

David Pye

three selections from

The Nature and Art of Workmanship

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1. Design proposes. Workmanship disposes

In the last twenty years there has been an enormous intensification of interest in Design. The word is everywhere. But there has been no corresponding interest in workmanship. Indeed there has been a decrease of interest in it. Just as the achievements of modern invention have popularly been attributed to scientists instead of to the engineers who have so often been responsible for them, so the qualities and attractions which our environment gets from its workmanship are almost invariably attributed to design.

This has not happened because the distinction between workmanship and design is a mere matter of terminology or pedantry. The distinction both in the mind of the designer and of the workman is clear. Design is what, for practical purposes, can be conveyed in words and by drawing: workmanship is what, for practical purposes, can not. In practice the designer hopes the workmanship will be good, but the workman decides whether it shall be good or not. On the workman's decision depends a great part of the quality of our environment.

Gross defects of workmanship the designer can, of course, point out and have corrected, much as a conductor can at least insist on his orchestra playing the right notes in the right order. But no conductor can make a bad orchestra play well; or, rather, it would take him years to do it; and no designer can make bad workmen produce good workmanship. The analogy between workmanship and musical performance is in fact rather close. The quality of the concert does *not* depend wholly on the score, and the quality of our environment does *not* depend on its design. The score and the design are merely the first of the essentials, and they can be nullified by the performers or the workmen.

Our environment in its visible aspect owes far more to workmanship than we realize. There is in the man-made world a whole domain of quality which is not the result of design and owes little to the designer. On the contrary, indeed, the designer is deep in its debt, for every card in his hand was put there originally by the workman. No architect could specify ashlar until a mason had perfected it and shown him that it could be done. Designers have only been able to exist by exploiting what workmen have evolved or invented.

This domain of quality is usually talked of and

thought of in terms of material. We talk as though the material of itself conferred the quality. Only to name precious materials like marble, silver, ivory, ebony, is to evoke a picture of thrones and treasures. It does not evoke a picture of gray boulders on a dusty hill or logs of ebony as they really are—wet dirty lumps all shakes and splinters! Material in the raw is nothing much. Only worked material has quality, and pieces of worked material are made to show their quality by men, or put together so that together they show a quality which singly they had not. "Good material" is a myth. English walnut is not good material. Most of the tree is leaf-mold and firewood. It is only because of workmanlike felling and converting and drying and selection and machining and setting out and cutting and fitting and assembly and finishing—particularly finishing—that a very small proportion of the tree comes to be thought of as good material; not because a designer has specified English walnut. Many people seeing a hundred pounds worth of it in a London timber yard would mistake it for rubbish, and in fact a good half of it would be: would have to be.

So it is with all other materials. In speaking of good material we are paying an unconscious tribute to the enormous strength of the traditions of workmanship still shaping the world even now (and still largely unwritten). We talk as though good material were found instead of being made. It is good only because workmanship has made it so. Good workmanship will make something better out of pinchbeck than bad will out of gold. *Corruptio optimi pessima!* Some materials promise far more than others but only the workman can bring out what they promise.

In this domain of quality our environment is deteriorating. What threatens it most is not bad workmanship. Much workmanship outside of mass-production is appallingly bad and getting worse, to be sure, and things are seen in new buildings which make one's hair rise. But at least it is easy to see what the remedies are, there, if difficult to apply them. Moreover, it is not the main danger, because it is outside the field of mass-production, and the greater part of all manufacture now is mass-production; in which, although there is some bad workmanship, much is excellent. Much of it has never been surpassed and some never equaled. The deteriora-

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tion comes not because of bad workmanship in mass-production but because the range of qualities which mass-production is capable of just now is so dismally restricted; because each is so uniform and because nearly all lack depth, subtlety, overtones, variegation, diversity, or whatever you choose to call that which distinguishes the workmanship of a Stradivarius violin, or something much rougher like a modern ring-net boat. The workmanship of a motor-car is something to marvel at, but a street full of parked cars is jejune and depressing; as if the same short tune of clear unmodulated notes were being endlessly repeated. A harbor full of fishing-boats is another matter.

