I

THE HISTORICAL OBJECT: BENJAMIN BAKER'S FORTH BRIDGE

. . . we think we know when we know the cause . . .
(Aristotle, *Posterior Analytics*)

1. *The idiographic stance*

ONE IMPLICATION of all this is that, given such odd objects of explanation, the relation of the art historian to historical method is likely to be a Bohemian one. The theory of historical explanation has tended to divide into two camps — the nomological (or nomothetic) and the teleological (or idiographic). On one side the nomological people argue that it is possible, at least in principle, to explain historical human actions within quite strictly causal terms as examples covered by general laws, on the same logical pattern as a physical scientist explaining the fall of an apple. On the other side are the teleological folk, who decline the model of the physical sciences and argue that the explanation of human actions demands that we attend formally to the actor's purposes: we identify the ends of actions and reconstruct purpose on the basis of particular rather than general facts, even while clearly if implicitly using generalizations, soft rather than hard ones, about human nature and so on.

Now it might seem that the explanation of a picture is more likely to feel at ease near if not in the teleological camp, and indeed we will not often be able to proceed with anything like a nomological gait: addressing a picture with a general law feels rather like addressing a peach with a billiard cue – the wrong shape and size of instrument, designed for movement in the wrong direction. But it seems best to be clear that this is a matter of sub-theoretical dis-affinity.

We are going to *behave* in a more or less teleological style because this is the direction of our energy and interest. The energy

within nomological explanation runs first towards generalization, towards identifying the general laws under which individual performances can be brought; our interest as historians or critics is more often idiographic, towards locating and understanding the peculiarities of particulars. We seek differentiating tools first; this does not mean our explanations could not be rewritten in a generalizing form. We do not know about that; we just have low-order tastes.

This goes with a further sub-theoretical restriction. Whereas the historian envisaged by many methodologists of history seems primarily concerned to explain actions or events like Caesar crossing the Rubicon or the French Revolution, we are typically concerned to explain certain material and visible deposits left behind by earlier people's activity – for this is one of the things pictures are. It will be said, the 'historian' too works with deposits from activity, physical records and documents, inscriptions and chronicles and much else, from which he must reconstruct both the actions or events he studies and their causes. This is clearly so. But his attention and explanatory duty are primarily to the actions they document, not to the documents themselves: otherwise one would say he was attending to an ancillary discipline, such as epigraphy. We by contrast, expect to attend primarily to the deposits, the pictures. We will certainly make inferences from these to the actions of man and instrument that made them as they are — these are involved in our language, in concepts like 'design' — but this will usually be as a means of thinking about their present visual character.

The difference is not sharp. Real historians study all sorts of purposeful artefacts, legal codes and constitutions; they study Polybius for his modes of explanation as well as for the historical actions he chronicles. As for the art historian, there are questions to ask about such things as how far he is concerned with pictures as objects and how far with their effects. But my purpose here is to make a rough distinction necessary to disengage us from unhelpful aspects of the method of history, and for this the broad point of difference is enough.

We cannot reconstruct the serial action, the thinking and manipulation of pigments that ended in Piero della Francesca's *Baptism of Christ*, with sufficient precision to explain it as an action. We address the finished deposit of an activity we are not in

a position to narrate. If there is an act we study it is Piero's relinquishing the *Baptism of Christ* as more or less fulfilling his purpose, and this, while assumed by us in important ways, is too artificial an object to be the centre of our attention. One is encouraged to take a stand here because there is a good symmetry between the focus of our attention and that of the actor's own purposefulness. Whereas the 'historian's' actor is purposeful more towards his action and its outcome than to its documentary appearance, our actor is purposeful relatively more towards the deposit of his activity and its effect than to the activity of hand and mind that produces it. We address a thing to which the maker's intention was attached, not a documentary by-product of activity.

The form of explanation one leans to, then, seeks to understand a finished piece of behaviour by reconstructing a purposiveness or intention in it. In fact, this *form* of explanation has been a widely sanctioned one: what is argued over is its status. Both the idealist Collingwood and the realist Popper, to drop just two names, men with divergent views on mind and induction and truth and much else involved in historical explanation, talk of the reconstruction of the process of thought – 'reflective consciousness' in the one case, 'objects of thought' in the other – aimed at solving problems in specific situations. Both see this as explanatory, not just a heuristic ploy, but they differ over its status. For Collingwood what we 're-enact' is the actor's reflection in a reconstructed situation; we do not reduplicate the important sensitive and emotional dimensions of his experience, as such, but there is a role for a sort of empathy to help cope with the fact that mind now is not what mind was in, say, the fifteenth century. For Popper we do not re-enact the actor's thought but produce an 'idealized and reasoned reconstruction' of an objective problem and objective situation on a level different from his actual reasoning; and the role of empathy is confined to 'a kind of intuitive check of the success of [the] situational analysis'. But the form, the procedural pattern of problems and situations and solutions, is common – to a degree reassuring to the sub-theorist. Since I want a low but sturdy platform to strike out from, it is this form I shall choose. One may have to adopt a position later about its status within what one actually finds oneself doing.

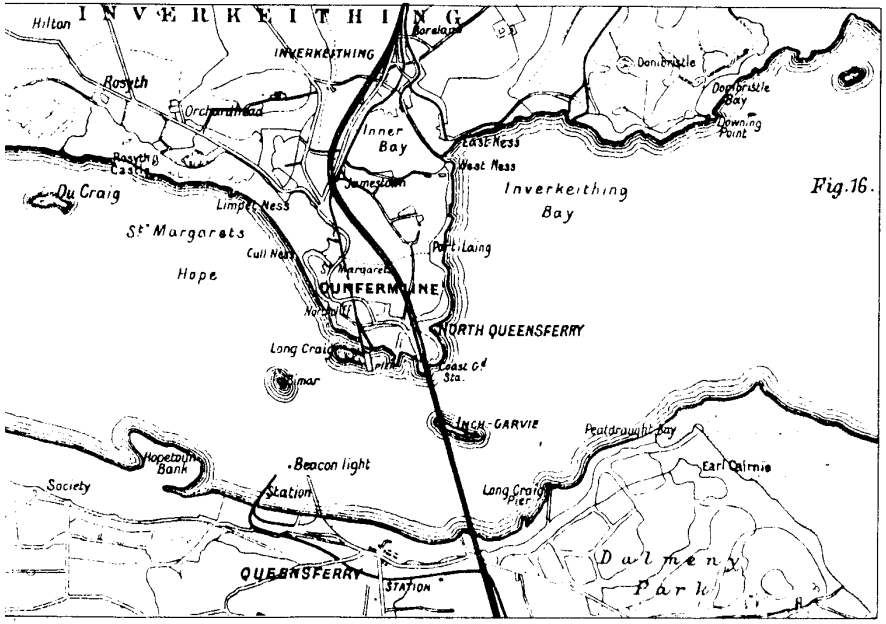
For the moment, then, let us say: The maker of a picture or other historical artefact is a man addressing a problem of which

his product is a finished and concrete solution. To understand it we try to reconstruct both the specific problem it was designed to solve and the specific circumstances out of which he was addressing it. This reconstruction is not identical with what he internally experienced: it will be simplified and limited to the conceptualizeable, though it will also be operating in a reciprocal relation with the picture itself, which contributes, among other things, modes of perceiving and feeling. What we are going to be dealing in are relations – relations of problems to solutions, of both to circumstances, of our conceptualized constructs to a picture covered by a description, and of a description to a picture.

This has all been rather a strain, and I now turn from a sub-theoretical tack to an anti-theoretical tack, anti-theoretical in the sense that I want to turn away from the elegance of general forms to as untidy and complicated a particular case as I have time for. But the purposeful object I shall consider first will be not a picture but a bridge: this will let me both postpone and, by postponing, emphasize a number of special difficulties and peculiarities of pictures and their explanation. I shall introduce in the form of a narrative (sequential and to that extent tendentious), a selection (obviously simplistic) of twenty-four causally pregnant items of information about the railway bridge built over the Firth of Forth (Pls. 1–6 and fig. 5) in the 1880s, and then I shall make an attempt to sort them out. Then I shall consider briefly where the pattern of explanation derived from the case of the Forth Bridge most conspicuously fails to accommodate the interest of a picture like Picasso's *Portrait of Kahnweiler*. And this will settle my stance for addressing more directly, afterwards, some of the explanatory demands made by that picture.

