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Abstract for

‘The Leverhulme Project, Engineering Romanticism: Measurement, Tolerance and Form’

This paper is about machine innovations at the turn of the C.19 and how they enabled the world of replication, standards and forms that exists today. In his *Romantic Cyborgs* (MIT, 2017) Mark Coeckelbergh argues that Romantic ideas and technologies persist and that we are still living in a Romantic age. This is certainly borne out in terms of cutting tool technology, which, although often computer controlled, still frequently employs breakthroughs achieved in the Romantic Period. In 1958 K. R. Gilbert noted that in ‘1775 the machine tools at the disposal of industry had scarcely advanced beyond those available in the Middle Ages: by 1850 the majority of modern machine-tools had been invented.’¹ The revolutionary machine was the screw-cutting lathe, which is often dated to the one produced by Henry Maudsley in 1798. Nonetheless, the centre lathe is an ancient and primary machine. It is capable, with skilled operators and the right materials, of self-replication, and as Joseph Whitworth wrote: ‘the lathe and the planning engine are used in the making of all other machines’. In literature, and particularly in poetry, there are standards and forms poets can use that go back centuries. This was not the case in engineering prior to the Romantic period when standards had not been set. For example, before the screw-cutting lathe thread forms were bespoke. Until that point, as Samuel Smiles observed: ‘No system was observed [...] Every bolt and nut was thus a speciality in itself, and neither possessed nor admitted any community with its neighbours. [...] all bolts and their corresponding nuts had to be marked as belonging to each other; and any mixing of them together led to endless trouble, hopeless confusion, and enormous expense.’² At the heart of mass production is the removable fastener. The screw, bolt, nut, collar or shaft, anything with a thread requires an opposite part to fit to it.

¹ K. R. Gilbert, ‘Machine Tool’ in *A History of Technology*, ed. Singer, 4 vols. (Oxford: OUP, 1958), IV, p. 417.

² Samuel Smiles, *Industrial Biography: Iron Workers and Tool Makers* (London: John Murray, 1863), p. 226.

Often referred to as male and female, only a screw with the correct diameter, pitch and thread angle will fit a mating form. Before the new lead-screw lathe the same person usually had to make both nut and bolt. After this a nut could be made in Baltimore and a bolt in Bolton and they could engage. This paper examines the cultural and technological moment when standards, forms and tolerances emerged, and enabled the kind of global replication, mass production and innovation that now exists.