Why do we accept this as inevitable? We made it so and we can unmake it. Unless workmanship comes to be understood and appreciated for the art it is our environment will lose much of the quality it still retains.

2. The workmanship of risk and the workmanship of certainty

Workmanship of the better sort is called, in an honorific way, craftsmanship. Nobody, however, is prepared to say where craftsmanship ends and ordinary manufacture begins. It is impossible to find a generally satisfactory definition for it in face of all the strange shibboleths and prejudices about it which are acrimoniously maintained. It is a word to start an argument with.

There are people who say they would like to see the last of craftsmanship because, as they conceive of it, it is essentially backward-looking and opposed to the new technology which the world must now depend on. For these people craftsmanship is at best an affair of hobbies in garden sheds; just as for them art is an affair of things in galleries. There are many people who see craftsmanship as the source of a valuable ingredient of civilization. There are also people who tend to believe that craftsmanship has a deep spiritual value of a somewhat mystical kind.

If I must ascribe a meaning to the word craftsmanship, I shall say as a first approximation that it means simply workmanship using any kind of technique or apparatus, in which the quality of the result is not predetermined, but depends on the judgment, dexterity and care which the maker exercises as he works. The essential idea is that the quality of the result is continually at risk during the process of making; and so I shall call this kind of workmanship 'The workmanship of risk': an uncouth phrase, but at least descriptive.

It may be mentioned in passing that in workmanship the care counts for more than the judgment and dexterity; though care may well become habitual and unconscious.

With the workmanship of risk we may contrast the workmanship of certainty, always to be found in quantity production, and found in its pure state in full automation. In workmanship of this sort the quality of the result is exactly predetermined before a single salable thing is made. In less developed forms of it the result of each operation done during production is predetermined.

The workmanship of certainty has been in occasional use in undeveloped and embryonic forms since the Middle Ages and I should suppose from much earlier times, but all the works of men which have been most admired since the beginning of history have been made

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by the workmanship of risk, the last three or four generations only excepted. The techniques to which the workmanship of certainty can be economically applied are not nearly so diverse as those used by the workmanship of risk. It is certain that when the workmanship of certainty remakes our whole environment, as it is bound now to do, it will also change the visible quality of it. In some of the following chapters I shall discuss what may be lost and gained.

The most typical and familiar example of the workmanship of risk is writing with a pen, and of the workmanship of certainty, modern printing. The first thing to be observed about printing, or any other representative example of the workmanship of certainty, is that it originally involves more of judgment, dexterity, and care than writing does, not less: for the type had to be carved out of metal by hand in the first instance before any could be cast; and the compositor of all people has to work carefully, and so on. But all this judgment, dexterity and care has been concentrated and stored up before the actual printing starts. Once it does start, the stored-up capital is drawn on and the newspapers come pouring out in an absolutely predetermined form with no possibility of variation between them, by virtue of the exacting work put in beforehand in making and preparing the plant which does the work: and making not only the plant but the tools, patterns, prototypes and jigs which enabled the plant to be built, and all of which had to be made by the workmanship of risk.

Typewriting represents an intermediate form of workmanship, that of limited risk. You can spoil the page in innumerable ways, but the N's will never look like U's, and, however ugly the typing, it will almost necessarily be legible. All workmen using the workmanship of risk are constantly devising ways to limit the risk by using such things as jigs and templates. If you want to draw a straight line with your pen, you do not go at it freehand, but use a ruler, that is to say, a jig. There is still a risk of blots and kinks, but less risk. You could even do your writing with a stencil, a more exacting jig, but it would be slow.