2. *The Forth Bridge – a narrative*

Movement north-south along the east coast of Scotland has long been hindered by a succession of estuaries or firths extending deep into the mainland. In the nineteenth century the Tay and the Forth, in particular, were felt as obstacles to rapid movement between the three main centres of population on the east coast – Aberdeen, Dundee and Edinburgh – and also in the way of access to the first two of these from England. The dominant means of land transport for both people and goods in the later nineteenth



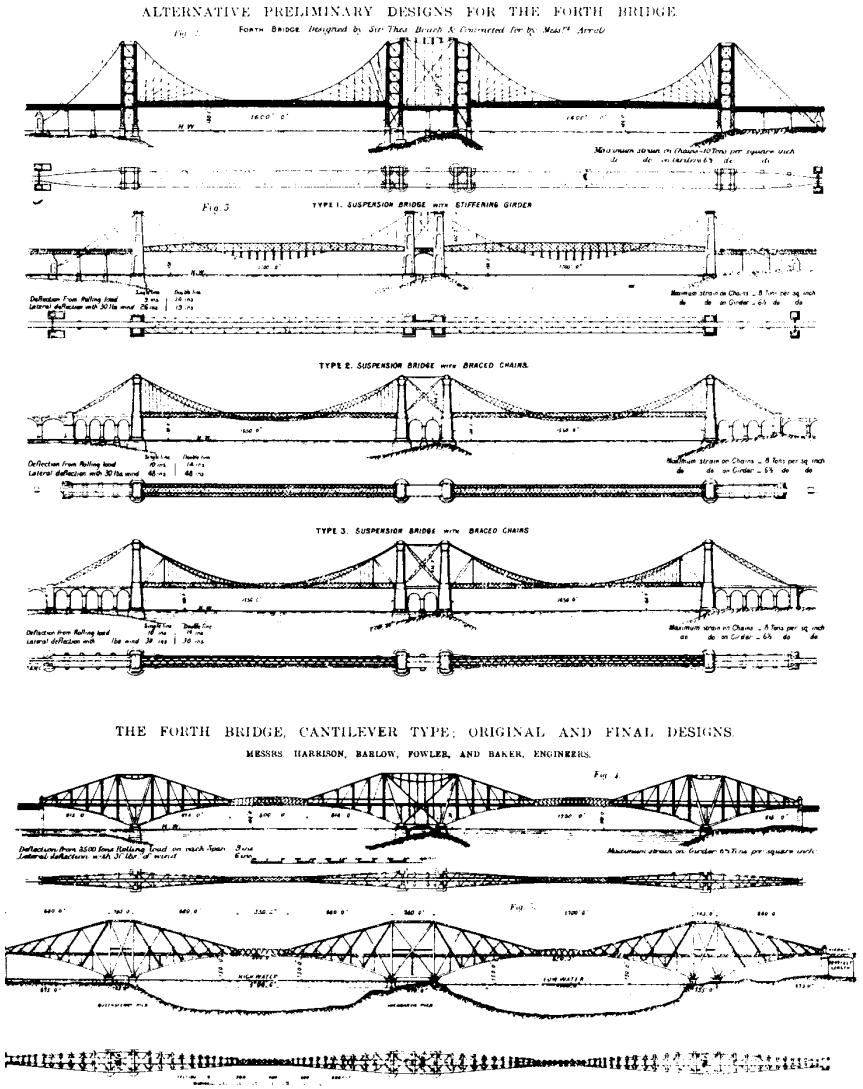
ig. 1. The Forth crossing at Queensferry (from W. Westhofen, *The Forth Bridge*, London, 1890, p. 8).

century was the railway, and for this the long-standing means of crossing the estuaries, ferry-boats, was conspicuously disruptive, and continuity of line by means of a bridge particularly convenient. The railways in Britain were run by a fair number of regional but overlapping companies competing for traffic; it was government policy that there should be such competition, in contrast to how things were managed in, say, France. Competition for north–south and particularly English–Scottish traffic led, in the obvious context of the elongated form of Britain, to rivalry, more intense than the participants' purely commercial advantage demanded, between the companies involved in the east-coast route and those of the west-coast route. There had long been proposals for bridging the Tay and the Forth, but by the 1870s the technology of bridge-building, which had been developing quickly partly in response to the needs of railways, had advanced to a point where it was realistic to think seriously of bridging the estuaries. The North British Railway Company, on whose section of the east-coast route they lay, bridged the Tay in 1871–78 — this being much the

easier of the two because the bed of the Tay allowed fairly frequent piers and short spans. In 1873 all four of those companies who would benefit by accelerating English–Scottish traffic through east Scotland — Great Northern, North Eastern, Midland and North British — agreed to form a joint company for the much harder task of bridging the Forth.

Thomas Bouch, the designer of the Tay Bridge just finishing, presently produced a design (fig. 2) to cross the Forth at the chosen point of Queensferry, an advantageous point not just in manageable breadth but in having, roughly half-way across, a rocky islet, Inchgarvie, which was a convenient base for an intermediate pier and thus for a two-span bridge. For in contrast to the Tay, the bottom of the Forth is too silted and deep to allow foundations for frequent piers: it demands a bridge with very long spans. Besides, the Forth was a naval station with a dockyard above Queensferry and the Admiralty made stipulations about unrestricted navigation under the bridge. Bouch designed a two-span suspension bridge (three piers supporting chains which suspended the road way), and work quickly started on the central pier on Inchgarvie. At this point, 1879, the Tay Bridge blew over in an easterly gale, taking a passenger train with it. Bouch was discredited and work on his Forth Bridge ceased. What had been constructed of his central pier in the Forth now carries no more than a warning beacon.

The Forth Bridge Company next turned to two other engineers, John Fowler and Benjamin Baker. Fowler was the senior man, an accomplished organizer, and was chiefly responsible for the complex approaches to the bridge; Benjamin Baker was primarily responsible for the design and construction of the bridge proper, and I shall simplify matters by treating him as the designer, even though he was a principal rather than a soloist. Two things are particularly noticeable about Baker's background and previous career. First, he had a strong background in metal technology. His family was in the iron-founding industry and he himself had served an apprenticeship in an ironworks at Neath. He had published papers in the 1860s on the strength and resistance of metal in structural use, including one in 1867 on its use for long-span bridges – a subject on which he had developed views and ideas long before the call to the Forth. Secondly, he had something of a historical view on his art: he was interested in the work



. Alternative projects for the Forth Bridge, including (top) Thomas Bouch's proposal and (bottom Baker and Barlow's first and revised plans (from W. Westhofen, *The Forth Bridge*, London, 1890, 5).

of past engineers and had restored some of the engineering monuments of the early industrial revolution, and he was aware of bridge-building solutions outside immediate contemporary practice.

His situation was coloured by the Tay Bridge *débâcle* and particularly by the most prominent element in this, the problem of side-wind pressure from the easterly gales met in the east-coast estuaries. It had turned out that Bouch had designed his disastrous bridge on an assumption that it would have to resist side winds of up to 10 pounds to the square foot only. Baker took wind measurements on Inchgarvie and soon recorded winds of the equivalent of 34 pounds to the square foot. The Board of Trade, representing government, insisted on a designed resistance to at least 56 pounds to the square foot. Alertness to this problem is clearly registered in the design: avoiding large flat surfaces presented to the side winds, cross-strutted, and, above all, broadbased in cross-section – each pier being 120 feet wide at its base as against only 33 feet at its top. All this amounted to allowing for an intermittent lateral load on each span of 2,000 tons, compared with 4,000 and 6,000 ton forces allowed for the static tension and compression respectively within each cantilever.

In recent engineering practice a number of different spanning principles had been used for long spans: suspension from chains hanging from towers as Bouch had intended for the Forth; large rectangular self-supporting tube girders actually enclosing the road as Robert Stephenson had used at Menai; circular tube girders with the road suspended beneath as Brunel had used at Saltash – both Menai and Saltash also being two-span railway bridges. Baker went right away from these and settled on the less familiar cantilever principle, three cantilevers joined by and supporting two straightforward truss sections, making two main spans of a third of a mile each. Though a cantilever principle had been tried out on a smaller scale and in a less radical form in Germany as early as 1867, a stimulus for the cantilever bridge – which Baker himself preferred to call 'continuous girder bridge' – was from a tradition of oriental wooden bridges which interested Baker, the man of historical bent. A Tibetan example (fig. 3) had been drawn in the late eighteenth century, and an example known in England was the Wangto Bridge across the Sutlej River in India. There is also one on the Willow Pattern ceramic design.

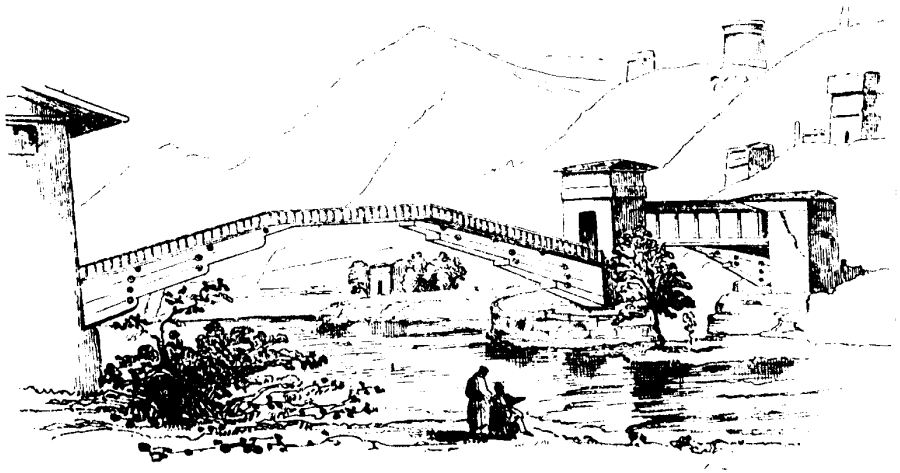


Fig. 3. Sketch by Lieutenant Davis, R.N., of a Tibetan bridge, 1783 (from W. Westhofen, *The Forth Bridge*, London, 1890, p. 6).

