tools'. Watch-maker William Walpole was also called into court to support the veracity of Stansbury's professional status: 'the Prisoner is a clock-maker: he used to work for me when I had clock-work to do, and I have work'd for him in the watch way'. And, 'I would trust him with any thing in the way of business. I have trusted him with a spring-clock, or table-clock, of 14, 15, or 20 L value. He is very good hand at spring work'.[33] Here we have two workers engaged in a reciprocal exchange of skills across a network of domestic/working

[30] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), May 1759, trial of Douglas Wyre (t17590530-5).
[31] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), June 1758, trial of David Macauly (t17580628-19).
[32] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1765, trial of Joseph Langham Elias Moring (t17650918-39).
[33] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), February 1745, trial of James Stansbury (t17450227-12).

spaces. And despite the absence of a shop, independent access to consumers, or prominent family connections, these makers were assertive in their claims to expertise.

The instrument maker's shop and display strategies

Occasionally shop owners revealed, through their testimony as alleged victims of crime, the material fixtures of their commercial spaces and associated techniques of display. These glimpses into shop layout and design enhance our understanding of the trade of instrument making, including the manufacture, retail, and consumption of instruments. Expect for the understanding that the shops of instrument makers probably combined 'on the shelf' instruments, ready to buy, and more exclusive and expensive customised objects, made to order, our knowledge of product display is hitherto limited.[34]

Research on the architectural design and decorative elements of seventeenth-and eighteenth-century London and provincial shops has demonstrated the significance of features or material fabrics such as glass windows, plaster moulding, and gilded cornices, in augmenting and advertising the social status of consumer, and retailer.[35] More particularly, histories of shopping for textiles and luxury products, such as porcelain, argue for the importance of interior display in marketing wares, articulating the professionalism of the seller, and cultivating an atmosphere of polite sociability.[36] Work on goldsmiths and apothecaries has separately shown how distinctive shop designs and display strategies could demonstrate the knowledge and expertise of the retailer, and the authentic nature of their products.[37] What can we say about the shops of instrument makers?

In his testimony concerning a stolen sextant, 'made of ebony, brass and ivory', valued at 50s, mathematical instrument maker Robert Gota of Wapping described the display of wares inside his shop. 'While I was at breakfast, a young lad knocked at the door and asked me if I had lost any thing, I looked round and saw a glass case door open, and the sextant in it taken out; this glass case stood in the shop, about nine feet from the door, against the shop wall.'[38] Nicholas Meredith, mathematical instrument maker in New Bond Street described a 'case of instruments […] on the counter'; which a neighbour later saw in the street, in the hand of the suspect. Samuel Cooley, aged nine years, was found guilty of stealing a black shagreen case, 'two pair of brass compasses', a box wooden sector, a box wooden scale, a brass protractor, a steel drawing pen, and three brass compass pieces.[39] Optical instrument maker Philip Brock of Church-row, Aldgate, suffered a considerable loss of stock in September 1818,

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35 Stobart et al., *Spaces of consumption*, pp. 112, 126.

36 Walsh, 'Shop design and the display of goods'.

37 Patrick Wallis, 'Consumption, retailing, and medicine in early modern London', *Economic History Review*, 61 (2008), pp. 26-53.

38 *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), October 1792, trial of Richard Russel (t17921031-59).

39 *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), May 1778, trial of Samuel Cooley (t17880507-9).

including a mahogany case, one body of a microscope, four glasses, four ivory sliders and objects, a concave and a plane mirror, and one side illuminator. Brock was 'at work at the window-the articles stated in the indictment were in a case behind me. The prisoner came in to buy a glass for a show. I said I had nobody to serve him […] he went round on my left hand'.[40] Benjamin Messer's wife explained to the court that the reading glass stolen from her husband's shop 'was exposed in the window for sale, before the robbery was committed'.[41] Edward Troughton also revealed something about the interior organisation and display of his ware-rooms: 'in the shop there is but one drawer kept locked, in which I generally keep small valuable items, and which had been wrenched from the bench'.[42]