Speed in production is usually the purpose of the workmanship of certainty but it is not always. Machine tools, which, once set up, perform one operation, such for instance as cutting a slot, in an absolutely predeter-

mined form, are often used simply for the sake of accuracy, and not at all to save time or labor. Thus in the course of doing a job by the workmanship of risk a workman will be working freehand with a hand tool at one moment and will resort to a machine tool a few minutes later.

In fact the workmanship of risk in most trades is hardly ever seen, and has hardly ever been known, in a pure form, considering the ancient use of templates, jigs, machines and other shape-determining systems [1], which reduce risk. Yet in principle the distinction between the two different kinds of workmanship is clear and turns on the question: 'Is the result predetermined and unalterable once production begins?'

Bolts can be made by an automatic machine which when fed with blanks repeatedly performs a set sequence of operations and turns out hundreds of finished bolts without anyone even having to look at it. In full automation much the same can be said of more complex products, substituting the words 'automated factory' for 'automatic machine'. But the workmanship of certainty is still often applied in a less developed form where the product is made by a planned sequence of operations, each of which has to be started and stopped by the operative, but with the result of each one predetermined and outside his control. There are also hybrid forms of production where some of the operations have predetermined results and some are performed by the workmanship of risk. The craft-based industries, so called, work like this.

Yet it is not difficult to decide which category any given piece of work falls into. An operative, applying the workmanship of certainty, cannot spoil the job. A workman using the workmanship of risk assisted by no matter what machine-tools and jigs, can do so at almost any minute. That is the essential difference. The risk is real.

But there is much more in workmanship than not spoiling the job, just as there is more in music than playing the right notes.

There is something about the workmanship of risk, or its results; or something associated with it; which has been long and widely valued. What is it, and how can it be continued? That is one of the principal questions

[1] Shape-determining systems are discussed in my book *The Nature of Design*, in which the chapters on Techniques and on 'Useless Work' are relevant to the present subject.

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which I hope this book may answer: and answer factually rather than with a series of emotive noises such as protagonists of craftsmanship have too often made instead of answering it.

It is obvious that the workmanship of risk is not always or necessarily valuable. In many contexts it is an utter waste of time. It can produce things of the worst imaginable quality. It is often expensive. From time to time it had doubtless been practiced effectively by people of the utmost depravity.

It is equally obvious that not all of it is in jeopardy: for the whole range of modern technics is based on it. Nothing can be made in quantity unless tools, jigs, and prototypes, both of the product and the plant to produce it, have been made first and made singly.

It is fairly certain that the workmanship of risk will seldom or never again be used for producing things in quantity as distinct from making the apparatus for doing so; the apparatus which predetermines the quality of the product. But it is just as certain that a few things will continue to be specially made simply because people will continue to demand individuality in their possessions and will not be content with standardization everywhere. The danger is not that the workmanship of risk will die out altogether but rather that, from want of theory, and thence lack of standards, its possibilities will be neglected and inferior forms of it will be taken for granted and accepted.

There was once a time when the workmanship of certainty, in the form colloquially called 'mass-production', generally made things of worse quality than the best that could be done by the workmanship of risk—colloquially called 'hand-made'. That is far from true now. The workmanship of a standard bolt or nut, or a glass or polyethylene bottle, a tobacco-tin or an electric-light bulb, is as good as it could possibly be. The workmanship of risk has no exclusive prerogative of quality. What it has exclusively is an immensely various range of qualities, without which at its command the art of design becomes arid and impoverished.

A fair measure of the aesthetic richness, delicacy and subtlety of the workmanship of risk, as against that of certainty, is given by comparing the contents of, say, the British Museum with those of a good department store. Nearly everything in the Museum has been made

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by the workmanship of risk, most things in the store by the workmanship of certainty. Yet if the two were compared in respect of the ingenuity and variety of the devices represented in them the Museum would seem infantile. At the present moment we are more fond of the ingenuity than the qualities. But without losing the ingenuity we could, in places, still have the qualities if we really wanted them.