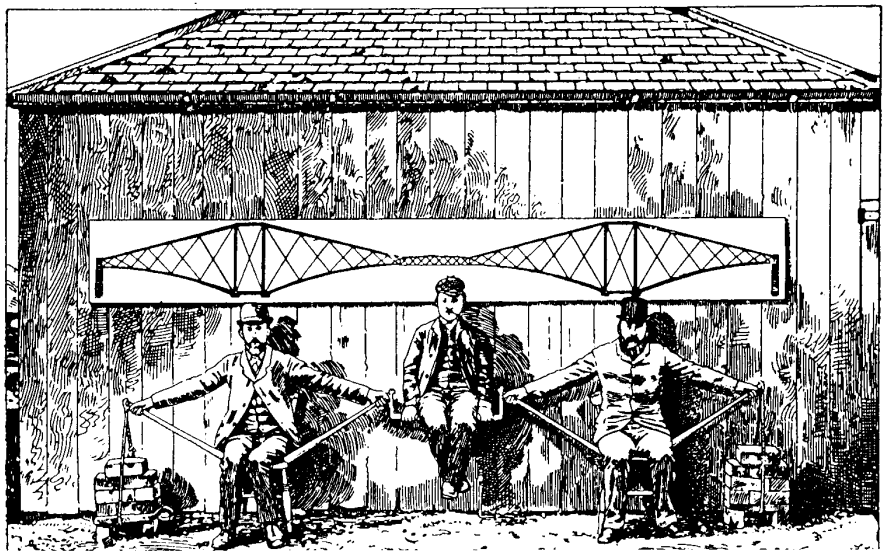
Baker adapted this ancient principle to metal construction on the colossal scale.

One of the advantages of cantilever bridges is that the pattern of stress is clearly and easily calculated: thus, partly, the clarity of the Forth design. In cantilever piers such as the three at Queensferry the top lateral members are in tension, the bottom lateral members in compression, as are the central vertical members (fig. 4). Baker decided that the strongest form for the girders in tension would be lattice girder composed of L-section beams and the strongest for girders in compression would be the circular tube (Pl. 1). This decision is clearly a basic and determining element in the rationale of the middle forms of the structure. Each cantilever tells its story of tension and compression in this vocabulary (Pls. 4, 5).

But the decision on the two girder forms was taken in specific relation to the properties of the metal available to him. Here one can feel a number of circumstances in play. First, as I have said, Baker was sophisticated about metal. Secondly, along with side-wind pressure, a cause of disaster identified in the inquest into the Tay Bridge affair had been a scandalous metallurgical slovenliness. Thirdly and very importantly, Baker was working up his design at a moment when mild steel manufactured in the Siemens open hearth furnace had recently become available in large enough quantities and sizes for use in such a large structure. In the United States it had already been used for bridge construction, though not on this scale, but in Britain worries about its tendency to corrode had confined bridge-builders to iron, mainly wrought iron. Steel was an exciting new material. As Baker put it, 'You can fold half-inch plates like newspapers and tie rivet bars like twine into knots'. Compared with wrought iron, it was more ductile and responsive in the working, it was of greater strength, and it came in larger sections – for instance in plates large enough for making Baker's tubular girders (Pl. 1). It is a prime condition of the form of the bridge. But it is important that, while mild steel of the kind available to Baker is absolutely stronger than wrought iron, it is not equally so under all kinds of stress. It withstands 50% more tension and compression but only 25% more *shear* stress – that is, the tangential stresses leading to angular deformation and, in the case of failure through strain, layered fracture along the beam. Steel's relative sensitiveness to shear stress is clearly expressed in Baker's choice of girder forms, most obviously in the lattice.

When construction of the bridge began, Baker was fortunate in the building contractor, William Arrol, an exceptional and

Fig. 4. The structural principle of the Forth Bridge demonstrated by members of Benjamin Baker's staff, after a contemporary photograph.



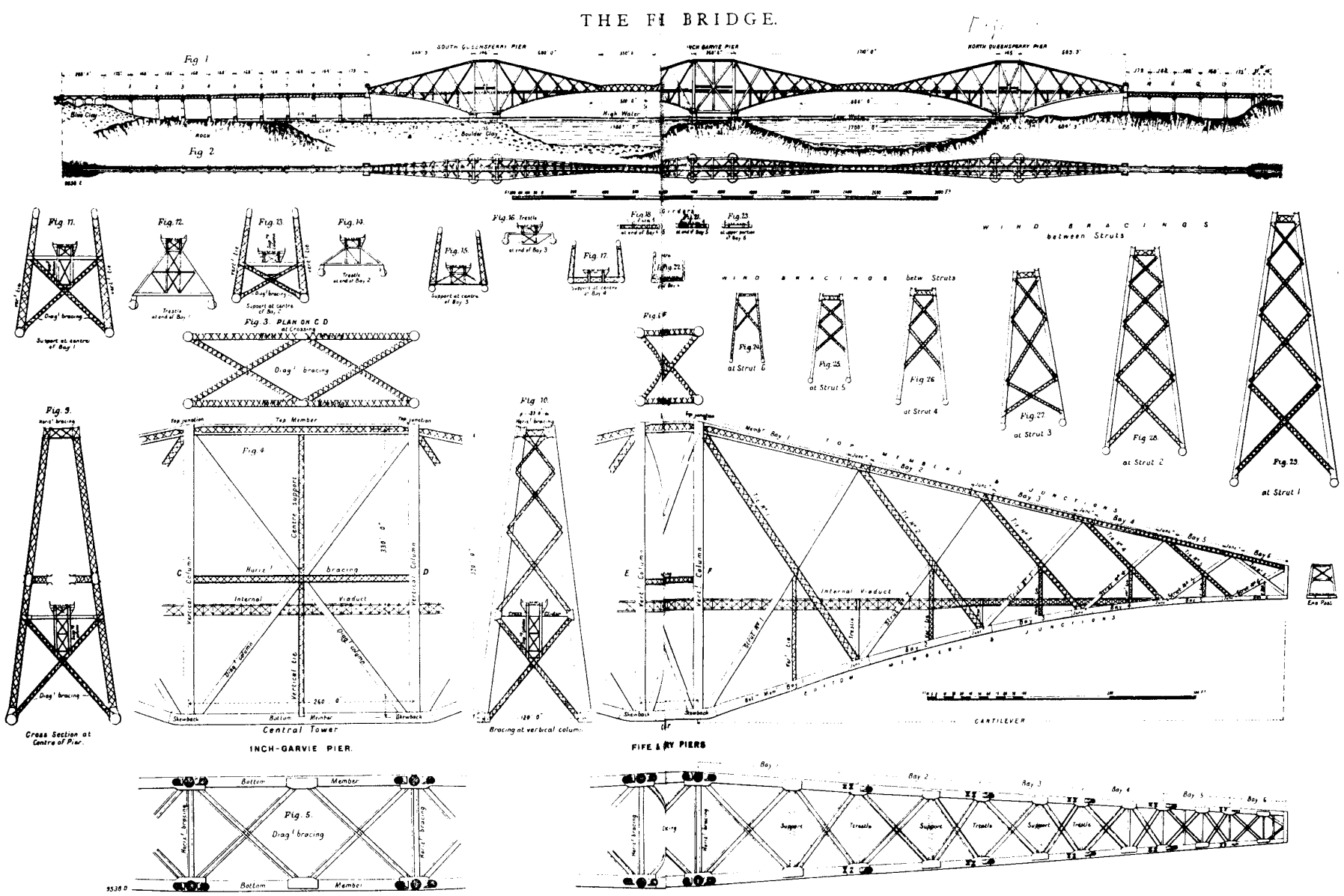


Fig. 5. The structural elements of the Forth Bridge (from W. Westhofen, *The Forth Bridge*, London, 1890).

resourceful man who was later to become a virtuoso executant in the new medium of mild steel. Arrol not only used the most advanced tools available – such as hydraulic presses for forming steel sheet into the great twelve-foot tubes of the cantilevers – he also invented new tools in response to the task: one was a hydraulic riveting machine to enable the driving of the seven million rivets the bridge demanded. The work was completed in 1889, having cost three million pounds and the lives of 57 workmen.

Public taste of the period identified itself across a wide spectrum. From familiar premises William Morris was negative: 'There never will be an architecture in iron, every improvement in machinery being uglier and uglier, until they reach the supremest specimen of all ugliness – the Forth Bridge.' Alfred Waterhouse, the architect of the Natural History Museum in London, was positive, from a broadly functionalist position: 'One feature especially delights me – the absence of all ornament. Any architectural detail borrowed from any style would have been out of place in such a work. As it is, the bridge is a style unto itself.' And Baker himself was pricked by Morris into producing, in an address to the Edinburgh Literary Institute, a statement of his own position, a sort of expressive functionalism. He said that he doubted

if Mr. Morris had the faintest knowledge of the duties which the great structure had to perform, and he could not judge of the impression which it made on the minds of those who, having that knowledge, could appreciate the direction of the lines of stress and the fitness of the several members to resist the forces. Probably Mr. Morris would judge the beauty of a design from the same standpoint, whether it was for a bridge a mile long, or for a silver chimney ornament. It was impossible for anyone to pronounce authoritatively on the beauty of an object without knowing its functions. The marble columns of the Parthenon were beautiful where they stood, but if they took one and bored a hole through its axis and used it as a funnel of an Atlantic liner it would, to his mind, cease to be beautiful, but of course Mr. Morris might think otherwise.