The impression we get from this testimony is of a wide range of products for sale in individual establishments, and varied of techniques of display. Instruments were shown-off behind glass windows, exposed within glass cases, stored within wooden cases on shop counters, and locked away within drawers. Items in eighteenth-century shop windows 'were vital in attracting passers-by' and giving potential consumers 'a taste of what lay inside the shop'.[43] Watch makers in particular testify to hanging their instruments on hooks behind window glass. Maker Thomas Sutherland had an instrument stolen 'by a violent blow made against the window, it hung up by small brass hook, within an inch of the window'.[44] Likewise William and Thomas Collett had 'a great many watches then at the window'.[45] Instrument maker John Marshall spoke of products 'in the inside of the shop, beside my work-board, within six or seven inches of the show-glasses. It is a kind of bow window'.[46]

Shopping in the eighteenth century was a negotiation between customer and retailer, and thus the (legitimate) opening up of glass cases and unlocking of drawers must have depended upon the impression made by the consumer upon the retailer. What is striking from this testimony is how few instruments were in fact locked away, out of the reach of consumers, and opportunistic thieves. Even expensive (and portable) instruments were on show and free standing in shops. One man nearly succeeded, for example, in carrying a telescope out of Thomas Parnell's shop. The thief was only thwarted by the unexpected dimensions of the telescope: the man 'tried to take up the telescope, and put it under his clothes, but it was too high above his clothes'. Noticing that the shop-owner was

[40] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), October 1818, trial of David Lazarus (t18181028-90).
[41] Presumably the display of this object in 'the window' of the shop, as opposed to within a glass case, related to the (lesser) value of the object. Messer himself referred to the merchandise stolen as 'trifling things'.
[42] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), June 1758, trial of David Macauly (t17580628-19).
[43] Stobart et al., *Spaces of consumption*, p. 116.
[44] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), February 1786, trial of Thomas Colbrook (t17860222-5).
[45] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), January 1795, trial of Michael Love (t17950114-9).
[46] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), February 1780, trial of William Davidson Mary Griffin (t17800223-20).

distracted at his workstation in the window, David Lazarus stole a microscope from a fixed case standing out of the artisan-retailer's sight.[47]

Necessarily absent from sources produced by a judicial institution are more 'legitimate' instances of browsing for instruments as consumer objects. Shopping in general required the purchaser to use a variety of senses, including touch, sight, smell, and even taste, to ascertain quality and workmanship.[48] But how much more important sensory interaction must have been for the browsing and purchase of instruments, for these were consumer products whose significance and functionality often depended upon a range of applied sensory knowledge. We have the accounts of some of the most elite shoppers in the market - Bennett's gentle and aristocratic foreign visitors to London - but what of more humble and quotidian interactions in the instrument maker's shop by 'middling' and 'lesser' sorts? This is an aspect of the history of instruments which deserves much greater attention, and can only be touched upon here. For now, it is worth observing that in describing interactions which later went badly wrong, instrument makers inadvertently revealed quotidian patterns of showing, handling, and examining instruments. An (alleged) customer usually informed the artisan-retailer of his requirements, then he or she was presented with an instrument, or multiple instruments, which fitted the description. It was usual for the buyer to then handle and examine the instrument(s) closely; John Farrow looked at a proffered watch, and to check its working 'clapped it to his ear'.[49] An extraordinary late eighteenth-century case involving instrument makers in an alleged treason plot including an air gun, includes details of instrumental demonstration within a maker's shop.[50] Mathematical instrument maker David Cuthbert, with premises in Greyhound Court, Arundel Street, off the Strand, showed watchmaker Thomas Upton the workings of an air gun that he had constructed, and explained the properties of air:

> Q. Do you recollect any conversation with him about the properties of air? - A. Yes; he saw an air-pump lying in the shop, I explained it to him as well as I could. I shewed him an air-gun, and I explained that to him […] Q. Did he handle the gun? - A. He looked at it, and viewed it, and said it was a handsome piece.[51]

Though the nature of the trial was highly unusual, the details of everyday workshop interactions with instruments of experimental philosophy are highly revealing.

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[47] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), October 1818, trial of David Lazarus (t18181028-90).
[48] Kate Smith, 'Sensing design and workmanship: the haptic skills of shoppers in eighteenth-century London', *Journal of Design History*, 25 (2012), pp. 1-10.
[49] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1768, trial of John Farrow (t17680907-20).
[50] This case-study is explored in much greater depth in Jim Bennett, 'Wind gun, air gun or pop gun: the fortunes of a philosophical instrument', in Lissa Roberts, Simon Shaffer, and Peter Dear, eds., *The mindful hand. Inquiry and invention from the late Renaissance to early industrialisation* (Amsterdam, 2007), pp. 221-45.
[51] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), May 1796, trial of Robert Thomas Crossfield (t17960511-1).