3. Is anything done by hand?

Things are usually made by a succession of different operations, and there are often alternative ways of carrying any one of them out. We can saw, for instance, with a hand-saw, an electrically driven band-saw, a frame-saw, and in other ways.

To distinguish between the different ways of carrying out an operation by classifying them as hand- or machine-work is, as we shall see, all but meaningless. But if we make an estimate of the degree of risk to the quality of the result which is involved in each we have a real and useful basis for comparison between them. Let us take two extreme examples: (A) A dentist drilling a tooth with an electrically driven drill. (B) A man drilling a piece of wood with a hand-driven wheelbrace, using a twist-drill and a jig. A is a machine-operation and B is a hand-operation: or, if you like, we will say that both are machine-operations. Operation A which the dentist does with a power-driven machine-tool involves 100 per cent risk (and there is no man that it lies in his mouth to deny it!) but operation B merely involves a five per cent risk or so, and only that because, if the hand-workman is fool enough, he may break the drill. Otherwise he has only to keep winding the handle and the result is a certainty. The source of power is completely irrelevant to the risk. The power tool may need far more care, judgment and dexterity in its use than the hand-driven one.

Let us consider some possible definitions of handicraft, or hand-work, or work done by hand. 'Done by hand' as distinct from work done by what? By tools? Some things actually can be made without tools it is true, but the definition is going to be rather exclusive for it will take in baskets and coiled pottery, and that is about all! Let us try something wider and say 'done by hand-tools as distinct from work done by machines'. Now we shall have to define 'machine' so as to exclude a hand-loom, a brace and bit, a wheelbrace, a potter's wheel and the other machines and tools which belong to what is generally accepted as hand-work. So that will not do either, unless we propose to flout the ordinary usage of mechanics: which on the subject of machinery seems a trifle risky.

Suppose that we try 'As distinct from power-driven machine tools'. Now we are faced with having to agree that the distinction between handicraft and not-handi-

craft has nothing to do with the result of handicraft—the thing made: for no one can possibly tell by looking at something turned, whether it was made on a power-driven, foot-driven, boy- or donkey-driven lathe. And then again, if we hold to this definition, do we say 'made *entirely* without the use of power-driven machine tools' or do we say 'made *partly* without...'? If we say 'entirely', then all the carpentry, joinery, and cabinet-making of the last hundred years is excluded, pretty nearly: indeed for longer than that. Louis Mumford remarks [2] (in a different context) that ... 'If power machinery be a criterion, the modern industrial revolution began in the twelfth century and was in full swing by the fifteenth.' The sawmill is a very ancient thing and so, of course, is the water-driven hammer.

But if we take the other course and say 'Partly without power-driven machine-tools' we include in handicraft most of the worst products of cheap quantity-production. Perhaps we can save the situation yet, by putting in a disclaimer and saying 'made *singly*, partly without power-driven machine-tools'. But now how do we know he hasn't made two of them and kept quiet about it? There is nothing about the product, the thing made, to tell us. And if we say 'in small numbers' why, exactly, do we include six and exclude seven or such-like? It sounds more like an expedient than a definition.

Suppose that we make a last attempt, shape a different course altogether, and say 'made by hand-guided tools, whether power-driven machine-tools or not'. By so doing we have written off every kind of drill, lathe, plane, and shooting board, all of which are shape-determining systems. So we shall now have to qualify the definition to include these tools which are only in part hand-guided; and then we shall have to try to exclude whatever machines we do not happen to fancy, from the same group.

Or shall we? Is it not time to give up and admit that we are trying to define in the language of technology a term which is not technical?

'Handicraft' and 'Hand-made' are historical or social terms, not technical ones. Their ordinary usage nowadays seems to refer to workmanship of any kind which could have been found before the Industrial Revolution.