He [Sir B. Baker] had been asked why the under side of the bridge had not been made a true arc, instead of polygonal in form, and his reply was that to have made it so would have materialized a falsehood. The Forth Bridge was not an arch, and it said so for itself. . . . Critics must first study the work to be done both by the piers, and by the superstructure, and also the materials employed, before they are capable of settling whether it is beautiful or ugly. It would, he added, be a ludicrous error to suppose that Sir John Fowler and he had neglected to consider the design from

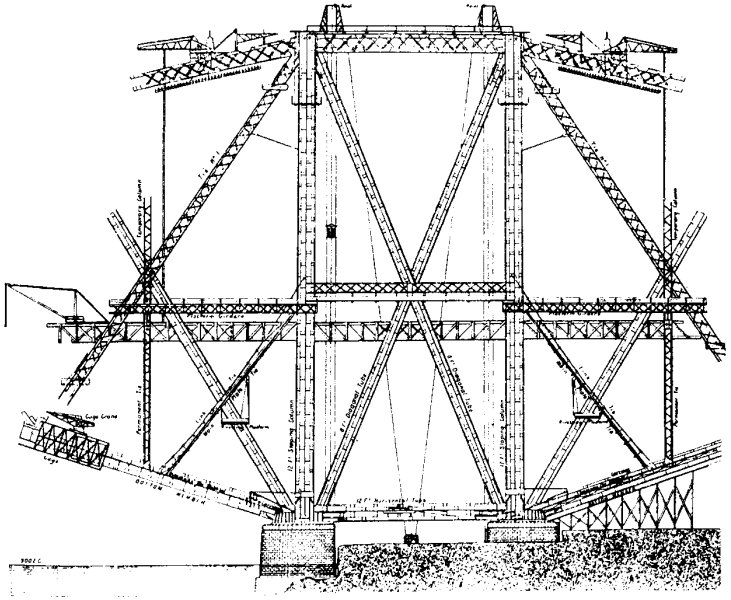


Fig. 6. A cantilever of the Forth Bridge under construction (from W. Westhofen, *The Forth Bridge*, London, 1890, p. 53).

the artistic point of view. They did so from the very first. An arched form was admittedly graceful, and they had approximated their bridge to that form as closely as they could without suggesting false constructions and shams. They made the compression members strong tubes, and the tension members light lattice work, so that to any intelligent eye the nature of the stresses and the sufficiency of the members of the structure to resist them were emphasized at all points. . . . The object had been so to arrange the leading lines of the structure as to convey an idea of strength and stability. This, in such a structure, seemed to be at once the truest and highest art.

This reads like a neo-classical statement, an argument from decorum that might have come from Leon Battista Alberti.

3. *Putting questions: why at all and why thus?*

It may help in what follows if I first number the main cause-suggesting features of the narrative:

1. East-coast estuaries of Scotland
2. Location of towns
3. Railway's need of continuity of line
4. Railways independent companies
5. East–west rivalry for north–south traffic
6. Near-competent state of bridge-building art
7. Inchgarvie Islet in the Forth
8. Silted bottom of Forth
9. Admiralty's demand for shiproom
10. The Tay Bridge disaster
11. Bouch dismissed: Fowler and Baker appointed
12. Baker's sophistication about metal
13. Baker's historical bent
14. People's alertness to side-wind problem (see 10)
15. The existing range of bridge types (declined)
16. Cantilever model in Orient (see 13)
17. Tube-and-lattice theory of girders (see 12)
18. Attention to metallurgy (see 10 and 12)
19. The Siemens open hearth
20. Steel's ductility and strength
21. Steel's sensitiveness to shear stress
22. William Arrol's executive virtuosity
23. A gamut of public taste
24. Baker's 'functional expressionism'

These are not homogeneous. It would be easy to multiply them several times. But twenty-four causes seem quite enough to handle in this demonstration, and they do represent a range of kinds.

When one sets about sorting them, it is hard to proceed at all until one frames questions adequate to them. To ask simply what are the causes of or in the Forth Bridge is too unfocused to do anything with. And, in fact, both the material and the question seem to fall into two principal episodes, not so much historical as analytical. The first episode consists of a question about why there is a bridge, and material relevant to it (principally items 1–6). The second consists of a question about why the bridge has the form it does, and the circumstances of that. These were not insulated from each other, either in their historical sequence or in the actors' minds, but the distinction is necessary to our thought about the whole affair. They are distinguished for us partly by being the

immediate provinces of two different chief agents, the railway companies for the first, Benjamin Baker for the second. And they are both linked and demarcated by a two-phase event, a double decision – 'Bridge!' and (eventually) 'Baker!' – necessary for modulation from one to the next. It is the second question, the question about the form of the bridge, that is closest to the specifically art-critical concern with the visual interest of objects.

The first question, however, the question about the decision to build a bridge, is a good historical question, as would be the subsidiary question about the reasons for Baker being chosen to direct its making. We do often concern ourselves with how it was decided to have an object made – because we have a larger preoccupation with something like 'patronage' or with the predominance of a certain genre, or with the success of an artist who makes a certain sort of object, or for other good purposes. But this is precisely the crossing-the-Rubicon sort of causal question for which methodologists of history do offer broad procedures, and I shall therefore be very brief about it.

For the question about why the bridge was made, the methodologists would first point out that the circumstantial items in nos. 1–6 are obviously very incomplete: all kinds of necessary conditions are omitted, from the fact of gravity, through the buckling of Lower Old Red Sandstone across central Scotland during the mid-Devonian period that laid the foundations of the east-coast estuaries, to such matters as the social acceptance of the high mortality among workmen involved in such grand projects. And they would then offer various procedures for selecting and organizing such items into a reasonably economical and tidy account.

One procedure would be to distinguish between things which are normal and general conditions – such as gravity – and those which are specially present – such as the placing of population centres – and to prefer the latter. A second procedure would be to distinguish between things that must necessarily have been in the reflecting minds of the actors for them to have acted as they did – such as the probable competence of the bridge-building art – and those that need not have been in their minds – such as mid-Devonian geology or indeed social acceptance of high mortality among workmen – and to prefer the former. Then also we might do a rough stemmatics about immediacy, letting no. 4, for example – the larger fact of competition between independent

companies – become a more general condition from which no. 5 – east-west rivalry for north-south traffic – partly derives as a particular and immediate condition of the bridge's making. And conversely we could move up from no. 4 to a yet more general condition in the economic organization of the United Kingdom in the 1870s; and afterwards, of course, if one wanted, further up still. The logical status of some of these distinctions does present difficulties to the methodologists in the working out, but the commonsense sorting of circumstances we habitually do in this style is not outrageous.

When we had done this kind of sorting, the next question would be about which of them we should actually adduce in our explanation. Here, I think, we would be told that this depended on our frame of reference. If our frame of reference was the kind of history of social and political institutions that the methodologists oddly call 'general history' we would attend to those circumstances that derived from those institutions; so the Bridge would interest us for what it embodied of demographic, administrative and economic organization. But if it were the history specifically of *bridges* with which we were concerned, our duty would be two-phase. First, we would isolate an immediate complex of necessary conditions – dominated by nos. 1, 2, 3, 5 and 6 – that makes the particular decision to build comprehensible. And then, we would compare these with those involved in other decisions to build bridges. And, of course, a similar process would go into accounting for the derivative decision to employ Baker – for which one would start off from nos. 10, 12 and 18.

All this is very obvious. I labour it because one often meets explanatory remarks on the pattern: 'In the last analysis it is the (say) economic structure of late-nineteenth-century Britain that determined the making of the Forth Bridge.' And there seem two kinds of basis, not always very clearly distinguished from each other, for giving this kind of privilege to one class of cause. The first is that one is really studying economic structures rather than either general history or bridges: in that case one's frame of reference would indeed make it reasonable to point to the Bridge as, among other things, a monument to the fluency of the Victorian money market, competitive capitalism, a class structure that valued steel fitters less than railway directors, and the other economic facts which are undeniably registered in it. The other is that one has a

specific general theory about human affairs in which economic institutions are seen as ultimate causes of human behaviour in general. The issue of whether this theory was a good one could not be settled within the special history of bridge-building: it would take its authority from a wider universe and would be declared – either explicitly or by a consistency in the balance of explanation. And of course the same would apply to the preferring of, say, mineral facts – such as the mid-Devonian foundations of the estuaries or the laying down of the iron ores of which the Bridge is made – by a mineral determinist, or of ideas by an idealist. To special histories of things like bridges (and pictures) one brings general theories derived from a more general experience.

4. *Sorting the causes of form*

But it is the second question – the question about how the Bridge came to take the form it does – that I shall concentrate on, partly because it seems closest to an art-critical concern with the visual interest of such objects as pictures, and partly because one finds much less guidance about how to proceed here, either from common-sense historical practice or from systematic procedures for describing cause.

The second analytical episode begins with Baker being given a very general charge within which to act: 'Bridge!' While Baker would certainly have been aware of the circumstances (nos. 1–6 and whatever else in that category one was drawn to adduce) in which the railway companies decided to build a bridge, it does not seem necessary to our analysis of the inventive act that produced the design that we should consider them as active in his mind. It seems enough that we should treat him as having received the charge into which they had been translated by other historical agents and that he should respond to it. However, because of the Tay Bridge and Bouch episode (nos. 10–11), there must have been one special accent on the charge. Explicitly or implicitly it must have been: 'Un-Bouch-like (i.e. solid) bridge!'.