Identifying and asserting expertise and authorship

A final theme to be drawn out from the sources under examination here relates to languages of expertise employed by those living, working, and selling within these metropolitan spaces. On rare occasions instrument makers were called upon to be, in effect, expert witnesses in Old Bailey trials. A case heard in the 1760s pertaining to coining offences drew upon the workshop knowledge of several optical, mathematical, and clockmakers. Robert Featley, John Hunter, and George Hodgson were cross-examined in court on the use of tools employed in their trade (though in this instance illicitly used to file coins); providing evidence these artisans gave rare insights into the technicalities of their working practices, and even recognised instrumental innovation. Optical instrument maker Robert Featley examined the tool by sight and touch in the courtroom and declared that 'this [tool] is proper for several particulars, microscopes, and things in our way'. John Hunter, said to be 'conversant in mathematical instruments and clock-work both' was asked 'To what purpose is such an instrument as this applicable?'. Hunter replied that 'We have several milled nuts, both in the mathematical and clock way; this is more useful than any thing we use, for any thing that will go into it; it is as great an improvement as ever I saw; the edges or jestering nuts for regulating clocks might be done with this.'[52]

More commonly, artisanal practitioners - as prosecutors and witnesses - had to draw upon their particular knowledge and expertise to assert that the instruments presented in court (and typically found in the possession of the accused) were the handiwork of their workshop. In the process of identifying stolen things as their own, there was also the opportunity for demonstrating knowledge about instrument designs and materialities. Optician John Arnold asserted that though the glasses produced in court had 'no shop-mark', he was absolutely certain that they were his creation: 'one of them is a very particular one; the object is let in different to what they generally are, and the eyeglass is larger than it ought to be; I have no doubt of their being mine'.[53] A member of Jesse Ramsden's sizeable workforce, Matthew Berge, swore to the court that 'two sexton glasses which were found in the prisoner's lodging' were unquestionably the property of his master: 'I know them to be Mr. Ramsden's by the size; they are the size we always make them.'[54] Presented with a watch in court, maker Richard Delahoy showed off his knowledge of materials:

> Q. Is that a shagreen outside case?
>
> Delahoy. No; it is a fish skin.
>
> Q. If I came to buy a watch, would that pass for a shagreen case?
>
> Delahoy. Yes.

[52] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1767, trial of William Guest (t17670909-41).
[53] t180008917-91
[54] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), January 1779, trial of Peter Kelly (t17790113-15).

In a case of 1773 concerning the theft of a watch, worth 30s., watch-maker James Stoddard was brought into court to ascertain the authenticity of the object. Stoddard's involvement is worth quoting in full, as it shows how the trial process might even involve the demonstration of intricate technical and experiential knowledge.

> James Stoddard. I am a watch-maker. (The watch shewn him). I know Alexander Williamson [prosecutor, and owner of the stolen watch]; to the best of my knowledge this is the watch I sold him two years ago; the name seems to have been erased, and another put in; to the best of my judgement it is the watch; if I was indulged to take it to pieces I could certainly tell whether the name has been erased.
>
> Q. How long would you be in taking it to pieces?
>
> Stoddard. Ten minutes in a convenient place. (He takes the watch home and returns with it in a short time).
>
> Q. Have you examined the watch?
>
> Stoddard. Yes; I have taken it to pieces; I can swear positively that it is my work, though the name is erased.[55]

Wider members of the artisan-retailer household could also be called upon to identify particular instruments through distinguishing design features, or marks. The wife of mathematical instrument maker Benjamin Messer identified instruments taken from her husband's shop: in 1787 she 'proved the property to be her husband's, by a light mark in the tortoise-shell, near the hinge, and that it was exposed in the window before sale, before the robbery was committed'.[56] Again in 1794, 'I know them by a private mark, which I always mark them with'.[57] Certainly subjectivity was involved in this process: Richard Ireland Thorogood, surgeons instrument-maker claimed that 'I know the [stolen] spatulas by being the work in my house; the files I know by the private mark'.[58] Mathematical and optical instrument maker Edward Nairne identified materials stolen by a former employee, as one of the pieces was said to be 'cast from my pattern'. Thomas Bardin Globemaker of Salisbury-square, Fleet Street claimed that he had 'no doubt' that the items presented in court belonged to him 'because there are few in the trade, and each in the trade have their own patterns, and the person who makes the patterns is here'.