Mumford, extending a conception of Patrick Geddes's, described [3] three phases in the development

[2] *Technics and Civilization*

[3] *Technics and Civilization*

of European economy and technics, each phase having a distinct pattern of economy and culture and a 'technical complex' of its own, which might be roughly indicated by referring to its principal materials and sources of power. The Eotechnic phase was reckoned to extend from about AD 1000 to 1760, and was a 'water-and-wood complex'. The Paleotechnic phase, of the Industrial Revolution, was a 'coal-and-iron complex', and the Neotechnic phase of our own day, which succeeded it, is an 'electricity-and-alloy complex' (Mumford was writing in 1930).

The essential ideas in his conception are, I think, first: that the Eotechnic phase contained, not so much the seeds, as the nine-month embryo of the Industrial Revolution; for all the prerequisite ideas, devices and techniques for it were already in being before it came about. Secondly: that the different phases 'interpenetrated and overlapped'. That is to say that, just as the technical features of the Paleotechnic phase, such as quantity-production and the workmanship of certainty, were in being quite early in the Eotechnic phase, so did techniques and devices characteristic of that phase persist through the Paleotechnic phase and even into our own day. I lately saw a wooden barrel (Eotechnic) with, beside it, a galvanized steel bucket (Paleotechnic) and a thermoplastic watering-can (Neotechnic). As for the workmanship of certainty having appeared during the Eotechnic phase, to quote but two examples: the monk Theophilus in the eleventh century gave a detailed description of punches and stamps for producing quantities of standardized ornaments in gold and silver [4], and in or about 1294 a smith called Thomas, from Leighton Buzzard, used stamping dies for forging standardized ornamental features for the grille of Eleanor of Castile's tomb in Westminster Abbey, which still exists [5]. It may be that in its earliest manifestations the workmanship of certainty was used for the quantity-production of ornaments more often than for utilitarian purposes.

Now the current idea of handicraft and the handmade has been deeply colored by the Arts and Crafts movement; and that became a movement of protest against the workmanship and aesthetics of the Industrial Revolution, which it contrasted with handicraft. As a result, I think, the idea has become accepted

[4] See H. Wilson, *Silverwork and Jewelry* (1903)

[5] See H. R. Schubert, *History of the British Iron and Steel Industry*

that before the Industrial Revolution everything was made without machines. This was certainly not William Morris's idea. He did not consider that handicraft flourished after the Middle Ages. But the fairly common error of supposing a complete break and opposition between the 'machine-made' workmanship of the Industrial Revolution and the 'handmade' workmanship of the Eotechnic phase immediately preceding it is presumably traceable partly to a misunderstanding of Morris.

It seems fairly clear that to Morris himself handicraft meant primarily work without division of labor, which made the workman 'a mere part of a machine'. During the Medieval period, he says, 'there was little or no division of labor, and what machinery was used was simply of the nature of a multiplied tool, a help to the workman's hand-labor and not a supplanter of it. The workman worked for himself and not for any capitalistic employer and he was accordingly master of his work and his time. This was the period of pure handicraft.' [6] It will be noted that for him handicraft did not exclude the use of machines and that the word had strong social and historical implications. It was not a word referring to any definable technique.

In this book there is no need for us to go into the question of whether Morris's beliefs about the Middle Ages are true.

One contributory cause of present confusions of thought about hand-work and craftsmanship is perhaps that people have generalized about it who did not know, or did not think enough about, the way tools do actually work. I am inclined to propose that the term hand-work should be confined to the work of a hand and an unguided tool; but that is an extremely restrictive definition. I do not think any woodworking tool can be properly said to be unguided after the moment when it enters the wood. They all cut their own jig as they work and sometimes a pretty exact one, as with a paring-chisel or a scribing-gouge. Workmanship in different trades differs so widely in its basis as well as its practice, that the only common factor and the only means of generalization in all the different branches of craftsmanship is the element of risk we have discussed.

The extreme cases of the workmanship of risk are those where a tool is held in the hand and no jig or any

[6] 'The Revival of Handicraft', *Fortnightly Review*, November 1888.