It may or may not be – I cannot judge – that our question about why or how the designer came up with such-and-such forms in the object is in principle convertible into a set of questions on the same model as the question in the first episode; that, even, it can be broken down into some negative feedback series of decisions

about whether or not to do something. Certainly the energy in current planning theory is often towards such a pattern. What is clear is that we cannot proceed in this way in our analysis after the fact. Indeed I want explicitly to eschew any ambition to construct a narrative of how Baker came to his design. It is true that with both bridges and pictures one can often distinguish phases of a design. For instance, there is an earlier design of Baker's for the Forth (fig. 2) in which cantilevers stand on two rather than four legs. One infers that a reason for him moving on to four legs was his attending to the need for stability of the cantilevers in the course of their construction, before each gave support to the next in his 'continuous girder'. But such cases offer too coarse a sequence for us to tell the story of his thinking. What we are faced with is simply the task of organizing, in relation to a complex *form*, a number of heterogeneous *circumstances* that appear to have had a part in the designer's conception.

Let us start by particularizing the general *charge* – 'Bridge!' – into a more specific *brief* for Queensferry. The Charge of 'Bridge!' embodies parts like 'span' and 'provide a way' and 'stand without falling'. What I shall call the Brief consists of local conditions in the special case. Specific items are:

7. [A mile-long crossing but] a rocky islet in mid-stream
8. The silted bottom of the Forth
9. The demand for shiproom
14. The strength of side winds

These are surely objective circumstances, in the sense of having a real presence apart from Baker's mind. However, what is less stable is their weighting, their relative mass in the thinking that made the design. For instance, 14 – the matter of side winds – is probably to be seen as affectively coloured high by 10, the Tay Bridge incident; perhaps 9 was simply anticipated by 8.

At this point some sort of demarcation seems called for between the terms of the immediate task the man addresses, the Brief, and the terms of the circumstances in which he addresses it. The pattern seems to be one of a man addressing an objective problem within a circumstantial frame of other facts that affect his perception both of the problem – laying weight on this or that specific term within the Brief – and of solution. They have the appearance of cultural facts.

I do not want to taxonomize them but they do offer themselves in three groups that are not logical but topical. One group relates to the physical medium:

19. The new availability of steel as an alternative to wrought iron
20–21. Steel's properties (ductility, strength, sensitiveness to shear . . .)
17. Theory of steel girders (tube and lattice)
22. Arrol's executive virtuosity with steel

(If one were being methodical, one would certainly want to sort this group out more tidily: thus, 19 embraces the others; 20–21 are descriptions of steel; 17 is a special description of steel in terms chosen by the historical agent for a purpose; 22 is a special remark about availability.) The second group involves facts about the history of the art of bridge-building:

10. Tay Bridge disaster
15. An existing range of railway-bridge types
16. The oriental cantilever model

(10 is an accented part of 15; 16 involves an enlarging of 15.) The third group, which consists of one, it is difficult not to call 'aesthetic':

23. A gamut of articulate visual taste, from Morris to Waterhouse

These all seem active parts in the framework from which Baker addressed his Charge and his Brief.

Several points might be made about this. One, of course, is that it is very gross. Another is that, in comparison with the nuclear four terms of the Brief at Queensferry, these are much more general in character. Most of them are facts of the mid-Victorian material and intellectual culture. If we wanted to use the bridge as a focus on mid-Victorian Britain, it is here and in the circumstances round the railway companies' decision to build the bridge at all that we would find the facts. Here in a sense is a selection from the collective resources of mid-Victorian Britain addressing a specific Brief about side wind, silt and so on. But it is a *selection* from those resources. Each of the three groups consists first of a range of options: a choice of metals and of thoughts about their qualities, a set of

types of bridge, a gamut of aesthetic positions. (The Forth Bridge might have been a wrought-iron suspension bridge with ogee-arched towers.) Who or what made the selection?

Benjamin Baker, an individual, seems to have been the agent in making the selection. It was the culture he lived in that made available to Baker a range of resources that included the possibility of knowledge of, among other bridges, oriental cantilever bridges; the Siemens open hearth together with a body of thought about its product; and a range of rationales about how things should look. Each of these has a complex history, involving in the further analysis everything from classical rhetoric to European commercial expansion. And Baker himself was culturally equipped with skills and attitudes that led him to approach Charge, Brief and resources in a certain style. Yet it was he who fixed on this or that rather than another and it was he who alloyed them all into *a* form. What do we have on Baker as a particular?

12. Baker's sophistication about metal
13. Baker's historical bent
24. Baker's 'functional expressionism'
25. Baker's evidently superior intellect, sensibility and will

Even with the overdue addition of something like no. 25 this is absurdly inadequate in all sorts of ways, and it looks unprofitable to try reducing him further along this line.

What we really have on Baker is, if not precisely the Forth Bridge, then a three-cornered relationship between the Forth Bridge, an objective task or problem, and a range of culturally determined possibilities. The intention of Baker presents itself to us in the form of this triangle. I now jump sideways and backwards.

5. *The triangle of re-enactment: a descriptive construct*

We have conceptualized and verbalized Baker's problem – his Charge and Brief – in such terms as 'bridge' and 'span', 'silt' and 'side winds', and so on. We have done the same with the resources within his situation: 'steel', 'tensile strength', 'cantilever', 'functional' and the rest. What about the third element, the Forth Bridge itself?

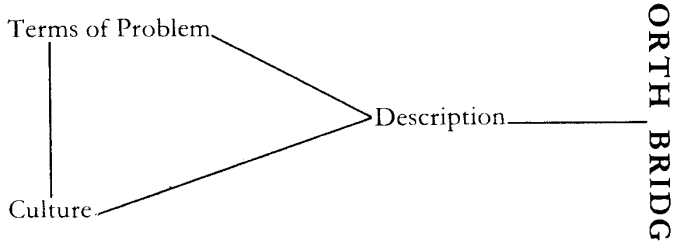
I started from the point that we explain not so much pictures

as pictures considered under a description, a conceptualized and verbalized specification. The same is true of bridges. If one went back to the narrative account of the making of the Forth Bridge in section 2, it would turn out to be made up of two ragged and unequal strands untidily intertwined. One strand, the more bulky of the two, consisted of selected circumstances – which themselves, one must say, contributed to a description by being an expanded and anecdotally based version of the kind of oblique critical language I called inferential about cause on p.6. The other strand consisted of a crude and more direct specification or description, sometimes explicit and sometimes implicit. It is of the type: '... high-level (rather than low-level) bridge on the cantilever (rather than suspension etc.) principle embodying two long (rather than, say, many short) spans, the cantilevers being structures of tube and lattice (rather than, say, of I-section) girders straddled (rather than parallel) in cross-section. ...' It has the same looseness of fit I pointed to in art-critical language. And it is this specification that the circumstances I assembled both supplement descriptively and propose immediately to explain.

The untidiness and circular potentiality of this does not seem vicious unless it is unrecognized. There is an affinity or homology between the circumstances collected and the Bridge as-considered-under-description to the extent that both are being represented by verbalized concepts. It is only this that allows us to think in an explanatory vein at all. It allows us to match in a quite rough way one representational concept with another, even to match circumstances with items in the description – *long span* with *silted bottom* and *shiproom* and so on. The matchings are very gross and very limited, and are modified in any total explanation. But they are in contrast with the impossibility of matching any circumstance directly with the Bridge.

I cannot distribute the different circumstances of the bridge among its different sections – side winds to the left, Siemens steel to the right, expressive functionalism somewhere else. In the form of the Bridge, Baker alloyed circumstances, he did not aggregate or collocate them, and we cannot follow him conceptually into the alloyed form of the Bridge. By assaying it out, in the sense of overlaying the form with conceptualizations that have at least something in common with the tissue of his own self-critical reflection, we make it treatable, to a degree.

So one might see the sort of thinking about the Bridge attempted here as a kind of rough triangle of re-enactment done between three bases: concepts pertaining to the Charge and Brief, concepts pertaining to resources used or *not* used, concepts descriptive of the Bridge. Or:



What we do if we want to know about Baker is to play a conceptual game on the triangle, a simplified reconstruction of the maker's reflection and rationality applying an individual selection from collective resources to a task. The triangle is beside the Bridge, with the description as the apex specially responsible for keeping in some sort of touch with the Bridge itself. It is a pity it can do so only coarsely, but at least two things make it better than it seems. One is that, as I have said, not only the direct description but the other elements play a descriptive part. Indeed the whole basis of what I am calling inferential criticism is that one brings all three corners of the triangle, in an active relation to each other, to description of the object. Description and explanation interpenetrate each other.

The other is, as I have also said, that we are back with the ostensive nature of the language of criticism: concepts and object reciprocally sharpen each other. For instance, if we are told or if we infer after observation that Benjamin Baker reckoned tubes best for compression lines and lattice girders best for tension lines with secondary shear stress, this surely sharpens our sense of the organization of matter within the cantilevers. But correspondingly, once one has got to this point, the object itself leads us to see the progressive sharpening of angle of the cross-tubes as one moves out on to the wings of the cantilevers (Pl. 5) and much else which one does not have to spell out. This is the nature of the critical act

we are concerned with: the concept sharpens perception of the object, and the object sharpens the reference of the word.