Positively identifying objects presented in court was a key element in successfully pursuing a criminal case, but for instrument-makers in particular, the question of authorship was especially significant against the backdrop of widespread subcontracting, and the increasing use of patents as a

[55] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), September 1773, trial of Thomas Price (t17730908-44).
[56] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), December 1787, trial of Samuel Harding William Archer (t17871212-87).
[57] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), April 1794, trial of Daniel Lemon Elizabeth Newton (t17940430-101).
[58] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), January 1789, trial of Henry Wilson (t17890114-66).

means of protecting authorship and commercial advantage.[59] Identifying the particular maker, or even workshop from which an instrument originated could be challenging. Moreover, the signature on a purchased instrument might well refer to the vendor, not a manufacturer. As Crawforth has argued, 'These false impressions became so widespread that from the late eighteenth century onwards several makers felt it necessary to claim, on their trade cards, that they were not just retailers.'[60] The evidence from Old Bailey trials shows that there was a further complication to this instrument/authorship issue: the re-sale of second-hand (and frequently stolen) objects was clearly facilitated by erasing the marks of the genuine maker. In a case of 1745 a horizontal sundial made by Thomas Wright, who traded at the sign of the Orrery and Globe, was stolen from a gentleman's garden. In this instance the thief attempted to erase all identifying marks on the dial, but while he succeeded in eradicating the arms of the sundial's owner, he failed to erase Thomas Wright, the maker's name, because it was 'engraved so deep'. [61] In the late seventeenth century, the practice of erasing the genuine maker's name from an instrument and inscribing it with a new or fabricated maker's name was an issue which was frequently raised in the courts of livery companies too. During the 1670s and 80s the Clockmakers' Company repeatedly attempted to mediate in trade disputes concerning 'false' and 'invented names' on watches and clocks.[62]

Conclusion

Criminal sources present us with a unique window upon the spaces of London's scientific instrument trade. Court room testimony conjures up vivid impressions of the physical layout of homes, workshops, and businesses, the multifunctional nature of these sites, and the material arrangement of these dynamic spaces. Reading the primary evidence against the grain also reveals a rich language of expertise and ownership employed by struggling journeymen and established masters alike.

Only artisan-retailers at the very top of the profession, like the Troughton brothers, were able to physically demarcate domestic, working, and commercial spaces. This separation of the practices of manufacture and trade might have had the effect of elevating elite makers from the realms of the 'mechanical' to 'polite' society. However, since witnessing the manufacture of instruments was desirable, in itself, for certain consumers with an interest in natural philosophy, this will have to remain a tentative conclusion, and a theme which deserves further attention. More detailed research might also be undertaken into the interactive nature of shopping and browsing for scientific instruments in relatively humble working and commercial spaces.

[59] Mario Biagioli, 'From prints to patents: living on instruments in early modern Europe', *Hist. Sci*, 44 (2006), pp. 139-189.
[60] Crawforth, 'Evidence from trade cards for the scientific industry', p. 478.
[61] *Old Bailey Proceedings Online* (www.oldbaileyonline.org, version 7.2, 28 January 2018), March 1745, trial of William Carter (t17450530-2).
[62] Guildhall Library, MSS 2710/1, fo. 277; 2710/2, fo. 27v.

The overall impression from the Old Bailey sources is of a great variety a highly specialized skills, dispersed between densely interconnected domestic, working, and commercial spaces. Knowledge and expertise concerning instrument making in the metropolis was not simply located in the large proto-factories, on which so much ink has been spilt, but could also be found in humble parlours and garrets. Moreover, lacking the usual features of artisanal status - such as a prominent position in a guild, or a prestigious trading address - did not mean that craftsmen were inhibited from asserting expertise. The historiographical focus upon a handful of renowned and unusually affluent eighteenth-century instrument makers has hitherto obscured the broader social dynamics of the trade.