6. *Summary*

The methodical status of all this is very shaky; it has been arrived at by travelling a zigzag route. I started from a very low and simple theoretical stance: that historical objects may be explained by treating them as solutions to problems in situations, and by reconstructing a rational relationship between these three. I then followed the prompting of a particular: following what felt like the grain of the case of the Forth Bridge has led us to this point. And, as it has fallen out, the attempt to address the Forth Bridge as a thing made to solve a problem in specific circumstances led to dealing with matters in a sequence that swung between attention to individual facts and attention to general facts.

The sequence began by positing that the object of interest, the Bridge, was a concrete *solution* to a problem. The solution was in a sense given and visible: the problem was not, except in the guise of a mile of water. In trying to identify it one came first to the general *Charge* that the agent, Benjamin Baker, would be responding to, and noted that while it could be terse — 'Bridge!' — it was a rubric for performance that contained within it various general terms of the problem — spanning, providing a way, not falling down. From this one moved on to more specific terms of the problem, which I called the *Brief*, though the name does not matter. What does matter is that these specific local conditions at Queensferry qualified the general Charge and were necessary to make it a specific problem susceptible to a solution. Together Charge and Brief seemed to constitute a *problem* to which we might see the bridge as a solution.

But this still left out much of the circumstantial matter one wanted to bring in – partly (and this seems important) because one enjoyed thinking about it, but partly also because one sensed that it was causally involved in the form of the Bridge. In practice, these circumstances came up as general ranges of *resources* offered the agent. As it happened they fell into three topical groups — resources of medium, of models (both positive and negative), and of 'aesthetic' — but this topical division is a different sort of division from the others, and may be an accident of the case.

An individual, Benjamin Baker or X, made a selection from these resources and alloyed his selection into a form, one solution. X is elusive; very little worth saying can be said about him directly, though some broad things can be inferred from his other behaviour and from his statements. The way we are proceeding seems to entail that we are thinking of him as a compound of rationality and culture and quiddity. This means, among other things, that we could not work through our sequence from the problem to his solution if the solution were not visible, because he is an insufficiently known quantity in the schedule; instead the solution is the given and we continually refer to it. What we do about X, then, is to play a conceptual game on what I have just called the *triangle of re-enactment*. This is a very simplified diagram of quite a high level of consciousness: it is not a narrative. It is a representation of reflection or rationality purposefully at work on circumstances — and I shall insist again that this representation takes life and meaning from its ostensive relation to the Bridge itself — and we derive a sense of the agent's quiddity by relating to these circumstances the solution he actually arrived at. If we 'explain' the form of the Bridge at all, it is only by expounding it as *one* rational way of attaining an inferred end.

What happens if we go through a sequence like this with a picture? More particularly, where does the shoe pinch — in the sense of the sequence excluding or distorting the kind of matter we want to do justice to in an account of a picture?

7. *The peculiarity of the pictorial object*

I do not want to prolong this. It is possible to find objects with which one can follow something that looks a little like the Forth-Bridge type of explanation: some late Dürer woodcuts, for instance, lend themselves to it. But it will be more expeditious to put the model under heavy strain at once. In working (as I shall now) with Picasso's *Portrait of Kahnweiler* (Pl. 1) of 1910, I have in mind both this and the fact that it is a picture from the most generally familiar of all episodes in the history of painting, early Cubism. This allows me to assume knowledge.

[But for those who wish to be reminded at least of the chronology of the run-up to 1910, the account current in handbooks goes in summary:

At the start of 1906 Picasso had still been producing pictures in a manner that seemed continuous with his circus vein of 1905. In retrospect, of course, there are in such paintings prefigurations of what was to come. But during the winter of 1906–1907 Picasso was first making exhaustive studies for (Pl. 8) and then eventually painting the picture that was later called *Les Demoiselles d'Avignon* (Pl. 7) which he considered an unfinished painting. The manner of this picture was not only novel, it was discrete, in that the right-hand figures and heads are in a more radically new mode than the left-hand figures. One, though only one, stimulus for this appears to have been African sculpture, which was having something of a vogue among some painters in Paris at the time. This would show itself not only in the two heads on the right but more generally in the reduction of the figures. More broadly, the picture offers little sense of represented three-dimensional space; nor is phenomenal perspective observed in the forms of the figures. In the winter of 1907–1908 Picasso painted a number of smaller pictures (Pl. 9) consolidating and experimenting with this vein, and he also met Georges Braque. Braque, unlike many of Picasso's admirers, reacted positively (Pl. 10) to the *Demoiselles* and the men became close, collaborating in many of the developments that followed in the next few years — 'two climbers on one rope', as Braque famously put it.

The second half of 1908, from the summer on, is for Picasso and Braque particularly a time of pictures (Pls. 10, 11) that show, among other things, a preoccupation with absorbing and using in new ways the advanced style of Cézanne, and particularly Cézanne's reduction of the local plane-structure of objects to a limited number of, so to speak, super-planes registering not so much the seen surface of things as a perceived underlying structure. The term *passage* is sometimes used in relation to this. The perceived structure, however, is not Cézanne's kind of perceived structure but of a kind that appears to evolve from the re-arranged element of the right-hand side of the *Demoiselles*. In particular, it conspicuously begins to presuppose more than a single angle of view on the object.

In the course of 1909, in a very complex development, this matured, and Picasso and Braque followed experimentally various consequences and suggestions within it (Pls. 12–14). Rounded forms are reduced to more rectilinear or crystalline forms. The role of relief modelling with light and shade is attenuated, and

light and dark themselves are used schematically to register the super-planes. The structure of contours and of the edges of planes is determined less simply by the three-dimensional realities out there, and responds more to a tension between these and the flat pattern on the picture plane. The use of more than one aspect, more than a single angle of view on an object is taken further: and much more — all these individual developments of course interacting on each other. 1909 was a very diversely experimental year.

In 1910 Picasso's paintings included a number of carefully considered portraits. One painted in the spring was of Vollard (Pl. 15) the picture dealer. During the summer Picasso was in Spain and painted some pictures in which the represented planes were detached even more from the edges of the super-plane structure, were made more simple and were also less finitely circumscribed (Pl. 16). Back in Paris in the autumn of 1910 he painted the portrait of Kahnweiler, who was becoming — partly because of Vollard's dislike of Picasso's post-1906 manner — important to him as a dealer. The picture took many sittings.]

If one attempts a Forth Bridge view of the *Portrait of Kahnweiler* what seems to fit best is Picasso's use of resources. The opposite number of Benjamin Baker's medium, metal structurally deployed, has to be not so much pigments as forms and colours perceived. Then Picasso's equivalent of Siemens open-hearth steel, a novel medium with new potentialities and also new problems within it, can be Cézanne's way with super-planes or *passage*. The exotic positive model corresponding to the oriental cantilever might be the schematization of form Picasso saw in African sculpture. He has himself given an illustration of an African mask in the *Portrait of Kahnweiler*, on the wall top left. As for Thomas Bouch and the Tay Bridge, negative examples to react away from, Picasso had many of these: the most immediate in 1910, perhaps, were offered by Matisse and also his earlier self, but the underlying case would be the painting and even more the rationale of Impressionism. The Impressionists' fiction that one registered in a picture a momentary sensation and their frivolity in attending to hues more than volumes were things Picasso is sometimes seen as working almost programmatically against. On the other hand, Picasso left no verbalized statement of an aesthetic as crisp and clear as Baker's address to the Edinburgh Literary Institute. And the equivalent of William Arrol, the resourceful executant, was Picasso himself.

These last two points of difference are a warning that all is not well. An explanation of the *Portrait of Kahnweiler* on the Forth Bridge pattern would rather quickly show itself inadequate to the interest of the case, and particularly at two points.

The first inadequacy is the disappearance of 'process', the sense of the picture as — what many good pictures are — something progressively worked out in the course of handling the medium. At Queensferry it seemed plausible to distinguish firmly between two phases, conception and execution: Baker and his men conceived and Arrol and his men executed. But in a picture like the *Portrait of Kahnweiler* it is not quite a matter of the painter first working out a finished design and then picking up his brushes in an executive role and just carrying it out. The phases interpenetrate, and one would surely wish at least to accommodate this sense of process.

Secondly, something quite preliminary that is missing is the problem that Picasso was addressing, both general Charge and specific Brief. In 'bridge' and in 'silt', 'side winds' and the rest we had sharply focused demands on Baker. Moreover, it seems clear who had issued the Charge to design the Bridge: the Forth Bridge Company. But what were Picasso's Charge and Brief — setting a problem in response to which he painted like this — and who on earth issued it, for that matter? If we are to exercise on the triangle of re-enactment, we cannot start with one of the three bases missing. Until we know what Picasso had been set to do, we cannot think constructively about his relation to the resources of the culture.

These two kinds of inadequacy will be addressed in the next chapter. I want to finish here with a last word on the Forth Bridge. For if one looks back at it now, with the unfulfilled demands of Picassos *Portrait of Kahnweiler* in mind, it becomes clear how far the twenty-five cause sketch simplified a greater causal intricacy. With an allowance of a hundred causal items one might have brought in matters analogous to those that are so conspicuously demanding in the picture.

There *is* an element of process, though in a rather different form, hanging round the bridge. If one pursues the matter it turns out that the Forth Bridge represents a late moment in Baker's development: in 1864 and again in 1871, it seems, Baker and Fowler had proposed long-span metal bridges for quite another estuary, the Severn, and at a time when Siemens steel would not have been available. The Forth Bridge is a development of the ideas a little as

the *Portrait of Kahnweiler* is a development from the *Demoiselles d'Avignon*. Then again, the final design replaced an earlier idea for the Forth itself (fig. 2) — a study, as it were. And the final design was a response to the need to take the process of making the Bridge into account: Baker redesigned the cantilevers so that they would be self-supporting at every moment of construction (fig. 6). Baker's mind, at least, went into the execution. And his design made demands on the builder for which the tools, a resource, did not yet exist but now, in response, were developed. Conception and execution are not rationally insulated from each other.

Then again, Baker's reflective perception of his problem would have been less simple and sharp-edged than the sketch admitted. His task was not purely to span a specifically conditioned gap. It was, one could argue, also to do it neatly, impressively, expressively, and with an eye to other secondary qualities. (He made one big and odd concession to neatness: the two side cantilevers are in fact unbalanced in that they do not sustain on the shore side the half truss section they do on the water side. This had to be quietly compensated for with iron weights encased in the stone piers.) The Bridge was, in a subsidiary aspect, a publicity exercise. It became the emblem of the east-coast route, represented on posters and on bank-notes. It was to redeem the reputation of British engineering after the literally disastrous Bouch, and at a moment when Britain was beginning to slip behind the technically better educated French and Germans. It was to be strong eloquently and with panache. There were, in other words, accents on the Brief that we have not attended to. And then again, in the matter of who issued Charge and Brief, one suspects that Baker would not have considered himself as working solely to the directors of the Forth Bridge Railway Company: he was working also to his professional colleagues and rivals, and to a society.

The Forth Bridge and the *Portrait of Kahnweiler*, both purposeful objects, are not necessarily in principle different. The differences seem more of degree and of balance, particularly the balance of our interest or of our critical priorities. One of the deep subject matters of good pictures is the tissue of human intention, in general.

II

INTENTIONAL VISUAL INTEREST: PICASSO'S *PORTRAIT OF KAHNWEILER*

Don't talk to the driver!
(Picasso, to Metzinger)

1. Intention

A WORD must be said about 'intention', I suppose. I have declared an interest in addressing pictures partly by making inferences about their causes, this both because it is pleasurable and because a disposition towards causal inference seems to penetrate our thought and language too deeply to be excised, at least without doing oneself a quite disabling mischief. But since pictures are human productions, one element in the causal field behind a picture will be volition, and this overlaps with what we call 'intention'.

I am not aligned or equipped to offer anything useful on the matter of whether it is necessary to appeal to an author's historical intention in interpreting a picture (or, of course, a poem). The arguments for doing so — that it is necessary if there is to be any determinate meaning in a work, that the relation between intention and actual accomplishment is necessary to evaluation, and so on — are often attractive, but they sometimes seem to refer to a slightly different sort of intention (a complex word) or to intention seen from a slightly different angle from what I feel committed to. The intention to which I am committed is not an actual, particular psychological state or even a historical set of mental events inside the heads of Benjamin Baker or Picasso, in the light of which — if I knew them — I would interpret the Forth Bridge or the *Portrait of Kahnweiler*. Rather, it is primarily a general condition of rational human action which I posit in the course of arranging my circumstantial facts or moving about on the triangle of re-enactment. This can be referred to as 'intentionality' no doubt. One assumes purposefulness — or intent or, as it were, 'intentiveness' — in the

TEXTS AND REFERENCES

INTRODUCTION

1. The point that it is only phenomena as covered by description that are susceptible of explanation is one learned from Arthur C. Danto, *Analytical Philosophy of History*, Cambridge, 1965, pp. 218–20, though I have pressed it in a simpler sense than his.

2. Libanius's description – my version of which is free – in *Libanii Opera*, VIII, ed. R. Foerster, Leipzig, 1915, pp. 465–8:

Ἀγρὸς ἦν καὶ οἰκήματα ἀγροίκοις πρέποντα, τὰ μὲν μείζω, τὰ δὲ ἐλάττω. πλησίον δὲ τῶν οἰκημάτων ἀνατρέχουσαι ἑωρῶντο κυπάριττοι. ὅλας μὲν οὐκ ἦν ἰδεῖν, ἐκώλυε γὰρ τὰ οἰκήματα, τὰ δὲ ἄκρα τῶν δένδρων ἐφαίνετο τὸ τέγος ὑπεραίροντα. ταῦτα, ὡς εἰκός, ἀνάπαυλαν παρεῖχε τοῖς ἀγροίκοις σκιᾷ τε τῇ ἀπὸ τῆς κόμης καὶ ὀρνίθων φωναῖς, οἳ χαίρουσιν ἐπὶ τῶν δένδρων ἱζάνοντες. ἐκδραμόντες δέ τινες ἐκ τῶν οἰκημάτων τέτταρες, ὁ μὲν παρεκελεύετό τι μειρακυλλίῳ πλησίον ἑστῶτι, τοῦτο γὰρ ἐμήνυεν ἡ δεξιά, ὡς ἄρα τι ἐπιτάττοι, ὁ δὲ ἐπεστρέφετο πρὸς τούτους οἷα φωνῆς ἀκούων τοῦ ἐπιτάττοντος. ὁ δὲ δὴ τέταρτος ὀλίγον προελθὼν τῶν θυρῶν τὴν δεξιὰν ἐκτετακὼς ῥάβδον τῇ ἑτέρᾳ φέρων ἐφαίνετό τι βοᾶν πρὸς τοὺς πονοῦντας περὶ τὴν ἅμαξαν. ἄρτι γὰρ ἅμαξα φορτίου πλήρης, οὐκ ἔχω δὲ εἰπεῖν εἴτε ἄχυρα ἦν εἴτε ἄλλο τι φορτίον, τὸν ἀγρὸν ἀφεῖσα μέσην εἶχε τὴν ὁδόν. ἅτε οὖν οὐκ ἀκριβῶς καταδήσαντες τὸ φορτίον, ἀλλὰ ῥᾳθύμως βοηθεῖν ἐπειρῶντο, ὁ μὲν ἔνθεν, ὁ δὲ ἔνθεν, ὁ μὲν γυμνὸς πλὴν διαζώματος βακτηρίᾳ τὸ φορτίον ἀνέχων, τοῦ δὲ ἐφαίνετο μὲν τὸ πρόσωπον καὶ μέρος τι τοῦ στήθους, ὅσα δὲ εἰκὸς ἐκ τοῦ προσώπου, ταῖν χεροῖν καὶ αὐτὸς ἤμυνε, τὰ δ' ἄλλα ὑπὸ τῆς ἁμάξης ἐκρύπτετο. ἡ δὲ ἅμαξα οὐ τετράκυκλος, ὡς ἔφησεν Ὅμηρος, ἀλλὰ δυοῖν τροχοῖν, ᾗ καὶ τὸ φορτίον περιέρρει καὶ ἐδέοντο τῶν ἀμυνόντων οἱ βόες ἄμφω τὸ χρῶμα φοίνικες καὶ εὖ τεθραμμένοι καὶ τοὺς αὐχένας πλατεῖς. τῷ βοηλάτῃ δὲ τὸν χιτωνίσκον ἀνέστελλεν εἰς γόνυ ζωστήρ. τῇ μὲν οὖν δεξιᾷ λαβόμενος τῶν χαλινῶν εἵλκε, ῥάβδον δὲ ἔχων ἐν θατέρᾳ οὐδὲν αὐτῆς ἐδεῖτο εἰς τὸ προθύμους ποιῆσαι τοὺς βοῦς, ἀλλ' ἠρκεῖτο τῇ φωνῇ. καὶ γὰρ ἡδύ τι πρὸς αὐτοὺς ἔλεγεν οἷα δή τι φθεγγόμενος ὧν ἂν ξυνίῃ βοῦς. ἔτρεφεν ὁ βοηλάτης καὶ κύνα, ὡς ἂν ἔχοι καθεύδειν ἔχων τὸν φύλακα. καὶ παρῆν ὁ κύων τοῖς βουσὶ παραθέων. χωροῦσα δὲ ἡ ἅμαξα πλησίον ἦν ἱεροῦ. τοῦτο γὰρ ἐσήμαινον οἱ κίονες καὶ τὰ ὑπερκύπτοντα δένδρα.

Kenneth Clark on the *Baptism of Christ* in his *Piero della Francesca*, London, 1951, pp. 11–14, the cited passage on p. 13.

3. A more exasperated version of this account of the indirect lexicon of art criticism in M. Baxandall, 'The Language of Art History', *New Literary History*, X, 1979, pp. 453–65.

Senses of 'design' extracted from the entry in the *Concise Oxford Dictionary*.

4. This section is obviously coloured by speech act philosophy of the general kind surveyed in, for instance, J.R. Searle (ed.), *The Philosophy of Language*, Oxford, 1971. This would, I think, point to the 'performative' or 'perlocutionary' character of art criticism, but I do not want to claim consistency with this style of analysis and so do not use its terminology.

I

1. The distinction between teleological and nomological traditions of explanation is clearly laid out in Georg Henrik von Wright, *Explanation and Understanding*, London, 1971, especially Pt. I, but also in many other books. The issue is the main feature of most collections of readings on the philosophy of history and can be conveniently pursued in, for example, Patrick Gardiner (ed.), *Theories of History*, London/New York, 1959, Pt. II; William H. Dray (ed.), *Philosophical Analysis and History*, New York, 1966; Patrick Gardiner (ed.), *The Philosophy of History*, Oxford, 1974.

For Collingwood's conception of 're-enactment', R.G. Collingwood, *The Idea of History*, Oxford, 1946, Part V, especially pp. 282–302. It should be said that Collingwood's idealist theory of art led him (pp. 313–14) to exclude art from the subject-matters open to historical explanation. For Collingwood's idea of art, his *The Principles of Art*, Oxford, 1938, and for its position within aesthetics Richard Wollheim, *Art and its Objects*, 2nd ed., Cambridge, 1980, Sections 21–3. Collingwood's philosophy of history is the subject of a growing literature. A thorough recent study with good bibliography is Rex Martin, *Historical Explanation: Re-enactment and Practical Inference*, Ithaca, 1977. The most convenient statement of Popper's position is in Karl R. Popper, *Objective Knowledge: An Evolutionary Approach*, Oxford, 1972, Ch. 4, especially pp. 166–90. This includes both an example – an explanation of Galileo's erroneous theory of tides – and Popper's own account of how his position differs from that of Collingwood.

2. The best general book on the Forth Bridge is still W. Westhofen, *The Forth Bridge*, London, 1890 (reprinted from the periodical *Engineering*, 28 February 1890). Also useful is Thomas Mackay, *The Life of Sir John Fowler, Engineer, Bart., K.C.M.G., Etc.*, London, 1900, Ch. XI ('The Forth Bridge'), with the comments of Morris and Waterhouse and the extract from Baker's address to the Edinburgh Literary Institute, pp. 314–15. The general technological context of the Bridge is well sketched by L. T. C. Rolt, *Victorian Engineering*, Harmondsworth, 1970. The best technical account of the construction of the Bridge is, significantly, G. Barkhausen, *Die Forth-Brücke*, Berlin, 1889. A fine series of photographs of its construction was published as Philip Phillips, *The Forth Bridge and its various stages of construction . . .*, Edinburgh, n.d.

3. Maurice Mandelbaum, *The Anatomy of Historical Knowledge*, Baltimore, 1977, both touches on the sorts of cause-sorting mentioned here and elaborates on the

distinction between general and special history. This is an unusually helpful book for art historians wishing to reflect on their activity.

7. This is no place for a bibliography of studies of Early Cubism but accessible studies of the kind this account derives from include: Edward F. Fry, *Cubism*, London and New York, 1966, particularly for its collection of translated documentary texts; John Golding, *Cubism: A History and an Analysis 1907–1914*, 2nd ed., London, 1968; Douglas Cooper, *The Cubist Epoch*, New York and London, 1971; Pierre Daix and Joan Rosselet, *Picasso: the Cubist Years 1907–16*, Boston and London, 1979.

II

1. The discussions of intention in aesthetics and literary theory do not mesh very well with those in the methodology of history. A good short bibliography for the first is in Richard Wollheim, *Art and its Objects*, 2nd ed., Cambridge, 1980, pp. 254–5. A good selection of papers in David Newton-de Molina (ed.), *On Literary Intention*, Edinburgh, 1974, the items by F. Cioffi and Q. Skinner being particularly helpful. For the second, Georg Henrik von Wright, *Explanation and Understanding*, London, 1971, Ch. III ('Intentionality and Teleological Explanation'), with bibliography, addresses the issues directly; but they are immanent in much of the more general philosophy of history represented in readers such as those cited in the references to I. 1, where however one must look less to 'intention' than things like 'motive' and 'rational explanation'. There are also Diltheyan, Phenomenological and other lines of discussion of intention in hermeneutics which I do not pursue.

2. The three functions of the religious image were a commonplace, sometimes attributed to Thomas Aquinas; two representative formulations, one thirteenth-century and the other fifteenth-century, are translated in M. Baxandall, *Painting and Experience in Fifteenth-Century Italy*, Oxford, 1972, p. 41.

The first edition of Kahnweiler's book – a shorter version of which had come out in the periodical *Die weissen Blätter* in 1916 – was Daniel-Henry Kahnweiler, *Der Weg zum Kubismus*, Munich, 1920. An English translation exists, called *The Rise of Cubism*, trans. Henry Aronson, New York, 1949; there are substantial extracts in Edward F. Fry, *Cubism*, London and New York, 1966, and in such readers as Herschel B. Chipp, *Theories of Modern Art*, Berkeley, 1968.

3. Roger-Marx's comment on the history of Salons is part of his untitled preface to the *Catalogue des ouvrages* of the Societé du Salon d'Automne, 6 October–15 November 1906, pp. 21–3:

La cour de Louis XIV s'accommodait de voir assemblés, chaque deux ans, les *Tableaux et pièces de sculpture* des membres de l'Académie; les étroites limites de la curiosité et de la production n'exigeaient point davantage. Dès les successeurs du Grand Roi s'ouvre l'ère des expositions dissidentes: Expositions de l'Académie de Saint-Luc, Expositions du Colisée, sans compter les passionnantes Expositions de la Jeunesse. Le XIXe siècle est jalonné jusqu'à son terme, par des manifestations, individuelles ou collectives, affectant parfois un caractère nettement protestataire: telle celle qui se produisit en 1863, sous le couvert de l'Etat. Plus tard (1890), s'instituera, en face du Salon bi-séculaire, le Salon de

la Societé Nationale et, voici que depuis 1903 les doubles assises de mai trouvent, dans le Salon d'Automne, une suite inattendue, bientôt jugée logique et normale.

Ses libres allures le rapprochent du Salon des Indépendants ou encore des Expositions impressionistes, de glorieuse mémoire; mais le programme parait plus vaste et les éléments constitutifs sont plus variés à raison de l'ambition évidente de faire la somme des initiatives d'où qu'elles viennent, en quelque sens qu'elles soient dirigées. . . . On y peut suivre l'essor des derniers venus dont le labeur n'apparait, au cours de l'an, que disséminé, morcelé, fragmenté: on y goûte le talent inédit, dans la verde parfois un peu acre de ces prémices: on s'y édifie au long sur ce que Duranty appelait naguère les tendances de la 'Nouvelle Peinture'.

For Picasso's ambience and market in these years: Douglas Cooper, 'Early Purchasers of True Cubist Art', in Douglas Cooper and Gary Tinterow, *The Essential Cubism 1907–20*, Tate Gallery, London, 1983, pp. 15–31; Daniel-Henry Kahnweiler, *Mes Galeries et mes peintres*, Paris, 1961 (*My Galleries and Painters*, trans. Helen Weaver, London, 1971), especially Ch. 2; Fernande Olivier, *Picasso et ses amies*, Paris, 1933 (*Picasso and his Friends*, trans. Jane Miller, London, 1964); Roland Penrose, *Picasso: His Life and Work*, London, 1958, Chs. 4–6; Harrison C. and Cynthia A. White, *Canvases and Careers: Institutional Change in the French Painting World*, New York, 1965.

For the early criticism of Cubism, Fry, *op. cit.* Apollinaire's criticism has been well edited: *Guillaume Apollinaire: Chroniques d'Art (1902–1918)*, ed. L.-C. Breunig, Paris, 1960, and *Méditations esthétiques: les peintres cubistes* [1913], ed. L.-C. Breunig and J. A. Chevalier, Paris, 1965. Braque's remark about him was made to Francis Steegmuller who reports it in his *Apollinaire: Poet among the Painters*, Harmondsworth, 1973, p. 130.

6. An attempt to systematize influence statements is Gören Hermerén, *Influence in Art and Literature*, Princeton, 1975, with bibliography.

My instances of Picasso's address to Cézanne are mainly drawn from John Golding, *op. cit.*, pp. 49–51 and 68–71.

7. On the matter of accommodating sub-reflective dispositional actions within a pattern of rational explanation, C. G. Hempel, 'Explanation in Science and History', in W. H. Dray (ed.), *Philosophical Analysis and History*, New York, 1966, pp. 95–126, especially 115–23, is helpful.

For Protogenes not knowing when to stop, Pliny, *Naturalis Historia*, XXXV, 80. For *Apelles faciebat*, Pliny, *Naturalis Historia*, Praef. 26. Picasso's agreement with Kahnweiler is often reproduced: for instance in Daniel-Henry Kahnweiler, *My Galleries and Painters*, London, 1971, fig. [9] and pp. 154–5.

8. Kahnweiler on Picasso's 'problems', *Der Weg zum Kubismus*, Munich, 1920, pp. 18–20:

Der Beginn des Kubismus! Der erste Anlauf. Verzweifeltes, himmelstürmendes Ringen mit allen Problemen zugleich.

Mit welchen Problemen? Mit den Urproblemen der Malerei: der Darstellung des Dreidimensionalen und Farbigen auf der Fläche, und seiner Zusammenfassung in der Einheit dieser Fläche. 'Darstellung' aber und 'Zusammenfassung' im strengsten, höchsten Sinne. Nicht Vortäuschung der Form durch Helldunkel, sondern Aufzeigung des Dreidimensionalen durch Zeichnung auf der Fläche. Keine gefällige 'Komposition', sondern